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CCP-AK-LANL-004

Central Characterization Project

For

LOS ALAMOS NATIONAL LABORATORY
TA-50 RADIOACTIVE LIQUID WASTE TREATMENT FACILITY
HOMOGENEOUS INORGANIC SOLIDS

WASTE STREAMS:
LA-MIN03-NC.001
LA-CIN02.001

Revision 7

October 22, 2007

D. K. Ploetz
Printed Name
APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	02/24/2004	Initial Issue.
1	04/04/2005	Revised to implement new Beryllium and payload management requirements of the WIPP WAC, and address comments from freeze file.
2	06/23/2006	Revised to address freeze file changes and findings from the Carlsbad Field Office (CBFO) Recertification Audit A-06-11 (CAR No. 06-025).
3	11/16/2006	Revised to implement the Waste Isolation Pilot Plant Hazardous Waste Facility Permit requirements resulting from the Section 311/Remote-Handled (RH) Permit Modification Request (PMR) by including the Waste Material Parameter Assessment for waste stream LA-MIN03-NC.001.
4	01/04/2007	Revised to include new cemented inorganic homogeneous solid waste stream number LA-CIN02.001 generated by the pretreatment operation at Technical Area (TA)-50. The pretreatment operation treats and solidifies liquid process waste from TA-55 Plutonium Facility Building (PF-4). This new waste stream is explained in detail in Section 6.0.
5	03/27/2007	Revised to update waste volumes and generation dates for waste streams LA-MIN03-NC.001 and LA-CIN02.001 to update affected sections/tables, and to incorporate miscellaneous editorial changes.
6	09/05/2007	Revised to incorporate container remediation and repackaging information, to correct inconsistencies in waste stream LA-CIN02.001 chemical table (Table 17) and subsequent characterization, and to address other miscellaneous editorial changes.
7	10/22/2007	Revised to address the potential presence and expected concentrations of flammable volatile organic compounds in waste streams LA-MIN03-NC.001 and LA-CIN02.001 containers and to address other miscellaneous editorial changes.

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LIST OF ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
AK	Acceptable Knowledge
AKIS	Acceptable Knowledge Information Summary
Am	Americium
CAI	Controlled Air Incinerator
CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	Contact-Handled
Cm	Curium
CMR	Chemistry and Metallurgy Research Building
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DOE	United States Department of Energy
DOT	United States Department of Transportation
DWLS	Discardable Waste Log Sheet
EPA	United States Environmental Protection Agency
FVOC	Flammable Volatile Organic Compound
FWO	Facility & Waste Operations
HWN	EPA Hazardous Waste Number
IDC	Item Description Code
IIM	Integrated Information Management
LANL	Los Alamos National Laboratory
m^3	Cubic Meters
MASS	LANL Material Accountability and Safeguards System
MSDSs	Materials Safety Data Sheets
MT	Material Type
NaOH	Sodium Hydroxide
OWR	Omega West Reactor
ppm	Parts Per Million
P/S	Process/Status Code
PCB	Polychlorinated Biphenyl
Pu	Plutonium
QA	Quality Assurance
R&D	Research and Development
R/hr	Roentgen per hour
RCRA	Resource Conservation and Recovery Act
RLW	Radioactive Liquid Waste
RLWTF	Radioactive Liquid Waste Treatment Facility
RSWD	Radioactive Solid Waste Disposal Record Form
RTR	Real-Time Radiography
TA	Technical Area
Th	Thorium
TRU	Transuranic
TRU WM	Transuranic Waste Management Database

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

TWBIR	Transuranic Waste Baseline Inventory Report
TWSR	TRU Waste Storage Record
U	Uranium
UC	University of California
UCNI	Unclassified Controlled Nuclear Information
WIPP	Waste Isolation Pilot Plant
WIPP-WAC	Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant
WIPP-WAP	WIPP Hazardous Waste Facility Permit Waste Analysis Plan
WMP	Waste Material Parameter
WODF	Waste Origination and Disposition Form
WSPF	Waste Stream Profile Form
WWIS	WIPP Waste Information System

1.0 EXECUTIVE SUMMARY

This document has been prepared for the Central Characterization Project (CCP) for contact-handled (CH) transuranic (TRU) waste generated at the Radioactive Liquid Waste Treatment Facility (RLWTF) in Technical Area (TA)-50 of the Los Alamos National Laboratory (LANL) generated between 1979 and 2000. This report presents the required characterization information for the mixed homogeneous solid waste streams LA-MIN03-NC.001 and LA-CIN02.001 generated from the treatment of radioactive liquid waste.

The CCP is tasked with certification of CH TRU waste for transportation to and disposal at the Waste Isolation Pilot Plant (WIPP). CCP-TP-005, *CCP Acceptable Knowledge Documentation* (Reference 8), describes how acceptable knowledge (AK) is compiled and confirmed by the CCP. The CCP is responsible for AK development in accordance with CCP procedures and will review and approve this report and maintain this report and supporting AK source documentation as CCP quality assurance (QA) records. The CCP maintains responsibility for all referenced documentation, stored at the CCP Records Center, Carlsbad, New Mexico.

This report, along with referenced supporting documents, provides a defensible and auditable record of AK for the designated waste stream from the RLWTF main treatment facility. The references and AK sources used to prepare this report are listed in Section 10.0. The AK sources referenced within this report by alphanumeric designations (e.g., C001, D001, DR001, M001, and P001), correspond to the Source Document Tracking Number using the following convention:

- C – Correspondance
- D – Documents
- DR – Discrepancy Resolution
- M – Miscellaneous
- P – Procedures

This AK report includes information relating to the facility's history, configuration, equipment, process operations, and waste management practices. Information contained in this report was obtained from numerous sources, including facility safety basis documentation, historical document archives, generator and storage facility waste records and documents, and interviews with cognizant personnel. Referenced source documents include Unclassified Controlled Nuclear Information (UCNI). No classified documents were reviewed.

This report complies with the requirements of the *Waste Isolation Pilot Plant Hazardous Waste Facility Permit*, Attachment B, *Waste Analysis Plan* (WIPP-WAP), Attachment B4, TRU Mixed Waste Characterization Using Acceptable Knowledge (Reference 1). This report and supporting references provide the mandatory waste program management and waste stream-specific AK information required by the WIPP-WAP.

2.0 WASTE STREAM IDENTIFICATION SUMMARY

Site Where TRU Waste Was Generated:

LANL
P.O. Box 1663
Los Alamos, New Mexico 87545

Facility Where TRU Waste Was Generated:

Building TA-50-01, RLWTF

Facility Mission:

The primary mission of LANL has been nuclear weapons research and development (R&D). LANL's current central mission is to enhance global security by ensuring the safety and reliability of the U.S. nuclear stockpile, developing technologies to reduce threats from weapons of mass destruction, and solving problems related to energy, environment, infrastructure, health and national security concerns. This mission supports disciplines that enable LANL to contribute to defense, civilian, and industrial needs, including the research, design, development, and analysis of nuclear weapons components; support to research programs in the national interest; energy and environmental research; and environmental management. The mission of the RLWTF was to treat radioactive liquid generated during site operations in a manner to ensure protection of workers, the public, and the environment (References D006 and D078).

Waste Streams:

The waste streams delineated in this report and their associated Transuranic Waste Baseline Inventory Report (TWBIR) numbers are presented in Sections 2.1 and 2.2

2.1 Waste Stream LA-MIN03-NC.001 (Homogeneous Inorganic Solids)

Summary Category Group: S3000 – Homogeneous Solids

Waste Matrix Code Group: Solidified Inorganics

Waste Matrix Code: S3120, Inorganic Sludges

TRUPACT-II Content Code (TRUCON): LA211

Waste Stream TWBIR Identification: LA-TA-50-19*

*TWBIR - 2004, DOE/TRU-2006-3344

Layers of Confinement: Maximum of one layer

Waste Stream Description:

Waste stream LA-MIN03-NC.001 consists of homogeneous dewatered sludge generated in the TA-50-01 RLWTF at LANL from November 16, 1979 to February 2, 2000. The treatment process removed particulate and heavy metals as a sludge that settled out of the clariflocculation tanks from November 1979 to June 1990. Dewatered sludge was also generated during the cleanout of the clariflocculation tanks from October 1997 to February 2000. This sludge was further treated by rotary drum vacuum filtration in a filter precoated with perlite or diatomaceous earth.

The final dewatered sludge consists of 25-40 percent solids. The dewatered sludge was packaged in a 5-mil plastic liner in a 90- or 125- mil polyethylene liner in a 55-gallon U.S. Department of Transportation (DOT) 17C drum. Approximately 10 pounds of dry Portland cement was added below and an additional 10 pounds above the sludge during packaging for moisture absorption, and the 5-mil plastic liner was twisted and taped closed. During the early 1980s, the use of tape to close the liner was discontinued and the plastic liner was simply folded over the waste material prior to installing the rigid liner lid. Confirmation activities will confirm that each rigid liner lid had been punctured and that a filter has been installed in each 55-gallon drum. The final 55-gallon payload container package configuration will result in either one layer of confinement if the plastic liner is twisted and taped closed, or no layers of confinement if the plastic liner is folded over the waste. If the 55-gallon payload container is remediated and/or repackaged, then one layer of confinement will be present if the outer 4 – 12 mil plastic liner bag located between the drum and the rigid liner is twisted and taped closed. Zero layers of confinement will be present if the outer 4 – 12 mil liner bag is folded over or an outer 4 – 12 mil plastic liner bag was not used between the drum and the rigid liner. For additional information on Waste Packaging, refer to Section 5.5.

The waste stream was determined to contain Resource Conservation and Recovery Act (RCRA)-regulated constituents and is assigned the following U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers (HWN): F001, F002, F004, F005, F006, F007, F009, D004, D005, D006, D007, D008, D009, D010, D011, D022, D028, and D037. See Section 5.4.3 for the rationale for assignment of these codes. Prevalent radionuclides by mass are uranium (U)-235 and U-238, as described in Section 5.4.2.

Based on the review of container documentation and documented waste management practices, no prohibited items were specifically identified in the waste stream, except the potential for residual liquids due to dewatering was identified in AK source documents. Additionally, CCP Real-Time Radiography (RTR) confirmation activities have identified drums in this waste stream with residual liquids below the surface of the sludge (i.e.,

layered residual liquids) and internal containers of liquids. CCP RTR has also identified drums with small amounts of metal, plastic, personnel protective equipment, and other miscellaneous debris, and drums with waste contents that are greater than 50 percent debris (up to 100 percent debris). These debris drums also were found with sealed containers greater than 4 liters. Waste packages containing prohibited items or free liquids identified during characterization activities will be segregated then dispositioned appropriately and/or repackaged to remove the items prior to certification and shipment. Any payload container consisting of more than 50 percent by volume of debris waste will be excluded from this waste stream. Refer to Section 5.4.4 for specific waste stream prohibited items information.

2.2 Waste Stream LA-CIN02.001 (Cemented TRU Waste)

Summary Category Group: S3000 – Homogeneous Solids

Waste Matrix Code Group: Solidified Inorganics

Waste Matrix Code: S3150, Solidified Homogeneous Solids

TRUCON: LA211

Waste Stream TWBIR Identification: LA-TA-50-17*, LA-TA-50-18*

* TWBIR – 2004, DOE/TRU-2006-3344

Layers of Confinement: None

Waste Stream Description:

Waste stream LA-CIN02.001 consists of homogeneous cemented inorganics generated in the TA-50 RLWTF at LANL from August 1979 to August 2000. The pretreatment process in the RLWTF concentrated and removed radioactive components from liquid wastes that were piped to TA-50 from PF-4 located at TA-55. The liquid waste includes acidic and caustic wastes generated by plutonium recovery, R&D processes, and facility and equipment operations and maintenance.

Prior to 1985, the thin sludge was cemented into monoliths by tumbling 55-gallon DOT 17C drums containing measured quantities of sludge, Portland cement, vermiculite, and sodium silicate. A 5-mil plastic sleeve was installed in the 55-gallon drum for contamination control during the adding of sludge. The dry ingredients include approximately 282 pounds of Portland cement, 4.5 pounds of vermiculite, and 2.5-gallons of sodium silicate. Between 22- to 23-gallons of sludge was then added to the drum and the drum lid was sealed to the drum with a ¼ inch bead of adhesive and tightened. The drum was tumbled to mix the contents and verify the absence of leaks. After 1985, the 55-gallon DOT 17C drums contained baked-on 90 mil poly liners; however, the cementation process did not change. Confirmation activities will confirm that a filter has been installed in each 55-gallon drum.

The final 55-gallon payload container package configuration will result in no layers of confinement. For detailed information on waste packaging, refer to Section 6.5.

The waste stream was determined to contain RCRA-regulated constituents and is assigned the following EPA HWNs: F001, F002, F005, D004, D005, D006, D007, D008, D009, D010, D011, and D022. See Section 6.4.3 for the rationale for assignment of these codes. Prevalent radionuclides by mass are plutonium (Pu)-239 and U-235, while over 95 percent of the total activity is from Pu-238, Pu-239, and americium (Am)-241. The radiological characterization information is presented in Section 6.4.2.

Based on the review of container documentation and documented waste management practices, no prohibited items were specifically identified in the waste stream, except the potential for residual liquids due to dewatering. Waste packages containing prohibited items or free liquids identified during confirmation activities will be segregated then dispositioned appropriately and/or repackaged to remove the items prior to certification and shipment. Refer to Section 6.4.4 for specific waste stream prohibited items information.

3.0 ACCEPTABLE KNOWLEDGE DATA AND INFORMATION

TRU waste destined for disposal at the WIPP must be characterized prior to shipment. The WIPP-WAP (Reference 1) permits use of knowledge of the materials and processes that generate and control the waste, provided a clear and convincing argument about the characteristics of the waste is achieved. The AK characterization documented herein complies with the requirements of the WIPP-WAP and was developed in accordance with Section B4 of CCP-PO-001, *CCP TRU Waste Characterization Quality Assurance Project Plan* (Reference 7), and CCP-TP-005 (Reference 8).

This report includes information relating to the facility's history, process operations, and LANL waste management practices related to management of waste described in this report. Information contained in this report was obtained from numerous sources, including facility safety basis documentation, historical documents, generator and storage facility waste records, materials safety data sheets (MSDS), and interviews with facility personnel.

4.0 REQUIRED PROGRAM INFORMATION

This section presents the waste management program information required by Section B4 of the WIPP-WAP (Reference 1). Included is a brief operational history of this facility, summaries of the missions, discussions of waste generating operations, and descriptions of the site's waste management program as it relates to these waste streams. Attachment 1, Acceptable Knowledge Documentation Checklist of CCP procedure CCP-TP-005 (Reference 8), provides a list of TRU waste management program information required to be developed as part of the AK record.

4.1 Facility Location

LANL is located in Los Alamos County in north-central New Mexico, approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL is owned by the U.S. Department of Energy (DOE) and has been operated jointly by DOE and the University of California (UC) for over 50 years. The LANL site encompasses 43 square miles subdivided into 49 TAs. Figure 1, Location of the LANL Site shows the location of LANL and the TAs. As illustrated by Figure 2, Location of the Building TA-50-01, Radioactive Liquid Waste Treatment Facility, the RLWTF (Building TA-50-01) is located in TA 50 (References D024 and D078).

4.2 LANL Operational History

In 1942, the U.S. Army Manhattan Engineer District established Project Y to develop the atomic bomb. The research quickly progressed to a point that necessitated a remote site for experimental work, and the Army selected the Los Alamos Ranch School for Boys as an appropriate location. The Undersecretary of War directed acquisition of the school site, which consisted of a group of approximately 50 log buildings on a 790-acre site northwest of Santa Fe. The project ultimately acquired an additional 3,120 privately owned acres and 45,666 acres of public land managed by the U.S. Forest Service. In 1943, this land became known as the Los Alamos Site, later as the Los Alamos Scientific Laboratory. It is now named LANL. Since its inception, UC has operated LANL for the federal government. With the end of World War II and the growth of international competition, a national policy of maintaining superiority in the field of atomic energy was established. Congress chose to sustain the Los Alamos site; the Atomic Energy Commission (AEC) received control of LANL from the Army and renewed the operating contract with UC. During subsequent years, LANL continued to expand at a steady rate, first under the AEC and later under the Energy Research and Development Administration. Since 1978, LANL has operated under the control of the DOE (Reference D078).

4.2.1 LANL Site Mission

The primary mission of LANL has been nuclear weapons R&D since its inception. LANL's current mission supports disciplines that enable LANL to contribute to defense, civilian, and industrial needs. Included in this mission are the research, design, development, and analysis of nuclear weapons components; support to research programs in the national interest; energy and environmental research; and environmental management. In achieving mission objectives, LANL used, and continues to use, hazardous and radioactive materials. Solid waste containing TRU contamination that may be commingled with RCRA hazardous waste has been, and continues to be, generated as a result of plutonium R&D activities, processing and recovery operations, and decontamination and decommissioning (D&D) projects (Reference D078).

4.2.2 TA-50 Radioactive Liquid Waste Treatment Facility Mission

The mission of the RLWTF was to treat radioactive liquid generated during LANL site operations in a manner to ensure protection of workers, the public, and the environment (Reference D006).

4.2.3 Defense Waste Assessment

DOE/WIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (WIPP-WAC) (Reference 3) requires generator sites to use AK to determine if the TRU waste streams to be disposed at the WIPP meet the definition of TRU defense waste. Based on guidance from DOE, a TRU waste is eligible for disposal at the WIPP if it has been generated in whole or part by one of the atomic energy defense activities listed in Section 10101(3) of the Nuclear Waste Policy Act of 1982.

As stated above, the primary mission of LANL has been nuclear weapons research and development since its inception. Section 4.3.2 of this report identifies specific buildings and operations that contributed process liquid waste to the RLWTF for treatment. Although these operations include both defense and non-defense related activities, liquid wastes generated from these operations were inseparably commingled in pipelines or within the influent holding tanks at the TA-50 RLWTF prior to treatment (References D005 and D025).

As one example, the PF-4 operations at TA-55 contributed aqueous liquid waste to the main treatment operation of the TA-50 RLWTF throughout the time period of generation for this waste stream LA-MIN03-NC.001 (References C014 and D018). In addition, TA-55 waste has been pretreated in Room 60 of the RLWTF since 1983, and effluent from the TA-55 pretreatment process is discharged to the main treatment operations of the RLWTF for further processing (Reference D005). Section 4.4.2 identifies specific TA-55 processes that generate liquid waste treated at the RLWTF, most of which are defense related activities, including plutonium recovery and purification processes for defense programs (References D001, D002, D003, D007, D046, D076, and D077). It should also be noted that a defense determination has previously been accepted for debris waste originating

from many of the same TA-55 operations, and these TA-55 debris wastes are currently eligible for shipment to WIPP (References D078 and D079).

Based on the review of the AK, the main treatment and pretreatment operations of the RLWTF treated aqueous liquids and produced waste that meets the WIPP-WAC (Reference 3) definition of TRU defense waste and can be categorized as item (E) of the activities listed in Section 10101(3) of the Nuclear Waste Policy Act of 1982 (Reference 4): Defense nuclear waste and materials by-products management.

4.3 TRU Waste Management

Between 1979 and 1983, all treatment sludge generated at the RLWTF was classified as TRU due to the higher level of TRU isotopes introduced to the process from TA-55. During 1983, LANL began to pretreat waste water from TA-55 to remove the majority of the TRU isotopes from the waste water before it entered the main treatment process, reducing the amount of TRU sludge generated by a factor of 10. After the installation of the pretreatment unit, only occasional batches of TRU sludge were generated until the cleanout of the clariflocculation tanks which began in the late 1990s. LANL segregated the low level from TRU waste based on sample results for the dewatered sludge on a batch basis prior to the dewatering process (References C013, C086, and D029).

During the initial generation time period for these waste streams (i.e., 1979), TA-50 RLWTF waste was packaged and labeled, and a Radioactive Solid Waste Disposal (RSWD) record form was completed for each waste package according to *Administrative Requirements 7-1: Radioactive Solid Waste Management, dated October, 1979* (Reference P001). Among other data, the RSWD form documented the date of generation, generator group and location, waste code, packaging, and radionuclide content information. The RSWD forms associated with the drums comprising waste streams LA-MIN03-NC.001 and LA-CIN02.001 have been retrieved as part of the AK record (References C083, D074, M026, and M218).

In 1984, a lab-wide TRU Waste Certification Plan was adopted for newly generated TRU waste (Reference D073). Waste Content Codes were assigned by the LANL Waste Management Group, Health, Safety and Environment Division (HSE-7 at that time). These codes were later known as the Item Description Codes (IDC), and categorized the waste into one of nine categories (Reference D073). Different waste identification and categorization schemes have been used over time at LANL, including RSWD waste codes, IDCs, and TRUCON codes. The code associated with individual containers in waste stream LA-MIN03-NC.001 is RSWD waste code A-75 (References D078 and M026). The codes associated with waste stream LA-CIN02.001 are IDC 002 (Cemented sludges – caustic sludge stabilized with Portland cement); RSWD waste codes A-25, A-26, and A-76; and TRUCON codes LA111 and LA114 (References C083 and M218).

An electronic data record for each container is stored in the Transuranic Waste Management (TRU WM) database. The TRU WM Oracle database is presently maintained by the Facility & Waste Operations (FWO) group and consists of a listing for all TRU waste

containers in storage at TA-54 Area G, including the containers in these waste streams. Figure 1 is a map identifying the location of TA-54 Area G (References 11 and D018). Along with the unique waste container identification number, the database contains AK information for each container, which includes (Reference D078):

- Generator organization and location;
- Site-based waste identifiers, including IDC, RSWD, and TRUCON codes;
- Generator assay results;
- Container type, volume, and gross weight;
- CH/RH flag;
- Closure and package dates; and
- Current storage location

Each TRU waste package has a unique Retrievable Serial number affixed to it that is referenced on the RSWD form and stored in the electronic data record (References D074, M026, and M218). The TRU WM database data was used, in part, to create the CONCERT database and the Acceptable Knowledge Isotopic Rations (AKIR) report. Various data fields in the CONCERT and AKIR databases were used to identify specific containers generated from TA-50 RLWTF main treatment operations, and to generate the AK Tracking Spreadsheet Containers list (References M219 and M220).

4.3.1 Types and Quantity of TRU Waste Generated

The waste streams described by this report have been characterized as TRU mixed waste. Waste stream LA-MIN03-NC.001, mixed inorganic homogeneous solids, consists of approximately 3,858 55-gallon drums (802 cubic meters), and 1,427 85-gallon drums (458 cubic meters), totaling 1,260 cubic meters. Waste stream LA-CIN02.001, mixed cemented TRU waste, consists of approximately 422 55-gallon drums (88 cubic meters), 273 85-gallon drums (88 cubic meters), 8 110-gallon drums (3 cubic meters), and 149 standard waste boxes (280 cubic meters) totaling approximately 459 cubic meters (References C083 and DR007). The characterization information presented in this report is based on the review of container-specific documentation for those containers listed in the most current AK Tracking Spreadsheet containers list. The future projection of additional generation of waste stream LA-MIN03-NC.001 is no additional containers will be generated in the future. The future projection of additional generation of waste stream LA-CIN02.001 is approximately four cubic meters per year and there is no projected end date for the termination of operations (References 6 and C082).

According to generator-reported radionuclide quantities on a drum basis, a portion of the hazardous waste from TA-50 main treatment operations may contain less than 100 nanocuries per gram (nCi/g) TRU alpha contamination but is managed by the site as TRU mixed waste. The percentage of waste stream LA-MIN03-NC.001 that is above 100 nCi/g is approximately 96 percent, and the percentage of the waste stream that is below 100 nCi/g is approximately 4 percent based on reported radionuclide quantities and drum net weights. The percentage of waste stream LA-CIN02.001 that is above 100 nCi/g is

approximately 64 percent, and the percentage of the waste stream that is below 100 nCi/g is approximately 36 percent based on reported radionuclide quantities and drum net weights (References C017, C080, M026, and M218).

4.3.2 Correlation of Waste Streams Generated from the Same Building and Process

Based on a review of the AK documentation, waste streams LA-MIN03-NC.001 and LA-CIN02.001 were generated from the TA-50 RLWTF treatment operations. Container-specific records have been reviewed to verify the physical composition and origin of the inventories. It has been determined that every container included in the most current AK Tracking Spreadsheet was generated from the operations described in Section 4.4 and meets the definition of waste material generated from a single process or from an activity that is similar in material, physical form, and hazardous constituents (References C083, M026, M218, M219, and M220).

4.4 Description of Waste Generating Process

The main treatment process in the RLWTF concentrated and removed radioactive components from liquid wastes that were piped or trucked to TA-50-01 from various locations at LANL. The treated water was discharged from NPDES-permitted outfalls to Mortandad Canyon. The treatment facilities have consisted of two operations since 1983: the main treatment operation and the TA-55 pretreatment operation. The pretreatment operation was used to treat aqueous process wastes from TA-55, which had much higher TRU activity than other liquid wastes that were treated at TA-50-01. Sludge resulting from the TA-55 pretreatment was cemented. Effluent from the pretreatment process was discharged to the main treatment process for further treatment (Reference D005). Prior to 1983, the main treatment operation directly treated TA-55 acid wastes and TA-55 industrial waste wasters with liquid wastes from other generators, while cementing caustic waste from TA-55. Figures 3 through 5 in Attachment 1 provide an illustration of the general process flow through the TA-50-01 facility (References C004, D018, D030, and P013).

4.4.1 Main Treatment Operation in the RLWTF

The pH of radioactive liquid waste entering TA-50-1 was initially adjusted by the addition of NaOH, and flowed by gravity to one of the two underground influent holding tanks. These tanks are part of the large underground structure known as TA-50-2. From the influent tanks, the liquid waste was pumped into TA-50-01 (References D005 and D025).

Liquid waste from the influent tanks flowed to a flash mixer where it was mixed with floc-forming chemicals and discharged to the first clariflocculator. Floc-forming chemicals, calcium hydroxide and ferric sulfate, were delivered to the flash mixer from overhead hoppers by vibratory feeders. Trisodium phosphate was also used as a floc-forming chemical during the 1980s (Reference C014). Mixing chambers mixed the dry chemical from a given feeder with water by mechanical agitation. Each chamber was equipped with a small, motor-driven mixer. Solution from each mixing chamber flowed by gravity into a flow splitter box (one per mixing chamber) which split the flow between the two flash

mixers. If operators found (from visual inspection of the liquid in the clariflocculator) that proper floc formation was not occurring, an additional coagulant was added to the stream to aid in floc formation in the clariflocculators. The coagulant used was Betz Polymer 1110. This polymer was manually mixed with water in a 30 ft^3 plastic tank and added directly to one of the flow splitter boxes using a small pump (References C014, D005, and D025).

Inside the clariflocculator, calcium carbonate and ferric hydroxide floc particles form as the waste was gently mixed by rotating paddles moving between fixed baffle plates. The heavy floc particles incorporating waste contaminants fell through the bottom of the flocculation tank and settled in the bottom of the outer (clarifier) tank, forming sludge. A sludge rake collected the sludge in a conical central sump of the clarifier tank, from where it could be drained to the sludge holding tank at TA-50-2 by opening a manually operated valve. The tank was equipped with a mixer, and it had draw-off taps at six different elevations to allow separation of the supernatant and the settled sludge. The supernatant was pumped back to the influent tanks (Reference D005).

Because of reduced volumes of influent and the requirement for removing greater amounts of alpha radioactivity, the plant has operated the dual clariflocculators in series since the late 1980s (Reference D025). Clarified liquid from the first clariflocculator was pumped to the flash mixer where additional floc-forming chemicals were added. The mixture then flowed to the second clariflocculator where additional containments are removed from the waste. Sludge from the second clariflocculator was periodically drained to the sludge tank at TA-50-2. Clarified liquid from the second clariflocculator flowed by gravity to the gravity filter. The filter media consisted of anthracite and sand supported by a 9-inch bed of silica gravel. The clarified liquid flowed into the inlet plenum at the bottom of the filter. Carbon dioxide gas was bubbled into the liquid at the bottom of the inlet plenum to lower the pH to below 9 and limit formation of carbonate scale in the filter media. The rate of carbon dioxide addition was set manually by the operator on the basis of visual inspection of the liquid in the filter (the liquid turned milky white if precipitate was forming). Liquid waste rose through the inlet plenum of the gravity filter, overflowed the walls, and then flowed down through the filter media. Periodically, the gravity filter unit was backwashed to remove collected particles that could cause excessive head losses. Backwashing was accomplished by pumping industrial water upward through the filter beds. The backwash water flowing out the tops of the filter beds overflowed into the filter unit's inlet plenum and was directed to the influent tanks at TA-50-2. Treated liquid waste exiting the gravity filter unit flowed by gravity to one of the two effluent tanks at TA-50-2. When an effluent tank was full, personnel discharged the tank's contents to the plant NPDES-permitted outfalls to Mortandad Canyon (References D005, D018, and D025).

From 1979 to approximately 1984, four ion exchange columns were used to improve the removal of positive ions such as strontium and cesium from the liquid waste. Upon exhaustion, the resins were regenerated with nitric acid. The spent regenerate was collected, neutralized, reacted with trisodium phosphate, and further treated with other flocculant sludges in the main treatment operation vacuum filter. Four new ion exchange columns were installed after 1984; however, since waste generators that once constituted the major sources of cesium and strontium were no longer generating waste, the new ion

exchange columns were not tested or put into operation (References C017, D005, and D018).

Sludge collected in the TA-50-2 sludge tank contained about 5 percent – 10 percent solids. The sludge was dewatered to about 25 percent to 40 percent solids via a vacuum filtering operation conducted in Room 116B of TA-50-01. Sludge from the TA-50-2 sludge tank was pumped to the vacuum filter basin. The vacuum filter consisted of a 3-foot long steel drum covered with stainless steel screen that rotated inside a covered steel basin. The filter basin was equipped with a steel, paddle-type agitator. A mixture of perlite (lava particles) or diatomaceous earth and water was introduced to the filter basis to precoat the filter. Then sludge was pumped into the filter basin. As the drum rotated, a vacuum was created inside it by a vacuum pump. The internal vacuum removed the water from the sludge that clung to the outside of the drum. The removed liquid was collected and discharged to the influent tanks at TA-50-2 (References C017, D005, and D018).

Precoat was supplied to the filter basin from a precoat mixing tank. Perlite (diatomaceous earth) was introduced to the mixing tank through a hopper located in the penthouse above the mixing area, and was mixed with water to form the filter precoat (Reference D005).

The dewatered sludge was removed from the drum surface by a manually retractable knife scraper and discharged into a 55-gallon drum through a manually retractable discharge chute that clamped to the top of the drum. The 55-gallon drum was prepared with a 5 mil plastic liner in a 90 mil or 125 polyethylene liner. Approximately 10 pounds of dry Portland cement was placed under the sludge and another 10 pounds on top of the sludge for moisture absorption. A manually operated sliding gate valve in the discharge chute allowed the operator to stop the discharge of dewatered sludge when a drum was full (References D005, D018, D074, DR003, and P002).

