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 Carlsbad Field Office
 P. O. Box 3090
 Carlsbad, New Mexico 88221

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NMED
 Hazardous Waste Bureau

Mr. John E. Kieling, Chief
 Hazardous Waste Bureau
 New Mexico Environment Department
 2905 Rodeo Park Drive East, Building 1
 Santa Fe, New Mexico 87505-6303

Subject: Review of Los Alamos National Laboratory - Central Characterization Program
 Waste Stream Profile Form Number LA-MIN05-V.001, *Absorbed TRU Waste*

Dear Mr. Kieling:

The Department of Energy, Carlsbad Field Office has approved the Waste Stream Profile Form (WSPF) Number LA-MIN05-V.001, *Absorbed TRU Waste* for the Central Characterization Program at the Los Alamos National Laboratory.

Enclosed is a copy of the WSPF as required by Section C-5a of the Waste Isolation Pilot Plant, Hazardous Waste Facility Permit, No. NM4890139088-TSDF.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have questions, please contact Mr. J. R. Stroble, Director of the Office of the National TRU Program, at (575) 234-7313.

Sincerely,


 Jose R. Franco, Manager
 Carlsbad Field Office

Enclosure

cc: w/enclosure	
S. Holmes, NMED	*ED
T. Kliphuis, NMED	ED
R. Maestas, NMED	ED
C. Smith, NMED	ED
C. Walker, TechLaw	ED
RCRA Chronology Record	ED
WIPP Operating Record	ED
CBFO M&RC	

*ED denotes electronic distribution



CCP-TP-002, Rev. 26
CCP Reconciliation of DQOs and
Reporting Characterization Data

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Attachment 2 – CCP Waste Stream Profile Form

(1) Waste Stream Profile Number: LA-MIN05-V.001		
(2) Generator site name: Los Alamos National Laboratory		(3) Generator site EPA ID: NM0890010515
(4) Technical contact: Veronica Waldram		(5) Technical contact phone number: 575-234-7187
(6) Date of audit report approval by New Mexico Environment Department (NMED): April 18, 2013		
(7) Title, version number, and date of documents used for WIPP-WAP Certification: CCP-PO-001, CCP Transuranic Waste Characterization Quality Assurance Project Plan, Revision 21, May 31, 2013; CCP-PO-002, CCP Transuranic Waste Certification Plan, Revision 27, May 31, 2013; CCP-PO-012, CCP/Los Alamos National Laboratory (LANL) Interface Document, Revision 15, January 23, 2014		
(8) Did your facility generate this waste? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>		
(9) If no, provide the name and EPA ID of the original generator: NA		
Waste Stream Information		
(10) WIPP ID: LA-TA-03-30		(11) Summary Category Group: S3000 – Homogeneous Solids
(12) Waste Matrix Code Group: Solidified Inorganics		(13) Waste Stream Name: Absorbed TRU Waste
(14) Description from the ATWIR: Waste stream LA-MIN05-V.001 consists primarily of mixed homogeneous solids (absorbed TRU waste). The waste includes liquids and residues/solids absorbed or mixed with absorbent.		
(15) Defense TRU Waste: YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>		
(16) Check One: CH <input checked="" type="checkbox"/> RH <input type="checkbox"/>		
(17) Number of SWBs: 1 (17a) Number of SLB2: N/A	(18) Number of Drums: 7 55-gallon drums	(19) Number of Canisters: N/A
(20) Batch Data Report numbers supporting this waste stream characterization: See Characterization Information Summary (CIS) Correlation of Container Identification Numbers to Batch Data Report Numbers.		
(21) List applicable EPA Hazardous Waste Numbers: D004, D005, D006, D007, D008, D009, D010, D011, D022, D027, D028, D029, D030, D037, D043, F001, F002, F004, and F005.		
(22) Applicable TRUCON Content Numbers: SQ111/SQ211, SQ112/SQ212, SQ113/SQ213, SQ129/SQ229 and LA112/LA212		
(23) Acceptable Knowledge Information		
(For the following, enter the supporting documentation used [i.e., references and dates])		
Required Program Information		
(23A) Map of site: CCP-AK-LANL-009, Revision 8, November 5, 2013, Figures 1, 2 and 3		
(23B) Facility mission description: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 4.2.2		
(23C) Description of operations that generate waste: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 4.4		
(23D) Waste identification/categorization schemes: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 4.3.1		
(23E) Types and quantities of waste generated: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 4.3.3		
(23F) Correlation of waste streams generated from the same building and process, as applicable: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 4.3.4		
(24) Waste certification procedures: CCP-TP-030, Revision 33, November 19, 2013		
(25) Required Waste Stream Information		

CCP-TP-002, Rev. 26
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Reporting Characterization Data

Effective Date: 06/19/2013

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(25A) Area(s) and building(s) from which the waste stream was generated: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 7.1		
(25B) Waste stream volume and time period of generation: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 7.2		
(25C) Waste generating process description for each building: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 7.3		
(25D) Waste Process flow diagrams: CCP-AK-LANL-009, Revision 8, November 5, 2013, Figures 4, 5, 6, and 7		
(25E) Material inputs or other information identifying chemical/radionuclide content and physical waste form: CCP-AK-LANL-009, Revision 8, November 5, 2013, Section 7.4		
(25F) Waste Material Parameter Weight Estimates per unit of waste: See table entitled "Waste Material Parameter Estimates for LA-MIN05-V.001" in Summation of Aspects of AK Summary Report: LA-MIN05.001		
(26) Which Defense Activity generated the waste:		
<input type="checkbox"/>	Weapons activities including defense inertial confinement fusion	Naval reactors development
<input type="checkbox"/>	Verification and control technology	X Defense research and development
X	Defense nuclear waste and materials by-products management	X Defense nuclear materials production
<input type="checkbox"/>	Defense nuclear materials security and safeguards and security investigations	
(27) Supplemental Documentation:		
(27A) Process design documents: NA		
(27B) Standard operating procedures: See D015, D016, D017, D019, M005, P003, P004, P005, P006, P007, P008, P009, P011, P012, P013, P014, P017, P018, P019, P020, P021, P022, P023, P024, P025, P026, P028, P029, P030, P031, P032, P033, P034, P035, P038, P040, P041, and P042 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27C) Safety Analysis Reports: See D001, D016, D018, D023, and D041 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27D) Waste packaging logs: See M286 and P007 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27E) Test plans/research project reports: NA		
(27F) Site databases: See C024, M018, M019, M021, and M282 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27G) Information from site personnel: See C003, C005, C007, C008, C009, C012, C016, C019, C022, C024, C025, C026, C027, C028, C029, DR003, and M024 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27H) Standard industry documents: See M017 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27I) Previous analytical data: See D022, DR001, and DR002 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27J) Material safety data sheets: See M017 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
(27K) Sampling and analysis data from comparable/surrogate Waste: NA		
(27L) Laboratory notebooks: See M284 in the Summation of Aspects of AK Summary Report: LA-MIN05-V.001, Source Documents		
Confirmation Information		
<i>For the following, when applicable, enter procedure title(s), number(s) and date(s)</i>		
(28)	Radiography: CCP Standard Real-Time Radiography (RTR) Inspection Procedure, CCP-TP-053, Revision 14, September 25, 2013	
	Visual Examination: NA	

(29) Comments: For a list of the waste characterization procedures used and date of respective procedures see the list of procedures on the attached CIS.

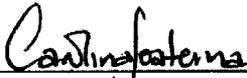
NOTE: ATWIR number LA-TA-03-30 was chosen based on the similarity to the waste material parameter estimates for waste stream LA-MIN05-V.001. Waste stream LA-MIN05-V.001 includes approximately 50 percent organic materials which matches the description of ATWIR number LA-TA-03-30.

Reviewed by AK Expert: YES Date: 3/11/2014

Reviewed by STR (if necessary): YES N/A Date: 3/11/2014

Waste Stream Profile Form Certification:

I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

	Carolina Soaterna	3/17/2014
Signature of Site Project Manager	Printed Name	Date

CHARACTERIZATION INFORMATION SUMMARY

WSPF# LA-MIN05-V.001 (CCP-AK-LANL-009)

Lot 1

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Characterization Information Cover Page.....	2
Correlation of Container Identification Numbers to Batch Data Report Numbers.....	5
RTR/VE Summary of Prohibited Items and AK Confirmation.....	6
Reconciliation with Data Quality Objectives.....	7

CCP Characterization Information Summary Cover Page

Waste Stream # LA-MIN05-V.001 Lot #: 1
 AK Expert Review: N/A Date: N/A
 SPM Review: Josh Houghton  Date: 03/17/2014

SPM signature certifies that through Acceptable Knowledge testing and/or analysis that the waste identified in this summary is not corrosive, ignitable, reactive, or incompatible with the TSDF.

A summary of the Acceptable Knowledge regarding this waste stream containing specific information about the corrosivity, reactivity, and ignitability of the waste stream is included as an attachment to the Waste Stream Profile Form. By reference, that information is included in this lot.

List of procedures used:

Non Destructive Assay (NDA):

- | | | |
|------------|--------|---|
| CCP-TP-050 | Rev 2 | 08/28/2013 Operating the Super High Efficiency Neutron Counter (SperHENC) Using NDA 2000 |
| CCP-TP-050 | Rev 1 | 09/19/2011 Operating the Super High Efficiency Neutron Counter (SperHENC) Using NDA 2000 |
| CCP-TP-050 | Rev 0 | 05/04/2011 Operating the Super High Efficiency Neutron Counter (SperHENC) Using NDA 2000 |
| | | |
| CCP-TP-063 | Rev 15 | 08/23/2013 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 14 | 08/01/2012 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 13 | 04/11/2011 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 12 | 11/17/2010 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 11 | 10/15/2008 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 10 | 11/27/2007 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 9 | 11/27/2007 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 8 | 11/30/2006 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 7 | 03/31/2006 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| CCP-TP-063 | Rev 6 | 10/10/2005 CCP Operating the High Efficiency Neutron Counter Using NDA2000 |
| | | |
| CCP-TP-064 | Rev 7 | 08/23/2013 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 6 | 04/08/2011 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 5 | 11/27/2007 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 4 | 03/31/2006 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 3 | 09/10/2004 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 2 | 05/14/2004 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 1 | 03/24/2004 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| CCP-TP-064 | Rev 0 | 10/11/2003 Calibrating the High Efficiency Neutron Counter and the Super High Efficiency Neutron Counter Using NDA 2000 |
| | | |
| CCP-TP-103 | Rev 12 | 11/04/2013 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 11 | 05/18/2013 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 10 | 06/30/2011 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 9 | 03/14/2011 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 8 | 07/12/2010 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 7 | 11/18/2008 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 6 | 02/08/2008 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 5 | 07/18/2005 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |
| CCP-TP-103 | Rev 4 | 10/26/2004 CCP Data Reviewing, Validating, and Reporting Procedure for the NDA Counters at LANL Using NDA 2000 |

Project Level Data Validation / DQO Reconciliation:

- | | | |
|------------|--------|---|
| CCP-TP-001 | Rev 21 | 06/08/2013 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 20 | 09/27/2012 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 19 | 12/29/2010 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 18 | 08/09/2010 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 17 | 09/24/2007 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 16 | 04/26/2007 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 15 | 11/22/2006 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 14 | 11/18/2006 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 13 | 07/21/2006 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 12 | 05/25/2006 CCP Project Level Data Validation and Verification |
| CCP-TP-001 | Rev 11 | 03/23/2005 CCP Project Level Data Validation and Verification |
| | | |
| CCP-TP-002 | Rev 26 | 06/19/2013 CCP Reconciliation of DQOs and Reporting Characterization Data |
| CCP-TP-002 | Rev 25 | 02/11/2013 CCP Reconciliation of DQOs and Reporting Characterization Data |
| CCP-TP-002 | Rev 24 | 12/28/2011 CCP Reconciliation of DQOs and Reporting Characterization Data |
| CCP-TP-002 | Rev 23 | 12/29/2010 CCP Reconciliation of DQOs and Reporting Characterization Data |

CCP Reconciliation of DQOs and Reporting Characterization Data

CCP-TP-002	Rev 22	06/30/2010	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 21	08/04/2009	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 20	08/18/2008	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 19	12/22/2008	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 18	11/16/2008	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 17	10/10/2008	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 16	08/08/2008	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 15	08/18/2005	CCP Reconciliation of DQOs and Reporting Characterization Data
CCP-TP-002	Rev 14	03/29/2005	CCP Reconciliation of DQOs and Reporting Characterization Data

CCP-TP-005	Rev 26	08/12/2013	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 25	06/19/2013	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 24	11/28/2011	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 23	08/30/2011	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 22	04/21/2011	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 21	12/29/2010	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 20	11/01/2010	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 19	07/06/2010	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 18	11/16/2008	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 17	06/05/2008	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 16	02/27/2008	CCP Acceptable Knowledge Documentation
CCP-TP-005	Rev 15	03/31/2005	CCP Acceptable Knowledge Documentation

CCP-TP-030	Rev 33	11/19/2013	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
CCP-TP-030	Rev 32	06/20/2013	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
CCP-TP-030	Rev 31	11/19/2012	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
CCP-TP-030	Rev 30	05/21/2012	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
CCP-TP-030	Rev 29	04/26/2011	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
CCP-TP-030	Rev 28	05/12/2010	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
CCP-TP-030	Rev 27	12/14/2009	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 26	05/27/2009	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 25	01/22/2009	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 24	08/20/2008	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 23	03/12/2008	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 22	07/24/2007	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 21	05/21/2007	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 20	02/07/2007	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 19	11/16/2006	CCP CH TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 18	05/01/2006	CCP TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 17	12/29/2005	CCP TRU Waste Certification and WWIS Data Entry
CCP-TP-030	Rev 16	04/22/2005	CCP TRU Waste Certification and WWIS Data Entry

Radiography (RTR/NDE):

CCP-TP-028	Rev 6	06/17/2013	CCP Radiographic Test Drum and Training Container Construction
CCP-TP-028	Rev 7	07/13/2012	CCP Radiographic Test Drum and Training Container Construction
CCP-TP-028	Rev 6	12/29/2010	CCP Radiographic Test Drum and Training Container Construction
CCP-TP-028	Rev 5	07/27/2010	CCP Radiographic Test Drum and Training Container Construction
CCP-TP-028	Rev 4	05/26/2010	CCP Radiographic Test Drum and Training Container Construction
CCP-TP-028	Rev 3	01/19/2008	CCP Radiographic Test Drum and Training Container Construction
CCP-TP-028	Rev 2	02/04/2004	CCP Radiographic Test Drum and Training Container Construction

CCP-TP-053	Rev 14	09/25/2013	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 13	05/14/2013	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 12	08/22/2012	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 11	07/20/2011	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 10	03/04/2011	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 9	09/30/2010	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 8	06/30/2010	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 7	10/21/2009	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 6	03/04/2008	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 5	11/16/2008	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 4	12/22/2005	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 3	03/21/2005	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
CCP-TP-053	Rev 2	07/14/2004	CCP Standard Real-Time Radiography (RTR) Inspection Procedure

CCP-TP-198	Rev 7	05/09/2013	CCP-HE-RTR Operating Procedure
CCP-TP-198	Rev 6	06/06/2012	CCP-HE-RTR Operating Procedure
CCP-TP-198	Rev 5	01/30/2012	CCP-HE-RTR Operating Procedure
CCP-TP-198	Rev 4	01/05/2012	CCP-HE-RTR Operating Procedure

CCP Reconciliation of DQOs and Reporting Characterization Data

CCP-TP-198	Rev 3	07/11/2011	CCP-HE-RTR Operating Procedure
CCP-TP-198	Rev 2	03/14/2011	CCP-HE-RTR Operating Procedure
CCP-TP-198	Rev 1	03/01/2011	CCP-HE-RTR Operating Procedure
CCP-TP-198	Rev 0	02/11/2011	CCP-HE-RTR Operating Procedure

WAP Certification:

CCP-PO-001	Rev 21	05/31/2013	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 20	06/16/2011	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 19	12/29/2010	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 19	06/30/2010	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 17	06/23/2009	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 16	10/31/2007	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 15	06/10/2007	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 14	03/28/2007	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 13	11/16/2006	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 12	03/22/2006	CCP Transuranic Waste Characterization Quality Assurance Project Plan
CCP-PO-001	Rev 11	03/10/2005	CCP Transuranic Waste Characterization Quality Assurance Project Plan

CCP-PO-002	Rev 27	05/31/2013	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 26	07/14/2011	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 25	12/29/2010	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 24	06/30/2010	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 23	04/07/2010	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 22	01/12/2010	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 21	01/28/2009	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 20	11/02/2007	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 19	05/22/2007	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 18	11/16/2006	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 17	11/16/2006	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 16	11/16/2006	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 15	03/22/2006	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 14	12/29/2005	CCP Transuranic Waste Certification Plan
CCP-PO-002	Rev 13	05/09/2005	CCP Transuranic Waste Certification Plan

