ENTERED

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

JUN 27 2012

JUN 2012

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

Subject: Transmittal of Current Revisions of the Advanced Mixed Waste Treatment Project Quality Assurance Project Plan

Dear Mr. Kieling:

This letter is to transmit the Advanced Mixed Waste Treatment Project (AMWTP) *Quality Assurance Project Plan* that has been revised. This notification is transmitted pursuant to the requirements contained in the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit (HWFP), Section C5-2, *Document Review, Approval, and Control.*

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

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

Sincerely,

E Jeminski for

Jose R. Franco, Manager
Carlsbad Field Office

Enclosure

cc: w/enclosure

T. Kliphuis, NMED	* ED
S. Holmes, NMED	ED
R. Maestas, NMED	ED
CBFO M&RC	

*ED denotes electronic distribution

120624

CBFO:NTP:JRS:PG:12-0521:UFC 5486.00

Quality Assurance Project Plan

Advanced Mixed Waste Treatment Project

(Signature on file. See DCR-10657.)
Ed Vokoun
Quality Assurance Manager

06/14/12
Date

DOCUMENT APPROVAL SHEET

Document Type: Compliance Plan **Document Number:** MP-TRUW-8.2

Title: Quality Assurance Project Plan

Author: Gina Tedford **Phone:** (208) 557-6449

Document Owner: Ed Vokoun **Phone:** (208) 557-0946

REVIEW CONCURRENCE AND APPROVAL SIGNATURES

Denote R for review concurrence, A for approval, as appropriate.

Type or Print Name	R/A	Date	Organization Discipline	Mailing Address
Signature				
Eric Schweinsberg Eric Schweinsberg Per e-mail	A	05/10/12	Site Project Manager	850 Energy Drive Idaho Falls, ID 83401-1502
Ed Vokoun Signature on file	A	05/10/12	Site QA Manager	850 Energy Drive Idaho Falls, ID 83401-1502
R. Unger Signature on file	A	06/12/12	DOE-CBFO, Director, Office of Quality Assurance	DOE-CBFO Carlsbad, NM 88221
J. R. Stroble Signature on file	A	06/12/12	DOE-CBFO, Director, Office of the National TRU Program	DOE-CBFO Carlsbad, NM 88221

REVISION LOG

Revision Number	Date Approved	Pages Affected	Description of Revision
0	08/29/02	All	Initial issue. DCR-2002-1171. Document issue date was 08/29/02. DOE/WIPP approval was received 09/09/02 thus the change in effective date to 09/12/02.
1	02/26/03	Various	DCR-1821. Correct procedure titles and numbers. Added DOE-ID to the Document Approval Sheet in accordance with MP-DOCS-18.4. Document issue date was 12/19/02. DOE/WIPP approval was received 02/25/03 thus the change in effective date to 02/26/03.
2	03/10/03	12, 153	DCR-2094. Added changes to the training sections A-7 & B3-14. Document issue date was 03/10/03. DOE/WIPP approval was received 03/17/03. The change in effective date is 03/31/03.
3	08/19/04	Various	DCR-2895: Revised to reflect the addition of new headspace gas sampling system, references to facility procedures and updates to NMED's WAP. Incorporation of CBFO review comments
4	04/18/05	P69	DCR-3280. Add text to P.69, B1-1a(5): "This Section is applicable to the AMWTP such that sampling and analysis may be performed by other contractors. Level I validation will be performed by a subcontractor. Level II validation will be performed by the AMWTP PLV&V group."
5	06/09/05	54, 55	DCR-4365 Incorporation of Class 1 Permit Modification Notification to Revise Language for Compacted 55-Gallon Drums With Rigid Liners, April 27, 2005 and WIPP Memorandum CBFO:OCT:KWW:VW:05-1164-UFC:5822. Incorporated the procedure to implement the UFGTP long-term objective.
6	02/03/06	All	DCR-4640. Periodic Review. Added carbon disulfide to the target analyte list in Table B3-2. Various editorial changes.

Revision Number	Date Approved	Pages Affected	Description of Revision
7	06/01/06	Various	DCR-5039. Change reference to reflect change in contractor. Editorial. BBWI address change. Optional headspace system configuration.
8	01/04/2007	All	DCR-5381. Implementation of the NMED 311 Permit modification. Incorporate CBFO DRR comments, AMWTP organization, OI-34 title change (global), and effective date to 1/24/07
9	08/09/07	Various	DCR-6104. Incorporate WIPP Class 1 Permit modifications, update procedural titles and references, and editorial changes.
10	10/24/07	Various	DCR-6307. Incorporate August 2007 WIPP Class 1 permit modifications.
11	08/29/08	Various	DCR-6887. Incorporate the Class 1 Permit Notifications, July, 2008. Add references to INST-OI-75, INST-OI-81, and CCP procedures. Update organization chart in Figure B5-1.
12	12/22/09	Various	DCR-8769. Annual review: updated the overview, description of the site, project description, and AMWTP organizations and responsibilities, WDS implementation; added characterization and AK of off-site waste, and update analytical lab name and location. Editorial changes consistent with MP-DOCS-18.3.
13	05/27/10	Various	DCR-9164. Incorporate Class 2 PMR change for liquid, VE, and NCRs.
14	12/17/10	Various	DCR-9605. Incorporate the new WIPP Hazardous Waste Permit Renewal structure (attachments and sections from B to C and modules to parts/subparts), revise the definitions of *waste stream* and *ITR*, delete (cis)1, 2-dichloroethylene, clarify the RTR training drum VEE training, RTR independent replicate scan and oversight functions, and AK.

Revision Number	Date Approved	Pages Affected	Description of Revision
15	06/20/11	Various	DCR-10191. Incorporate the Class 2 PMR to add the TRUPACT-III and Standard Large Box 2. Also incorporated editorial comments from the Class 1 permit notification dated 07/11/2011.
16	06/14/12	Various	DCR-10657. Annual review. Added sentence on Page 128. Incorporated ITG BLUESHEET-073. Updated acronyms and references.