4.4.2 TA-55 Pretreatment Operation in the RLWTF

The pretreatment process in the RLWTF concentrated and removed radioactive components from liquid wastes that are piped to TA-50 from the Plutonium Facility (Building PF-4) located at TA-55. Caustic process liquid from chloride operations was cemented directly in drums in Rooms 60 and 116B of the RLWTF. This process was performed from 1979 to 1983. For several years beginning in 1979, acidic process liquids from nitrate operations were introduced into the main treatment operations of the RLWTF. The inclusion of the acidic process liquids contaminated the sludge with high enough concentrations of actinides to render it TRU waste (Reference C086, D004, and M218).

After 1983, TA-55 caustic and acidic process liquids have been fed into two holding tanks and then into Room 60 of the RLWTF where the pretreatment process is performed. Prior to pretreatment, the caustic and acidic liquids are sampled for pH, americium, and plutonium content while in their respective holding tanks. Based on the analytical results, the approximate fissile content of the liquid waste is known and the appropriate amount of materials needed for neutralization. A thin sludge is generated from treating blended acidic and caustic process liquids is generated by either of two batch methods. One method uses

calcium hydroxide (lime), ferric sulfate, a flocculation aid, and enough sodium hydroxide to bring the pH to 11.5 or greater. The other method uses a mixture of ferrous sulfate, ferric sulfate, sodium hydroxide, and water. This method also increases the pH to 11.5 or greater and added a flocculation aid. Either method produces a thin sludge containing approximately 5 percent to 25 percent solids that is always alkaline and compatible with Portland cement (References D004, D005, D020, and P013).

The thin sludge is subsequently cemented to form TRU cement monoliths. Prior to cementation, the sludge is recirculated to assure that all the sludge in the batch has the same composition. The cemented monoliths are produced by tumbling 55-gallon drums containing measured quantities of sludge, Portland cement, vermiculite, and sodium silicate. A 5-mil plastic liner/sleeve is installed in the 55-gallon drum for contamination control during the adding of sludge. The dry ingredients are typically placed in the drums prior to cementation. The cementation process uses three pre-packaged 94-pound bags of Portland cement. Approximately 4.5-pounds of vermiculite added to the 55-gallon drum to serve as an absorbent and as an aggregate. A premeasured amount of sodium silicate (2.5-gallons) is added to the dry ingredients to assure incorporation of sludge components that may not be compatible with Portland cement. Between 22- to 23-gallons of sludge is then added to the drum, and the drum lid is installed. During the sludge addition step, aqueous sources (radionuclides in an aqueous solution) from various facilities were also known to be cemented in this waste stream. However, the addition of these items are identified on the RSWD forms (Reference C082). The assembled drum is slowly tumbled end-over-end while an operator watches for leaks. The drum is then allowed to cure for at least two days (References D004, D005, and P013)

The effluent from the pretreatment process fed into the headworks of the main treatment operations of the RLWTF. After the pretreatment operation began, the amount of TRU sludge produced by the main treatment operation decreased until it eventually reached zero beginning in 1990 (References D004 and D005).

4.4.3 Facilities Contributing Liquid Waste to the RLWTF

Numerous facilities at LANL generated liquid waste that was either piped or trucked to TA-50-01 to be treated by the treatment operations of the RLWTF. This section provides a brief summary of the facilities and operations identified in the AK documentation. Figure 3 illustrates the general flow of LANL liquid radioactive waste to the RLWTF.

TA-55, Plutonium Facility

Since 1979, the Plutonium Facility (Building PF-4) located at TA-55 has been used for the extraction and recovery of plutonium from residues and scraps generated from operations at various LANL facilities and other U.S. Department of Energy (DOE) sites in the defense complex. Most processes at TA-55 that generate liquid waste sent to TA-50 for treatment were solely defense related. Although non-defense related processes were also conducted at TA-55, any liquid waste from non-defense work was commingled in the liquid state prior

to being treated at the RLWTF (References C014, D001, D002, D003, D007, D046, D077, D079, and D082).

TA-55 has conducted more than 170 individual operations; each associated with a process/status (P/S) code. The LANL Material Accountability and Safeguards System (MASS) and associated P/S codes were developed to track nuclear materials throughout TA-55 plutonium recovery operations, and now provide information to associate waste materials with a specific operation of origin (Reference D079). Review of the TA-55 process documentation identified numerous P/S codes that are associated with operations that contributed liquid waste to the RLWTF from TA-55. Radiological properties and chemical constituents associated with process effluent from these P/S codes are summarized from source documents in Sections 5.4.2, 5.4.3, 6.4.2, and 6.4.3. The following processes and associated P/S codes provide examples of former and current operations contributing liquid waste to the RLWTF through the TA-55 acid and caustic aqueous waste lines.

Chloride Operations at TA-55

- Chloride Operations Pretreatment; P/S codes PB, PUB: Pretreatment includes primarily physical processes used to prepare scrap and residues for dissolution. Pretreatment may include sorting, crushing, and pulverizing. Liquid waste sent to the RLWTF included low pH solutions used to extract beryllium sources during the decladding of Pu-Be sources (References D007, D082, M069, M075, and M076).

- Hydroxide Precipitation; P/S codes CLS, CW, CX, CXL, PRR: Potassium, magnesium, or sodium hydroxide is added to solutions originating from Purification activities (i.e., solvent extraction, ion exchange, and oxalate precipitation) to precipitate Pu-rich hydroxide salts. The resulting enriched cakes go to nitrate operations for further processing. Caustic liquid wastes are disposed through the caustic waste line to the RLWTF (References D007 D082, M068, and M073).

Metal Operation Processes at TA-55

- Advanced Recovery and Integrated Extraction System (ARIES); P/S code ARI: The ARIES Electrolytic Can Decontamination System decontaminates the external surfaces of canned plutonium using an electrolytic decontamination system. An electrolyte (sodium sulfate) and water are used in the system in a recycle mode. Sodium hydroxide is used for pH control. Wastes include electrolyte and water solutions contaminated with plutonium. This liquid waste is sent either to cement fixation or to the RLWTF (References D077 and D100).

- Burst Testing; P/S code BT: Hemi-shells are placed on a test stand and a buffered test solution is pumped into the shell and pressurized until it bursts. Strain gauges monitor the deformation of the shell. The test solution is sodium tetraborate and sodium hydroxide and is filtered and reused. The solution is eventually discarded in the caustic waste line to the RLWTF (References C035, D077, and D082).

Miscellaneous Operations at TA-55

- Analytical Chemistry Laboratory; P/S code ACL: Includes all analytical techniques performed in Room 124 of the TA-55. Operations involve the analysis of plutonium and americium, RCRA metals, and trace metals. Unused liquid samples are returned to the originator, sent to radiochemistry for counting, sent to aqueous recovery operations, or sent to the RLWTF (References D003 and D101).

- Actinide Processing Demonstration; P/S code APD: A hydrothermal processing technique that involves the reaction of aqueous/organic mixtures, pure organic liquids, solvents, explosives, salts, sludges or contaminated combustible solids (e.g., ion exchange resins, plastic filters, and cellulose rags) with water under supercritical or near-supercritical (elevated temperature and/or pressure) conditions. Acidic and caustic effluents generated during this process are sent to the RLWTF (References 12 and D003).

- Electrochemistry; P/S code ECHM: This operation examines the electrochemical behavior of actinide or actinide contaminated metal samples and compounds in aqueous and non-aqueous solutions. Once the examination process is complete, the residual solution is made more basic to precipitate the actinide. After settling, the liquid is decanted and the precipitate is filtered and dried. The filtrate is sent to TA-55 aqueous recovery or to the RLWTF (Reference 12).

- Metallography Operations; P/S code ME: This operation characterizes the microstructure of metallic or ceramic pieces and establishes the quality and effectiveness of welds. Materials examined consist of plutonium and uranium carbides, nitrides, and oxides, as well as zirconium and tantalum alloys, and stainless steel. The materials are cleaned, polished, and etched with several different chemical compounds. The spent acids and bases are sent to aqueous recovery or to the RLWTF (References D003 and D101).

- Electrolytic Decontamination; P/S code EDC: Electrochemistry methodologies are designed to decontaminate items, replace operations that produce large amounts of waste, or enhance chemical reactions. The process involves uranium decontamination of disassembled weapon components from various sites with various levels of surface contamination with plutonium. Rinse water generated during this process is discarded to the RLWTF (References D003 and D101).

Nitrate Operations at TA-55

- Nitrate Operations Pretreatment; P/S codes BL, BM, BU, CR, DP, ETD, GMS, HGMS, IS, MAG, MAS, MF, OH, OY, PA, PAF, PTS, RC, RO, TDC, TSC, VP2, VUL: Pretreatment primarily includes physical processes used to prepare scrap and residues for the dissolution, and may include any or all of the following process: calcinations, caustic leaching, chemical separation (hydroxide or oxalate precipitation), crushing and pulverizing, distillation, filtering of liquids or oils, incineration, magnetic separation, passivation, scraping, and sorting. As materials are received from various operations within TA-55, they are sorted and sent to pretreatment processes or directly to dissolution depending on the physical nature of the scrap. Caustic solutions from the caustic scrubber and from the leach process, along with other aqueous liquid wastes from pretreatment operations were sent to the RLWTF (References D046, D082, M046, M193, M201, and M204).

- Dissolution; P/S codes AL, AS, AT, ATL, BAC, CD, COD, COL, CPOD, ED, HCD, HD, LC, LG1, LG2, MB, MELL, ML, MPD, NC, NL, NR, OD, PS, PT, SC, SP, SSD, UPS, US, US2, VC, VP1, ZD: Dissolution is comprised of numerous processes that generate a plutonium-nitrate solution for feed to a purification process. Solutions from a silica-removal process using a hydrofluorinator with potassium hydroxide scrubber were sent to the RLWTF. Solutions from a caustic leach process used to pretreat electrorefining furnace scrapings from the Rocky Flats Plant and other residues high in chlorides were also sent to the RLWTF (References D046, D082, M043, and M201).

- Purification and Oxide Conversion; P/S codes AO, AP, CC, CH, DF, DS, FA, FC, HC, LR, OH, OY, PR, RB, RBJ, RCM, RFX, RR, SX, VP3: Purification consists of both ion exchange and precipitation process. Intermediate solutions used to condition the ion exchange feed, such as caustic solutions to “kill” the peroxide, are filtered and then sent to the RLWTF. Additionally, distillates from the evaporator are also sent the RLWTF (References D046, D082, and M216).

- Evaporator; P/S code EV: Plutonium-poor ion exchange effluents and oxalate precipitation filtrates are sent to the evaporator to re-concentrate plutonium, if possible, and reduce the volume of disposed wastes. The resulting distillate is sent the RLWTF (References C064, D046, D082, M111, M112, and M198).

Pyrochemical Processes at TA-55

- Direct Oxide Reduction; P/S codes OR, MCDOR, SCB: Prior to the multiple-cycle DOR process, a single pass DOR process was used for plutonium oxide. Plutonium oxide and calcium metal are reacted in molten calcium chloride (or a mixture of calcium chloride and calcium fluoride) to produce plutonium metal. The chloride off-gas is passed through a caustic scrubber, with the caustic solution going to the RLWTF (References D002, D082, and M165).

- Metal Purification Operations; P/S codes ER, MSE: Purification operations are used to separate americium and the more reactive elements such as rare earth elements, alkali metals, and alkaline earth metals from plutonium metal. In addition, these operations take impure metal and produce high purity plutonium metal. Caustic solution from the chlorine off-gas scrubbers used in these operations is sent to chloride operation or the RLWTF (References D002 and D100).

- Plutonium Trichloride Preparation; P/S code PTP): Plutonium Trichloride Preparations was an intermediate process used in Pu metal production. Carbon Tetrachloride was used to prepare plutonium trichloride by bubbling a carrier gas through plutonium oxide. The scrubber solution went in the caustic waste line to the RLWTF (References D002, D082, and M114).

Special Processing at TA-55

- Nitrate Anion Exchange; P/S codes IX and NP: Nitrate anion exchange is the primary method used at LANL fort the aqueous concentration of plutonium. Effluents from nitrate ion exchange, when discardable, are sent to the evaporator, where they are reduced in volume by evaporation. Similar to ion exchange processes in nitrate operation, distillate is sent to the RLWTF (References 12, D001, D082, M035, and M036).

- Separation and Purification by Precipitation; P/S codes CP, DO, POSM, PPD: The separation of plutonium from aqueous solutions or dissolution of plutonium contaminated materials make use of many different precipitation reactions, the most common are reactions involving oxalate, peroxide, hydroxide, and fluoride anions. Precipitation of plutonium and americium hydroxides from waste solutions such as oxalate or peroxide filtrates produced alkaline filtrate discarded to the caustic waste line for treatment at the RLWTF (References 12, D001, D082, M038, M153, M154, M155, M156, M158, and M164).

- Metal Purification and Recovery Operations; P/S codes PX, RM, SBB: The purification and recovery processes generate pure plutonium metal from molten salt, impure metals, and plutonium scrap. The molten material is regenerated by sparging the calcium chloride – calcium oxide mixture with chlorine gas between plutonium metal production runs. The chlorine off-gas is passed through a caustic scrubber, with the caustic solution going to the RLWTF (References C040, D001, D082, and M166).

Pu-238 Operations

- Heat Source Fabrication; P/S codes GPHS and P1: Pu-238 heat sources that are routinely fabricated at TA-55 include the General Purpose Heat Source, Lightweight Radioisotope Heater Unit, and Milliwatt Generator Program. Radioactive liquids sent the RLWTF include waste water from cleaning and acid solutions used for decontamination (References C020 and D076).

- Routine Pu-238 Waste Solidification; P/S code R8: The process of solidifying Pu-238 solutions has been conducted since 1978. Solutions are treated with sodium hydroxide, ferric nitrate, and phenolphthalein in ethanol to precipitate Pu-238. Caustic filtrate is discarded into the caustic drain for treatment at the RLWTF (References D076 and P010).

- Aqueous Scrap Processing; P/S code ASP: This process involves the purification of Pu-238 oxide in a nitric acid stream, similar to the recovery activities already established for Pu-239 as part of TA-55 nitrate operations. During the process soluble Pu-238 is recovered with ferric nitrate and sodium hydroxide, and the filtrate resulting from the solidification process is discarded into the caustic waste line to the RLWTF (References 12 and D076).

- Welding and Decontamination; P/S code WD: Heat source capsules were welded and a solution of nitric and hydrofluoric acid was used for decontaminating the fuel clads. The TRU acid solutions generated by the decontamination steps were neutralized to precipitate plutonium, and the filtrate was discarded into the caustic waste line to the RLWTF (References 12 and D076).

In addition to the aqueous liquid waste sent to the TA-50 RLWTF through the acid and caustic waste lines, industrial waste water utilized in laboratory sinks, decontamination showers, and janitor sinks was discharged to the TA-50 RLWTF through the TA-55 industrial waste line.

The remaining identified facilities that contributed radioactive liquid to the RLWTF main treatment operation are identified below. Radiological and chemical properties associated with process effluent from these facilities are summarized from source documents in Sections 5.4.2 and 5.4.3, respectively.

TA-2, Omega Site

Primary facilities located at the Omega Site were the Omega West Reactor (OWR) and an equipment building. The OWR was a water-cooled uranium-fueled reactor facility used for research and irradiation studies. The equipment building housed the ion-exchange columns used for cleanup of primary circulating cooling water and makeup water. Liquid wastes were collected in tanks and later transported by vehicle to the RLWTF for final treatment (Reference D018). At some point prior to 1992, a pipeline from TA-2 was connected to deliver effluent discharge from TA-2 to the TA-50 RLWTF for treatment (References D005, D025, D027, and D040).

TA-3-16, Van de Graff Facility

Building TA-3-16 had one radioactive liquid waste pipeline connection to the RLWTF. Small amounts of tritium, I-125 and S-35 were discharged. Rooms discharging include labs, mechanical rooms, a dark room, target preparation areas, workrooms, and assembly areas. Specific sources of discharge originated from film developer rinse water, a condensed water drain, radioactive pipe strainer discharge, emergency showers, floor washings, and hand washing (Reference D041).

TA-3-29, Chemistry and Metallurgy Research (CMR) Building

The CMR Building, located in TA-3, was an R&D facility composed of six interconnected, but different experimental areas. Wing 9 housed an irradiated-fuel examination facility. Five other wings (Wings 2, 3, 4, 5, and 7) housed numerous and varied R&D and analytical chemistry operations. Liquid wastes were discharged to holding tanks that drained to an underground pipeline system terminating at the RLWTF (References D018, D033, and D035).

TA-3-34, Cryogenics “B”

Building TA-3-34 had one drainage source to the radioactive liquid waste system that flowed into the RLWTF from sinks in laboratories and shops that may have been radioactively contaminated (Reference D043).

TA-3-35 (Press Building), TA-3-66 (Sigma Building), and TA-3-141 (Rolling Mill Building), Sigma Complex

The function of the Sigma Complex was to develop and fabricate materials for LANL programs. The Sigma Building housed seven specific sections where development work on both radioactive and non-radioactive materials was performed. The Press Building housed a portion of the Nuclear Fuels Section and was the facility where all enriched uranium-loaded graphite or carbide fuel elements were manufactured. The Rolling Mill Building housed parts of the Nuclear Fuels Section, Coatings Section, and Metal Processing Section (Reference D018).

The Electrochemistry Section performed electropolishing and acid etching. U-238 and thorium (Th)-232 were processed in the standard cleaning and plating tanks in the Electrochemistry Section. Spent concentrated plating solutions were transferred to 55-gallon drums, which were trucked to TA-50 for treatment in the Batch Treatment process. Resulting liquids from the cyanide destruction process were discharged to the treatment tanks at TA-54, Area L, were allowed to evaporate, and were subsequently managed in a different waste stream (References D005 and D068).

Although concentrated cyanide plating bath solutions were treated separately, several other liquid wastes from the plating operations were sent to the main treatment operations of the TA-50 RLWTF, including liquids from the hot water rinse; lead rinse tank; gold rinse tank; copper rinse tank; nickel rinse tank; electropolishing rinse tank; anodizing line (15% sulfuric acid); cleaning line (NaOH); copper strike and nitric acid pickling baths, and from steam condensate (References D034 and M010). Additionally, facility personal confirmed minor spills of concentrated cyanide plating bath were collected in the facility sump and pumped to the TA-50 RLWTF. Major spills (i.e., greater that 200 milliliters) were contained in the facility sump and removed for separate cyanide treatment (Reference C078).

A sink and drain connection to the industrial waste sewer system was provided for disposal of radioactive and/or chemical waste at the Press Building (Reference D018).

TA-3-39 and TA-3-102, Tech Shops

Building TA-3-39 had two drainage sources to the site radioactive liquid waste treatment system. Sources include floor drains, equipment drain, floor sinks, condensate from a small calibration lab test furnace, a trench drain, and oil interceptor. Rooms involved are storage areas, machine shops, battery charging room, and a steam cleaning room. Drains from a steam cleaning area went to Building TA-3-102, as verified by dye tests (Reference D044).

TA-3-65, Source Storage

Building TA-3-65 discharged radioactive liquid waste to the RLWTF. At the time of the referenced report (1992), the building was not occupied. Rooms connected to the discharge included a source storage vault, work rooms, a utility room, leak test room, cart storage room, change rooms, storage rooms, and restrooms. Specific discharge locations include floor drains (although some were plugged at the time of the referenced report), water heater drain, floor washings, hand washing, a lavatory, and sinks (Reference D041).

TA-3-154

Building TA-3-154 had one discharge from liquid waste storage tanks to the RLWTF. This drainage source drained liquid waste from underground storage tanks outside of the CMR Building TA-3-29. The liquid waste in the storage tanks is from the CMR building, and it is pumped out "periodically" (Reference D035).

TA-3-216, Weapons Test Support

Building TA-3-216 has one drainage source to the RLWTF consisting of discharges from sink and floor drains, although the referenced source document dated 1992 states that "industrial waste is no longer generated in this building." Five sink drains located in non-lab areas were recommended to be re-routed to the sanitary sewer, but six were expected to continue to be connected to the radioactive liquid waste system. Liquid waste was identified from equipment rooms, a conference room, lounges, offices, labs, and restrooms. Identified sources were floor washings, steam traps, hand washing (most common), Heliarc system cooling water, a hood cup and lab sinks in an equipment room, water chiller drains, condensed water, steam trap drains, vacuum pump drains, and floor washings in the restroom (Reference D038).

TA-3-1264

Building TA-3-1264 had three drainage sources to the RLWTF. The building was a storage/ maintenance building with an exterior underground radioactive liquid waste holding tank. One drainage source was a trench drain in the truck bay of the building designed to catch any spills that might occur during radioactive liquid waste transfers to transport trucks. The second drainage source is a connection to a standpipe for pumping out the underground holding tank. The third is the discharge from the site radioactive liquid waste system to the discharge point of the holding tank (Reference D045).

TA-3-2009

Building TA-3-2009 had one radioactive liquid waste connection, a fume hood cup drain that discharges daily to the RLWTF from a work room (Reference D041).

TA-16-205, S Site

Building TA-16-205 had one drain to a waste holding tank that is ultimately disposed at the RLWTF. The drainage source waste tank in question "receives flow from the drains in the tritium processing area" that was later trucked to the RLWTF for treatment. The liquid waste originated from recovery and process rooms, with the bulk of the flow from a sink in a process room. The remaining identified liquids were from floor washing (References D037 and D048).

TA-21, DP-West and DP-East

TA-21 was known as DP Site and is on DP Mesa immediately southeast of the Los Alamos town site. DP-West began operations in 1945 to produce metal and alloys of Pu from nitrate feedstock from other production facilities using several acid dissolution and chemical precipitation steps. A major research objective at DP-West was to develop new purification techniques for Pu and reprocess waste to enhance recovery. The DP-West included the site's main Pu facility until the Pu work was transferred to TA-55 in June 1978. DP-West conducted nondestructive examinations involving uranium and mixed oxide irradiated

reactor-fuel elements, and also housed uranium recovery operations. DP-East performed R&D work on tritiated compounds from early 1975 and generated only small quantities of waste. Note: At both DP West and TA-55, U-235/Pu-239 carbide fuel was prepared. In material types (MTs) 51 and 52, i.e. > 93.78 weight % Pu-239, there was an upper limit ratio of 0.001 U-235. That is, the ratio of the mass of U-235 to the total plutonium mass was small. In MT 12, (i.e. U-238 as the primary isotope), the amount of U-235 was depleted to a range of 0.21% to 0.24 % (References D018 and D050).

Liquid waste from the DP-West and DP-East facilities was treated in TA-21-257. TA-21 waste was not processed at TA-50-1 until 1984, when it began to be pumped there by a cross-country sewer line. Since the treated liquid from TA-21 required no additional treatment (other than occasional pH adjustment), the TA-21 effluent could have been piped directly to the TA-50 effluent tanks prior to discharge from the NPDES-permitted drainage sources to Mortandad Canyon. This option was never used, and all of the liquid waste received from TA-21 was processed through the main treatment operations of the TA-50 RLWTF (References C017, D005, and D018).

TA-35, Ten Site

TA-35 Ten Site housed research operations including a hot cell for preparing La-140 in kilo Ci sources for plutonium research, as well as a facility for handling lithium tritide components. TA-35 also was home to the Target Fabrication Facility used for processing deuterium and tritium microsphere targets for laser operations and for processing beryllium. TA-35 had a wastewater treatment facility that operated until 1963. Later, radioactive liquid waste was sent to the RLWTF (Reference D019).

TA-43, HRL1, Health Research

Building TA 43-1 was the Health Research Laboratory. Radiological studies produced liquid waste that was containerized and transported to the RLWTF. Roughly 40 percent of the facility conducted radiological work in "controlled" areas. The building housed animal research programs (Reference D036).

TA-48-1, Radiochemistry

Building RC-1 at TA-48 housed nuclear and radiochemistry operations. This work was concerned with the application of radioactivity measurements to laboratory programs and with the study of nuclear reactions and structure. The facility's primary function was to obtain information on the yield and other performance parameters of nuclear test devices by the analysis of debris samples collected after underground testing at the Nevada Test Site. Some radiochemical preparations, such as the production of a variety of purified radioisotopes for medical applications, were also conducted. Liquid waste was collected, neutralized if necessary, and pumped to the TA-50-01 pipeline. Small volumes of gamma-active liquid waste (from 5-50 R/hr on contact) were transported in shielded containers for decay and subsequent fixation in cement (References D018, D049, and D051).

TA-50-37 (Controlled Air Incinerator)

LANL began a study of TRU waste treatment in 1973, selecting a controlled air incinerator (CAI) that was tested with TRU and low-level waste beginning in 1980. The primary objective of incineration was to reduce the volume of TRU wastes, followed by chemical stabilization of waste and destruction of hydrogen gas. A high-energy aqueous scrubber was selected to provide off-gas cleanup. Construction began in 1976 and the first radioactive test was conducted in 1979 using solid TRU waste from the TA-55 Plutonium facility. Other waste processed had an average 20 nCi/g Pu-239 and Am-241. Resin combustion studies were to be completed in 1982, as were tracer-level studies to track cesium (Cs), iodine, iron, and cobalt (Co) isotopes (References D013, D015, D022, and D074).

Scrub solution acidity was controlled by adding caustic solution at the process sump tank. Scrub solution specific gravity and volume was also controlled at the process sump tank. As the specific gravity increase or the tank volume exceeds set limits, the rate of flow to the RLWTF increased (Reference D022).

RLWTF operations personnel do not believe that liquid wastes from the CAI were ever treated at the RLWTF since the CAI never went into full production (Reference C017). However, it is assumed that some quantities of chemical contaminants in incinerator feed material were contained in the scrub solution that may have been discharged to the RLWTF.

TA-50-69, Size Reduction Facility

The Size Reduction Facility reduced bulky metallic waste to meet WIPP criteria. It was used to develop volume reduction and repackaging techniques for TRU-contaminated metallic waste items. Waste equipment was brought into an enclosure, positioned, cut by a plasma-arc cutting tool, and bagged out in pieces. Contaminated enclosure wash down water was collected in 55-gallon drums and transferred to a holding tank, which was moved to the RLWTF for treatment when full (References D074 and D056).

TA-53, Meson Physics Facility

The Clinton P. Anderson Meson Physics Facility was used to conduct experiments in medium-energy physics and nuclear chemistry for the production of radioisotopes for nuclear medicine, and for clinical experiments in the treatment of certain types of cancer with negative pi mesons. Radioactive liquids from these activities consisted of activated water in cooling systems, which was purified in ion-exchange columns and not sent to the RLWTF for treatment. The facility also contains a separate laboratory and several sample-handling facilities where a broad range of experiments are performed. Liquid wastes are fed to the basement storage tanks for pump transfer to a tank truck for delivery to TA-50-01 (Reference D018).

TA-59, Occupational Health Center

Building TA-59-1 had one liquid stream that was transferred to the RLWTF. Building TA-59-19 also had a single discharge to the system. The drainage source from Building TA-59-1 received flow from labs in the basement and first floor of the building, with sources including 91 lab sinks, 9 floor drains, an ice machine drain, and 7 dishwashers. More specifically, contributors included janitor's closets, an electron microscopy lab, and floor washings from laboratories. The drainage source for Building TA-59-19 discharged water from two lab sinks in a portable lab trailer (Reference D039).

4.5 Waste Identification and Categorization

A Radioactive Solid Waste Disposal (RSWD) record form was completed for each waste package associated with these waste steams (Reference P001). Among other data, the RSWD form documented the date of generation, generator group and location, waste code, packaging, and radionuclide content information. The RSWD forms associated with the drums comprising waste streams LA-MIN03-NC.001 and LA-CIN02.001 have been retrieved as part of the AK record (References C083, M026, and M218).

In 1984, the TRU Waste Certification Plan was adopted for newly generated TRU waste (Reference D073). Waste Content Codes were assigned by the LANL Waste Management Group, Health, Safety and Environment Division (HSE-7 at that time). These codes were later known as the Item Description Codes (IDC), and categorized the waste into one of nine categories (Reference D073). The code associated with individual containers in waste stream LA-MIN03-NC.001 is the RSWD waste code A-75 (References D078 and M026). The codes associated with waste stream LA-CIN02.001 are IDC 002 (Cemented sludges – caustic sludge stabilized with Portland cement); RSWD waste codes A-25, A-26, and A-76; and TRUCON codes LA111 and LA114 (References C083, M218, M219, and M220).

Each TRU waste package has affixed to it a unique retrievable serial number which can be utilized to relate the RSWD form and stored electronic data record to the package (References C083, D074, M026, and M218).

4.6 Waste Certification Procedures

TRU mixed waste in waste streams LA-MIN03-NC.001 and LA-CIN02.001, generated from the treatment operations of the TA-50 RLWTF, will be certified in accordance with CCP-PO-001 (Reference 7).

5.0 REQUIRED WASTE STREAM INFORMATION: LA-MIN03-NC.001

This section presents the mandatory waste stream AK required by Section B4 of the WIPP WAP (Reference 1). Attachment 1 of procedure CCP-TP-005 (Reference 8) provides a list of the TRU waste stream information required to be developed as part of the AK record.

5.1 Area and Building of Generation

All of the waste containers included in waste stream LA-MIN03-NC.001 were generated by the main treatment operations of the RLWTF. RSWD records and database information were reviewed for each container to verify that each container originated from the RLWTF.

5.2 Waste Stream Volume and Period of Generation

Waste Stream LA-MIN03-NC.001 (Table 1) consists of approximately 3,858 55-gallon drums (802 cubic meters), and 1,427 85-gallon drums (458 cubic meters), totaling 1,260 cubic meters (Reference M026). The projection is no additional containers of this waste stream will be generated in the future (Reference 6). The list of containers included in this stream is included in the current Waste Containers list.

Table 1. LA-MIN03-NC.001 Waste Stream Volume and Generation Dates

Waste Stream	Containers (Volume)	Package Dates
LA-MIN03-NC.001	3,858 55-gal. drums (802 m^3) 1,427 85-gal. drums (458 m^3)	Nov. 1979 – Feb. 2000

According to generator reported radionuclide quantities on a drum basis, a portion of the hazardous waste from TA-50 main treatment operations may contain less than 100 nCi/g TRU alpha contamination but is managed by the site as TRU mixed waste. The percentage of the waste stream that is above 100 nCi/g is approximately 96 percent, and the percentage of the waste stream that is below 100 nCi/g is approximately 4 percent based on reported radionuclide quantities and drum net weights (References C017, C080, C086, DR007, and M026).

Each payload container shipped to WIPP will be certified in accordance with CCP-PO-002, *CCP Transuranic Waste Certification Plan* (Reference 10) as containing more than 100 nCi/g of alpha emitting isotopes with half-lives greater than 20 years.

5.3 Waste Generating Activities

As described in Section 4.4, effluent aqueous liquid waste was piped or trucked to TA-50-01 from various LANL site locations (see Section 4.4.2 for descriptions of contributing facilities). The liquid was pH-adjusted with sodium hydroxide, and clarified by the addition of calcium hydroxide and ferric sulfate flocculant-forming chemicals. Trisodium phosphate was used during the 1980s and a non-hazardous polymer, Betz Polymer 1110

was also used as needed. The flocculation process removed particulate radioactivity and heavy metals as a sludge that settled out of the clariflocculation tanks. This sludge was further treated by rotary drum vacuum filtration in a filter precoated with perlite or diatomaceous earth, which dewaters it (References C014, D005, D018, and D025).