CCP-PO-003	Rev 13	07/31/2013	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 12	12/29/2010	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 11	06/04/2009	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 10	11/16/2006	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 9	12/29/2005	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 8	01/25/2005	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 7	11/22/2004	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 6	06/08/2004	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 5	09/19/2003	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 4	02/11/2003	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)
CCP-PO-003	Rev 3	05/31/2002	Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPC)

CCP-PO-012	Rev 15	01/23/2014	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 14	10/30/2013	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 13	06/25/2013	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 12	11/05/2012	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 11	10/01/2012	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 10	07/09/2012	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 9	01/04/2012	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 6	12/29/2010	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 7	05/08/2008	CCP/Los Alamos National Laboratory (LANL) Interface Document
CCP-PO-012	Rev 8	08/06/2007	CCP/Los Alamos National Laboratory (LANL) interface Document
CCP-PO-012	Rev 5	11/16/2006	CCP/Los Alamos National Laboratory (LANL) interface Document
CCP-PO-012	Rev 4	03/31/2006	CCP/Los Alamos National Laboratory (LANL) Interface Document

**CCP Correlation of Container Identification
Numbers to Batch Data Report Numbers**

Waste Stream: #

LA-MIN05-V.001

Container ID Number	Historical Container ID	NDA BDR	RTR BDR	VE BDR	Load/Manage Overpack Yes
84415	LA00000084415	1LANDA1865	LA-RTR2-13-0126	N/A	No
91087	LA00000091087	1LANDA1865	LA-RTR2-13-0126	N/A	No
91388	LA00000091388	1LANDA1865	LA-RTR2-13-0126	N/A	No
92298	LA00000092298	3LANDA0222	LA-HERTR-13-0114	N/A	No
S903056	LAS903056	1LANDA1865	LA-RTR2-13-0126	N/A	No


Signature of Site Project Manager

Josh Houghton
Printed Name

3/17/2014
Date

CCP RTR/VE Summary of Prohibited Items and AK Confirmation

Waste Stream Number: LA-MIN05-V.001

Lot #: 1

Container Number	RTR Prohibited Items ^{a,b}	Visual Examination Prohibited Items ^{a,b}	Does the Physical Form of the Waste Match the Waste Stream Description as Determined by AK
See correlation of container ID numbers for list of remaining drum numbers in this Lot.	None of the containers in this lot had prohibited items identified during RTR.	VE was not used to certify any containers in this Lot.	The physical form of the waste matches the waste stream description as determined by AK.
<p>^a See Batch Data Reports ^b If AK has assigned U134 to this waste stream, then any liquids in these containers are prohibited items (not acceptable by the TSDF)</p>			
<p>Justification for the selection of RTR and/or VE: RTR was selected as the characterization method for this lot because the waste was previously packaged and RTR meets all the Data Quality Objectives for NDE for the waste.</p>			


 Site Project Manager Signature

Josh Houghton
 Printed Name

03/17/2014
 Date

CCP Reconciliation of DQOs and Reporting Characterization Data

CCP Reconciliation with Data Quality Objectives

WSPF# LA-MIN05-V.001

Lot # 1

Sampling Completeness

RTR/VE:

Number of Valid Samples: 5
Percent Complete: 100 (QAO is 100%)

Number of Total Samples Analyzed: 5

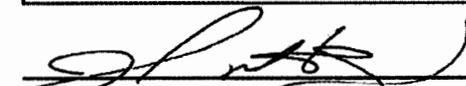
NDA:

Number of Valid Samples: 5
Percent Complete: 100 (QAO is 100%)

Number of Total Samples Analyzed: 5

CCP Reconciliation of DQOs and Reporting Characterization Data

	Y/N/NA	Reconciliation Parameter												
1	Y	Waste Matrix Code.												
2	Y	Waste Material Parameter Weights.												
3	Y	The TRU activity reported in the BDRs for each container demonstrates with a 95% probability that the container of waste contains TRU radioactive waste.												
4	N	AK Sufficiency. Is there an approved AK sufficiency Determination for this waste stream?												
5	Y	The data demonstrates whether the waste stream exhibits a toxicity characteristic under Title 40 Code of Federal Regulations (CFR), Part 261, Identification and Listing of Hazardous Waste, Subpart C, Characteristics of Hazardous Waste.												
6	Y	Does the waste stream contain listed waste found in 20.4.1.200 NMAC incorporating 40 CFR Part 261, Subpart D, Lists of Hazardous Wastes.												
7	Y	Waste stream can be classified as hazardous or nonhazardous.												
8	Y	The overall completeness, comparability, and representativeness QAOs were met for each of the analytical and testing procedures as specified in the WAP Sections C3-1 through C3-2 prior to submittal of a waste stream profile form for a waste steam or waste stream lot.												
		<table border="1"> <thead> <tr> <th></th> <th>Completeness</th> <th>Comparability</th> <th>Representativeness</th> </tr> </thead> <tbody> <tr> <td>Radiography</td> <td>Y</td> <td>Y</td> <td>Y</td> </tr> <tr> <td>VE</td> <td>NA</td> <td>NA</td> <td>NA</td> </tr> </tbody> </table>		Completeness	Comparability	Representativeness	Radiography	Y	Y	Y	VE	NA	NA	NA
	Completeness	Comparability	Representativeness											
Radiography	Y	Y	Y											
VE	NA	NA	NA											
Comments: None														


 Signature of Site Project Manager

Josh Houghton
 Printed Name

03/17/2014
 Date

SUMMATION OF ASPECTS OF AK SUMMARY REPORT: LA-MIN05-V.001**Overview**

Waste stream LA-MIN05-V.001 is contact-handled (CH) mixed absorbed transuranic (TRU) waste generated at the Technical Area (TA)-03, Chemistry and Metallurgy Research (CMR) Facility at Los Alamos National Laboratory (LANL). The TRU waste generated at the CMR Facility is the result of chemical and metallurgical research and associated analytical chemistry, hot cell, and maintenance operations that primarily support plutonium recovery and processing at TA-55 and its predecessor TA-21. Waste may also be generated during decontamination and decommissioning (D&D), and waste repackaging. The primary mission of the CMR Facility operations since 1952 has been to provide a facility that enables/fosters engineering, chemistry, and research operations for those LANL divisions/groups working to ensure the safety and reliability of the U.S. nuclear stockpile, improve the capability to handle nuclear materials and manufacture nuclear components, support plutonium recovery/processing, and solve problems related to energy, environment, infrastructure, health, and national security.

Waste stream LA-MIN05-V.001 was contaminated with or generated by the following defense related activities: defense nuclear waste and materials by-products management, defense nuclear materials production, and defense research and development activities. Therefore, this waste stream is defense related waste.

This Summation of the Acceptable Knowledge (AK) Summary Report includes information to support Waste Stream Profile Form (WSPF) number LA-MIN05-V.001 for mixed absorbed TRU waste. The primary source of information for this Summation is CCP-AK-LANL-009, *Central Characterization Program Acceptable Knowledge Summary Report For Los Alamos National Laboratory Chemistry and Metallurgy Research (CMR) Facility, Waste Streams: LA-MHD03.001, LA-CIN03.001, LA-MIN05-V.001*, Revision 8, November 5, 2013.

Waste Stream Identification Summary

Waste Stream Name:	Absorbed TRU Waste
Waste Stream Number:	LA-MIN05-V.001
Dates of Waste Generation:	May 1989 to August 2003
Waste Stream Volume – Current:	7 55-gallon drums and 1 standard waste box (SWB)
Waste Stream Volume – Projected:	None
Summary Category Group:	S3000 – Homogeneous Solids
Waste Matrix Code Group:	Solidified Inorganics
Waste Matrix Code:	S3900

TRUPACT-II Content Code (TRUCON): SQ111/211*

*Real-time radiography (RTR) will confirm TRUCON Code SQ111/211; however, TRUCON Codes LA112/212, SQ112/212, SQ113/213, and SQ129/229 may be used.

Annual Transuranic Waste Inventory
Report Identification Number: LA-TA-03-30**Waste Stream Description and Physical Form**

Waste stream LA-MIN05-V.001 consists primarily of mixed homogeneous solids (absorbed TRU waste). The waste includes liquids and residues/solids absorbed or mixed with absorbent (e.g., Aquasorb [polyacrylate polymer], NoChar A660 or Acid Bond [granular polymer], Slikwik [processed corncobs], sodium silicate, vermiculite [hydrated magnesium-aluminum-iron silicate], zeolite [aluminosilicate mineral]). Examples of absorbed liquids include actinides immersed in brines (i.e., water saturated with magnesium, potassium, or sodium salts), acids (e.g., hydrochloric, nitric, sulfuric, hydrogen bromide), bases (e.g., sodium hydroxide, ammonium hydroxide), and chemical reagents and solvents (e.g., sodium nitrate, methyl benzoate, methyl isobutyl ketone, and xylene). Examples of residues/solids mixed with absorbents include filter media residues, sludge, and spent resins. In addition, this waste stream may include floor sweepings and small amounts (less than 50 percent by volume) of heterogeneous debris waste, such as cardboard, cloth (e.g., coveralls), filter media, glass (e.g., containers, labware), high-efficiency particulate air (HEPA) filters, leaded rubber glove, metal (e.g., electrical equipment, hardware, mesh, ties, tools, tubing), plastics (e.g., bags, bottles, containers, labware, sheeting), respirator filters, and rubber gloves. Some secondary waste generated during remediation/repackaging operations may be added to the waste containers, including but not limited to: absorbent (e.g., Waste Lock 770 [sodium polyacrylate]), alkaline batteries, Fantastik bottles used during decontamination, miscellaneous hand tools, paper/plastic tags and labels, plastic/metal wire ties, personal protective equipment (PPE), plastic sheeting used for contamination control, rags and wipes (Kimwipes), and original packaging material (e.g., metal, plastic bags, plywood sheathing, rigid liner lids cut into pieces).

Waste stream LA-MIN05-V.001 meets the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit, Waste Analysis Plan waste stream definition. The waste stream consists of waste materials that have common physical form, that contain similar hazardous constituents, and that are generated from a single process or activity. This waste stream was originally generated from or contaminated by chemical and metallurgical research and associated analytical chemistry, hot cell, maintenance, D&D, and waste repackaging.

Point of Generation**Location**

Waste stream LA-MIN05-V.001 was generated at LANL in Los Alamos, New Mexico. The waste is stored at the TA-54 Material Disposal Area G (Area G).

Area and/or Buildings of Generation

Waste stream LA-MIN05-V.001 was generated in the TA-03 CMR Facility laboratory wings (Wings 2, 3, 4, 5, 7, and 9).

Generating Processes

Description of Waste Generating Processes

As a multi-operational facility, the primary programmatic uses of the CMR Facility have not changed significantly since its construction in 1952. The CMR Facility performs chemical and metallurgical research and associated analytical chemistry, hot cell, and maintenance operations that primarily support plutonium recovery and processing at TA-55 and its predecessor TA-21. All of these operations contribute to the generation of TRU waste. Waste may also be generated during D&D, and waste repackaging (References 6, D020, D024, D028, and D029).

Descriptions for each activity and summaries of the associated operations described in the AK record are provided in the following subsections (References D020, D024, D028, and D029).

Analytical Chemistry

Analytical chemistry operations at CMR performed qualitative and quantitative analyses of radioactive and non-radioactive samples/materials, and interpretation of the subsequent data. This area typically handled and prepared nuclear material samples, performed chemical/radiochemical analyses, performed optical and electron microscopy, determined particle size and surface area, conducted loss-on-ignition analyses, and provided analog/digital video imaging capabilities for the analytical operations described below (References C002, D001, D016, D017, D020, D029, M003, M004, M005, P017, P019, P020, P021, P022, P026, P027, P028, and P029).

Mass Spectrometry

Mass spectrometry capabilities at the CMR include the performance of high-precision chemical and isotopic analyses by Thermal Ionization Mass Spectrometry, Glow Discharge Mass Spectrometry (GDMS), Gas Mass Spectrometry, and analysis of trace interstitial gases (e.g., carbon, oxygen, and hydrogen) using combustion and inert gas fusion techniques in Wings 5 and 7. These methods are used to determine the isotopic composition of nuclear materials, the composition of gas samples, the assay of major, minor, and trace elements in all sample types, and the interstitial gas composition in inorganic, organic, and radioactive samples (References D020 and D029).

Materials received for mass spectrometry analysis at the CMR typically consist of small (~ 1 gram [g]) samples of acids, oxides, metals, or pure elements. Typical radiological samples consist of materials, including Pu-238, Pu-239, U-233, U-235, U-238, and other radionuclides. Solutions of hydrobromic, hydrochloric, hydrofluoric, hydriodic, nitric, perchloric, and sulfuric acids are used to dissolve solid samples. Liquid extraction, aliquoting, drying, ion exchange, and heating techniques may also be used to prepare the sample specimens for mass spectrometry analysis (References D029, M004, and P022).

GDMS is a direct solids analytical technique that may require the samples to be prepared using cutting, filing, cleaning, welding, pulverizing, and baking sample preparation techniques. Solid metal samples and other electrically conductive solid materials require minimal sample preparation, including cleansing with a dilute acid or base solution followed by cutting and oven drying (References D016, D020, D029, M015, and P022).

Powdered, radioactive samples require additional sample preparation. These samples must be mixed with an internal standard (typically bismuth trioxide or indium sesquioxide). Powdered insulating samples require both an internal standard and a metal binder (usually high-purity tantalum or aluminum powder). Once homogenized, powdered sample mixtures are transferred to a disposable Teflon pellet mold and compressed in a Beckman 16-ton press to form sample pellets for analysis. Because powdered samples contain adsorbed gases, the samples may require baking in a furnace attached to the GDMS discharge cell. Liquid nitrogen may be used to cool and remove gaseous impurities from the sample (References D016, D029, M014, and P022).

Interstitial analysis measures the amount of hydrogen (including tritium), oxygen, and carbon contained as interstitial elements in a sample. The samples for interstitial analysis are normally Special Nuclear Materials (SNMs), predominantly plutonium. Other samples, including lithium hydride, are analyzed for carbon. Metal samples are analyzed as received. Oxide powders are subdivided into smaller aliquots in a glovebox and placed in small tin capsules for the hydrogen, tritium, and carbon analyses. Powders requiring oxygen analysis are wrapped in platinum foil. Interstitial analysis for nitrogen in samples, performed in Wing 5 by wet chemical dissolution with lead shot, generate aqueous waste solutions containing dissolved lead. These solutions are absorbed on NoChar (References C029, D020, and D029).

TRU waste materials generated during sample preparation include used mixing cylinders, wipes, and Teflon pellet molds. Solid and liquid residues are collected in residue containers and returned to Sample Management for transfer to TA-55 for recovery of the plutonium as product or sent to the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) for disposal as waste. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste. Unused samples are returned to the customer (References C029, D016, D029, P001, P006, P022, and P039).

Radiochemistry

In Wing 3 of the CMR Facility, quantitative and qualitative radiochemistry analyses of samples are conducted by counting the natural and induced radiation in solid and liquid samples. Alpha, beta, gamma-ray, X-ray, and neutron detection methods are used to analyze the samples. The major emphasis of CMR's radiochemical operations is the assay and trace impurity analysis of TRU elements for both accountability and product certification. These radiochemical capabilities support other CMR Facility operations, such as the WIPP Source-Term Test Program (STTP) described below (References D029, M005, and M012).

Radiochemistry receives solid and liquid samples submitted to the CMR Sample Management group for analysis. Ion-exchange, solvent extraction, and other separation techniques are routinely performed on complex matrices to improve detection limits and remove potential interferences. Plutonium metal samples are dissolved in acid and then prepared for analysis in the same way as liquid samples. Liter-amounts of acids (e.g., hydrochloric, nitric, sulfuric, hydrogen bromide), bases (e.g., sodium hydroxide, ammonium hydroxide), and small amounts of chemical reagents and solvents such as sodium nitrate, methyl benzoate, methyl isobutyl ketone, and xylene are used in the radiochemistry laboratories. Minimal amounts of combustibles are generated by these operations (e.g., paper towels, books, and paper) (References D020, D029, M005, and M012).

After samples are counted, they are transported back to the sample preparation laboratory either for disposal or for collection in residue bottles. Unused samples and contaminated liquid are returned to Sample Management for transfer to TA-55 for plutonium recovery as product or sent to the RLWTF for disposal as waste. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste. TRU waste materials generated during radiochemistry also include acids and radioactive sample residues (References C029, D029, M005, P001, P006, and P039).