TABLE OF CONTENTS

A. INTRODUCTION 1

A-0 Scope 1

A-1 Overview 1

A-2 Description of the Site 2

B. PROJECT DESCRIPTION 2

B-0 AMWTP Organization and Responsibilities 2

C. WASTE ANALYSIS PLAN 5

C-0 Introduction and Highlights 5

C-0a Waste Characterization 7
C-0b AK Sufficiency Determination 9
C-0c Waste Stream Profile Form Completion 12
C-0d Waste Confirmation 12

C-1 Identification of TRU Mixed Waste to be Managed at the WIPP Facility 13

C-1a Waste Stream Identification 13
C-1b Waste Summary Category Groups and Hazardous Waste Accepted at the WIPP Facility 13
C-1c Waste Prohibited at the WIPP Facility 13
C-1d Control of Waste Acceptance 15
C-1e Waste Generating Processes at the WIPP Facility 15

C-2 Waste Characterization Program Requirements and Waste Characterization Parameters 15

C-3 Generator Waste Characterization Methods 17

C-3a Sampling and Analytical Methods 17
C-3b Acceptable Knowledge 19
C-3c Radiography and Visual Examination 19
C-3d Characterization Techniques and Frequency for Newly Generated and Retrievably Stored Waste 20

C-4 Data Verification and Quality Assurance 23

C-4a Data Generation and Project Level Verification Requirements 24

C-5 CBFO Level Waste Stream Screening and Verification of TRU Mixed Waste 28

C-6 CBFO's Waste Shipment Screening QA/QC 35

C-7 Records Management and Reporting 35

C-8 Reporting 36

Attachment C1. Waste Characterization Sampling Methods 53

C1-1 Sampling of Debris Waste (Summary Category S5000) 53

C1-1a Method Requirements 53
C1-1b Quality Control 64
C1-1c Equipment Testing, Inspections, and Maintenance 66
C1-1d Equipment Calibration and Frequency 68

C1-2 Sampling of Homogeneous Solids and Soil/Gravel (Summary Categories S3000/S4000) 69

C1-2a Method Requirements 69
C1-2b Quality Control Requirements 72
C1-2c Equipment Testing, Inspection, and Maintenance 75
C1-2d Equipment Calibration and Frequency 76

C1-3 Radiography 77

C1-4 Visual Examination 79

C1-5 Custody of Samples 81

C1-6 Sample Packing and Shipping 82

Attachment C2. Statistical Methods Used In Sampling and Analysis 93

C2-1 Approach for Selecting Waste Containers for Statistical Sampling 93

C2-1a Statistical Selection of Containers for Totals Analysis 93
C2-1b Statistical Selection of Containers for Headspace Gas Analysis 97

C2-2 Upper Confidence Limit for Statistical Sampling 99

C2-2a Upper Confidence Limit for Statistical Solid Sampling 99
C2-2b Upper Confidence Limit for Statistical Headspace Gas Sampling 100

Attachment C3. Quality Assurance Objectives and Data Validation Techniques for Waste Characterization Sampling and Analytical Methods 102

C3-1 Validation Methods 102

C3-2 Headspace Gas Sampling 108

C3-3 Sampling of Homogeneous Solids and Soils/Gravel 110

C3-4 Non-Destructive Examination Methods 112

C3-5 Gas Volatile Organic Compounds Analysis 114

C3-6 Total Volatile Organic Compound Analysis 116

C3-7 Total Semivolatile Organic Compound Analysis 118

C3-8 Total Metal Analysis 119

C3-9 Acceptable Knowledge 121

C3-10 Data Review, Validation, and Verification Requirements 123

C3-10a Data Generation Level 124
C3-10b Project Level 127
C3-10c CBFO Level 129

C3-11 Reconciliation with Data Quality Objectives 129

C3-11a Reconciliation at the Project Level 129
C3-11b Reconciliation at the CBFO Level 131

C3-12 Data Reporting Requirements 131

C3-12a Data Generation Level 131
C3-12b Project Level 131

C3-13 Nonconformances 134

C3-14 Special Training Requirements and Certifications 135

C3-15 Changes to Plans and Procedures 136

Attachment C4. TRU Waste Characterization Using Acceptable Knowledge 155

C4-1 Introduction 155

C4-2 Acceptable Knowledge Documentation 156

C4-2a Required TRU Mixed Waste Management Program Information 156
C4-2b Required TRU Mixed Waste Stream Information 157
C4-2c Additional Acceptable Knowledge Documentation 159

C4-3 Acceptable Knowledge Training, Procedures, and Other Requirements 160

C4-3a Qualifications and Training Requirements 160
C4-3b Acceptable Knowledge Assembly and Compilation 161

C4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste Stream 162
C4-3d AK Sufficiency Determination Request Contents 163
C4-3e Requirements for Re-Evaluating AK Information 164
C4-3f Acceptable Knowledge Data Quality Requirements 167
C4-3g Audits of Acceptable Knowledge 167

Attachment C5. Quality Assurance Project Plan Requirements 169

C5-1 Quality Assurance Project Plans 169

C5-2 Document Review, Approval, and Control 169

Attachment C6. Audit and Surveillance Program 171

C6-1 Introduction 171

C6-2 Internal Management Assessments and Independent Surveillances 172

Attachment C7. TRU Waste Confirmation 173

C7-1 Permittee Confirmation of TRU Mixed Waste 173

C7-1a Permittee Confirmation of a Representative Subpopulation of the Waste 173
C7-1a(1) Confirmation Training Requirements 174
C7-1b Radiography Methods Requirements 174
C7-1c Visual Examination Methods Requirements 174

C7-2 Noncompliant Waste Identified During Waste Confirmation 176

D. RECORDS PROCESSING 177

E. REFERENCES 177

E-0 AMWTP Documents 177

E-1 CCP Analytical Laboratory Department Documents 178

E-2 External References 179

F. GLOSSARY 182

F-0 Acronyms and Abbreviations 182

FIGURES

Figure B-1. AMWTP Organization. 4

Figure C-1.WIPP waste stream profile form (example only). 48

Figure C-2. Waste characterization process. 50

Figure C-3. TRU mixed waste screening and verification flow diagram. 51

Figure C1-1. Headspace Gas Drum Age Criteria Sampling Scenario Selection Process. 92