5.4 Type of Wastes Generated

This section describes the process inputs, Waste Matrix Code assignment, waste material parameters, radionuclide contaminants, and RCRA hazardous waste determinations for waste stream LA-MIN03-NC.001. The waste stream is characterized based on knowledge of the materials, knowledge of the processes generating the waste, and physical descriptions of the waste.

5.4.1 Material Input Related to Physical Form

This waste stream consists of homogeneous dewatered sludge. The sludge contains approximately 25-40% inorganic solids with a “wet clay” consistency. The flocculent forming chemicals added to the liquid waste produced precipitate that is chiefly calcium carbonate and ferric hydroxide. Perlite or diatomaceous earths, used in the vacuum filtration step, are silicate materials. Portland cement, added to the bottom and top of the sludge during packaging, also contains silicate minerals (References D005, D018, and D025).

In addition to sludge, CCP RTR characterization activities have identified drums in this waste stream with small amounts of metal, plastic, personnel protective equipment, and other miscellaneous debris, and waste containers that are greater than 50% debris, and drums with residual liquids below the surface (i.e., layered residual liquids) and internal containers of liquids (References C017, DR004, and DR005).

5.4.1.1 Waste Matrix Code

The waste matrix code was assigned to this waste stream based on the evaluation of AK information relating to the physical form of the waste, such as packaging procedures, waste generating activities, and the RSWD forms completed by the waste generator for each container (Reference D074).

The waste stream is comprised nearly completely of vacuum filter sludge and Portland cement, and no other materials greater than trace quantities are expected on a waste stream basis; therefore, waste matrix code S3120, inorganic sludge, is assigned to this waste stream.

5.4.1.2 Waste Material Parameters

To estimate the waste material parameters (WMP) for waste stream LA-MIN03-NC.001, WMP data were obtained from the WIPP Waste Information System (WWIS) database as of October 3, 2006. The WMP data were derived from real-time radiography (RTR) and

visual examination (VE) of this waste stream by the Central Characterization Project (CCP) TRU Waste Certification Program (TWCP) at the Los Alamos National Laboratory (LANL) for this waste stream. In cases where WWIS data included both RTR and VE data for the same container, only the VE data was included in this assessment.

The WMPs for waste stream LA-MIN03-NC.001 were estimated by reviewing WWIS WMP data for 1,135 drums packaged from November 1979 to June 1990. The 1,135 containers included in this assessment represent over 23% of the current waste stream. The closure dates for the containers in CCP waste stream LA-MIN03-NC.001 range from November 1979 to February 2000. Therefore, it is assumed that the WMP data for 1,135 containers are representative of CCP waste stream LA-MIN03-NC.001 as a whole. Average, minimum, and maximum WMP weight percentages were calculated using the WWIS data. The results of this analysis are presented in Table 2, Waste Material Parameters Estimates for LA-MIN03-NC.001 (References C086 and DR007).

The statistical analysis of the data is documented in a memorandum (included with Attachment 6) as required by CCP-TP-005 (Reference 8).

Table 2. Waste Material Parameter Estimates for LA-MIN03-NC.001

WMP Description	Average Weight Percent	Weight Percent Range
IRON BASE METAL/ALLOYS	0.01%	0 - 3.01%
OTHER INORGANIC MATERIALS	<0.01%	0 - 0.75%
PLASTICS	0.53%	0 - 9.17%
INORGANIC MATRIX	99.46%	90.83% - 100.00%
TOTAL INORGANIC	**99.5%**	
TOTAL ORGANIC	**0.5%**	

5.4.2 Radiological Characterization

As described in Section 5.2, Waste Stream LA-MIN03-NC.001 (Table 1) consists of approximately 3,858 55-gallon drums (802 cubic meters), and 1,427 85-gallon drums (458 cubic meters), totaling 1,260 cubic meters (Reference M026). This information can be further subdivided on an annual basis, which is summarized in Table 3 (References C086, DR007, and M026).

Table 3. LA-MIN03-NC.001 Waste Stream Volume Estimate on an Annual Basis

Year Packaged	No. of Containers *
1979	91
1980	715
1981	1327
1982	920
1983	812
1984	391
1985	584
1986	103
1987	19
1988	138
1989	73
1990	30
1997	5
1999	26
2000	51

* Containers are both 85-gallon and 55-gallon size (Based on information from RSWDs)

A wide variety of different radionuclides contaminate the LA-MIN03-NC.001 waste stream due to the more than 20 different facilities discharging or shipping waste to the TA-50 RLWTF. Although predominant radionuclides appear to be U-235, U-238, and Pu-239, many other radionuclides are expected to be present in the waste stream.

5.4.2.1 Sludge Data

Total curies of Am-241, Pu-238, and Pu-239 in vacuum filter sludge were tracked by the RLWTF for the years 1982* - 1990, as well as U-235 starting in 1985, although in most cases it is unclear how many of the drums generated were TRU and how many were low-level (Reference M007). Numbers for these isotopes were reported on facility documentation such as annual reports from this time period. The TRU radionuclides were reported quantitatively in sludge drums on the Radioactive Solid Waste Disposal Record (RSWD) Forms (References D074 and M026) required for each TRU waste drum or in TA-50 facility reports (Reference M117) or site databases, but only for Am-241, Pu-238, and Pu-239 in most cases. U-235 only began to be reported in 1985 on facility documentation because that is when the RLWTF began to treat TA-21 wastewater, which had U-235 contamination (Reference C017). The available data were compiled based on sampling and gamma spectroscopy of sludge; they are summarized in Table 4. It should be noted that when U-235 began to be reported, it was by far the prevalent radionuclide by

mass, neglecting the effect of any unreported radionuclides (Reference D005). Other minor radionuclides reported in the sludge were strontium (Sr)-90, Sr-89, and Cs-137, which may have come from cutting of reactor fuel elements at CMR (References D004 and M117). U-234 and tritium were also known to be present (Reference M117).

*Note – Sludge data was also available for drums generated in the period 1979 - 1982, but was not summarized on an annual basis and therefore not included in the following table.

Table 4. Available Radiological Data for Waste Stream LA-MIN03-NC.001[2]

Year	Am-241		Pu-239		Pu-238		U-235	
	Ci	Wt%[1]	Ci	Wt%[1]	Ci	Wt%[1]	Ci	Wt%[1]
1982	132.7	1.15	206.4	98.8	44.0	0.08	NR	NA
1983	68.535	2.87	41.975	97.1	5.1987	0.04	NR	NA
1984	4.35	2.69	2.84	97.1	1.96	0.24	NR	NA
1985	7.457	0.10	5.72	4.06	2.98	0.01	0.0047	95.8
1986	2.355	0.05	3.686	3.90	1.169	0.00	3.16e-3	96.0
1987	1.06	0.02	2.48	2.45	0.909	0.00	3.44e-3	97.5
1988	1.72	0.05	5.96	10.4	0.834	0.01	1.78e-3	89.5
1989	2.50	0.38	1.42	12.0	0.49	0.02	3.6e-4	87.6
1990	1.07	0.20	1.61	16.6	0.79	0.03	2.8e-4	83.1
Totals	221.7		272.1		58.3		0.014	

[1] Mass calculated assuming negligible contributions from other radionuclides.
[2] Not all of this activity was in TRU drums – some was in LLW containers.
NR = Not reported, NA = Not applicable
Source: D004, M007

Totaled across all reported years (and assuming no U-235 in sludge prior to 1985), the above data translate to 58.8 wt% U-235, 40.6 % Pu-239, 0.60% Am-241, and 0.03% Pu-238. Influent data on U-234 indicates that U-235 was present prior to 1985 (References D004, D075, and M007). In both 1982 and 1991 influent data, the mass (converted from reported activity) of U-234 is greater than Pu-238 (References D004, D005, and D006). Because, after 20 years, about 0.14 wt% U-234 is produced by decay of Pu-238, the U-234 in the influent must include sources other than decay product. Because U-238 was not reported, although it is expected to be present where U-235 is present based on descriptions of waste generating activities and material types, its effect on these calculations cannot be determined (Reference C019).

The RSWD Forms on which generators were required to document the radionuclide content of each container (References D074 and M026) show that, in practice, the facility only reported as primary radionuclides (by activity) for this waste stream Pu-238, Pu-239, and Am-241. The facility recognized these three radionuclides as the most important contributors to total TRU activity (Reference C017). U-235 was also reported on RSWD Forms, but not until 1990 (Reference M018). The values reported on RSWDs for each

container were based on process knowledge of liquids being sent for treatment and analytical data for the sludge (Reference C017). In order to quantify the radionuclide content of each batch, the facility tracked sludge transfers from the clarifier into its sludge tank, recorded the date of the transfer, and periodically dewatered the sludge into a batch of drums. One drum from each batch was sampled to confirm the radionuclide content determined based on the sludge tank content (Reference C017). In 1986, Pu-239 replaced Am-241 as the predominant isotope reported by activity. For the waste stream as a whole, the following radionuclide composition based on container-specific data was reported in wt% (ranges are on a container basis) on RSWD forms (Reference M018):

- Pu-239: Average 94.9%, Range 0 – 99.97%
- Am-241: Average 4.5%, Range 0 – 100%
- U-235: Average 0.38%, Range 0 – 69.9%
- Pu-238: Average 0.13%, Range 0 – 100%

Note that U-235 appears to be a very minor contaminant, because no U-235 was reported on RSWDs until 1990. Data obtained from the TA-54 personnel and database (Reference M015) are reasonably consistent with the above information. This data is believed to be directly from the RSWD forms completed by generators. This data set shows the following isotopic distribution for the stream, as well as the range of wt% for each isotope that were calculated on a container basis:

- Pu-239: 98.3 wt%, Range 0 – 100%
- Am-241: 1.6 wt%, Range 0 – 100%
- Pu-238: 0.05 wt%, Range 0 – 100%
- U-235: 0.04 wt%, Range 0 – 67%
- Pu-241: < 0.01 wt%

In this data set, the Pu-239 contribution is slightly relatively higher with respect to all other isotopes.

For both container-specific data sets, U-235 was reported for only a few individual containers (a total of 30 out of 5,480 containers). Where present, U-235 wt% in these data sets ranged from 66.9 percent - 69.9 percent (References M015 and M018). This data for U-235 conflicts somewhat with data available for the sludge on an annual basis, as shown in Table 4. U-235 values in Ci may not have been reported for individual containers because U is not a TRU isotope and because the activity values, as for the sludge data (References D004 and M007), would have been very low relative to other isotopes (Reference C017), on the order of magnitude of 10^{-5}. Because these values were unlikely to be reported for individual containers due to their relatively low magnitude in comparison with other isotopes, except in a few cases, it is not surprising not to see U-235 values listed on RSWDs. Also, facility personnel believe that in those few cases, additional U material may have been placed in the containers (Reference C017). Therefore, the sludge data described previously is most reliable for determining whether U-235 was a prevalent radionuclide for this waste stream.

5.4.2.2 Sources of Various Radionuclides

Principle nuclear materials used in the TA-55 facility are Pu-238, Pu-239, and U-235, although a variety of other isotopes are also used or processed (References C019 and D082). Almost all liquid waste is contaminated with various Pu isotopes and their daughters (Reference C016), primarily Pu-239. In addition to Pu contaminants, liquid waste from TA-55 operations is expected to contain the following radionuclides: Am (including Am-241 and Am-243), cerium (Ce)-144, curium (Cm)-244, Cs-137, neptunium (Np)-237, protactinium (Pa)-231, Th-232, U-233, U-234, U-235, U-236, U-238, Pu-236, and Pu-244 (Reference C019). Trace contaminants in the Pu materials processed and thus in waste generated are expected to include the following (Reference C028):

- Am-241 ingrowing at about 50 parts per million (ppm)/yr
- Np-237 from decay of Am-241, possibly up to 100 ppm
- U-237 at a few ppm from alpha decay of Pu-241
- Am-243 at a few ppm as a contaminant in purified Pu
- Am-242m at ppb levels or lower, along with lesser quantities of its daughters Am-242, Cm-242, and Np-237, which quickly decay to Pu-238
- U-234, U-235, and U-238 from decay of Pu alpha-emitting isotopes, at less than 10-20 ppm

From other contributing facilities, Table 5 identifies possible radiological contaminants and the facilities from which they may have come from (Reference C019). Some additional isotopes are possible. For example, at CMR, neutron-activated samples, actinides, lanthanides, and other TRU isotopes were used (Reference D033). In Building RC-1 at TA-48, prevalent radionuclides in the dissolver area that would have generated liquid waste treated at the RLWTF included transplutonium actinides, and the lanthanide lutetium (Reference D051). At TA-53, by 1995, the majority of waste was contaminated by activation and spallation products, including various hafnium, lutetium, and europium isotopes (Reference D031). All of these could be present in sludge waste in minor quantities. However, most of the isotopes expected based on information regarding influent flows have short half lives such that they are significantly decayed from their original concentrations, including some isotopes described as major contributors to total discharged activity, such as vanadium (V)-49, selenium (Se)-75, niobium (Nb)-95, sodium (Na)-24, nitrogen (N)-16, and manganese (Mn)-54 (Reference C019). Therefore, only the isotopes shown in Table 5 in addition to those in liquid waste from TA-55, are anticipated to still be present in potentially measurable concentrations in sludge waste generated before 1991 (Reference C019), along with any daughters of relatively short-lived isotopes (such as californium [Cf]-252) that do not themselves quickly decay.

Table 5. Possible Radiological Contaminants from Facilities Other Than TA-55

Radionuclide	Half Life	Source Facility	Document Source
Am-241	430 y	CMR, TA-21, TA-48, TA-50-69	D031, D033, D047, D051, D056
Am-243	7.4×10^3 y	CMR, TA-48	D033, D051
C-14	5,715 y	CMR, TA-21	M002, D047
Cf-249	351.0 y	TA-48	D049, D051
Cf-252	2.6 y	TA-48	D051
Cm-244	18.1 y	TA-48	D049. D051
Cs-137	30.3 y	TA-2, CMR, TA-35, TA-48	C014, D009, D026, D031, D049, D051, D054
Co-60	5.3 y	TA-2, TA-35, TA-48	D009, D023, D026 D049, D051
Eu-152	13.5 y	TA-2, TA-35, TA-48	D009, D023, D051
Fe-55	2.7 y	TA-53	D031
Gd-148	75.0 y	TA-48	D051
H-3	12.3 y	TA-2, TA-3-16, Sigma, CMR, TA-16-205, TA-21, TA-35, TA-48, TA-53, TA-59-1	D009, D018, D026, D031, D033, D047, D048, D049, D051, D071, M002
Na-22	2.6 y	TA-48, TA-53	D031, D049, D051
Np-237	2.1×10^6 y	CMR, TA-48	D031, D033, D049, D051
Pm-145	17.7 y	TA-48	D049, D051
Pu-238	87.7 y	CMR, TA-21, TA-48, TA-50-69	D031, D033, D047, D054, D056
Pu-239	2.4×10^4 y	CMR, TA-21, TA-48, TA-50-69	D031, D033, D047, D051, D054, D056
Pu-240	6500 y	CMR, TA-48, TA-50-69	D031, D051, D056
Pu-241	14.4 y	CMR, TA-50-69	D031, D056
Pu-242	3.8×10^5 y	TA-48, TA-50-69	D051, D056
Sb-125	2.8 y	CMR, TA-48	D031, D049, D051
Si-32	160 y	TA-48	D051
Sr-90	29.1 y	TA-2, CMR, TA-35, TA-48	C014, D009, D023, D049, D051, D054
Tc-97	2.6×10^6 y	TA-48	D049, D051
Tc-98	4.2×10^6 y	TA-48	D049, D051
Tc-99	2.1×10^5 y	TA-2, CMR, TA-21, TA-48	D026, D047, D049, D051, M002
Th-232	1.4×10^{10} y	Sigma, CMR, TA-21	D018, D033, D047
Tl-204	3.8 y	TA-48	D049, D051
U-232	68.9 y	TA-48	D051
U-235	7.0×10^8 y	Sigma, CMR, TA-21, TA-35, TA-48	D009, D018, D033, D047, D051
U-238	4.5×10^9 y	Sigma, CMR, TA-21, TA-48	D018, D033, D047, D051

5.4.2.3 Prevalent Radionuclides

Prevalent radionuclides have been determined for this waste stream based on available quantitative data and a few key assumptions described herein.

Uranium

Several uranium material types could be present in the sludge. The following are three examples of uranium material types (Reference M025):

Isotope	Material Type U10	Material Type U36	Material Type U38
U-234	0.006 wt%	0.740 wt%	1.100 wt%
U-235	0.720 wt%	62.500 wt%	93.300 wt%
U-236	0.000 wt%	0.150 wt%	0.200 wt%
U-238	99.274 wt%	36.610 wt%	5.400 wt%

U material types listed for TA-55 debris containers included those listed above, as well as the following: MT 12, with 99.8 wt% U-238 and 0.23 wt% U-235; MT 35, with 61.9 wt% U-238 and 37.6 wt% U-235; and MT 39, with 97.5 wt% U-235 and 1.32 wt% U-234 (Reference C021). Another U MT, MT 72, was listed for some containers in site documentation (Reference M014); this MT had primarily U-233, with some U-232.

As discussed previously, based on available sludge data for the years 1982-1990, U-235 is the prevalent radionuclide at 58.8 wt% U-235 (References C019 and M007). However, since data were not provided for U-238, its influence on this distribution cannot be quantified. While some source documents suggest prevalence of U-235 and associated material types (References C017, D001, D009, D082, M007, M015, and M018), others suggest that U-238 is also important (References D003, D047, and D082). The source of the U in many cases is fuel fabrication or reactor operations (References C017, D018, and D051), some with highly enriched U and others with depleted U or U-238-dominated compositions. For purposes of calculating prevalent radionuclides on a mass basis, the mass of U-238 in the sludge waste was assumed to be the same as that of U-235. This is based on the known presence of both and the range of reported material types for both sludge and solid waste containers. Revisiting the sludge data in Table 4, and adding a mass of U-238 equivalent to that of U-235, the following isotopic composition for the waste stream as a whole results: U-235 – 37 wt%; U-238 – 37 wt%; Pu-239 – 25.6 wt%; Am-241 – 0.38 wt%; and Pu-238 – 0.02 wt% (Reference C019). The presence of tritium and other Pu isotopes such as Pu-240 would tend to decrease all of these values by a small amount.

Plutonium

Pu MTs listed for sludge containers and TA-55 debris waste included MT 42 (predominantly Pu-242), MTs 51-57 (75-96% Pu-239), and MT 83, with 83.9-89.3 wt% Pu-238 and 10.1-13.8 wt% Pu-239 (References C021, M014, and M025). Pu-239 is clearly prevalent by mass over other Pu isotopes based solely on sludge data (References C019 and M007), although the presence of U isotopes is indicated by reported U-234, as described previously.

Tritium

In the late 1970s, managers believed that releases of tritium oxide were inadvertent, infrequent, and so minor as to not be worth controlling in the TA-50-1 process (Reference C007). However, tritium was definitely present in RLWTF discharges, with a maximum of 100 curies per year (Ci/yr) discharged in 1987 (Reference D054). By 1995, eight different facilities were identified as discharging tritium liquid wastes to the RLWTF (Reference C019). Based on 1993 data, 120 millicuries per year (mCi/yr) tritium was also discharged from the CMR facility (TA-3-29) (Reference D033). Other tritium-contaminated liquid waste generators going back to the late 1970s are shown in Table 5. The treatment facility effluent shows Pu-239 and hydrogen (H)-3 as predominant radionuclides by mass, with Pu-239/240 – 96.4 wt% (all assumed to be Pu-239) and H-3 at 1.75% (Reference D054). Many of the radionuclides, particularly Pu and Am isotopes, are present in the liquid waste as particulate and thus substantially removed in the flocculation treatment, unlike tritium, which is a dissolved specie that passes through the treatment process with the bulk of the water (Reference C017). Therefore, the concentration of tritium in the treated sludge is assumed to be lower than that of the RLWTF effluent, or lower than 1.75 wt% (Reference C019).

5.4.2.4 Summary

Considering all of the above data, the prevalent radionuclides for the waste stream are shown in Table 6. U-235 and U-238 are the two prevalent radionuclides by mass, followed by Pu-239. This conclusion is based on generator-supplied data, material type prevalence, and contributions from both TA-55 and other generators, as well as the assumption that U-238 is present in the waste stream at roughly the same mass as U-235 (Reference C019). Am-241 is assumed to be the next most prevalent nuclide. Although tritium is expected to be present in the waste, its relative closeness by weight to Am-241 quantities in effluent samples suggests that Am-241 is more prevalent in sludges because it is removed from the wastewater by flocculation much more efficiently than tritium. As reported on RSWDs (Reference M026), U-235 may be present in quantities up to 94 wt% in a small percentage of individual waste containers. It should be noted that significant variability is possible on a container basis, depending on whether projects such as Special Processing at TA-55-4 made large discharges that comprised a significant portion of the volume of a treated batch of wastewater. This variability is shown in the “Range of Wt%” column in Table 6.

Table 6. Radionuclides Potentially Present in LA-MIN03-NC.001

Radionuclide	Average Wt%	Range of Wt%
Required Radionuclides		
Pu-238	0.02	0 – 100%
Pu-239	25.6	0 – 100%
Am-241	0.38	0 – 100%
Pu-240	Trace	0 – 16%
Pu-242	Trace	0 – 96%
U-233	Trace	NA
U-234	Trace	0 – 1.4%
U-238	37.0	0 – 99.8%
Sr-90	Trace	NA
Cs-137	Trace	0 – 0.34%
Other Potential Radionuclides		
U-235	37.0	0 – 94%
H-3	< 1.75%	0 – 1.75%
Am-242	Trace	NA
Am-243	Trace	NA
C-14	Trace	NA
Cf-249	Trace	NA
Cf-252	Trace	NA
Cm-244	Trace	NA
Co-60	Trace	NA
Cs-134	Trace	NA
Eu-152	Trace	NA
Fe-55	Trace	NA
Gd-148	Trace	NA
Na-22	Trace	NA
Np-237	Trace	NA
Pa-231	Trace	NA
Pm-145	Trace	NA
Pu-236	Trace	NA
Pu-241	Trace	NA
Pu-244	Trace	NA
Sb-125	Trace	NA
Si-32	Trace	NA
Tc-97	Trace	NA
Tc-98	Trace	NA
Tc-99	Trace	NA
Th-228	Trace	NA
Th-230	Trace	NA
Th-232	Trace	NA
Tl-204	Trace	NA
U-232	Trace	NA
U-236	Trace	NA

Trace = < 1 wt%
The following radionuclides are not anticipated due to very short half-lives: Sr-89, Ce-144, U-237, Cm-242, and Am-242m.

5.4.2.5 Determination of 95% of the Radiological Hazard

The radioisotopes that contribute 95 percent of the activity in the waste stream may vary depending on when the sludge was generated. There are two sources of information regarding sludge waste activity (References M007 and M117). In one data set previously summarized in Table 4, only Am-241, Pu-238, and Pu-239 data were available (as well as U-235 data after 1984) (Reference M007). In the second data set, influent and effluent data were available for Sr-89 and –90, Cs-137, U-234, Am-241, and Pu-238 and Pu-239, allowing the residual activity in the sludge waste to be calculated (Reference M117). Based on the 1982 influent data, Am-241 will be the prevalent isotope in the sludge because it was generated before the pre-treatment of TA-55 waste began (Reference M007). The more detailed calculated sludge data confirm that Am-241 was prevalent by activity for the years 1982-1984 (Reference M117). Pu-239 and Pu-241 are the other isotopes that contribute significant activity to the sludge from this time period (Reference M007). This is consistent with the prevalence of Pu MTs listed in site documentation, which show 53.5-94% Pu-241 by activity except for MT 83, which had 98.7 activity % Pu-238 (References C021, M014, and M025). An evaluation of the 1991 influent data also indicates that Pu-241 (although not an alpha emitting TRU isotope) will be the prevalent isotope in the sludge. Pu-238, Pu-239, and Am-241 will also contribute to 95 percent of the activity and account for most of the TRU alpha activity (Reference D005). For the waste stream as a whole, the calculated sludge activities show about 53 activity percent Pu-239, 39.5 percent Am-241, 6.3% Pu-238, 1.0 percent U-234, and smaller quantities of the fission products Cs and Sr (Reference M117). Accounting for the predominance of Pu-241 relative to Pu-239 and the fact that it is not reported in this data set, only Pu-241, Pu-239, Am-241, and Pu-238 are expected to contribute significantly to the radiological hazard of the waste stream.

Assuming a U composition consistent with the U MT 36, given the 50/50 relative mass assumed for U-235 and U-238 isotopes (about 0.7 wt% but 95.9 activity % U-234) (Reference M025), U-235 and U-238 combined are not expected to exceed 5 activity percent of the total U present. Because the calculated activity percent of U-234 in the sludge is 1 percent, U-235 and U-238 are not expected to represent 95 percent of the radiological hazard.

Tritium is not expected to be a significant contaminant by activity because facility personnel assume that tritium is essentially not removed from the influent wastewater by the flocculation process (Reference C017). The maximum tritium wastewater concentration was approximately 0.004 millicuries per liter (mCi/l) in 1987; conservatively assuming that 75 percent of the weight of a sludge drum was water and an average sludge drum weight of 461 pounds (Reference M015), 346 pounds of water would be about 157 liters of water, resulting in about 0.63 mCi per drum of tritium (Reference M117). Over the approximately 5000 containers in this waste stream, this would amount to about 3,140 total mCi of tritium, or 3.1 Ci, clearly far less than 5 percent of the total activity in the waste stream, given that the activity of Pu-239 alone was approximately 300 Ci (References M007 and M117).

To investigate this question on a container basis, then, a very conservative estimate for the per drum tritium content in this waste stream is 0.63 mCi x 10^6 nCi/mCi=6.3 x 10^5 nCi per drum. Based on LANL database information, the average weight of a drum in this waste stream is 461 pounds (Reference M015), or 2.1 x 10^5 grams. The most conservative weight for calculation purposes is 300 pounds, or 1.36 x 10^5 g. Based on these estimates, the highest tritium activity per drum would be about 4.6 nCi/g. If the waste is TRU waste, it must have at least 100 nCi/g of TRU alpha activity; again conservatively assuming no activity contributed by any other non-TRU isotopes, the maximum possible contribution of tritium on a drum basis would be 4.4 percent of 104.6 nCi/g. In reality, because at least some of the water in a sludge drum is tritium-free makeup water added during the vacuum filtration process, rather than original feed water, this number should be much lower. References used in Section 5.4.2 and/or are part of C019 include: C004, C005, C007, C014, C016, C017, C021, C022, C023, C024, C025, C026, C027, C028, C029, C030, C031, C032, D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D017, D018, D019, D023, D026, D027, D028, D030, D031, D033, D037, D046, D047, D048, D049, D050, D051, D054, D056, D058, D059, D060, D064, D067, D071, D074, D075, D076, D077, D080, D081, D082, D083, M002, M004, M007, M014, M015, M018, M025, M026, M029, M030, M031, M032, M033, M034, M035, M036, M037, M038, M039, M040, M041, M042, M043, M044, M045, M046, M047, M048, M049, M050, M051, M052, M053, M054, M055, M056, M057, M058, M059, M060, M061, M062, M063, P011, P012, and DR002.

5.4.3 Chemical Content Identification – Hazardous Constituents

The TA-50 RLWTF is a wastewater treatment facility subject to regulation under the Clean Water Act (CWA); therefore, the effluent discharge is not subject to regulation as a solid waste. However, the exclusion from being a solid waste under 40 CFR 261.4(a)(2) applies only to the actual point source discharge, and it does not exclude industrial waste waters while they are being collected, stored or treated before discharge, nor does it exclude sludge generated by industrial wastewater treatment. Therefore, this waste stream is a solid waste.

The following sections describe the characterization rationale for the assignment of EPA HWNs to waste stream LA-MIN03-NC.001. Table 7 summarizes the waste codes assigned to this waste stream.

Table 7. Waste Stream LA-MIN03-NC.001 Hazardous Waste Characterization Summary

Waste Stream	EPA HWNs
LA-MIN03-NC.001	F001, F002, F004, F005, F006, F007, F009, D004, D005, D006, D007, D008, D009, D010, D011, D022, D028, and D037

To assign EPA HWNs, the available AK documentation was reviewed to identify chemical usage in the buildings contributing to the RLWTF influent and potentially hazardous materials (including commercially available products) that may have been introduced into

the waste stream. In addition, MSDSs were obtained for the commercial products to determine the presence of potentially regulated compounds. As described below in Table 8, several of the HWNs were conservatively assigned due to lack of evidence that these constituents would have not exceeded the regulatory thresholds (References C013, C018, C089, D001, D002, D003, D004, D007, D029, D046, D076, D077, D083, D100, D101, DR001, and DR006).