Plasma Spectrometry

Plasma spectrometry analysis is performed in Wing 7 of the CMR to determine major, minor, and trace elemental constituents in a variety of materials. Typical sample types analyzed include, but are not limited to (References D020, D029, and M011):

- SNMs in all forms, including all plutonium, uranium, americium, and neptunium isotopes
- Other actinides and lanthanides
- Tritium-bearing materials
- Beryllium-bearing materials
- Mixed-oxide fuels
- Environmental remediation and waste samples, TRU, WIPP, and low-level waste
- Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) regulated wastes
- Various process and experimental residues, products, and intermediates

Typical working aliquot sizes range from 100 milligram (mg) to 100 g, from samples weighing as much as 200 g. Sample preparation techniques include dissolution, weighing, filtering, dilution, fusions, spiking, ashing, grinding, sieving, extraction, and drying. In addition, sample preconcentrators may be used to enhance detection (References D029 and M011).

Solid sample preparation includes toxicity characteristic leaching procedure extraction, dissolution with acids, bases, or other reagents using open hot plate, open test tube, microwave-assisted, and bomb techniques, or fusion with a flux. Solid samples that do not require dissolution are oxidized and/or ground to a fine power and mixed with carriers, spectroscopic buffers, and/or standards. Chemical separations may be performed on some samples using either ion exchange or solvent extraction techniques prior to analysis (References D029 and M011).

Solid samples are analyzed using either laser ablation/inductively coupled plasma-mass spectrometry or direct current-arc spectroscopy. The sample is volatilized by the arc and dissociated into atoms and ions. Ion chromatography is used to analyze samples for the chemical presence of fluoride, nitrate, nitrite, chloride, phosphate, sulfate, and oxalate anions on

a routine basis. Cold vapor atomic fluorescence liquid samples for low-level mercury analysis are mixed with a reducing agent (stannous chloride) where the mercury is reduced to its elemental form. In a typical capillary zone electrophoresis experiment, the sample is diluted with a low concentration salt solution, called a "running buffer," and placed in a septum sealed vial. Atomic absorption liquid samples are mixed with a reducing or hydriding agent (stannous chloride or sodium borohydride) where the analytes are reduced (mercury) or hydrided (selenium, arsenic) (References D020, D029, M011, and M013).

The residues generated by the ion-exchange process, which contain 99 percent of the original plutonium and uranium materials, are collected in residue bottles. Solid and liquid residues are collected in residue containers and returned to the customers (References D020 and D029).

Plutonium Assay

Plutonium assay operations are conducted in Wing 5 to prepare and assay plutonium, uranium, neptunium, and other actinide samples. Loss-on-ignition measurements of oxides, pH and redox potential determinations for solutions, and standards preparation are also performed as part of this process. Plutonium assay supports other operations by performing sample dissolutions, separations, washing and caustic leaching (References D020, D029, and M014).

Incoming radioactive materials are received from Sample Management as oxides, metals, solutions, salts, or other compounds. Samples are dissolved using various methods, including the following (References D020 and D029):

- Open beaker dissolution using hydrochloric acid
- Open beaker dissolution using nitric acid with dilute hydrofluoric acid
- Sealed reflux dissolution using hydrochloric-nitric-hydrofluoric acids at elevated temperature and pressure
- Fusion with sodium bisulfate at elevated temperatures
- Microwave digestion with acids
- Sulfuric acid fuming

Other sample preparation techniques include chemical digestion, centrifugation, precipitation, settling, blending, filtration, ion exchange, liquid-liquid extraction, and combustion. Actinide standard solutions are periodically prepared for calibration of nondestructive solution assay equipment and destructive assay equipment (References D020, D029, and M014).

Residues from this activity are collected in residue containers and are packaged and turned over to Sample Management for transfer to TA-55 for recovery as product or sent to the RLWTF for disposal as waste. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste. The TRU waste is packaged in a plastic bag inside the containment. The plastic bag is placed inside another clean plastic bag outside the containment to ensure that no contamination exists on the

outside of the package. The package is checked for contamination, and moved to the central collection point for TRU waste where it becomes the responsibility of Waste Handling (References D020, D029, P001, P006, and P039).

Plutonium Chemistry

Plutonium Chemistry operations conducted in Wings 5 and 7 consist of the following (References D029 and M016):

- Chemical characteristics and behavior of plutonium (Rooms 7131 and 7133)
- Trace element analysis of plutonium, uranium, and other materials in solids and solutions
- Plutonium standards preparation (Rooms 7016 and 7059)
- TRU waste management (Room 5125)

Plutonium compatibility testing was conducted to determine the degree of plutonium reactivity with common manufacturing materials, including hydrogen-based lubricants, machining coolants, tape, and Raschig rings. Testing was performed in an inert atmosphere glovebox using up to 200 g mass samples of plutonium metal cut into approximately one square centimeter (cm²) coupons. The coupons were prepared by brushing and polishing followed by an organic solvent surface cleansing. Compatibility test methods included smearing for highly viscous materials, immersion for lower viscosity fluids, and sandwiching techniques for solid materials. After these tests were performed, the coupons were assessed for any changes in surface characteristics (References D029 and M016).

Except for samples received as solutions, trace analysis required dissolution of 100- to 500-mg aliquots of samples. Dissolution operations for all nuclear materials are performed in gloveboxes using acid dissolution methods. For most trace element analyses, separations are required using ion exchange, solvent extraction, distillation, precipitation, and ion chromatography methods. Acid fuming operations are performed to enhance dissolution or to remove volatile interferences. Chemicals used in the plutonium chemistry process include: acetone, ethyl alcohol, 4-methyl-2-pentanone, t-butyl alcohol, isopentyl acetate, and hydrochloric, hydrofluoric, nitric, perchloric, and sulfuric acids (References D001 and D029).

TRU waste reduction operations were performed by compressing compactable waste into 55-gallon drums and by crushing contaminated glassware. Depending on the radionuclide activity, waste solutions were sent to TA-55 for recovery as product or to the RLWTF for disposal as waste. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste. Plutonium metal standards were prepared and placed into a small metal Pyrex-glass tube. The tubes were evacuated and sealed. The sealed standards were removed from the glovebox, surveyed for contamination, and packaged for shipment (References C029, D001, D029, P001, P006, and P039).

Uranium Conversion and Dissolution Chemistry

Uranium Conversion and Dissolution Chemistry operations are performed in Wings 4 and 9. The purpose of these operations is to recover uranium from scrap materials and generate various chemical compounds associated with uranium conversion chemistry. Uranium source materials are dissolved or converted to stable chemical forms. Conversion chemistry may include fluoride reduction, precipitation, gas-solid reactions, separation (e.g., ion exchange, solvent extraction), calcining, and purification. Chemicals used in the various operations include: ammonium bifluoride, ammonium hydroxide, calcium metal, hydrochloric acid, hydrogen peroxide, iodine, magnesium oxide, malonic acid, nitric acid, potassium hydroxide, sodium hypochlorite, and sulfuric acid. Once operations are complete, the product materials are blended, quantified, characterized, packaged, stored, and/or delivered to a customer (References D001 and D029).

Fluoride reduction involves the preparation of uranium tetrafluoride by hydrofluorination of uranium oxide at 550 degrees Celsius in an oxygen atmosphere. An alternative to hydrofluorination is the reaction of uranium dioxide with ammonium bifluoride. The resulting uranium tetrafluoride is then reduced with calcium metal initiated with laser heating or with calcium metal using iodine. Gas-solid reactions involve calcining uranium and converting it to an oxide form. After the furnace is allowed to cool to room temperature, the oxide is removed and sieved to separate unburned pieces. Those pieces are calcined again until the uranium is completely converted to an oxide form. In some cases, oxide reduction is performed using a furnace with a hydrogen gas atmosphere. Precipitation, separation (e.g., ion exchange, solvent extraction), and purification involve the dissolution of metal alloys and oxides. Contacting these solutions with polymeric resins and adsorbing materials, the use of solvent extraction, or precipitation are means of obtaining a pure uranium product from these solutions. Solutions and products are analyzed using liquid scintillation, gamma spectroscopy, and gas permeation methods. An integral part of these operations is to isolate by-product streams in separate containers for analysis before further treatment or disposal. Minimal amount of waste generation is expected from these operations (Reference D001).

Trace Element Analysis

Trace element analysis is conducted in Wing 5 of the CMR as part of Plutonium Assay to identify trace impurities in plutonium, uranium, other nuclear materials, and non-radioactive materials using a variety of wet analytical chemistry methods and Direct-Current Plasma Spectrometry. Analytical techniques in this area include open beaker dissolution, sealed quartz tube dissolution, sealed reflux dissolution, pyrohydrolysis, microwave irradiation, precipitation, ion exchange, thermogravimetric processing, nitrogen analysis, plutonium assay, ion selective electrode, ion chromatography, and auto-titration (Reference D029).

Plutonium samples to be analyzed are generally limited to quantities of 10 g or less in any laboratory at one time. Most trace analysis methods require the dissolution of the sample and the separation of the analytes of interest from the matrix material. Chemical separations using organic extraction, ion exchange, separation, precipitation, and pyrohydrolysis, along with instrumental detection and analysis, determines trace elements at microgram (μg) per gram concentrations. Sample preparation uses mineral acids such as hydrochloric, nitric, hydrofluoric, and perchloric acids of which less than 500 milliliters of any acid is maintained in the process enclosures at any one time (References C002, C029, D020, and D029).

Thermogravimetric analysis (TGA) is performed in Wing 2 (Rooms 2116, 2120, 2127, and 2124). Actinide samples in the metallography glovebox line are cut to 3 millimeter diameter by 0.1 millimeter thick discs. After analysis, the discs are removed and disposed of as TRU waste. The radioactive samples prepared for TGA in Room 2124 consist of approximately 30 mg samples of solid pieces or powders. Actinide waste above allowable discard limits is sent to TA-55 for recovery as product. Acetone and ethanol were used for cleaning in the TGA areas (References D029 and P035).

Nitrogen analysis determines the amount of nitrogen present in plutonium and uranium sample solutions. The pH of these solutions is adjusted using hydrochloric acid, water, and sodium hydroxide. Distillation volatilizes the ammonia in the sample releasing it from the sample. The off gas is bubbled through dilute boric acid, changing the ammonia vapors into an ammonium solution. The ammonium solution is measured using an ion selective electrode to quantify the amount of nitrogen in the original sample matrix (References D020 and D029).

Plutonium assay utilizes a suite of wet chemistry techniques to determine the amount of plutonium, neptunium, uranium, and iron present in oxide samples. Plutonium solutions are received from the sealed reflux process into the assay glovebox where aliquots are taken for analysis. Zirconium chloride, ascorbic acid, and dilute hydrochloric are added to the solution to reduce the plutonium. When the analysis is complete, the solution is dumped into a residue bottle. Solid and liquid residues are collected in residue containers and returned to Sample Management or sent to the RLWTF for disposal. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste (References C029, D020, D029, M014, P001, P006, and P039).

X-Ray Analysis

The CMR X-Ray Team performs quantitative and qualitative analyses using Wavelength Dispersive X-Ray Fluorescence (WDXRF) and Energy Dispersive X-Ray Fluorescence (EDXRF) spectrometers, the electron microprobe, and X-Ray Diffraction (XRD) to determine the elemental composition, phase, and other material characteristics of nuclear and non-nuclear materials. The X-Ray analysis process in Wing 7 determines both trace impurities and major components in actinides and other samples (References D020 and D029).

SNM samples (usually less than 1 g) received from Sample Management are dissolved in a glass tube on a hot plate with a small amount of acid (nitric, hydrofluoric, or hydrochloric). Once the samples are dissolved, additional treatment, such as ion exchange to remove the radioactive matrix from the samples may be required. XRD is used to obtain powder diffraction patterns for solid radioactive materials in Wing 2 (Room 2124). Electron microprobe samples are typically returned to the submitter after completion of the analysis. Residues generated from the ion-exchange process are collected in residue bottles and returned to Sample Management or sent to the RLWTF for disposal. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste (References C029, D020, D029, P001, P006, P023, and P039).

Thermochemistry and Molten Salt Electrochemistry

The purpose of this process is to measure the thermochemical properties of actinide and non-actinide materials using Knudsen Effusion Mass spectrometry, Molten Salt Electrochemistry, and Pressure-Volume-Temperature (PVT) Kinetics. The ancillary tasks of sample preparation and analysis are conducted in Wing 2 and utilize additional techniques such as powder XRD, TGA, and Differential Scanning Calorimetry (DSC). TGA/DSC analyzes the metals, metal oxides and other chemicals to determine the optical properties and reactivity under variable temperatures and gaseous environments (References D029 and P035).

Solid and powder samples prepared from bulk specimens are cut, pulverized, sanded, ground, polished, and weighed to obtain the ideal sample weight required for analysis. Samples prepared for Knudsen Effusion Mass spectrometry range from approximately 1 μg to tens of mg. The maximum sample mass for PVT Kinetics experiments is 100 mg per experiment. TGA/DSC samples are typically 100 mg or less and should be as flat and smooth as possible for good thermal contact (References D029 and P035).

The Molten Salt Electrochemistry operations measure the electromotive force of radioactive materials including, but not limited to, zirconium, uranium, plutonium, europium, samarium, neptunium, americium, and curium samples. The molten salt electrochemistry operations use either a fluoride-based system or a chloride-based system. The fluoride-based system uses a lithium/beryllium fluoride molten salt solution. The chloride-based system does not require the salt purification step. The system uses a lithium/potassium chloride molten salt solution and uses a liquid bismuth electrode instead of a solid beryllium electrode (References D020 and D029).

Depending on the radionuclide activity, all actinide contaminated materials (e.g., excess sample or sample residue, cutting fluid residue, grinding paper) are sent to TA-55 for recovery as product or to the RLWTF for disposal as waste. Liquid and sludge residues with plutonium concentrations less than discard limits can be absorbed on various absorbent media (e.g., NoChar, vermiculite) or solidified in cement (e.g., Portland cement). Absorbent material is discarded in plastic bottles and typically integrated into the debris waste stream generated in the wing. Waste solidified in cement is typically mixed in a metal can and disposed of as homogeneous waste (References C029, D029, P001, P006, P035, and P039).

Standards Laboratories

The Standards Laboratories are located in Wings 3, 5, and 7 and produce radioisotope standards or Working Reference Materials (WRMs) for various radioactive materials. These high-purity and well characterized standards may be in the form of metals, oxides, solutions, or solids. The radionuclides may include, but are not limited to, plutonium, uranium, americium, curium, neptunium, and strontium (Reference D029).

The quantity of radionuclide in each standard or WRM can range from nanograms to kilograms of material, depending on the customer's requests and the type of radionuclide. The preparation of standards and WRMs may include one or many of the following subtasks (References D029 and P023):

- Receive feed material (e.g., metals, oxides, and solutions)

- Submit feed material for analytical characterizations either by the Analytical Chemistry group or others
- Prepare containment vessels (e.g., stainless tube, plastic container, glass vial, test tube, bottle, metal can, filter paper, and other containers)
- Prepare feed materials
- Prepare blends, as required
- Transfer the feed materials into the containment vessels
- Seal the containment vessel (e.g., taping, welding, gluing)
- Decontaminate filled containment vessels, as necessary
- Conduct leak tests, as necessary (e.g., helium leak checks or customer-required methods)
- Verify measurements
- Package and ship material

Solid waste generated during this activity can include transfer paper, PPE, protective devices, empty blending bottles, and decontamination swipes and towels. Solid and liquid residues are collected in residue containers and returned to Sample Management (References D029, P018, and P019).

Organic Analysis

Volatile Organic Compound (VOC) and Semi-Volatile Organic Compound (SVOC) analysis is performed in Wings 3 and 7. VOCs and SVOCs are analyzed using purge and trap gas chromatography-mass spectrometry (GC/MS), gas chromatography electron capture detection, and gas chromatography-flame ionization detection methods. Gas chromatography equipment is maintained with adjustable flow controllers and sometimes a sub-ambient oven controller in order to accurately adjust the column flow rate and temperature to the desired set point (References D029, P017, P020, P025, and P029).

All samples are received from Sample Management and prepared for extraction. Sample matrices analyzed in this area include: aqueous liquids (e.g., groundwater), oils, sludges, solids, soils, solidified (cemented) TRU waste and sludges, and pyrochemical salts. The laboratory also has the capability to analyze non-purgeable VOCs, hydrocarbons, Polychlorinated Biphenyls (PCBs), explosive materials, and reaction products (References C022, D023, D029, DR003, M003, P017, P020, and P025).

Other analytical methods performed in this area include: Headspace Gas Analysis for oxygen, nitrogen, carbon dioxide, and other gases; Fourier Transform Infrared Spectroscopy for semi-quantitative analysis of organic solutions; and Supercritical Fluid Extraction to determine moisture content in materials (References D029 and P021).

Solid and liquid residues are collected in residue containers and returned to the customers. Solid wastes include disposable glass pipettes, syringes, wipes and automated liquid sampler vials. Unused environmental samples are returned to Sample Management for disposal (References C003, D029, P021, and P025).