Figure C2-1. Approach for Solid and Headspace Gas Sampling and Analysis to Obtain Additional Waste Characterization Information. 101

TABLES

Table C-1. Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste 37

Table C-2. Headspace Target Analyte List and Methods 40

Table C-3. Required Organic Analyses and Test Methods Organized by Organic Analytical Groups 41

Table C-4. Summary of Sample Preparation and Analytical Methods for Metals 42

Table C-5. Summary of Parameters, Characterization Methods, and Rationale for Transuranic Waste (For Both Stored Waste and Newly Generated Waste Unless Otherwise Specified) 43

Table C-6. Required Program Records Maintained in AMWTP Project Files 44

Table C-7. Waste Data System/WIPP Waste Information System Data Fields 45

Table C-8. Waste Tanks Subject to Exclusion. 46

Table C-9. Listing of Permitted Hazardous Waste Numbers. 47

Table C1-1. Gas Sample Requirements 83

Table C1-2. Headspace Gas: Summary of Field Quality Control Sample Frequencies. 83

Table C1-3. Summary of Sampling Quality Control Sample Acceptance Criteria 84

Table C1-4. Sample Handling Requirements for Homogeneous Solids and Soil/Gravel 84

Table C1-5. Headspace Gas Drum Age Criteria Sampling Scenarios 85

Table C1-6. Scenario 1 Drum Age Criteria (In Days) Matrix 85

Table C1-7. Scenario 2 Drum Age Criteria (In Days) Matrix 86

Table C1-8. Scenario 3 Packaging Configuration Groups 87

Table C1-9. Scenario 3 Drum Age Criteria (In Days) Matrix for S5000 Waste by Packaging Configuration Group 89

Table C3-1. Waste Material Parameters and Descriptions 137

Table C3-2. Gas Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives. 138

Table C3-3. Summary of Laboratory Quality Control Samples and Frequencies for Gas Volatile Organic Compound Analysis 139

Table C3-4. Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives 140

Table C3-5. Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compound Analysis 142

Table C3-6. Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives 144

Table C3-7. Summary of Laboratory Quality Control Samples and Frequencies for Semi-Volatile Organic Compounds Analysis 145

Table C3-8. Metals Target Analyte List and Quality Assurance Objectives 146

Table C3-9. Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis 147

Table C3-10. Minimum Training and Qualification 149

Table C3-11.Testing Batch Data Report Contents 150

Table C3-13.Analytical Batch Data Report Contents 153

Table C3-14.Data Reporting Flags 154

Table C5-1. Minimum requirements for review, approval, implementation, and control of QAPjP. 169

A. INTRODUCTION

The Advanced Mixed Waste Treatment Project (AMWTP) characterizes and certifies contact-handled (CH) transuranic (TRU) waste for disposal at the Waste Isolation Pilot Plant (WIPP). The AMWTP has developed this Quality Assurance Project Plan (QAPjP) to comply with the *WIPP Hazardous Waste Facility Permit* (NMED 1999), *Attachment C, Waste Analysis Plan* (WIPP-WAP).The format of this document parallels that of the WIPP-WAP.

A-0 Scope

This QAPjP describes how the characterization and certification requirements of the WIPP-WAP are met at the AMWTP. The Site Project Manager (SPM) will ensure any conflicts between this QAPjP and any existing WIPP-WAP requirements are resolved.

This QAPjP implements the applicable requirements of United States (U.S.) Department of Energy (DOE)/Carlsbad Field Office (CBFO)-94-1012, Quality Assurance Program Document, which identifies the quality of data necessary to maintain quality.

A-1 Overview

The AMWTP is operated under a non-commercial contract with the DOE and is located at the Idaho National Laboratory's (INL) Radioactive Waste Management Complex (RWMC).

The AMWTP plans to dispose of approximately 65,000 m^3 of contact-handled transuranic (CH-TRU) waste at the WIPP. These wastes are byproducts of nuclear weapons production and are identified in terms of waste streams based on the processes that produced them. Each waste stream is assigned to a waste category summary to facilitate Resource Conservation and Recovery Act (RCRA) waste characterization and reflect the final waste forms acceptable for WIPP disposal. TRU mixed waste processed at the AMWTP is currently stored in drums, boxes, and bins in the Transuranic Storage Area (TSA) Retrieval Enclosure (RE) and in Type II storage modules at the RWMC.

The AMWTP has the capability of treating specific waste streams to be retrieved from the TSA-RE and may treat other applicable INL and DOE national waste streams. The majority of TRU mixed waste within the TSA-RE is CH-TRU. Although some remote-handled (RH) TRU waste will be encountered during the retrieval operations, the RH-TRU waste will be segregated from the CH-TRU and will not be shipped to the WIPP for disposal.

Approximately 95% of the TRU waste stored at the RWMC contains hazardous waste regulated under the RCRA. Mixed waste refers to waste that is both radioactive and contaminated by hazardous constituents, and is regulated by both the Atomic Energy Act and RCRA. Some of the waste stored at the RWMC may also contain Toxic Substance Control Act (TSCA)-regulated material such as polychlorinated biphenyls (PCBs) and asbestos.

Capabilities established to support the TRU waste management mission include: storage; characterization (nondestructive examination [NDE], nondestructive assay [NDA], headspace gas sampling [HSGS] and analysis, and solid sampling); and treatment, as appropriate. Transportation and chemical analysis of homogeneous solids are performed by the Central Characterization Project (CCP).

A-2 Description of the Site

The AMWTP is located in the southwest corner of the INL. The INL, located approximately 30 miles west of Idaho Falls, encompasses 900 square miles. Facilities supporting characterization, treatment, certification, and transportation activities are located within the INL at the RWMC.

B. PROJECT DESCRIPTION

Consistent with requirements in the WIPP-WAP, AMWTP uses acceptable knowledge (AK) to initially characterize TRU waste which provides the basis for identifying TRU waste streams eligible for WIPP disposal. A waste stream is defined as waste materials that have common physical form, that contain similar hazardous constituents, and that are generated from a single process or activity.

