File Enforcement
NM 0890010515

LIBRARY COPY

ENTERED

0100
FFCO

EXHIBIT B

LOS ALAMOS NATIONAL LABORATORY

MIXED WASTE SITE TREATMENT PLAN

COMPLIANCE PLAN VOLUME (CPV)

BACKGROUND VOLUME

August 17, 1995 (Draft - for public comment)

1751

TL/TO

1.0 PURPOSE AND SCOPE

1.1 Introduction

On October 6, 1992, Congress passed the Federal Facility Compliance Act (FFC Act) to address compliance by the United States Department of Energy (DOE) with the land disposal restrictions (LDR) for the storage of mixed waste set forth in Section 3004(j) of RCRA. The FFC Act requires the DOE to submit a Site Treatment Plan (STP) for developing treatment capacities and technologies to treat all of the facility's mixed waste, regardless of the time generated, to the standards promulgated pursuant to Section 3004(m) of RCRA. The FFC Act provides that the appropriate regulatory authority, the New Mexico Environment Department (NMED), may approve, approve with modifications or disapprove the STP. Prior to making such a determination, NMED is required by FFC Act to provide public notice, consider public comments, consult with the Environmental Protection Agency (EPA) and any other state in which a facility affected by the STP is located.

On March 31, 1995, DOE submitted its proposed STP to NMED. On April 17, 1995, the public was given notice of and an opportunity to comment to NMED on the draft STP submitted by DOE. After considering public comment and otherwise complying with the FFC Act, NMED determined to approve the draft STP with modifications as provided for below. Although not required by the FFC Act, NMED is providing the public with the additional opportunity to comment upon the STP as it is proposed to be approved by the NMED.

The STP is intended to fulfill the requirements of the FFC Act and establish an enforceable framework to allow DOE to achieve full compliance with LDR requirements under the New Mexico Hazardous Waste Act (HWA) and RCRA. The compliance dates set forth herein are enforceable time periods in which DOE will be required to develop treatment capacities and technologies, and treat or otherwise meet the requirements set forth for LDR under the HWA and RCRA. The STP will be fully implemented by a Compliance Order issued by NMED on or before October 6, 1995.

1.2 Contents

The STP contains two volumes and is intended to bring LANL into compliance with LDR storage prohibitions under the HWA and RCRA. The Compliance Plan Volume of the STP provides overall schedules, including compliance dates, for achieving compliance with LDR storage and treatment requirements for mixed waste at LANL. The Compliance Plan includes a schedule for the submittal of applications for permits, construction of treatment facilities, technology development, off-site transportation for treatment, and the treatment of mixed wastes in full compliance with the HWA and the implementing regulations at 20 NMAC 4.1, which incorporates by reference 40 CFR Parts 260 through 270. The Background Volume of

the STP contains progress reports as required in the Compliance Order. Respondents shall carry out the activities described in the STP, including the Compliance Plan Volume of the STP, in accordance with the schedules and requirements set forth in the STP and the Order.

2.0 Compliance Schedules

The STP provides overall schedules for achieving compliance with LDR storage and treatment requirements for mixed waste at LANL. The schedules include those activities required to bring existing waste treatment technologies into operation, process backlogged and currently generated waste, include schedules required to develop new facilities and capacity for treatment and establish an overall time frame for achieving compliance with the LDR requirements under the HWA and 20 NMAC 4.1.

2.1 Categories of Activities for Compliance Dates

The categories of activities for which compliance dates will be provided for different types of treatment approaches in the STP are listed in the tables below. The categories of activities are based on Section 3021(b)(1)(B)(I), (ii), and (iii) of the RCRA, to the extent appropriate.

2.1.1 Plans Where Treatment Technology Exists

For most of the mixed waste, treatment technologies have been identified and developed. For the waste that will be treated on-site, the categories of activities for compliance dates identified in Table I shall apply. Compliance dates for the activities identified in Table I may be found in Section 3.1.

Table I. Categories of Activities for Compliance for Mixed Waste with Existing Treatment Technologies.

A.	Submit appropriate RCRA permit applications to the NMED.
B.	Initiate construction
C.	Complete system testing and commence operation
D.	Begin treating mixed waste

2.1.2 Plans Where Technology Must Be Developed

For some mixed waste, no treatment technologies have been identified and developed, or the treatment technology must be modified or adapted to apply to such waste. For the waste that will be treated on-site, the categories of activities for compliance dates are identified in Table II and shall apply. Compliance dates for the activities identified in Table II may be found in Section 3.2.

Table II. Categories of Activities for Compliance Dates for Mixed Waste Without Existing Treatment Technologies.

A. Identify and develop technology. B. Submit appropriate RCRA permit application to NMED or C. Submit a Notification of intent to perform treatability study to the NMED a minimum of 45 days prior to commencement of the study. D. Initiate construction. E. Commence systems testing F. Begin treating mixed waste

2.1.3 Requirements Pertaining to Radionuclide Separation

The FFC Act sets additional requirements in cases in which DOE intends to conduct radionuclide separation of mixed waste. Should the DOE determine to do radionuclide separation of such mixed waste, DOE will schedule specific compliance dates based on category activities identified in Table III. "Radionuclide separation" shall mean segregating the radioactive portion of the mixed waste from the hazardous portion of the mixed waste.

Table III. Categories of Activities for Compliance Dates for Radionuclide Separation of Mixed Waste

A. Complete an estimate of the volume of waste generated by each case of radionuclide separation. B. Complete an estimate of the volume of waste that would exist or be generated without radionuclide separation. C. Complete an estimate of the costs of waste treatment and disposal if radionuclide separation is used compared with the estimated costs if it is not used. D. Provide the assumptions underlying such estimates of waste volumes and cost estimates. E. Provide characterization methodologies for determining waste type. F. Submit a plan for treating or managing hazardous waste residues, accomplished by an appropriate RCRA permit application.

2.1.4 Plans for Mixed Waste to be Shipped Off-site for Treatment

Should DOE decide to treat waste at an off-site facility in lieu of plans to treat such waste on-site, the DOE shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for off-site treatment in accordance with the revision process

pursuant to the Compliance Order.

Table 2-4 Activities for Mixed Waste to be Shipped Off-Site for Treatment

a) Request necessary approval from NMED for shipment of waste b) Meet all regulatory requirements for off-site shipment c) Provide documentation to NMED that waste has been received at an off-site facility for treatment, disposal or storage pending treatment or disposal.

2.1.5 Plans Related to Other Mixed Waste Activities

1. Activities other than the types of activities specifically called for in the FFC Act as requiring schedules are described in this STP. Some of these activities may be associated with schedules which may contain compliance dates related to treatment of the DOE's mixed waste.

2. For mixed waste which is not sufficiently characterized to allow identification of appropriate treatment, notification of the characterization of such waste shall be in accordance with the revision process pursuant to the Compliance Order.

3.0 LOW-LEVEL MIXED WASTE STREAMS

This section presents proposed schedules for treatment technologies and the preferred options to treat low-level mixed waste streams (LLMW) at LANL. All preferred options described below must be approved by NMED in accordance with the revision process pursuant to the Compliance Order.

3.1 Mixed Waste Streams for Which Technology Exists

The following subsections summarize LLMW treatability groups for which technology exists.

3.1.1 Commercial Off-site Treatment by Thermal Treatment

Treatability Group(s):

LLMW for Commercial Thermal Treatment (MWIR Treatment ID DS-S001)

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
IPA wastes	LA-W901	D001, D009, F002, F003, F005	104	15.89
scintillation fluids	LA-W902	D001, F003, F005	18	2.47
Totals			122	18.36

Treatment Technology:

The waste will be treated at an off-site commercial facility that combusts organic liquid waste.

Activity	Compliance Dates
A. Meet all regulatory requirements prior to shipping waste	9/30/96
B. Complete shipping waste	12/30/96
C. Provide documentation to NMED that waste was received at off-site facility	Within 30 days of receipt of waste

3.1.2 Commercial Off-site Treatment by Stabilization or Macroencapsulation

Treatability Group(s):

LLMW for Commercial Stabilization

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (M^3)
lead blankets	LA-W903	D007, D008	4	0.74
soil with heavy metals	LA-W904	D004, D005, D006, D007, D008, D009,	59	10.53
ER soils	LA-W905	D028, D029, F001, F005 D010, D011	36	39.32
Totals			99	50.59

Treatment Technology:

The waste will be treated at an off-site commercial facility that stabilizes or macroencapsulates wastes.

Activity	Compliance Dates
A. Meet all regulatory requirements prior to shipping waste	05/30/97
B. Complete shipping waste	09/30/97
C. Provide documentation to NMED that waste was received at off-site facility	Within 30 days of receipt of waste

3.1.3 Evaporative Oxidation (MWIR Treatment ID GJ-S801C)

Treatability Group(s):

LLMW for Evaporative Oxidation/Off-site Treatment (preferred option)

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
aqueous organic liquids	LA-W906	D001, D002, D005, D007, D008, D010, D018, D019, D022, D027, D028, D030, D032, D033, D036, D037, D038, D039, D041, D042, D043, F001, F002, F003, F004, F005	45	1.65
Totals			45	1.65

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated off-site and operated on-site. Shipment off-site for treatment is a parallel preferred option. Should DOE decide to treat waste at an off-site facility in lieu of plans to treat such waste on-site, the DOE shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for off-site treatment in accordance with the revision process pursuant to the Compliance Order.

Activity	Compliance Dates
A. Submit appropriate permit application to NMED	12/30/96
B. Initiate construction	01/04/99
C. Complete system test and commence operation	3/17/99
D. Begin treating mixed waste	3/17/99
E. Complete treatment of existing wastes to applicable regulatory standards	11/09/99

3.1.4 Thermal Desorption (MWIR Treatment ID GJ-S801B)

LLMW for Thermal Desorption/Off-site Treatment (preferred option)

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
organic-contaminated combustible solids	LA-W911	D001, F001, F002, F003, F005	307	28.32
Totals			307	28.32

LLMW for Thermal Desorption

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
organic-contaminated noncombustible solids	LA-W919	D001, D003, D004, D005, D006, D007, D008, D009, D010, D011, D027, D030, D032, D033, D034, D042, D043, F001, F002, F004, F005	80	7.82
Totals			80	7.82

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated off-site and operated on-site. Should DOE decide to treat waste at an off-site facility in lieu of plans to treat such waste on-site, the DOE shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for off-site treatment in accordance with the revision process pursuant to the Compliance Order.

Activity	Compliance Dates
A. Submit appropriate permit application to NMED	11/16/98
B. Initiate construction	As specified in RCRA permit
C. Complete system testing and commence operations	01/02/01
D. Begin treating mixed waste	01/02/01
E. Complete treatment of existing wastes to applicable regulatory standards	02/02/01

3.1.5 Macroencapsulation (MWIR Treatment ID PX-S803)

Treatability Group(s):

LLMW for Macroencapsulation/Off-site treatment (preferred option)

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
combustible debris	LA-W912	D001, D002, D003, D005, D006, D007, D008, D009, D011, D035, F001, F002, F003, F005	83	13.82
Totals			83	13.82

LLMW for Macroencapsulation

Treatability group		RCRA codes	Number of items	Net volume (m3)
activated or inseparable lead	LA-W921	D008	74	15.60
noncombustible debris	LA-W922	D001, D004, D005, D006, D007, D008, D009, D010, D011	41	5.62
Totals			115	21.22

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated off-site and operated on-site. Should DOE decide to treat waste at an off-site facility in lieu of plans to treat such waste on-site, the DOE shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for off-site treatment in accordance with the revision process pursuant to the Compliance Order.

Activity	Compliance Dates
A. Submit appropriate permit application to NMED	01/04/98
B. Initiate construction	As specified in RCRA permit
C. Complete system testing and commence operation	02/01/00
D. Begin treating complete processing mixed waste	02/01/00
E. Complete treatment of existing wastes to applicable regulatory standards	08/25/00

3.1.6 Chemical Plating Waste Treatment Skid (MWIR Treatment ID LA-S004)

Treatability Group(s):

LLMW for Chemical Plating Waste Skid/Off-site Treatment (preferred option)

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
aqueous wastes with heavy metals	LA-W913	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011	203	1.85
corrosive solutions	LA-W914	D001, D002	162	1.36
aqueous cyanides, nitrates, chromates, and arsenates	LA-W915	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, F007, P029, P098	15	0.13
Totals			380	3.34

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated off-site and operated on-site. Should DOE decide to treat waste at an off-site facility in lieu of plans to treat such waste on-site, the DOE shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for off-site treatment in accordance with the revision process pursuant to the Compliance Order.

Activity	Compliance Dates
A. Resubmit revised permit application to NMED	10/30/95
B. Initiate construction	As specified in RCRA permit
C. Complete system testing and commence operations	03/17/99
D. Begin treating mixed waste	03/17/99
E. Complete treatment of existing wastes to applicable regulatory standards	05/08/00

3.1.7 Water-reactive Metals Treatment Skid (MWIR Treatment ID LA-S003)

Treatability Group(s):

LLMW for Water-Reactive Metals Skid

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
water-reactive wastes	LA-W916	D001, D003	78	6.03
Totals			78	6.03

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated on-site and operated on-site.

Activity	Compliance Dates
A. Submit appropriate permit application to NMED	**06/30/01**
B. Initiate construction	**As specified in RCRA permit**
C. Complete system testing and commence operations	**09/09/03**
D. Begin treating mixed waste	**09/09/03**
E. Complete treatment of existing wastes to applicable regulatory standards	**04/21/04**

3.1.8 Gas-scrubbing Skid (MWIR Treatment ID LA-S801)

Treatability Group(s):

LLMW for Gas-Scrubbing Skid

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
compressed gases requiring scrubbing	LA-W917	D001, D002, P056	13	0.35
Totals			13	0.35

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated on-site and operated on-site.

Activity	Compliance Dates
A. Submit permit application to NMED	03/10/98
B. Initiate construction	As specified in RCRA permit
C. Complete system testing and commence operations	05/10/02
D. Begin treating mixed waste	05/10/02
E. Complete treatment of existing wastes to applicable regulatory standards	08/28/03

3.1.9 Gas Oxidation Skid (MWIR Treatment ID LA-S801)

Treatability Group(s):

LLMW for Gas Oxidation Skid

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
compressed gases requiring oxidation	LA-W918	D001	6	0.08
Totals			6	0.08

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated on-site and operated on-site.

Activity	Compliance Dates
A. Submit appropriate permit application to NMED	03/10/98
B. Initiate construction	As specified in RCRA permit
C. Complete system testing and commence operations	05/10/02
D. Begin treating-mixed waste	05/10/02
E. Complete treatment of existing wastes to applicable regulatory standards	08/28/03

3.1.10 Mercury Amalgamation (MWIR Treatment ID PI-S801)

Treatability Group(s):

LLMW for Amalgamation

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
elemental mercury	LA-W920	D006, D009, F005	45	0.50
Totals			45	0.50

Treatment Technology

The waste will be treated in a mobile treatment unit that will be fabricated off-site and operated on-site.

Activity	Compliance Dates
A. Submit appropriate permit application to NMED	01/30/98
B. Initiate construction	As specified in RCRA permit
C. Complete system testing and commence operations	06/05/00
D. Begin treating mixed waste	06/05/00
E. Complete treatment of existing waste to applicable regulatory standards	11/15/00

3.2 Mixed Waste Streams for Which Technology Requires Adaptation or for Which No Technology Exists

The following subsections summarize mixed waste streams for which technology requires adaptation or for which no technology exists.

3.2.1 Hydrothermal Processing

Treatability Group(s):

LLMW for Hydrothermal Processing/Off-site Treatment (preferred option)

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
halogenated organic liquids	LA-W907	D001, D002, D003, D007, D009, D018, D019, D022, D028, D029, D035, D043, F001, F002, F003, F005, U077, U080, U226, U227, U228, U236	385	16.58
nonhalogenated organic liquids	LA-W908	D001, D002, D003, D004, D007, D008, D009, D011, D018, D038, D040, F002, F003, F004, F005, U002, U019, U169, U188, U220, U246	275	14.34
bulk oils	LA-W909	D002, D004, D005, D006, D007, D008, D009, D010, D011, D021, D027, D039, F001, F002, F003, F005	28	3.75
PCB wastes with RCRA components	LA-W910	D008, D039, F002	4	0.74
Totals			692	35.41

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
inorganic solid oxidizers	LA-W923	D001, D003, D005	55	0.20
Totals			55	0.20

Treatment Technology:

The waste will be treated in a mobile treatment unit that will be fabricated on-site and operated on-site. LANL has an RD&D RCRA permit for this technology that would have to be modified for mixed waste studies if development of the process exceed volume limits of treatability studies. Should DOE decide to treat waste at an off-site facility in lieu of plans to treat such waste on-site, the DOE shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for off-site treatment in accordance with the revision process pursuant to the Compliance Order.

Activity	Compliance Dates
A. Complete technology development	09/30/96
B. Submit appropriate permit application to NMED, or	3/30/97
C. Submit a notification of intent to perform treatability study to the NMED a minimum of 45 days prior to commencement of study	3/30/97
D. Initiate construction	As specified in RCRA permit
E. Commence system testing	As specified in RCRA permit
F. Complete treatment of existing waste to applicable regulatory standards	As specified in RCRA permit

3.3 Mixed Waste Requiring Further Characterization or for Which Technology Assessment Has Not Been Done (MWIR Treatment ID LA-S701)

Treatability Group(s):

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m3)
lead wastes - TBD	LA-W924	D003, D008	186	51.44
mercury wastes - TBD	LA-W925	D007, D008, D009, F001	63	18.30
compressed gases - TBD	LA-W926	D001, D007, D009, D022, P056, U080, U226	10	1.25
biochemical laboratory wastes	LA-W927	D001, D003	9	1.34
dewatered treatment sludge	LA-W928	see Subsection 3.3 in the Background Volume	1288	268.17
Totals			1556	340.50

Treatment Technology:

The following steps will be taken to properly characterize this waste:

- Conduct additional generator interviews
- Prepare a sampling plan for waste not adequately characterized
- Conduct sampling and analysis
- Determine treatment options

Activity	Compliance Dates
A. Complete generator interviews	10/30/95
B. Complete sampling and analysis plan	1/30/96
C. Complete sampling and analysis	9/30/98
D. Complete determination of treatment options	12/20/98

3.4 Plans for Other Types of Activities

The following subsection summarizes plans for other types of activities.

3.4.1 Lead Decontamination (MWIR Treatment ID LA-S001)

Treatability Group(s):

Treatability group	MWIR waste ID	Net volume (m3)	Preferred option
lead for surface contamination	LA-W930	56.20	lead decontamination trailer
Totals		56.20	

Treatment Technology:

Lead bricks and shapes will be decontaminated for recycle in an on-site decontamination trailer. The trailer is on-site and has operated, but needs an upgrade for prolonged operation.

Activity	Compliance Date
complete lead decontamination	09/30/97

3.4.2 Sorting, Surveying, and Decontamination (MWIR Treatment ID GJ-S804)

Treatability Group(s):

Treatability group	MWIR waste ID	Number of items	Net volume (m3)
nonradioactive or suspect waste items to be surveyed	LA-W929	1250	14.24
Totals		1250	14.25

Treatment Technology:

This field operation will survey waste suspect of radioactive contamination to determine whether it is radioactively contaminated. The work will be done on-site with equipment and staffing provided by another DOE-site. Waste determined not to be radioactively contaminated will be treated using commercial facilities permitted to treat hazardous waste.

Activity	Compliance Dates
begin survey	9/30/95
complete survey	10/30/96

4.0 MIXED TRANSURANIC WASTE

Treatment Group(s):

Assorted Mixed Transuranic Waste

Treatment Technology

Respondents are required to develop treatment technologies and treat mixed transuranic (MTRU) waste at LANL. In the event DOE determines to dispose of MTRU waste at WIPP because (1) EPA grants DOE's "No-Migration Petition"; (2) NMED and EPA have approved any proposed variances from treatment standards for land disposal for MTRU waste; (3) WIPP opens for receipt of waste and (4) disposal of MTRU waste is otherwise a practicable option, Respondents shall immediately notify the NMED Project Manager in writing. DOE shall request approval from NMED for the treatment of MTRU waste to be disposed at WIPP in accordance with the revision process set forth in the Compliance Order.