Actinide Spectroscopy

The Actinide Spectroscopy operations at CMR characterize actinide-containing materials using several types of continuous wave pulsed lasers to measure Raman, infrared, and fluorescence signals. Materials analyzed include: contaminated soils, residues, and inorganic complexes from TA-55, Hanford, and WIPP/STTP. Samples are encapsulated in a binding material or contained in sealed optical cells before being transferred to the lab. Small quantities of nitric acid are used to prepare the samples. Methanol and ethanol are used in the laboratory for cleaning optics (References C002, D015, D017, D020, and D029).

Sample Management

The Sample Management office is responsible for shipping, receiving, and staging packages from other facilities, subdividing environmental and nuclear materials, and transferring the materials to and from analytical chemistry areas in the CMR. The analytical chemistry sample management areas consist of Material Balance Area (MBA) 520 (Wings 3, 5, and 7) and MBA 524 (main vault). Nuclear material is received from facilities outside of the CMR and other MBAs within the CMR (Reference D029).

Sample Management is capable of receiving various sample materials, including salts, solutions, oxides, metals, and other materials. SNM solid samples are delivered in U.S. Department of Transportation (DOT) Type 6M drums. Other solid radioactive samples are typically delivered in metal cans. The total amount of radionuclide material present is monitored and documented in a radionuclide inventory and tracked in the Material Accountability and Safeguards System (References D023, D029, and P024).

Each package is moved to a staging area. Drums are moved to a controlled area in Wing 3 (Room 3119). Each container is swiped for radiological contamination prior to being unpacked. Any received drums or pressure cookers exceeding the allowable limit of 20 disintegrations per minute per cm^2 must be cleaned, as appropriate. Cans exceeding the limit are discarded and the sample is transferred to a clean can under a ventilation hood. Samples are received by the Chemical Science and Technology group, unpacked from archival packaging, cut, labeled, re-packaged for internal delivery, and distributed to the requesting CMR analytical area (References D017, D029, and P024).

Sample Management operations generate small amounts of radioactive waste. Waste that is generated in confinement structures (gloveboxes or ventilated hoods) is designated TRU waste. TRU waste is collected in a plastic bag, removed from the confinement structure, placed inside a clean plastic bag, and brought to a centrally located TRU waste container, where it becomes the responsibility of Waste Handling (Reference D029).

Metallurgical and Surface Science Chemistry

The main objectives of the metallurgical and surface science chemistry operations at CMR are to fabricate, recover, and characterize various forms of actinide and actinide-bearing materials in support of LANL weapon and environmental programs. Characterization methods such as

metallography; optical and electron microscopy; surface science spectroscopy; liquid chromatography; diffraction analysis; particle size analysis; dissolution and ignition testing; X-ray fluorescence; and anion, carbon, and organic analysis, are utilized by CMR's Metallurgical and Surface Science Chemistry Division (References C004, D001, D017, D029, M006, P023, P030, P031, P032, P033, and P034).

Plutonium Metallography

Plutonium Metallography is conducted in Wing 2 to determine the constitution and structure of plutonium and other actinide materials. The techniques employed assess the microstructure, crystal structure, and hardness of these materials. Actinide samples, consisting predominantly of plutonium metal are sectioned, mounted in clear epoxy, and polished or etched. All preparation operations are performed in a glovebox or an open-front box. Chemical and electrochemical etching may also be performed, as required, using nitric acid, oxalic acid, and phosphoric acid (References D001, D029, and P004).

Actinide metal fines from sectioning and impregnated abrasive paper are collected, along with the corresponding samples after examination, and returned to TA-55 for recovery as product. Electropolishing operations generate a small amount of waste, mostly in the form of solutions, glass, and stainless-steel items with residual solids. Small quantities of ethanol are used for specimen cleaning in this operation (References C004 and D029).

X-Ray Diffraction (XRD)

XRD is used in Wing 2 to characterize bulk plutonium and other actinide metal, metal powders, or metal oxide mixtures for phase content, structure, or elemental content using an X-ray Diffractometer. Samples are irradiated by a collimated beam of x-rays. The resulting diffracted radiation provides information relating to the crystalline structure, phase content, and elemental content of the samples (References D017, D029, and P003).

Samples are prepared by either placing the materials to be analyzed into or on metallographic mounts or sealing the material in capillary tubes. Metallographic samples are sealed in epoxy and polished. Nonpyrophoric powder samples are mounted on double sided tape on the surface of the metallographic mounts. Radioactive samples are mounted or sealed, wrapped in Mylar and taped to contain contamination during analysis. Pyrophoric powders are sealed in an inert holder at TA-55 then sent to the CMR for analysis (References D017, D029, P003, and P023).

Optical Metallography

Optical Metallography is used in Wing 2 to prepare a polished metal sample from bulk material to examine the surface microstructure of radioactive materials. During these polishing operations, water or other lubricants are used. Samples are mechanically polished using aluminum oxide or diamond paste until an ultra-fine polishing medium is obtained and a scratch-free mirror finish is attained. After final mechanical polishing, samples may be electrochemically polished (References D001, D017, and D029).

After a sample is prepared for mechanical testing, a thin film of photoresist is applied to the area of the sample to be gridded and dried with a heat gun. A grid negative is then taped to the sample. The sample is exposed to ultraviolet light to expose the photoresist, immersed in developer, and transferred to the thinner to remove undeveloped photoresist. After this process

is complete, the sample is coated with blue dye; excess blue dye is removed by rinsing with cold water. If a good grid pattern is obtained, the pattern is baked onto the sample then sent for optical examination. If a poor grid pattern is obtained, the sample is cleaned and the process is repeated (References D001, D029, and M017).

Electron Microscopy

Electron Microscopy is used in Wing 2 to examine surface and internal microstructures at both low and high magnifications. This operation prepares an electron-transparent sample from radioactive material for examination using a transmission electron microscope (TEM) and/or a scanning electron microscope (SEM) (References D017 and D029).

Sample preparation for electron microscopy commonly involves cutting, grinding, and electrolytic etching in acid. Samples are cut into sections ranging from 0.005 to 0.010 inches (in) thick using a diamond-wheel saw, and are ground with carbon carbide sandpaper to a thickness of approximately 0.003 in. Three-millimeter disks are punched or core-drilled from these sections. Water or other liquid lubricants are used during bench-top grinding operations. Samples are mounted in the sample holder, placed in the electropolisher, and polished. Samples are removed from the electropolisher and cleaned with methanol or distilled water and ethanol. A dimple is ground into one side of a sample, and the sample is cleaned with acetone. The sample is positioned in the ion milling instrument, cooled with liquid nitrogen, and ion milling is started. When the milling is complete, the sample is allowed to warm to room temperature prior to removal from the ion mill (References D029 and P034).

Glass Encapsulation System

This operation seals metallic and other research samples in an inert or vacuum atmosphere inside Pyrex, Vycor, quartz, or other types of glass tubing. The glass encapsulation system allows for long-term storage of reactive materials and sample protection during heat treatment in atmospheric furnaces. Plutonium metal samples are encapsulated using the system located in Wing 2 (References D029 and P033).

The Glass Encapsulation System consists of a high-vacuum pumping station connected to a manifold. Actinide research samples are prepared for glass encapsulation in a ventilated hood; high alpha-activity samples are prepared in a glovebox. The samples consist of pieces of metal; therefore, sample ignition is an unlikely hazard. However, powdered graphite is kept in the ventilated hood for emergency fire suppression. The samples are cleaned with ethanol loaded into Pyrex, Vycor, or quartz tubes with fire polished ends and glass wool is inserted into the tube ends. An oxyacetylene torch is used to seal one end of the glass tube. When cool, the other end of the glass tube is attached to a manifold and the open end of the tube is then sealed. The sealed sample is removed from the manifold when the tube has cooled (References D029 and P033).

Plutonium Lathe and Drill Press

This operation was performed in Wing 2 and was used to machine and drill small plutonium metal specimens. The lathe was used to cut open welded metal cans to retrieve plutonium specimens. The specimens were machined or drilled. After machining or drilling, the specimens were weighed and then sent to their next processing destination. Plutonium turnings were segregated from any steel turnings and weighed before being sent to TA-55 for recovery as product (References D001 and D029).

Plutonium Rolling

This operation located in Wing 2 produces either sheets or rods by placing feedstock metal between two turning rollers. The resulting sheet or rod material is used for experimental applications at TA-55. Metal samples (25 g or less produced at TA-55) are reduced in thickness by passing them between two rollers. The roller speed is adjustable, and lubricants (i.e., oil) are commonly used to reduce friction effects to minimize heating. Once the metal sample is rolled to a thin cross section (<1 millimeter), it can be cut (sheared) into any required size. The sized pieces may then be processed using heat treatment or micro structural characterization (References D001, D029, and P032).

A criticality limit of 500 g of plutonium has been established for all rolling operations. In addition, the waste generated by this operation can include radiological and actinide solid and mixed TRU waste. All residual actinide-bearing material above the discard limits is returned to TA-55 for recovery as product (References D029 and P032).

Mechanical Testing of Plutonium and Plutonium Alloys

This testing activity in Wing 2 is used to characterize the mechanical properties of plutonium metal and alloys using a servo-hydraulic testing machine. Radioactive test samples are provided to testing operations personnel from Sample Management. The samples are contained in a plastic bag within double containment (typically two stainless-steel slip-top containers). The samples are removed from the container for analysis inside an inert atmosphere glovebox. The Mechanical Testing process has not been used for 15 years (References D001, D020, and D029).

Compression Testing of Depleted Uranium

This operation is conducted in Wing 2 and its purpose is to compression test depleted uranium ceramic pellets in a vacuum furnace at elevated temperatures. Depleted uranium ceramic pellets are brought in a closed container to the test area where a sample is placed in the furnace. The furnace is backfilled with argon, and then turned on. When the specimen reaches the desired temperature, the experiment is conducted. The specimen is cooled to room temperature, and the vacuum chamber is opened. The specimen is removed with tweezers and placed in a plastic bag, which is then sealed. The furnace is monitored for potential contamination from the experiment (References D001 and D029).

Coating Stainless-Steel Substrates with Uranium

This operation is conducted in Wing 4 and its purpose is to coat stainless-steel substrates with an enriched-uranium solution. Stainless-steel substrates are received, cut to size, and baked in a hydrogen atmosphere tube furnace to remove surface contamination. The substrates are then weighed and recorded. Enriched-uranium source material is dissolved in nitric acid, evaporated, and then mixed with acetone. The solution is applied to the stainless-steel substrate surface in several coats using an air gun. The substrate is removed from the glovebox, transferred to a furnace, and baked. The procedure is repeated as necessary until the desired weight of the coating is bonded to the substrate. Once operations are complete, the product materials are quantified, packaged, stored, and/or delivered to the customer (References D001 and D029).

Uranium Oxide Preparation

This operation is conducted in Wings 4 and 9 and its purpose is to obtain one large master blend of uranium oxide materials by mixing and blending uranium oxide from different sources. Material consisting of uranium oxide is transferred into a blending jar and mixed for a set period of time. The material is either rolled or tumbled to achieve the proper blend. After the blending operation is complete, the material is sampled for analysis and for archive records (References D001 and D029).

Uranium Metal Recovery Conversion

This operation is conducted in Wings 4 and 9 and its purpose is to recover uranium from scrap and legacy residues. The operations and materials include bulk metals and oxide powders, wet chemical processing, and high-temperature processing. Uranium source materials are dissolved or converted to stable chemical forms. They are also blended to obtain one large master blend of uranium oxide materials by mixing and blending uranium oxide from different sources. Conversion chemistry may include precipitation, gas-solid reactions, separation (e.g., ion exchange, solvent extraction), spraying solutions onto stainless-steel substrates, calcining, and purification. Once operations are complete, the product materials are blended, quantified, characterized, packaged, stored, and/or delivered to a customer (References D001 and D029).

Induction Heating Process

This operation is conducted in Wing 5 and its purpose is to develop induction heating methods and equipment and carry out research on inductively heated materials under differing conditions. Test items may be prepared by cleaning them with ethanol and mounting them in fixtures. Induction heating operations are performed in Pyrex or quartz mantles, metal bell jars, or a metal vacuum-dry box. After cooling, the test item is removed from the furnace and examined. Some silver soldering and induction-brazing assembly operations are conducted in this area (References D001 and D029).

Uranium Hexafluoride Inventory Reduction Project

This operation is conducted in Wing 5 and its purpose is to transfer uranium hexafluoride to containers suitable for inter-lab and off-site shipments. The work involves vacuum transfers of uranium hexafluoride from research containers to Laboratory-approved storage vessels or DOT-approved shipping containers. The vacuum transfer includes a scrubber trap to remove any volatile material and the storage vessels are purged with nitrogen. Off-site shipments are destined for the Portsmouth processing plant in Ohio (References D001 and D029).

Surface Science

This operation is conducted in Wing 7 and its purpose is to analyze solid samples to determine surface chemical composition. Samples are received in a state ready for analysis (e.g., radioactive samples are metallographically mounted and polished). Occasionally, radioactive samples need to be metallographically repolished. Samples are checked for loose contamination, and if clean are transferred to instrumentation for surface analysis. The three types of analysis systems used are as follows: Secondary Ion Mass Spectroscopy (SIMS)/Secondary Neutral Mass Spectrometry (SNMS) system, X-ray Photoelectron Spectroscopy (XPS)/Auger Electron Spectroscopy (AES) surface analysis system, and Electron Microprobe

Analysis (EMPA) system. Chemicals used in the process include acetone, ethanol, hydrochloric acid, methanol, nitric acid, phosphoric acid, and sulfuric acid (References D001 and D029).

Hydrogen Plasma Torch

This operation is conducted in Wing 7 and its purpose is to use induction heating to study high-temperature processing of actinide materials (metal formation and compound synthesis). Samples are introduced into the induction furnace as a gas mixed with a suitable control/carrier gas. Research and development (R&D) on reduction of actinide compounds to metal or synthesis of actinide compounds at high temperatures is performed under induction heating and controlled atmosphere conditions. Acetone is used to clean process parts and equipment (References D001 and D029).

Enriched Uranium Extrusion

This operation is conducted in Wing 9 and its purpose is to provide a means of forming powdered materials into shapes, usually rods or tubes, by forcing a mixture of materials through a die body. Materials to be extruded are first weighed individually and combined in a blending operation where the dry ingredients are homogenized by passing them through a grinder several times. As the mixture is being prepared, the extrusion press is readied by assembling the die and associated components, then allowed to warm to operating temperatures. The extrusion chamber is loaded with the mixture and a hydraulic ram is moved into position so as to close the chamber; then a vacuum is applied. Applying pressure on the hydraulic ram forces the mixture through the die. The material may be kept at this point by allowing the extrusions to flow into a fixture that aids in maintaining its shape or the process of grinding and extrusion may be repeated. The final extruded components are cured in an oven. After curing, the components are cut to length or transferred for further processing (References D001 and D029).

Enriched Uranium Foundry

This operation is conducted in Wing 9 and its purpose is to prepare enriched-uranium metal and cast enriched-uranium components. The enriched-uranium-metal feed material is check weighed upon receipt. If the metal requires size reduction, a hydraulic press is used. Metal chips or other small pieces that require cleaning are placed in a closed container, and the container is filled with acetone. Casting operations are done in one of two vacuum induction furnaces. The molten metal is poured into a preheated mold and allowed to cool overnight under vacuum. After cooling, the cast component is removed from the mold and scrap materials are packaged for disposal or recovery (References D001 and D029).

Curium-244 Storage

This operation is conducted in Wing 9 and its purpose is to store containers of Curium-244 in Wing 9 floor storage silos for the Nuclear Materials Technology Division and to package the containers for transport as needed for use. Personnel in Wing 9 maintain the shielded floor storage of welded stainless-steel capsules containing gram quantities of Curium-244. The capsules are transferred to and from the floor storage holes via a bottom-entry cask using an overhead crane (References D001 and D029).

Material Characterization

This operation provides support for the other CMR operations conducted in laboratories in Wings 2, 5, and 7. Radioactive materials may be received from offsite, other Laboratory facilities, other

operations within the CMR, or Sample Management. Radioactive materials characterization encompasses a variety of operations including radioactive sample management and preparation. Operations performed as part of radioactive sample preparation include polishing, hand cutting, sample mounting, coating, spot welding, etching, and cleaning (References D017 and D029).

For each process, samples can be received in either solid or solution form. Radioactive samples are removed from packages within a confinement system (ventilated hood or glovebox) depending on the hazard level (based on the material's dispersability, quantity, and activity). Once removed from their packaging, samples are prepared for the analysis and mounted. Mounted samples are removed from the confinement and are transported to the analysis equipment in a package, typically a plastic bottle, to minimize the risk of material release. The package is opened, and the sample is loaded into the analysis equipment and analyzed. When the analysis is completed, samples are removed and placed back into a package. The package is either put into storage for future analysis, disposed of as waste, or returned to Sample Management. All TRU waste generated during this process is placed in a clean plastic bag, checked for contamination, and brought to a central TRU waste collection point for Wing 2 operations (Reference D029).