Once a waste stream has been identified, characterization information must be collected in order to complete and submit the WIPP Waste Stream Profile Form (WSPF) to the CBFO for approval. Waste characterization activities include the following, although not all of these techniques are used on each container: AK, HSGS, and analysis, homogeneous solids waste sampling and analysis, radioassay (RA), real-time radiography (RTR), and visual examination (VE). RA characterization is covered in MP-TRUW-8.1, *Certification Plan for INL Transuranic Waste*. Data generated by these methods are assessed on a waste stream basis or lot. For each waste stream characterized, the SPM determines if sufficient data have been collected to determine the waste parameters required for completion of the WSPF. After a WSPF has been submitted to and approved by CBFO, characterization activities continue on subsequent lots of the waste stream to verify consistency with the WSPF.

B-0 AMWTP Organization and Responsibilities

The AMWTP organization and responsibilities for implementation of the requirements of this QAPjP are described in the following sections. Figure B-1 provides the organization structure.

President and Project Manager has overall responsibility for all aspects of the AMWTP, which includes permitting, operations, characterization, and certification.

Plant Manager is responsible for the production, maintenance, and implementation necessary to support waste treatment and disposal.

TRU Programs Manager is responsible for the management and direction of activities related to the characterization, certification, transportation, and disposal of TRU waste destined for WIPP. The TRU Programs Manager's responsibilities include the following:

- Providing the necessary planning, organization, direction, control, resources, and support to achieve the defined objectives
- Ensuring compliance with all applicable regulations, DOE orders and requirements, and applicable Federal, state, and local laws
- Developing, implementing, and maintaining plans, policies, and procedures that implement WIPP requirements
- Ensuring that adequate technical and quality assurance (QA) training are provided for personnel performing WIPP activities.
- Ensuring that personnel adhere to procedures for the generation, identification, control, and protection of QA records
- Identifying, investigating, reporting, and correcting quality problems.

Site Project Manager has overall responsibility for TRU waste characterization and certification activities and is responsible for the following:

- Development, maintenance, review, and implementation of procedures and reports
- Review and approval of the QAPjP and subsequent revisions
- Waste selection and tracking
- Validation/verification of data
- Reconciliation of data with data quality objectives (DQOs)
- Assignment of EPA hazardous waste numbers (HWNs)
- Preparation and submission of SPM Data Validation Summaries, WSPFs, Characterization Information Summaries, and Waste Stream Characterization Packages (if requested by CBFO)
- Review of the QA/semiannual report, commenting if appropriate, and forwarding a copy of the report with comments to DOE-ID.

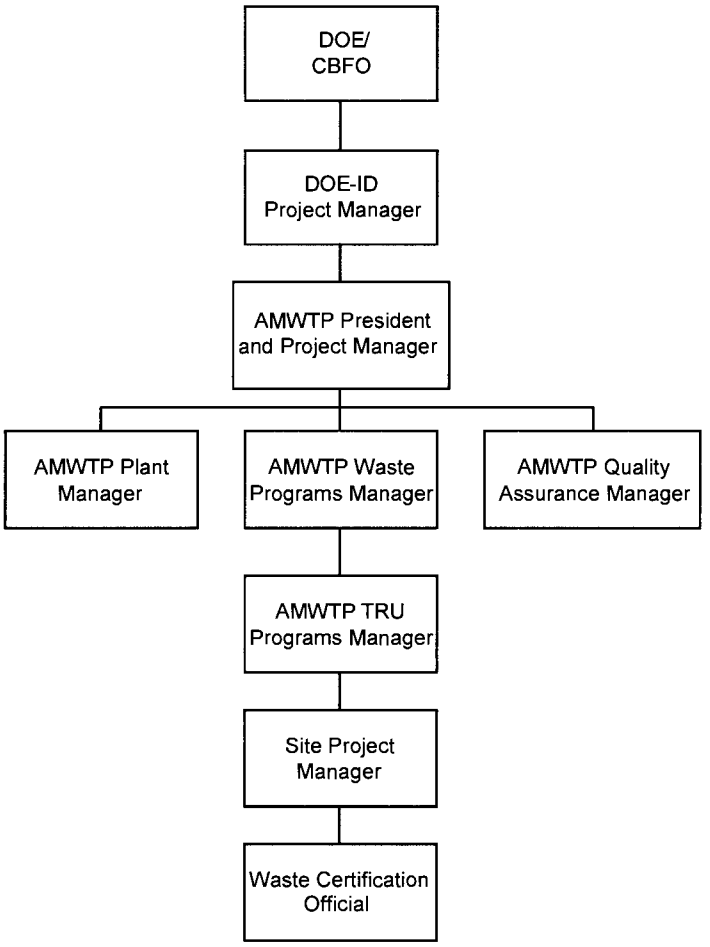


Figure B-1. AMWTP Organization.

C. WASTE ANALYSIS PLAN

C-0 Introduction and Highlights

This QAPjP has been prepared for the management, storage, or disposal activities to be conducted at the WIPP facility to meet the requirements set forth in 20.4.1.500 New Mexico Administrative Code (NMAC; incorporating 40 Code of Federal Regulations [CFR] §264.13). Guidance in the most recent U.S. Environmental Protection Agency (EPA) manual on waste analysis has been incorporated into the preparation of the WIPP-WAP (EPA 1994a). This QAPjP includes test methods, details of planned waste sampling and analysis for complying with the general waste analysis requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.13), a description of the waste shipment screening and verification process, and a description of the quality assurance/quality control (QA/QC) program. The AMWTP will implement the requirements of the WIPP-WAP prior to offering waste for shipment and disposal at WIPP.

TRU mixed wastes stored at the AMWTP were generated by DOE generator/storage sites by various specific processes and activities. Examples of the major types of operations that generated these wastes include:

- Production of Nuclear Products – Production of nuclear products includes reactor operation, radionuclide separation/finishing, and weapons fabrication and radionuclide separation/finishing processes. More specifically, wastes consist of residues from chemical processes, air and liquid filtration, casting, machining, cleaning, product quality sampling, analytical activities, and maintenance and refurbishment of equipment and facilities.

- Plutonium Recovery – Plutonium recovery wastes are residues from the recovery of plutonium-contaminated molds, metals, glass, plastic, rags, salts used in electro refining, precipitates, firebrick, soot, and filters.