Activity	Compliance Dates
Development of treatment technologies or schedules	December 31, 1998
Submit appropriate permit application to NMED for treatment of mixed tru waste	June 30, 1999
Begin treating mixed tru waste	December 31, 1999
Complete treatment of existing mixed tru waste to applicable regulatory standards	December 31, 2010

PROPOSED SITE TREATMENT PLAN FOR LOS ALAMOS NATIONAL LABORATORY

BACKGROUND VOLUME

Contents

Executive Summary iv
Acronyms and Abbreviations ix
1.0 INTRODUCTION 1
1.1 Purpose and Scope 1
1.2 Site History and Mission 3
1.3 Framework For Developing DOE's Site Treatment Plans 3
1.4 Organization of the Proposed Site Treatment Plan 5
1.5 Related Activities 6
1.5.1 Mixed Waste Inventory Report 6
1.5.2 NEPA Activities 7
1.5.3 Compliance Agreements 8
1.5.4 DOE-AL Mixed Waste Treatment Plan 9
2.0 METHODOLOGY 9
2.1 Assumptions 10
2.2 Selection Process for Preferred Options 13
2.3 Coordination with Regulatory Agencies and Other Stakeholders 15
2.3.1 Major Stakeholder Issues 16
2.4 Characterization of Mixed Waste 18
2.5 Waste Minimization 21
2.5.1 Program Elements 22
2.5.2 Awareness Initiatives 23
2.5.3 Applying Commercial Waste Minimization Solutions to LANL Needs 24
3.0 LOW-LEVEL MIXED TREATABILITY GROUPS 24
3.1 Mixed Treatability Groups for Which Technology Exists 27
3.1.1 Commercial Thermal Treatment (MWIR Treatment ID DS-S001) 28
3.1.2 Commercial Stabilization (MWIR Treatment ID LA-S806) 29
3.1.3 Controlled-Air Incinerator/Evaporative Oxidation (MWIR Treatment ID LA-S007/GJ-S801C) 30
3.1.4 Controlled-Air Incinerator/Hydrothermal Processing (MWIR Treatment ID LA-S007/LA-S084) 33
3.1.5 Controlled-Air Incinerator/Thermal Desorption (MWIR Treatment ID LA-S006/GJ-S801B) 34
3.1.6 Controlled-Air Incinerator/Macroencapsulation (MWIR Treatment ID LA-S006/PX-S803) 35
3.1.7 Chemical Plating Waste Skid (MWIR Treatment ID LA-S004) 35
3.1.8 Water-Reactive Metals Skid (MWIR Treatment ID LA-S003) 37
3.1.9 Gas Scrubbing Skid (MWIR Treatment ID LA-S801) 37
3.1.10 Gas Oxidation Skid (MWIR Treatment ID LA-S801) 38
3.1.11 Thermal Desorption (MWIR Treatment ID GJ-S801B) 39

3.1.12 Amalgamation (MWIR Treatment ID PI-S801) 39
3.1.13 Macroencapsulation (MWIR Treatment ID PX-S803) 40
3.2 Mixed Treatability Groups for Which Technology Exists But Needs Adaptation or for Which No Technology Exists 40
3.2.1 Hydrothermal Processing (MWIR Treatment ID LA-S804) 41
3.2.2 DETOX Process (MWIR Treatment ID LA-S005) 42
3.3 Mixed Treatability Groups Requiring Further Characterization or for Which Technology Assessment Has Not Been Done (MWIR Treatment ID LA-S701) 42
3.4 Other Types of Mixed Waste Activities 43
3.4.1 Sort, Survey, and Decontamination (MWIR Treatment ID GJ-S804) 43
3.4.2 Lead Decontamination Trailer (MWIR Treatment ID LA-S001) 45
3.4.3 Lead Requiring Sorting (MWIR Treatment ID LA-S701) 45
4.0 TRU MIXED TREATABILITY GROUPS 46
4.1 TRU Treatability Groups Expected to Go to the WIPP 46
4.3 Characterization of TRU Mixed Waste 47
4.4 Site-specific Activities for Characterizing Mixed Transuranic Waste 48
4.4.1 Capabilities 48
4.4.2. Assumptions 50
4.4.3 Summary of Characterization Activities for MTRU Waste 50
4.5 Site-specific Schedule for Managing Mixed Transuranic Waste 50
4.6 TRU Waste Not Destined for WIPP 51
5.0 HIGH-LEVEL MIXED TREATABILITY GROUPS 52
6.0 FUTURE GENERATION OF MIXED TREATABILITY GROUPS 52
6.1 Environmental Restoration Waste 52
6.2 D&D Waste 53
6.3 Other Waste 53
7.0 STORAGE OF AFFECTED WASTES 55
7.1 Low Level Mixed Treatability Groups 55
7.1.1 Storage Configuration 56
7.2 TRU Mixed Treatability Groups 56
7.2.1 Storage Configuration 57
7.2.2 Future Configuration 57
8.0 PROCESS FOR EVALUATING DISPOSAL ISSUES IN SUPPORT OF THE STP DISCUSSIONS 57
8.1 Background 58
8.2 Disposal Planning Process 59
8.2.1 Activities to Date 59
8.2.2 Next Steps in the Evaluation Process 61
8.3 Integration with the STP Process 63
8.4 Site-specific Options 63

Appendix. Methodology Used to Select Preferred and Alternate Options to Treat Low-level Mixed Waste at Los Alamos National Laboratory A-1

PROPOSED SITE TREATMENT PLAN FOR LOS ALAMOS NATIONAL LABORATORY

BACKGROUND VOLUME

1.0 INTRODUCTION

1.1 Purpose and Scope

The Department of Energy (DOE) is required by section 3021(b) of the Resource Conservation and Recovery Act (RCRA), as amended by the Federal Facilities Compliance Act (the Act or FFCAct) to prepare site treatment plans (STPs or plans) describing the development of treatment capacities and technologies for treating mixed waste. Plans are required for facilities at which DOE generates or stores mixed waste, defined by the Act as a waste containing both a hazardous waste subject to RCRA and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954 (42 USC 2011 *et seq.*). The Proposed Site Treatment Plan (PSTP or Proposed Plan) of Los Alamos National Laboratory (LANL) is being provided to the State of New Mexico for approval in accordance with the Act.

The LANL Proposed Plan is the result of a bottom-up process described in a notice in the April 6, 1993, *Federal Register* (58 FR 17875). DOE has followed and iterative process in developing the Plans, working closely with State regulatory agencies and the Environmental Protection Agency (EPA) at the site and national level throughout the process. This Proposed Plan follows two interim versions—a Conceptual Site Treatment Plan (CSTP) submitted in October 1993 and a Draft Site Treatment Plan (DSTP) submitted in August 1994, which were provided to regulatory agencies and made publicly available. The CSTP identified a range of preliminary options for treating the mixed waste at LANL. The DSTP identified site-specific preferred treatment options that had not been evaluated for impacts on other DOE sites or to the overall DOE program. DOE initially planned to submit the Proposed Plans at the end of February 1995. However, DOE revised its submittal date with the support of the States and EPA to allow for additional discussions. See 60 FR 10840 (February 28, 1995). The LANL CSTP and DSTP and other information are available at the Los Alamos National Laboratory Community Reading Room, 1350 Central Avenue, Los Alamos, New Mexico.

This Proposed Plan contains DOE's preferred options developed after evaluation and integration of the site-specific treatment options contained in the Draft Plans of other sites with DOE mixed waste. The process DOE followed was coordinated with State and EPA regulators and is described in Subsection 2.2. DOE believes the treatment options contained in the Proposed Plans represent a sensible national configuration for mixed waste treatment systems that balances DOE's interests and concerns and the input DOE received on the Draft Plans from the regulatory agencies and others.

The Proposed Plan also contains schedules for building mobile treatment units and a support building for operating these units. However, the schedules in this Proposed Plan have not yet been integrated with those of other DOE sites from a technical, complex-wide perspective. Moreover, DOE faces increasingly tight budgets throughout the DOE complex and anticipates that funding will continue to be constrained. The schedules in this and other Plans reflect those constraints. DOE is providing schedules to support further discussions with the expectation that schedules in the approved Plans will differ for some sites from the schedules in the Proposed Plans.

The schedules contained in this and the Proposed Plans for other sites are based on funds currently budgeted for and projected to be available for waste management activities. As a result, schedules in the Proposed Plans for some facilities, particularly the largest and most costly facilities, may be protracted. Schedules for small sites that rely on the treatment capacity at larger sites are also affected. DOE anticipates that, at some sites, funds will be shifted from other environmental management activities to support more sensible and integrated schedules for mixed waste treatment.

DOE discussed with States and EPA the difficulty DOE faces in providing timely schedules for some new treatment facilities, given current budgetary constraints and the need to consider whether funds from other activities should be shifted to support more timely schedules. The States and EPA recommended that the Proposed Plans be submitted with schedules consistent with current budget and priorities, even though they recognized that schedules may be extended. As part of its efforts to develop its budget request for FY 1997, DOE has asked regulatory agencies to work with DOE and other interested parties at the site and national levels to assist DOE in prioritizing its activities, including mixed waste treatment, and in assessing activities that are underway and that must be accomplished at the site. Though this budget development process and through discussions of the Proposed Plans, DOE and regulatory agencies expect that some schedules will be revised before the Site Treatment Plans are approved and orders issued.

Even after the Plans are approved, DOE anticipates that modifications and adjustment to the Plan will be necessary because of the technical and funding uncertainties that naturally exist with long-term activities like those covered by the Plans. For example, emerging or new technologies not yet considered may be identified in the future that provide opportunities to manage waste more safely, effectively, and at lower cost than the current technologies identified in the Proposed Plan. DOE will continue to evaluate and develop technologies that offer potential advantages in public acceptance, risk abatement, and performance and life-cycle cost. Should more promising technologies be identified, DOE may request a modification of its treatment plan in accordance with provisions of the final Site Treatment Plan and/or the Order.

This Background Volume is one of the two volumes that constitute the PSTP and is submitted for informational purposes only. It provides a detailed discussion of the

preferred option or options, identifies the waste streams the option addresses, and gives explanatory information for the Compliance Plan Volume. The Compliance Plan Volume identifies the capacity to be developed and associated schedules as required by the Act.

1.2 Site History and Mission

LANL is a multidisciplinary research laboratory in Los Alamos County, New Mexico. Its original mission to design, develop, and test nuclear weapons has been broadened and has evolved as technologies, US priorities, and the world community have changed. Today LANL uses the core technical competencies developed for defense programs to carry out both national security responsibilities and broadly based programs in energy, nuclear safeguards, biomedical science, environmental protection and cleanup, computational science, materials science, and other basic sciences. An intermediate role for LANL—between academic and industrial research—will help expedite the development and commercialization of emerging technologies. In all its programs, LANL continues to maintain an intellectual environment that is open to new ideas. DOE is committed to ensuring that all its activities are designed to protect its employees, the public, and the environment.

The Waste Management Facilities Operations Group, CST-27, is responsible for all waste management facilities at the Laboratory, except those related to high-explosives waste and sanitary waste, and those operated by waste generators in preparing their wastes for disposal. The Waste Management Program includes treating radioactive liquid and solid waste; packaging, transporting, treating, and disposing of hazardous chemical waste; and operating the disposal and storage sites for mixed waste.

The Environmental Restoration Project (ER) remedies environmental problems by assessing, cleaning up, and overseeing the decontamination and decommissioning of LANL facilities. The Waste Management Program provides treatment, storage, and disposal for ER-generated waste.

1.3 Framework For Developing DOE's Site Treatment Plans

LDR requirements. The RCRA Land Disposal Restrictions (LDRs) require the treatment of hazardous waste (including the hazardous component of mixed waste) to certain standards before the waste can be land-disposed, and prohibit storage of hazardous waste that does not meet LDR standards except to accumulate sufficient quantities to facilitate proper recovery, treatment, or disposal of the waste. DOE stores mixed waste inconsistent with the LDR provisions because the treatment capacity for such wastes, either at DOE sites or in the commercial sector, is not adequate or is currently unavailable.

FFCAct. The Federal Facilities Compliance Act (FFCAct), signed on October 6, 1992, waives sovereign immunity for fines and penalties for RCRA violations at federal facilities. However, the Act postpones the waiver for three years for LDR storage prohibition

violations for DOE's mixed waste and requires DOE to prepare plans for developing the required treatment capacity for its mixed waste at each site at which it stores or generates mixed waste. Each plan must be approved by the State or EPA, after consultation with other affected states and consideration of public comment, and an order must be issued by the regulatory agency requiring compliance with the plan. The Act further provides that DOE will not be subject to fines and penalties for LDR storage prohibition violations for mixed waste as long as it complies with an approved plan and order.

The Act requires the plans to contain schedules to develop capacity for mixed waste for which identified treatment technologies exist, and, for mixed waste without an identified existing treatment technology, schedules to identify and develop technologies. The Act also requires the plan to provide certain information when radionuclide separation is proposed. The Act states that the plans may provide for centralized, regional, or on-site treatment of mixed waste, or any combination of these, and requires the states to consider the need for regional treatment facilities in reviewing the plans.

Schedule. The "Schedule for Submitting Plans for the Treatment of Mixed Waste Generated or Stored at Each Site" was published in the *Federal Register* (April 6, 1993; 58 FR 17875). In the notice, DOE committed to providing the site treatment plans in three phases:

- a "Conceptual Plan" completed in October 1993,
- a "Draft Plan" completed in August 1994, and
- a "Final Proposed Plan" no later than February 1995 (DOE extended the date to April 5, 1995).

This process allows early involvement by the states and other stakeholders to discuss technical and equity issues associated with the plans.

The CSTP focused on identifying treatment needs, capabilities, and options for treating the site's mixed waste. The DSTP focused on identifying preferred options for treating the site's mixed waste. The options presented represent the site's best judgment of the available information and the states' preferences; the options were viewed as a starting point for discussion leading to the development of the Final Proposed Plan, which is being submitted to the NMED for review and approval, approval with modification, or disapproval, as required by the Act. Each version of the plan reflects discussions among states and site-specific input from the NMED and other stakeholders on the previous submittal. The DOE intended that this iterative process, with ample opportunity for input and discussion, will facilitate approval of the Site Treatment Plan and issuance of the FFCAct order required by the Act. DOE's goal is to have all plans and orders in place by October 1995.

1.4 Organization of the Proposed Site Treatment Plan

To facilitate cross-site comparisons, LANL's PSTP follows the same format as those of other DOE sites. The Proposed Plan is organized in two integrated volumes. The Background Volume provides the detailed discussion of the options:

- information on the treatability groups and treatability groups a particular treatment option or options would address,
- descriptions of uncertainties associated with that option, and
- the budget status of the option.

The Compliance Plan Volume is a short, focused document containing the preferred options and schedules for implementing the options and contains the information required by the Act. The Compliance Plan Volume also contains a mechanism to implement the plan and establish enforceable milestones. It references but does not duplicate details on the options in the Background Volume.

Sections 1.0 and 2.0. Sections 1.0 and 2.0 in both volumes contain introductory material relevant to the purpose of the volume. The Background Volume contains general information on the Proposed Plan and the site in Section 1.0 and provides top-level assumptions and a description of the process used to determine the preferred options in Section 2.0.

Sections 1.0 and 2.0 of the Compliance Plan Volume propose certain administrative provisions appropriate for implementing the finalized plan.

The specific language will be likely refined with the regulatory agency and may eventually be expanded to address other administrative provisions or incorporated into a separate consent order.

Sections 3.0 through 5.0. Sections 3.0 through 5.0 discuss the preferred option or options for low-level mixed waste (LLMW), mixed transuranic (MTRU) waste, and mixed high-level waste, and each volume discusses the same treatability groups and options in parallel sections. The Background Volume discusses the treatability groups, technology needs, and uncertainties and other details about the preferred options. The sections in the Compliance Plan Volume include proposed schedules, to the extent feasible, as required under the Act.

Section 6.0. The Background Volume includes three additional sections that are not included in the Compliance Plan Volume because they are not required by the Act and are not compliance related. Planning and anticipating treatment needs for the generation of future mixed treatability groups are discussed in Section 6.0. These treatability groups will be incorporated into the Compliance Plan Volume, and treatment approaches and schedules developed when the waste is generated.

Section 7.0. Section 7.0 discusses storage capacity needs and how compliant storage will be provided for LANL's mixed waste pending treatment.

Section 8.0. Section 8.0 describes a process used by DOE and the states to evaluate options to dispose of mixed waste treatment residues. Although the Act does not require disposal to be covered in the plans, DOE includes disposal information because it is an integral part of waste management and compliance with RCRA (that is, properly managing waste from cradle to grave).

The Proposed Plan also discusses the options selection process in the appendix. Changes in the treatability groups and preferred treatment option from the DSTP to the PSTP are discussed in the appendix.

1.5 Related Activities

Other DOE efforts are closely linked to STP development. These include the Mixed Waste Inventory Report (MWIR); activities conducted pursuant to the National Environmental Policy Act (NEPA); and compliance and cleanup agreements containing commitments relevant to mixed waste.

1.5.1 Mixed Waste Inventory Report

The MWIR, required by the Act, provides an inventory of mixed waste currently stored or generated, or expected to be generated over the next five years, at each DOE site, and an inventory of treatment capacities and technologies. The Interim Mixed Waste Inventory Report, published by DOE in April 1993, provided information on a waste stream-by-waste stream basis for each DOE site that generates or stores mixed waste. DOE made updated data on waste stream and capacity available to the states and EPA in May 1994. The May 1994 MWIR data represents the best record of DOE's mixed waste inventory at the beginning of 1994. However, because data is constantly being refined, waste stream information in LANL's Proposed Plan will differ from the May 1994 MWIR data. LANL has been recharacterizing LLMW. This work significantly changes LLMW information included in the PSTP from that currently in the MWIR. For this reason, new MWIR waste identification codes for LLMW are used in the PSTP and differ from those used in the CSTP and DSTP. Changes in waste stream information are explained in the appendix.

DOE is further updating the MWIR data. The MWIR update is being closely coordinated with preparation of the Proposed Plans to ensure maximum consistency in waste stream information between the Proposed Plans and the MWIR. The updated MWIR data will be available by June 1995.

1.5.2 NEPA Activities

The Programmatic Environmental Impact Statement for Environmental Restoration and Waste Management. DOE is preparing a Waste Management Programmatic Environmental Impact Statement (WM PEIS), which will be used to formulate and implement a waste management program in a safe and environmentally sound manner and in compliance with applicable laws, regulations, and standards. The WM PEIS will present to the public, tribes, local governments, states, EPA, other federal agencies and DOE an analysis of impacts to human health and the environment and the costs associated with a wide range of alternative strategies for managing the DOE's waste management program. The WM PEIS will examine high-level, transuranic, mixed low-level, low-level, and hazardous waste. The analysis for the waste management WM PEIS will evaluate decentralized, regional, and centralized approaches for storage of high-level waste; treatment and storage of transuranic waste; treatment and disposal of low-level and low level mixed waste; and treatment of hazardous waste.

Development of the WM PEIS is being coordinated with the preparation of the Site Treatment Plans under the FFCAct. Information being generated to support the WM PEIS (for example, hypothetical configurations, preliminary risk analyses, and cost studies) is shared with states to support STP discussions. The Draft WM PEIS will not identify a preferred alternative (that is, configuration) for mixed waste facilities because this activity will evolve in consultation with the states and EPA through the STP process. However, the WM PEIS analyses of potential environmental risks and costs associated with a range of possible waste management configurations will provide valuable insight as the public, tribes, states, EPA, and DOE discuss using existing facilities and constructing new mixed waste facilities to treat mixed waste.

The Draft WM PEIS is scheduled to be issued for public review and comment in June 1995. The DOE anticipates that the Final PEIS will be issued after a public comment period at or near the time of issuance of an order to enforce the plan by NMED. To remain flexible and accommodate potential changes, the DOE intends to prepare Records of Decision for waste issues. DOE plans to issue these after the NMED has fulfilled its legislative requirement of issuing a statutory order.

Site-Wide Environmental Impact Statement for LANL. An Advance Notice of Intent (ANOI) for the LANL Site-Wide EIS (SWEIS) was published in the *Federal Register* on August 10, 1994. The effects of the SWEIS on activities outlined in the PSTP have not been determined. Many of the proposed treatment options in this plan, the Hazardous Waste Treatment Facility, skid-mounted treatment, and the Controlled-Air Incinerator, were included in the ANOI to be considered in the SWEIS. The decision about whether the proposed options remain in the SWEIS or are addressed with separate environmental assessments or other NEPA documentation will be decided after the ANOI public meetings. Milestones, target dates, and schedules presented in the Compliance Plan Volume may be affected by the SWEIS.

Environmental assessments. DOE and LANL are preparing an Environmental Assessment (EA) for the Hazardous Waste Treatment Facility and Mixed Waste Receiving and Storage Facility (HWTF/MWRSF), proposed projects critical to the implementation of the PSTP.

Other NEPA documentation. DOE may review other proposed actions under NEPA while the WM PEIS and LANL SWEIS are underway. LANL continually prepares DOE Environmental Checklists (DECs, also called ECLs) to assist the DOE in determining the appropriate initial course of NEPA review. Several DECs currently under consideration involve waste management proposals. For example, as explained, in the LANL SWEIS ANOI (59 FR 40896), DOE is considering preparing an EA on its proposal to use portable skids to treat hazardous, low-level radioactive, and mixed wastes in various locations at LANL, in addition to the skids proposed as part of the HWTF.

1.5.3 Compliance Agreements

LANL is working to satisfy commitments contained in a Federal Facilities Compliance Agreement (FFCAgreement). The FFCAgreement was negotiated and approved by the DOE and EPA Region VI on March 15, 1994, and applies to LDR waste, the same wastes covered by the FFCAct. Upon issuance of the order under the FFCAct, the FFCAgreement will terminate.

On December 10, 1993, DOE, LANL, and the New Mexico Environmental Department (NMED) signed a final Consent Agreement (CA) addressing the remediation of TRU waste stored beneath earthen cover on Pads 1,2, and 4 at Technical Area (TA) -54, Area G. The CA requires DOE and LANL to implement an action plan to remediate the pads and place the waste in RCRA-compliant inspectable configuration by 2003. Interim CA milestones require completion of Pad 1 activity by September 1998 and Pad 4 activity by September 2000. This activity prescribes how MTRU wastes will be stored.

In order to implement the action plan required by the CA addressing the remediation of TRU waste stored beneath earthen cover on Pads 1, 2, and 4 at TA-54, Area G, LANL submitted a RCRA Part B Permit Application that included storage units for permitted storage of the retrieved waste. NMED issued a Notice of Deficiency (NOD) on this permit application on December 17, 1993. On March 15, 1994, NMED authorized relocation of the mixed waste on Pads 1, 2, and 4, contingent on the condition that LANL submit a "revised waste analysis plan containing a schedule for characterization of this mixed waste through sampling and analysis" by March 31, 1995. The plan prescribes how MTRU waste will be characterized.

DOE has also entered into a Federal Facilities Compliance Agreement (CWA-FFCAgreement) with EPA addressing violations of the Clean Water Act (CWA) at LANL. This agreement addresses violations of pollutant discharge limits at several National

Pollutant Discharge Elimination System (NPDES) outfalls throughout LANL. The CWA-FFCAgreement requires

- construction of the Sanitary Wastewater Systems Consolidation (completed);
- treatability group characterization surveys (completed);
- addressing deficiencies identified in the surveys (final due date for 100% completion is September 30, 1996);
- construction of the High-Explosive (HE) Wastewater Treatment Project by September, 1997; and
- compliance with NPDES permit limits by October, 1997.

On May 23, 1990, the EPA issued a permit jointly to DOE and the University of California under the Hazardous and Solid Waste Amendments (HSWA) of 1984 to RCRA that prescribes a specific corrective action program for LANL, which includes provisions for mitigating releases from facilities currently in operation and for cleaning up inactive sites. These activities are expected to generate currently unknown quantities of mixed waste. The permit requires all studies for corrective measures to be submitted to EPA by May 23, 2000. It is anticipated that this permit will be transferred to NMED when NMED receives HSWA authority from the EPA, possibly in the summer of 1995.