Confinement Vessel Disposition (CVD) Project

The CVD Project is conducted in Wing 9 and its purpose is to process the contents of the Pulsed High-energy Radiographic Machine Emitting X-rays (PHERMEX) confinement vessels. The PHERMEX Facility operated for nearly 40 years and the confinement vessels were used in PHERMEX Hydrotest Experiments. For each experiment, high explosive material was loaded around a plutonium metal test object. Support plates, clamp plates, hanger rods, reservoirs, baffles, retaining rings, and other objects were installed and/or welded in the confinement vessels. These items were made of steel, aluminum, brass, stainless steel, and copper. Other materials placed in the confinement vessels included vermiculite, perlite, glass bulbs, concrete, plaster-of-paris, lead, cardboard, ceramic components, polyethylene sheets/slabs, and copper wiring with plastic coating. The vermiculite, perlite, concrete, glass bulbs, and plaster-of-paris were generally used as shock mitigators or absorbing materials. The experiments were performed to simulate weapon implosion without producing a nuclear explosion. During implosion, shock waves produced by the high explosives compressed the nuclear materials. The detonated explosives generated high temperatures and extremely high pressures. During the experiments, all materials in the confinement vessel were thrown against the internal walls of the confinement vessel and crushed. The shock mitigator materials formed a grainy, sand-like mixture (i.e., ash). The confinement vessels successfully contained the high temperatures and pressures without release of radioactive material. The experiments were designed to ensure complete consumption of the high explosive material (References C062 and P057).

The CVD Project processes confinement vessels which have been stored as product at TA-55 (they contained kilogram quantities of plutonium prior to implosion). The confinement vessels are first transferred to the CMR Wing 9. The confinement vessels are then loaded into an enclosure room, vented, and opened to accommodate a "work station" glovebox. The material is then removed, evaluated, sorted, and segregated. If the material contains plutonium above the discard limit, it is stored or recovered. If the material is below the discard limit, it is managed as waste and packaged into 55-gallon drums (References C062 and P057).

Research and Development (R&D)

The R&D area at CMR conducts chemical research and development in support of the WIPP, plutonium storage characterization, weapons component characterization, and plutonium and uranium separations technology development. This includes the operations and maintenance of hot cells as well as basic and applied research in support of the CMR missions (References D001, D018, D020, and D029).

Actinide Waste Source-Term Test Program (STTP)

The WIPP Actinide Waste STTP was established to measure the time dependent and soluble concentrations of actinides (and other analytes) from different types of TRU wastes immersed in brines (i.e., water saturated with magnesium, potassium, or sodium salts) that were chemically similar to those found in the underground formations of the WIPP. The purpose was to provide quantitative analytical data on soluble actinide concentrations in two types of WIPP brines under a variety of influencing variables that might be realistically expected to be found at the repository. This experimental operation was a semi-passive, long-term storage experiment conducted in specially designed environmental enclosures in Wing 9 of the CMR. The waste generated by the STTP experiments consists primarily of experimental containers; ancillary equipment; source waste materials; STTP material inputs, absorbed brines, and PPE (References D020 and D029).

The STTP material inputs were selected from the existing TRU waste inventories stored in TA-54, TA-55, and the CMR. These materials consisted of heterogeneous and homogeneous (core samples) waste containing 20 to 100 g of weapons-grade plutonium. Other radionuclides including uranium, thorium, neptunium, and americium were also added to STTP experimental containers (References D020 and D029).

The STTP test containers consist of unpressurized 3-liter, pressurized 2-liter, and drum scale (~65-gallon) test containers. All test containers were fabricated from titanium metal to resist corrosion from the concentrated brine solutions. The pressurized test containers were pressurized with carbon dioxide and all tests containers were maintained at approximately 30 degrees Celsius and agitated once each week. Brine samples taken from the containers were transferred to Wing 5 for filtration and were distributed to other wings for further analysis (References D020 and D029).

During decommissioning, the 2- and 3- liter test containers were transferred to an argon purge glovebox for disassembly, inspection, sampling, and absorption. The brine from each container was pumped or ladled into bottles for analysis and absorption. Each container was filled with absorbent to remove any remaining liquid and installed with a new lid containing a WIPP-approved filter. The brines removed for analysis were also absorbed and packaged into filtered plastic bags that were disposed of as waste. The container, original lid, and miscellaneous equipment (e.g., bolts, ladles, wiring, and tubing) were packaged into a WIPP-vented 55-gallon drum for waste disposal (Reference D029).

The drum-scale containers were decommissioned by closing the valves, disconnecting the thermocouple wires, and removing the vent tubing on each container. Each container was removed from the assembly and set vertically into a containment pallet. The center drum plug was removed and a hole drilled through the screen to facilitate the addition of absorption media to the drum. A hose and pump was attached to the sampling port valve on the drum and used to remove 15 to 30 gallons of brine from the container. A funnel was attached to the drum plug and the absorbent was added to the container. The container was tilted periodically to distribute

the absorbent. The brine was pumped back into the container until it was full and the brine absorbed. Excess brine, if any, was mixed with sufficient absorbent to immobilize the liquid and packaged into plastic bags. The drum plug for each container was then resealed or installed with a WIPP-certified vent and the ports and valves closed. Each container was rotated for approximately 15 minutes to ensure complete mixing and absorption of the brine. After mixing, a ball valve in the lid of each container was opened and a wire inserted to ensure that the container remained unsealed. The drum-scale containers were packaged horizontally into an SWB. The ancillary equipment (piping, valves, wiring) and the excess absorbed brines (packaged in vented plastic bags) associated with each container were placed into the SWB and vermiculite added to stabilize the load (Reference D029).

Organic and Actinide Separations Research and Inorganic Compound Synthesis and Characterization

The purpose of this operation was to perform separations research and organic analysis development. Organic compounds were synthesized and evaluated for the separation of actinides, lanthanides, and other metal ions. Aryl halides, alkyl halides, amines, benzene, cyanides, dioxane, ethanol, methanol, organic acids, polyaromatic hydrocarbons, polymers, tetrahydrofuran, and toluene are the chemicals that may be present in TRU waste from this area (References D001 and D029).

Gram-scale organic syntheses were performed in an apparatus constructed from glass, plastic, or metal labware, with secondary containment where the quantities of liquid were significant. Syntheses operations typically required dissolving, combining, mixing, heating, cooling, sonicating, centrifuging, precipitating, evaporating, filtering, and distilling. When milligram sample sizes were dissolved in appropriate solvents, synthesized compounds were characterized by personnel in the task area using a variety of analytical instrumentation (References D001 and D029).

The effectiveness of the synthesized compounds for actinide separation was evaluated using surrogate non-actinide metal ions or was evaluated with actinide ions in the radiological controlled laboratories. Separators such as membrane systems and supercritical fluid extractors were used. All solution preparation and dilution for ligand evaluation was done in the task area. All solution and sample preparation for use with chromatographic instrumentation was typically performed with submilligram samples (References D001 and D029).

In Wing 3, gas cylinders were connected to a manifold system, and small samples were transferred into sampling chambers. The sample chamber was then connected to a mass spectrometer and the gas analyzed. After analysis, the sample was pumped through scrubbers to the wing exhaust system. Nuclear magnetic resonance analysis was performed in Wing 3 on small samples in sealed tubes. The samples were prepared by dissolving milligram quantities of material in milliliter amounts of a solvent such as chloroform (References D001 and D029).

Sorbent Activity Studies

This operation is conducted in Wing 4 and its purpose is to study the adsorption and decomposition of selected toxic gases while they are in contact with activated carbons. Toxic gas/air mixtures are prepared by serial dilution of pure toxic gas with air using large syringes. These mixtures are injected by syringe into stainless-steel tubes containing activated charcoal. Alternately, microliter-per-minute flows of selected toxic gases are added to a flowing air stream

and passed through a test canister. Microliter per-minute samples are taken of influent headspace and effluent gases and passed through a gas chromatograph or mass spectrometer. Chemicals used in this process include ethanol, Freon, perfluorocyclobutene, and potassium hydroxide (References D001 and D029).

Actinide Research and Development (R&D)

Actinide R&D performed in Wing 5 is used to prepare and characterize newly synthesized actinide inorganic and organometallic compounds and to perform solid dissolution, solution, and solid-state chemistry R&D on actinide isotopes. This is done in support of basic science, core competency maintenance, nuclear waste R&D, and other programmatic missions (References D020 and D029).

Experimentation is typically performed on a milligram-scale, and occasionally on a gram-scale, in gloveboxes (solids/powders) and open boxes (solutions). The samples are dissolved in mineral acids and heated on a hot plate. Reagent chemicals include ammonium hydroxide, benzene, sodium hydroxide, sodium perchlorate, and hydrochloric, nitric, and sulfuric acids (References D001 and D029).

Actinide solutions undergo a variety of treatments including precipitation from solutions using chemical agents. Typical precipitation agents include salts, acids, and bases. After precipitation, the solid is isolated by either filtration or centrifugation. Various studies are performed while exposing the samples to electrical currents, concentrating, changing the temperature, or adding liquid or gaseous chemicals (e.g., scintillation cocktail solution). The purpose of treating solutions with ozone is to obtain oxidation state pure samples of the actinides in high oxidation states in support of other R&D operations (References D001 and D029).

Solvent extraction is used to separate actinides from an aqueous phase to an organic phase by adding and mixing organic extractants to the aqueous phase. After mixing, the organic phase is separated (decanted) from the aqueous phase and then the solvents are evaporated leaving the actinides of interest for analysis. Solid residues are collected in residue containers and returned to Sample Management. Solid wastes are collected by Waste Handling (References D001 and D029).

Americium/Plutonium WRM Production Capability Evaluation Project (CEP)

The CEP involved the manufacture of four nondestructive waste assay WRM sources. The four WRM sources fabricated contained americium oxide and weapons-grade plutonium oxide. The WRMs were double sealed and shipped to the Idaho National Laboratory (INL) to acquire capability/performance data on systems proposed for nondestructive assay (NDA) characterization (References D018, D029, and P023).

Americium oxide from the TA-55 containment was transported to Wing 3 of the CMR (Room 3119). The oxide was then transferred to Wing 5 (Room 5131) for sample preparation and delivery for analyses and WRM production. Material characterization was accomplished by mass spectrometry, radiochemistry, and plasma spectroanalysis. Analytical chemistry procedures included pyrohydrolysis for halide determination. A test blend of 8 mg of americium oxide and 100 mg of plutonium oxide was prepared, sampled, and checked for homogeneity. Two nominal WRMs were prepared and two WRMs with increasing quantities of americium and plutonium (110 mg americium/2 g plutonium and 900 mg americium/6 g plutonium) were blended

and loaded into steel WRM containers and sealed by welding. WRM containers were decontaminated, leak checked, welded, and smear checked prior to packaging and shipment to INL (References D018, D029, and P023).

Hot Cell Operations

From the early 1970s through the early 1990s the operation of the Wing 9 hot cell consisted primarily of the metallurgical examination of post-irradiated fuel pin and capsule samples from several breeder reactor programs. These operations are described in detail in CCP-AK-LANL-500, *Central Characterization Project Acceptable Knowledge Summary Report For 16 Canisters of Remote-Handled Transuranic Debris Waste From Los Alamos National Laboratory Chemistry and Metallurgy Research Facility, Waste Stream: LA-MHD03.002* (Reference 6). CH waste from the hot cell was generated primarily during D&D. The following summarizes the AK information contained in the above report.

Shipping casks containing fuel pins and capsules (fuel elements) were transferred into the hot cell area and remotely unloaded. Preliminary tests were conducted on capsules and pins after they were unloaded to establish an "as-received" condition, and to determine if any of the capsules or pins required special treatment because of abnormal contamination, radiation, temperature, or appearances. Preliminary examination included visual inspection using periscopes or binoculars to identify abnormalities such as scratches, dents, discoloration, excessive bow, loose spacer wires, etc. Bow measurements were performed to determine the amount of bow relative to a series of grid lines, and evaluation of swipe samples on capsules or fuel pins using alpha survey meters and beta-gamma survey meters were performed to indicate potentially breached pins. The temperature of each pin was measured using a thermocouple device, and dimensional measurements were also made using a hand micrometer (μm) or optical profilometer. Photographs were taken to satisfy the specific request of the experimenter and to document abnormalities identified during the initial examination (Reference 6).

Gas sampling of the capsule/cladding for fissionable gas products was also typically performed during the initial examination. Radiography or drawings were used to determine where to puncture the capsule for gas sampling. A variety of techniques were used to reseal the fuel pins and capsules following gas sampling, including the use of shrinkable tubing and laser sealing (Reference 6).

Following the initial examination, fuel elements were disassembled and sectioned in preparation for additional examinations and measurements, such as micro structural, microprobe, density, burn-up, chemical analysis, and other special examinations. Sectioning was performed in an inert atmosphere with low levels of oxygen and moisture. A sectioning diagram was prepared for each fuel element to specify where the cuts were to be made and the purpose for each section. A high-speed saw with a 0.020 to 0.035 inch blade was used to make the section cuts. Lubricants were not used during the sectioning process. Each section was then marked on the opposite surface from that which was to be polished and placed in individually identified stainless-steel containers (Reference 6).

Irradiated fuel capsules and pins were often received with thermal bonds of sodium (Na), or sodium-potassium (NaK) alloy. During the remote disassembly of capsules and pins, the Na or NaK thermal bonds were removed in a manner to protect the pin cladding from exposure to the air until the Na or NaK was removed. The Na or NaK was removed from the capsule to withdraw the fuel pin. Hot mineral oil was used to melt the bonded Na until the capsule clad moved off the fuel pin. Dowanol was added to the cooled mineral oil to react the Na. The fuel

pin was then placed in a Dowanol bath, then rinsed with ethanol or Freon trifluoroethane (TF) and placed in water. Immersion in water assured that all of the Na was reacted and all of the Na salts (such as sodium monoxide) were dissolved. NaK was removed in a similar manner, except the liquid NaK was collected in kerosene and a mixture of kerosene and Dowanol was used to initially react the NaK. A distillation technique was also employed to remove Na bonds from the fuel element sections. Fuel cladding specimens of ½-inch to ¾-inch lengths were placed in sample holders and transferred to the still. Temperatures on the order of 500 degrees Celsius and vacuum pressure at approximately 10^{-4} millimeters mercury were obtained to remove Na from the fuel elements. Liquid nitrogen was used to cool the condenser (Reference 6).

Various potting techniques were used to secure fuel samples for grinding and polishing. Vacuum potting was achieved by pouring Epon (an epoxy resin) into sample cups, and applying a vacuum in the vacuum potting device. The process was carefully monitored to avoid bubbling Epon out of the sample. After curing overnight, the hardened Epon samples were moved to the metallographic cell. High pressure potting and heating was also used to improve hardening and impregnation of the potting material with the fuel sample. The sample was then ground several times using successively finer grit sand paper. Kerosene was used as a lubricant during the grinding process. The grinding paper was changed frequently and regular cleaning with alcohol was performed throughout grinding and polishing (Reference 6).

Polishing was performed to create the smooth surface necessary to observe the crystalline properties of the fuel. Polishing was first performed with a diamond paste (6, 3, and 1 μm grit size), then with aluminum oxide powder (down to 0.03 μm grit size). An "as polished" photograph was taken of the samples (Reference 6).

Depending on the experimenter's request, several techniques for etching were performed to enhance the delineation of the grain boundaries, followed by additional photographs. Samples were etched using acid etching, cathodic etching, or electrolytic etching. Electrolytic etching used a nine volt alkaline battery. Cathodic etching was used only to etch the stainless-steel cladding (on samples where it was not removed). Chemicals utilized in the various etching techniques include ethanol, hydrofluoric acid, lactic acid, nitric acid, oxalic acid, and sulfuric acid. Picric acid was also identified as an etching agent; however, review of logbooks and interviews of site personnel indicate its use was a once only experimental use (Reference 6).

Samples selected for electron microbe examination included polished, unetched, and mildly etched metallographic specimens. Following polishing, the samples were ultrasonically cleaned to a surface contamination level of 500 counts per minute. The samples were painted with a carbon-coating or a silver stripe to assure electrical conductivity from the sample to the mount. The samples were then transferred to the microprobe for analysis (Reference 6).

Samples of irradiated fuel and cladding materials were dissolved for wet chemistry analytical evaluations. After weighing, samples were dissolved in nitric, hydrochloric, sulfuric, perchloric, and hydrofluoric acid, or combinations of these acids. Sample solutions were separated from slow dissolving or insoluble sample residues which were further treated by dissolution with a combination of hydrochloric, nitric, and hydrofluoric acids and then heated. Some low solubility materials were dissolved using a sealed reflux system. The resulting sample solution was collected into an appropriate container (Reference 6).

Density determinations were conducted for irradiated cladding and fuel materials in the hot cells. Cladding density sample preparation included submersion and heating of the sample in nitric or

hydrofluoric acid to ensure complete absence of fuel materials. To measure the density, sample materials were placed on a holding tool, weighed, immersed in a known volume of bromobenzene, and weighed again (Reference 6).