Table 8. Chemical Identification and Use Summary

Chemical	Use	Building	Document Source	EPA HWNs
1,1,1-Trichloroethane	Automated chemical analysis process in CMR Building. Detected in samples of influent and effluent liquids associated with RLWTF. Detected in 1986 sludge samples, but estimated value reported since less than detection limit. Filtering oils in pretreatment operations in the Plutonium facility.	TA-3-29 TA-50-1	D029 D033 M011 M047 M196	F001, F002
1,1,2-Trichloroethane	Detected in samples collected from influents to RLWTF.	TA-50-1	C013 D029	F002
1,1,2-Trichloro-1,2,2-trifluoroethane/1,1,2-trichlorotrifluoroethane (Freon)	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building. Detected in samples of influent to RLWTF. Identified for the DOR and MCDOR, and separation and purification by precipitation operations in the Plutonium Facility.	TA-3-29 TA-50-1 TA-55	C037 D029 D033 M145 M154	F001, F002
1,2-Dichlorobenzene	Detected in samples of influent to RLWTF.	TA-50-1	D029	F002
1,2-Dichloroethane	Detected in very low concentrations in wastewater samples collected from influents to RLWTF.	TA-50-1	C013	D028
2-Butoxyethanol	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building.	TA-3-29	D033	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Acetic acid	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building. Identified in the Sigma Building.	TA-3-29 TA-3-66	D028 D033	NA[1,2]
Acetone	Various analysis processes in CMR Building. Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility. Reported in sampling data for the influent to the RLWTF and sludge. Detected in 1986 sludge samples, but estimated value reported since less than detection limit.	TA-3-29 TA-55 TA-50-1	C008 C012 C013 C032 C061 C063 D007 D033 D046 M011	NA[1]
Alconox	Detergent used in several facilities. Heat source fabrication in the Plutonium Facility.	TA-3-16 TA-3-34 TA-48-1 TA-48-45 TA-55 TA-59-1	D028 D076 M178 M214	NA
Aluminum nitrate	Sample preparation. Pretreatment, dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion processes in the Plutonium Facility.	TA-48-1 TA-55	D001, D046 D051, D076 D089, M036 M042, M044 M059, M063 M086, M088 M089, M091 M092, M094 M095, M097 M098, M099 M100, M101 M103, M172 M198, M199 P012	NA[1]
Ammonium chloride	Separation and purification by precipitation operations in the Plutonium Facility.	TA-55	M038	NA
Ammonium bifluoride	Uranium conversion and dissolution chemistry in CMR Building.	TA-3-29	D033	NA[2]

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Ammonium hydroxide	Potential pollutant identified. Actinide research and development and uranium conversion and dissolution chemistry processes in CMR Building.	TA-48-45 TA-3-29	D033 D049	NA[2]
Arsenic	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, as well as RLWTF filter cake and 1986 sludge samples. Contaminant in feed material to the pretreatment, evaporator, DOR and MCDOR, heat source fabrication, and routine Pu-238 waste solidification operations in the Plutonium Facility and as part of the influent design basis for the RLWTF. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Potential pollutant.	TA-50-1 TA-55 TA-48-1	C009, C013 C020, C032 C057, D004 D005, D046 D049, D051 D067, M007 M011, M211	D004
Ascorbic acid	Plutonium assay process in CMR Building. Dissolution and separation and purification by precipitation operations in the Plutonium Facility.	TA-3-29 TA-55	D033, D046 M158, M198	NA[2]
Barium	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, as well as RLWTF filter cake and 1986 sludge samples. Contaminant in feed material to the pretreatment, dissolution, evaporator, heat source fabrication, routine Pu-238 waste solidification, hydroxide precipitation, pyrochemical matrix studies, DOR or MCDOR operations in the Plutonium Facility and as part of the influent design basis for the RLWTF. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Component of superconductor samples prepared in the metallography section of the Sigma Building. Potential pollutant.	TA-50-1 TA-55 TA-3-66 TA-48-1	C009 C013 C020 C032 C041 C057 D001 D003 D004 D005 D034 D046 D049 D067 D085 M007 M011 M211	D005

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Barium oxide	Thallium superconductor research sample preparation and processing in CMR Building.	TA-3-29	D033	D005
Benzene	Detected in samples of influent and effluent liquids associated with RLWTF. TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Actinide research and development process in CMR Building.	TA-50-1 TA-3-29	C013 D004 D029 D033 M007	F005
Beryllium	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building. Component of samples prepared in the metallography section of the Sigma Building. Potential pollutant. Contaminant identified as part of the influent design basis for, and detected in effluent from, RLWTF. Used in decladding of plutonium/beryllium sources in pretreatment process in the Plutonium Facility.	TA-3-29 TA-3-66 TA-48-1 TA-50-1 TA-55	D007 D033 D034 D049 D051 D060 D067	NA
Betz Polymer 1110	Coagulation agent in RLWTF.	TA-50-1	C014, D004 D005, M214	NA
Bis(2-ethylhexyl) Phosphate (HDEHP)	Separation of lanthanides.	TA-48-1	D051	NA
Bis(2-ethylhexyl) Phthalate	Detected in 1986 sludge samples.	TA-50-1	M011	NA
Boric acid	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA[2]
Bromine	Hazardous chemical inventory.	TA-48-1	D051	NA
Bromocresol	Separation and purification by precipitation operations in the Plutonium Facility.	TA-55	M038	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Cadmium	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, effluent samples, as well as RLWTF filter cake and 1986 sludge samples. Contaminant in feed material to the pretreatment, dissolution, DOR and MCDOR, evaporator, heat source fabrication, routine Pu-238 waste solidification, pyrochemical matrix studies, or purification and oxide conversion operations in the Plutonium Facility, and as part of the influent design basis for the RLWTF. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Potential pollutant. Upgrade to batch waste treatment system to treat this waste type.	TA-50-1 TA-55 TA-48-1	C009, C013 C020, C032 C040, C041 C057, C066 C068, D001 D003, D004 D005, D007 D046, D049 D060, D067 D068, D072 D075, D082 D085, M007 M081, M101 M107, M211	D006
Cadmium oxide	Hazardous materials inventory. Plutonium oxidation agent.	TA-48-1	D051, D089	D006
Calcium	DOR and MCDOR processes in the Plutonium Facility.	TA-55	C040, D002 D082, M115 M116, M121 M122, M145 M166, M173	NA[3]
Calcium carbonate	Flocculation, clarification of liquid wastes in RLWTF. Separation and purification by precipitation operations in the Plutonium Facility.	TA-50-1 TA-55	D025, D030 M038, M148 M158, M169	NA
Calcium chloride	DOR and MCDOR processes in the Plutonium Facility.	TA-55	C040, D001 D002, M006 M115, M116 M121, M145 M166, M173	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Calcium fluoride	Dissolution, nitrate anion exchange, DOR and MCDOR, separation and purification by precipitation operations in the Plutonium Facility.	TA-55	C032, C066 D002, D046 D089, M043 M059, M063 M087, M088 M089, M090 M091, M094 M095, M116 M148, M149 M153, M166 M172, M198 M199	NA
Calcium hydroxide	Precipitation, flocculation, clarification agent used in RLWTF.	TA-50-1	D005, D020 D059	NA[2]
Calcium nitrate	Identified as reagent in Nitrate Operations in the Plutonium Facility.	TA-55	D046	NA[1]
Calcium oxide (Lime)	Precipitation/flocculation/clarification in RLWTF. Thallium superconductor research sample preparation and processing in CMR Building. MCDOR process in the Plutonium Facility.	TA-50-1 TA-3-29 TA-55	C013, C014 C040, D001 D004, D006 D010, D018 D020, D021 D028, D030 D033, M006 M116, P004	NA
Carbon disulfide	Detected in samples of influent and effluent liquids associated with RLWTF.	TA-50-1	D029	F005
Carbon tetrachloride	Plasma spectroscopy process in CMR Building. Detected in samples of influent and effluent liquids associated with RLWTF. TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations, and reagent in MCDOR and plutonium trichloride preparation operations and plutonium trichloride preparation in the Plutonium Facility.	TA-3-29 TA-50-1 TA-55	C032 C061 C063 D002 D004 D007 D033 D029 D046 M007 M114 M165	F001
Cellulose tetranitrate	Hazardous materials inventory.	TA-48-1	D051	NA[1]
Ceric sulfate	Plutonium assay process in CMR Building.	TA-3-29	D033	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Cerium nitrate	Dissolution operations in the Plutonium Facility.	TA-55	D046 M093	NA
Chlorobenzene	Detected in samples of influent to RLWTF. TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-50-1 TA-55	C032, C061 C063, D004 D007, D029 D046, M007	F002
Chloroform	EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility. Hazardous materials inventory. Extraction.	TA-50-1 TA-55 TA-48-1 TA-48-45	C032, C061 C063, D004 D007, D046 D049, D051 M007, M011	D022
Chromic acid	Potential pollutant.	TA-48-1	D049	D007[2]
Chromium	Chromate plating from TA-3-66 solutions treated in RLWTF. Potential pollutant. Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, effluent samples, as well as RLWTF filter cake and 1986 sludge samples. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, purification and oxide conversion, hydroxide precipitation, heat source fabrication, routine Pu-238 waste solidification, or pyrochemical matrix studies operations in the Plutonium Facility, and as part of the influent design basis for the RLWTF.	TA-3-66 TA-48-1 TA-50-1 TA-55	C009, C013 C014, C017 C020, C032 C033, C036 C040, C041 C057, C063 C066, C068 D001, D003 D004, D005 D007, D046 D049, D060 D063, D067 D068, D072 D076, D077 D082, D085 D091, M007 M011, M060 M081, M104 M208, M211	D007

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Chromium trioxide	Reagent in sample preparation process in CMR Building. Acid polishing, plating, anodizing and conversion solutions used in the electroplating section of the Sigma Building.	TA-3-29 TA-3-66	D033 D034	D007
Citofix	Epoxy used in the heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020	NA
Cobalt nitrate	Dissolution operations in the Plutonium Facility.	TA-55	D046 M093	NA[1]
Copper cyanide	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034 M214	NA[3]
Copper oxide	Thallium superconductor research sample preparation and processing in CMR Building.	TA-3-29	D033	NA
Copper sulfate	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Cyanides	Organic and actinide separations research and inorganic compound synthesis and characterization. Contaminant identified as part of the influent design basis for the RLWTF. Waste cyanide plating solutions from TA-3-66 treated in RLWTF. Upgrade to batch waste treatment system to treat this waste type. Identified contaminant in industrial waste.	TA-3-29 TA-50-1 TA-3-66 TA-50-1	D024 D033 D067 D068 D072 D075 M010	F007, F009
Diatomaceous earth	Added to RLWTF sludges to absorb liquids that might dewater from the sludge. Pretreatment operations in the Plutonium Facility.	TA-50-1 TA-55	C014 C017 M047	NA
Diethylenetriamine	Heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020	NA
Diethyl oxalate	Identified as reagent in dissolution operations in the Plutonium Facility.	TA-55	D046 M198	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Diethyl phthalate	Detected in 1986 sludge samples, but estimated value reported since less than detection limit.	TA-50-1	M011	NA
Dioxane	Organic and actinide separations research and inorganic compound synthesis and characterization.	TA-3-29	D033	NA[1]
DUCO cement	Heat source fabrication operations in the Plutonium Facility.	TA-55	M178 M214	NA[1]
Durofix	Epoxy used in the heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020	NA
Epon Resin 8132	Epoxy resin used in heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020 M214	NA
Ethyl alcohol	Used in various processes in the CMR Building. Contaminant in feed material to the heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility. Hazardous materials inventory.	TA-3-29 TA-55 TA-48-1	C054, C056 D033, D046 D049, D051 D076, M100 M177, P010	NA[1]
Ethyl benzene	Detected in 1986 sludge samples, but estimated value reported since less than detection limit.	TA-50-1	M011	NA[1]
Ethyl ether	Super acid R&D, extraction, separation, and characterization studies solvent in the Plutonium Facility.	TA-55	D003, D078, D079	NA[1]
Ethylene glycol	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building. Heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-3-29 TA-55	C020 C056 D033 D076 M178	NA
Ethylenediaminetetra-acetic acid (EDTA)	Reagent.	TA-3-16	D028	NA
Extran 1000	Detergent in RLWTF. Detergent in Laboratory and Office Building.	TA-50-1 TA-55-2	D028 M214	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
F001 Solvents	Degreasers generated from Main Shops Department. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS based on 1988 influent sampling data. Acceptable in wastes treated in Controlled Air Incinerator (CAI).	TA-3-39 TA-50-1 TA-50-37	D004 D068 M006	F001
F002 Solvents	Solvents generated from Main Shops Department. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS based on 1988 influent sampling data. Acceptable in wastes treated in CAI.	TA-3-39 TA-50-1 TA-50-37	D004 D068 M006	F002
F003 Solvents	Nonhalogenated solvents generated from Main Shops Department. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS based on 1988 influent sampling data. Acceptable in wastes treated in CAI.	TA-3-39 TA-50-1 TA-50-37	D004 D068 M006	NA[1]
F005 Solvents	EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS based on 1988 influent sampling data. Acceptable in wastes treated in CAI.	TA-50-1 TA-50-37	D004 M006	F005
Fantastik	Heat source fabrication in the Plutonium Facility. Detergent in Weapons Engineering Tritium Facility. Detergent in Radiochemistry Laboratory.	TA-55 TA-16-205 TA-48-1	D028 D076 M178 M214	NA
Ferric ammonium sulfate	Dissolution and purification and oxide conversion operations in the Plutonium Facility.	TA-55	D046 M044	NA
Ferric nitrate	Identified as reagent in pretreatment, dissolution, routine Pu-238 waste solidification, nitrate anion exchange, purification and separation by precipitation, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	D046, D076 M036, M044 M062, M157 P010	NA[1]
Ferric sulfate	Precipitation/flocculation/clarification agent.	TA-50-1	D004, D005 D018, D020 D021, D030	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Ferric sulfate hexahydrate	Precipitation/flocculation/clarification agent.	TA-50-1	D010	NA
Ferrous ammonium sulfate	Dissolution and nitrate anion exchange operation in the Plutonium Facility.	TA-55	D001, D046 D089, M036 M087, M098 M100, M198	NA
Ferrous sulfamate	Ion exchange process in the Plutonium Facility.	TA-55	D046, M094 M098	NA
Fluoristan	Dissolution process in the Plutonium Facility	TA-55	M198	NA
Fluoroboric acid	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA[2]
Formamide	Identified as reagent in dissolution operations in the Plutonium Facility.	TA-55	D046 M198	NA
Formic acid	Dissolution and evaporator process in the Plutonium Facility.	TA-55	C064, D046 M198	NA[2]
Franklin 77	Detergent.	TA-3-16 TA-3-66 TA-3-141	D028 M214	NA
Heptane	Potential pollutant.	TA-48-1	D049	NA[1]
Hexane	Automated chemical analysis process in CMR Building.	TA-3-29	D033	NA[1]
Hydraulic fluid	Potentially disposed down drain.	TA-3-35	D028	NA
Hydrazine	Hazardous materials inventory.	TA-48-1	D051	NA[1]
Hydriodic acid	Mass spectroscopy process in CMR Building.	TA-3-29	D033	NA[2]
Hydrobromic acid	Mass spectroscopy process in CMR Building. Metallographic sample etching in TA-55.	TA-3-29 TA-55	D033 P009	NA[2]

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Hydrochloric acid	Numerous chemical analysis processes in CMR Building. Acid pickling, plating, solutions used in the electroplating and metallography sections of the Sigma Building. Used in treatment of waste solutions in RLWTF. Dissolution, hydroxide precipitation, separation and purification by precipitation, MCDOR, and evaporator operations in the Plutonium Facility. Sample dissolution. Metallographic sample etching in TA-55.	TA-3-29 TA-3-66 TA-50-1 TA-55 TA-48-1 TA-48-45	C016, C032 C066, D001 D028, D033 D034, D046 D049, D051 D071, D082 D089, M054 M060, M087 M148, M149 M153, M158 M164, M169 M171, M198 P009	NA[2]
Hydrofluoric acid	Numerous chemical analysis processes in CMR Building. Sample dissolution. Component of acid pickling and polishing solutions used in the electroplating and metallography sections of the Sigma Building. Pretreatment, nitrate anion exchange, separation and purification by precipitation, heat source fabrication, and dissolution processes in Plutonium Facility. Metallographic sample etching in TA-55.	TA-3-29 TA-48-1 TA-48-45 TA-3-66 TA-55	C032, D028 D033, D034 D046, D049 D051, D071 D076, D082 D089, M006 M042, M043 M054, M057 M059, M060 M061, M062 M085, M090 M091, M092 M095, M096 M097, M098 M099, M100 M196, M101 M105, M148 M149, M150 M153, M155 M157, M164 M172, M176 M198, M201 M203, M204 P009, P012	NA[2]
Hydrogen bromide	Hazardous materials inventory.	TA-48-1	D051	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Hydrogen peroxide	Uranium conversion and dissolution chemistry in CMR Building. Dissolution, pretreatment, nitrate ion exchange, separation and purification by precipitation, and purification and oxide conversion operations in the Plutonium Facility. Identified in the Sigma Building. COD reduction for RLWTF influent. Hazardous materials inventory. Potential pollutant.	TA-3-29 TA-55 TA-3-66 TA-50-1 TA-48-1 TA-48-45	D001, D028 D033, D046 D049, D051 D089, M038 M044, M097 M098, M099 M100, M101 M104, M155 M156, M198 M205, M208	NA[1]
Hydroquinone	Hazardous materials inventory.	TA-48-1	D051	NA
Hydroxylamine hydrochloride	Plutonium assay process in CMR Building. Nitrate anion exchange and separation and purification by precipitation operations in the Plutonium Facility.	TA-3-29 TA-55	D033, M034 M158, M169 M171	NA[2]
Hydroxylamine nitrate	Dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	D001, D046 D076, D089 M006, M034 M035, M038 M041, M044 M097, M098 M099, M100 M101, M102 M155, M198 P012	NA[1,2]
Iodine	Used with calcium to reduce plutonium fluoride	TA-55	M122	NA
Iron sulfate	Precipitation/flocculation/clarification of non TA-55 influents.	TA-50-1	C013, C014 D006, D059 M006	NA
Isopentyl acetate	Plutonium chemistry process in CMR Building.	TA-3-29	D033	NA
Isopropyl ether	Automated chemical analysis process in CMR Building.	TA-3-29	D033	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Kerosene	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building. Lubricant for sample grinding in the Sigma Building. Pretreatment process in the Plutonium Facility.	TA-3-29 TA-3-66 TA-55	D033 D034 M047	NA
Lactic acid	Identified in the Sigma Building.	TA-3-66	D028	NA
Lanthanum nitrate	Dissolution and Plutonium/thorium separation processes in the Plutonium Facility.	TA-55	D046 P012	NA[1]
Lead	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, effluent samples, as well as RLWTF filter cake and 1986 sludge samples. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, heat source fabrication, purification and oxide conversion, hydroxide precipitation, routine Pu-238 waste solidification, pyrochemical matrix studies, or burst testing operations in the Plutonium Facility and as part of the influent design basis for the RLWTF. Identified in numerous processes in CMR Building. Contaminants in decon rinsate from Waste Management Decon Trailer. Potential pollutant.	TA-50-1 TA-55 TA-3-29 TA-50-185 TA-48-1	C009, C013 C014, C020 C032, C040 C041, C057 C066, C068 D001, D003 D004, D005 D007, D028 D033, D046 D049, D051 D067, D075 D076, D082 D085, M007 M011, M081 M211	D008
Lead fluoborate	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	D008
Lithium	MCDOR operations in the Plutonium Facility.	TA-55	M166, M173	NA[3]
Liquinox	Detergent in Occupational Health Laboratory.	TA-59-1	D028	NA
Lithium chloride	MCDOR operations in the Plutonium Facility.	TA-55	M166, M173	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Lithium fluoride	Heat source fabrication in the Plutonium Facility.	TA-55	M176	NA
Lithium hydroxide	PH adjustment.	TA-48-1	D051	NA[2]
Magnesium chloride	Routine Pu-238 Waste Solidification operations in the Plutonium Facility.	TA-55	M185	
Magnesium hydroxide	Hydroxide precipitation and separation and purification by precipitation operations in the Plutonium Facility.	TA-55	D007, D091 M038	NA[2]
Magnesium oxide	Identified as reagent in pretreatment operations in the Plutonium Facility.	TA-55	D046, D089 M045, M062 M122, M190 M197	NA
Mercuric chloride	Hazardous materials inventory.	TA-48-1	D051	D009
Mercuric iodide	Analysis of trace elements.	TA-48-1	D051	D009
Mercuric nitrate	Dissolution processes in the Plutonium Facility.	TA-55	C032, D046 M054	D009[1]
Mercuric oxide	Hazardous materials inventory. Sample preparation in CMR Building.	TA-48-1 TA-3-29	D033 D051	D009
Mercuric thiosilene	Potential pollutant.	TA-48-45	D049	D009

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Mercury	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, effluent samples, as well as RLWTF filter cake and 1986 sludge samples. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, heat source fabrication, hydroxide precipitation, routine Pu-238 waste solidification, or purification and oxide conversion operations in the Plutonium Facility and as part of the influent design basis for the RLWTF. Interstitial analysis process in CMR Building. Acceptable in wastes treated in CAI. Potential pollutant.	TA-50-1 TA-55 TA-3-29 TA-50-37 TA-48-1	C009, C013 C020, C032 C057, C066 D001, D004 D005, D007 D033, D046 D049, D051 D060, D067 D076, D085 M006, M007 M011, M059 M060, M080 M211	D009
Methyl alcohol	Numerous processes in CMR Building. Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility. Detected in solid samples from randomly selected drums of RLWTF sludge.	TA-3-29 TA-55 TA-50-1	C032 C061 C063 D007 D008 D033 D046	NA[1]
Methyl ethyl ketone	Extraction. Detected in samples of influent and effluent liquids associated with RLWTF, and detected in 1986 sludge samples, but at less than detection limit and also detected in method blank. TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS.	TA-48-45 TA-50-1	D004 D029 D049 M007 M011	F005
Methyl isobutyl ketone	Plutonium chemistry process in CMR Building.	TA-3-29	D033	NA[1]

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Methylene chloride	Reported and detected in both the influent and effluent liquids from the RLWTF, and 1986 sludge samples, but also detected in method blank. Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-50-1 TA-55	C008, C013 C032, C061 C063, D007 D029, D046 M011	F001, F002
Microclean	Detergent in Occupational Health Laboratory.	TA-59-1	D028, M214	NA
Malonic acid	Uranium conversion and dissolution chemistry in CMR Building.	TA-3-29	D033	NA
MSA Cleaner/Sanitizer II	Detergent in Occupational Health Laboratory.	TA-59-1	D028	NA
n-Butyl alcohol	Plutonium transmission electron microscope (TEM) and sample preparation process in CMR Building. Contaminant in feed material to dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-3-29 TA-55	C032 C061 C063 D007 D033 D046	NA[1]
Nickel acetate	Component of anodizing and conversion solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Nickel chloride	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Nickel sulfamate	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Nickel sulfate	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Nitric acid	Numerous processes in CMR Building. Component of acid pickling and polishing solutions in electroplating and metallography sections of the Sigma Building. Dissolution, pretreatment, purification and oxide conversion, nitrate anion exchange, separation and purification by precipitation, evaporator, heat source fabrication, and routine Pu-238 waste solidification operations in the Plutonium Facility. Identified from the Roller Mill Building. Influent material to RLWTF. Sample dissolution.	TA-3-29 TA-3-66 TA-55 TA-3-141 TA-50-1 TA-48-1 TA-48-45	C016, C032 C066, D001 D028, D033 D034, D046 D049, D051 D068, D071 D076, D082 D089, M006 M034, M035 M036, M042 M043, M044 M048, M054 M057, M059 M060, M061 M062, M063 M086, M087 M088, M089 M090, M091 M092, M093 M094, M095 M096, M097 M098, M099 M100, M101 M102, M103 M104, M105 M110, M111 M112, M113 M148, M149 M150, M151 M153, M155 M156, M157 M172, M196 M198, M199 M201, M202 M203, M204 M205, M208 M210, M216 P010, P012	NA[2]
Nitrobenzene	Detected in concentrations below regulatory levels in wastewater samples collected from influents to RLWTF.	TA-50-1	C013	F004
Oil (engine)	Assumed to have been filtered in pretreatment operations in the Plutonium Facility.	TA-55	D046 M047	NA
Oil (light instrument)	Hazardous materials inventory.	TA-48-1	D051	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Oxalic acid	Plutonium metallography process in CMR Building. Utilized in the pretreatment, dissolution, hydroxide precipitation, nitrate anion exchange, separation and purification by precipitation, or purification and oxide conversion operations in the Plutonium Facility. Component of anodizing and conversion solutions used in the electroplating section of the Sigma Building. Potential pollutant.	TA-3-29 TA-55 TA-3-66 TA-48-45	C032, C063 D001, D007 D028, D033 D034, D046 D049, D076 D089, M006 M034, M035 M097, M098 M099, M101 M102, M103 M110, M155 M158, M171 M198, P012	NA[2]
Pentachlorophenol	Contaminant in wastes incinerated in Controlled Air Incinerator.	TA-50-37	D017	D037
Perchloric acid	Sample dissolution. Numerous processes in the CMR Building.	TA-48-1 TA-48-45 TA-3-29	D033, D049 D051	NA[1,2]
Perlite	Dewatering/filter agent in RLWTF sludge.	TA-50-1	C017, D005 D020, D059 P002	NA
Phenolphthalein	Dissolution, heat source, and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	D046, D076 M100, P010	NA
Phosphoric acid	Numerous processes in the CMR Building. Component of acid polishing solutions used in the electroplating section of the Sigma Building.	TA-3-29 TA-3-66	D028 D033 D034	NA[2]
Polyvinyl pyridine (resin)	Ion exchange resin in dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion processes in the Plutonium Facility.	TA-55	D001 M044 M198	NA
Portland cement	Added to RLWTF sludges to absorb liquids that might dewater from the sludge.	TA-50-1	C013, C014 D004, D074 M006, P002	NA[2]
Potassium chloride	MCDOR operations in the Plutonium Facility.	TA-55	M166, M173	NA
Potassium cyanide	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034 M214	NA[3]

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Potassium dichromate	Plutonium assay process in CMR Building. Pretreatment, dissolution, separation and purification by precipitation, and hydroxide precipitation operations in the Plutonium Facility.	TA-3-29 TA-55	C034, D007 D033, M169 P012	D007
Potassium fluoride	Dissolution operations in the Plutonium Facility.	TA-55	M059	NA
Potassium fluoride hydrate	Ion exchange process in the Plutonium Facility.	TA-55	D046	NA
Potassium gold cyanide	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034 M214	NA[3]
Potassium hydroxide	Uranium conversion and dissolution chemistry in CMR Building. Dissolution, pretreatment, evaporation, hydroxide precipitation, nitrate anion exchange, MCDOR, separation and purification by precipitation, plutonium trichloride preparation, or purification and oxide conversion operations in the Plutonium Facility.	TA-3-29 TA-55	C065, C066 D001, D007 D033, D046 D071, D082 D089, D091 M034, M038 M042, M043 M046, M062 M081, M088 M090, M114 M116, M158 M165, M166 M193, P012	NA[2]
Potassium pyrosulfate	Dissolution operations in the Plutonium Facility.	TA-55	M059 M094	NA
Potassium thiocyanate	Dissolution operations in the Plutonium Facility.	TA-55	D046 M087	NA
Pyridine	TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS.	TA-50-1	D004 M007	F005

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Scintillation cocktails	Contaminant in wastes incinerated in Controlled Air Incinerator. Identified for facility. Listed as contaminant from Radiochemistry Laboratory. Listed as contaminant in RLWTF. Listed as contaminant in Laboratory and Office Building. Listed as contaminant in Weapons Engineering Tritium Facility. Listed as contaminant in Occupational Health Laboratory.	TA-50-37 TA-3-16 TA-3-29 TA-48-1 TA-50-1 TA-55-2 TA-55-4 TA-16-205 TA-59-1	D017 D028 D071	NA
Selenious acid	Hazardous materials inventory.	TA-48-1	D051	D010
Selenium	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, as well as RLWTF filter cake and 1986 sludge samples. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant identified as part of the influent design basis for the RLWTF. Contaminant in feed material to the pretreatment, evaporator, DOR and MCDOR, heat source fabrication, and routine Pu-238 waste solidification operations in the Plutonium Facility. Potential pollutant.	TA-50-1 TA-55 TA-48-1	C009, C020 C032, C057 D004, D005 D028, D046 D049, D051 D063, D067 D082, M007 M011, M211	D010

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Silver	Detected in very low concentrations in wastewater samples collected from TA-50 receiving tank and 1991 liquid influent samples, as well as RLWTF filter cake and 1986 sludge samples. EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS. Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, heat source fabrication, routine Pu-238 waste solidification, or purification and oxide conversion operations in the Plutonium Facility and as part of the influent design basis for the RLWTF. Identified in numerous processes in the CMR Building. Component of superconductor samples prepared in the metallography section of the Sigma Building. Potential pollutant.	TA-50-1 TA-55 TA--3-29 TA-3-66 TA-48-1	C009, C033 C020, C032 C040, C041 C057, C063 D001, D003 D004, D005 D033, D034 D046, D049 D051, D067 D076, D082 D085, M007 M011, M211	D011
Silver chloride	Analytical reagent.	TA-48-1	D051	D011
Silver cyanide	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034 M214	D011[3]
Silver iodide	Analytical reagent.	TA-48-1	D051	D011
Silver nitrate	Electrochemical dissolution process in the Plutonium Facility. Pretreatment, dissolution, purification and oxide conversion, separation and purification by precipitation, hydroxide precipitation operations in the Plutonium Facility.	TA-55	C033, C034 D007, D046 M044, M078 M079, M087 M094, M169 M216	D011[3]
Sodium	MCDOR operations in the Plutonium Facility.	TA-55	M166, M173	NA[3]
Sodium arsenate	Hazardous materials inventory.	TA-48-1	D051	D004
Sodium arsenite	Hazardous materials inventory.	TA-48-1	D051	D004

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Sodium bicarbonate	Separation and purification by precipitation operations in the Plutonium Facility.	TA-55	M169	NA
Sodium chloride	Dissolution processes in the Plutonium Facility.	TA-55	D046, M087	NA
Sodium chromate	Dissolution and Plutonium/thorium separation processes in the Plutonium Facility.	TA-55	D046 P012	D007
Sodium cyanide	Component of plating solutions used in the electroplating section of the Sigma Building. Hazardous materials inventory.	TA-3-66 TA-48-1	D034, D049 D051	NA[3]
Sodium dithionite	Nitrate anion exchange and separation and purification by precipitation operations in the Plutonium Facility.	TA-55	M034 M158 M171	NA[3]
Sodium fluoride	Dissolution operations in the Plutonium Facility.	TA-55	M059, M094	NA
Sodium gold sulfite	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Sodium hydrosulfide	Used in treatment of chromate solutions in RLWTF.	TA-50-1	D068	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Sodium hydroxide	Actinide research and development process in CMR Building. Alkaline cleaning solutions and component of plating, anodizing and conversions solutions used in the electroplating section of the Sigma Building. Neutralization/pH adjustment/flocculation. Heat source operations, routine Pu-238 waste solidification, MCDOR, pretreatment, dissolution, nitrate anion exchange, separation and purification by precipitation, evaporation, purification and oxide conversion, hydroxide precipitation, and burst testing operations in the Plutonium Facility. Caustic scrubber for the Controlled Air Incinerator for volume reduction of Plutonium Facility waste. Potential pollutant.	TA-3-29 TA-3-66 TA-50-1 TA-55 TA-50-37 TA-48-1	C032, C035 C041, C065 C066, D001 D004, D005 D006, D007 D010, D013 D020, D028 D033, D034 D046, D049 D068, D071 D076, D077 D082, D089 D091, M042 M044, M046 M054, M058 M062, M081 M088, M100 M103, M104 M105, M114 M116, M153 M155, M156 M157, M164 M187, M198 M208, M216 P004, P010 P012	NA[2]
Sodium hypochlorite	Uranium conversion and dissolution chemistry in CMR Building. Used in treatment of cyanide solutions in RLWTF.	TA-3-29 TA-50-1	D033 D068	NA
Sodium hypophosphite	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Sodium metaphosphate	Heat source fabrication operations in the Plutonium Facility.	TA-55	C056	NA
Sodium nitrate	Pretreatment operations in the Plutonium Facility. Dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	D001, D046 D076, D077 D089, M036 M044, M094 M098, M103	NA[1]

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Sodium oxalate	Dissolution and purification and oxide conversion operations in the Plutonium Facility.	TA-55	C032 D001 D046	NA
Sodium perchlorate	Actinide research and development process in CMR Building.	TA-3-29	D033	NA
Sodium silicate	Sludge 'solidification'.	TA-50-1	M006	NA
Sodium sulfite	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA
Sodium tetraborate	Burst testing process in the Plutonium Facility.	TA-55	C035, D077	NA
Sulfuric acid	Numerous processes in the CMR Building. Component of acid polishing, plating, anodizing and conversion solutions used in the electroplating section of the Sigma Building. Influent contaminant and used in treatment of chromate solutions in RLWTF. Pretreatment, dissolution, separation and purification by precipitation, and purification and oxide conversion operations in the Plutonium Facility. Hazardous materials inventory. Potential pollutant.	TA-3-29 TA-3-66 TA-50-1 TA-55 TA-48-1 TA-48-45	D005, D028 D033, D034 D046, D049 D051, D068 D089, M104 M156, M198 M208	NA[2]
Tetrachloroethylene	Contaminant in feed material to the evaporator and hydroxide precipitation operations in the Plutonium Facility. Detected in samples of influent and effluent liquids associated with RLWTF. TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS.	TA-55 TA-50-1	C032, C061 C063, D004 D007, D029 D046, M007	F001, F002
Tetrahydrofuran	Organic and actinide separations research and inorganic compound synthesis and characterization.	TA-3-29	D033	NA[1]
Thallium oxide	Sample preparation and processing in the CMR Building.	TA-3-29	D033	NA

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Tintaous chloride	Plutonium assay process in CMR Building.	TA-3-29	D033	NA
Toluene	Detected in samples of RLWTF influent and effluent liquids, and detected in 1986 sludge samples, but detected in method blank, and estimated value reported since less than detection limit. Organic and actinide separations research and inorganic compound synthesis and characterization.	TA-50-1 TA-3-29	C013 D029 D033 M011	F005
Tributyl phosphate (TBP)	Separation of lanthanides.	TA-48-1	C014, D051 D089	NA
Tributyl phosphate and kerosene	Used for americium solvent extraction from 1980-83 in TA-55.	TA-55	C014	NA
Tributyl phosphate dissolved in tetrachloroethylene	Used in chloride operations from 1986-90 in TA-55.	TA-55	C014	F001/F002
Trichloroethylene	Contaminant in feed materials to the dissolution process, heat source fabrication operations, and diluent for filtering oils in the pretreatment process in the Plutonium Facility. Detected in samples of influent to RLWTF. TC EPA code conservatively assigned to TA-50-19 sludge by LANL AKIS.	TA-55 TA-50-1	C056 C063 D004 D029 D046 M007 M047 M085	F001, F002
Trichlorofluoromethane	Detected in samples of influent and effluent liquids associated with RLWTF. Detected as a TIC in 1986 sludge samples.	TA-50-1	D029 M011	F002

Table 8. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Trisodium phosphate	Reagent in liquid waste treatment operations in RLWTF.	TA-50-1	C014, C017 D004, D005 D018, D021 D030	NA
Urea	Dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	D001, D046 D076, D089 M035, M044 M097, M098 M099, M100 M102, M198	NA
VARIAN Torr Seal	Epoxy used in heat source fabrication operations in the Plutonium Facility.	TA-55	M177 M214	NA
Vacuum grease	Identified as reagent in dissolution operations in the Plutonium Facility.	TA-55	D046 M202	NA
Vermiculite	Sludge 'solidification'. Pretreatment and heat source fabrication operations in the Plutonium Facility.	TA-50-1 TA-55	C032, M006 M054, M178	NA
Waste Lock 770	Polymer-based absorbent material used during repackaging activities.	TA-50-1	C090, M214	NA
Xylene	Solvent extraction in radiochemistry process in CMR Building. Detected in 1986 sludge samples, but estimated value reported since less than detection limit. Contaminant in feed materials to the dissolution, purification and oxidation, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-3-29 TA-50-1 TA-55	C032 C061 C063 D007 D033 D046 M011	NA[1]
Zinc oxide	Component of plating solutions used in the electroplating section of the Sigma Building.	TA-3-66	D034	NA

Notes 1, 2, and 3:
These chemicals may exhibit the characteristic of ignitability (1), corrosivity (2), or reactivity (3) in their pure form. Based on the analysis of the generating process and waste management practices no pure or unused chemicals would have been introduced into the process influent or remain in the process sludges.