1.5.4 DOE-AL Mixed Waste Treatment Plan

The DOE–Albuquerque Operations Office (DOE-AL) has prepared a comprehensive plan (AL Mixed Waste Treatment Plan [ALMWTP]) to treat LLMW generated and stored at the nine sites managed by DOE-AL. The plan resulted from the activities of the Treatment Selection Team and includes recommendations for treating most treatability groups at DOE-AL sites, including LANL. The ALMWTP, with the FFCAgreement, forms the basis for identifying the preferred options presented in the PSTP. The ALMWTP defines how nine DOE sites will create and share mobile treatment capacity for LLMW. Additional information about the ALMWTP is in Subsection 2.2.

2.0 METHODOLOGY

The methodology for managing mixed waste parallels that included in the FFCAgreement. The FFCAgreement was negotiated and approved by the DOE and EPA Region 6 and addresses compliance with LDRs under RCRA.

Primary components. The primary components of the PSTP and the FFCAgreement are improved waste characterization and treatment. LANL generates and stores many small-volume mixed treatability groups from its R&D mission. To effectively evaluate, select, and implement treatment processes, the physical and chemical characteristics of the waste must be clearly defined. The strategy for establishing the capacity to treat mixed waste at LANL requires characterizing these wastes such that treatment processes can be evaluated

and implemented. The methodology for improved waste characterization appears in Subsection 2.4.

The plan for treating mixed waste consists of three major components:

- off-site treatment at commercial and other DOE facilities where technically and economically feasible;
- determining the feasibility of treatment of combustible waste in the Controlled-Air Incinerator (CAI), an existing facility; and
- treatment of waste that cannot be treated off-site or in the CAI that will be treated in the Hazardous Waste Treatment Facility (HWTF) using mobile skid-mounted treatment units.

Hazardous Waste Treatment Facility. The HWTF is in the definitive design phase. The HWTF will house treatment processes for LLMW and hazardous wastes that are not amenable to off-site treatment or CAI treatment. The HWTF is being designed to accommodate the fact that LANL must treat many small-volume hazardous and LLMW streams in this facility. The HWTF provides two treatment rooms for LLWM that allow concurrent operation of two mobile skid-mounted treatment units.

Skid-mounted treatment equipment will process waste in the HWTF. This equipment will allow multiple use of the treatment facility by processing waste in campaigns. When a campaign has been completed, the skid will be decontaminated and moved into storage or to another DOE site. The treatment room will then be available to process a different treatability group using a different treatment skid. Treatment of waste using skids may precede completion of the HWTF, provided that suitable facility space can be found and permitting requirements are satisfied.

Through the ALMWTP, the concept of using skid-mounted mobile treatment units has been adopted by DOE sites. Different sites are providing different skid units that will be shared. The proposed treatment options in the PSTP include the skid-mounted treatment units built at other sites and used at LANL to treat the wastes accumulated. Scheduling of these units includes coordinating their use at different sites.

2.1 Assumptions

All sites used the following assumptions for a degree of consistency in preparing the Proposed STPs. The assumptions were developed as a part of the Draft Site Treatment Plan Development Framework and reflect review and comment from the states and EPA.

1. For defense-related TRU waste, the PSTPs reflect DOE's current strategy that the Waste Isolation Pilot Project (WIPP) will open and receive a No-Migration Variance. The PSTPs identify characterization, processing, and treatment of TRU waste to meet the WIPP waste acceptance criteria (WAC). Consistent with this

policy, treatment of MTRU waste to meet LDR standards is not now included in the PSTPs.

However, the STPs recognize that DOE's policy on the WIPP is under review and may change in the future. As such, the STPs provide for the flexibility to modify activities and milestones regarding MTRU waste to reflect potential future changes in DOE policy.

Under current DOE policy, nondefense-related MTRU waste will not be disposed at the WIPP. As such, the PSTPs reflect LDR treatment of nondefense mixed MTRU waste.

2. DOE recognizes some states' preference for treating all waste on-site. Where appropriate, existing on-site capacity is used before new facilities are constructed. When on-site treatment or use of commercial or mobile facilities is not practicable, the use of existing off-site capacity and the construction of new facilities is considered.

3. Sites in the same state have investigated the practicality of consolidated treatment facilities.

4. Mixed waste resulting from activities in ER and decontamination and decommissioning (D&D) will be factored into planning activities and equity discussions, particularly when the use of facilities identified in the PSTPs is considered for managing ER and D&D waste.

5. Any changes or corrections to the MWIR treatability group and treatment facility information are explained in the PSTP appendix. Updated waste characterization information generated by recent activities will be used to update the MWIR.

6. Most of DOE's mixed waste will be treated on-site on a volume basis. Because of transportation concerns and costs, these wastes generally include process wastewater and some explosives and remote-handled waste. Other large-volume treatability groups will also generally be treated on-site. At a minimum, Richland, Oak Ridge, Idaho, and Savannah River will have on-site facilities to treat most of their wastes.

7. The WM PEIS is being prepared in parallel with the development of the STPs. The PSTP process will provide information for the WM PEIS. Each site will prepare any necessary specific NEPA documentation before proceeding with a given project or facility ordered by the state or EPA because of the STP process.

8. In support of DOE's philosophy of cradle-to-grave waste management, disposal site location and criteria will be factored into state equity discussions, waste treatment facility designs, and the characteristics of the final waste forms.

Specific assumptions and activities or processes that apply to the LANL mixed waste treatment program and this STP include the following.

1. Technology options have been identified in this plan based on whether they can be used to treat the waste to standards required by the RCRA LDR requirements provided in 40 CFR Part 268.

2. Treatability groups included in this plan are based on recent characterization work and differ from those included in Phase I of the Final MWIR. Changes to the MWIR treatability group data are explained in the appendix.

3. The LANL ER Project is being done under a HSWA module to the LANL RCRA permit that will outline the corrective action or cleanup processes at a specific site at LANL. Therefore, this plan will not address treatment technologies for ER-generated waste until the program progresses and additional information is available concerning the types and quantities of waste that will be generated.

4. Multiple technology options are not identified for every treatability group or treatability group.

5. Off-site treatment facilities that are operational have been identified as off-site facility options.

6. Waste management activities will comply with all applicable federal and State of New Mexico regulations (that is DOE orders, NEPA, National Emissions Standards for Hazardous Air Pollutants, and so forth). Variances, exemptions, and waivers provided for in regulations are available when regulatory criteria are met.

7. LANL will be able to use available commercial facilities.

8. This plan was prepared based on currently available information. Any additional characterization data that becomes available or new treatability groups generated will be presented in the annual updates. The STPs will be updated periodically reflect treatment needs of newly generated or characterized waste in the pla

9. This plan was prepared based on the ALMWTP, which outlines the treatment options for each treatability group within the DOE–A treatment assignments for each site. The ALMWTP require with and depend on one another to meet schedules to de

treatment technology. The responsibility for the ALMWTP and this PSTP will be with the DOE–AL Operations Office.

10. This plan was developed based on funding projections as they were understood February 1995. Changes in funding can impact the content and implementation of this plan.

11. As well-scoped waste management activities are identified, preparation of appropriate NEPA documentation under 10 CFR Part 1021 and DOE Order 5440.1E will proceed as directed by DOE. Under the recent delegation of DOE NEPA authority to DOE–LAAO, timing for completing the EA and other NEPA documentation should be reduced significantly. EAs under the new system should take no more than one year from submittal to determination. Categorical exclusions should take no more than one month.

2.2 Selection Process for Preferred Options

DOE-HQ support. DOE prepared several guidance documents to assist the sites in working through treatment identification and selection of preferred options. The overall process appears in the Draft Site Treatment Plan Development Framework (DSTP Framework). The DSTP Framework establishes common terminology, objectives and values, planning assumptions, and a recommended methodology for narrowing the alternatives presented in the Conceptual STP. The Treatment Selection Guide provides information on selecting among treatment options by comparing the options on such fundamental criteria as regulatory compliance; environmental, health, and safety issues; treatment effectiveness; ability to implement; stakeholder concerns; life-cycle costs; and technology development. The Draft Site Treatment Plan Cost Information Guidance provides a level of consistency in the cost information by providing common cost assumptions. Drafts of these and other technical assistance documents were provided to the states, and their comments were incorporated into the final revision.

Selection process for treatment options. Because the DSTPs were prepared by the sites using a bottom-up approach, the resulting treatment configuration, when viewed from a national level, contained many redundancies and inefficiencies. In developing the PSTPs, an assessment was performed to determine what accommodations are necessary to blend the bottom-up DSTPs into a more sensible national configuration of treatment systems. To facilitate this assessment, DOE established the Options Analysis Team (OAT) composed of site representatives and members of the Headquarters' FFCAct Task Force. The OAT coordinated its effort with the States, through the National Governors' Association, to ensure that the national mixed waste configuration reflects both the States' and the DOE's concerns. As part of this evaluation, the impacts of implementing the emerging DSTP configuration and alternative configurations were evaluated.

The focus of the OAT's efforts has been on LLMW. Although high-level waste (HLW) and MTRU are also covered by the FFCAct, the strategies for managing these wastes have already been established. However, DOE recognizes that modifications of these strategies may be needed as the programs evolve and new information becomes available.

In combination, the DSTPs form a mixed waste treatment configuration that was the baseline for the OAT analyses. Changes to the DSTP configuration proposed by the OAT are based on the following analyses:

- review of the DSTP baseline configuration to identify redundant and technically inefficient proposed treatment options;
- identification of alternative treatment configurations that emphasize key State and DOE concerns; and
- evaluation of the DSTP baseline and alternative configurations against key evaluation areas to determine what combination of treatment options results in a configuration that best meets the concerns of DOE, the States, EPA, and other stakeholders.

The results of the initial OAT analysis were shared with each of the sites, the State regulators, and DOE management. The OAT worked for several more months responding to State requests for additional analysis, incorporating ongoing site analysis, and responding to comments. As presented in the PSTPs, the resulting configuration is DOE's best attempt to balance competing DOE and stakeholder interests.

DOE-AL support. The DOE-AL has prepared the ALMWTP to address LLMW generated and stored at DOE-AL sites. DOE-AL oversees nine DOE sites that have mixed waste. The size and activities of the DOE-AL sites vary greatly, but volumes of LLMW are generally small. The total volume of LLMW for the nine sites participating in the ALMWTP is less than a volume equivalent to 7000 drums. Of the nine sites, five have less than 50 drums of waste, and three of those have less than 10 drums. The ALMWTP was prepared to address treatment of these wastes. The plan was prepared by a Treatment Selection Team made up of representatives from four of the sites and DOE-AL. The overall approach used to develop the plan was that used in the classical solution of any engineering problem:

- define the problem;
- determine what is given to work with;
- determine a basis for solution; and
- solve the problem.

The team visited each of the nine DOE-AL sites to collect available information on waste and site capabilities. Waste data was recorded and the waste categorized with common treatment approaches. Information was also gathered on off-site treatment capacity, treatment technologies, and regulations affecting treatment. The team rated alternate

treatment options for each waste group. Treatment options that rated highly or for which there were no practical alternatives were used to formulate the ALMWTP.

The ALMWTP uses the resources of the nine DOE-AL sites to create treatment capacity for mixed waste that minimizes time and cost. The plan utilizes portable treatment units, off-site treatment capacity, and the ability to survey some waste out of the radioactive designation. Each DOE-AL site is responsible for securing funding, managing, and completing specific activities outlined by the ALMWTP. An Overall Program Manager, the Grand Junction Project Office (GJPO), ensures that each site meets its obligations and manages a schedule of when mobile treatment units are available to participating sites. The activities assigned to LANL by the ALMWTP are consistent with activities included in the FFCAgreement. The preferred options presented in Section 3.0 reflect the recommendations presented in the ALMWTP.

2.3 Coordination with Regulatory Agencies and Other Stakeholders

The Act allows DOE and the state and EPA regulators who will approve the plans to cooperatively define mixed waste treatment plans. As requested by the states, DOE signed a cooperative agreement in August 1993 with the National Governors' Association (NGA) to facilitate the DOE-to-state interactions. To date, the NGA has sponsored several national meetings between DOE, the states, EPA, and the Indian tribes to discuss the development of the STPs. Two working groups have been formed to discuss technical issues related to treatment and disposal of mixed waste. NGA and the states have also reviewed and provided comment on the guidance documents discussed in Section 2.2.

The Act requires the states and DOE to provide public involvement after the final Proposed Plans are submitted to the appropriate regulatory agencies. DOE has provided additional opportunities for public input into the development of the DSTP and the proposed STP through existing public involvement mechanisms at the site.

Stakeholder involvement efforts have been implemented at several levels.

DOE-HQ national stakeholder involvement activities. At the national level, DOE has presented information on the development of STPs to the Environmental Management Advisory Board (EMAB) and will continue to provide information to the EMAB and other national groups as the STPs are developed.

DOE–HQ met with representative s from environmental organizations, civic and labor groups, and state and local governments; and DOE sites discussed the status of and issues related to the FFCAct in December 1994.

Over the two days of the meeting, DOE shared informational briefings and discussions with the participants. Each participant was provided background material on the FFCAct before the meeting. Further, each participant was asked to identify national issues that he

or she felt must be addressed by the DOE, the EPA, and the states in preparing STPs. Participants were asked to prepare and submit a brief statement describing why the issues they indicated were a national priority. Based on these issues and discussions held during the meeting, nine major topics emerged:

- DOE's efforts and tribal/stakeholder involvement in preparing the STPs;
- the role of incineration and its alternatives in the Plans;
- DOE's approach to funding and schedules for the treatment configurations proposed in the Plans;
- consideration of contingencies for the use of the WIPP and Yucca Mountain;
- resolution of issues about low-level waste and mixed low-level waste disposal;
- the role of prioritization in the Plans and its potential effects on worker health and safety;
- the values that the DOE is assuming in its approach to restoration and land use decisions;
- DOE's use of assumptions about what existing facilities may be available; and
- the potential for interstate impacts, including transportation impacts, from the treatment configuration DOE is developing.

DOE-AL stakeholder involvement activities. DOE-AL coordinates public participation associated with the implementation of the ALMWTP and participates in meetings with the state.

LANL site-specific activities for stakeholder involvement. LANL has held meetings with local governments, Pueblos, civic groups, and concerned citizens to discuss the draft STP and listen to stakeholder concerns and ideas. Some of the meetings were specific to the Act and preparation of the STP. Other meetings were part of the SWEIS (see Subsection 1.5) and included discussion of treatment options proposed in the draft STP. Meetings with new groups and follow-up meetings will continue as the STP is developed. A copy of the draft plan was put in the local public reading room.

2.3.1 Major Stakeholder Issues

Several major issues were identified from the site specific stakeholder involvement activities.

Off-site transportation of mixed waste. Off-site shipment of part of the low-level mixed waste to commercial facilities is an option in the draft site treatment plan. Although specific transportation routes have not been identified, the possible routes require transport across Pueblo lands and through neighboring communities. The safety of these shipments is a major concern. Issues include possible exposure of people along the route should an accident occur, the ability for local emergency response organizations to handle accidents, and the possibility that an accident may permanently contaminate the accident scene. The Pueblos are not sure that any emergency response organization would respond

to an accident involving mixed waste on their lands. Neither the Pueblos nor the locals communities feel they have the personnel, equipment, and training needed to respond to a transportation accident involving mixed waste.

The stakeholders in New Mexico have been sensitized to this issue by plans to move transuranic waste to the WIPP. LANL is preparing more detailed information on the quantities and types of mixed waste that would be shipped and the availability of emergency response from LANL and the DOE; DOE will continue to work with the stakeholders.

Receiving off-site waste for treatment at LANL. Although not proposed in the DSTP for LANL, other sites listed LANL as an option for treating wastes in their DSTPs, and the DOE is considering the option of moving waste between sites to consolidate treatment facilities.

The stakeholders have two concerns with off-site wastes coming to LANL. Moving waste to LANL increases the amount of waste that must be transported, thus increasing the risk of a transportation accident.

The stakeholders are also concerned that the complementary climate and the presence of on-site disposal facilities, the HWTF, and the CAI may encourage the DOE to make LANL a treatment and disposal center. There is concern about the risk that additional treatment activities would bring to local people and the environment and about the impact on how the area is perceived. Tourism is a major industry in northern New Mexico, and there is concern that moving waste to LANL could taint the area as waste-processing site rather than a tourist haven.

The State of New Mexico takes the position that with the WIPP, the state has done its part in helping the DOE solve its national waste problems. Accepting significant volumes of additional wastes from out of state is not realistic. The State, however, did find shipping waste between the DOE sites within the state to be acceptable as long as the applicable environmental permits addressed and approved the movement of those wastes.

Except for small volumes needed for treatability studies, no PSTPs for DOE facilities currently include shipping wastes to LANL for treatment. However, receiving wastes from other sites must still be considered as the national program for treating mixed waste develops.

Incineration of waste. Current public perception of incineration is generally negative. With the exception of two speakers at an SWEIS meeting, one for and one against, there has not been strong opposition or support during the stakeholder meetings for restarting the CAI for mixed waste. There have been much interest in and many questions about safety of operations, history of operations of similar units handling radioactive waste, handling of ash, monitoring of the stack, and long-term impacts of operations. The

stakeholders are uncertain whether the proposed operation is good or bad because they do not yet have sufficient information on which to judge. Ongoing meetings with stakeholder will continue to put information on the CAI before the public.

Treatment of TRU mixed waste. The national DOE policy for defense TRU waste calls for shipment to WIPP without treatment to LDR standards (see Subsection 2.1). This plan follows that policy. The State of New Mexico takes the position that the STP must include an option for treatment of TRU mixed waste to LDR standards should the WIPP not open as scheduled. The different positions of the DOE and the State have been presented during meeting with stakeholders. Several stakeholders have supported the position of the State. Most stakeholders have expressed concern about the problem but have not given a clear position.

Pueblo participation in the STP. The Pueblos are interested in being viewed as equal partners with the State and DOE in negotiating the STP. During a meeting with Pueblo representatives (September 8, 1994), participants discussed an amendment to the FFCAct that would require negotiation of the STP with the Pueblos. DOE–HQ is addressing the legalities of direct negotiation of the STP with the Pueblos.

The message heard from the Pueblos was they want to live on their own land in their own way. The people of the Pueblos are inseparable from their land. They cannot leave it and live elsewhere without leaving their culture and religion behind. They are deeply concerned about activities—such as transportation of mixed waste across their land—that pose the risk of ruining the land and making it uninhabitable. They are equally concerned with creating good jobs that allow their young people to stay on the land and with education to allow their young people to protect the land.

Additional information on transportation of mixed waste and available emergency response is being prepared for further discussions. The STP is being reviewed to determine whether there are opportunities for Pueblo involvement in its implementation.

2.4 Characterization of Mixed Waste

LLMW at LANL has been characterized to the extent necessary to comply with RCRA requirements for storage compatibility and EPA waste code designation. Most of the waste (>75%) is radiologically contaminated with plutonium and/or uranium. The radioactive components of the remaining waste are primarily activation products (materials made radioactive by exposure to neutron bombardment or particle beams) or mixed fission products.

LANL has implemented a plan to improve the characterization of the population of LLMWs known as legacy LLMW. This characterization plan appears in the FFCAgreement as deliverable HLL 100, Low-level Mixed Waste Characterization Plan,

submitted to EPA in April 1994. The document is titled Final Characterization Pln for Low-Level Mixed Waste (October 1993). As part of the plan, LANL did the following:

- collected additional acceptable knowledge from generator interviews to establish the chemical and physical characteristics of the wastes;
- identified containers requiring visual examinations to help support the acceptable knowledge of the generators; and
- identified the waste containers that will require sampling and analysis to support waste characterization.

The methodology used to characterize the waste was initially defined in the Final Characterization Plan for Low-level Waste that included a quality assurance plan. The methodology was adjusted to accommodate conditions found during the characterization effort. The modified methodology is given in the Report for Characterization Review of Low-level Mixed Wastes (March 1995), the final report on the characterization work.

The methodology is summarized as follows. On a six-page questionnaire, the Generator Process Knowledge Interview Form, waste generators were interviewed to obtain detailed information on individual waste items. The form was used to develop a complete description of the waste, beginning with a discussion of the waste-generation process and including a flow diagram if visual interpretation helped to clarify process details. All chemical constituents known to be in the waste were recorded, with concentrations where available. Available packaging information for internal containers and drums was described in detail for every waste. A section of the form is dedicated to capture radionuclide information, including the isotopes present in the waste, information about the use of radioactive materials in the area of generation, and activities of radioactive components.

The completed interview sheet was placed in a folder with all other available documentation, including the waste profile prepared when the waste was generated. A folder was prepared for each waste drum or for a group of drums that were generated from the same waste-generating activity and that were generated at the same time. The folder was sent to the quality assurance staff, who reviewed the folder for consistency of content (a determination that all the data from different source documents was consistent) and for technical consistency (a determination that the waste description was consistent with the process generating the waste). If inconsistencies were found, the folder was rejected for additional investigation until the discrepancies were resolved. The discrepancies could not be resolved for roughly 200 drums, which must be sampled.

The folders passing the quality assurance were then reviewed to ensure that proper waste designation codes were used. The completed folders were archived. The data from the folders has been put on the Laboratory's Internet computer system and is available to waste management personnel and researchers.

Newly generated and future generated LLMWs will be characterized in accordance with the LANL Waste Analysis Plan, submitted in the permit modification package to NMED (March 1995).

A portion of the LLMW in storage is suspect for radioactive contamination. These wastes were generated in areas handling radioactivity, but adequate survey methods were not in place when the waste was generated to determine whether the wastes were contaminated. Under the ALMWTP, GJPO is providing a mobile field service that will sort and survey these wastes to determined whether the waste are contaminated with radioactivity. Surface contamination of containers, such as chemical bottles or aerosol cans, will be removed if the survey can demonstrate that the contents are not contaminated. This activity is called sorting, surveying, and decontamination, and is included in this plan.

The sorting, surveying, and decontamination will allow a portion of the waste to be declared nonradioactive and thus available for treatment at commercial hazardous waste facilities.

As treatment capacity becomes available, additional sampling, analysis, and treatability studies will be conducted to ensure that the treatment unit can adequately treat the waste.

LLMW that cannot be treated with existing or planned units will require a technology evaluation, which will be done using the same methodology outlined in the ALMWTP and summarized in the appendix.