Other sample processing conducted in the hot cells included steam distillation, collection of gaseous fission products from irradiated fuels, induction and incineration of irradiated fuel and cladding, and sample solution drying. Gases from dissolution were carried out of the hot cells in a helium gas stream, through a purification system to remove acid fumes, and onto a silica gel trap. Following acid dissolution, some sample solutions were steam distilled, and the collected distillates transferred from the hot cell and analyzed. When required, fuel samples were fumed to dryness with sulfuric acid. For determination of oxygen, carbon, hydrogen, tritium, or metallic impurities in irradiated fuels or cladding materials, samples were placed in crucibles and heated to temperatures ranging from 700 to 2000 degrees Celsius with air or oxygen in an induction furnace. Combustion gases were handled and treated to collect oxygen, carbon, hydrogen, or tritium for analysis outside of the hot cells. For some operations, furnace gases were passed over hot copper oxide-lead chromate to ensure complete oxidation. For oxide fuels, pellets consisting of fuel mixed with graphite were created for reaction in the furnace. To identify metals in irradiated fuels, oxidized samples were packed into electrodes and excited with a 15 amp direct current arc for 50 seconds, and the resulting emission spectrum recorded on spectrographic plates (Reference 6).

A variety of materials including paints, plastics, elastomers, insulation, sewage bacteria, and electronic components were irradiated in the hot cells with a 1450 curie cobalt-60 source. After the sample materials were placed in the cell, the source, stored in floor hole Z-17 when not in use, was transferred to the corridor in a 4-ton, bottom-loading cask, and remotely positioned in the applicable cell. Following use, the source was returned to floor storage (Reference 6).

Auto-radiography was conducted in the hot cells and consisted of placing specimens on film. The exposure to the film differed according to the activity of the sample and ranged from 20-25 seconds for alpha and 30 seconds to 3 minutes for beta-gamma measurements (Reference 6).

Facility and Equipment Maintenance Operations

Facility and equipment maintenance operations conducted in the CMR include cleaning and decontamination, equipment inspection and replacement, modification of facilities, and general housekeeping. Cleaning and decontamination methods include physical wiping and the use of cleaning solutions (e.g., Fantastik, household detergents, or water) to remove potential contamination and to restore work areas and equipment to their original condition. Paper, plastic, and rags with a cleaning solution are used to remove or contain the spread of contamination. Cleaning operations also include equipment and tank draining. Liquid and sludge contained in the tanks could be discharged to the RLWTF for disposal or solidified in cement. The majority of containers assigned to waste stream LA-CIN03.001 were generated during tank cleaning operations. Equipment inspection, calibration, and replacement operations are performed to ensure continued operability and process efficiency. Solid wastes generated from these operations include paper and plastic wastes, particulate matter, and spent parts (e.g., quartz insulators, metal slits). Modification of facilities include plumbing, electrical fixtures and equipment installation, painting of facilities and equipment (e.g., Plasite, Steel Coat), and installation of shielding. General housekeeping includes cleaning, repair, and organization of the facility/infrastructure. Solid waste generated from these operations is disposed of as TRU waste (References 6, C004, C047, D016, D018, D020, D023, D024, D028, D029, M281, P001, P006, P019, P022, P034, and P035).

Decontamination and Decommissioning (D&D) Operations

D&D operations are commonly performed in the CMR Facility to reduce the amount of floor space posted as radiological controlled areas and to support upgrades to existing facilities and equipment. These efforts assist in contamination control and result in a significant decrease in the amount of radiological waste generated from the CMR. These radiological controlled areas house the equipment and material used to perform the above listed operations and the waste generated during D&D operations contain the same chemical and radiological contaminants. No hazardous chemicals are added to the waste during D&D. Commercially available, non-hazardous cleaning products, such as Fantastik, are used to remove loose contaminants. The goal of D&D is to reduce the amount of TRU waste generated as much as possible through decontamination and size reduction (References 6, C004, C009, D001, and D029).

Decontamination operations are used to accomplish several goals, such as reducing occupational exposures, limiting potential releases of radioactive materials, permitting the reuse of components, and reducing the amount of TRU waste generated. Decontamination includes the use of mechanical and chemical cleaning techniques such as brushing, stripping, washing, and wiping to remove contamination. In addition, physical isolation and draining of equipment are performed when necessary. Based on the radiological contamination, drained liquids are either further treated or solidified. Decommissioning includes the physical removal of contaminated gloveboxes, equipment, machinery, furnishings, and support systems. This includes the removal and size reduction of glovebox internals, process piping and supports, tanks and ancillary equipment, and other fixed equipment such as ducting, wires, conduits, electrical panels, and cabinets. Gloveboxes and equipment are size reduced as necessary and packaged for disposal. Size reduction operations are sometimes performed in other facilities as discussed in the following section. Secondary waste such as combustibles, metal, and plastic generated during D&D is expected to be part of the waste. D&D operations also include the removal of stored radiological and hazardous materials and other related actions (References 6, 17, C004, D001, D024, D028, D029, P005, and P038).

A major D&D operation was conducted in the CMR Wing 9 hot cells from 1986 to 1991. The decommissioning operations included the removal of all spent reactor fuel from Wing 9, the packaging of equipment and excess waste, and the removal of highly contaminated alpha containment boxes. The spent fuel was packaged, placed in shipping containers, and then shipped in a shielded cask to the Hanford site for storage. Equipment and excess waste was removed from the hot cells and the contaminated alpha containment boxes. The equipment and other materials were contaminated through contact with fuel materials during processing, or removal and decontamination operations. The excess waste consisted of residue materials from process operations including samples in particulate state from cutting, grinding, and polishing operations, as well as solidified sample etchant solutions (e.g., acetic acid, ammonium hydroxide, chromic acid). The alpha containment boxes were remotely decontaminated. The boxes were then transported to the Size Reduction Facility (SRF) for reduction and packaging. No special chemicals or decontamination practices were introduced during D&D. A commercial cleaner (e.g., Fantastik) was the only product identified and was used to wipe down the surfaces of the alpha boxes during the preliminary decontamination of these areas. This is further supported by the container specific documentation completed in accordance with LANL waste management practices requiring the generators to identify chemicals introduced during the D&D operations (References 6, C004, C007, and D029).

Waste Repackaging and Prohibited Item Disposition

Waste repackaging and prohibited item disposition can be performed in four facilities outside of the CMR. Containers that fail to meet WIPP criteria are sent to these facilities to be safely remediated. The first facility was established in 1979 at TA-50 as the SRF to size reduce non-routine items such as decommissioned gloveboxes, ductwork, and process equipment to fit in 55-gallon drums or SWBs. A plasma torch was commonly used during size reduction operations to cut up these large items into manageable pieces. The SRF historically combined waste from multiple facilities and these containers will be identified and characterized under a separate TA-50 waste stream. As LANL TRU waste characterization and certification activities increased, the mission of the SRF was expanded to include various operations to support TRU waste characterization. In 1993, the name of the SRF was changed to the WCRR Facility to reflect the expanded remediation and repackaging mission. Size reduction operations at the WCRR Facility were discontinued around 1997. The second repackaging facility, the TA-54 Building 412 facility, operated for a short time in the early 2000s and resumed operations again in 2010. The third facility, the TA-54 Dome 231 Permacon, was established in 2006 at which time Central Characterization Program (CCP) personnel began observing operations. The fourth facility, the Box Line Process, began operations in 2012 at the TA-54 Dome 375. All three TA-54 facilities perform the same basic functions including sorting, segregating, size reduction, and repackaging operations on waste containers (e.g., 55-gallon drums) that contain WIPP nonconforming items. The facilities also safely process oversized containers (e.g., fiberglass-reinforced plywood [FRP] waste boxes, corrugated metal boxes [CMBs]). They disassemble oversized containers (e.g., FRPs), process waste items located within, size reduce waste items (if necessary), and process the original packaging (e.g., plywood sheathing). They then repackage these wastes in standard containers (e.g., 55-gallon drums, SWBs) that can be permanently disposed of at the appropriate disposal facilities. These facilities also process (i.e., modify and vent) CMBs in order to load them into ten drum overpacks (TDOPs). Modification of the CMBs includes cutting the edges of the box so it will fit into a TDOP. The original packaging materials (e.g., plywood sheathing) from these operations are managed as either TRU or Low-level waste (References C036, C037, C057, D003, D024, D028, D035, P040, P041, P042, P044, P046, P047, P048, P049, P050, P051, P052, P055, and P056).

These facilities are used to perform visual examination (VE), repackaging, and prohibited item dispositioning of TRU waste. VE is performed to provide information that is used to 1) confirm the waste stream delineation by AK, 2) ensure the absence of prohibited items, and 3) characterize retrievably stored waste with inadequate AK, in lieu of RTR. Waste containers with prohibited items are segregated then dispositioned appropriately and/or repackaged into new containers, during which time liquids are absorbed, sealed containers greater than four liters are opened, and other items (e.g., unpunctured aerosol cans) removed and segregated if necessary prior to certification and shipment. Waste items with high dose rates may be repackaged into a pipe overpack container (POC). Current repackaging procedures ensure that waste items placed into a new container originate from a single parent container. Therefore, if repackaging is necessary, the original CMR characterization is retained. Some secondary waste generated during remediation/ repackaging operations may be added to the waste containers, including but not limited to: absorbent (e.g., Waste Lock 770), alkaline batteries, Fantastik bottles used during decontamination, miscellaneous hand tools, paper/plastic tags and labels, plastic/metal wire ties, PPE, plastic sheeting used for contamination control, rags and wipes (Kimwipes), and original packaging material (e.g., metal, plastic bags, plywood sheathing, rigid liner lids cut into pieces). Although these operations are performed outside of the CMR, there is no cross contamination with waste from other LANL facilities for the containers covered in this report (References C034, C052, M024, P040, P041, P042, P044, P046, P047, P048, P049, P050, P051, P052, and P055).

Waste Stream Material and Chemical Inputs

The following table identifies the RCRA toxicity characteristic and listed constituents identified in this waste stream.

Chemical Identification and Use Summary

Chemical	Use	CMR Wing	Reference/AK Source(s)	EPA HWNs
1,1,1-trichloroethane (methyl chloroform)	Sample preparation reagent. R&D chemical analysis reagent. Solvent cleaning. Ingredient of Hyprez lubricant.	3, 5, 7, 9	6, C004, D001, D024, D033	F001, F002
1,1,2-trichloro-1,2,2-trifluoroethane (Freon TF)	Depleted uranium metallography-electropolishing and etching. Component of Freon Precision Cleaning Agent. Sorbent activity research and TEM sample preparation reagent. Sample cleaning and cell decontamination.	2, 4, 9	6, C004, D001, D024, D033, M017	F002
1,1-dichloroethylene (1,1-dichloroethene)	GC/MS matrix spike standard.	3	M003, P017, P021, P025	D029
1,2-dichloroethane	RCRA regulated contaminant assigned to CMR waste containers.	3, 5	M019, M020	D028
1,4-dichlorobenzene	SVOC matrix spike standard.	3	P017, P020, P025, P029	D027
2,4-dinitrotoluene	SVOC matrix spike standard.	3	P020, P029	D030
2-ethoxyethanol	Optical metallography – component of KPR thinner and dye.	2	D001, M017	F005
2-nitropropane	Sample and standard preparation.	9	6	F005
Arsenic	Cold vapor atomic absorption analyte. Constituent detected in PHERMEX confinement vessel ash.	7, 9	C008, D020, M019, P038, P057	D004
Barium	Superconductor research (BaO, BaCO ₃ , Ba[NO ₃] ₂). Component of paint and polyvinyl chloride heat stabilizing agent. Constituent detected in PHERMEX confinement vessel ash.	2, 9	6, D001, D007, D024, M017, M019, P038, P057	D005
Benzene	Separations and synthesis reagent. Actinide R&D reagent. GM/MS matrix spike standard. Solvent cleaning. Ingredient in paint thinners and strippers. Constituent detected in PHERMEX confinement vessel ash.	3, 5, 7, 9	6, D001, D024, D033, M003, M017, P017, P025, P057	F005
Cadmium	Intermetallic and magnetic materials experiments. Decontamination and cleanup reagent/contaminant. Silver solder and paint component. Polyvinyl chloride heat stabilizing agent. Constituent detected in PHERMEX confinement vessel ash.	2, 9	6, C004, D007, D033, M017, M019, P038, P057	D006
Carbon disulfide	Cleaning solvent	Unspecified	D033	F005
Carbon tetrachloride	ICP laboratory reagent. Cleaning and degreasing solvent.	7, 9	6, C004, D024, D029, D033, M019, M281	F001
Chlorobenzene	GC/MS sample standard. Optical metallography – component of KPR thinner.	2, 3	D001, D008, M003, M017, M019, P017, P021, P025, P038	F002
Chloroform	GC/MS sample preparation standard reagent. Cleaning solvent.	3	D001, D033, P021	D022

Waste Stream Profile Form: LA-MIN05-V.001

Chemical	Use	CMR Wing	Reference/AK Source(s)	EPA HWNs
Chromium	Depleted uranium metallography-electropolishing and etching. TEM sample preparation reagent. Area decontamination reagent. Decontamination and cleanup reagent/contaminant. Component of stainless-steel cladding, paint, welding wire, potassium dichromate, and copper oxide-lead chromate. Constituent detected in PHERMEX confinement vessel ash. Metallography sample preparation. Used to ensure complete oxidation of combusted samples.	2, 9	6, C004, D001, D007, D024, M017, P038, P057	D007
Cresols (mixed isomers)/ Cresylic acid	RCRA-listed contaminant of incoming sludge samples. Constituent detected in PHERMEX confinement vessel ash.	9	DR001, M019, P057	F004
Isobutyl alcohol	Laboratory reagent.	Unspecified	C004	F005
Lead	Brass brush used in density determination for fuel cladding. Sample storage tubes for larger samples. Material used in PHERMEX confinement vessels. Intermetallic and magnetic materials experiments. Decontamination and cleanup reagent/contaminant (lead scrap, shielding and tape). Component of solder (circuit boards) and paint. Superconductor research (lead oxide and lead carbonate). Interstitial nitrogen analysis (lead shot). Constituent detected in PHERMEX confinement vessel ash. WIPP source term test program reagent. Metallography sample preparation. Used to ensure complete oxidation of combusted samples.	2, 3, 5, 9	6, C004, C009, C029, D007, D016, D018, D024, D033, M017, P038, P057	D008
Mercury	Interstitial analysis – diffusion pumps and manometers. Cold vapor atomic absorption analyte. Component in mercury vapor lights, fluorescent lights, thermometers, and paint. Constituent detected in PHERMEX confinement vessel ash.	7, 9	6, C007, D001, D007, D020, D024, M017, P038, P057	D009
Methyl ethyl ketone	Component of Microstop used in metallurgy operations. Solvent used during maintenance operations. Common ingredient of paint strippers, thinners, and removers	2, 9	6, D008, D024, M017, P038	F005
Methylene chloride	Decontamination and cleanup reagent/contaminant. Component of paint strippers. SVOC sample extraction solvent.	9	6, C004, M017, P020, P021, P029, P038	F001, F002
Nitrobenzene	SVOC surrogate standard. RCRA-listed contaminant of incoming sludge samples.	3	DR001, M018, P020, P029	F004
Pentachlorophenol	SVOC matrix spike standard.	3	P020, P029	D037
Pyridine	TA-55 solvent potentially contaminating samples sent to CMR.	Unspecified	7, D029	F005
Selenium	Cold vapor atomic absorption analyte. Constituent detected in PHERMEX confinement vessel ash.	7, 9	D008, D020, P038, P057	D010

Chemical	Use	CMR Wing	Reference/AK Source(s)	EPA HWNs
Silver	Intermetallic and magnetic materials experiments. Superconductor (silver oxide). Decontamination and cleanup reagent/contaminant. Component of circuit board solder and photographic chemicals. TEM sample preparation reagent. Painted on fuel assembly samples. Welding operations. Constituent detected in PHERMEX confinement vessel ash. Wet chemistry sample preparation. Sample Oxidizer.	2, 9	6, C004, C009, D001, D020, D024, D033, P038, P057	D011
Tetrachloroethylene	Fuel dissolution and extraction. Cleaning solvent.	9	6, C004, D033	F001, F002
Toluene	Decontamination and cleanup reagent/contaminant. Component of paint strippers and thinners. Separations and Synthesis reagent. GC/MS matrix spike standard.	3, 7, 9	6, C004, D001, D024, M003, M017, P017, P021, P025	F005
Trichloroethylene	GC/MS matrix spike standard. Plutonium metal sample cleaning solvent.	2, 3, 4, 7, 9	6, D024, D033, M003, M016, P017, P025	F001, F002
Vinyl chloride	GC/MS sample preparation standard.	3	C005, M018, P017, P021	D043

RCRA Determinations

Historical Waste Management

Waste stream LA-MIN05-V.001 has historically been managed in accordance with the generator site requirements and in compliance with the requirements of the New Mexico Environmental Department. Based on historical waste management and LANL's TRU Program, the containers in this waste stream were managed as hazardous and assigned U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers (HWNs) for arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), silver (D011), benzene (D018), carbon tetrachloride (D019), chlorobenzene (D021), chloroform (D022), 1,2-dichloroethane (D028), methyl ethyl ketone (D035), pyridine (D038), tetrachloroethylene (D039), trichloroethylene (D040), and F-listed solvents (F001, F002, F003, and F005). In addition, the AK documentation indicates the waste may also be contaminated with cresols and cresylic acid (D026 and F004), 1,4-dichlorobenzene (D027), 1,1-dichloroethylene (D029), 2,4-dinitrotoluene (D030), nitrobenzene (D036 and F004), and pentachlorophenol (D037), and vinyl chloride (D043). A review of available AK documentation has determined that this waste is hazardous for the above constituents; however, HWNs D018, D019, D021, D026, D035, D036, D038, D039, D040, and F003 were not assigned. These HWNs were not included because the more specific F-listed HWNs have been assigned to the waste stream and the waste will not exhibit the characteristic of ignitability (Reference 20). The following sections further describe the characterization rationale for the assignment of EPA HWNs to waste stream LA-MIN05-V.001. The Chemical Identification and Use Summary table summarizes the waste codes assigned to this waste stream (References D028, D029, DR021, M282, and M286).