- Research and Development (R&D) – R&D projects include a variety of hot cell or glovebox activities that often simulate full-scale operations described above, producing similar TRU mixed wastes. Other types of R&D projects include metallurgical research, actinide separations, process demonstrations, and chemical and physical properties determinations.

- Decontamination and Decommissioning – Facilities and equipment that are no longer needed or usable are decontaminated and decommissioned, resulting in TRU mixed wastes consisting of scrap materials, cleaning agents, tools, piping, filters, Plexiglas, gloveboxes, concrete rubble, asphalt, cinder blocks, and other building materials.

TRU mixed waste contains both TRU radioactive and hazardous components, as defined in Permit Section 1.5.7. TRU and TRU mixed waste are designated and separately packaged as either CH or RH based on the radiological dose rate at the surface of the waste container.

The hazardous components of the TRU mixed waste to be managed at the WIPP are designated in Table C-9. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at WIPP as long as the WIPP Hazardous Waste Permit Treatment, Storage, and Disposal Facility (TSDF) Waste Acceptance Criteria (WAC) in Part 2 are met. This QAPjP describes the measures that will be taken to ensure that the TRU mixed wastes received at the WIPP facility are within the scope of Table C-9 as established by 20.4.1.500 NMAC (incorporating 40 CFR §264), and that they comply with unit-specific requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.600), Miscellaneous Units.

Some TRU waste is retrievably stored at the AMWTP. Additional TRU waste is generated and packaged into containers. Retrievably stored waste is defined as TRU mixed waste generated after 1970 and before the New Mexico Environment Department (NMED) notifies the CBFO, by approval of the final audit report, that the characterization requirements of the WAP have been implemented. Newly generated waste is defined as TRU mixed waste generated after NMED approves the final audit report. Acceptable Knowledge (AK) information is assembled for both retrievably stored and newly generated waste. Waste characterization of retrievably stored TRU mixed waste will be performed on an ongoing basis, as the waste is retrieved. Waste characterization of newly-generated TRU mixed waste is typically performed as it is generated, although some characterization occurs post-generation. Waste characterization requirements for retrievably store and newly-generated TRU mixed waste differ, as discussed in Sections C-3d(1) and C-3d(2).

Waste characterization is defined in Part 1 of the WIPP RCRA Permit as the activities performed by the waste generator to satisfy the general waste analysis requirements of 20.4.1.500 NMAC (incorporating 40 CFR §240.13[a]) before waste containers have been certified for disposal at WIPP. The characterization process for WIPP waste is presented in Figure C-2. AMWTP's waste characterization program was first audited by CBFO in August 2003, with NMED approving the final audit report. After this, AMWTP determines whether AK alone is sufficient for characterization, or whether a Sampling and Analysis Program in conjunction with AK is necessary to adequately characterize wastes. If an AK Sufficiency Determination is sought, information is provided to the CBFO for their review and provisional approval. NMED determination of adequacy of the AK information is required before final approval by the CBFO. If the sampling and analysis route is chosen, AMWTP proceeds to sample and analyze waste in conjunction with AK and in accordance with this QAPjP. Once an AK Sufficiency Determination is obtained, or when required sampling and analysis data are obtained, AMWTP would then prepare and submit the WSPF for CBFO approval. Once the WSPF is approved, AMWTP may ship waste to WIPP. AMWTP will provide sufficient data to allow CBFO to perform waste confirmation prior to shipment of the waste from AMWTP to WIPP pursuant to Section C7 by performing RTR or VE of a representative subpopulation of certified waste containers, to ensure that the wastes meet the applicable requirements of the TSDF-WAC.

C-0a Waste Characterization

Characterization requirements for individual containers of TRU mixed waste are specified on a waste stream basis. A waste stream is defined as waste materials that have common physical form, that contain similar hazardous constituents, and that are generated from a single process or activity. Waste streams are grouped by Waste Matrix Code Groups that relate to the physical and chemical properties of the waste. The AMWTP uses the characterization techniques described in the WIPP-WAP to assign appropriate Waste Matrix Code Groups to waste streams for WIPP disposal. The Waste Matrix Code Groups are solidified inorganics, solidified organics, salt waste, soils, lead/cadmium metal, inorganic nonmetal waste, combustible waste, graphite, filters, heterogeneous debris waste, and uncategorized metal. Waste Matrix Code Groups can be grouped into three Summary Category Groups: Homogeneous Solids (Summary Category S3000), Soil/Gravel (Summary Category S4000), and Debris Waste (Summary Category S5000).

TRU mixed waste are initially categorized into the three broad Summary Category Groups that are related to the final physical form of the waste. Waste characterization requirements for these Summary Category Groups are specified separately in Section C-2 of this document. Each of the three broad groups is described below.

- S3000 – Homogeneous Solids

  Homogeneous solids are defined as solid materials, excluding soil, that do not meet the NMED criteria for classification as debris (20 NMAC 4.1.800 (incorporating 40 CFR §268.2[g] and [h]). Included in the series of homogeneous solids are inorganic process residues, inorganic sludges, salt waste, and pyrochemical salt waste. Other waste streams are included in this Summary Category Group based on the specific waste stream types and final waste form. This Summary Category Group is expected to contain toxic metals and spent solvents. This category includes wastes that are at least 50 percent by volume homogeneous solids.

- S4000 – Soils/Gravel

  This Summary Category Group includes S4000 waste streams that are at least 50 percent by volume soil/gravel. This Summary Category Group is expected to contain toxic metals.

- S5000 – Debris Wastes

  This Summary Category Group includes heterogeneous waste that is at least 50 percent by volume materials that meet the criteria specified in 20 NMAC 4.1.800 (incorporating 40 CFR §268.2[g]). Debris means solid material exceeding a 2.36-inch (60 millimeter [mm]) particle size that is intended for disposal and that is:

  1. A manufactured object, or
  2. Plant or animal matter, or
  3. Natural geologic material.

  Particles smaller than 2.36 inches in size may be considered debris if the debris is a manufactured object and if it is not a particle of S3000 or S4000 material.