The level of detail for characterizing mixed TRU (MTRU) waste is sufficient to allow safe storage but insufficient to determine the extent to which criteria for shipment by TRUPACT-II and disposal at the WIPP are met and which wastes will require treatment, repackaging, and/or other processing before shipment and disposal at the WIPP. LANL plans to further characterize MTRU waste to address shipping, treatment, and disposal requirements.

LANL has reviewed the characterization documentation available for legacy TRU waste. LANL has also conducted additional generator interviews to improve characterization of MTRU waste though acceptable knowledge and to evaluate which TRU treatability groups are mixed (that is, which treatability groups may contain RCRA-regulated hazardous constituents). Because much of LANL's TRU waste inventory predates RCRA, only some of the information necessary to make hazardous waste determinations was documented at the time of generation. The results of these reviews are reflected in the MWIR, and improving the characterization of legacy MTRU waste is ongoing. The most current information on legacy MTRU waste is in the Draft Transuranic Treatability Group Hazardous Characterization Study, which will likely be finalized in March 1995. Characterization of MTRU waste is ongoing, and new information will be reported in the MWIR and in updates to the Site Treatment Plan.

To address requirements for shipping, treatment, and disposal for the WIPP, TRU waste—including MTRU waste—will be characterized in accordance with the requirements of the WIPP Quality Assurance Program Plan (draft, 1994). Characterization activities include radioassay, radiography, visual examination, headspace gas analysis, and sampling and analysis of homogeneous solid waste forms. LANL has been developing systems for these characterizations and will have some capabilities with limited throughputs available in 1995 and 1996. Characterization of MTRU waste is directed at certifying waste for shipment to the WIPP for disposal and at meeting the requirements of LANL's RCRA Part B Permit Application Waste Analysis Plan (March 1995 submittal.).

2.5 Waste Minimization

The overall waste minimization program at LANL systematically identifies the waste generation problem, identifies possible solutions, analyzes costs and risks of solutions, implements solutions, and evaluates the results.

The first step in solving waste generation problems by waste minimization is to rank the separate treatability groups at the Laboratory. General criteria for ranking streams are

- volume and toxicity of stream,
- cost of existing treatment vs. minimization implementation,
- regulatory drivers, and
- periodic vs. continuous waste generation.

Once problems are identified, existing technical and administrative solutions will be identified.

Technical approaches to minimization include

- abatement or prevention of generation, including substitution and process and program modifications;
- segregation of materials to prevent excess generation; and
- reuse and recycling of waste whose generation could not be prevented by the first two approaches.

Administrative approaches to waste minimization include

- specifying procedures and methodologies to control materials through standard operating procedures;
- oversight of generating functions by the Pollution Prevention Program Office (P3O) and generators;
- review of new projects by the P3O;

- substantial changes to existing projects through the Environmental, Safety, and Health Questionnaire Committee, which reviews these projects for all regulatory and procedural concerns; and
- purchasing discipline and housekeeping to prevent mismanagement of materials.

Reasonable technical solutions will be implemented, the resulting waste minimization successes tracked, and an annual report on the program prepared.

LANL has established the P3O to promote waste reduction, minimization, recycling and reuse, and other alternatives that reduce or simplify the need to treat and dispose of waste materials at the Laboratory. The P3O supports LANL efforts to meet waste reduction goals established by DOE, LANL management, and the University of California. LANL is committed to a proactive and innovative waste minimization and pollution prevention and ensuring that all activities are designed to protect employees, the public, and the environment. This effort includes a range of program elements and initiatives that are summarized below.

2.5.1 Program Elements

Process waste opportunity assessments (PWOAs). The greatest opportunity for waste minimization involves evaluating how existing and future treatability groups can be eliminated, reduced, or changed so that their management is simplified. The P3O assists waste generators in evaluating the potential for waste minimization by completed PWOAs for specific treatability groups. These assessments systematically examine the potential for reducing a given treatability group using various technical methods.

The P3O has coordinated the development of PWOA software for use by LANL waste generators in assessing PPO in their processes. This software makes PWOAs easier and more consistent than before. The P3O provides and coordinates training on the use of this product and PWOAs and can assist waste generators in any needed evaluation.

Charge-back program. A major obstacle to waste minimization implementation, including PWOAs and the development of site-specific plans (SSPs) for waste minimization, has been the lack of funding for such work. To address this issue, the P3O developed a charge-back program for waste minimization designed to capture implementation funds from operations programs based on their waste-generation rates and waste types. This program has received LANL and DOE approval and is scheduled for implementation in FY95. The P3O anticipates that funding captured through this process will support a significantly increased PWOA effort. Further, based upon waste quantities generated, this type of economic impact is expected to enhance pollution prevention awareness among LANL waste generators and provide additional incentives for waste reduction.

Reporting. The P3O collects, analyzes, and collates relevant data on waste-generation rates, pollution prevention activities, PWOAs, SSPs, successes and problems with individual waste minimization efforts, cost modeling, and new program starts. The P3O uses this information to

- track the progress of waste-generating organizations against Laboratory waste-reduction goals,
- provide LANL managers with feedback about waste-generation rates,
- track information for use in the University of California contract about waste generation and waste minimization activities, and
- provide input needed for other regulatory progress reports.

The P3O prepares and distributes the Pollution Prevention Reporter, which explains technical developments that may interest LANL waste generators, reports progress towards LANL waste minimization goals, and identifies how the P3O can assist generators with waste minimization.

2.5.2 Awareness Initiatives

Pollution prevention awareness. The P3O has established a pollution prevention awareness campaign that provides general waste minimization information to LANL employees and provides training support to the LANL Training Office. Training modules for waste minimization and pollution prevention have been developed and incorporated into general employee training at LANL. A video and training handbook on pollution prevention have been developed for use at LANL and are part of new employee orientation for all employees and subcontractors.

Awards program. The Waste Minimization Incentive Awards Program has been established to identify individuals and groups that pursue waste minimization at LANL. This annual competition encourages employees to submit waste minimization suggestions for consideration, with winners selected by a committee representing a cross-section of Laboratory organizations. Cash awards are presented to several winners in various categories.

Publications. P3O pollution prevention awareness also includes publication of articles in the LANL Newsbulletin, the employee newspaper, and articles about LANL activities in external publications throughout the DOE complex.

Recycling. The Laboratory has recognized recycling as an area in which significant improvements can be made in its pollution prevention activities. After source reduction, recycling is the most desirable option. LANL activities produce numerous materials that are potentially recyclable.

The P3O is expanding recycling at the Laboratory. This initiative includes

- identifying recyclable materials for use by others,
- identifying and developing external market demand for LANL materials, and
- developing a chemical tracking system that allows LANL employees to offer excess chemicals and materials to other organizations instead of purchasing new quantities.

The Automated Chemical Inventory System (ACIS) enables the P3O to track organizations and individuals making outstanding efforts in internal reuse or exchange and allows information about excess materials to be announced or advertised for potential reuse. More than half of all chemicals advertised as available for reuse were successfully exchanged instead of being disposed in 1993. The P3O will continue to expand this reuse and exchange initiative and will work to formalize reuse and exchange as part of the chemical procurement process.

2.5.3 Applying Commercial Waste Minimization Solutions to LANL Needs

The P3O is pursuing the use of technologies, expertise, and equipment demonstrated to reduce or eliminate waste within the commercial chemical and nuclear industry. Although this initiative is balanced by a range of technology development efforts within the Laboratory, specific waste minimization needs can be addressed using commercially available techniques, technologies, or equipment. When practical, these commercial applications are being implemented for LANL treatability groups, with the P3O assisting waste generators in evaluating and selecting appropriate technologies and expertise.

Examples of technologies from the commercial sector identified for use at LANL include the following:

- performing pollution prevention opportunity assessments to identify potential areas for improvement specific to individual processes;
- implementing "green is clean" programs and other procedural changes within radioactive material management areas that assist in waste segregation and reduce the volume of wastes that must be managed as radioactive or mixed waste;
- identifying and establishing disposal alternatives, such as recycling and free release;
- developing and implementing a procurement program for pollution prevention; and
- implementing improved treatment technologies and equipment for radioactive liquid waste.

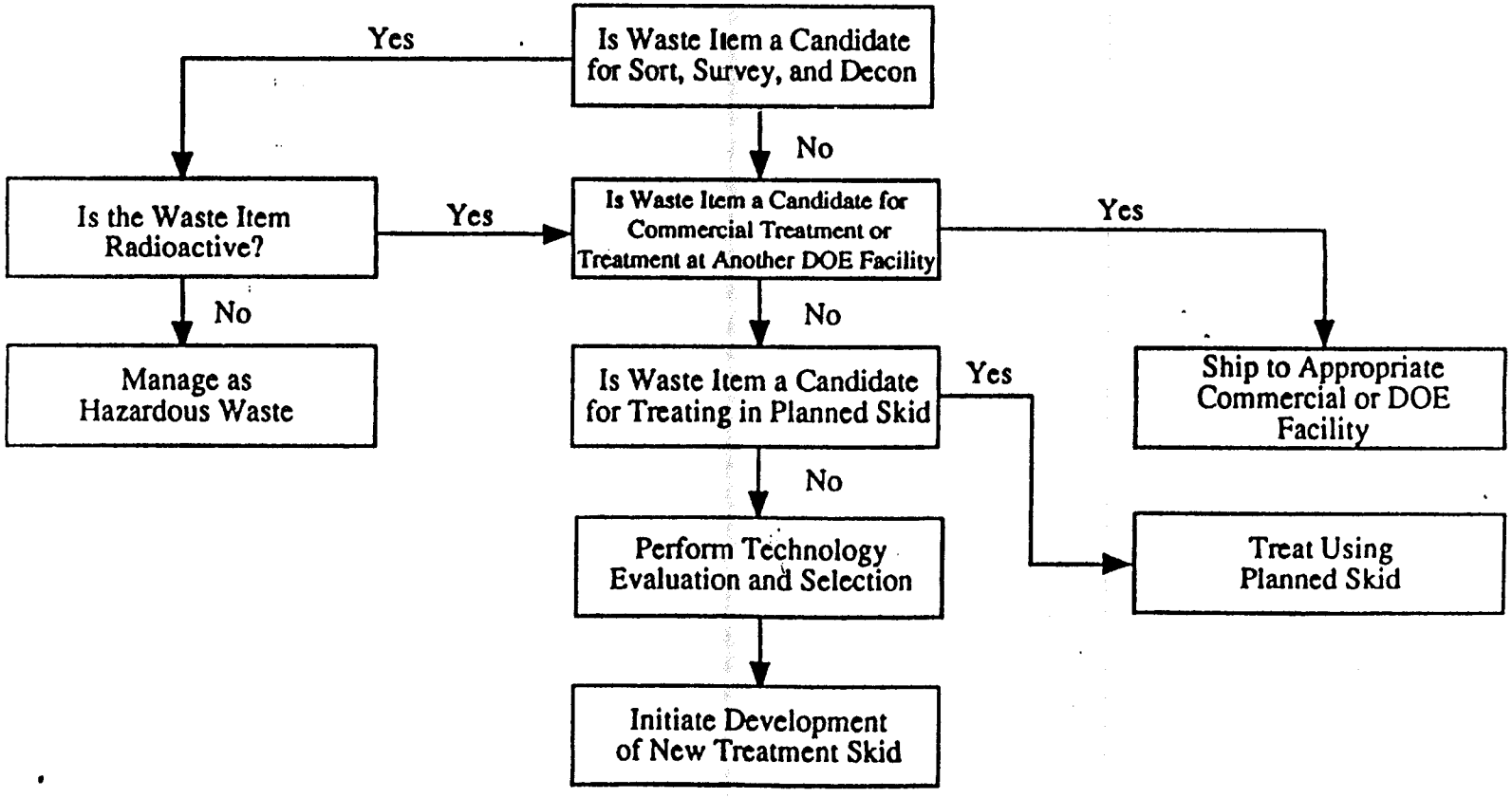
3.0 LOW-LEVEL MIXED TREATABILITY GROUPS

This section describes the proposed strategy for treating LLMW at LANL. It includes the identification of preferred and alternate treatment options for each of the treatability groups established in the recently completed improved characterization activity. The following table summarizes the LLMW treatability groups and the corresponding proposed treatment options. This information is also presented graphically in the

appendix. The table includes the number of items in an individual treatability group. An "item" is the smallest container of waste that allows the waste to be physically or chemically distinguished from other waste. For example, a chemical reagent bottle and a drum of homogeneous waste are both considered to be items.

Treatability group	MWIR waste ID	number of items	Net volume (m^3)	Preferred option	Alternate option
nonradioactive or suspect waste items	LA-W929	1250	14.24	sort, survey, and decontaminate	appropriate treatment
surface-contaminated lead	LA-W930	125	56.20	lead decontamination trailer	TBD
soil with heavy metals	LA-W904	59	10.53	commercial treatment	chelator extraction
activated or inseparable lead	LA-W921	74	15.60	macroencapsulation	TBD
lead requiring sorting	LA-W931	48	9.97	sort based on treatment	appropriate treatment
lead wastes - TBD	LA-W924	186	51.44	TBD	TBD
lead blankets	LA-W903	4	0.74	commercial treatment	macroencapsulation
water-reactive wastes	LA-W916	78	6.03	water-reactive metals skid	TBD
elemental mercury	LA-W920	45	0.50	amalgamation	triple distillation
mercury wastes - TBD	LA-W925	63	18.30	TBD	TBD
compressed gases requiring scrubbing	LA-W917	13	0.35	gas scrubbing skid	TBD
compressed gases requiring oxidation	LA-W918	6	0.08	gas oxidation skid	CAI
compressed gases - TBD	LA-W926	10	1.25	TBD	TBD
aqueous organic wastes	LA-W906	45	1.65	CAI/evaporative oxidation	hydrothermal
aqueous wastes with heavy metals	LA-W913	203	1.85	chemical plating waste skid	evaporative oxidation
corrosive solutions	LA-W914	162	1.36	chemical plating waste skid	evaporative oxidation
aqueous cyanides, nitrates, chromates, and arsenates	LA-W915	15	0.13	chemical plating waste skid	evaporative oxidation
halogenated organic liquids	LA-W907	385	16.58	CAI/hydrothermal	DETOX
nonhalogenated organic liquids	LA-W908	275	14.34	CAI/hydrothermal	DETOX
bulk oils	LA-W909	28	3.75	CAI/hydrothermal	DETOX

Figure 3-1: Methodology Used to DetermineTreatment Options for LANL Low-Level Mixed Waste



Treatability group	MWIR waste ID	number of items	Net volume (m^3)	Preferred option	Alternate option
organic-contaminated combustible solids	LA-W911	307	28.32	CAI/thermal desorption	TBD
organic-contaminated non-combustible solids	LA-W919	80	7.82	thermal desorption	TBD
inorganic solid oxidizers	LA-W923	55	0.20	hydrothermal	TBD
noncombustible debris	LA-W922	41	5.62	macroencapsulation	TBD
combustible debris	LA-W912	83	13.82	CAI/macroencapsulation	TBD
PCB wastes with RCRA components	LA-W910	4	0.74	CAI/hydrothermal	DETOX
biochemical laboratory wastes	LA-W927	9	1.34	TBD	TBD
IPA wastes	LA-W901	104	15.89	DSSI	CAI/hydrothermal
scintillation fluids	LA-W902	18	2.47	DSSI	CAI/hydrothermal
ER soils	LA-W905	36	39.32	commercial treatment	macroencapsulation
dewatered treatment sludge	LA-W928	1288	268.17	TBD	TBD
Totals		5099	608.61		

The strategy presented in the STP reflects and is coordinated with the ALMWTP. It is based on the evaluation and recommendations made by the DOE–AL treatment selection team (TST). The ALMWTP establishes a coordinated program in which LLMW treatment capacity for a particular waste type is realized at one of the DOE–AL sites as determined by ALMWTP. Treatment units developed at a site are used to treat applicable waste at DOE–AL as needed. The primary objective of the ALMWTP is to establish treatment capacity for LLMW in a cost- and time-effective manner using the combined capabilities of the DOE–AL sites.

The methodology presented in the STP for treatment of LANL LLMW is illustrated in the Figure 3.1. It is built around three major components: using off-site commercial treatment, treatment at the DOE sites, or treatment where available, the feasibility of using the controlled-air incinerator (CAI), and construction and operation of the Hazardous Waste Treatment Facility (HWTF). Treatment processes to be used in the HWTF are skid-mounted and mobile. The design and fabrication of the individual treatment skids are the responsibility of the DOE–AL sites as assigned by the ALMWTP. These activities are separate from the HWTF construction project.

Additional efforts are proposed to reduce the overall inventory of LLMW requiring treatment at LANL. These activities are described in more detail in Subsection 3.4. They

include the decontamination and recycling of lead shielding, and sort, survey, and decontamination of nonradioactive or suspect waste items.

The proposed preferred and alternate treatment options presented in the following subsections have been selected based on their abilities to meet applicable regulatory requirements, including treatment standards and requirements for final disposal of residuals. Disposal of residuals from the treatment processes is discussed in more detail in Subsection 8.4. Each treatment process will require separate permit review and approval (RCRA, National Emissions Standards for Hazardous Air Pollution Sources [NESHAPS], etc.), and will be subject to the requirements of NEPA, thus ensuring compliance with regulatory requirements.

The selection of the proposed treatment options was based on the ability of an appropriately sized unit (skid, drum-scale, or bench-top system) to treat the backlog of applicable wastes at the DOE–AL sites in a reasonable time frame. This criterion ensures that the treatment units described in the following subsections have been designed to have adequate capacity.

A preferred and alternate treatment option can apply to more than one treatability group. To avoid repetition and allow easier reference to the Plan Volume, the following sections are organized by treatment option rather than by individual treatability groups, as may be found in the PSTPs for other sites. The treatability groups handled by a common option are identified in table at the beginning of each section.

Because of the recent characterization work discussed in Subsection 2.4, the treatability groups cannot be meaningfully related to the MWIR data. New MWIR waste identification numbers have been assigned to these wastes and are used in this plan.

3.1 Mixed Treatability Groups for Which Technology Exists

This subsection identifies LLMW that can be treated to standards of the LDR best demonstrated available technology (BDAT) using proven technologies; only minor modifications of the technology, if any, are needed to treat the waste. Options identified for these treatability groups include using

- existing on-site or off-site DOE facilities;
- commercial facilities;
- facilities constructed and not currently operating, but being brought into operational status; and
- new on-site or off-site facilities.

3.1.1 Commercial Thermal Treatment (MWIR Treatment ID DS-S001)

The LLMW inventory has undergone a preliminary review to determine the availability of commercial treatment capacity. The following table presents two treatability groups for which treatment at a commercial facility appears to be feasible.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
IPA wastes	LA-W901	D001, D009, F002, F003, F005	104	15.89
scintillation fluids	LA-W902	D001, F003, F005	18	2.47
Totals			**122**	**18.36**

The IPA waste is an aqueous mixture of isopropyl alcohol and ammonium hydroxide and is contaminated with trace levels of depleted uranium and uranium-235. The scintillation fluids are pseudocumene-based organics. They are contaminated with trace amounts of tritium, plutonium, and americium. The scintillation fluid has been removed from individual vials and consolidated in 55-gallon drums.

Preferred treatment option - commercial thermal treatment. The preferred option for treating these wastes is to package and transport them to a commercial thermal treatment facility. This facility, Diversified Scientific Services Inc., (DSSI), in Kingston, Tennessee; is available to liquid LLMW using incineration. The facility does not accept solid or gaseous mixed waste.

A contract to ship and treat waste at DSSI is in place. The DOE order governing management of radioactive materials requires LANL to seek an exemption from DOE Order 5820.2A for treatment and disposal of mixed waste at a commercial facility. LANL is preparing an exemption package for the shipment of waste to DSSI. Activities are also underway to ensure that the waste meets the acceptance criteria for the DSSI facility. Preliminary review of the data suggests that the scintillation fluids meet the requirements for treatment at DSSI. Additional review of the IPA waste composition will be required to determine whether this waste meets the requirements.

Completing activities associated with shipping and treating the scintillation fluids at DSSI is subject to adequate funding of budget requests.

Alternate treatment option - CAI/hydrothermal processing. The alternate options for treatment of the IPA wastes and the scintillation fluids are the CAI and the hydrothermal skid under development at LANL. The CAI is discussed in Subsection 3.1.3. The hydrothermal skid is discussed in Subsection 3.2.1.

3.1.2 Commercial Stabilization (MWIR Treatment ID LA-S806)

The LLMW inventory has undergone a preliminary review to determine the availability of commercial treatment capacity. The following presents three treatability groups for which treatment at a commercial stabilization facility appears to be feasible.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
lead blankets	LA-W903	D007, D008	4	0.74
soil with heavy metals	LA-W904	D004, D005, D006, D007, D008, D009, D010, D011	59	10.53
ER soils	LA-W905	D028, D029, F001, F005	36	39.32
Totals			99	50.59

The lead blankets are generally used to shield equipment and personnel from exposure to radiation. They are flexible, usually woven lead, and are encased by a plastic or cloth covering. The lead has been activated and is not compatible with the lead decontamination process. The soil containing heavy metals and the soils resulting from Environmental Restoration activities contain low concentrations of RCRA-regulated heavy metals. Most of the soils are contaminated with lead. The ER soils are contaminated with trace levels of mercury.

Preferred treatment option - commercial stabilization. The preferred option for treating these wastes will be to package and transport them to a commercial stabilization facility.

Shipping these wastes to a commercial facility will require the preparation and approval of an exemption from DOE Order 5820.2A. This activity has been initiated for ER soils. A review of the characterization data and limited sampling and analysis of the ER soils is in progress to determine whether this waste meets the acceptance criteria for the facility. Characterization and sampling and analysis have not been initiated for the lead blankets and soils with heavy metals.

Completing activities associated with waste analysis, shipping, and treating these wastes is subject to adequate funding of budget requests.

Alternate treatment option - macroencapsulation/chelator extraction. The alternate option for the lead blankets is to macroencapsulate the waste at LANL using the mobile treatment skid. A development and demonstration program for the macroencapsulation/stabilization process has been initiated through the ALMWTP. The Pantex Plant is responsible for this program. Macroencapsulation would meet the LDR-technology standard for radioactive lead and would be done in the HWTF. The skid could also be used to treat the ER soils.