5.4.3.1 F-Listed and Other Solvents

The TA-50 RLWTF influent is exempt from being a mixture-rule hazardous waste for certain F-listed solvent constituents under 40 CFR 261.3(a)(2)(iv)(A) and (B) if the concentration of the solvents is below certain levels in the head works of the treatment facility. However, data to quantify the listed solvent concentrations in the TA-50 head works for the time period of generation of this waste stream are not available. Therefore, this waste stream does not qualify for this exclusion.

Based on review of AK relative to chemicals used or present in facilities and processes potentially discharging liquids to the RLWTF, including sampling and analysis of RLWTF liquid influent, effluent, and sludge, waste stream LA-MIN03-NC.001 may contain or be mixed with F-listed hazardous wastes from non-specific sources listed in 40 CFR 261.31. As shown in Tables 7 and 8, F001, F002, and F005 listed solvents that were utilized and potentially discharged to the RLWTF. Nitrobenzene (F004) was detected in samples of liquid influent to the RLWTF (Reference C013). Although specific uses of nitrobenzene in liquid waste generating processes were not identified, it is assumed this material could have been used as a solvent, therefore EPA HWN F004 is conservatively added to this waste stream. F003 constituents include acetone, n-butyl alcohol, ethyl benzene, ethyl ether, methyl alcohol, methyl isobutyl ketone, and xylene, listed solely because these solvents are ignitable in the liquid form. The waste stream will not exhibit the characteristic of ignitability because it is an inorganic solid resulting from the treatment of aqueous wastewaters, therefore F003 is not assigned.

In addition, liquid wastes from cyanide plating operations (F007, F009) conducted in the Sigma Building, TA-3-66 have been treated in the RLWTF (References D028, D034, and D068), and EPA HWN F006 also applies to the RLWTF sludge derived from the treatment of the liquids from plating operations. Therefore waste stream LA-MIN03-NC.001 is assigned F-listed EPA HWN F001, F002, F004, F005, F006, F007, and F009 (References C013, C018, D003, D004, D007, D046, D077, D083, D100, D101, and DR001).

5.4.3.2 Toxicity Characteristic Compounds

Based on review of AK relative to chemicals used or present in facilities and processes potentially discharging liquids to the RLWTF, including sampling and analysis of RLWTF liquid influent, effluent, and sludge, waste stream LA-MIN03-NC.001 may be contaminated with toxicity characteristic compounds as defined in 40 CFR 261.24. 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 conservatively added to this waste stream.

The AK identified the potential presence of additional toxicity characteristic compounds, however the more specific F-listed EPA HWN have been assigned to waste stream LA-MIN03-NC.001 for the following constituents: benzene (D018), carbon tetrachloride (D019), chlorobenzene (D021), methyl ethyl ketone (D035), nitrobenzene (D036), pyridine (D038), tetrachloroethylene (D039), and trichloroethylene (D040). Therefore, these

characteristic HWNs are not assigned to the waste stream. Waste stream LA-MIN03-NC.001 is assigned toxicity characteristic HWNs D004, D005, D006, D007, D008, D009, D010, D011, D022, D028, and D037 (References C013, C018, C089, D001, D002, D003, D004, D007, D029, D046, D076, D077, D083, D100, D101, DR001, and DR006).

5.4.3.3 Ignitables, Reactives, and Corrosives

The inorganic sludge in waste stream LA-MIN03-NC.001 does not meet the definition of ignitability as defined in 40 CFR 261.21. The materials are not liquid, and radiography and/or visual examination is performed to ensure the absence of free liquids. The materials are not capable of causing fire through friction or absorption of moisture. The materials in this waste stream are, therefore, not ignitable D001 wastes (References C018 and D004).

The inorganic sludge does not meet the definition of corrosivity as defined in 40 CFR 261.22. Sodium hydroxide is used early in the process, but only to adjust the pH of the influent wastewater to between 6 and 9. Precipitated sludges are chiefly hydroxides with a pH of 10 to 12. The final waste form materials are not liquid, and radiography and/or visual examination is performed to ensure the absence of free liquids. The materials in this waste stream are, therefore, not corrosive D002 wastes (References C018 and D004).

The material in this waste stream does not meet the definition of reactivity as defined in 40 CFR 261.23. The material is stable and will not undergo violent chemical change. 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. The materials do not contain sulfides and are not capable of detonation or explosive reaction. The waste is expected to contain less that 500 parts per million concentrations of cyanide from plating operations. Concentrated plating bath waste was collected and treated in a separate process not associated with this waste stream (Reference D068). This waste stream includes solutions from cleaning and rinse baths from plating operation where cyanides were used in previous steps in the process, and may also include spilled solutions. Only trace concentrations of cyanide (less than 0.1%) in solutions from plating operations sent to the RLWTF is expected, and significant additional dilution occurred from other non-cyanide waste waters received at the RLWTF. Conservative estimates from facility personnel and calculations show the concentration total cyanide in this waste stream well below 500 parts per million and well below the RCRA treatment standards for cyanide containing wastes from plating operations (References C078 and C018). The materials in this waste stream are, therefore, not reactive, D003 wastes (References C018 and D004).

5.4.3.4 P- and U-Listed Waste

The TA-50 RLWTF influent is exempt from being a mixture-rule hazardous waste for P- and U-listed constituent under 40 CFR 261.3(a)(2)(iv)(D) if the discarded commercial chemical product, or chemical intermediate arises from "*de minimis*" losses. *De minimis* losses are defined as those from normal material handling operations (e.g., spills from the unloading or transfer of materials from bins or other containers, leak from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well maintained pump packing and seals; sample purging; relief device discharges; discharges from safety showers and rinsing and cleaning of personal safety equipment; and rinsate from empty containers or from containers that are rendered empty by that rinsing.

Any P- and U-listed waste entering the influent to the TA-50 RLWTF head works would be through *de minimis* losses, and therefore, the resulting waste water mixture would not be assigned the P- or U- HWN. Subsequently, waste stream LA-MIN03-NC.001 would also not be assigned the P- or U-listed HWN (References C018, D001, D002, D003, D004, D007, D046, D076, D077, D100, and D101).

5.4.3.5 K-Listed Waste

The material in this waste stream is not hazardous from specific sources since it was not generated from any of the processes listed in 40 CFR 261.32 (References C018, D001, D002, D003, D004, D007, D046, D076, D077, D100, and D101).

5.4.3.6 Polychlorinated Biphenyls

Based on the review of chemical usage, polychlorinated biphenyl (PCB) liquids were not identified in liquid waste sent to the RLWTF. The only PCB source identified were PCB contaminated liquids sent to be incinerated in the CAI, Building TA-50-37 (References D017 and D068). Since this facility was permitted to treat PCB contaminated liquids, PCBs would be destroyed in the incinerator and would not contaminate spent scrubber liquids discharged to the RLWTF (Reference D068).

5.4.3.7 Beryllium

Based on a review of the AK documentation, beryllium materials were not included in these waste streams. Any beryllium present would be a result of residual contamination in waste waster solutions that would not result in concentrations exceeding 1 percent by weight of the final waste form or 5 kg in any payload container (Reference C081).

5.4.3.8 Flammable Volatile Organic Compounds

The main treatment process in the RLWTF concentrated and removed radioactive components from liquid wastes that were piped or trucked from various facilities at LANL. Based on review of AK relative to chemicals used or present in these facilities, trace

quantities of flammable volatile organic compounds (FVOCs) may have been present in the liquid wastes prior to processing and therefore an evaluation of potential FVOC concentrations was performed.

The first step of the main treatment operation was the addition of flocculants to produce a precipitate. The chemicals used during this step were primarily calcium carbonate and ferric hydroxide. The precipitate or sludge was then dewatered and contained approximately 25-40% inorganic solids with a “wet clay” consistency. Perlite or diatomaceous earth was used after dewatering to further filter and absorb liquids present in the sludge. Finally, Portland cement was added to the bottom and top of the sludge during packaging. The main treatment process was performed in a closed system, which prevented any introduction of extraneous material such as flammable compounds (References D005, D018, and D025).

The estimated waste weight percentages for inorganic waste materials (sludge, flocculants, and absorbents) and organic waste materials (miscellaneous plastics) for this waste stream are 99.50 percent and 0.50 percent, respectively. In addition, the results of available headspace gas sampling and analysis of 166 drums in this waste stream indicated that FVOCs are not present in significant amounts. The total FVOCs measured for each of the drums is less than 500 ppm. Based on the final waste form and sample data, containers in waste stream LA-MIN03-NC.001 are not expected to exceed a total FVOC concentration of greater than or equal to 500 ppm (References 8 and M223).

5.4.4 Prohibited Items

The waste is produced in a closed system, which precludes any mechanism in the process from producing compressed gas or the introduction of extraneous material such as pressure vessels, sealed containers, or explosives. Based on the review of the container documentation and process operations, no prohibited items were specifically identified in waste stream LA-MIN03-NC.001, except the potential for residual liquids due to dewatering was identified in AK source documents. Additionally, CCP RTR characterization activities have identified drums in this waste stream with residual liquids below the surface of the sludge (i.e., layered residual liquids) and internal containers of liquids. CCP RTR characterization activities have also identified drums that contain small amounts of metal, plastic, personnel protective equipment and other miscellaneous debris and drums that are predominantly debris that include sealed containers greater than 4 liters and aerosol cans. Waste packages containing prohibited items or free liquids identified during characterization activities will be segregated then dispositioned appropriately and/or repackaged to remove the items prior to certification and shipment. Any payload container consisting of more than 50 percent by volume of debris waste will be excluded from this waste stream (References C017, DR004, DR005, and P014).

During the remediation and repackaging of containers in the TA-54 Dome 231 Permacon, secondary waste may be generated and subsequently added to the waste containers. The secondary waste includes Waste Lock 770, rags and wipes containing Fantastik used for

decontamination, personal protective equipment, and rigid liner lids that have been cut into pieces (Reference C090).

5.5 Waste Packaging

The dewatered sludge was packaged in a 5-mil plastic liner in a 90 or 125 mil rigid polyethylene liner in a 55-gallon Department of Transportation (DOT) 17C drum. Approximately 10 pounds of dry Portland cement was added below and an additional 10 pounds above the sludge during packaging for moisture absorption, and the 5 mil plastic liner was twisted and taped closed in a horse tail fashion. At some point during the early 1980s, the use of tape to close the liner was discontinued and the plastic liners were simply folded over the waste material prior to installing the rigid liner lid. During waste management and drum storage activities following initial waste generation, many 55-gallon drums were over-packed into 85-gallon drums to correct drum integrity problems, such as pin hole corrosion, dents, etc. (References C017, C036, D005, D018, D074, P002, and DR003).

Many of the drums in this waste stream were originally packaged with a sealed rigid liner lid and no drum vent in the 55-gallon drum. Also, some drums were packaged without rigid liners and some drums were packaged with baked on poly-liners (Reference DR008). LANL personnel have installed drum filters in many of the drums in this waste stream during drum venting campaigns, and many of the rigid liner lids were vented. In some instances, the installation of the drum filter was intended to also puncture and vent the rigid liner lid but did not. Therefore, the available AK information cannot be used to identify specific containers which do not have a punctured and vented rigid liner. Confirmation activities (i.e., RTR or visual examination) must verify on a container basis venting of each rigid liner, and external examination of the drum must be used to identify the presence and type of installed drum filter. Waste packages with an unvented rigid liner or drum will be vented prior to certification and shipment.

During remediation/repackaging of drums at the TA-54 Dome 231 Permacon, some drums may be packaged with a 4 – 12 mil liner bag between the drum and the rigid liner. Also if the original container was packaged with the internal plastic liner bag twisted and taped closed, then the horsetail is cut open. If the original container was packaged with the internal plastic liner bag folded over, the internal bag is left folded over.

Consequently, 55-gallon payload containers offered for certification and shipment from this waste stream will have the following packaging configurations:

1) Unless remediated and/or repackaged, one layer of confinement if the internal 5-mil plastic is twisted and taped closed, or zero layers of confinement if the plastic liner is folded over the waste and not taped closed.

2) If remediated/repackaged, then either one layer of confinement will be present if the outer 4 – 12 mil plastic liner bag located between the drum and the rigid liner is twisted and taped closed, or zero layers of confinement will be present if the outer

4 – 12 mil liner bag is folded over or an outer 4 – 12 mil plastic liner bag was not used between the drum and the rigid liner (References P014 and DR009).

The new packaging configurations generated from remediation and/or repackaging are bounded by the existing TRUCON Code LA211 for LA-MIN03.NC-001. The payload container and final packaging configuration of the 55-gallon drums currently stored in over packed 85-gallon drums has not been determined (Reference C091).

6.0 REQUIRED WASTE STREAM INFORMATION: LA-CIN02.001

This section presents the mandatory waste stream AK required by Section B4 of the WIPP-WAP (Reference 1). Attachment 1 of CCP procedure CCP-TP-005 (Reference 8) provides a list of the TRU waste stream information to be developed as part of the AK record.

6.1 Area and Building of Generation

All of the waste containers included in waste stream LA-CIN02.001 were generated by the pretreatment operation of the RLWTF. RSWD records and database information were reviewed for each container to verify that each container originated from the RLWTF (References M218 and M219).

6.2 Waste Stream Volume and Period of Generation

Waste stream LA-CIN02.001 (Table 9, LA-CIN02.001 Waste Stream Volume and Generations Dates) consists of approximately 422 55-gallon drums (88 cubic meters), 273 85-gallon drums (88 cubic meters), 8 110-gallon drums (3 cubic meters), and 149 standard waste boxes (280 cubic meters) totaling approximately 459 cubic meters (References C083 and DR007). The future projection of additional generation of this waste stream is approximately four cubic meters per year. There is no projected end date for the termination of operations that generate this waste stream (Reference C082).

Table 9. LA-CIN02.001 Waste Stream Volume and Generation Dates

Waste Stream	Containers (Volume)	Package Dates
LA-CIN02.001	422 55-gal. drums (88 m^3) 273 85-gal. drums (88 m^3) 8 110-gal. drums (3 m^3) 149 standard waste boxes (280 m^3)	Aug. 1979 – Aug. 2000

According to generator-reported radionuclide quantities on a drum basis, a portion of the hazardous waste from TA-50 pretreatment operations may contain less than 100 nCi/g TRU alpha contamination but is managed by the site as TRU mixed waste. The percentage of the waste stream that is above 100 nCi/g is approximately 64 percent, and the percentage of the waste stream that is below 100 nCi/g is approximately 36 percent

based on reported radionuclide quantities and drum net weights (References C082, C084, D004, and DR007).

Each payload container shipped to the WIPP will be certified in accordance with CCP-PO-002 (Reference 10) as containing more than 100 nCi/g of alpha emitting isotopes with half-lives greater than 20 years.

6.3 Waste Generating Activities

As described in Section 4.4, effluent aqueous liquid waste was piped to TA-50 from TA-55 (see Section 4.4.3 for descriptions of contributing processes from TA-55). The acidic and caustic liquids are processed by two batch methods. One method uses calcium hydroxide (lime), ferric sulfate, a flocculation aid, and sodium hydroxide. The other method uses a mixture of ferrous sulfate, ferric sulfate, sodium hydroxide, and water. This method added a flocculation aid as needed. Both methods produce a thin sludge containing approximately five percent to 25 percent solids that is always alkaline and compatible with Portland cement (References D004, D005, and P013).

6.4 Type of Wastes Generated

This section describes the process inputs, Waste Matrix Code assignment, waste material parameters, radionuclide contaminants, and RCRA hazardous waste determinations for waste stream LA-CIN02.001. The waste stream is characterized based on knowledge of the materials, knowledge of the processes generating the waste, and physical descriptions of the waste.

6.4.1 Material Input Related to Physical Form

Waste stream LA-CIN02.001 consists primarily of homogeneous solids from TA-55 operations, including the following items encased in Portland cement (References 12, D001, D002, D003, D007, D046, D076, D077, D082, D100, and D101):

- Acidic and Caustic liquid wastes from multiple TA-55 operations
- Contaminated aqueous and non-aqueous solutions from multiple TA-55 operations
- Low pH solutions used to extract beryllium sources during the decladding of plutonium-beryllium sources
- Contaminated electrolyte and water solutions
- Unused liquid samples for the analytical chemistry laboratory process
- Evaporator distillates

- Caustic solutions from chloride off-gas scrubbers
- Oxalate, peroxide, and hydroxide solutions generated during precipitation

6.4.1.1 Waste Matrix Code

The waste matrix code was assigned to this waste stream based on the evaluation of AK information relating to the physical form of the waste, such as packaging procedures, waste generating activities, and the RSWD forms completed by the waste generator for each container (References D074, DR004, DR005, and M218).

The waste stream is comprised nearly completely of pretreatment sludge and Portland cement (cemented TRU waste), and no other materials greater than trace quantities are expected on a waste stream basis; therefore, waste matrix code S3150, solidified homogeneous solid waste is assigned to this waste stream.

6.4.1.2 Waste Material Parameters

The waste material parameters (WMP) for waste stream LA-CIN02.001 were based on the descriptions of waste packaged into each of the 852 containers. This waste stream is greater than 50 percent by volume material that meets the criteria for cemented TRU waste. The waste was generated during the pretreatment of radioactive aqueous liquid waste that was piped to TA-50 from TA-55.

The WMPs for waste stream LA-CIN02.001 were estimated by reviewing the waste container inventory records for 852 containers packaged from August 1979 through August 2000. The waste container inventory provides a volume for waste materials packaged in each container. Average, minimum, and maximum WMP weight percentages were calculated using this data. These calculations conclude that the relative waste weight percentages for organic waste materials and inorganic waste materials (primarily 5-mil plastic sleeves and solidified solids) for waste stream LA-CIN02.001 is 0.10 percent and 99.90 percent, respectively. The results of the assessment are presented in Table 10, Waste Stream LA-CIN02.001 Waste Material Parameter Estimates.

The statistical analysis of the data is documented in a memorandum (included with Attachment 6) as required by CCP-TP-005 (Reference 8).

Table 10. Waste Material Parameter Estimates for LA-CIN02.001

WMP Description	Average Weight Percent	Weight Percent Range
PLASTICS	0.10%	0.08% - 1.37%
INORGANIC MATRIX	99.90%	98.63% - 99.92%
TOTAL INORGANIC	**99.90%**	
TOTAL ORGANIC	**0.10%**	

6.4.2 Radiological Characterization

As described in Section 6.2, waste stream LA-CIN02.001 (Table 9) consists of approximately 422 55-gallon drums (88 cubic meters), 273 85-gallon drums (88 cubic meters), 8 110-gallon drums (3 cubic meters), and 149 standard waste boxes (280 cubic meters) totaling approximately 459 cubic meters. This information can be further subdivided on an annual basis, which is summarized in Table 11, LA-CIN02.001 Waste Stream Volume Estimate on an Annual Basis (References C083 and DR007).

Table 11. LA-CIN02.001 Waste Stream Volume Estimate on an Annual Basis

Year Packaged	No. of Containers *
1979	73
1980	213
1981	114
1982	52
1983	15
1984	79
1985	35
1986	74
1987	38
1988	21
1989	32
1990	24
1991	0
1992	13
1993	1
1994	0
1995	0
1996	25
1997	0
1998	0
1999	23
2000	20

* Containers are 55-gallon drums, 85-gallon drums, 110 gallon drums, or standard waste boxes.

A wide variety of different radionuclides contaminate the LA-CIN02.001 waste stream due to the multiple TA-55 processes discharging to the TA-50 RLWTF. Although the predominant radionuclides are Pu-239, U-235, Am-241, and U-238, based on Generator-reported quantities, many other radionuclides are expected to be present in the waste stream.

6.4.2.1 Pu-238, Pu-239, Pu-240, Pu-241, and Pu-242

The primary plutonium material type inputs for the plutonium recovery process are listed in Table 12, Average isotopic Content of Plutonium Material Types and Enrichments. However, other MTs are occasionally introduced as feed material. The assignment of MTs is used to describe the isotopic composition of common blends of radioactive materials used within the DOE complex (References 12, C054, D076, D078, D079, D080, D081, D102, and M029).

Recovery operations are not expected to alter the plutonium isotopic ratios of the feed material. The material type used in the operation generating each waste item is documented on generator records; however, cross-contamination of equipment with different material types can lead to variable material types detected by radioassay (References 12 and D079).

The primary MT that feeds into the Pu-238 operations described in this report is heat source grade plutonium (MT 83), and these operations are not expected to alter the plutonium isotopic ratios of the feed material. Table 12 identifies the isotopic distribution of MT 83 based on 100 isotopic analyses and decay corrected assuming the material was not chemically separated for 45 years (References 12, C054, D076, D078, D080, D081, D102, and M029).

6.4.2.2 U-233, U-234, U-235, and U-238

Uranium-233 and U-238 are not normally components of the plutonium MTs handled at PF-4. Uranium-235 is present from the decay of Pu-239 only at 0.1% by weight of the total plutonium content. However, all three isotopes have been introduced as special material. In addition, uranium-plutonium oxide mixtures have been processed to recover the plutonium. Significant quantities of U-234 will be present from the decay of Pu-238 in containers originating from heat source plutonium activities (References 12, D079, and D102).

In general, uranium and its isotopes are expected to be present only at trace levels, if at all, if the feed material did not purposely contain uranium. However, some reactor fuel development, uranium-plutonium separation, and pit disassembly activities have uranium material as the feed material. The primary uranium MT inputs are listed in Table 13, Average Isotopic Content of Uranium Material Types and Enrichments.

Uranium-234 content must be estimated since this isotope cannot be reliably measured using NDA techniques (Reference 12). The MT provides the basis for estimating an upper bound for U-234 based on the rate of decay of the precursor, Pu-238, and the assumption that there is no other source of uranium in the waste material. The content of U-234 in the Pu-239 MTs is calculated as the sum of the contributions expected from decay of Pu-239 and from uranium input to the operation, with the value of 0.014 conservatively used for the ratio of abundance of U-234 and U-235 in typical uranium MTs. The standard uranium MTs

provide an estimate of the ratio of U-234 to U-235 where one of the MTs listed in Table 13 is an indicated MT in the waste container (References D078 and D079).

Table 12. Average Isotopic Content of Plutonium Material Types and Enrichments

Material Type (MT)	Plutonium Isotope (Wt. %)						Estimated Weight% Relative to Total Pu[a]		
	Pu-238	Pu-239	Pu-240	Pu-241	Pu-242	Pu-244	U-234	U-235	Am-241
MT 51	0.006	96.77	3.13	0.076	0.018	-	0.001	0.1	0.06
MT 52	0.01	93.78	6.0	0.2	0.02	-	0.002	0.1	0.2
MT 53	0.03	91.08	8.45	0.366	0.071	-	0.007	0.09	0.3
MT 54	0.046	87.42	11.5	0.81	0.22	-	0.01	0.09	0.7
MT 55	0.06	83.88	14.73	1.03	0.304	-	0.02	0.09	0.9
MT 56	0.061	81.9	16.51	1.18	0.355	-	0.02	0.09	1.0
MT 57	0.433	74.63	20.7	2.55	1.69	-	0.1	0.08	2.0
MT 42	0.73	1.06	6.40	1.97	89.83	-	0.3	0.0009	3.0
MT 83	78.9	18.4	2.5	0.055	0.15	-	33.1	0.02	0.42

[a] These ratios are calculated under the assumption that there is no chemical fractionation.
Sources: References 12, C021, and D079.

Table 13. Average Isotopic Content of Uranium Material Types and Enrichments

Material Type	U-234	U-235	U-236	U-238
MT 12	0.0015	0.23	0.008	99.77
MT 35	0.36	37.6	0.14	61.9
MT 36	0.63	62.44	0.18	36.75
MT 38	1.03	93.04	0.41	5.53
MT 39	1.32	97.52	0.17	0.99

Sources: References 12 and D079

6.4.2.3 Americium-241

Acceptable Knowledge on the MT inputs provides the basis for estimating an upper bound for Am-241 content based on the rate of decay of the precursor, Pu-241. The purpose of such bounding calculations is to provide a basis for identifying significant enrichment of depletion of Am-241 based on radioassay results for individual waste containers. The calculations assume that (a) none of these isotopes were initially present in the material, (b) the oldest plutonium material in inventory dates back to January 1, 1960, and (c) the legacy waste was packaged on January 1, 1996, making it 36 years old at that time. In general, wastes from the plutonium recovery process are enriched with Am-241, because a primary

intent of the recovery process is to reduce the americium content of the retained plutonium (References 12, D078, and D079).

No correlation is expected among the different radioelements, plutonium, neptunium, uranium, protactinium, or americium. The differences in valence states and chemical affinities among these elements are expected to result in substantial fractionation during several recovery operations, including ion exchange, solvent extraction, hydroxide precipitation, and dissolution (References D078 and D079).

6.4.2.4 Other Radionuclides Present Due to Decay

Other radionuclides will be present in most of the wastes from the decay of a plutonium isotopic precursor or as a contaminant in the feed material (References 12, C024, D076, D078, and D079).

- Neptunium (Np)-237, the decay product of Am-241 (half-life, 485 years), is expected to be present in minor amounts in most waste from recovery operations.

- Americium-243, the decay product of Pu-243 (half-life, 5.0 hours), is expected to be present in minor amounts in most wastes from recovery operations. Pu-243 is produced by neutron capture on Pu-242 during fuel irradiation.

- Protactinium (Pa)-231, the decay-chain daughter of U-235, is expected to be present in trace amounts in some wastes due to its widespread presence as a contaminant in recovery operations (References 12 and C024).

- Actinium (Ac)-227, the decay-chain daughter of Pa-231, is expected to be present in trace amounts where Pa-231 is present, but at several orders of magnitude less than Pa-231 (Reference C024).

6.4.2.5 Cesium-137 and Strontium-90

Cesium-137

Cesium-137 is a product of the spontaneous fission of Pu-238, Pu-239, and especially Pu-240. Cesium-137 is also a trace contaminant in purified plutonium from the production reactors (References 12 and C024). In the latter case, the remaining cesium could be on the order of 0.5 nanograms per gram plutonium. In the former instance, the formation of Cs-137 due to spontaneous fission would lead to about 0.4 picograms per gram plutonium in plutonium that is 10 years old. Because Cs-137 due to spontaneous fission is about a factor of a thousand less than that due to residual contamination from the original separation on the production fuel, the latter is the dominant source of cesium in waste (References 12, C024, D078, and D079).

Strontium-90

Based on interviews with a Subject Matter Expert (SME), no spent nuclear fuel or other material containing Sr-90 were introduced into the TRU waste streams (Reference C028). No references of procedures related to spent fuel processing were located in the AK investigation of records. No generator documents (e.g., WODF, DWLS, TWSR, and WSPF) identified spent fuel or Sr-90 as inputs or as present in the waste. During review of the WSPFs and database records from the waste storage facility (TA-54), use of material containing Sr-90 was not identified. However, because of the requirement that an estimate of Sr-90 content be made, the following approach is taken. In plutonium production runs, Cs-137 and Sr-90 are produced at approximately the same level. These two nuclides have very similar half-lives (~ 30 years) and will therefore be present at roughly the same activity level prior to commencement of any processing operations. If it is assumed that strontium and cesium are not fractionated from one another during chemical processing, Cs-137 may be used as a marker for Sr-90 activity at a ratio of 1:1 (References 12, C024, D078 and D079).

6.4.2.6 Other Radionuclides Introduced as Feed Material

Secondary radionuclides are also present in the waste due to operations involving feed materials other than plutonium (Reference C028). Additional radionuclides expected to be present in each operation were listed by a panel of experts from LANL. The resulting list is documented in a memorandum linking the radionuclides to P/S Codes (References C025 and C028). The list includes Am-241, Am-243, cerium (Ce)-144, curium (Cm)-244, Np-237, Pa-231, Pu-238, Th-230, Th-232, U-233, U-235, and U-238 (References 12, C028, D078, and D079).