If a waste does not include at least 50% of any given Summary Category Group by volume, characterization shall be performed using the waste characterization process required for the category constituting the greatest volume of waste for that waste stream (see Section C-3d).

The AMWTP characterizes waste in accordance with this QAPjP and ensures that waste proposed for storage and disposal at WIPP meets the applicable requirements of the WIPP Hazardous Waste Permit TSDF-WAC. The AMWTP assembles the AK information into an auditable record[a] for the waste stream as described in Attachment C4. For those waste streams with an approved AK Sufficiency Determination, sampling and analysis per the methods described in Attachments C1 and C2 are not required.

All waste characterization activities specified in this QAPjP are carried out at the AMWTP and, as applicable, at the WIPP approved laboratories in accordance with the WIPP-WAP. CBFO will audit generator/storage site waste characterization programs and activities as described in Section C-3. Waste characterization activities at the AMWTP include the following, although not all these techniques will be used on each container, as discussed in Section C-3:

- Real-time radiography, which is an x-ray technique to determine physical contents of containers
- Visual examination of opened containers as an alternative way to determine their physical contents

a. "Auditable Records" are those records which allow the CBFO to conduct a systematic assessment, analysis, and evaluation of the site's compliance with the QAPjP and the WIPP RCRA Permit.

- Headspace-Gas Sampling to determine volatile organic compound (VOC) content of gases in the void volume of the containers

- Sampling and Analysis of waste forms that are homogeneous and can be representatively sampled to determine concentrations of hazardous waste constituents and toxicity characteristic (TC) contaminants of waste in containers

- Compilation of AK documentation into an auditable record.

C-0b AK Sufficiency Determination

AMWTP may submit a request to the CBFO for an AK Sufficiency Determination (Determination Request) to meet all or part of the waste characterization requirements. The contents of the Determination Request are specified in Attachment C4, Section C4-3d. The Determination Request may take one of the following forms:

Scenario 1 Radiography or VE of the waste stream is not required, and Chemical Sampling and Analysis is not required;

Scenario 2 Radiography or VE of the waste stream is not required, but Chemical Sampling and Analysis of a representative sample of the waste stream is required; or

Scenario 3 Chemical Sampling and Analysis is not required, but RTR or VE of 100% of the containers in the waste stream is required.

The CBFO shall evaluate the Determination Request for completeness and technical adequacy. This evaluation shall include, but be limited to whether the Determination Request is technically sufficient for the following:

- The Determination Request must include all information specified in Attachment C4, Section C4-3d.

- The AK Summary must identify relevant hazardous constituents and must correctly identify all TC and listed EPA HWNs.

- All EPA HWN assignments must be substantiated by supporting data and, if not, whether this lack of substantiation compromises the interpretation.

- Resolution of data discrepancies between different AK sources must be technically correct and documented.

- The AK Summary must include all the identification of waste material parameter weights by percentage of the material in the waste stream and determinations must be technically correct.

- All prohibited items specified in the WIPP Hazardous Waste Permit TSDF-WAC should be addressed and conclusion drawn must be technically adequate and substantiated by supporting information.

- If the AK record includes process control information specified in Attachment C4, Section C4-3b, the information should include procedures, waste manifests, or other documentation demonstrating that the controls were adequate and sufficient.

- The AMWTP must provide the supporting information necessary to substantiate technical conclusions within the Determination Request and this information must be correctly interpreted.

The CBFO will review the Determination Request for technical adequacy and compliance with the requirements of the WIPP-WAP, using trained and qualified individuals in accordance with the standard operating procedures that, at a minimum, address all of the technical and procedural requirements listed above. CBFO shall resolve comments with AMWTP and the CBFO may change the scope of the Determination Request to one of the three scenarios.

If CBFO determines that the AK is sufficient, they will inform the public of the Determination Request, the CBFO evaluation of it, and the date and time of a public meeting to provide information to and solicit comments from interested members of the public hearing regarding the Determination Request. Notice of the meeting and comment period shall be provided by the following:

1. Written notice to all individuals on the facility mailing list

2. Public notice in area newspapers, including the *Carlsbad Current-Argus*, *Albuquerque Journal*, and *Santa Fe New Mexican*

3. Notice on the WIPP home page

4. E-mail notification as specified in Permit Section 1.11.

CBFO will take written comment of the Determination Request for at least 30 days following the public meeting. CBFO will compile all comments, including any disagreement between the CBFO and commenters.

If CBFO provisionally approves the Determination Request, they may forward it along with all relevant information submitted with the Determination Request to NMED for an evaluation that the provisional approval made by the CBFO is adequate. CBFO will also provide NMED with a

separate appendix to the Determination Request, the compilation of all comments, and CBFO's response to each comment. After submitting a Determination Request to NMED, the CBFO will post a link to the transmittal letter to NMED on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11. Based on the results of NMED's evaluation, the CBFO will notify the AMWTP whether the AK information is sufficient and the Determination Request is approved. The CBFO will not approve a Determination Request that NMED has determined to be inadequate unless the AMWTP resolves the inadequacies and provides the resolution to NMED for evaluation of adequacy. Should the inadequacies not be resolved to NMED's satisfaction, the CBFO shall not submit a Determination Request for the same waste stream at a later date. CBFO shall not submit a Determination Request if a previous Determination Request is pending evaluation by NMED.

In the event CBFO disagrees, in whole or in part, with an evaluation performed by NMED resulting in a determination by NMED that CBFO's provisional approval for a particular waste stream is inadequate, CBFO may seek dispute resolution. The dispute resolution process is specified in Part 1. The Secretary's final decision under Permit Section 1.16.4 shall constitute a final agency action.

By July 1 of each year, the CBFO will submit to NMED a list of waste streams that CBFO may submit for an AK Sufficiency Determination during the upcoming federal fiscal year. The CBFO will post a link to the transmittal letter to NMED and announce a public meeting to discuss the list with interested members of the public on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11.

If AMWTP does not submit a Determination Request, or if the CBFO does not approve a Determination Request, or if NMED finds that the CBFO's provisional approval of a Determination Request is inadequate, the AMWTP shall perform RTR or VE on 100% of the containers in a waste stream and chemical sampling and analysis on a representative sample of the waste stream using HSGS and analysis (for debris wastes) or solids sampling and analysis (for homogeneous solid or soil/gravel waste) as specified in Attachments C1 and C2.