The soils with heavy metals may be amenable to the stabilization process and could be treated in the skid provided by Pantex. Some of the soil, however, contains lead shot and may not demonstrate compliance with the LDR standards for disposal following treatment by this method. Results from the Pantex program will be used to evaluate the potential for applying the technology to LANL wastes. An alternative treatment option is chelator extraction of the lead. This process uses a chelating agent to extract the lead from the soil. The soil, which is the bulk of the waste, is no longer subject to RCRA and can be disposed of as LLW. The lead is stripped from the chelator, concentrated, and recovered or stabilized for disposal. The chelator extraction process is in the development stage, and its availability is dependent on funding.

3.1.3 Controlled-Air Incinerator/Evaporative Oxidation (MWIR Treatment ID LA-S007/GJ-S801C)

The following table presents a treatability group for which the CAI and evaporative oxidation are the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
aqueous organic liquids	LA-W906	D001, D002, D005, D007, D008, D010, D018, D019, D022, D027, D028, D030, D032, D033, D036, D037, D038, D039, D041, D042, D043, F001, F002, F003, F004, F005	45	1.65
Totals			**45**	**1.65**

The aqueous organic liquids come from a large number of operations and contain a wide variety of organic contaminates. The concentration of organic in the waste is generally less than 1000 ppm and are primarily contaminated with trace quantities of plutonium and uranium. Many of these wastes also contain low concentrations of heavy metals.

Preferred treatment option - CAI/evaporative oxidation. The preferred treatment options for this treatability group are the CAI and evaporative oxidation. The uncertainties associated with the operational schedule for the CAI have necessitated the selection of two preferred options. These technologies will be pursued in parallel until a decision has been reached on the operation of the CAI.

Controlled-Air Incinerator. The controlled air incinerator (CAI) is an existing unit built in the early 1970s as an R&D project to demonstrate that standard industrial incineration components could be modified and used to safely treat materials contaminated with TRU nuclides. Between 1976 and 1987, 23 tests, including trial burns under RCRA and the Toxic Substances Control Act (TSCA), were conducted. Based on the performance of the system, the CAI was granted TSCA approval to treat polychlorinated biphenyl (PCB)

wastes in 1986 and a RCRA Part B Permit to treat hazardous waste in 1989. The CAI is permitted to treat PCB solids and liquids under TSCA and a variety of hazardous solids, semisolids, and liquids under RCRA. The permit status for mixed waste in the CAI is under review.

Waste handled. The CAI can treat solid, semisolid and liquid wastes. Gases wastes could be treated with minor piping modifications. The unit is equipped to treat liquid and slurry waste by combusting these materials in the primary chamber of the incinerator. Solid waste must be packaged in a 1-ft x 1-ft x 2-ft cardboard box. Each box will be placed in an airlock, moved through a glovebox, and fed into the primary chamber by a hydraulic ram.

The CAI is nominally rated at 1.5 million Btu/h and can handle up to 125 lb./h of solid waste or 185 lb./h of liquid waste.

Nuclide contamination. The CAI has some limitations. It is designed to treat waste contaminated with TRU nuclides but can also treat waste contaminated with other radionuclides, including small quantities of volatile radionuclides (carbon-14 and tritium). The WAC will limit the quantities of volatile radionuclides to minimize impacts on the environment. The existing RCRA Part B permit for the system currently prohibits the treatment of Freon-11, Freon-12, and tribromomethane except in trace amounts.

Noncombustible materials. Treatment of noncombustible materials, including contaminated soil, is limited because of the fixed-hearth design of the CAI. Solvent-contaminated vermiculite cannot be treated because the vermiculite is an insulator and prevents the ash mass on the hearth floor from reaching temperatures required to complete combustion.

Residuals. Residuals from the CAI include bottom ash, scrubber blowdown, activated carbon, and spent high-efficiency particulate air (HEPA) filters. Disposal of residuals depends on whether they were generated during the processing of characteristic waste or listed waste.

Radionuclides are concentrated in the bottom ash. If the ash meets the definition of TRU waste, it will be immobilized and managed as other TRU waste. If ash from treatment of RCRA characteristic waste is no longer hazardous under RCRA and does not meet the concentration restrictions for TRU, it will be immobilized to meet WAC requirements and disposed of at TA-54, Area G, as LLW. Ash from the treatment of listed RCRA waste will be immobilized and stored until a mixed waste disposal facility is available on-site or off-site.

Filters and spent activated carbon will be encapsulated and disposed of as mixed waste. Scrubber blowdown from treatment of RCRA characteristic waste will be

sampled to ensure that the hazardous characteristic has been removed and sent to LANL's existing Radioactive Liquid Waste Treatment Plant for further treatment. Blowdown from treatment of RCRA listed waste will be evaporated, the clean water recycled, and the salts encapsulated for disposal as a mixed waste. Several options are being explored to minimize the volume of secondary waste generated. These options include but are not limited to delisting the listed blowdown and incinerating spent activated carbon.

Schedule. Operations were discontinued in 1987 for an upgrade to replace worn equipment and to upgrade existing equipment for routine operations. The schedule to restart CAI waste treatment operations is uncertain and depends on funding and the completion of several activities, including

- training operating personnel,
- completing system upgrades,
- preparing and obtaining approval of safety documentation,
- performing a RCRA trial burn or a destruction and removal efficiency (DRE) reverification;
- obtaining appropriate NEPA approval for waste treatment operation,
- obtaining approval of a permit modification for mixed waste, and
- successfully completing an Operational Readiness Review (ORR).

Completing NEPA activities for waste treatment operations is the primary uncertainty associated with the schedule for CAI availability. DOE is planning to prepare a Site-Wide Environmental Impact Statement (SWEIS) for LANL. The decision to include the routine operation of the CAI in the SWEIS will be made following the Advanced Notice of Intent (ANOI) meetings. A schedule for waste treatment operations in the CAI cannot be made until a Record of Decision (ROD) on the NEPA requirements has been made. A schedule for CAI waste treatment activities will be prepared after a decision on NEPA requirements. Funding required to complete activities associated with startup of the CAI and routine waste treatment operation of the facility is included in the budget.

Evaporative oxidation. The Grand Junction Project Office (GJPO) is developing the evaporative oxidation process in accordance with the ALMWTP. This process combines evaporation and vapor catalytic oxidation to destroy volatile organic compounds and concentrate nonvolatile contaminants into a thick liquor or slurry. The aqueous waste is concentrated in an evaporator by boiling off most of the water and the volatile compounds. Air or oxygen is added to the vaporized fraction and then forced through a fluidized catalyst bed, where the organic and inorganic compounds are oxidized. Demonstration of the process will be conducted in FY95 by GJPO. The results of the demonstration will be used to design and build a skid-sized portable unit for use at DOE–AL sites.

Alternate treatment option - hydrothermal processing. Hydrothermal processing is an alternate to CAI/evaporative oxidation for aqueous organic liquids. The hydrothermal skid is being developed at LANL in accordance with the ALMWTP. A description of the process is presented in Subsection 3.2.1.

3.1.4 Controlled-Air Incinerator/Hydrothermal Processing (MWIR Treatment ID LA-S007/LA-S084)

The following summarizes the treatability groups for which the CAI and hydrothermal processing are the preferred treatment options.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
halogenated organic liquids	LA-W907	D001, D002, D003, D007, D009, D018, D019, D022, D028, D029, D035, D043, F001, F002, F003, F005, U077, U080, U226, U227, U228, U236	385	16.58
nonhalogenated organic liquids	LA-W908	D001, D002, D003, D004, D007, D008, D009, D011, D018, D038, D040, F002, F003, F004, F005, U002, U019, U169, U188, U220, U246	275	14.34
bulk oils	LA-W909	D002, D004, D005, D006, D007, D008, D009, D010, D011, D021, D027, D039, F001, F002, F003, F005	28	3.75
PCB wastes with RCRA components	LA-W910	D008, D039, F002	4	0.74
Totals			**692**	**35.41**

The halogenated and nonhalogenated organic liquids are generally spent solvents, laboratory chemicals, and bulk organics that have been contaminated with low levels of plutonium and/or uranium. Most of the bulk oils are vacuum pump oil and hydraulic fluids that are contaminated with low levels of tritium. Many of these wastes also contain trace quantities of heavy metals.

Preferred treatment option - Controlled-Air Incinerator/hydrothermal processing. The preferred options for treating these wastes are the CAI and the hydrothermal skid being developed at LANL. The CAI is described in Subsection 3.1.3. The hydrothermal skid is presented in Subsection 3.2.1.

Alternate treatment option - DETOX. The alternate option for these treatability groups is the DETOX process. The DETOX process is being developed as a cooperative effort between several DOE sites. It is described in Subsection 3.2.2.

3.1.5 Controlled-Air Incinerator/Thermal Desorption (MWIR Treatment ID LA-S006/GJ-S801B)

The following table summarizes the treatability group for which the CAI and Thermal Desorption are the preferred treatment options.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
organic-contaminated combustible solids	LA-W911	D001, F001, F002, F003, F005	307	28.32
Totals			**307**	**28.32**

Organic-contaminated combustible solids are generally room trash, solvent-contaminated rags, and personnel protection equipment (PPE).

Preferred treatment option - Controlled-Air Incinerator/thermal desorption. The preferred options for treating organic-contaminated combustible solids are the CAI and the thermal desorption skid being developed by the GJPO. The CAI is described in Subsection 3.1.3.

Thermal desorption is a batch drying process that separates organic and other volatile contaminants from solids, soils, and sludges. In the process, the organic contaminants are vaporized under vacuum in an indirectly heated vessel and passed through an off-gas treatment system. Volatile organics are condensed and treated similar to organic liquids. If designated as debris, solid residues can be disposed of as LLW. Nondebris solids remaining after treatment must meet LDR standards and must be disposed of in a RCRA-permitted facility.

The primary component of this system is a jacketed batch dryer. Heated electrically or with a fuel to a temperature of about 620° F, hot oil, the heat-transfer medium, is circulated through the dryer jacket. The desorption rates of the contaminants are enhanced by operating under vacuum, down to 29 inches Hg, and stirring the contaminated solids with an internal agitator or by using a rotating double-cone dryer. Nitrogen at low flow rates may be used to inert the dryer and carry the volatiles through the vapor-handling system.

The vapor-handling system is usually a condensation train consisting of a regular filter, a HEPA filter, a multiple-stage chilled water condenser, and an activated-carbon adsorber. Hazardous organics collected in the vapor-handling system require subsequent destruction. Alternatives for destruction of hazardous organic liquids are described above.

A development and demonstration program for this technology has been initiated through the ALMWTP. The GJPO is responsible for this program. Results from the program will be used to evaluate the potential for applying the technology to LANL wastes.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.1.6 Controlled-Air Incinerator/Macroencapsulation (MWIR Treatment ID LA-S006/PX-S803)

The following table summarizes the treatability group for which the CAI and macroencapsulation are the preferred treatment options.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
combustible debris	LA-W912	D001, D003, D005, D006, D007, D008, D009, D011, D022, D035, F001, F002, F003, F005	83	13.82
Totals			83	13.82

The wastes in this treatability group fall under the EPA's hazardous debris regulations under 40 CFR §268.45. These wastes can, therefore, be treated to waste specific standards or using a debris rule technology (that is, extraction, destruction, or immobilization type technologies).

Preferred treatment option - Controlled-Air Incinerator/macroencapsulation. The preferred options for treating combustible debris are the CAI and macroencapsulation. The CAI is described in Subsection 3.1.3. A development and demonstration program for macroencapsulation has been initiated through the ALMWTP. The Pantex Plant is responsible for this program. Results from the program will be used to evaluate the potential for applying the technology to LANL wastes.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.1.7 Chemical Plating Waste Skid (MWIR Treatment ID LA-S004)

The following table summarizes the treatability groups for which the chemical plating waste skid is the preferred option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
aqueous wastes with heavy metals	LA-W913	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011	203	1.85
corrosive solutions	LA-W914	D001, D002	162	1.36
aqueous cyanides, nitrates, chromates, and arsenates	LA-W915	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, F007, P029, P098	15	0.13
Totals			**380**	**3.34**

These wastes are aqueous solutions that are corrosive or that contain heavy metals, cyanides, nitrates, chromates or arsenates. They are typically contaminated with trace amounts of plutonium and/or uranium.

Preferred treatment option - chemical plating waste skid. The preferred option for treating these wastes is the chemical plating waste skid being developed at LANL. This treatment skid provides equipment for inorganic oxidation and reduction reactions and for acid and base neutralization. The skid can be used for a variety of wet chemical treatment operations, including cyanide and ammonia oxidation and metals precipitation.

The unit consists of a reactor module, a solids module, an off-gas module, and a utility module. The reactor module is a 500-gal. stirred Kynar-lined reactor that can accept solid or liquid reagents. The reactor is jacketed to allow heating or cooling. A diaphragm pump circulates the contents of the reactor. Following precipitation, the reactor contents are pumped to the solids-handling module through a filter press. Solids collected drop into a drum to which grout is added; the drum is tumbled to mix the grout and solid residual. The off-gas module includes a caustic scrubber to control toxic gases that could be generated when treating cyanides, and HEPA filter to control emissions of radioactive particulates. The off-gas is continuously monitored for toxic gases. The utility module includes a water chiller that cools the reactor.

The water left after treatment can be discharged to the RLWTP if it is not an F waste (cyanide) that will require solidification. An electro-oxidation and electrodeposition cell is being investigated to pretreat electroplating waste. Successful use of the electrolytic cell would reduce reagent requirements and therefore reduce secondary waste generation. The process is a batch operation. Throughput is a function of the batch size and the chemistry. Funding for development of this skid has been included in budget requests.

Alternate treatment option - evaporative oxidation. The alternate option for treating these wastes is evaporative oxidation. This technology is described in Subsection 3.1.3. In this application the process oxidizes cyanides and ammonium. Acids and bases can be

neutralized, and the solution concentrated to assist in the precipitation of metals. The concentrated solution must be stabilized for disposal.

3.1.8 Water-Reactive Metals Skid (MWIR Treatment ID LA-S003)

The following table summarizes the treatability group for which the water-reactive metals skid is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
water-reactive wastes	LA-W916	D001, D003	78	6.03
Totals			**78**	**6.03**

The wastes included in this treatability react violently with water, including lithium hydride, and magnesium, calcium, and sodium metal. The radioactive contaminates are generally tritium and uranium.

Preferred treatment option - water-reactive metals skid. The preferred option is to treat these wastes in the water-reactive metals skid. In this process, the waste is reacted with water under controlled conditions. The metal or metal hydride reacts to form the metal hydroxide and hydrogen. The hydroxide is then neutralized to make a simple salt solution that is discharged to the RLWTP. The hydrogen gas is diluted below flammability limits and vented. The reaction rate is controlled by adjusting the rate at which waste is introduced to the reactor The process can handle water-reactive metals alloyed with such nonreactive metals as depleted uranium. Funding for development of the water-reactive metals skids is included in the budget requests.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.1.9 Gas Scrubbing Skid (MWIR Treatment ID LA-S801)

The following table summarizes the treatability group for which the Gas Scrubbing Skid is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
compressed gases requiring scrubbing	LA-W917	D001, D002, P056	13	0.35
Totals			**13**	**0.35**

The wastes included in this treatability group are compressed gases that are internally contaminated, generally with tritium, or contain a radioactive component and that can be rendered nonhazardous by scrubbing.

Preferred treatment option - gas scrubbing skid. The preferred option for treating these wastes is the gas scrubbing skid being developed by LANL. The skid can perform caustic scrubbing, acid scrubbing, and water scrubbing, or combinations of these process operations. The skid will treat a wide range of compressed gases and will handle both radioactively contaminated gases and nonradioactive gases for which commercial treatment has not been identified. The process involves passing the gas through a series of solutions typically to neutralize the gas and remove the hazardous characteristic.

A separate component to handle gas cylinders is a recontainerization operation for damaged gas cylinders that cannot be safely opened. A recontainerization process skid is being fabricated. Gas cylinders are loaded into a pressure vessel, which is sealed and purged. The cylinder is then pierced and the contents released to the pressure container, where they can be sampled and analyzed, then compressed into new cylinder or drawn off for treatment. The recontainerization process is skid mounted for portability and will include a trailer-mounted mobile laboratory for gas analysis. Gas analysis includes an ion chamber, Fourier transform infrared spectroscopy (FTIR), and mass spectroscopy. Funding for development of these skids is included in the budget requests.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.1.10 Gas Oxidation Skid (MWIR Treatment ID LA-S801)

The following table summarizes the treatability group for which the gas oxidation skid is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
compressed gases requiring oxidation	LA-W918	D001	6	0.08
Totals			**6**	**0.08**

The wastes included in this treatability group are compressed gases that are internally contaminated, generally with tritium, or that contain a radioactive component and the hazardous component must be treated using an oxidation process.

Preferred treatment option - gas oxidation skid. The preferred option for treatment of these wastes is the gas oxidation skid. The development of this skid has not been initiated. Funding is included in the budget for development of the process.

Alternate treatment option - Controlled-Air Incinerator. The alternate option for treatment of gases requiring oxidation is the CAI. The BDAT for oxidation of hazardous gases is incineration. The CAI is described in Subsection 3.1.3 and could be used to treat this waste. Modifications to the existing facility would be required to process gases. Funding for modification of the CAI has not been included in budget requests.

3.1.11 Thermal Desorption (MWIR Treatment ID GJ-S801B)

The following table summarizes a treatability group for which Thermal Desorption is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
organic-contaminated noncombustible solids .	LA-W919	D001, D003, D004, D005, D006, D007, D008, D009, D010, D011, D027, D030, D032, D033, D034, D042, D043, F001, F002, F004, F005	80	7.82
Totals			**80**	**7.82**

This treatability group consists of a wide variety of wastes such as organic-contaminated vermiculite. These wastes cannot be classified as debris under RCRA.

Preferred treatment option - thermal desorption. The preferred option for treating these wastes is thermal desorption process being developed by GJPO. The thermal desorption process is discussed in Subsection 3.1.5.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.1.12 Amalgamation (MWIR Treatment ID PI-S801)

The following table summarizes the treatability group for which amalgamation is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
elemental mercury	LA-W920	D006, D009, F005	45	0.50
Totals			**45**	**0.50**

Mercury has been used historically in vacuum systems at LANL. Most of the waste in this treatability group has been reclaimed from surplus vacuum systems. It is typically contaminated with trace concentrations of plutonium and americium.

Preferred treatment option - amalgamation. The preferred treatment option for elemental mercury is amalgamation. A development and demonstration program for the process has been initiated through the ALMWTP. The Pinellas Plant is responsible for this program. Results from the program will be used to evaluate the potential for applying the technology to LANL wastes.

Alternate treatment option - triple distillation. The alternate option for treating this waste is triple distillation. This process is being developed at LANL and is a method for removing the radioactive component of the waste and reclaiming the mercury. The process is well demonstrated, and a system is being built at LANL. However, an analytical technique to demonstrate the effectiveness of the process needs to be developed. Funding for this activity is uncertain.

3.1.13 Macroencapsulation (MWIR Treatment ID PX-S803)

The following table summarizes the treatability groups for which macroencapsulation is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
activated or inseparable lead	LA-W921	D008	74	15.60
noncombustible debris	LA-W922	D001, D004, D005, D006, D007, D008, D009, D010, D011	41	5.62
Totals			**115**	**21.22**

The activated lead has been volume-contaminated with radioactivity, generally through exposure to an accelerator beam. This material is not compatible with operation of the lead decontamination trailer. Macroencapsulation is the technology-based standard for treatment of radioactively-contaminated lead. The noncombustible debris is subject to the EPA hazardous debris rule. These wastes can, therefore, be treated using one of the debris rule technologies (that is, extraction, destruction, or immobilization).

Preferred treatment option - macroencapsulation. The preferred option for treating these wastes is macroencapsulation. A development and demonstration program for macroencapsulation has been initiated through the ALMWTP. The Pantex Plant is responsible for this program. Results from the program will be used to evaluate the potential for applying the technology to LANL wastes.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.2 Mixed Treatability Groups for Which Technology Exists But Needs Adaptation or for Which No Technology Exists

This section includes mixed waste that it is believed can be treated to LDR BDAT standards using existing technologies, but the technologies are expected to require adaptation and technology development because of the radioactive component or the innovative nature of the process.

3.2.1 Hydrothermal Processing (MWIR Treatment ID LA-S804)

The following table summarizes the treatability group for which hydrothermal processing is the preferred treatment option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
inorganic solid oxidizers	LA-W923	D001, D003, D005	55	0.20
Totals			**55**	**0.20**

This treatability group is primarily uranium and thorium nitrate and magnesium perchlorate wastes. Most of the waste is laboratory chemicals. The magnesium perchlorate is contaminated with trace amounts of plutonium and americium.

Preferred treatment option - hydrothermal processing. The preferred option for treating these wastes is hydrothermal processing. Hydrothermal processing is a relatively low-temperature destruction technology that destroys most organic compounds and some inorganics.

In a hydrothermal system, water is mixed with waste in relatively low concentrations (<20%) and with a reactant at temperatures between 400-600° C and at pressures between 250-1000 atm. Because these conditions are above the critical point of pure water (374° C and 218 atm), this process is sometimes referred to as supercritical water oxidation.

Under these conditions, water is a fluid with densities high enough that reasonable process throughput can be achieved, but its transport properties are like those of a gas, allowing rapid chemical reaction. Water near the critical point is a unique solvent in which chemical oxidation or reduction can occur at relatively low temperatures, thereby limiting the production of harmful byproducts, such as NO_x and char.

The reaction occurs entirely in an enclosed pressure vessel containing dilute reactants, so the solvent absorbs the heat of reaction, and the temperature can be maintained readily at the desired level. Rapid chemical reaction occurs on the time scale of seconds to minutes; thus, reactor volumes are relatively small.

Development and demonstration of the hydrothermal process is ongoing at LANL in accordance with the ALMWTP. Funding for the project is included in the budget.

Alternate treatment option - TBD. An alternate treatment option for this treatability group has not been identified.

3.2.2 DETOX Process (MWIR Treatment ID LA-S005)

The DETOX process has not been selected as a preferred option for any of the LANL treatability groups. It has, however, named as an alternate option. The DETOX is a liquid phase, iron-catalyzed oxidation process. Candidate waste includes ignitable liquids, metal-contaminated oils, chlorinated solvents, and fluorinated solvents. The process does not oxidize rubber or plastics.