To assign EPA HWNs, available AK documentation is reviewed to assess chemical usage and to identify potentially hazardous materials that may have been introduced into the waste stream. In addition, Material Safety Data Sheets (MSDSs) and other manufacturer information are obtained for the commercial products to determine the presence of RCRA-regulated compounds. As described in the following sections, several of the HWNs are assigned due to lack of analytical evidence that these constituents have not exceeded the regulatory thresholds. The chemical inputs identified in the Chemical Identification and Use Summary table are used

during various CMR chemical and metallurgical research and associated analytical chemistry, hot cell, and maintenance operations. This waste stream is comprised of liquids and residues/solids that are generated by or contaminated with waste from these operations. Therefore, these constituents have the potential to contaminate this waste stream (Reference DR021).

Hazardous Waste Determinations

Ignitability, Corrosivity, Reactivity

Based on the AK documentation reviewed relating to LANL waste management practices, the materials contained in waste stream LA-MIN05-V.001 do not exhibit the characteristics of ignitability (Title 40 Code of Federal Regulations [CFR] 261.21), corrosivity (40 CFR 261.22), or reactivity (40 CFR 261.23) (Reference 14). The CMR waste practices require liquid to be discharged to the RLWTF for treatment, pretreated if the liquids are characteristic, solidified using an absorbent or cement material, or returned to the generating organization if the liquid is excess sample material. However, prior to 1994 even though general waste management policies prohibited the inclusion of these materials in waste containers, formal implementation of these policies in procedures and training was limited. For this reason, container-specific information verifying the absence of ignitable, corrosive, and reactive materials was not consistently documented. Potentially ignitable, corrosive, or reactive materials (e.g., liquids, unpunctured aerosol cans) identified during RTR will be remediated or removed from the waste prior to shipment to WIPP (References C009, C016, D008, D009, D010, D019, D021, D028, D029, P001, P006, P014, and P038).

Ignitability

The materials in this waste stream do not meet the definition of ignitability as defined in 40 CFR 261.21 (Reference 14). LANL waste management practices prohibit liquids in any container of solid waste materials. Although ignitable chemicals (e.g., methyl alcohol, n-butyl alcohol) and oxidizers (e.g., aluminum nitrate, ferric nitrate) are identified as being used in the CMR, these reagents are used in small quantities as needed, and should only be present as trace (non-liquid) contaminants. This material will not cause fire through friction, absorption of moisture, or spontaneous chemical changes. The materials are not compressed gases, nor does the waste contain compressed gases. Compounds including Aquasorb, NoChar A660 or Acid Bond, Slikwik, sodium silicate, vermiculite, and zeolite are used to solidify the materials in this waste stream. The materials are not liquid, and RTR is performed to ensure the absence of liquids. The materials in this waste stream are therefore not ignitable D001 wastes (References D008, D009, D019, D028, D029, M017, P001, P006, P012, and P014).

Corrosivity

The materials in this waste stream are not liquids and do not contain unreactive corrosive chemicals; therefore, they do not meet the definition of corrosivity as defined in 40 CFR 261.22 (Reference 14). LANL waste management practices prohibited liquids in containers of solid waste materials. Waste management practices required corrosive liquids (e.g., hydrochloric acid, nitric acid, sodium hydroxide) used in the CMR to be neutralized and solidified or absorbed. Compounds including Aquasorb, NoChar A660 or Acid Bond, Slikwik, sodium silicate, vermiculite, and zeolite are used to solidify the materials in this waste stream. The

materials are not liquid, and RTR is performed to ensure the absence of liquids. The materials in this waste stream are therefore not corrosive D002 wastes (References D008, D009, D010, D019, D028, D029, M017, P001, P006, P012, and P038).

Reactivity

The materials in this waste stream do not meet the definition of reactivity as defined in 40 CFR 261.23 (Reference 14). The materials are stable and will not undergo violent chemical change without detonating. The materials will not react violently with water, form potentially explosive mixtures with water, or generate toxic gases, vapors, or fumes when mixed with water. LANL waste management policies did not allow the disposal of potentially reactive materials (e.g., magnesium oxide). Cyanide containing wastes are neutralized with alkaline chlorination to destroy the cyanide prior to disposal. Sulfide containing wastes were not identified. Picric acid was identified; however, the acid is used in small quantities, and disposed of as a low content liquid down the acid drain. Explosives are handled and analyzed at LANL; however, explosives are not expected to be used or analyzed in the CMR, and in general would not have been disposed of in any LANL radioactive waste streams. Although the PHERMEX confinement vessels being processed in the CMR used high explosives, the experiments were designed to ensure complete consumption of the explosive material. The materials are not liquid, and RTR is performed to ensure the absence of liquids and prohibited items (e.g., unpunctured aerosol cans). The materials in this waste stream are therefore not reactive D003 wastes (References C004, C022, D002, D003, D006, D019, D028, D029, DR003, P001, P006, P014, and P057).

Toxicity Characteristic

Based on review of AK relative to chemicals used or present in CMR operations, waste stream LA-MIN05-V.001 may be contaminated with toxicity characteristic compounds as defined in 40 CFR 261.24 (Reference 14). Where a constituent has been identified and there is no quantitative data available to demonstrate that the concentration of a constituent is below regulatory threshold levels, the applicable EPA HWN is applied to the waste stream.

The AK identified the potential presence of organic toxicity characteristic compounds that are also assigned to the more specific F-listed EPA HWNs, including benzene (D018), carbon tetrachloride (D019), chlorobenzene (D021), cresols (D026), methyl ethyl ketone (D035), nitrobenzene (D036), pyridine (D038), tetrachloroethylene (D039), and trichloroethylene (D040). These characteristic EPA HWNs are not assigned to this waste stream (Reference 20). Pesticide and herbicide samples were analyzed in the CMR; however, the data available indicates that the concentrations of these compounds in the samples could not result in solid waste exceeding the regulatory threshold for these compounds. Waste stream LA-MIN05-V.001 is assigned HWNs D004, D005, D006, D007, D008, D009, D010, D011, D022, D027, D028, D029, D030, D037, and D043 (References D024, D028, D029, DR021, M282, and M286).

Listed Waste

F-Listed Waste

Based on review of AK relative to chemicals used or present in CMR operations, waste stream LA-MIN05-V.001 may contain or be mixed with F-listed hazardous wastes from non-specific sources listed in Title 40 CFR 261.31 (Reference 14). As shown in the Chemical Identification and Use Summary table, F001, F002, F004, and F005 listed solvents were used and potentially

contaminated the waste. EPA has provided a regulatory clarification that the F001-listing is only applicable when the listed solvents are used in a large-scale degreasing operation such as cold cleaning or vapor degreasing (Reference 20). Although large-scale degreasing operations have not been identified in the CMR, F001 has been assigned to the waste stream to remain consistent with historical CMR HWN assignment. In addition, waste from performing laboratory analysis of samples with F001-listed solvent contamination from TA-21, TA-55, or other offsite facilities may be present in this waste stream. F003 constituents, including acetone, n-butyl alcohol, ethyl benzene, ethyl ether, methyl alcohol, methyl isobutyl ketone, and xylene are listed solely because these solvents are ignitable in the liquid form. The waste stream will not exhibit the characteristic of ignitability because it is not liquid; therefore, F003 is not assigned (Reference 20). Waste stream LA-MIN05-V.001 is assigned F-listed EPA HWNs F001, F002, F004, and F005 (References D024, D028, D029, DR021, M019, M282, and M286).

K-Listed Waste

The material in this waste stream is not a hazardous waste from any of the specific sources listed in 40 CFR 261.32 (References 14 and DR021).

P- and U-Listed Wastes

The AK did not identify any source or incident where the materials in this waste stream were mixed with or contaminated with discarded commercial chemical product, an off-specification commercial chemical product, or a container residue or spill residue thereof as defined in 40 CFR 261.33 (Reference 14). No listed chemicals were identified in the container-specific documentation and no record of a significant spill of listed chemicals was located (e.g., incident report). Production scale operations involving beryllium metal or powder were not performed at the CMR Facility. The only sources of beryllium identified in the AK record were contamination of small SNM samples (1 mg to 25 g), actinide/beryllium sources, and beryllium fluoride salt used as a reagent for the analysis of electromotive forces of radionuclides. Based on the type of beryllium used in the CMR Facility, the waste stream will not meet the definition of P015-listed waste. Hydrofluoric acid (U134-listed waste) was used in the CMR; however, there is no indication that unused acid or materials from spills of the acid were disposed of in this waste stream. Waste stream LA-MIN05-V.001 is therefore not assigned a P- or U-listed HWN (References D001, D016, D020, D028, D029, DR021, M282, and M286).

Polychlorinated Biphenyls (PCBs)

With the exception of samples sent to the CMR for analysis and suspect PCB fluorescent light ballasts found in the debris waste stream, no other sources for PCBs were identified in the AK. Based on CMR waste management and analytical practices, PCBs are not expected in this waste stream. Any unused samples are returned to the generating facility. In addition, waste contaminated with PCBs is managed separately and labeled accordingly. The generator documentation did not identify the presence of PCBs. Therefore, this waste stream is not regulated as a TSCA waste under 40 CFR 761 (References 16, C038, D001, D029, M282, M286, P026, and P027).

Prohibited Items

Prohibited items are not expected to be present. However, the presence of liquids due to dewatering is possible. In addition, procedures allowed containers greater than four liters, sealed with tape, to be used for waste packaging until LANL WIPP-approved procedures were implemented (References D028 and D029).

Prohibited items are detected by RTR and reported with the characterization results. Waste containers with prohibited items are segregated then dispositioned appropriately and/or repackaged into new containers, during which time liquids are absorbed, sealed containers greater than four liters are opened, and other items removed and segregated if necessary prior to certification and shipment. Some secondary waste generated during remediation and repackaging operations may be added to the waste containers, including but not limited to absorbent (e.g., Waste Lock 770), alkaline batteries, Fantastik bottles used during decontamination, miscellaneous hand tools, paper/plastic tags and labels, plastic/metal wire ties, PPE, plastic sheeting used for contamination control, rags and wipes (Kimwipes), and original packaging material (e.g., metal, plastic bags, plywood sheathing, rigid liner lids cut into pieces) (References C034, C052, D029, M024, P040, P044, and P055).

Method for Determining Waste Material Parameters (WMPs) Weights per Unit of Waste

To estimate the WMP weights for waste stream LA MIN05-V.001, WMP data were obtained from Batch Data Reports of RTR examination of this waste stream by the CCP TRU Waste Certification Program at LANL. In addition, waste description/content information provided with the container paperwork was used to supplement the RTR information (References M282 and M286).

The WMPs for waste stream LA MIN05-V.001 were estimated by reviewing RTR WMP data for seven out of eight containers and waste description/content information from the container paperwork. This waste stream includes containers with organic absorbent (e.g., Aquasorb) and inorganic absorbent (e.g., vermiculite, zeolite). This waste stream also includes containers where the type of absorbent/material is unknown. Some containers identify the presence of absorbed inorganics (e.g., brines); however, some containers do not identify the type of material absorbed. In addition, the container paperwork indicates that filter media residues, sludge, and spent resins are present. Filter media residues and sludge can be either organic or inorganic (resins are typically organic). Due to the variability and uncertainty of the type of absorbent used and the material absorbed, the homogeneous material identified for each container in the waste stream was divided equally as both inorganic and organic matrix. Average, minimum, and maximum WMP weight percentages were calculated using this data, and the results of this analysis are presented in the Waste Material Parameter Estimates for LA-MIN05-V.001 table.

Waste Material Parameter Estimates for LA-MIN05-V.001

Waste Material Parameter	Avg. Weight Percent	Weight Percent Range
Iron-based Metals/Alloys	7.4%	0.0% - 34.7%
Aluminum-based Metals/Alloys	1.4%	0.0% - 2.4%
Other Metals	0.0%	0.0% - 0.0%
Other Inorganic Materials	<0.1%	0.0% - 0.6%
Cellulosics	2.9%	0.0% - 15.8%
Rubber	0.3%	0.0% - 5.4%
Plastic (waste materials)	4.2%	0.0% - 10.9%
Organic Matrix	41.9%	27.47% - 50%
Inorganic Matrix	41.9%	27.47% - 50%
Soils/Gravel	0.0%	0.0% - 0.0%
Total Inorganic Waste	50.7%	
Total Organic Waste.	49.3%	

List of AK Sufficiency Determinations Requested for the Waste Stream

No AK Sufficiency Determinations were requested for this waste stream.

Transportation

This waste stream and its chemical constituents have been reviewed for consistency with the listed TRUCON codes and they are consistent.

Beryllium

Beryllium will not be present in amounts greater than 1% by weight of the waste in each payload container.

Radionuclide Information

The radiological distribution for waste stream LA-MIN05-V.001 is listed in the Estimated Radionuclide Distribution in LA-MIN05-V.001 table. The distribution represents existing generator-reported radionuclide data for each container in the waste stream. The "Total Radionuclide Weight%" values in the following table are the gram value for each radionuclide over the entire waste stream divided by the total radiological mass in the waste stream. The same calculation produced the values for the "Total Radionuclide Curie%" using the sum of activity values for each radionuclide over the entire waste stream (References C049, M021, M282, and M286).

The columns "Radionuclide Weight% Range for Individual Containers" and "Radionuclide Curie% Range for Individual Containers" illustrate the reported ranges of radionuclides in individual containers by identifying the maximum and minimum values for each radionuclide on a container-by-container basis over the entire waste stream. As illustrated in the following table, the radionuclide weight percent of individual radionuclides varies on a container-by-container basis. Because of this variability, some containers will not include the waste stream predominant radionuclides but may include other radionuclides expected in this waste stream (References C049, M021, M282, and M286).

From the data presented in the following table, the two predominant isotopes by mass for waste stream LA-MIN05-V.001 are Pu-239 and Np-237. However, Np-237 is estimated at 17.67% and U-238 is estimated at 17.42%. Therefore, certified nondestructive assay data may identify U-238 as one of the two predominant radionuclides. Over 95 percent of the activity for the entire waste stream is from Am-241, Pu-239, Pu-240, and Pu-241 (References C049, M021, M282, and M286).

Estimated Radionuclide Distribution in LA-MIN05-V.001

Radio-nuclide	Total Radionuclide Weight% ^{1,5}	Radionuclide Weight% Range for Individual Containers ^{2,5}	Total Radionuclide Curie% ^{3,5}	Radionuclide Curie% Range for Individual Containers ^{4,5}	Expected in Waste Stream
WIPP Required Radionuclides					
Am-241	0.58%	0% - 15.95%	9.81%	0% - 71.15%	Yes
Pu-238	0.04%	0% - 5.40%	3.13%	0% - 77.34%	Yes
Pu-239	60.15%	47.11% - 100.00%	18.60%	3.47% - 100.00%	Yes
Pu-240	3.77%	0% - 5.95%	4.26%	0% - 4.79%	Yes
Pu-242	0.03%	0% - 1.20%	Trace	0% - Trace	Yes
U-233 ⁶	Not Reported				Yes
U-234	0.02%	0% - 2.31%	Trace	0% - 0.02%	Yes
U-238	17.42%	0% - 24.76%	Trace	0% - Trace	Yes
Sr-90	Trace	0% - Trace	Trace	0% - Trace	Yes
Cs-137	Trace	0% - Trace	Trace	0% - Trace	Yes
Additional Radionuclides					
Am-243	0.03%	0% - 1.02%	0.03%	0% - 0.27%	Yes
Np-237	17.67%	0% - 24.91%	0.06%	0% - 0.12%	Yes
Pu-241	0.13%	0% - 0.48%	64.11%	0% - 72.16%	Yes
U-235	0.18%	0% - 21.86%	Trace	0% - Trace	Yes

1. This listing indicates the total weight percent of each radionuclide over the entire waste stream.
2. This listing is the weight percent range of each radionuclide on a container-by-container basis.
3. This listing indicates the total activity (curie) percent of each radionuclide over the entire waste stream.
4. This listing is the curie percent range of each radionuclide on a container-by-container basis.
5. "Trace" indicates <0.01 weight or activity (curie) percent for that radionuclide.
6. Radionuclide not reported in individual containers, but suspected present from secondary radionuclides, decay, or waste generating process information.