6.4.2.7 Estimated Predominant Isotopes and 95 Percent Total Activity

Radionuclide data established by the waste generators on a container basis and container data from the Area G waste storage records was evaluated to determine the relative radionuclide weight and activity for waste stream LA-CIN02.001. This evaluation was performed using the combined data for all drums in this waste stream (References C084 and DR007). From this evaluation, the two predominant isotopes for the waste stream are Pu-239 and U-235, while over 95 percent of the total activity in the waste stream is from Pu-238, Pu-239, and Am-241. Table 14 identifies the relative radionuclide weight and activity percent of expected radionuclides over the entire waste stream based on the container data evaluated. As illustrated in Table 14, the radionuclide weight percent of individual radionuclides varies on a drum-by-drum basis. Because of this variability in drum loadings, some drums will not contain the waste stream predominant radionuclides but may contain other radionuclides expected in this waste stream. Uranium-235 was not measured in this waste stream until February of 1990; therefore, the averaged data may show artificially elevated percentages of Pu-238, Pu-239 and Am-241. In order to compensate for the missing data for uranium isotopes prior to 1990, Table 15 identifies the relative radionuclide weight and activity percent of expected radionuclides over the waste stream from February 1990 until August of 2000 based on the container data evaluated. This data

may more accurately represent the relative radionuclide weight and activity over the entire waste stream if the uranium isotopes had been measured throughout the lifetime of the waste stream. It should be noted that in either case, the two predominant radionuclides are Pu-239 and U-235 (References 12, C084, D078, and DR007).

6.4.2.8 Use of Radionuclide Isotopic Ratios

Based on limited information associated with identified and quantified radionuclides by AK for waste stream LA-CIN02.001, it is not possible to establish default ratios for use in reporting radionuclides not directly measured or detected by available assay systems. The specific use and confirmation of AK related to WIPP-certified assay measurements of containers in this waste stream is documented in the memorandum written in accordance with the requirements of CCP-TP-005 (Reference 8).

Table 14. Estimated Radionuclide Distribution in LA-CIN02.001

Nuclide	Number of Containers with Reported Nuclide	Total Nuclide Weight%[1]	Total Nuclide Curie%[2]	Nuclide Wt% Range for Individual Drums[3]	Nuclide Ci% Range for Individual Drums[4]	Expected Present
WIPP Required Radionuclides						
Am-241	848	1.05%	41.01%	0 - 13.53%	0 - 89.15%	Yes
Pu-238	829	0.03%	5.65%	0 - 12.5%	0 - 96.24%	Yes
Pu-239	852	**75.18%**	53.12%	0 - 99.98%	2.42% - 94.33%	Yes
Pu-240	Not Reported					Yes[6]
Pu-242	1	Trace	Trace	0 - Trace	0 - Trace	Yes
U-233	2	.02%	Trace	0 - 96.20%	0 - 69.08%	Yes
U-234	67	.06%	Trace	0 - 1.02%	0 - 0.12%	Yes
U-238	1	0.34%	Trace	0 - 99.70%	0 - 0.04%	Yes
Sr-90	2	Trace	Trace	0 Trace	0 0.49%	Yes
Cs-137	3	Trace	0.01%	0 Trace	0 18.23%	Yes
Additional Radionuclides						
Ac-227	Not Reported					
Am-240	1	Trace	Trace	0 - Trace	0 - 62.53%	Yes
Am-243	2	Trace	Trace	0 - Trace	0 - Trace	Yes
Ce-144	Not Reported					Yes[6]
Cl-36[7]	1	Trace	Trace	0 - 0.10%	0 - 0.22%	Yes
Cm-244	Not Reported					Yes[6]
Co-60[7]	1	Trace	Trace	0 - Trace	0 - Trace	Yes
H-3[7]	1	Trace	Trace	0 - Trace	0 - 0.11	Yes
Na-22	1	Trace	Trace	0 - Trace	0 - Trace	Yes
Np-237	2	Trace	Trace	0 - 0.04%	0 - 0.01%	Yes
Pa-231	Not Reported					Yes[6]
Pu-236[7]	1	Trace	Trace	0 - Trace	0 - Trace	Yes
Pu-241	4	Trace	0.20%	0 - 0.11%	0 - 86.28%	Yes
Ra-226[7]	1	Trace	Trace	0 Trace	0 - Trace	Yes
Th-230	Not Reported					Yes[6]
Th-232	Not Reported					Yes[6]
U-232[7]	1	Trace	Trace	0 - Trace	0 - Trace	Yes
U-235	105	**23.32%**	Trace	0 - 95.38%	0 - 0.01%	Yes

1. This listing indicates the total weight percent of each radionuclide over the entire waste stream.
2. This listing indicates the total activity (curie) percent of each radionuclide over the entire waste stream.
3. This listing is the weight percent range of each radionuclide on a drum-by-drum basis.
4. This listing is the curie percent range of each radionuclide on a drum-by-drum basis.
5. “Trace” indicates <0.01 weight or activity percent for that radionuclide.
6. Radionuclides not reported but suspected present from secondary radionuclides or decay.
7. Radionuclides reported in drums from cementation of aqueous sources and are not expected in other drums in this waste stream.

Table 15. Estimated Radionuclide Distribution in LA-CIN02.001 from February 1990 until August 2000

Nuclide	Number of Containers with Reported Nuclide	Total Nuclide Weight%[1]	Total Nuclide Curie%
Am-241	106	0.57%	47.21%
Pu-238	105	0.02%	10.19%
Pu-239	106	**28.11%**	42.44%
U-233	1	0.024%	0.01%
U-234	67	0.18%	0.03%
U-238	1	1.01%	Trace
U-235	105	**70.08%**	Trace

1. Only radionuclides greater than Trace quantities (greater than .01 weight percent) are shown.

6.4.3 Chemical Content Identification – Hazardous Constituents

The TA-50 RLWTF is a wastewater treatment facility subject to regulation under the Clean Water Act (CWA); therefore, the effluent discharge is not subject to regulation as a solid waste. However, the exclusion from being a solid waste under 40 CFR 261.4(a)(2) applies only to the actual point source discharge, and it does not exclude industrial waste waters while they are being collected, stored or treated before discharge, nor does it exclude sludge generated by industrial wastewater treatment. Therefore, this waste stream is a solid waste.

The following sections describe the characterization rationale for the assignment of EPA HWNs to waste stream LA-CIN02.001 Table 16 summarizes the waste codes assigned to this waste stream.

Table 16. Waste Stream LA-CIN02.001 Hazardous Waste Characterization Summary

Waste Stream	EPA HWNs
LA-CIN02.001	F001, F002, F005, D004, D005, D006, D007, D008, D009, D010, D011, and D022

To assign EPA HWNs, the available AK documentation was reviewed to identify chemical usage in the processes contributing to the pretreatment operation of the RLWTF and potentially hazardous materials (including commercially available products) that may have been introduced into the waste stream. In addition, MSDSs were obtained for the commercial products to determine the presence of potentially regulated compounds. As described below in Table 17, several of the HWNs were conservatively assigned due to lack of evidence that these constituents would have not exceeded the regulatory thresholds (References C013, D001, D002, D003, D004, D007, D029, D046, D076, D077, D083, D100, D101, and DR006).

Table 17. Chemical Identification and Use Summary

Chemical	Use	Building	Document Source	EPA HWNs
1,1,1-Trichloroethane	Filtering oils in pretreatment operations, chloride operations extraction solvent, and machining operations solvent in the Plutonium facility.	TA-55	C063, D078 M047, M196	F001, F002
1,1,2-Trichloro-1,2,2-trifluoroethane/1,1,2-trichlorotrifluoroethane (Freon)	Identified for the DOR and MCDOR, and separation and purification by precipitation operations in the Plutonium Facility.	TA-55	C037, M145 M154	F001, F002
Acetone	Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	NA[1]
Alconox	Heat source fabrication reagent in the Plutonium Facility.	TA-55	D076, M178 M214	NA
Aluminum nitrate	Pretreatment, dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion processes reagent in the Plutonium Facility.	TA-55	D001, D046 D076, D089 M036, M042 M044, M086 M088, M089 M091, M092 M094, M095 M097, M098 M099, M100 M101, M103 M172, M198 M199	NA[1]
Ammonium chloride	Separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	M038	NA
Arsenic	Contaminant in feed material to the pretreatment, evaporator, DOR and MCDOR, heat source fabrication, and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020, C032 C057, D046 M211	D004
Ascorbic acid	Dissolution, separation, and purification by precipitation operations in the Plutonium Facility.	TA-55	D046, M158, M198	NA[2]
Barium	Contaminant in feed material to the pretreatment, dissolution, evaporator, heat source fabrication, routine Pu-238 waste solidification, hydroxide precipitation, pyrochemical matrix studies, and DOR or MCDOR operations in the Plutonium Facility.	TA-55	C020, C032 C041, C057 D001, D003 D046, D085 M211	D005

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Benzene	Super acid R&D, extraction, separation, and characterization studies solvent in the Plutonium Facility.	TA-55	D003, D078 D079	F005
Beryllium	Used in decladding of plutonium/beryllium sources in pretreatment process and present in metallography grindings in the Plutonium Facility.	TA-55	D003, D007 D101, M069	NA
Bromocresol	Separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	M038	NA
Cadmium	Contaminant in feed material to the pretreatment, dissolution, DOR and MCDOR, evaporator, heat source fabrication, routine Pu-238 waste solidification, pyrochemical matrix studies, purification, and oxide conversion operations in the Plutonium Facility.	TA-55	C020, C032 C040, C041 C057, C066 D001, D003 D007, D046 D082, D085 M081, M101 M107, M211	D006
Calcium	DOR and MCDOR processes reagent in the Plutonium Facility.	TA-55	C040, D002 D082, M115 M116, M121 M122, M145 M166, M173	NA[3]
Calcium carbonate	Separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	M038, M148 M158, M169	NA
Calcium chloride	DOR and MCDOR processes reagent in the Plutonium Facility.	TA-55	C040, D001 D002, M006 M115, M116 M121, M145 M166, M173	NA
Calcium fluoride	Dissolution, nitrate anion exchange, DOR and MCDOR, separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	C032, C066 D002, D046 D089, M043 M059, M063 M087, M088 M089, M090 M091, M094 M095, M116 M148, M149 M153, M166 M172, M198 M199	NA
Calcium hydroxide	Precipitation, flocculation, and clarification agent used in RLWTF.	TA-50-1	D005, D020 D059	NA[2]
Calcium nitrate	Identified as reagent in Nitrate Operations in the Plutonium Facility.	TA-55	D046, D078	NA[1]

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Calcium oxide (Lime)	Precipitation, flocculation, and clarification in RLWTF. MCDOR process reagent in the Plutonium Facility.	TA-50-1 TA-55	C014, C040 D001, D020 M006, M116	NA
Carbon tetrachloride	Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations, and reagent in MCDOR and plutonium trichloride preparation operations in the Plutonium Facility.	TA-55	C032, C061 C063, D002 D007, D046 M114, M165	F001
Cerium nitrate	Dissolution operations reagent in the Plutonium Facility.	TA-55	D046, M093	NA
Chlorobenzene	Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	F002
Chloroform	Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	D022
Chromium	Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, purification and oxide conversion, hydroxide precipitation, heat source fabrication, routine Pu-238 waste solidification, and pyrochemical matrix studies operations in the Plutonium Facility.	TA-55	C014, C020 C032, C033 C036, C040 C041, C057 C063, C066 D001, D003 D007, D046 D076, D077 D082, D085 D091, M081 M104, M208 M211	D007
Citofix	Epoxy used in the heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020	NA
Cobalt nitrate	Dissolution operations reagent in the Plutonium Facility.	TA-55	D046, M093	NA[1]
Diatomaceous earth	Pretreatment operations reagent in the Plutonium Facility.	TA-55	C014, M047	NA
Diethylenetriamine	Heat source fabrication and routine Pu-238 waste solidification operations reagent in the Plutonium Facility.	TA-55	C020	NA
Diethyl oxalate	Identified as reagent in dissolution operations in the Plutonium Facility.	TA-55	D046, M198	NA

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
DUCO cement	Heat source fabrication operations reagent in the Plutonium Facility.	TA-55	M178, M214	NA[1]
Durofix	Epoxy used in the heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020	NA
Epon Resin 8132	Epoxy resin used in heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020, M214	NA
Ethyl alcohol	Contaminant in feed material to the heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C054, C056 D046, D076 M100, M177 P010	NA[1]
Ethyl ether	Super acid R&D, extraction, separation, and characterization studies solvent in the Plutonium Facility.	TA-55	D003, D078 D079	NA[1]
Ethylene glycol	Heat source fabrication and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020, C056 D076, M178	NA
Extran 1000	Detergent in Plutonium Facility laboratory and office buildings.	TA-55-2	D028, M214	NA
Fantastik	Heat source fabrication reagent in the Plutonium Facility.	TA-55	D076, M178 M214	NA
Ferric ammonium sulfate	Dissolution and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	D046, M044	NA
Ferric nitrate	Identified as reagent in pretreatment, dissolution, routine Pu-238 waste solidification, nitrate anion exchange, purification and separation by precipitation, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	D046, D076 M036, M044 M062, M157 P010	NA[1]
Ferric sulfate	Precipitation, flocculation, and clarification agent.	TA-50-1	D004, D005 D020, M006	NA
Ferric sulfate hexahydrate	Precipitation, flocculation, and clarification agent.	TA-50-1	D010	NA
Ferrous ammonium sulfate	Dissolution and nitrate anion exchange operation reagent in the Plutonium Facility.	TA-55	D001, D046 D089, M036 M087, M098 M100, M198	NA
Ferrous sulfamate	Ion exchange process reagent in the Plutonium Facility.	TA-55	D046, M094 M098	NA
Fluoristan	Dissolution process reagent in the Plutonium Facility	TA-55	M198	NA
Formamide	Identified as reagent in dissolution operations in the Plutonium Facility.	TA-55	D046, M198	NA

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Formic acid	Dissolution and evaporator process reagent in the Plutonium Facility.	TA-55	C064, D046 M198	NA[2]
Hydrobromic acid	Metallographic sample etching in the Plutonium Facility.	TA-55	P009	NA[2]
Hydrochloric acid	Dissolution, hydroxide precipitation, separation and purification by precipitation, MCDOR, metallographic, and evaporator operations reagent/contaminant in the Plutonium Facility.	TA-55	C016, C032 C066, D001 D046, D082 D089, M054 M087, M149 M153, M158 M164, M169 M171, M198 P009	NA[2]
Hydrofluoric acid	Pretreatment, nitrate anion exchange, separation and purification by precipitation, heat source fabrication, metallographic, and dissolution operations reagent in Plutonium Facility.	TA-55	C032, D046 D076, D082 D089, M006 M042, M043 M054, M059 M062, M085 M090, M091 M092, M095 M096, M097 M101, M105 M149, M150 M153, M155 M157, M164 M172, M176 M198, M201 M203, M204 P009	NA[2]
Hydrogen peroxide	Dissolution, pretreatment, nitrate ion exchange, separation and purification by precipitation, and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	D001, D046 D089, M038 M044, M097 M100, M101 M104, M155 M156, M198 M205, M208	NA[1]
Hydroxylamine hydrochloride	Nitrate anion exchange and separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	M034, M158 M169, M171	NA[2]
Hydroxylamine nitrate	Dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	D001, D046 D076, D089 M006, M034 M035, M038 M041, M044 M097, M098 M099, M100 M101, M102 M155, M198	NA[1,2]

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Iodine	Used with calcium to reduce plutonium fluoride	TA-55	M122	NA
Kerosene	Pretreatment process reagent in the Plutonium Facility.	TA-55	M047	NA
Lanthanum nitrate	Dissolution and Plutonium/thorium separation process reagent in the Plutonium Facility.	TA-55	D046, P012	NA[1]
Lead	Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, heat source fabrication, purification and oxide conversion, hydroxide precipitation, routine Pu-238 waste solidification, pyrochemical matrix studies, and burst testing in the Plutonium Facility.	TA-55	C014, C020 C032, C040 C041, C057 C066, D001 D003, D007 D046, D076 D082, D085 M081, M211	D008
Lithium	MCDOR operations reagent in the Plutonium Facility.	TA-55	M166, M173	NA[3]
Lithium chloride	MCDOR operations reagent in the Plutonium Facility.	TA-55	M166, M173	NA
Lithium fluoride	Heat source fabrication reagent in the Plutonium Facility.	TA-55	M176	NA
Magnesium chloride	Routine Pu-238 Waste Solidification operations in the Plutonium Facility.	TA-55	M185	NA
Magnesium hydroxide	Hydroxide precipitation and separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	D007, D091 M038	NA[2]
Magnesium oxide	Identified as reagent in pretreatment operations in the Plutonium Facility.	TA-55	D046, D089 M045, M062 M122, M190 M197	NA
Mercuric nitrate	Dissolution process reagent in the Plutonium Facility.	TA-55	C032, D046 M054	D009[1]
Mercury	Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, heat source fabrication, hydroxide precipitation, routine Pu-238 waste solidification, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	C020, C032 C057, C066 D001, D007 D046, D076 D085, M059 M080, M211	D009
Methyl alcohol	Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D008, D046	NA[1]
Methyl ethyl ketone	Machining operations solvent in the Plutonium facility.	TA-55	D077, D078 D102	F005

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Methylene chloride	Contaminant in feed material to the dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	F001, F002
n-Butyl alcohol	Contaminant in feed material to dissolution, purification and oxide conversion, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	NA[1]
Nitric acid	Dissolution, pretreatment, purification and oxide conversion, nitrate anion exchange, separation and purification by precipitation, evaporator, heat source fabrication, and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C016, C032 C066, D001 D046, D076 D082, D089 M034, M035 M036, M042 M043, M044 M048, M054 M059, M062 M063, M086 M087, M088 M089, M090 M091, M092 M093, M094 M095, M096 M097, M098 M099, M100 M101, M102 M112, M113 M148, M150 M151, M153 M155, M172 M198, M199 M201, M202 M203, M204 M205, M208 M216, P010 P012	NA[2]
Oil (e.g., engine)	Assumed to have been filtered in pretreatment operations in the Plutonium Facility.	TA-55	D046, M047	NA
Oxalic acid	Utilized in the pretreatment, dissolution, hydroxide precipitation, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	C032, C063 D001, D007 D046, D076 D089, M006 M034, M035 M099, M101 M102, M110 M155, M158 M171, M198	NA[2]

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Phenolphthalein	Dissolution, heat source, and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	D046, D076 P010, M100	NA
Polyvinyl pyridine (resin)	Ion exchange resin in dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion processes in the Plutonium Facility.	TA-55	D001, M044 M198	NA
Portland cement	Pretreatment solidification process used to absorb sludge.	TA-50-1	C014, D004 D005, M006	NA[2]
Potassium chloride	MCDOR operations reagent in the Plutonium Facility.	TA-55	M166, M173	NA
Potassium dichromate	Pretreatment, dissolution, separation and purification by precipitation, and hydroxide precipitation operations reagent in the Plutonium Facility.	TA-55	C034, D007 M169, P012	D007
Potassium fluoride	Dissolution operations reagent in the Plutonium Facility.	TA-55	M059	NA
Potassium fluoride hydrate	Ion exchange process reagent in the Plutonium Facility.	TA-55	D046	NA
Potassium hydroxide	Dissolution, pretreatment, evaporation, hydroxide precipitation, nitrate anion exchange, MCDOR, separation and purification by precipitation, plutonium trichloride preparation, and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	C065, C066 D001, D007 D046, D082 D089, D091 M034, M038 M042, M043 M062, M088 M090, M114 M116, M158 M166, M193 P012	NA[2]
Potassium pyrosulfate	Dissolution operations reagent in the Plutonium Facility.	TA-55	M059, M094	NA
Potassium thiocyanate	Dissolution operations reagent in the Plutonium Facility.	TA-55	D046, M087	NA
Pyridine	Super acid R&D, extraction, separation, and characterization studies solvent in the Plutonium Facility.	TA-55	D003, D078 D079	F005
Scintillation cocktails	Chemical used in Plutonium Facility laboratory and office buildings.	TA-55-2 TA-55-4	D028, D071	NA
Selenium	Contaminant in feed material to the pretreatment, evaporator, DOR and MCDOR, heat source fabrication, and routine Pu-238 waste solidification operations in the Plutonium Facility.	TA-55	C020, C032 C057, D046 D082, M211	D010

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Silver	Contaminant in feed material to the pretreatment, dissolution, evaporator, DOR and MCDOR, heat source fabrication, routine Pu-238 waste solidification, and purification and oxide conversion operations in the Plutonium Facility.	TA-55	C020, C032 C033, C040 C041, C057 C063, D001 D003, D046 D076, D082 D085, M211	D011
Silver nitrate	Electrochemical dissolution, pretreatment, dissolution, purification and oxide conversion, separation and purification by precipitation, and hydroxide precipitation operations reagent in the Plutonium Facility.	TA-55	C033, C034 D007, D046 M044, M078 M079, M087 M094, M169 M216	D011[3]
Sodium	MCDOR operation reagent in the Plutonium Facility.	TA-55	M166, M173	NA[3]
Sodium bicarbonate	Separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	M169	NA
Sodium chloride	Dissolution process reagent in the Plutonium Facility.	TA-55	D046, M087	NA
Sodium chromate	Dissolution and plutonium/thorium separation processes reagent in the Plutonium Facility.	TA-55	D046, P012	D007
Sodium dithionite	Nitrate anion exchange and separation and purification by precipitation operations reagent in the Plutonium Facility.	TA-55	M034, M158 M171	NA[3]
Sodium fluoride	Dissolution operations reagent in the Plutonium Facility.	TA-55	M059, M094	NA
Sodium hydroxide	Neutralization, pH adjustment, and flocculation reagent. Heat source operations, routine Pu-238 waste solidification, MCDOR, pretreatment, dissolution, nitrate anion exchange, separation and purification by precipitation, evaporation, purification and oxide conversion, hydroxide precipitation, and burst testing operations reagent in the Plutonium Facility.	TA-50-1 TA-55	C032, C035 C041, C065 C066, D001 D004, D005 D007, D046 D076, D077 D082, D089 D091, M042 M044, M046 M054, M062 M081, M088 M100, M103 M104, M105 M114, M116 M153, M155 M164, M187 M198, M208 M216, P004 P010, P012	NA[2]

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Sodium metaphosphate	Heat source fabrication operations reagent in the Plutonium Facility.	TA-55	C056	NA
Sodium nitrate	Dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	D001, D046 D076, D077 D089, M036 M044, M094 M098, M099 M100, M101 M103, M169	NA[1]
Sodium oxalate	Dissolution and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	C032, D001 D046	NA
Sodium silicate	Pretreatment solidification reagent.	TA-50-1	D020, M006	NA
Sodium tetraborate	Burst testing process regent in the Plutonium Facility.	TA-55	C035, D077	NA
Sulfuric acid	Pretreatment, dissolution, separation and purification by precipitation, and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	D046, D089 M104, M156 M198, M208	NA[2]
Tetrachloroethylene	Contaminant in feed material to the evaporator and hydroxide precipitation operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	F001, F002
Toluene	Super acid R&D, extraction, separation, and characterization studies solvent in the Plutonium Facility.	TA-55	D003, D078 D079, M085	F005
Tributyl phosphate and kerosene	Used for americium solvent extraction from 1980-83 in the Plutonium Facility.	TA-55	C014	NA
Tributyl phosphate dissolved in tetrachloroethylene	Used in chloride operations from 1986-90 in the Plutonium Facility.	TA-55	C014	F001, F002
Trichloroethylene	Contaminant in feed materials to the dissolution process, heat source fabrication operations, and diluent for filtering oils in the pretreatment process in the Plutonium Facility.	TA-55	C056, C063 D046, M047 M085	F001, F002
Urea	Dissolution, nitrate anion exchange, separation and purification by precipitation, and purification and oxide conversion operations reagent in the Plutonium Facility.	TA-55	D001, D046 D076, D089 M035, M044 M097, M098 M099, M100 M102, M198	NA
VARIAN Torr Seal	Epoxy used in heat source fabrication operations in the Plutonium Facility.	TA-55	M177, M214	NA

Table 17. Chemical Identification and Use Summary (Continued)

Chemical	Use	Building	Document Source	EPA HWNs
Vacuum grease	Identified as reagent in dissolution operations in the Plutonium Facility.	TA-55	D046, M202	NA
Vermiculite	Pretreatment solidification process absorbent. Pretreatment and heat source fabrication operations reagent in the Plutonium Facility.	TA-50-1 TA-55	C032, M006 M054, M178	NA
Xylene	Contaminant in feed materials to the dissolution, purification and oxidation, hydroxide precipitation, and evaporator operations in the Plutonium Facility.	TA-55	C032, C061 C063, D007 D046	NA[1]

Notes 1, 2, and 3:
These chemicals may exhibit the characteristic of ignitability (1), corrosivity (2), or reactivity (3) in their pure form. Based on the analysis of the generating process and waste management practices no pure or unused chemicals would have been introduced into the process influent or remain in the cemented sludges.

6.4.3.1 F-Listed and Other Solvents

The TA-50 RLWTF influent is exempt from being a mixture-rule hazardous waste for certain F-listed solvent constituents under 40 CFR 261.3(a)(2)(iv)(A) and (B) if the concentration of the solvents is below certain levels in the head works of the treatment facility. However, data to quantify the listed solvent concentrations in the TA-50 head works for the time period of generation of this waste stream are not available. Therefore, this waste stream does not qualify for this exclusion.

Based on review of AK relative to chemicals used or present in the TA-55 Plutonium Facility and the pretreatment operation of the RLWTF, waste stream LA-CIN02.001 may contain or be mixed with F-listed hazardous wastes from non-specific sources listed in 40 CFR 261.31. As shown in Tables 14 and 15, F001, F002, and F005 listed solvents that were utilized and potentially discharged to the RLWTF. F003 constituents include acetone, n-butyl alcohol, ethyl benzene, methyl alcohol, and xylene, listed solely because these solvents are ignitable in the liquid form. The waste stream will not exhibit the characteristic of ignitability because it is an inorganic solid resulting from the treatment of aqueous wastewaters, therefore F003 is not assigned.

Therefore waste stream LA-CIN02.001 is assigned F-listed EPA HWN F001, F002, and F005 (References C013, D003, D004, D007, D029, D046, D077, D083, D100, D101, and DR006).

6.4.3.2 Toxicity Characteristic Compounds

Based on review of AK relative to chemicals used or present in the TA-55 Plutonium Facility and the pretreatment operation of the RLWTF, waste stream LA-CIN02.001 may be contaminated with toxicity characteristic compounds as defined in 40 CFR 261.24. 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 conservatively added to this waste stream.

The AK identified the potential presence of additional toxicity characteristic compounds, however the more specific F-listed EPA HWN have been assigned to waste stream LA-CIN02.001 for the following constituents: benzene (D018), carbon tetrachloride (D019), chlorobenzene (D021), methyl ethyl ketone (D035), pyridine (D038), tetrachloroethylene (D039), and trichloroethylene (D040). Therefore, these toxicity characteristic HWNs are not assigned to the waste stream. Waste stream LA-CIN02.001 is assigned toxicity characteristic HWNs D004, D005, D006, D007, D008, D009, D010, D011, and D022 (References C013, D001, D002, D003, D004, D007, D046, D076, D077, D083, D100, D101, and DR006).

6.4.3.3 Ignitables, Reactives, and Corrosives

The material in this waste stream does not meet the definition of ignitability as defined in 40 CFR 261.21. The materials are not liquid, and radiography and/or visual examination is performed to ensure the absence of free liquids. The materials are not capable of causing fire through friction or absorption of moisture. The materials in this waste stream are, therefore, not ignitable D001 wastes (References D002 and D004).

The material in this waste stream does not meet the definition of corrosivity as defined in 40 CFR 261.22. Sodium hydroxide is used early in the pretreatment process, but only to adjust the pH of the influent to aid in cementation. The final waste form materials are not liquid, and radiography and/or visual examination is performed to ensure the absence of free liquids. The materials in this waste stream are, therefore, not corrosive D002 wastes (Reference D004).

The material in this waste stream does not meet the definition of reactivity as defined in 40 CFR 261.23. The material is stable and will not undergo violent chemical change. 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. The materials do not contain sulfides and are not capable of detonation or explosive reaction. The materials in this waste stream are, therefore, not reactive, D003 wastes (Reference D004).

6.4.3.4 P- and U-Listed Waste

The TA-50 RLWTF influent is exempt from being a mixture-rule hazardous waste for P- and U-listed constituent under 40 CFR 261.3(a)(2)(iv)(D) if the discarded commercial chemical product, or chemical intermediate arises from “*de minimis*” losses. *De minimis* loses are

defined as those from normal material handling operations (e.g., spills from the unloading or transfer of materials from bins or other containers, leak from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well maintained pump packing and seals; sample purging; relief device discharges; discharges from safety showers and rinsing and cleaning of personal safety equipment; and rinsate from empty containers or from containers that are rendered empty by that rinsing.

Any P- and U-listed waste entering the influent to the TA-50 RLWTF head works would be through *de minimis* losses; therefore, the resulting waste water mixture would not be assigned the P- or U- HWN. Subsequently, waste stream LA-CIN02.001 would also not be assigned the P- or U-listed HWN (References D001, D002, D003, D004, D007, D046, D076, D077, D100, and D101).

6.4.3.5 K-Listed Waste

The material in this waste stream is not hazardous from specific sources since it was not generated from any of the processes listed in 40 CFR 261.32 (References D001, D002, D003, D004, D007, D046, D076, D077, D100, and D101).

6.4.3.6 Polychlorinated Biphenyls

Based on the review of chemical usage, PCB liquids were not identified in liquid waste sent to the RLWTF. The only PCB source identified were PCB contaminated liquids sent to be incinerated in the CAI, Building TA-50-37, and the spent scrubber liquids generated by the CAI were not sent to the pretreatment process of cementation (References D017 and D068).

6.4.3.7 Beryllium

Based on a review of the AK documentation, beryllium materials were not included in these waste streams. Any beryllium present would be a result of residual contamination in waste water solutions that would not result in concentrations exceeding 1 percent by weight of the final waste form or 5 kg in any payload container (References 12, C081, and C085).

6.4.3.8 Flammable Volatile Organic Compounds

The pretreatment process in the RLWTF concentrates and removes radioactive components from acidic and caustic process liquids that are piped from the Plutonium Facility located at TA-55. Based on review of AK relative to chemicals used or present in this facility, trace quantities of FVOCs may be present in the aqueous liquids prior to processing and therefore an evaluation of potential FVOC concentrations was performed.

The first step of the pretreatment operation involves the pH adjustment of the liquid waste. This includes a combination of blending the acidic and caustic process liquids and the addition of flocculants and caustic chemicals such as calcium hydroxide (lime), ferrous

sulfate, ferric sulfate, and sodium hydroxide. The thin precipitate or sludge generated by this step contains approximately 5-25% inorganic solids. The sludge is then mixed with measured quantities of Portland cement, vermiculite, and sodium silicate to form a cement monolith. The pretreatment process is performed in a closed system, which prevents any introduction of extraneous material such as flammable compounds (References D004, D005, D020, and P013).