If AMWTP submits a Determination Request, the CBFO provisionally approves the Determination Request as Scenario 1, and NMED finds that the CBFO's provisional approval is adequate, neither RTR or VE nor chemical sampling and analysis of the waste stream is required.

If AMWTP submits a Determination Request, the CBFO provisionally approves the Determination Request as Scenario 2, and NMED finds that the CBFO's provisional approval is adequate, chemical sampling and analysis of a representative sample of the waste stream is required, but RTR or VE is not required.

If AMWTP submits a Determination Request, the CBFO provisionally approves the Determination Request as Scenario 3, and NMED finds that the CBFO's provisional approval is adequate, RTR or VE of 100% of the containers in the waste stream is required, but chemical sampling and analysis is not required.

C-0c Waste Stream Profile Form Completion

After a complete AK record has been compiled and either a Determination Request has been approved by the CBFO or the AMWTP has completed the applicable representative sampling and analysis requirements specified in Attachments C1 and C2, AMWTP will complete a WSPF and Characterization Information Summary (CIS). The requirements for the completion of a WSPF and a CIS are specified in Attachment C3, Sections C3-12b(1) and C3-12b(2), respectively.

The WSPF and CIS for the waste stream resulting from waste characterization activities are transmitted to the CBFO, who reviews them for completeness and screens them for acceptance prior to loading any TRU mixed waste into the CH or RH Packaging, as described in Section C-4. The review and approval process will ensure the submitted waste analysis information is sufficient to meet the DQOs for AK in Section C-4a(1) and allow the CBFO to demonstrate compliance with the requirements of this QAPjP. Only TRU mixed waste and TRU waste that has been characterized in accordance with the WIPP-WAP and that meets the WIPP Hazardous Waste Permit TSDF-WAC will be accepted at the WIPP facility for disposal. Upon notification of DOE's approval of the WSPF by the CBFO, the AMWTP may be authorized to ship waste to WIPP.

In the event CBFO requests detailed information on a waste stream, the AMWTP will provide a Waste Stream Characterization Package (Section C3-12b[2]). For each waste stream, this package will include the WSPF, the CIS, and the complete AK summary. The Waste Stream Characterization Package will also include specific Batch Data Reports (BDRs) and raw analytical data associated with waste container characterization as requested by CBFO.

C-0d Waste Confirmation

The CBFO will perform waste confirmation on a representative subpopulation of each waste stream shipment after certification and prior to shipment pursuant to Attachment C7. The CBFO will use radiography, review of radiography audio/video recordings, VE, or review of VE records (e.g., VE data sheets or packaging logs), to examine at least 7 percent of each waste stream shipment to confirm that the waste does not contain ignitable, corrosive, or reactive waste. Waste confirmation will be performed by the CBFO prior to shipment of the waste from AMWTP to WIPP.

C-1 Identification of TRU Mixed Waste to be Managed at the WIPP Facility

C-1a Waste Stream Identification

TRU mixed waste destined for disposal at WIPP is characterized on a waste stream basis. The AMWTP delineates waste streams using AK. Required AK is specified in Section C-3b and C4.

All of the waste within a waste stream may not be accessible for sampling and analysis at one time. Attachment C2 addresses the requirements for selecting waste containers used for characterization of waste streams as they are generated or retrieved.

C-1b Waste Summary Category Groups and Hazardous Waste Accepted at the WIPP Facility

Once a waste stream has been delineated, a Waste Matrix Code is assigned to the waste stream based on the physical form of the waste. Waste streams are then assigned to one of three broad Summary Category Groups: S3000-Homogeneous Solids, S4000-Soils/Gravel, and S5000-Debris Wastes. These Summary Category Groups are used to determine further characterization requirements.

The AMWTP ships only those TRU mixed waste streams which have EPA HWNs already listed in Table C-9. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at the WIPP as long as the WIPP Hazardous Waste Permit TSDF-WAC is met. The AMWTP will perform characterization of all waste streams as required by the WIPP-WAP. If during the characterization process, new EPA HWNs are identified; those wastes will not be shipped for disposal to the WIPP facility until the EPA HWN has been added to the WIPP Hazardous Waste permit and AMWTP WSPF.

C-1c Waste Prohibited at the WIPP Facility

The following TRU mixed wastes are prohibited at WIPP and therefore will not be shipped to the WIPP facility for disposal:

- Liquid waste is not acceptable at WIPP. Liquid in the quantities delineated below is acceptable.
  - Observable liquid shall be no more than 1 percent by volume of the outermost container at the time of RTR or VE.
  - Internal containers with more than 60 milliliters or 3 percent by volume observable liquid, whichever is greater, are prohibited.
  - Containers with EPA HWN U134 assigned shall have no observable liquid.

- Overpacking the outermost container that was examined during radiography or visual examination or redistributing untreated liquid within the container shall not be used to meet the liquid volume limits.

- Non-radionuclide pyrophoric materials, such as elemental potassium.
- Hazardous wastes not occurring as co-contaminants with TRU mixed waste (non-mixed hazardous waste).
- Wastes incompatible with backfill, seal and panel closures materials, container and packaging materials, shipping container materials, or other wastes.
- Wastes containing explosives or compressed gases.
- Wastes with PCBs not authorized under an EPA PCB waste disposal authorization.
- Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (EPA HWNs D001, D002, or D003).
- Waste that has ever been managed as high-level waste and waste from tanks specified in Table C-8, unless specifically approved through a WIPP RCRA Permit Modification.
- Any waste container from a waste stream (or waste stream lot), which has not undergone either radiographic examination or VE of a statistically representative subpopulation of the waste stream in each shipment, pursuant to Attachment C7.
- Any waste container from a waste stream, which has not been preceded by an appropriate, certified WSPF (refer to Section C-ld of this document).

Before shipping a container holding TRU mixed waste to the WIPP facility, CBFO will perform waste confirmation activities pursuant to Attachment C7 on each waste stream shipment to confirm that the waste does not contain ignitable, corrosive, or reactive waste and the assigned EPA HWNs are allowed for storage and disposal by the WIPP RCRA Permit. Section C-4 and Attachment C7 include descriptions of the waste confirmation processes that are conducted prior to shipping waste to the WIPP facility.