The DETOX process uses iron (III) in an acid solution as the primary oxidant, and the iron (II) formed in the oxidation process is converted back to iron (III) by a second catalyzed reaction with oxygen. The primary benefit of the DETOX process is the ability to oxidize organic constituents in a contained reactor at about 250° C and 40 psig.

Development and demonstration of the DETOX process is a cooperative effort between several DOE sites. The DETOX process is in the development stage, and its availability is dependent on funding.

3.3 Mixed Treatability Groups Requiring Further Characterization or for Which Technology Assessment Has Not Been Done (MWIR Treatment ID LA-S701)

This section identifies treatability groups that require additional characterization before evaluation and selection of treatment options or for which a technology assessment has not been done.

LANL has recently completed an improved characterization activity that has provided additional information on the physical, chemical, and radioactive nature of the LLMW. As a result, it is now possible to more fully define the treatability groups that exist in storage at LANL and to more clearly group these wastes into treatability groups for assignment to treatment processes. This increased level of detail in waste characteristics has identified wastes that cannot be grouped into existing treatability groups, or the improved characterization data is insufficient to for assigning treatment capacity.

The following table summarizes wastes for which technology assessments have not been performed or additional information is required to assign treatment capacity.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
lead wastes - TBD	LA-W924	D003, D008	186	51.44
mercury wastes - TBD	LA-W925	D007, D008, D009, F001	63	18.30
compressed gases - TBD	LA-W926	D001, D007, D009, D022, P056, U080, U226	10	1.25

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
biochemical laboratory wastes	LA-W927	D001, D003	9	1.34
dewatered treatment sludge	LA-W928	NA	1288	268.17
Totals			**1556**	**340.50**

Most of the wastes identified in the table above were generated between 01/01/93 and 09/30/94 and were outside the scope of the improved characterization activity. Additional characterization information will be obtained through generator interviews, and the waste will be assigned to appropriate treatability groups.

New treatability groups will be defined for wastes that cannot be assigned to those identified in the STP. These wastes will be addressed as Newly Identified Wastes. The procedure for evaluating and selecting treatment capacity is described in the appendix.

Over 1250 drums of wastewater treatment sludge generated between 1987 and 1992 have been managed as LLMW and were included in the MWIR, the CSTP, and the DSTP. In 1987, LANL conservatively decided to manage this waste as LLMW because of the potential for trace quantities of solvents being introduced into the wastewater treatment facility. Substantial evidence demonstrates that the amount of solvents introduced into the wastewater treatment facility did not cause the sludge to become a listed hazardous waste. LANL therefore proposes to request a regulatory decision that the sludge be classified as low-level waste and removed from the STP.

3.4 Other Types of Mixed Waste Activities

This section describes activities that will be performed to reduce the LLMW inventory at LANL, but are not considered to be treatment.

3.4.1 Sort, Survey, and Decontamination (MWIR Treatment ID GJ-S804)

Sort, survey, and decontamination is a preferred option for labpacked reagent chemicals from radioactive material management areas. The service will also be applied to bulk chemicals and selected solid items in other treatability groups. Over 1200 waste items have been identified as suspect for radioactive contamination and will be considered for this service.

The following table summarizes the treatability group for which sorting, surveying, and decontamination is the preferred option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
nonradioactive and suspect waste items	LA-W929	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D018, D019, D022, D027, D028, D030, D032, D033, D034, D035, D037, D038, D039, D041, D042, D043, F001, F002, F003, F004, F005, P012, P029, P030, P056, P098, P106, P113, P120, U001, U002, U003	1250	14.24
Totals			**1250**	**14.24**

An appreciable volume of the LLMW inventory is suspected of being contaminated with radioactivity. These waste items came from radioactive materials management areas (RMMAs) before adequate survey procedures were in place to verify whether the wastes were radioactively contaminated. The fact that a article is in a radioactive management area does not make the item contaminated. An analytical laboratory handling radioactive samples is an example. The radioactive samples may be handled in a glovebox or hood separated from the rest of the room, while the room is a controlled area. Before adequate survey methods were in place, any item from the room was considered suspect, even if the risk of contamination was small. Outdated or partially used chemicals became mixed waste.

The GJPO, as part of the MWTP, is providing a mobile sort, survey and decontamination service to LANL. Containers of suspect waste will be opened, sampled, and surveyed to determine whether the waste are radioactively contaminated. Minor contamination, such as small amounts of surface contamination on containers, will be removed. If the waste is not radioactively contaminated, the fact will be documented and the waste released for treatment at commercial hazardous waste treatment facilities. Wastes that are contaminated remain in the mixed waste inventory. The following table identifies treatment alternatives for nonradioactive or suspect waste items that are determined to be mixed waste.

Sort, survey, and decontamination: treatment alternatives	Number of items
Controlled-Air Incinerator	470
chemical plating waste skid	195
gas oxidation skid	155
macroencapsulation	150
DETOX	125
water-reactive metals skid	47
evaporative oxidation	40

Sort, survey, and decontamination: treatment alternatives	Number of items
hydrothermal processing	33
triple distillation of mercury	22
gas-scrubbing skid	9
thermal desorption	4
lead decontamination trailer	0
stabilization	0
DSSI	0
commercial stabilization	0
Totals	**1250**

3.4.2 Lead Decontamination Trailer (MWIR Treatment ID LA-S001)

The following table summarizes the treatability group for which lead decontamination is the preferred option.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
surface-contaminated lead	LA-W930	D008	125	56.20
Totals			**125**	**56.20**

The lead decontamination trailer (LDT) houses a process that applies to lead shielding which is surface contaminated with radioactivity. The process removes the contamination and permits reuse of the shielding. The operation of the LDT is considered recycle under the guidelines of RCRA and does not require a RCRA permit. Contamination is removed using a high-pressure jet of an inert abrasive material, waste, and air. The jet slurry is recycled through the process until the abrasive material breaks down and is no longer effective in removing contamination. Spent slurry is dewatered and solidified. The solidified product is sampled and subjected to the Toxic Characteristic Leach Procedure (TCLP) test to ensure that it does not exhibit hazardous characteristics. After passing the TCLP, the solidified product is disposed as LLW. After meeting the free release standards and release criteria specified in DOE Order 5400.5, the decontaminated shielding is then available for reuse at LANL.

3.4.3 Lead Requiring Sorting (MWIR Treatment ID LA-S701)

The following table summarizes the treatability group for which physical sorting of the waste will be required before treatment.

Treatability group	MWIR waste ID	RCRA codes	Number of items	Net volume (m^3)
lead requiring sorting	LA-W931	D008	48	9.97
Totals			**48**	**9.97**

Wastes in this treatability group are generally heterogeneous and will require different treatment processes. Drums will be opened, the contents removed, and the waste repackaged based on appropriate treatment requirements. Wastes in this treatability group are primarily lead brick, lead shot, and lead-contaminated soils that have been packaged in the same drum.

The wastes will be reclassified to the applicable treatability group after physical separation and repackaging. The wastes will be treated by the appropriate technology.

4.0 TRU MIXED TREATABILITY GROUPS

4.1 TRU Treatability Groups Expected to Go to the WIPP

The characterization information in the table reflects the most current information as reported in the MWIR. Characterization information will be updated as additional information and data become available.

Waste Category	IMWIR ID #	MWIR ID #	RCRA Code	Inventory as of 12/92 (m^3)
scrap metal - Na	2089	LA-W034	D003	110.1
debris - Ba	2086	LA-W035	D005	15.0
process residues - Cr	2091	LA-W036	D007	115.9
shielding	2100	LA-W037	D008	2050.7
cemented process sludges - Pb	2103	LA-W038	D008	15.2
decontamination waste	2159	LA-W039	F001, F002	276.4
cemented process sludges	2166	LA-W040	D007, F001, F002, F003	183.9
dewatered treatment sludges	2160	LA-W041	F001, F002, F005	1088.3
Total				3855.5

4.2 National Strategy for Managing Mixed Transuranic Waste

The current DOE strategy for managing MTRU waste is to

- segregate MTRU wastes from LLMW;
- maintain the MTRU wastes in safe interim storage;
- characterize, certify, process if necessary, and package the wastes to meet the WIPP WAC; and
- permanently dispose of applicable MTRU waste in the WIPP.

Compliance with the requirements of theFFCAct for MTRU waste will be achieved using the RCRA no-migration variance petition approach provided in 40 CFR §268.6.

Under this strategy, no treatment other than that necessary to meet the WIPP WAC is anticipated; however, the performance assessment, and the EPA no-migration variance determination will ascertain what treatments, if any, will be required to ensure disposal compliance.

DOE is actively gathering inventory and characterization data for input into the performance assessment and preparing several regulatory submittals to EPA to demonstrate compliance with requirements of the no-migration variance petition. The current plan is summarized in the following table.

Activity	Date
submit a draft compliance certification package to EPA	March 1995
submit a no-migration variance petition to EPA	May 1995
submit a revised RCRA Part B permit application to the NMED	June 1995
submit a final compliance certification package, including final performance assessment results, to EPA	December 1996
finalize the disposal WIPP WAC	June 1997

DOE plans to declare operational readiness for the WIPP by December 1997. Disposal of contact-handled (CH) TRU waste will begin in June 1998, followed by remote-handled (RH) TRU waste in June 1999. These dates are contingent upon permit approval, certification of disposal compliance, and determination of no-migration from the appropriate regulators and are subject to the availability of funds.

In the interim, site-specific information is included in Subsections 4.4 and 4.5 to outline activities being performed at LANL to maintain safe, compliant storage, waste characterization activities, and other activities planned to support the ultimate goal of shipment to and disposal at WIPP under a no-migration variance petition.

4.3 Characterization of TRU Mixed Waste

LANL's existing TRU mixed waste inventory has been characterized for safe storage using acceptable knowledge and, for some waste containers, sampling and analytical data. Further characterization will be done before treatment, repackaging, or shipment to the WIPP.

Newly generated TRU mixed waste and existing MTRU waste in inspectable storage will be characterized according to the waste analysis plan, under the RCRA Part B Permit Application, that will be submitted to NMED in March 1995, provided that NMED approves the plan. Alternatively, this MTRU waste will be characterized according to the agreement reached with NMED regarding the waste analysis plan. The proposed waste characterization methods include nondestructive testing (real-time radiography and radioassay techniques) for all waste drums; headspace gas sampling and visual examination for a statistically appropriate subpopulation of all waste forms, and sampling and analysis for a statistically appropriate subpopulation of homogeneous waste forms.

The proposed characterization methods and approach are consistent with those in the TRU Waste Characterization Quality Assurance Program Plan (Rev. B) for the WIPP (currently under review by NMED). The characterization data obtained will also support characterization for WIPP-related activities for these wastes.

The MTRU waste stored beneath earthen cover on Pads 1, 2, and 4 at TA-54, Area G, will be characterized according to the waste analysis plan under the RCRA Part B Permit Application and a characterization schedule that will be submitted to NMED in March 1995, provided that NMED approves the plan and schedule. Alternatively, this mixed waste will be characterized according to agreements reached with NMED regarding this waste analysis plan and schedule. The proposed waste analysis plan and schedule provide for characterizing the MTRU waste on Pads 1, 2, and 4 using statistically based sampling and analysis. The plan responds to the requirements of the Notice of Deficiency (NOD) issued by NMED (December 1993 and March 1994) on a previous RCRA Part B Permit Application for storage units needed to store the retrieved waste in accordance with the CA from NMED (December 10, 1993).

The remaining legacy TRU mixed waste in retrievable storage will be characterized in accordance with those requirements proposed in the TRU Waste Characterization Quality Assurance Program Plan (Rev. B) for the WIPP (currently under review by NMED) or with applicable characterization requirements from the WIPP at the time the waste is retrieved for characterization, packaging, and shipment to the WIPP.

4.4 Site-specific Activities for Characterizing Mixed Transuranic Waste

4.4.1 Capabilities

LANL has developed systems to provide capabilities to characterize MTRU waste. Existing systems and those currently under development include the following.

Passive/active neutron interrogation systems (PAN). PAN systems

- accurately measure the quantity of fissionable material in 55-gallon waste drums and
- determine the alpha curie content, fissile gram equivalent, ^{239}Pu equivalent activity, and the thermal loading data requirements of waste acceptance and storage criteria.

These systems provide enhanced accuracy when used in conjunction with the S/TGS system (see below).

System	Location	Comment	Operational by
stationary PAN	TA-54-West		09/95
mobile PAN		mounted in a mobile trailer to allow transporting the system to the waste location instead of transporting waste containers to TA-54 West	01/96

Real-time radiography system (RTR). Real-time and digital radiography systems are used for noninvasive examination of waste drums up to 85-gallons. The system determines the packaging and waste forms required by waste acceptance and storage criteria by verifying knowledge of process information. Data can be stored as videocassette recorder tape and digital data on compact disk or floppy disk.

System	Location	Comment	Operational by
stationary RTR	TA-54 West		09/95
mobile RTR		mounted in a mobile trailer to allow transporting the system to the waste location instead of transporting waste containers to TA-54-West	01/96

Mobile segmented/tomographic gamma scanning (S/TGS) system. This fully mobile system locates and quantifies gamma and x-ray sources in 55- and 85-gallon waste drums. The system can determine the isotopic ratio of radioactive materials in waste; this feature, when used with the PAN system, enhances the accuracy of characterization. The S/TGS system can determine the alpha curie content, fissile gram equivalent, ^{239}Pu equivalent, and thermal loading data requirements of waste acceptance and storage criteria. The system will be operational by September 1995.

Portable drum-venting system (DVS). The portable DVS is a self-contained system to safely penetrate and vent waste drums up to 85-gallons. It can safely contain deflagrations while venting drum with potential flammable gas concentrations. The system automatically installs a filtered vent and can take and analyze headspace gas samples. The system will be operational by February 1996.

Portable waste characterization glovebox (WCG). This four-station glovebox system is used to safely open and examine the contents of waste drums. It can be used to determine waste packaging and waste form, to obtain samples, and to statistically validate RTR results. The system will be operational by October 1996.

Mobile drum-coring glovebox system (DCG). This mobile system allows core sampling of drum of cemented and solidified waste. Samples obtained are available for RCRA characterization. The system will be operational by March 1997.

Mobile headspace gas sampling system (HGS). This system can obtain and analyze samples of headspace gases from previously vented drums of waste. The system will be operational by February 1996.

4.4.2. Assumptions

The following assumptions were made in detailing the dates above.

- funding to complete the design and assembly of several systems remains available;
- funding to operate the systems remains available;
- approval to operate the Radioassay and Nondestructive Testing Facility is received;
- funding to operate the Radioassay and Nondestructive Testing Facility remains available;
- funding to operate the Waste Characterization, Reduction, and Repackaging Facility remains available;
- for systems for which permit applications apply, characterization of TRU mixed waste may be impacted by the time frame of permitting; and
- for systems for which requirements under NEPA apply, characterization of TRU mixed waste may be impacted by the time frame of NEPA-related activities.

4.4.3 Summary of Characterization Activities for MTRU Waste

Characterization System	Operational Date
PAN	01/96
RTR	01/96
S/TGS	09/95
DVS	02/96
WCG	10/96
DCG	03/97
HGS	02/96

Although the characterization systems can provide a wide range of capabilities, for characterization of transuranic mixed waste, they provide for only limited throughput of existing waste containers for characterization. Full characterization of a large quantity of waste containers and treatment of a large quantity of waste will not be possible until the Waste Characterization, Processing, and Transportation Facility is constructed and is operational. This facility will likely be operational in about 2008; the funding request process for this facility has been initiated, but funding for developing, constructing, and operating the facility has not yet been committed. Further, certain special types of TRU waste, such as large boxes, tritium-contaminated TRU waste, and remote-handled waste, cannot be characterized, treated, or repackaged for shipment to the WIPP until additional capabilities are available.

4.5 Site-specific Schedule for Managing Mixed Transuranic Waste

Storage activities. LANL is currently operating under a CA, discussed in Subsection 1.5 of the Background Volume, to retrieve the TRU waste stored beneath earthen cover on Pads 1, 2, ,and 4 at TA-54, Area G. Retrieval and placement of the waste in RCRA-compliant inspectable configuration will be completed according to the CA milestone.

Newly generated TRU waste is placed into RCRA-compliant inspectable storage after it is generated.

The remaining TRU inventory at LANL will be retrieved before characterization, treatment, and processing (as necessary), repackaging (as necessary), and shipment for disposal at the WIPP.

These activities are premised on the following assumptions;

- funding will remain available to maintain safe storage of existing and newly generated TRU waste;
- the WIPP opens in 1998, and LANL's TRU waste qualifies for disposal at the WIPP according to the WIPP WAC for the disposal phase;
- funding will be available to retrieve waste and prepare it for shipment to the WIPP; and
- funding will be available for shipping waste to the WIPP.

Certification activities. LANL currently has a TRU certification program to certify waste to WIPP WAC (Rev. 3). After the WIPP WAC for the disposal phase is issued, LANL will revise its certification program to meet the WIPP WAC for the disposal phase. LANL will complete the update of its TRU certification program to the WIPP WAC for the disposal phase by a planned date of one year after the WIPP WAC for the final disposal phase is issued. This planned date is premised on the following assumptions:

- funding will remain available to maintain a TRU certification program as the WIPP WAC evolves;
- funding will be available to upgrade the program as necessary to intermediate revisions of the WIPP WAC; and
- funding will be available to upgrade the program to the WIPP WAC for the disposals phase.

4.6 TRU Waste Not Destined for WIPP

Under currently interpreted definitions, LANL does not currently generate or plan to generate or store nondefense related TRU waste. Therefore, this section does not apply.

5.0 HIGH-LEVEL MIXED TREATABILITY GROUPS

LANL does not currently generate or plan to generate or store high-level mixed treatability groups. Therefore, this section does not apply.

6.0 FUTURE GENERATION OF MIXED TREATABILITY GROUPS

This site has a current HSWA permit with the EPA governing the cleanup of the site; however, the State of New Mexico is not a party to the agreement. This section of the STP addresses certain wastes expected to result from environmental restoration activities, including D&D, over the next five years. Those environmental restoration wastes resulting from previous response actions that are currently in storage and are subject to LDR and those wastes for which a cleanup or management decision has been made and placement of LDR restricted wastes will occur are identified in Sections 3.0, 4.0, or 5.0, as appropriate, and are included in the Compliance Plan Volume of this PSTP.

Mixed wastes for which a cleanup decision is scheduled within the next five years and for which treatment in accordance with the RCRA LDRs may be required are identified in this section for general planning purposes. To the extent applicable, this section of the PSTP identifies the current schedule for making remedial action decisions. Section 2.0 of the Compliance Plan Volume of the PSTP provides a mechanism for updating the STP to include new treatability groups after remedial action decisions are made.

Because of the uncertainty of how contamination will ultimately be addressed and therefore any waste generated that is subject to LDR will ultimately be managed, including environmental restoration wastes into the Compliance Plan volume of the PSTP—and therefore the specification of how and when they will be treated—will not occur until a final cleanup decision (that is, the RCRA Permit Modification and Statement of Basis) has been reached. If the decision document requires LDR treatment this site will work with EPA and the State of New Mexico to ensure that the wastes be covered under only one enforceable document at a time, either the cleanup agreement or the STP, not both. This final decision will be made in compliance with applicable statutory and regulatory requirements and established schedules in existing compliance agreements and orders.

6.1 Environmental Restoration Waste

The ER Project responds to RCRA, which is the statutory basis for the ER Project and provides a framework to remediate certain hazardous materials at the Laboratory. RCRA was amended by HSWA in 1984. For radioactive and mixed waste, the requirements of the Atomic Energy Act (AEA) also apply.

The volume of mixed waste that will be generated from corrective actions and site remediation activities in the ER Project has been estimated to be 200,000 m^3 or less. About 10,000 m^3 of soils contaminated with mixed waste are likely to be generated before

the proposed Mixed Waste Disposal Facility is constructed and ready for operation, which is expected to be in 1999. Thus, most of the ER mixed waste will not be generated until after the five-year period being considered for the STP. Wastes generated by the ER Project will be handled under the STP only if they are not subject to a permit, agreement, or order independent of the PSTP that addresses treatment or disposal of ER waste. Compliance with HSWA requirements described in Subsection 1.5.3 could generate separate agreements for treating ER-generated mixed waste.

In response to requests from local property owners, the ER Project gives priority to field work at former Laboratory locations in the townsite, which are no longer owned by the DOE. The project identifies sites for no further action or cleanup under EPA's provisions for voluntary corrective action as early in the process as possible. Up to 1500 m^3 of mixed waste will likely be generated from these voluntary corrective actions. LANL is preparing characterization plans for ER Program activities. Therefore, waste types and specific characteristics of these wastes are not available.

6.2 D&D Waste

DOE/EM established the Laboratory's current D&D Program in 1989 to manage nonoperational, contaminated facilities in accordance with guidelines. The LANL ER and D&D programs were combined in March 1993. The primary responsibilities of the D&D Program involve facility assessment and cleanup of inactive and surplus contaminated buildings, structures, and equipment not regulated under RCRA. D&D Program subprojects are done according to federal and state requirements and DOE orders applicable to nuclear and other facilities that generate radioactive and/or hazardous materials and waste. Occasionally, preliminary activities may be required, including removing all stored hazardous and radioactive materials, debris, and waste from process areas; identifying material; and isolating and securing equipment.

Currently in the five-year window covered by the Site Treatment Plan, estimated volumes of D&D waste are based on preliminary assumptions. Buildings 2 and 4 South at TA-21, the Phase Separator Pit at TA-35, several wooden structures at TA-16, and the Tritium Facility at TA-33 are scheduled for D&D by FY 1998. Approximately 75 m^3 of low-level mixed waste will likely be generated from D&D of these buildings. Specific characteristics of these wastes will be determined through sampling and analysis before initiating D&D activities.

6.3 Other Waste

In addition to mixed waste generated as a result of the ER Project (Subsection 6.1) and D&D (Subsection 6.2), LANL expects to generate mixed waste as a result of routine research and development activities.

The following table estimates the quantities of LLMW that will be generated during 1995–2000, the five years following the characterization of the current inventory of LLMW. Waste projections are based on the average generation rate for the last three years projected over the next five years, which give a crude approximation of future LLMW generation. Actual waste types and quantities will vary depending on the specific research and development projects performed and are difficult to predict. LANL will continue to pursue a vigorous waste minimization program that limits LLMW production.