Payload management will not be utilized for this waste stream.

References

1. CCP-TP-005, *CCP Acceptable Knowledge Documentation*, Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
2. NM4890139088-TSDF, *Waste Isolation Pilot Plant Hazardous Waste Facility Permit*, New Mexico Environment Department, Santa Fe, New Mexico
3. DOEWIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, Carlsbad, New Mexico, U.S. DOE Carlsbad
4. CCP-PO-001, *CCP Transuranic Waste Characterization Quality Assurance Project Plan*, Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
5. 42 U.S. Code 10101, *Nuclear Waste Policy Act of 1982*, U.S. Congress
6. CCP-AK-LANL-500, *Central Characterization Project Acceptable Knowledge Summary Report for 16 Canisters of Remote-Handled Transuranic Debris Waste from Los Alamos National Laboratory Chemistry and Metallurgy Research Facility, Waste Stream: LA-MHD03.002* Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
7. CCP-AK-LANL-006, *Central Characterization Program Acceptable Knowledge Summary Report for Los Alamos National Laboratory TA-55 Mixed Transuranic Waste, Waste Streams: LA-MHD01.001, LA-CIN01.001, LA-MIN02-V.001, LA-MIN04-S.001*, Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
8. DOE Order 5820.1, *Management of Transuranic Contaminated Materials*, U.S. DOE (Dated September 30, 1982)
9. DOE Order 5820.2, *Radioactive Waste Management*, U.S. DOE (Dated February 1984)
10. DOE Order 435.1, *Radioactive Waste Management*, U.S. DOE, Environmental Management
11. DOEWIPP 01-3194, *CH-TRU Waste Content Codes (CH-TRUCON)*, U.S. DOE Carlsbad
12. DOE/TRU-12-3425, *Annual Transuranic Waste Inventory Report –2012*, Carlsbad, New Mexico, U.S. DOE Carlsbad Field Office
13. CCP-PO-002, *CCP Transuranic Waste Certification Plan*, Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
14. Title 40 Code of Federal Regulations (CFR), Part 261, *Identification and Listing of Hazardous Waste*, U.S. EPA
15. *Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)*, U.S. DOE Carlsbad
16. Title 40 Code of Federal Regulations, Part 761, *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions*, U.S. EPA

17. CCP-AK-LANL-010, *Central Characterization Program Acceptable Knowledge Summary Report for Los Alamos National Laboratory TA-21 DP West Facility, Waste Streams: LA-MHD04.001, LA-MSG04.001*, Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
18. Public Law 102-579, *Waste Isolation Pilot Plant Land Withdrawal Act* (as amended)
19. CCP-PO-003, *CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)*, Carlsbad, New Mexico, Nuclear Waste Partnership, LLC.
20. McCoy and Associates, Inc. *McCoy's RCRA Unraveled*. 2007 Edition.

Source Documents

Source Document Tracking Number	Title
C002	USQD Screen on Microwave Dissolution for Trace Element Analysis
C003	Levels of TCLP Compounds in Solid Waste
C004	Mixed Waste Reply
C005	Interview: Stanley Kosiewicz Discussing Waste Stream Documentation, Operational history and Hazardous Waste Codes
C007	Interview: Robert Romero - Waste Streams at CMR, Wings 3, 4, 5, 7 and 9
C008	Interview: Jeff Carmichael, Rick Staroski - Waste Streams TA-55-19 and TA-55-30
C009	Interview: Tom Zocco - CMR Waste Management
C012	Record of Communication - CMR Waste Streams
C016	Record of Communication CMR Waste Streams
C018	Memo with Attachments to K. Dziewinska re: Material Type Isotopic Compositions
C019	Layers of Packaging in TA-55 Combustible TRU Waste
C021	Memorandum to Ed Wilmont, Pu 238 Waste at TA-55
C022	Record of Communication – Interview with Robert Donohoe, Explosives Analyzed at CMR
C024	AK Isotopic Files for Input to NDA Radioassay Spreadsheets
C025	Assay of U-234
C026	U-234 and Sr-90 Calculations for NDA Reporting
C027	Interview with Jim Foxx, Source of Cs-137, Pa-231, and Cm-244 in TA-55 Waste
C028	Interview with Jim Foxx, Source of Cs-137 and Pa-231 TA-55 Waste
C029	Record of Communication, Interview with Laurie Walker, Waste Generating Processes and CMR Tenant and Management Organizations
C031	Record of Communication: TRU Waste Generation Activities at Wing 9, CMR
C032	Fiberboard Drum Liner Use at Los Alamos National Laboratory
C033	Waste Characterization, Reduction, and Repackaging Facility Container Evaluation
C034	Secondary Waste Discussions to be Added to AK 4 and AK 6
C035	AK9 Future Generation
C036	Decontamination and Volume Reduction System (DVRS) Information
C037	DVRS Info: Methodology for Assigning DVRS Waste Streams
C038	Prohibition on PCB waste lifted from LANL
C039	Emails regarding WMS Production Start Date
C042	Evaluation of Volume, Period of Generation, and Calculation of Individual Total Radionuclide Masses and Activities for Waste Stream LA-MHD03.001
C045	Evaluation of Volume, Period of Generation, and Calculation of Individual and Total Radionuclide Masses and Activities for Waste Stream LA-MHD03.001
C047	Evaluation of Volume and Calculation of Individual and Total Radionuclide Masses and Activities for Waste Stream LA-CIN03.001
C048	CMR Estimated Volume of Cemented and Absorbed Liquid Waste
C049	Evaluation of Volume and Calculation of Individual and Total Radionuclide Masses and Activities for Waste Stream LA-MIN05-V.001

Source Document Tracking Number	Title
C050	Drum Washing of Drums Retrieved from Below-Grade
C051	Evaluation of Volume and Calculation of Individual and Total Radionuclide Masses and Activities for Waste Stream LA-MHD03.001
C052	Secondary Waste Generated by the Remediation/Repackaging Processes at Dome 231 and WCRRF
C057	TA-54 Building 412 vs. DVRS Facility
C058	Addition of Below-Grade Containers to TA-3 Waste Streams and the Recalculation of Individual and Total Radionuclide Masses and Activities
C059	Evaluation of Additional Containers for Waste Stream LA-MHD03.001
C062	Email: CVD – GK Report, and Identification of CCP Waste Stream
C063	Waste Stream LA-MIN05-V.001 Future Generation
D001	Safety Analysis Report for the TA-3 Chemistry and Metallurgy Research Facility
D002	Waste Management Site Plan, 1980
D003	Waste Management Site Plan, LANL, December 1984
D006	1985 Waste Management Site Plan
D007	Assessment of Perchlorate Salt and Toxic Contaminants in the CMR HVAC System: A Basis for worker Safety and Waste Management Action Levels
D008	CMR Facility TWID (Transuranic Waste Interface Document)
D009	Analytical Chemistry TRU Waste Certification Plan
D010	Los Alamos TRU Waste Certification Plan, Attachment 4: Analytical Chemistry TRU Waste Certification Plan CLS-1
D011	Preparation of Certified TRU Waste for WIPP
D015	Unreviewed Safety Question and Determination Worksheet: Actinide Spectroscopy
D016	USQD Worksheet: Operation of the Kratos GDMS Hazard Assessment
D017	Unreviewed Safety Question Determination and Screening Worksheet - Characterization of Interdicted Materials - Special Sample #1
D018	USQD and Screening Worksheet: Capability Evaluation Project-Part A. Increased AM/Pu (IAP) WRMs
D019	Preparation of Certified TRU Waste of WIPP
D020	CMR Basis for Interim Operations (UCNI)
D021	CMR Waste Management Plan
D022	TA-3 Chemistry and Metallurgy Building Acceptable Knowledge Report
D023	CMR Building 29, Wing 5 Hazard Control Plan
D024	LANL Transuranic Waste Characterization Sampling Plan
D025	TA-55 Plutonium Facility Acceptable Knowledge Report - Process Acceptable Knowledge Report for Plutonium-238 Operations at TA-55
D026	LANL Project 2010 Acceptable Knowledge Report - Acceptable Knowledge Operations Report for Plutonium-238 Processes at LANL Facilities
D027	LANL Project 2010 Acceptable Knowledge Report - Acceptable Knowledge Operations Report for Plutonium Processing at the TA-21 DP West Facility
D028	Los Alamos National Laboratory Transuranic Waste Characterization Acceptable Knowledge Information Summary
D029	LANL Project 2010 Acceptable Knowledge Report-Acceptable Knowledge Operations Report for CMR
D031	Guidelines for the Interim Storage of AEC-Generated Solid Transuranic Wastes

Source Document Tracking Number	Title
D032	Los Alamos TRU Waste Certification Plan for Newly Generated TRU Waste
D033	Los Alamos Scientific Laboratory Health and Safety Manual
D034	Transuranic Waste Inspectable Project (TWISP) Final Report - Waste Retrieval from Pads 1, 2 and 4 at TA-54, Area G Los Alamos National Laboratory
D035	Upgrade and Performance Testing for the Linc System at TA-54 Area G
D036	Project Management Objectives for Pit 9 TRU Waste Retrieval
D037	Retrieval Plan for TA-54 Area G TRU Waste for Pit 9
D038	TA-54, Area G Pit 9 Waste Description
D039	TA-54, Area G Pit 9 Waste Description
D040	TA-54, Area G Trenches A-D Waste Description
D041	TA-54, Area G Documented Safety Analysis
DR001	RCRA EPA Hazardous Waste Number Assignment Discrepancy Report for CMR Waste
DR002	CMR Waste Stream Delineation Discrepancy Resolution
DR003	High Explosives in the CMR and Management at LANL
DR005	Discrepancy Resolution for NDA NCRs
DR006	Discrepancy Resolution for TA-3 (CMR) Mixed Heterogeneous Debris Waste
DR008	Discrepancy Resolution for the Reassignment of Previously Generated Soil Containers to Debris Waste Stream
DR009	Acceptable Knowledge Source Document Discrepancy Resolution – EPA Hazardous Waste Number Discrepancy Resolution for Waste Stream LA-CIN03.001 Revised
DR014	Acceptable Knowledge Source Document Discrepancy Resolution – Removal of Drum Nos. 84415 and S903056 from debris waste stream (Over 50% homogeneous material)
DR019	Acceptable Knowledge Source Document Discrepancy Resolution – Addition of Lead Shielding to Waste Packaging for Waste Stream LA-MHD03.001
DR020	Acceptable knowledge Source Document Discrepancy Resolution – Removal of 5 drums from debris waste stream (LA-MHD03.001) (Over 50% homogeneous materials)
DR021	Acceptable Knowledge Source Document Discrepancy Resolution – EPA Hazardous Waste Number Discrepancy Resolution for Waste Stream LA-MIN05-V.001
M003	VOC analysis operations, room 3121, analysis of Rocky Flats samples
M004	Analysis of Chelator Set 2 Using Electrospray Mass Spectrometry
M005	Measure of total alpha by liquid scintillation counting and of Am-241 by gamma-ray spectrometry
M006	Description of activities in Wing 4, Uranium Processing Laboratory
M010	A Brief History of C-AAC
M011	Actinide Analytical Chemistry Plasma Spectroscopy
M012	Radiochemistry
M013	Actinide Analytical Chemistry Ion Chromatography
M014	Pu Assay
M015	Actinide Analytical Chemistry Mass Spectrometry
M016	Pu Compatibility Activity
M017	MSDSs and Other Manufactures Information
M018	CMR Container List Database
M019	CMR Container Databases - Drum List, Radionuclides, and EPA HWNs

Source Document Tracking Number	Title
M020	LANL Generator Container Documentation (RSWDs and TWSRs)
M021	Concert and AKIR Databases and CMR Waste Stream Radiological, Physical, and Inventory Analyses
M022	LANL Hard Copy RSWDs and TWSRs for LA-MHD03.001
M023	LANL Hard Copy RSWDs and TWSRs for LA-MHD03.001
M024	Record of Communication - Secondary Waste Added During Remediation and Repackaging Operations
M025	List of 14 LA-MHD03.001 Containers that Contain Concrete
M027	LANL Generator Container Documentation (RSWDs) for Waste Stream LA-MSG03.001
M028	LANL Generator Container Documentation (RSWDs) for Waste Stream LA-MHD03.001
M029	NUGEN TWSRs for LA-MHD03.001
M278	TRU Waste Storage Records (TWSRs) and Radioactive Solid Waste Disposal Forms (RSWDs) for numerous containers: 80036, 80101, 80134, 80164
M281	LANL Generator Container Documentation (RSWDs) for Waste Stream LA-CIN03.001
M282	Waste Stream LA-MIN05-V.001 Generation Data From TA-54 Database and CCP RTR Data
M283	TA-54, Area G, Pit 9 Waste Information Spreadsheet
M284	Trenches A-D Logbook
M286	Container Documentation for LA-MIN05-V.001
P001	Managing TRU Waste and TRU Mixed Waste at the CMR Facility
P003	X-Ray Diffraction
P004	Actinide Metallography
P005	Managing Oversize TRU waste at the CMR facility
P006	Managing TRU Waste and TRU Mixed Waste at the CMR Facility
P007	Drum Handling Instructions for WIPP TRU Waste
P008	Solid Waste Disposal from the CMR Building
P009	Waste Handling Procedure
P011	Drum Handling Instructions for WIPP TRU waste
P012	Waste Handling Procedure
P013	Drum Handling Instructions for WIPP TRU waste
P014	Preparation of Certified TRU Waste for WIPP
P017	Method 8260 TRUCON Determination of Volatile Organic Compounds in Mixed Waste Samples Using a Modified Purge and Trap GC/MS
P018	Filling the Containers with Reference Material
P019	Analytical Chemistry Decontaminating the Containers for the NDA Standards
P020	Semivolatile Organics in Aqueous Matrices-Solvent Extraction
P021	Volatile Organic Compounds Capillary column technique - GC/MS for Gas Samples
P022	Operation of the Kratos "Concept" Glow Discharge Mass Spectrometer
P023	Blending the PuO ₂ and Matrix for the PDP Reference Materials
P024	Receiving and Unpackaging of Sample Shipment
P025	Volatile Organic Compound in Radioactive and Non-radioactive Matrices
P026	PCBs in Water: Solvent Extraction - GC/ECD

Source Document Tracking Number	Title
P027	Polychlorinated Biphenyls (PCBs) in Oil: Solvent Extraction - GC/ECD Polychlorinated Biphenyls (PCBs) in Soil: Solvent Extraction - GC/ECD
P028	Microwave Dissolution for Elemental Analysis
P029	Semivolatiles Organics in Solid Matrices - Solvent Extraction
P030	Uranium Oxide Purification
P031	Ammonium Diuranate Precipitation
P032	Operating the Cold Rolling Mill in Room 2137
P033	Glass Encapsulation System
P034	Preparation of Actinide Transmission Electron Microscopy Specimens
P035	Thermal and Gravimetric Analysis
P038	CMR Facility Transuranic Waste Interface Document
P039	C-AAC Integrated Work Document - Absorption of Acid Residues with Nochar Acid Bond
P040	Prohibited Item Dispositioning in Dome 231 PermaCon, TA-54 Area G Sludge Remediation Activities
P041	Standard Waste Visual Examination and Prohibited Item Dispositioning
P042	Processing Waste in the Waste Characterization Glovebox
P043	Trenches A-D Retrieval Operations
P044	Sort, Segregate, Size Reduction, and Repackaging
P046	TA-54 Area G TRU SWB/Drum Operations
P047	TA-54-231 PermaCon Upgrades
P048	Sort, Segregate, Size Reduction, and Repackaging Activities
P049	TA-54 Area G Sludge Remediation Activities
P050	TA-54 Area G TRU Crate SSSR Activities
P051	WCRRF Waste Characterization Glovebox Operations
P052	TA-54-375 TRU Oversized Box Processing Capability Project
P055	TA-54 Area G TRU Corrugated Metal Box SSSR Activities
P056	TA-54 Area G Ten-Drum Overpack Container Operations
P057	Generator Knowledge Report for the Contents of the Pulsed High-Energy Radiographic Machine Emitting X-rays (PHERMEX) Confinement Vessels