The estimated waste weight percentages for inorganic waste materials (cemented sludge and absorbents) and organic waste materials (plastic sleeves) for this waste stream are 99.90 percent and 0.10 percent, respectively. In addition, the results of available headspace gas sampling and analysis of 94 drums in this waste stream indicated that FVOCs are not present in significant amounts. The total FVOCs measured for each of the drums is less than 500 ppm. Based on the final waste form and sample data, containers in waste stream LA-CIN02.001 are not expected to exceed a total FVOC concentration of greater than or equal to 500 ppm (References 8 and M224).

6.4.4 Prohibited Items

The waste is produced in a closed system, which precludes any mechanism in the process from producing compressed gas or the introduction of extraneous material such as pressure vessels, sealed containers, or explosives. Based on the review of the container documentation and process operations, no prohibited items were specifically identified in waste stream LA-CIN02.001 or AK source documents, except the potential for residual liquids due to dewatering is expected. Additionally, based on CCP characterization experience with waste stream LA-MIN03-NC.001, containers in the current inventory of waste stream LA-CIN02.001 are expected to contain small amounts of metal, plastic, personnel protective equipment, aerosol cans, and other miscellaneous debris and may include drums with greater than 50 percent debris. Waste packages containing prohibited items or free liquids identified during characterization activities will be segregated then dispositioned appropriately and/or repackaged to remove the item prior to certification and shipment (References C017, C082, DR004, DR005, and P014).

6.5 Waste Packaging

Prior to 1985, the pretreatment process cemented sludge into monoliths by tumbling 55-gallon DOT 17C drums containing measured quantities of sludge, Portland cement, vermiculite, and sodium silicate. First, the small bung on the drum was replaced with a customized bung equipped with a nipple that allows the drum to be vented. Then a 5-mil plastic sleeve was installed in the 55-gallon drum for contamination control during the adding of sludge. The dry ingredients are typically placed in the drums prior to cementation and include approximately 282-pounds of Portland cement, 4.5-pounds of vermiculite, and 2.5-gallons of sodium silicate. Between 22- to 23-gallons of sludge was then added to the drum and the drum lid was sealed to the drum with a ¼-inch bead of adhesive and tightened. The drum was tumbled to mix the contents and verify the absence of leaks. A carbon filter was then attached to the vent nipple. After 1985, the 55-gallon DOT 17C drums contained baked on 90 mil poly liners; however, the cementation process did not

change. During waste management and drum storage activities following initial waste generation, some 55-gallon drums were over-packed into 85-gallon drums to correct drum integrity problems, such as pin hole corrosion, dents, etc. (References C082, D004, D005, M007, D074, and P013).

Some of the drums in this waste stream were originally packaged without a drum vent in the 55-gallon drum. LANL personnel have installed drum filters in many drums during drum venting campaigns. Confirmation activities (i.e., visual examination) must be used to identify the presence and type of installed drum filter. Consequently, 55-gallon payload containers offered for certification and shipment from this waste stream will have no layers of confinement. The payload container and final packaging configuration of the 55-gallon drums currently stored in over packed 85-gallon drums has not been determined.

7.0 SUPPLEMENTAL WASTE STREAM INFORMATION

Numerous sources of supplemental AK information were collected for the TA-50 RLWTF waste. These sources are referenced throughout this document and listed in Section 10.0. The types of supplemental information include:

- Standard operating procedures related to packaging of waste (Reference P002)
- Radioactive Solid Waste Disposal records for each waste container described in this document (References C083 and M026)
- MSDSs related to products identified (Reference M214)
- Technical reports describing historical operations of the TA-50 RLWTF (Reference D005)
- AK documents describing LANL TRU Waste operations and management (Reference D073)
- Waste generator interviews (Reference C017)

8.0 CONTAINER SPECIFIC INFORMATION

Radioactive Solid Waste Disposal records have been completed by the LANL waste generators for each waste container in these waste streams described in this AK document. The list of containers included in these streams, including current information relating to the radiological, physical, and chemical characterization of these containers is included in the current Waste Containers list, as applicable.

9.0 REFERENCES

1. *Waste Isolation Pilot Plant Hazardous Waste Facility Permit,* NM4890139088-TSDF. New Mexico Environment Department, Santa Fe, New Mexico.

2. DOE/LLW-217, *DOE Waste Treatability Group Guidance*, Idaho Falls, Idaho, INEL-Lockheed Idaho Technologies.

3. DOE/WIPP-02-3122, *Contact Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, Carlsbad, New Mexico, U.S. Department of Energy.

4. *Interim Guidance on Ensuring that Waste Qualifies for Disposal at the Waste Isolation Pilot Plant*, U.S. DOE Carlsbad, 1997.

5. *Waste Isolation Pilot Plant Land Withdrawal Act* (as amended), Public Law 102-579.

6. DOE/TRU-2006-3344*Transuranic Waste Baseline Inventory Report*, U.S. DOE Carlsbad, NM

7. CCP-PO-001, *CCP TRU Waste Characterization Quality Assurance Project Plan*, Carlsbad, New Mexico, Washington TRU Solutions, LLC.

8. CCP-TP-005, *CCP Acceptable Knowledge Documentation*, Carlsbad, New Mexico, Washington TRU Solutions, LLC.

9. DOE/WIPP 89-004, *TRUPACT-ll Content Codes* (TRUCON).

10. CCP-PO-002, *CCP Transuranic Waste Certification Plan*. Washington TRU Solutions, Carlsbad, NM

11. CCP-AK-LANL-009, *Los Alamos National Laboratory Chemistry and Metallurgy Research (CMR) Facility*. Washington TRU Solutions, Carlsbad, NM

12. CCP-AK-LANL-006, *Los Alamos National Laboratory TA-55 Mixed Heterogeneous Debris.* Washington TRU Solutions, Carlsbad, NM

10.0 AK SOURCE DOCUMENTS

Source Document Tracking Number	Title	Document Number	Revision	Date
C004	Memo to G. Kestell et al re: Effects of TA-55 Process Wastes on TA-50 Operations	N/A	N/A	9/18/80
C005	Request for Directive, Radioactive Liquid Waste Treatment Plant Improvements	N/A	N/A	2/18/77
C007	Memo to J. Bratton re: Upgrading of Industrial Liquid Waste Treatment Plants, LASL	RLWT-11	N/A	4/20/78
C008	Memo to K. Sisneros and A. Davis (NMED and EPA) re: Relabeling Sludge from the RLWTF, TA-50-1	N/A	N/A	8/20/91
C009	Memo to B. Jorgensen re: RCRA Metals in Filtered TA-50 Wastewaters	N/A	N/A	12/15/92
C012	Memo to Distribution re: Organic Solvents in Drain Lines	N/A	N/A	4/93
C013	Memo to B. Garcia re: Re-characterization of Wastewater Treatment Sludge in Storage at Technical Area (TA) 54 - Request for Removal from Federal Facility Compliance Order (FFCO)	N/A	N/A	1/12/96
C014	Interviews of Radioactive Liquid Waste Knowledgeable Personnel	TWCP-02788	N/A	9/99
C016	Interview with Steve Schreiber, NMT-2	TWCP-08658	N/A	5/1/02
C017	Outstanding Questions on Vacuum Filter Sludge Waste	N/A	N/A	11/13/03
C018	RCRA Evaluation	N/A	N/A	11/03
C019	Radiological Evaluation	N/A	N/A	11/03
C020	Interview with Jim Foxx and Gary Rinehart	TWCP-3545, P238-20	N/A	N/A
C021	NMT Memo, NMT-7 WM/EC-96-032 Benchmark Environmental Corp. Memo, AL-7193 BEC	TWCP-698	N/A	N/A
C022	Written information obtained from a TA-55 waste management expert	TWCP-1037	N/A	N/A
C023	Interview with Jim Foxx, 10/20/00	TWCP-4168	N/A	10/20/00
C024	Interview with Jim Foxx (TA-55 SME) on April 2, 2001	TWCP-5164	N/A	4/2/01

Source Document Tracking Number	Title	Document Number	Revision	Date
C025	Interview with Jim Foxx (TA-55 SME) on April 11, 2001	TWCP-5166	N/A	4/11/01
C026	Jim Foxx, NMT-7	TWCP-3543, SP-45	N/A	N/A
C027	Jim Foxx, NMT-7 2/3/00	TWCP-3543, SP-38	N/A	2/3/00
C028	Memo from Jim Foxx	TWCP-882	N/A	N/A
C029	James Barfield, 02/25/00	TWCP-3546, M-042	N/A	2/25/00
C031	Jim Foxx, SME, 5/2/2000	TWCP-3541, MET-73	N/A	5/20/00
C032	Nitrate Acceptable Knowledge Report forms completed by SMEs Tim Hayes and Jim Foxx	TWCP-3568, N-81	N/A	N/A
C033	Interview with Jim Foxx, 10/17/00	TWCP-4166	N/A	10/17/00
C034	Interview with Jim Foxx, 10/18/00	TWCP-4167	N/A	10/18/00
C035	Jim Foxx, SME, 3/15/2000	TWCP-3541, MET-58	N/A	3/15/00
C036	Steve Long, 02/29/00	TWCP-3546, M-039	N/A	2/29/00
C037	Mike West, NMT-2, Greg Bird, NMT-2	TWCP-3542, PYRO-24	N/A	N/A
C040	Jim Foxx, NMT-7	TWCP-2502	N/A	N/A
C041	Jim Foxx, NMT-7-WM/EC-99-118	TWCP-2540	N/A	N/A
C054	Comments from Jim Foxx on the draft Pu-238 AK Summary Report, 11/99	TWCP-3545, P238-01	N/A	N/A
C056	Interview with Jim Foxx, 8/31/99	TWCP-3545, P238-05	N/A	8/31/99
C057	Email from Jim Foxx, "RCRA Codes for Pu-238," 12/9/99	TWCP-3545, P238-18	N/A	12/9/99
C061	Interview with Jim Foxx 9/23/99	TWCP-3547, Cl-25	N/A	9/23/99
C063	Interview with Jim Foxx of TA-55	TWCP-3567, N-39	N/A	N/A
C064	Interview with Tim Hayes of TA-55 Nitrate Operations, 1/4/00	TWCP-3568, N-76	N/A	N/A
C065	Comments from Tim Hayes and Jim Foxx on the Acceptable Knowledge Summary for TA-55 Nitrate Operations, 2/25/00	TWCP-3568, N-79	N/A	2/25/00
C066	Jim Foxx, SME, response to comments received on the Acceptable Knowledge Summary for TA-55 Nitrate Operations, 2/25/00	TWCP-3568, N-82	N/A	2/25/00

Source Document Tracking Number	Title	Document Number	Revision	Date
C068	Rosemary Glenn, email to Karen Chandler, "Re: Chromium," 6/8/00 and John Musgrave, email to Karen Chandler, "Re: Light Bulb!" 6/14/00	TWCP-3568, N-84	N/A	6/14/00
C076	Interview with Jim Foxx	TWCP-4164	N/A	10/12/00
C078	Interview with Richard Bramlett	N/A	N/A	1/29/04
C079	Interview with Terry Wickland – Drum Filters Potentially Used for TA-50 RLWTF 55-Gallon Drums	N/A	N/A	4/24/04
C080	Acceptable Knowledge Payload Management Calculations for LA-MIN03-NC.001	N/A	N/A	3/28/05
C081	Acceptable Knowledge Beryllium Assessment for LA-MIN03-NC.001	N/A	N/A	3/28/05
C082	Interview with David Moss, TA-50 Pretreatment Operation SME	N/A	N/A	2/28/07
C083	Addition of Solidified Inorganic and Organic Process Solids (Waste Stream #LA-CIN02.001 to Acceptable Knowledge Report AK4)	N/A	N/A	3/19/07
C084	Calculation of Individual and Total Radionuclide Masses and Activities for Waste Stream # LA-CIN02.001	N/A	N/A	3/19/07
C085	Acceptable Knowledge Beryllium Assessment for LA-CIN02.001	N/A	N/A	4/9/07
C086	TRU waste drums generated from vacuum filter operations between 1997 and 2000	N/A	N/A	2/20/07
C088	Addition of 82 Containers to Waste Stream LA-MIN03.001	NA	NA	3/12/07
C089	Waste Stream LA-MIN03-NC.001 and LA-MHD03.001 EPA HWN Assignment Comparison	N/A	N/A	5/23/07
C090	Secondary Waste Discussions	N/A	N/A	8/2/07
C091	TRUCON Code Clarification	N/A	N/A	8/8/07
D001	Process Acceptable Knowledge Report for Special Processing at TA-55	TWCP-AK-2.1-007	Rev. 2	5/18/02

Source Document Tracking Number	Title	Document Number	Revision	Date
D002	Process Acceptable Knowledge Report for Pyrochemical Processes at TA-55	TWCP-AK-2.1-006	Rev. 2	5/18/01
D003	Process Acceptable Knowledge Report for Miscellaneous Operations at TA-55	TWCP-AK-2.1-004	Rev. 2	6/18/01
D004	AK Summary Report for Waste Stream TA-50-19, Vacuum Filter Cake	LA-UR-02-6472	Draft	10/4/02
D005	Los Alamos National Laboratory TA-50/21/63 Waste Management Operations Safety Analysis Report, TA-50 Radioactive Liquid Waste Treatment Facility	LA-UR-94-1141	Rev. 1	3/94
D006	Environmental Information Document, Radioactive Liquid Waste Treatment Facility	N/A	Rev. 0	2/27/94
D007	Process Acceptable Knowledge Report for Chloride Operations at TA-55	TWCP-AK-2.1-002	Rev. 2	5/17/01
D008	Characterizing Cemented TRU Waste for RCRA Hazardous Constituents	LA-UR-96-1267	N/A	8/96
D009	Final Project Report, TA-35 Los Alamos Power Reactor Experiment No. II (LAPRE) Decommissioning Project	LA-12464	N/A	2/93
D010	Radioactive Liquid Waste Treatment Facility Secondary Stream Study	LA-UR-00-4332	N/A	9/00
D013	Controlled Air Incinerator for Radioactive Waste, Volume I	LA-UR-82-2282	N/A	11/82
D015	The Los Alamos Controlled Air Incinerator for TRU Waste	LA-UR-89-3598	N/A	11/89
D017	Ready, Set, …Quit! A Review of the Controlled Air Incinerator	LA-UR-96-1102	N/A	5/96
D018	Waste Management Site Plan	LA-UR-80-2836	N/A	10/80
D019	TA-35 RCRA Facility Investigation (RFI) Report	LA-UR-95-0295	N/A	6/96
D020	Best Available Technology Study for the Los Alamos National Laboratory Radioactive Liquid Waste Treatment Facility	LA-UR-94-1510	N/A	10/15/93

Source Document Tracking Number	Title	Document Number	Revision	Date
D021	Final Safety Analysis Report for the Transuranic Contaminated Solid Waste Treatment Development Facility	LA-7971-MS	N/A	7/79
D022	The Los Alamos Controlled Air Incinerator for Radioactive Waste, Volume I: Rationale, Process, Equipment, Performance, and Recommendations	LA-9427	N/A	8/82
D023	1969 Status Report on the Omega West Reactor, with Revised Safety Analysis	LA-4192	N/A	7/69
D024	Ground Water Discharge Plan Application for the TA-50 Radioactive Liquid Waste Treatment Facility	P2010-0065	N/A	8/16/96
D025	Future Radioactive Liquid Waste Streams Study	LA-12667-MS	N/A	11/93
D026	The Omega West Reactor and Water Boiler Building TA-2-1	LA-UR-3854	N/A	8/14/00
D027	Final Project Report, TA-2 Water Boiler Reactor Decommissioning Project	LA-12049	N/A	N/A
D028	Radioactive Liquid Waste Collection System Study	RLWPO/CST-13	Rev. 0	Early 1995
D029	Work Release #24, Study of Alternatives for Radioactive Wastewater Treatment Sludges	N/A	N/A	8/93
D030	Review of Radioactive Liquid Waste Management at Los Alamos	LA-UR-77-1195	N/A	5/77
D031	Characterization of Waste Streams and Suspect Waste from Largest Los Alamos National Laboratory Generators	LA-UR-95-4293	N/A	2/96
D033	A Survey of the Liquid Waste Discharge of NPDES Regulated Chemical Species in the Acid/Rad Lines of the CMR Building (TA-3, SM29)	N/A	N/A	10/15/93
D034	Radioactive Liquid Waste Survey Sigma Building (TA-3 SM-66)	N/A	N/A	8/23/93
D035	Wastewater Stream Characterization for TA 3-29, 154, 503, 1196, 1610, 1614, 1615	N/A	March 1994	10/92
D036	Wastewater Stream Characterization for TA-43	N/A	March 1994	11/92

Source Document Tracking Number	Title	Document Number	Revision	Date
D037	Wastewater Stream Characterization for TA 16-205, 248, 450, 459, 1380, and 1381	N/A	N/A	4/92
D038	Wastewater Stream Characterization for TA-3-216, 1531, 1546, 1579, 1648, 1774, 1775, 1776, 1778, 1782, 1784, 1855, 1937, 1938, 1939, 1940, 1941, 1943, 2031, 2036, 2056, 2058, 2063, 2064, and 2065	N/A	February 1994	11/92
D039	Waste Water Stream Characterization for TA-59	N/A	February 1994	9/92
D040	Wastewater Stream Characterization for TA-2-1, 4, 21, 27, 36, 44, 46, 49, 50, 51, 57, 63, 69, and 70	N/A	N/A	5/93
D041	Wastewater Stream Characterization for TA-3-16, 65, 130, 208, 316, 477, 550, 1228, 1229, 1522, 1538, 1612, 1730, 1731, 1734, 1762, 1898, 1944, 1945, 1946, 1949, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2062, 2130, 2143, 2164	N/A	February 1994	7/92
D043	Wastewater Stream Characterization for TA-3-32, 33, 34, 480, 481, 482, 483, 500, 1543, 1544, 1545, 1552, 1553, 1554, 1565, 1567, 1570, 1571, 1575, 1586, 1599, 1688, 1706, 1712, 1732, 1739, 1741, 1745, 1746, 1747, 1748, 1749, 1750, 1760, 1761, 1767, 1771.	N/A	February 1994	10/92
D044	Wastewater Stream Characterization for TA-3-39, 42, 102, 128, 149, 164, 356, 357, 409, 422, 497, 531, 542, 551, 1635, 1636, 1814, 1847, 1994, 1995, 2012, 2029, 2134, 2135, 2140, and 2141	N/A	March 1994	4/93
D045	Wastewater Stream Characterization for TA 3-35, 67, 141, 145, 147, 159, 160, 161, 169, 187, 317, 541, 1264, 1504, 1514, 1524, 1525, 1796, 2132, and 2165	N/A	February 1994	10/93
D046	TA-55 Plutonium Facility Acceptable Knowledge Report, Nitrate Operations	TWCP-AK-2.1-005	Rev. 2	5/17/01
D047	TA-21 Current and Future Radioactive Liquid Waste Generation-Draft	N/A	N/A	1/94

Source Document Tracking Number	Title	Document Number	Revision	Date
D048	The Weapons Engineering Tritium Facility Final Safety Analysis Report for the Los Alamos National Laboratory Nuclear Weapons Complex	N/A	N/A	6/16/87
D049	Radioactive Liquid Waste Survey of the Radiochemistry Site, TA-48	N/A	N/A	8/18/93
D050	Decontamination and Size Reduction of Plutonium Contaminated Process Exhaust Ductwork and Gloveboxes	LA-UR-97-254	N/A	11/15/96
D051	Safety Assessment for TA-48 Radiochemical Operations	LA-SUB-95-225	N/A	8/94
D054	Work Plan for Mortandad Canyon	LA-UR-97-3291	N/A	9/97
D056	Los Alamos Transuranic Waste Size Reduction Facility	LA-UR-87-1916	N/A	1987
D058	Biological Information Document Radioactive Liquid Waste Treatment Facility	LA-UR-94-1509	N/A	1994
D059	Hazard Identification Worksheets for the Radioactive Liquid Waste Treatment Facility at Technical Area 50, Los Alamos National Laboratory	H&R-458-2	Rev. 1	2/97
D060	Mortandad Canyon Elemental Concentrations in Vegetation, Streambank Soils, and Stream Sediments – 1979	LA-13325-MS	N/A	1979
D063	Technical Safety Requirements for the Radioactive Liquid Waste Treatment Facility	N/A	N/A	4/94
D064	Project Management Plan for Radioactive Liquid Waste Treatment Plant Improvements	N/A	N/A	1977-1978
D067	Radioactive Liquid Waste Treatment Facility Information Package	N/A	N/A	7/28/95
D068	RCRA Part B Permit Application, Volume I	N/A	N/A	11/88
D071	Los Alamos National Laboratory RLWTF Conceptual Design Best Demonstrated Available Technology Evaluation, Technical Memorandum 1 Segregation and Pretreatment	N/A	Draft A	2/15/95
D072	Modification to Design Criteria for Upgrading of Industrial Liquid Waste Treatment Plant	N/A	N/A	Circa 1981

Source Document Tracking Number	Title	Document Number	Revision	Date
D073	Los Alamos TRU Waste Certification Plan for Newly Generated TRU Waste	WCP-HES7-CPL-01	Rev. 2	11/84
D074	Final TRU Waste Inventory Work-Off Plan	LA-UR862932	Revised 12/15/86	8/86
D075	A Newly Continuously Monitored Collection System for Liquid Industrial Wastes	N/A	N/A	10/6/83
D076	Process Acceptable Knowledge Report for Plutonium-238 Operations at TA-55	TWCP-AK-2.1-009	Rev. 0	8/7/01
D077	Process Acceptable Knowledge Report for Metal Operation Processes at TA-55	TWCP-AK-2.1-003	Rev. 2	5/17/01
D078	Acceptable Knowledge Information Summary for LANL Transuranic Waste Streams	AK-00-019	Rev. 1	9/22/03
D079	Acceptable Knowledge Report for Debris Waste Streams Containing Pu-239	TWCP-AK-2.1-015	Rev. 3	4/10/03
D080	LANL Report number LA-11166-MS pp. 8, 9, 14	TWCP-1025	N/A	N/A
D081	LANL Report number LA-13143-MS pp. 5-6, 7-8, 17-18	TWCP-1030	N/A	N/A
D082	TA-55 Final Safety Analysis Report (Entire Document)	TWCP-415	N/A	7/13/95
D083	Acceptable Knowledge Summary for the TA-55 Chloride Operations	TWCP-3567, N-40	N/A	N/A
D085	Cover letter and enclosed report, “Sampling and Analysis Project Validates Acceptable Knowledge on TA-55-43, Lot No. 01”	TWCP-1698	Rev. 0	11/16/98
D089	Wastes from Plutonium Conversion and Scrap Recovery Operations, LA-11069-MS, March 1988	TWCP-352	N/A	3/88
D091	Waste-form development for conversion to Portland cement at Los Alamos National Laboratory (LANL) Technical Area 55 (TA-55), by G.W. Veazey et al. Report LA-13125, October 1996	TWCP-5378	N/A	10/96
D100	Acceptable Knowledge Report for Newly Generated Waste from Metal/Pyrochemical Operations at	TWCP-AK-2.1-017 (LA-UR-02-6906) (TWCP-15421)	N/A	10/22/02

Source Document Tracking Number	Title	Document Number	Revision	Date
D101	Acceptable Knowledge Report for Newly Generated Waste from Miscellaneous Operations at TA-55	TWCP-AK-2.1-014 (LA-UR-02-6904) (TWCP-15419)	N/A	11/18/02
D102	Acceptable Knowledge Summary Report for Waste Streams TA-55-43, TA-55-44, TA-55-45, TA-55-56, TA-55-47	TWCP-AK-2.1-011	Rev. 0	9/20/01
DR001	Resolution of RCRA Discrepancies for Waste Stream LA-MIN03-NC.001	N/A	N/A	4/15/04
DR002	Resolution of Radiological Discrepancies for Waste Stream LA-MIN03-NC.001	N/A	N/A	4/16/04
DR003	Discrepancy Resolution Form for Rigid Liner Type	NA	N/A	4/26/04
DR004	Discrepancy Resolution Form for Containers > 50% Debris	N/A	N/A	5/1/06
DR005	Discrepancy Resolution Form for Layered Residual Liquids, Internal Containers, and Sealed Containers Greater than 4 Liters	N/A	N/A	2/25/07
DR006	Discrepancy Resolution Form for Historical and Current RCRA Characterization and Assignment of EPA Hazardous Waste Numbers	N/A	N/A	3/2/07
DR007	Discrepancy Resolution Form for Reassignment of LA-CIN02.001 Containers	N/A	N/A	5/15/07
DR008	Disrepancy Resolution Form for inter-related discrepancies for drums in Waste Streams LA-MIN03.NC.001 and LA-CIN02.001	N/A	1	6/27/07
DR009	Discrepancy Resolution Form for New Packaging Configuration From Remediation/Repackaging in TA-54 Dome 231 Permacon	N/A	N/A	8/18/07

Source Document Tracking Number	Title	Document Number	Revision	Date
M002	Characterization, Decontamination, and Decontrol Efforts within the Los Alamos Chemistry Metallurgy Research Facility	LA-UR-94-3691	N/A	11/94
M004	NPDES Permit Re-Application, Permit No. NM0029355	NM0028355	N/A	5/98
M006	Facility Check Lists, Plutonium Operations at Los Alamos National Laboratory	N/A	N/A	N/A
M007	Attachments Related to TA-50, Building 1	N/A	N/A	8/94
M010	Presentation on Sigma Electroplating Operations/TA-50 Sludges	N/A	N/A	8/93
M011	Memo to J. Buchholz re: Interlaboratory Comparison of TA-50 Sludge Analysis	N/A	N/A	7/3/90
M012	Evaluation of TA-50 Sludge Waste Form for Compliance with TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant	N/A	N/A	After 1989
M014	Spreadsheet “AKIS Rev 19 Draft”	N/A	N/A	9/16/03
M015	Spreadsheet “Area G MIN03 Data from VA”	N/A	N/A	10/15/03
M018	Spreadsheet “Area G Rad Values from Opp”	N/A	N/A	10/6/03
M025	Tables of Isotopic Composition for Various Material Types	N/A	N/A	10/1/03
M026	Radioactive Solid Waste Disposal (RSWD) Records	N/A	N/A	N/A
M029	LANL Progress Report numbers LA-9170-PR, LA-9672-PR, LA-11217-PR, LA-11220-PR, LA-11346-PR, LA-12236-PR, LA-13258-PR	TWCP-1026	N/A	N/A
M030	TA-55 Document 122-LPN-R00	TWCP-3543, SP-41	Rev. 0	2/10/87
M031	TA-55 Document, 258-MPP-R00-R05	TWCP-3543, SP-18	Rev. 0 – Rev. 5	4/7/89 – 5/21/96
M032	TA-55 Document, 262-MPP-R00-R04	TWCP-3543, SP-19	Rev. 0 – Rev. 4	4/7/89 – No Date
M033	TA-55 Document, 290-MPP-R02-R03	TWCP-3543, SP-22	Rev. 2 – Rev. 3	2/2/87 – 9/14/90
M034	TA-55 Document, 216-MPP-R01-R08	TWCP-3543, SP-7	Rev. 1 – Rev. 8	12/15/88 – 4/30/96

Source Document Tracking Number	Title	Document Number	Revision	Date
M035	TA-55 Document, 215-MPP-R01	TWCP-3543, SP-6	Rev. 1	12/15/88
M036	TA-55 Document, 219-MPP-R01-R07	TWCP-3543, SP-8	Rev. 1 – Rev. 7	12/15/88 – 4/30/96
M037	TA-55 Document, 236-MPP-R00-R06	TWCP-3543, SP-9	Rev. 0 – Rev. 6	No Date – 5/10/96
M038	TA-55 Document, 230-MPP-R01-R08	TWCP-3543, SP-15	Rev. 1 – Rev. 8	No Date – 12/21/95
M039	Americium R&D Facilities, 474-REC-R00	TWCP-3546, M-018	Rev. 0	7/17/79
M040	Process Research and Development Facilities, 474-REC-R01	TWCP-3546, M-019	Rev. 1	8/29/83
M041	Procedure for Eluting Plutonium From Ion Exchange Columns, 473-REC-R00 and R01	TWCP-3567, N-46	Rev. 0 – Rev. 1	8/15/79 – 12/2/82
M042	Slag and Crucible Dissolution Procedure; 424-REC-R00, R03 thru R08	TWCP-3566, N-24	Rev. 0, Rev. 3 – Rev. 8	1/26/78 – 8/26/97
M043	Residue Leaching , 426-REC-R00	TWCP-3567, N-35	Rev. 0	2/27/87
M044	Nitrate Anion Exchange, 461-REC-R00 thru R02	TWCP-3567, N-44	Rev. 0 – Rev. 2	2/25/78 – 11/29/88
M045	Magnetic Separation Research and Development; Magnetic Separation, 460-REC-R00 thru R01	TWCP-3548, N-2	Rev. 0 – Rev. 1	1/30/89 – 11/2/92
M046	Incinerator, 422-REC-R00	TWCP-3548, N-5	Rev. 0	3/1/78
M047	Procedure for Disposal of Oils Containing Recoverable Amounts of Pu in the Form of (U, Pu) Carbides, 431-REC-R00, R01	TWCP-3548, N-10	Rev. 0 – Rev. 1	1/26/78 – No Date
M048	Evaluation of Pu (VI) Reduction by Nitrous Oxide, 493-REC-R00	TWCP-3548, N-16	Rev. 0	No Date
M049	TA-55 Document 440-MPP-R00-R08	TWCP-3542, PYRO-25	Rev. 0 – Rev. 8	1/31/83 – 11/8/95
M050	FAB-MS-2006, Material specification for U-235	TWCP-3541, MET-18	Rev. 0 – Rev. 1	12/20/83 – 5/10/85
M051	FAB-MS-2000, Material specification for U oxide powder, depleted	TWCP-3541, MET-21	Rev. 0 – Rev. 3	6/16/78 – 8/25/88
M052	TA-55 Document, 450-MPP-R04	TWCP-3542, PYRO-9	Rev. 1 – Rev. 4	1/28/87 – 11/22/91
M053	TA-55 Document, 434-MPP-R01	TWCP-3542, PYRO-15	Rev. 0 – Rev. 1	2/24/87 – 7/7/89
M054	Memo from Jim Foxx of TA-55, 1/17/2000	TWCP-3568, N-77	N/A	1/17/00
M055	TA-55 Document, 408-MPP-R05	TWCP-3542, PYRO-1	Rev. 0 – Rev. 5	1/15/87 – 11/22/91