Projected LLMW Generation

Treatability group	MWIR waste ID	Annual average Net volume (m^3)	5-year average Net volume (m^3)
nonradioactive or suspect waste items	LA-W929	1.9	9.5
surface-contaminated lead	LA-W930	2.5	12.5
soil with heavy metals	LA-W903	0.4	2.0
activated or inseparable lead	LA-W921	0.2	1.0
lead requiring sorting	LA-W931	0.0	0.0
lead wastes - TBD	LA-W924	2.0	10.0
lead blankets	LA-W903	0.04	0.2
water-reactive wastes	LA-W916	0.04	0.2
elemental mercury	LA-W920	0.01	0.05
mercury wastes - TBD	LA-W925	5.1	25.5
compressed gases requiring scrubbing	LA-W917	0.02	0.1
compressed gases requiring oxidation	LA-W918	0.02	0.1
compressed gases - TBD	LA-W926	0.4	2.0
aqueous organic liquids	LA-W906	0.1	0.5
aqueous wastes with heavy metals	LA-W913	0.2	1.0
corrosive solutions	LA-W914	0.1	0.5
aqueous cyanides, nitrates, chromates, and arsenates	LA-W915	0.002	0.01
halogenated organic liquids	LA-W907	1.1	5.5
nonhalogenated organic liquids	LA-W908	2.0	10.0
bulk oils	LA-W909	0.6	3.0
organic-contaminated combustible solids	LA-W911	1.4	7.0
organic-contaminated noncombustible solids	LA-W919	1.6	8.0
inorganic solid oxidizers	LA-W923	0.01	0.05
noncombustible debris	LA-W922	0.6	3.0
combustible debris	LA-W912	0.3	1.5
PCB wastes with RCRA components	LA-W910	0.04	0.2
IPA wastes	LA-W901	0.003	0.01
scintillation fluids	LA-W902	0.8	4.0
Totals	604	21.6	107.9

Projected MTRU generation. The following table estimates the quantities of MTRU waste that will be generated during 1993–1997, the five years following the cutoff date (December 31, 1992) of the Final MWIR. These volumes are those reported in MWIR

and will be updated when the additional characterization in Subsection 2.4 provides better data.

Waste Category	IMWIR ID	MWIR ID	Annual projection (m^3)	5-year projection (m^3)
scrap metal - Na	2089	LA-W034	0.6	3.1
debris - Ba	2086	LA-W035	0.0	0.0
process residues - Cr	2091	LA-W036	0.1	0.3
shielding	2100	LA-W037	60.8	304.0
cemented process sludges - Pb	2103	LA-W038	4.2	21.2
decontamination waste	2159	LA-W039	47.7	238.9
cemented process sludges	2166	LA-W040	7.7	38.3
dewatered treatment sludges	2160	LA-W041	0.0	0.0
Totals			121.1	605.8

7.0 STORAGE OF AFFECTED WASTES

LANL is upgrading its existing LLMW and MTRU waste storage facilities to ensure compliance with the requirements for permitted RCRA storage facilities in 40 CFR Part 264. Under the FFCAgreement, studies were undertaken to assess the status of LANL's compliance with requirements of 40 CFR Part 264. Some upgrades have been completed; others are planned. Additionally, new storage facilities for both LLMW and MTRU wastes are in the planning stages.

Selected treatment residues will be tested to determine whether applicable treatment standards or prohibition levels are met. LLMW streams containing listed wastes and LLWM streams treated to LDR standards remain subject to RCRA Subtitle C requirements and will be stored accordingly until shipment off-site to permitted disposal facilities. Characteristic LLMW streams treated to remove the hazardous characteristic will be managed as LLW.

7.1 Low Level Mixed Treatability Groups

LANL currently has 1700 drum equivalents of LLMW in storage at Technical Area (TA) - 54, Areas G and L. Additional container storage facilities exist to support research activities at other areas at the Laboratory including TAs -3, -16, -21, -50, and -55. Wastes are stored in compliance with 40 CFR Part 265 (and, in some cases, Part 264) requirements. To comply with FFCAgreement milestone IFLL 200, schedules to complete facility upgrades that address 40 CFR Part 264 permitted standards and/or identified best management practices were submitted to the EPA in September 1994. Several upgrades have been completed. A Part B Permit Application addressing storage requirements under 40 CFR Part 264 is currently in development.

The storage of mixed wastes at Area L and G complies with requirements of 40 CFR Part 265, Subpart I, the interim status management standards that currently apply to these units. The Laboratory believes that the Area G storage facility also generally complies

with the requirements of 40 CFR Part 264. Both facilities are being upgraded as necessary to comply fully with 40 CFR Part 264 requirements before the permit is issued for these units, which is not anticipated to occur before 1998. Following is a description of existing and planned LLMW storage facilities.

7.1.1 Storage Configuration

Solid LLMW is stored primarily at Area G in Building 49. This facility contains a bermed (curbed) asphalt pad with a tension support dome structure (60 ft. x 440 ft.). Containers stored in this building consist primarily of 55-gallon Department of Transportation (DOT) -approved steel drums stacked two and three high on pallets in rows. The rows are separated by a minimum 2-ft aisle space. Some non-RCRA-regulated low-level radioactive wastes likewise are stored in this area, principally as a best management practice to minimize the potential for worker radiation exposure and to ensure that the management of the waste complies with DOE requirements for worker safety and environmental protection.

Liquid LLMW is stored at TA-54, Area L. This storage area has about a 100,000-gallon capacity. The containers, which are primarily 30- and 55-gallon DOT-approved polyethylene and steel containers and 85-gallon DOT-approved overpacks, are stacked two and three high on pallets in rows separated by a minimum 2-ft aisle space. Some non-RCRA-regulated low-level radioactive wastes likewise are stored in this area, principally as a best management practice to minimize the potential for worker radiation exposure and to ensure that management of the waste complies with DOE requirements for worker safety and environmental protection.

In addition, the need for development of a new, permanent storage facility designed and constructed in accordance with 40 CFR Part 264 standards is being evaluated at the Laboratory. This Mixed Waste Receiving and Storage Facility (MWRSF) is scheduled to replace LLMW storage operations at TA-54, Areas G and L. The MWRSF is designed to support the HWTF by providing storage for LLMW generated at LANL. Wastes received at the facility will be inventoried, characterized (if required), and stored for later processing. Stored waste will be staged for treatment or size reduction. Title I engineering design for the MWSRF is complete. The facility is designed to accommodate existing and future LANL-generated wastes. It is not expected that the facility will receive wastes from sources outside LANL.

7.2 TRU Mixed Treatability Groups

LANL has managed solid radioactive waste at TA-54, Area G, since approximately 1957. Until 1971, radioactive wastes were placed in shallow landfill cells and shafts without segregation according to radioactivity or waste type. Beginning in 1971, in accordance with Atomic Energy Commission orders, LANL and other facilities began segregating TRU solid wastes from other radioactive treatability groups for eventual off-site shipment

to the planned WIPP. In 1979, LANL began construction of aboveground asphalt pads designed for retrievable TRU waste storage. Drummed TRU wastes were stacked atop the pad in dense-pack configuration, surrounded by larger wastes packaged in fiberglass-reinforced, polyester-coated plywood boxes. Wastes were covered with plastic sheeting and earthen fill. This management method was used until early 1991.

7.2.1 Storage Configuration

Knowledge of the waste-generating process indicated that part of the stored TRU wastes is likely to be mixed waste. Since 1991, solid TRU and MTRU waste have been stored aboveground an asphalt pads at TA-54, Area G. Membrane-covered fabric dome enclosures provide weather protection and prevention of run-on. Drums are stored on pallets, and fiberglass-reinforced, polyester-coated crates are fitted with skids to maintain them above the floor. Wastes are managed in accordance with 40 CFR Part 265, Subpart I.

Additional TRU container storage units are located within permanent structures at TA-3 and TA-55. These units support R&D activities and are not intended for long-term storage of MTRU waste. High-activity or remote-handled TRU wastes are placed in shafts at TA-54, Area G.

7.2.2 Future Configuration

In January 1993, NMED issued Compliance Order 93-03, which required LANL to retrieve TRU wastes from above-ground earth-covered Pads 1 through 4 and manage them in accordance with requirements of 40 CFR Part 264, Subpart I. Pursuant to the December 1993 Consent Agreement, LANL has initiated the TRU Waste Inspectable Storage Project to provide for retrieval and inspection of the wastes, and replacement in new aboveground storage domes at TA-54, Area G. This activity is also required pursuant to the FFCAgreement.

In addition, pursuant to the FFCAgreement, LANL completed the Preconceptual Study to Identify Short- and Long-Term Storage Needs for TRU Mixed Waste (FFCAgreement milestone STRU 100) for the EPA in September 1994. This study recommended constructing eight new storage domes for TRU at Area G by FY2000. The domes will have the same structural design and operational capabilities as existing structures. However, based on estimates of anticipated TRU and MTRU waste generation, this design may not provide sufficient capacity for all wastes by FY2000. New requirements for fire protection are being evaluated to determine whether they will further reduce available storage capacity by reducing aisle space.

8.0 PROCESS FOR EVALUATING DISPOSAL ISSUES IN SUPPORT OF THE STP DISCUSSIONS

This section discusses the overall DOE process for evaluating issues related to the disposal of residuals from the treatment of LLMW subject to the FFCAct. LANL is among the sites being analyzed further for potential development as a disposal site for residuals from the treatment of LLMW subject to the FFCAct. This section outlines the disposal planning process developed by DOE, in consultation with the states, for evaluating potential options for the disposal of residuals from the treatment of LLMW. Importantly, because DOE is not currently developing LLMW disposal sites (except for the Hanford Site) preferred alternatives or final destinations for disposal of treatment residuals are not known at this time. The results of this process are intended to be considered during subsequent planning activities and discussions between DOE and regulatory agencies.

Site-specific options are discussed in Subsection 8.4.

8.1 Background

The FFCAct requires DOE to develop a plan to treat mixed wastes. The Act does not impose any similar requirement for the disposal of mixed wastes after they have been treated; however, DOE recognizes the need to address this final phase of mixed waste management. The following process reflects DOE's current strategy for evaluating the options for disposal; the evaluation will increase understanding of the strengths and weaknesses of a site's potential for disposal but is not a site selection process. Ultimately the identification of sites that may receive mixed waste for disposal will follow state and federal regulations for siting and permitting and will include appropriate public involvement.

High-level and MTRU wastes are among the mixed waste subject to the FFCAct. Options for disposal of these mixed wastes are not identified by this process because established processes exist for studying, designing, constructing, and operating disposal facilities for these wastes.

The DOE has historically planned to develop LLMW disposal facilities at the six DOE sites currently disposing of low-level waste: Hanford, Savannah River, Oak Ridge Reservation, Idaho National Engineering Laboratory, Nevada Test Site, and Los Alamos National Laboratory. Currently, the Hanford Site has the only active permitted facility operated by DOE for the disposal of residuals from the treatment of LLMW. This plan has been re-directed in conjunction with the planning efforts of the FFCAct to include the results of the disposal planning process (Fig. 8.1), and the EM PEIS. The sites subject to evaluation under this process are the 49 sites that were reported to Congress by DOE in the MWIR (April 1993) and that are currently storing or expected to generate mixed waste.

8.2 Disposal Planning Process

Although the FFCAct does not specifically address disposal of treated mixed wastes, both DOE and the States have recognized that disposal issues are an integral part of treatment discussions. A process was established to evaluate and discuss the issues related to the potential disposal of the residuals from the treatment of DOE LLMW at the sites subject to the FFCAct (Fig. 8.1). The focus of this process has been to identify, from among the 49 sites that currently store or are expected to generate mixed waste, sites that are suitable for further evaluation of their potential as disposal sites. Sites determined to have marginal or no potential for disposal will be removed or deferred from further evaluation under this process. The remaining sites will be evaluated more extensively. Ultimately, several sites are expected to be identified that are technically acceptable for disposal of treated residuals.

8.2.1 Activities to Date

Site grouping. The initial step in this process was to examine each of the 49 sites to determine which sites, while individually listed in the MWIR, were in such geographic proximity that further analysis could address them as a single site. This grouping reduced the number of sites to 44, as follows:

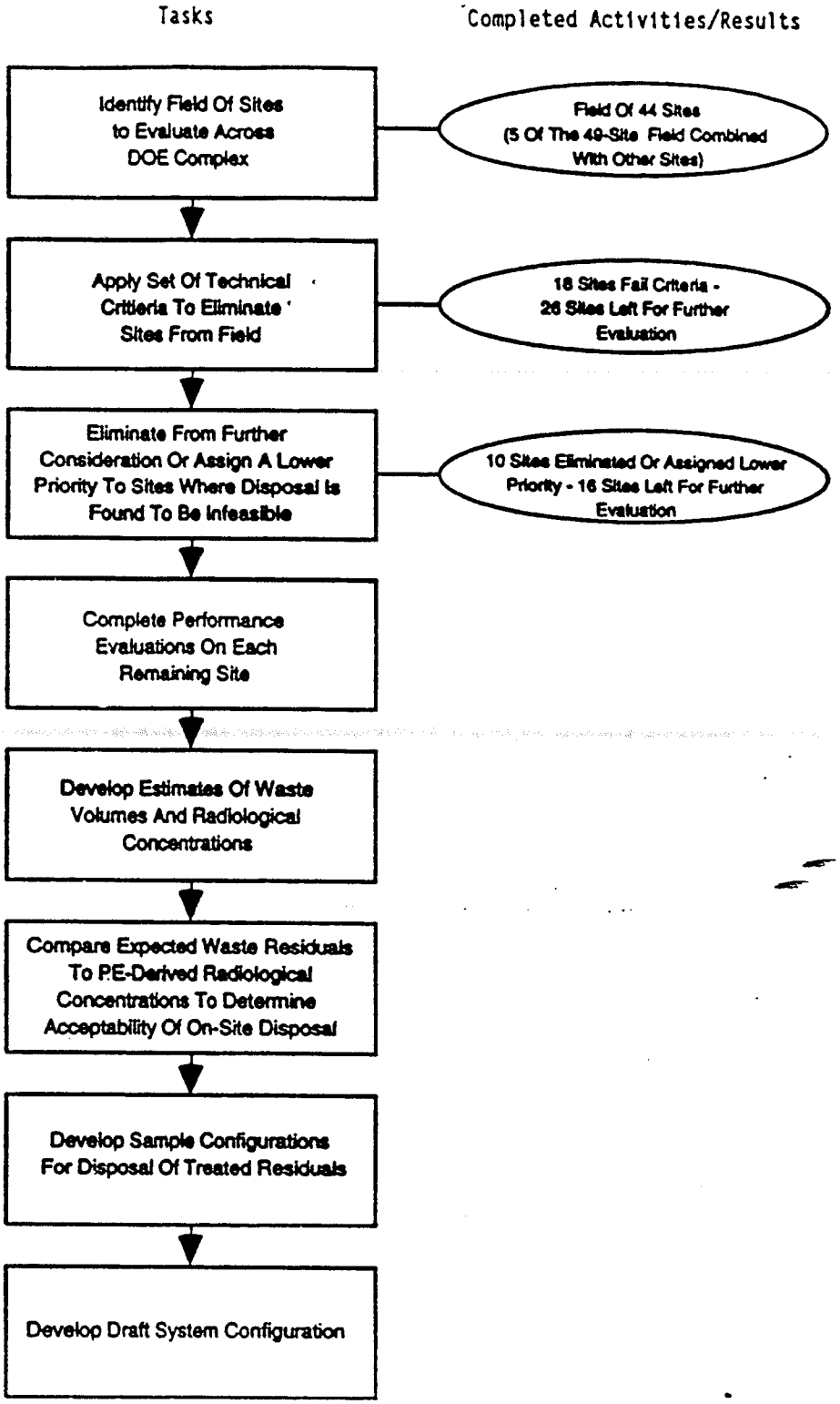
- Idaho National Engineering Laboratory and Argonne National Laboratory (West) are located on a single federally-owned reservation near Idaho Falls, Idaho;
- Sandia National Laboratories, California, and Lawrence Livermore National Laboratory are located on adjoining, federally-owned properties near Livermore, California;
- the Inhalation Toxicology Research Institute and Sandia National Laboratories, New Mexico, are located on the same federally-owned reservation, and;
- Oak Ridge National Laboratory, Oak Ridge K-25 Site, and Oak Ridge Y-12 are all located within the federally-owned Oak Ridge Reservation near Oak Ridge, Tennessee.

Initial Site Screening. At a joint meeting on March 3-4, 1994, DOE and the states agreed on three exclusionary criteria for further screening the 44 remaining sites. These criteria were developed by reviewing federal and state requirements for the siting of waste treatment, storage, and disposal facilities. To be evaluated further, a site

- must not be located within a 100-year floodplain;
- must not be located within 61 meters (200 feet) of an active fault, and;
- must have sufficient area to accommodate a 100-meter buffer zone.

The first criterion (100-year flood plain) is derived from requirements of the Nuclear Regulatory Commission (NRC) and RCRA. The second criterion (active fault) was selected from requirements found in RCRA that restrict the location of waste treatment,

Figure 8.1: Disposal Planning Process



storage, and disposal facilities. The third criterion (sufficient area for 100-meter buffer) is derived from guidance from the EPA, NRC, and DOE for the proper operation of waste facilities.

Evaluation of the 44 sites resulted in identification of 26 sites meeting the criteria. At a joint meeting on March 30-31, 1994, DOE and the states agreed to remove from further evaluation those sites not meeting the screening criteria. DOE also agreed to collect additional, more detailed information on the remaining 26 sites to identify additional strengths and weaknesses of the sites. DOE or any affected state may propose further elimination of sites from consideration following the site-specific evaluation.

Evaluation of the Remaining 26 Sites. DOE and the states met on July 26-27, 1994, to discuss the site-specific data on the remaining 26 sites and to consider proposals for eliminating additional sites from further evaluation. The focus of these discussions was to identify sites suitable for further evaluation under this process.

The criteria that DOE and the states used to eliminate sites from further evaluation at this stage were derived from three main groupings of considerations: technical considerations, potential receptor considerations, and practical considerations. Each of the remaining 26 sites were evaluated against criteria in these groupings including soil stability and topography, precipitation and evapotranspiration, population, proximity to sensitive environment, land acquisition, government presence at the site, and regulatory constraints.

Sites with marginal or no potential for disposal based on these criteria were recommended for removal or postponement from further evaluation. From the meeting, DOE and the states agreed to eliminate five sites from further evaluation due to their limited potential for disposal.

Site	State
Energy Technology Engineering Center	California
General Atomics	California
General Electric Vallecitos Nuclear Center	California
Pinellas Plant	Florida
Site A/Plot M	Illinois

DOE and the states also agreed to merge the evaluation of Knolls Atomic Power Laboratory at Niskayuna, New York, and Knolls Atomic Power Laboratory at Kesselring, New York, because of their close geographic proximity.

Although not eliminated from further evaluation, an additional four sites received lower evaluation priority. Issues such as the technical capabilities of the site, the volume of mixed waste that may be generated by the sites, and the acceptability of off-site waste contributed to a conclusion that further evaluation of some sites should not be a high priority. DOE and the states agreed to evaluate these sites for their capability to dispose of their own mixed waste if no other off-site disposal options could be identified. These

sites will not be considered for disposal of wastes from other sites and may be eliminated from further analysis if enough evidence suggests the potential for disposal is too limited. The sites in this category are as follows.

Site	State
Weldon Spring Remedial Action Project	Missouri
Brookhaven National Laboratory	New York
Mound Plant	Ohio
Bettis Atomic Power Laboratory	Pennsylvania

Performance evaluation. The performance evaluation being done for the 16 sites identified for further evaluation requires collecting more detailed site-specific data about the site characteristics. The methodology for performance evaluation is based on the principles of radiological performance assessments and was developed by DOE performance assessment experts. Additionally, the evaluation will be based on RCRA-compliant engineered facilities. This information will be used to evaluate the sites and estimate the radionuclide concentration limits of waste that may be disposed at a given site. The performance evaluations began in August 1994. The 16 sites for which performance evaluations are being prepared are as follows.

Site	State
Lawrence Livermore National Laboratory, Site 300	California
Rocky Flats Environmental Technology Site	Colorado
Idaho National Engineering Laboratory	Idaho
Argonne National Laboratory	Illinois
Paducah Gaseous Diffusion Plant	Kentucky
Nevada Test Site	Nevada
Los Alamos National Laboratory	New Mexico
Sandia National Laboratories	New Mexico
Knolls Atomic Power Laboratory-Kesselring	New York
West Valley Demonstration Project*	New York
Fernald Environmental Management Project	Ohio
Portsmouth Gaseous Diffusion Plant	Ohio
Savannah River Site	South Carolina
Oak Ridge Reservation	Tennessee
Pantex Plant	Texas
Hanford Site	Washington

*Because the West Valley Demonstration Project Act does not authorize the site to accept off-site wastes, the site will be evaluated only for disposal of on-site wastes.

8.2.2 Next Steps in the Evaluation Process

Progress has been made in the planning of the disposal process (Fig. 8.1). The following steps outline future activities that are either ongoing or are to be completed to facilitate an informed decision about the disposal of DOE LLMW. Coordination with the states will continue to ensure stakeholder input and to resolve concerns at the earliest possible stage.

Complete Remaining Performance Evaluations. To date, 10 performance evaluations have been completed for the following sites: Savannah River, Oak Ridge Reservation, Idaho National Laboratory, Hanford, Sandia National Laboratories, Rocky Flats Environmental Technology Site, Los Alamos National Laboratory, Pantex Plant, Nevada Test Site, and Lawrence Livermore Laboratory. Performance evaluations for the remaining 6 sites are scheduled to be completed by June 1995. A progress report for the performance evaluation activities has been issued at approximately the same time frame as the final PSTPs to keep the states and other interested parties informed of the progress.

Develop estimates of waste volumes and radionuclide concentrations in treated residuals. Once treatment methods for the LLMW waste streams are finalized through the FFCAct process, estimates of the volumes and radionuclide concentrations of the treated residuals will be developed for all waste streams; this analysis will take place after the PSTPs have been approved by the appropriate regulatory agencies. These estimates are needed to compare to the guides for radionuclide concentrations derived from the performance evaluation.