Source Document Tracking Number	Title	Document Number	Revision	Date
M056	TA-55 Document, 410-MPP-R03	TWCP-3542, PYRO-2	Rev. 0 – Rev. 3	11/15/89 – 11/6/92
M057	Recovery of Contaminated Platinum, 430-REC-R00	TWCP-3566, N-22	Rev. 0 – Rev. 1	3/1/78 – No Date
M058	Distillation of AMIX Column Effluents to Reduce Acidity and Volume, 470-REC-R00	TWCP-3566, N-26	Rev. 0	8/21/89
M059	Processing of Contaminated Solids, 420-REC-R00 and R01	TWCP-3566, N-30	Rev. 0 – Rev. 1	2/25/78 – 7/9/84
M060	Dissolution of Materials, 440-REC-R00	TWCP-3566, N-30A	Rev. 0 – Rev. 1	2/25/78 – 12/16/85
M061	Plutonium Metal Dissolution, 441-REC-R00 thru R01	TWCP-3566, N-30B	Rev. 0 – Rev. 1	2/25/78 – N/A
M062	Dissolving Chloride Melt Portion of Electrorefining Residues; Dissolving the Chloride Melt Portion of Salt-Stripping Residue, 444-REC-R00 thru R01	TWCP-3566, N-30E	Rev. 0 – Rev. 1	2/25/78 – 9/26/83
M063	Dissolution of Residues for Ion-Exchange Feed; SOP for the Residue for Ion-Exchange Feed, 447-REC-R00 thru R01	TWCP-3566, N-30F	Rev. 0 – Rev. 1	7/13/79 – 6/30/81
M068	Procedure 474-CLO, all revisions	TWCP-3547, Cl-13	All Revs.	N/A
M069	Procedure 476-CLO, all revisions	TWCP-3547, Cl-14	All Revs.	N/A
M073	Procedure 481-REC, all revisions	TWCP-3547, Cl-18	All Revs.	N/A
M075	Procedure 482-CLO, all revisions	TWCP-3547, Cl-20	All Revs.	N/A
M076	Procedure 483-CLO, all revisions	TWCP-3547, Cl-21	All Revs.	N/A
M078	Interview with Jim Foxx 8/31/99	TWCP-3547, Cl-23	N/A	8/31/99
M079	Interview with Jim Foxx 9/15/99	TWCP-3547, Cl-24	N/A	9/15/99
M080	Interview with Tim Hayes, 1/12/00	TWCP-3547, Cl-26	N/A	1/12/00
M081	Interview with Tim Hayes, 6/1/00	TWCP-3547, Cl-27	N/A	6/1/00
M085	Polystyrene Cube Processing, 437-REC-R00 thru R02	TWCP-3548, N-18	Rev. 0 – Rev. 2	N/A
M086	Preferential Dissolution of Uranium Oxides from a Uranium-Plutonium Oxide Mixture, 445-RE-R00 thru R03	TWCP-3566, N-19	Rev. 0 – Rev. 3	N/A

Source Document Tracking Number	Title	Document Number	Revision	Date
M087	Catalyzed Electrochemical Plutonium Oxide Dissolver (CEPOD), 490-REC-R00 thru R01	TWCP-3566, N-21	Rev. 0 – Rev. 1	N/A
M088	Multipurpose Cascade Dissolver System 489-REC-R00	TWCP-3566, N-25	Rev. 0	N/A
M089	Ash Leaching, 423-REC-R00	TWCP-3566, N-28	Rev. 0	N/A
M090	Leaching of Contaminated Metals in Nitric Acid, 431-REC-R00 and R01	TWCP-3566, N-29	Rev. 0 – Rev. 1	N/A
M091	Pickling or Surface Leaching, 421-REC-R00 and R01; Leaching of Noncombustible Materials in Nitric Acid, 421-REC-R03 thru R09	TWCP-3566, N-31	Rev. 3 – Rev. 9	N/A
M092	Dissolution of Chloride Generated Cake in Nitric Acid; Dissolution of Pu Hydroxide Cake in Nitric Acid, 442-REC-R00 thru R03	TWCP-3566, N-32	Rev. 0 – Rev. 3	N/A
M093	Mediated Electro-Oxidation of Low-Level Organic Waste (formerly Catalyzed Electrochemical Plutonium Oxide Dissolver), 490-REC-R00 thru R01	TWCP-3566, N-33	Rev. 0 – Rev. 1	N/A
M094	Incinerator Ash R&D Facility, 427-REC-R00	TWCP-3567, N-36	Rev. 0	N/A
M095	Dissolution of filter Residues and Glovebox Sweepings in Hot HNO3-HF; Dissolution of filter Residues, Impure Oxide, and Glovebox Sweepings, 446-RE-R00 thru R06	TWCP-3567, N-37	Rev. 0 – Rev. 6	N/A
M096	Dissolution of Impure Plutonium Dioxides, Filter Residues, and Glovebox Sweepings in Hot HNO3-HF, 447-REC-R02	TWCP-3567, N-37A	Rev. 2	N/A
M097	Nitrate Anion Exchange for the Rich Column Material System, 472-REC-R00	TWCP-3567, N-41	Rev. 0	N/A
M098	Nitrate Anion Exchange for the Lean Residue System, 471-REC-R00 thru R02	TWCP-3567, N-42	Rev. 0 – Rev. 2	N/A
M099	Nitrate Anion Exchange for the Rich Residues Ion Exchange Column, 470-REC-R00	TWCP-3567, N-43	Rev. 0	N/A
M100	Nitrate Anion Exchange [for the Dissolved Solids (DS) System] 473-REC-R00 thru R06	TWCP-3567, N-45	Rev. 0	N/A

Source Document Tracking Number	Title	Document Number	Revision	Date
M101	Nitrate Anion Exchange for the Rich-Feed Ion-Exchange System, 495-REC-R00 and R01	TWCP-3567, N-47	Rev. 0 – Rev. 1	N/A
M102	Oxalate Precipitation of Nitrate Solutions, 479-REC-R00 thru R03	TWCP-3567, N-50	Rev. 0 – Rev. 3	N/A
M103	Oxalate Precipitation and Calcination of Ion-Exchange Elutes, 466-REC-R00 thru R03	TWCP-3567, N-51	Rev. 0 – Rev. 3	N/A
M104	Peroxide Precipitation, 480-REC-R00 and R01	TWCP-3567, N-52	Rev. 0 – Rev. 1	N/A
M105	Procedure for Americium Hydroxide Precipitation and Filtration; Filtration of Caustic-Treated Peroxide Filtrates, 469-REC-R00 thru R03	TWCP-3567, N-55	Rev. 0 – Rev. 3	N/A
M106	Oxide Roasting and Blending, 433-REC-R00 thru R01	TWCP-3567, N-57	Rev. 0 – Rev. 1	N/A
M107	Roasting and Blending JR., 443-REC-R00 and 443-REC-R02	TWCP-3567, N-57A	Rev. 0 – Rev. 2	N/A
M108	Roasting and Blending JR., 434-NMT7-R00, R03, R00 (Draft and Final)	TWCP-3567, N-57B	Rev. 0, Rev. 3 (Rev. 0 Draft and Final	N/A
M110	Treatment of Evaporator Bottoms, 485-REC-R00 thru R02	TWCP-3568, N-61	Rev. 0 – Rev. 2	N/A
M111	Computer Operated Nitric Acid Volume Reduction & Treatment of Evaporator Bottoms, 485-REC-R00 thru R03	TWCP-3568, N-62	Rev. 0 – Rev. 3	N/A
M112	Nitric Acid Process Evaporator 485-REC-R04 and R05	TWCP-3568, N-63	Rev. 4 – Rev. 5	N/A
M113	Process Nitric Acid Volume Reduction, 484-REC-R00 thru R02	TWCP-3568, N-64	Rev. 0 – Rev. 2	N/A
M114	TA-55 Document, 407-MPP-R04	TWCP-3542, PYRO-13	Rev. 4	N/A
M115	TA-55 Document, 420-MPP-R05	TWCP-3542, PYRO-14	Rev. 5	N/A
M116	TA-55 Document, 426-MPP-R05	TWCP-3542, PYRP-16	Rev. 5	N/A
M117	Annual/Monthly TA-50 Influent and Effluent Radiological Data Compiled from Facility Reports	N/A	N/A	12/17/03
M121	TA-55 Document, 426-MPP-R08	TWCP-2507	Rev. 8	10/29/98
M145	TA-55 Document, 445-MPP-R06.1	TWCP-3542, PYRO-8	Rev. 0, 1, 2, 3, 5, 6.1, 7	11/24/86 – 8/14/87

Source Document Tracking Number	Title	Document Number	Revision	Date
M148	TA-55 Document, 209-MPP-R00-R01	TWCP-3543, SP-1	Rev. 0 – Rev. 1	4/6/94 – No Date
M149	TA-55 Document, 211-MPP-R00-R04	TWCP-3543, SP-2	Rev. 0 – Rev. 4	12/15/88 – 12/18/91
M150	TA-55 Document, 240-MPP-R00-R07	TWCP-3543, SP-3	Rev. 0 – Rev. 7	3/7/83 – 4/30/96
M151	TA-55 Document, 241-MPP-R01-R08	TWCP-3543, SP-4	Rev. 1 – Rev. 9	3/7/83 – 5/15/96
M153	TA-55 Document, 212-MPP-R01-R06	TWCP-3543, SP-10	Rev. 1 – Rev. 6	12/15/88 – 11/6/92
M154	TA-55 Document, 213-MPP-R01-R09	TWCP-3543, SP-11	Rev. 1, 2, 3, 5-9	12/15/88 – 12/23/97
M155	TA-55 Document, 214-MPP-R01-R07	TWCP-3543, SP-12	Rev. 1 – Rev. 7	12/15/88 – 5/1/96
M156	TA-55 Document, 217-MPP-R01	TWCP-3543, SP-13	Rev. 1	12/15/88
M157	TA-55 Document, 226-MPP-R00	TWCP-3543, SP-14	Rev. 0	No Date
M158	TA-55 Document, 232-MPP-R01-R03	TWCP-3543, SP-16	Rev. 1 – Rev. 3	2/2/89 – 2/27/90
M164	TA-55 Document, 210-MPP-R02	TWCP-3543, SP-25	Rev. 1 – Rev. 2	2/2/89 – 12/15/88
M165	TA-55 Document, 224-MPP-R00	TWCP-3543, SP-26	Rev. 0	No Date
M166	TA-55 Document, 251-MPP-R00-R05	TWCP-3543, SP-27	Rev. 0 – Rev. 5	2/2/89 – 11/10/97
M169	TA-55 Document, 273-CLO-R02, R03, R04	TWCP-3543, SP-30	Rev. 2 – Rev. 4	4/20/92 – 2/24/95
M171	TA-55 Document, 242-MPP-R00-R01	TWCP-3543, SP-33	Rev. 0 – Rev. 1	3/7/83 – 4/15/85
M172	TA-55 Document, 235-MPP-R00	TWCP-3543, SP-34	Rev. 0	No Date
M173	TA-55 Document 422-MPP-R00	TWCP-3543, SP-39	Rev. 0	1/27/87
M176	Process flow diagram for Routine Pu-238 Heat Source Production-Fuel Fabrication, 5/14/98	TWCP-3545, P238-03	N/A	5/14/98
M177	Sampling PuO2 Procedure; HS-CMB11-PP13, Rev. 0 thru Rev. 3; HS-MST11-PP-13, Rev. 4 thru Rev. 10	TWCP-3545, P238-04	Rev. 0 – Rev. 3 & Rev. 4 – Rev. 10	2/20/80 – 4/26/89
M178	Particle Size Analysis of Oxide Powders Procedure, HS-NMT9-PP-42, Rev. 0 thru Rev. 1	TWCP-3545, P238-06	Rev. 0 – Rev. 1	4/12/91 – 12/11/91
M185	Process flow diagram for Recovery of Pu238O2 from Contaminated Iridium	TWCP-3545, P238-14	N/A	6/10/91
M187	Process flow diagram for Pu238 Waste Solidification 2/25/99	TWCP-3545, P238-17	N/A	2/25/99

Source Document Tracking Number	Title	Document Number	Revision	Date
M190	Oxidation of Pu Metal and Alloys Prior to Dissolution; Oxidation of Pu Metal and Alloys; Passivation Furnaces, 429-REC-R00 thru R05	TWCP-3548, N-7	Rev. 0 – Rev. 5	3/1/78 – 12/12/95
M193	Thermal Decomposition of Cellulose Items, 498-REC-R00 thru R02	TWCP-3548, N-12	Rev. 0 – Rev. 2	6/2/95 – 8/15/97
M196	Processing Lapping Oil and Similar Organics, 435-REC-R00	TWCP-3548, N-15	Rev. 0 – Rev. 1	3/1/78 – No Date
M197	Crushing and Pulverizing, 435-REC-R00 thru R05	TWCP-3548, N-17	Rev. 0 – Rev. 5	2/18/87 – 8/25/97
M198	Advanced Testing Line for Actinide Separations (ATLAS) Unit Operations, 491-REC-R00 thru R03	TWCP-3566, N-20	Rev. 0 – Rev. 3	12/23/91 – 8/25/97
M199	Casting Crucible Dissolution, 425-REC-R00 and R01; Four-Inch Cascading Airlift Dissolvers, 425-REC-R00 thru R07	TWCP-3566, N-23	Rev. 0 – Rev. 7	1/26/78 – 8/15/97
M201	Dissolution of High Salt and/or Chloride Contaminated Plutonium Dioxide, 448-REC-R00	TWCP-3566, N-26A	Rev. 0	1/6/88
M202	Distillation of Am IX Column Effluents to Reduce Acidity and Volume, 470-REC-R01	TWCP-3566, N-27	Rev. 1	8/27/84
M203	Dissolution of Oxide Derived from Calcination of Oxalate; SOP for the Dissolution of Oxide Whose Nitrate Solutions are Destined for the Metal Prep Line; The dissolution of Plutonium Dioxide Derived form Calcined Plutonium Oxalate, 442-REC-R00 thru R02	TWCP-3566, N-30C	Rev. 0 – Rev. 2	2/25/78 – 5/23/84
M204	Dissolution of Oxide Derived from Passivation of Carbides, Metal or Casting Skulls, 443-REC-R00	TWCP-3566, N-30D	Rev. 0	2/25/78
M205	Silica Removal from Americium Feed Solutions, 468-REC-R00 and R01	TWCP-3567, N-34	Rev. 0 – Rev. 1	10/6/83 – 11/29/83
M208	Peroxide Precipitation, 464-REC-R00 and R01	TWCP-3567, N-53	Rev. 0 – Rev. 1	2/25/78 – No Date
M210	Volume Reduction of Nitrate Feed Solutions Using a Mini-Evaporator, 496-REC-R00	TWCP-3568, N-65	Rev. 0	10/23/95
M211	Development of Control Charts for the Evaporator Bottoms Newly Generated Waste Stream from TA-55, 3/19/99	TWCP-3568, N-66	N/A	3/19/99

Source Document Tracking Number	Title	Document Number	Revision	Date
M214	Miscellaneous MSDSs	N/A	N/A	1/8/92
M216	P/S diagram, chemical list; process description (p/S OH)	TWCP-3567, N-55	N/A	N/A
M218	Radioactive Solid Waste Disposal (RSWD) Records LA-CIN02.001	N/A	N/A	N/A
M219	CONCERT Database	TWCP-24370	N/A	2/2/05
M220	Acceptable Knowledge Isotopic Ratios (AKIR) database, Versions 2.0 and 2.1.	TWCP-AK-00-20 P2010-0643	N/A	9/22/03
M223	Determination of Flammable Volatile Organic Compounds Concentration for Los Alamos National Laboratory TA-50 Radioactive Liquid Waste Treatment Facility Homogeneous Inorganic Solids Waste Stream LA-MIN03-NC.001	N/A	N/A	9/20/07
M224	Determination of Flammable Volatile Organic Compounds Concentration for Los Alamos National Laboratory TA-50 Radioactive Liquid Waste Treatment Facility Homogeneous Inorganic Solids Waste Stream LA-CIN02.001	N/A	N/A	9/20/07
P001	Los Alamos Scientific Laboratory Administrative Requirements 7-1: Radioactive Solid Waste Management	Section 7, HSE Manual	N/A	10/79
P002	Detailed Operating Procedures, TA-50-1 Main Radioactive Liquid Waste Treatment Plant	LW-CST13-DOP-09	N/A	4/95
P004	Detailed Operating Procedures for Lime and Sodium Hydroxide Operations	DOP-50RLWTF-03	Rev. 8	12/97
P010	Pu238 Waste Solidification, HS-MST11-PP-34, Rev 0; HS-NMT9-PP-34, Rev 1 thru Rev 3	TWCP-3545, P238-16	Rev. 1 - Rev. 3	8/4/86 - 12/9/92
P011	TA-55 Document, 406-GEN-R00	TWCP-3943	Rev. 0	1/26/78 - No Date
P012	Thorium Fluoride Precipitation, 468-REC-R00 and R01	TWCP-3567, N-54	Rev. 0 - Rev. 1	N/A
P013	TA-50 Document, WCP-HSE7-AT-02	WCP-HSE7-AT-02	Rev. 1	1/17/86
P014	Prohibited Item Dispositioning in Dome 231 Permacon	TRU-DOP-0334	Rev. 0 – Rev. 2	9/11/06 - 11/28/06

Figure 1. Location of the LANL Site

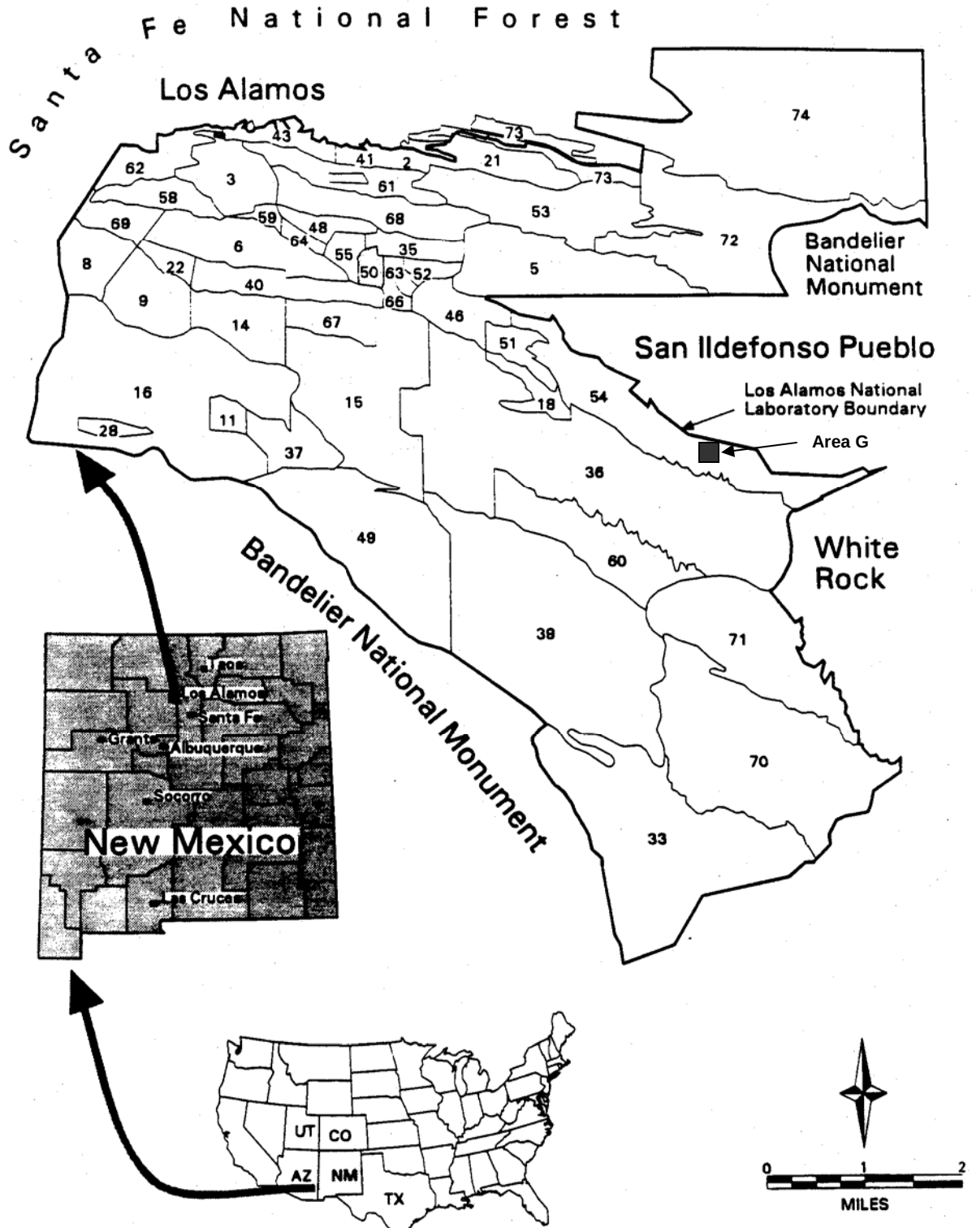

Figure 2. Location of the Building TA-50-01, Radioactive Liquid Waste Treatment Facility

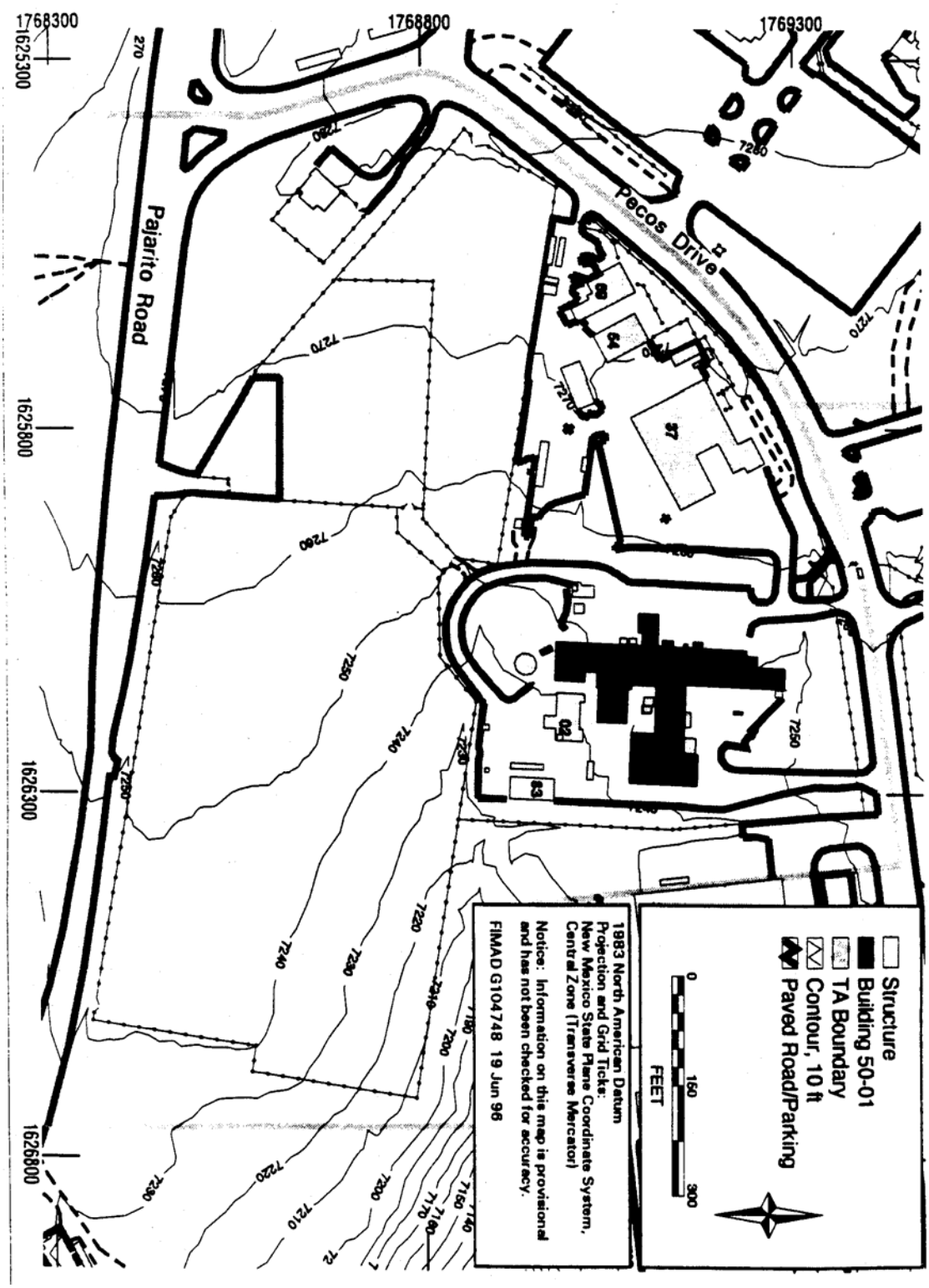

Figure 3. Main Treatment Operation Process Flow Diagram

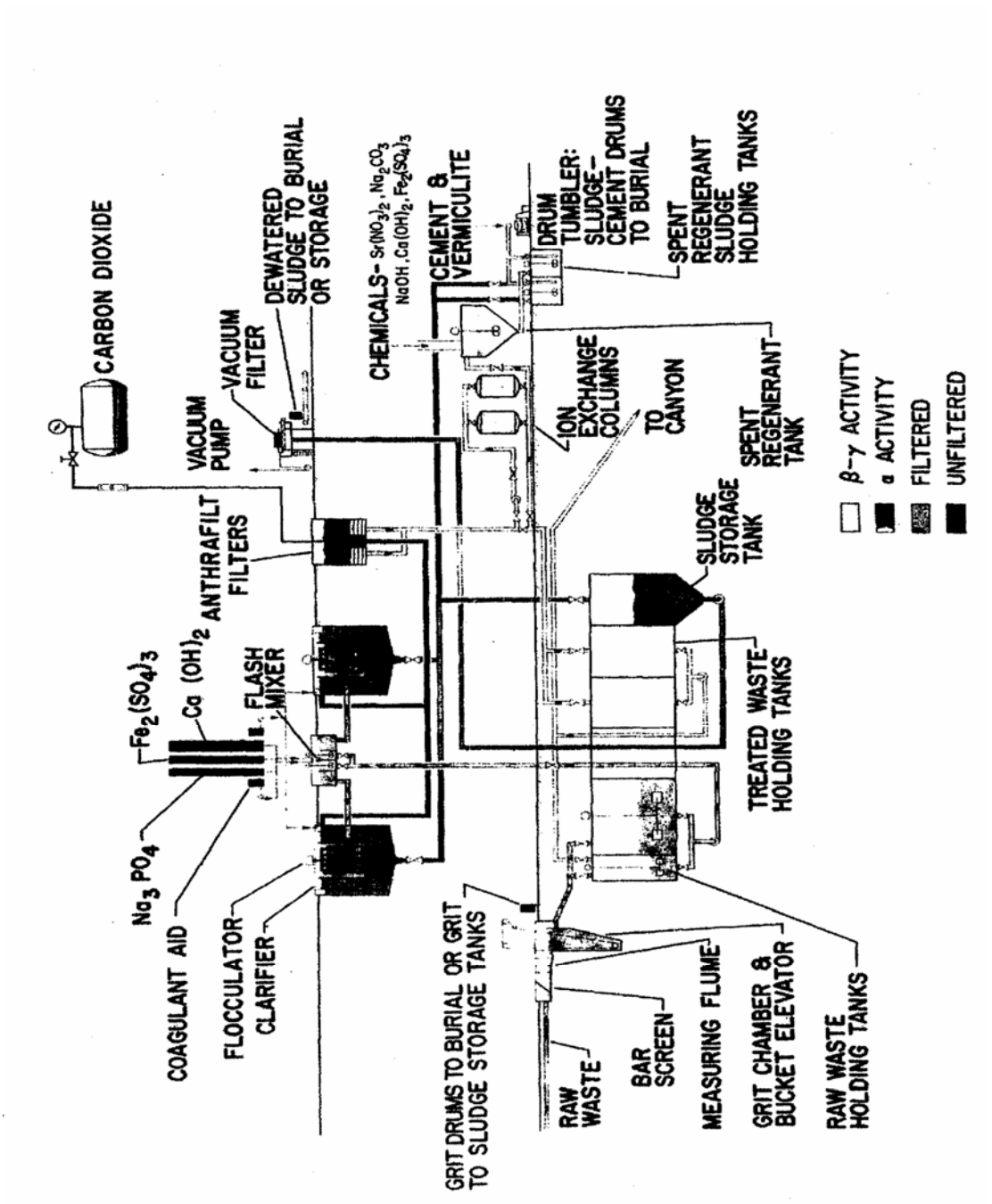

Figure 4. Pretreatment Operation Process Flow Diagram

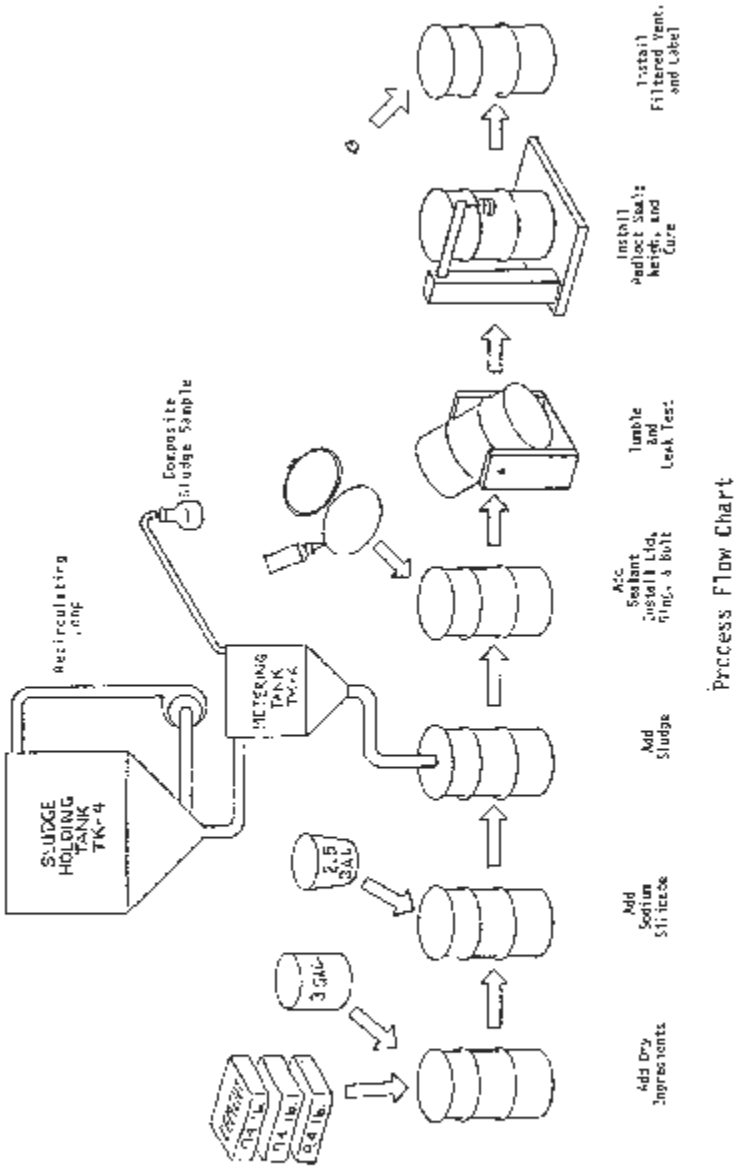

Figure 5. Liquid Radioactive Waste Flow to the RLWTF