Compare estimates of radionuclide concentration in treated residuals the guides for radionuclide concentrations derived from the performance evaluation. Radionuclide concentrations for each treated residual will be compared with those disposal values derived in the performance evaluation. Comparing radionuclide concentrations in treated residuals with performance evaluation concentration guides will compare LLMW stream characteristics to potential disposal sites' capabilities. This evaluation will also include off-site DOE and commercial disposal site candidates for those treated waste streams that do not have on-site capabilities. The candidates streams and sites will be confirmed through detailed performance assessments.

Develop sample configurations for disposal of treated residuals. An OAT approach will develop sample complex-wide configurations to dispose of treated LLMW residuals. These configurations will consider such technical issues as compatibility of radionuclides (both handled at the site and those considered acceptable by the performance evaluations) and capacity to handle projected residual volumes. Under the OAT approach, other types of issues—such as transportation costs and distances—will be weighed during the configuration discussions.

Develop a draft disposal system configuration. Using the sample configurations as a starting point, DOE will develop with state and stakeholder input, a draft disposal system configuration. This configuration will be the basis for determining future funding and schedules for proposed disposal facilities. The Final EM PEIS will provide bounding analysis of potential environmental impacts for the range of sample configurations considered. It will identify preferred sites for further development as disposal facilities. Following the issuance of the ROD for the EM PEIS, DOE may initiate site-specific NEPA evaluations for the proposed disposal facilities, initiate performance assessment

analyses for compliance with DOE Order 5820.2A, and initiate processes for permitting disposal facilities.

8.3 Integration with the STP Process

The FFCAct does not require disposal to be included in the STPs; however, given the complex issues involved, DOE recognizes the importance of state input to facilitate resolution of issues related to disposal. Chapter 8.0 information is provided in the PSTP to continue to involve the states and inform them of DOE's continued work on the disposal issue. For more detailed information on the ongoing performance evaluation process, see the Progress Report on Performance Evaluation of DOE Sites' Capabilities for Mixed Low-Level Waste Disposal. As the disposal planning process progresses, further information will be provided, and coordination with the states will continue.

8.4 Site-specific Options

Generally, the preferred options for on-site treatment of LLMW will generate two secondary treatability groups, water and solid residuals. Options for managing these secondary wastes depend on the hazardous classification of the waste treated.

Characteristic wastes. LLMW that RCRA regulations define as characteristic waste are treated to remove the hazardous characteristic. Residuals generated from treating characteristic waste are no longer regulated as hazardous if they no longer exhibit the hazardous characteristic and meet the Universal Treatment Standards in 40 CFR §268.48. Residuals meeting these requirements can be handled as low-level radioactive waste.

Low-level radioactive wastewater can be discharged to the Radioactive Liquid Waste Treatment Facility at TA-50, Building 1. The water is further treated at this facility and discharged under an NPDES permit.

Low-level radioactive treatment solids can be disposed of on-site at TA-54, Area G, or shipped off-site to licensed facilities, such as the disposal facility at the Nevada Test Site.

Listed wastes. LLMW that RCRA regulations define as listed wastes are treated to destroy the hazardous constituent. Residuals from treating listed wastes—except debris—remain hazardous under the regulations.

Wastewater generated from treating listed wastes will be evaporated in a mobile skid-mounted treatment unit to reduce the volume, then solidified. Both the solidified water and solids generated from treating listed wastes will be handled as LLMW. One commercial facility is available to dispose of these materials and will be used if the residuals meet the WAC for the facility. Residuals from listed wastes that cannot be shipped off-site will be stored in compliance with hazardous waste regulations until a disposal site is made available through the process described in Section 8.0.

Off-site treatment at commercial facilities. DOE orders require that residuals from treating mixed waste at off-site facilities be returned to the site that generated the waste. A variance can be obtained from the DOE allowing the residuals to be disposed of with the rest of the residuals from the off-site treatment facility. LANL plans to apply for variances for residuals generated by treating mixed wastes at off-site commercial treatment facilities. If the variances are granted, the residuals from treatment of LANL waste at off-site commercial facilities will go to the commercial disposal sites used by the treatment facilities. LANL will audit the disposal facilities to ensure that each has the proper permits and licenses and complies with applicable regulations.

If the variances are not approved, the residuals will be returned to LANL. Ultimate disposal of these residuals follows the options discussed previously in these sections.

Appendix

Methodology Used to Select Preferred and Alternate Options to Treat Low-level Mixed Waste at Los Alamos National Laboratory

The appendix includes the following elements:

- methodology used to select preferred and alternate options to treat low-level mixed waste (LLMW),
- explanation of changes in LLMW data between the DSTP and the PSTP,
- explanation of changes in the preferred options between the DSTP and the PSTP, and
- a graphic presentation of the proposed and alternate treatment options for LLMW.

1.0 METHODOLOGY USED TO SELECT PREFERRED OPTIONS TO TREAT LLMW

This section summarizes the methodology used to select the preferred and alternate options presented in the DSTP for treating LLMW at Los Alamos National Laboratory (LANL). A more detailed explanation of the process and support documentation for decision making by the DOE-AL Treatment Selection Team (TST) appears in the AL Mixed Waste Treatment Plan (ALMWTP). The ALMWTP provided a bottom–up approach to selecting treatment options to solve LLMW problem at multiple DOE sites.

1.1 Introduction

Nine Department of Energy (DOE) sites reporting to the Albuquerque Office (AL) have mixed waste, waste that is chemically hazardous and radioactive. The hazardous waste regulations require the chemical portion of mixed waste to be treated to certain standards. The total volume of low-level mixed waste at the nine sites is less than a volume equivalent to 7000 drums, with individual site volumes ranging from 1 gallon of waste at the Pinellas Plant to 3000 drum equivalents at Los Alamos National Laboratory. Nearly all the sites have a diversity of wastes requiring a diversity of treatment processes. Treatment capacity does not exist for much of this waste, and it would be expensive for each site to build the diversity of treatment processes needed to treat its own wastes.

DOE-AL assembled a team that developed the AL Mixed Waste Treatment Plan that uses the resources of the nine sites to treat the waste at the sites. Work on the plan started in October 1993, and the plan was finalized in March 1994. The plan uses commercial treatment, treatability studies, and mobile treatment units. The plan specifies treatment technologies that will be built as mobile treatment units to be moved from site to site. Mobile units include bench-top units for very small volumes and treatability studies, drum-size units that treat one drum per day, and skid-size units that handle multiple drum volumes. After the tools needed to treat the wastes were determined, the sites were assigned to provide part of the treatment capacity using their own resources and expertise.

The sites are making progress on treatability studies, commercial treatment, and mobile treatment design and fabrication.

To date, this is the only plan for treating waste that brings the resources of several DOE sites together to treat mixed waste. It is the only program actively planning to use mobile treatment coordinated between DOE sites.

1.2 The Problem of Mixed Waste

Congress passed the Federal Facilitates Compliance Act (FFCAct) in 1992. Generally, mixed wastes are wastes that have a hazardous component, as defined in the RCRA regulations, and a radioactive component. The FFCAct requires each DOE facility to negotiate a site treatment plan (STP) with the state in which the facility is located. The STP must specify how and when mixed waste will be treated.

Nine sites that have mixed waste report to the DOE Albuquerque Office (DOE-AL):

- Grand Junction Project Office; Grand Junction, Colorado;
- Inhalation Toxicology Research Institute; Albuquerque, New Mexico;
- Kansas City Plant; Kansas City, Missouri;
- Los Alamos National Laboratory; Los Alamos, New Mexico
- Mound Facility; Miamisburg, Ohio;
- Pantex Plant; Amarillo, Texas;
- Pinellas Plant; Pinellas, Florida
- Sandia National Laboratories, California; Livermore, California; and
- Sandia National Laboratories, NM; Albuquerque, New Mexico.

The level and type of radioactive contamination group the waste into different categories based on DOE definitions. The nine sites have low-level mixed waste, and a few sites have transuranic mixed waste. Transuranic mixed waste will be handled following a national program developed by the DOE. Treatment is therefore needed for only low-level mixed waste.

1.3 Waste Volumes

Approximately 7000 drum equivalents of low-level mixed wastes are at the nine sites. Volumes at individual sites range from 1 gallon at Pinellas to 3000 drum equivalents at Los Alamos. Five of the nine sites have less than 50 drums of waste, and three of those have less than 10 drums. Few waste streams are greater than 50 drums. The wastes are diversified. Even sites with small volumes have waste that requires a diversity of treatment approaches. For example, the Grand Junction Project Office has less than 10 drums of waste made up of 19 waste streams.

1.4 The Problem

The problem is that various treatment processes are needed at most of the nine sites. The treatment must be implemented quickly to meet the intent of the FFCAct. Because the activity is funded by taxpayers and there are serious competing needs for tax dollars, the treatment must be implemented as inexpensively and efficiently as possible.

1.5 The AL Mixed Waste Treatment Plan

The purpose of the AL Mixed Waste Treatment Plan is to use the resources of the nine sites to create real treatment capacity for mixed waste that minimizes the time and cost. Each site is responsible for negotiating a site treatment plan with its state agencies. The plan offers resources outside those of the individual sites that can be used in planning the site treatment plan.

1.6 Methodology for Developing the Plan

The plan was developed by the Treatment Selection Team: four representatives of the sites, two representatives of DOE-AL, and one consultant on regulatory affairs.

The overall approach used to develop the plan is that used in the classical solution of any engineering problem:

- define the problem;
- determine what is given to work with;
- determine basis for solution; and
- solve the problem.

In defining the problem, the team took an approach different from past efforts. The team visited each site and discussed the waste, existing and planned treatment, and site capabilities. Instead of reducing the information into computer forms, the information was recorded as text wherever possible. This approach was important in characterizing the waste because it created a visual picture of the waste and allowed the team to maintain the true identity and character of the waste throughout the development of the plan. A data sheet with text describing the waste is included in the plan document for each of the 141 waste streams.

In solving an engineering problem, engineers identify givens, things that affect decision-making. The team then prepared fact sheets for information affecting decision-making and included those in the plan document.

These fact sheets . . .	provide this information . . .
site fact sheets	general information on the site, on mixed waste generation, and on the ability of the site to support on-site treatment.

These fact sheets . . .	provide this information . . .
site capability lists	list of existing equipment or operations on-site that could be used to treat mixed waste if properly permitted.
off-site treatment fact sheets	capabilities of commercial facilities that can handle mixed waste.
regulatory fact sheets	regulations that affect decision-making.
technology information sheets	information on treatment technologies applicable to the waste.

Each team member reviewed all the waste data sheets and fact sheets so that all team members had a common background for problem-solving.

1.7 Developing the Basis

Developing a basis bounds a problem so that an engineer can define the problem to solve it. To bound this problem, the waste streams were divided into treatability groups that were the basis for solving the problem. The 141 individual wastes found at the sites were manually separated into categories, then waste streams, and finally waste substreams that were treatability groups. Each progressive step recognized the characteristics of the waste that affect treatment. The 48 waste substreams or treatability groups were arranged on matrix sheets that include the quantity and site identification number for each waste.

A base treatment was selected for each substream. Base treatment is not the best treatment or a selected treatment, but a treatment approach the team thought could handle all the wastes in substream. Base treatments were treatment approaches that the sites recommended or that the team felt could treat all the waste in the substream.

The validity of the substreams as treatability groups was verified by ensuring that each waste included in a substream could be treated using the base treatment.

1.8 Developing the Solution

Several ground rules were established for developing the plan. The treatment options considered were directed toward the volumes and waste types found at the DOE-AL sites. Treatment options evaluated must be implementable within five years. Treatment options considered must have a realistic approach to shipping waste; that is, shipping waste to commercial facilities for treatment or shipping small volumes of waste between DOE sites for treatability studies is reasonable, but shipping between DOE sites for treatment or disposal is not practical in the short term. The ground rule on shipping waste is based on input on the states' attitudes during site visits. Finally, common sense must be used in rating and selecting alternatives. Solutions must fit the problems.

Using criteria that addressed regulatory standards, public acceptance, safety, scalability, and probability of success, alternative treatment approaches were rated against the base

treatment for each of the 48 waste substreams. The top three treatment approaches were ranked as first, second, or third. If two or more approaches were rated equally, both were given the same rating. A list was made for each treatment option, which was ranked as first, second, and third choice for each substream. Matrices were prepared showing the waste that could be treated with each treatment option. These matrices are essentially client lists for the treatment approaches that rated the highest.

The matrix sheets were laid out on a table. The team assessed whether any of the treatment approaches were unavoidable, things that had to be done regardless of what other treatment approaches were used. The unavoidable treatment matrices were saved. Next, the team determined whether there were any treatment approaches for which there was no other option or for which a site was well along in design and fabrication of treatment capacity. These were also selected. The team then determined whether there were any obvious winners, treatment approaches that handle appreciable volumes of waste and that were easily implemented. These were selected. The team looked for and rejected obvious failures, treatment approaches that handle limited wastes. The selection process left nine treatment approaches on the table. The team evaluated each of these treatments individually to determine whether they fit into an overall approach.

Using the waste matrices showing the volumes and locations of waste in each treatability group, the team analyzed each selected treatment option and determining how it should be used. The actions needed to implement the options were then assigned to the sites. Distribution of assignments was based on available resources site interest and site expertise. The assignments are summarized in Table I.

Table I. Summary of Site Assignments.

Site	Treatment Option	Assignment
Grand Junction	sort, survey, decontaminate	develop mobile service
	thermal desorption	develop treatability test and skid unit
	evaporative oxidation	develop treatability test and skid unit
	treated water evaporation	develop bench-scale and skid-sized units
Kansas City	off-site commercial treatment	support site efforts
	plating waste treatment	develop bench-scale unit
	supercritical CO_2	support R&D efforts
Los Alamos	plating waste treatment	develop skid unit
	gas cylinder treatment	develop skid unit
	reactive metals treatment	develop skid unit
	uranium chips treatment	develop skid unit
	DETOX	develop treatability test and skid unit

Table I. Summary of Site Assignments (cont).

Site	Treatment Option	Assignment
	chelation of lead	develop treatability testing
	controlled-air incinerator	support restart of existing unit
	lead decontamination	operate existing trailer
	hydrothermal processing	develop treatability test
	triple distillation of Hg	develop treatability tests
Mound	tritium capture	develop various sizes to support other units
	packed bed reactor/silent discharge	develop skid unit
	glass melter	support restart of existing unit
Pinellas	amalgamation	develop bench-scale unit
Pantex	stabilization	develop bench-, drum-, and skid-sized units
	sulfate precipitation of barium	adapt skid stabilization unit
	macroencapsulation	develop skid unit
	metal melting	support R&D effort
	biodegradation	support R&D effort
Sandia/NM	steam reforming	develop skid unit
	retorting of Hg salts	develop bench unit

1.9 Summary of the Plan

The plan makes use of

- treatability studies,
- portable treatment units in sizes ranging from bench-scale to skid-sized units,
- off-site treatment capacity, and
- the ability to survey some waste out of the radioactive designation.

The plan defines an activity for each selected treatment option and assigns a site to be project manager for that activity. The plan does not give specific direction about how each site completes its assignments but allows each site to use its own initiative to find the most efficient approach to completing the assignment.

The plan establishes an Overall Program Manager, the Grand Junction Project Office (GJPO), to implement the plan, coordinate overall activities, and maintain a master schedule. Support working groups quickly resolve issues related to implementation of the plan.

This working group . . .	will address . . .
portable treatment	issues related to the design, fabrication, transportation, storage, maintenance, and operation of portable treatment units.
National Environmental Policy Act (NEPA)	issues relate to developing consistent and effective NEPA documentation for activities in the plan.
safety analysis reports	issues related to developing consistent and effective safety documentation related to the plan.
permitting	issues related to permitting portable treatment units.
disposal	issues related to the disposal of treatment residuals.
public involvement	how to provide public involvement support for the plan.

1.10 Problem Areas

The plan presents some new concepts that create problems.

Interdependency of sites. Each site has tried to be self-sufficient in its waste management activities. The plan requires that sites depend on one another to create treatment capacity. This approach raises questions about how the concept can be incorporated into the site treatment plan negotiations and who is liable if one site fails to meet a schedule affecting other sites.

Permitting portable treatment. Permitting portable treatment units is no worse than each site's permitting multiple treatment units individually. The plan raises a question about whether there is a more efficient way of permitting portable treatment units that recognizes the individual rights of the states.

Transportation of portable treatment units. Using portable treatment units means that the units are moved to the waste, rather than the waste being moved to treatment. What are the states' concerns about moving portable treatment units?

Orphaned waste. The plan is based on the characterization data available at the time of the site visits. The treatment options selected are appropriate for a variety of wastes. Even still, some wastes are expected to be orphaned as characterization improves and the design and implementation of treatment alternative progress. The plan makes the Overall Program Manager responsible for evaluating orphaned waste and for determining whether additional treatment options are needed.

2.0 EXPLANATION OF CHANGES IN LLMW DATA BETWEEN THE DSTP AND THE PSTP

LANL negotiated a Federal Facilities Compliance Agreement (FFCAgreement) with EPA Region 6 for mixed waste. The agreement required that LANL recharacterize LLMW. That effort was completed in the last quarter of 1994 and resulted in much better data for

determining treatability groups. The new data is reflected in the treatability groups and volume data in the PSTP. The reorganization of waste based on the new characterization data does not easily allow a waste-stream-by-waste-stream comparison between the DSTP and the PSTP.

Several factors contribute to the reduction of the total volume of LLMW reported in the PSTP relative to the DSTP.

Recharacterization. Inventory volumes reported in the DSTP were based on the waste container volume. Recharacterization work determined that some of the containers were only partially full or contained smaller containers (sometimes a few bottles) overpacked in a drum. The data in the PSTP is the net volume of the waste rather than the container volume.

Scintillation vials. The DSTP included over 600 drums of scintillation vials. Scintillation vials are small glass or plastic bottles containing 10 milliliters of a mixture of water and an ignitable organic liquid. The liquid has been removed from the vials and bulked; the liquid fills approximately 15 drums. The net scintillation liquid volume is included in the PSTP.

Lead decontamination. Approximately 50 tons of lead bricks have been cleaned of radioactive contamination and recycled. The cleaned lead has been removed form the waste inventory in the PSTP.

3.0 EXPLANATION OF CHANGES IN THE PREFERRED OPTIONS BETWEEN THE DSTP AND THE PSTP

Changes in preferred options were caused recharacterizing the waste, value engineering studies for mobile skid-mounted treatment units, and uncertainties about the future of the Controlled-Air Incinerator. The preferred options in the PSTP are treatment options included in the ALMWTP.

Recharacterization. New characterization data resulted in choosing macroencapsulation over stabilization for some solid waste. The change addresses the fact that the solid waste is made up of larger pieces than originally thought.

Value engineering studies. As part of the skid development program, value engineering studies were conducted for both hydrothermal processing and DETOX. The studies indicated that although both processes had similar treatment capabilities, hydrothermal processing could be fielded as a mobile skid-mounted treatment unit in less time and at less cost than DETOX. Hydrothermal processing was therefore selected over DETOX.

Uncertainties about the CAI. The uncertainties about the future of the CAI are discussed in the PSTP. The advantage of the CAI is that it is an existing, demonstrated technology that can treat significant volumes of waste in a short time. Alternative mobile skid-mounted treatment units are being developed in parallel with the CAI as part of the

ALMWTP. The alternatives have much less capacity and will take longer to work off the backlog of waste. Four alternative options are needed to replace the capability of the CAI. One of these technologies, hydrothermal processing, is unproved. Thermal desorption and evaporative oxidation have been demonstrated on hazardous waste, but have not been widely applied to mixed waste. Because of the uncertainty about the availability of the CAI for waste treatment, it is proposed as a parallel preferred option to the alternative. This approach differs from that in the DSTP, in which the CAI was proposed as the preferred option.

The following figures graphically show the preferred and alternate treatment processes included in the PSTP.

Low-Level Mixed Waste Treatment Options

Waste	IPA Wastes	Scintillation Fluids	Lead Blankets	Soil w/ Heavy Metals
Preferred option	DSSI	DSSI	Envirocare	Envirocare
2nd option	CAI / Hydrothermal	CAI / Hydrothermal	Macroencapsulation	Chelator Extraction

Waste	ER Soil	Aqueous Organic Liquids	Halogenated Organic Liquids	Nonhalogenated Organics
Preferred option	Envirocare	CAI / Evaporative Oxidation	CAI / Hydrothermal	CAI / Hydrothermal
2nd option	Macroencapsulation	Hydrothermal	DETOX	DETOX

Low-Level Mixed Waste Treatment Options (con't)

Waste	PCB Waste w/ RCRA Solvents	Bulk Oils	Organic-Contaminated Combustible Solids	Inorganic Combustible Debris
Preferred option	CAI / Hydrothermal	CAI / Hydrothermal	CAI / Thermal Desorption	CAI / Macroencapsulation
2nd option	DETOX	DETOX	TBD	TBD

Waste	Aqueous Waste w/ Heavy Metals	Corrosive Solutions	Aqueous Cyanides, Nitrates, Chromates and Arsenates	Water-reactive Metals
Preferred option	Chemical Plating Waste Skid	Chemical Plating Waste Skid	Chemical Plating Waste Skid	Water-reactive Metals Skid
2nd option	Evaporative Oxidation	Evaproative Oxidation	Evaporative Oxidation	TBD

Low-Level Mixed Waste Treatment Options (con't)

Waste	Gases Requiring Scrubbing	Gases Requiring Oxidation	Organic-contaminated Noncombustible Solids	Elemental Mercury
Preferred option	Gas Scrubbing Skid	Gas Oxidation Skid	Thermal Desorption	Amalgamation
2nd option	TBD	CAI	TBD	Triple Distillation

Waste	Activated or Unseparable Lead	Noncombustible Debris	Inorganic Solid Oxidizers	Lead Wastes - TBD
Preferred option	Macroencapsulation	Macroencapsulation	Hydrothermal	TBD
2nd option	TBD	TBD	TBD	TBD

Low-Level Mixed Waste Treatment Options (con't)

Waste	Mercury Waste TBD	Biochemical Laboratory Wastes	Gaseous Wastes TBD	Surface Contaminated Lead
Preferred option	TBD	TBD	TBD	Lead Decontamination Trailer
2nd option	TBD	TBD	TBD	TBD

Waste	Lead Requiring Sorting	Nonradioactive / suspect Waste Items
Preferred option	Sort by Treatment	Sort, Survey and Decontaminate
2nd option	NA	