Containers are vented through filters allowing any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over pressurization or development of conditions within the container that would lead to the development of ignitable, corrosive, reactive, or other characteristic wastes.

To ensure the integrity of the WIPP facility, waste streams identified to contain incompatible materials or materials incompatible with waste containers are not shipped to the WIPP until after they have been treated to remove the incompatibility. Only those waste streams that are compatible or have been treated to remove incompatibilities are shipped to the WIPP.

C-1d Control of Waste Acceptance

Every waste stream shipped to WIPP shall be preceded by a WSPF (Figure C-1) and a CIS. The required WSPF information and the CIS elements are discussed in Section C3-12b(1) and Section C3-12b(2).

The AMWTP provides the WSPF for each waste stream to CBFO for acceptance prior to shipping the waste (refer to MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*) to the WIPP. The WSPF and CIS will be transmitted to CBFO for each waste stream. If continued waste characterization reveals discrepancies that identify different EPA HWNs or indicates that the waste belongs to a different waste stream, the waste is redefined to a separate waste stream, and a new WSPF is submitted. The AMWTP will develop criteria to determine the specific circumstances under which a WSPF is revised, versus when a new WSPF is required. These criteria will be evaluated during site audits (Attachment C6). Any time CBFO requests additional information concerning a waste stream, the AMWTP will provide a Waste Stream Characterization Package. The option to request additional information ensures that waste being offered for disposal is adequately characterized and accurately described in the WSPF.

C-1e Waste Generating Processes at the WIPP Facility

The requirements contained in this section are specific to the WIPP facility. Therefore, these requirements have not been addressed in this document.

C-2 Waste Characterization Program Requirements and Waste Characterization Parameters

AMWTP has developed procedures which specify programmatic waste characterization requirements. CBFO evaluates the procedures during audits conducted under the CBFO Audit and Surveillance Program (Section C-5a[3]), and may also evaluate the procedures as part of the review and approval process of the WSPF. AMWTP must notify CBFO and obtain approval prior to making data-affecting modifications to procedures (Attachment C3, Section C3-15). Program procedures shall address the following minimum elements:

- Waste characterization and certification procedures for retrievably stored and newly generated wastes to be sent to the WIPP facility.

- Methods used to ensure prohibited items are documented and managed. These will include procedures for performing RTR, VE, or treatment, if these methods are used to ensure prohibited items are not present in the waste prior to shipment of the waste to WIPP.

- Procedures used to verify packaging configurations to determine the correct drum age criteria (DAC) if HSGS and analysis is used to collect waste characterization information per Section C1-1a(1) of this QAPjP.

- Identify the organizations responsible for compliance with waste characterization and certification procedures.

- Identify the oversight procedures and frequency of actions to verify compliance with waste characterization and certification procedures.

- Develop training specific to waste characterization and certification procedures.

- Ensure that personnel may stop work if noncompliance with waste characterization or certification procedures is identified.

- Develop a nonconformance process that complies with the requirements in Attachment C3 of this QAPjP to document and establish corrective actions.

- As part of the corrective action process, assess the potential time frame of the noncompliance, the potentially affected waste populations, and the reassessment and recertification of those wastes.

- A list of all approved EPA HWNs which are acceptable at WIPP is included in Table C-9.

For those waste streams or containers that are not amenable to RTR (e.g., RH TRU mixed waste, direct loaded ten-drum overpacks [TDOPs]) for waste confirmation by CBFO pursuant to Attachment C7, AMWTP VE data may be used for waste acceptance. In those cases, the CBFO will review the AMWTP VE procedures to ensure that data sufficient for the CBFO's waste acceptance activities pursuant to Attachment C7 will be obtained and the procedures meet the minimum requirements for VE specified in Attachment C1, Section C1-4.

The following waste characterization parameters are obtained at the AMWTP:

- Determination whether TRU mixed waste streams comply with the applicable provisions of the WIPP Hazardous Waste Permit TSDF-WAC
- Determination whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC incorporating 40 CFR, §261, Subpart C)
- Determination whether TRU mixed waste are listed (20.4.1.200 NMAC incorporating 40 CFR §261, Subpart D)

- Estimation of waste material parameter weights.

Tables C-1, C-2, C-3, and C-4 provide the parameters of interest for the various constituent groupings and analytical methodologies. The following sections provide a description of the acceptable methods to evaluate these parameters for each Summary Category Group.

C-3 Generator Waste Characterization Methods

The characterization techniques used by the AMWTP includes AK and may also include, as necessary, HSGS and analysis, RTR, VE, and homogeneous waste sampling and analysis. AMWTP receives off-site DOE CH-TRU waste that may require generator requested characterization (e.g., solid sampling) or characterization, profiling, and certification by AMWTP for disposal at WIPP. All characterization activities are performed in accordance with this QAPjP. Table C-5 provides a summary of the characterization requirements for TRU mixed waste.

C-3a Sampling and Analytical Methods

C-3a(1) Headspace Gas Sampling and Analysis

Representative HSGS and analysis is used by the AMWTP to determine the types and concentrations of VOCs in the void volume of randomly selected waste containers in order to resolve the assignment of EPA HWNs for those debris waste streams for which an AK Sufficiency Determination Request has not been approved by the CBFO. In addition, VOC constituents are compared to those assigned by AK which may include an analysis of radiolytically derived VOCs. The AMWTP may also consider radiolysis and packaging materials when assessing the presence of hazardous constituents in the headspace gas results, and whether radiolysis would generate wastes which exhibit the TC. Refer to Section C4 for additional clarification regarding EPA HWN assignment and headspace gas results. The methods for random selection of containers for HSGS and analysis are specified in Attachment C2. HSGS and analysis shall be subject to the CBFO Audit and Surveillance Program (Attachment C6).

In accordance with EPA convention, identification of hazardous constituents detected by gas chromatography/mass spectrometry (GC/MS) methods that are not on the list of target analytes shall be reported. These compounds are reported as tentatively identified compounds (TICs) in the analytical BDR and shall be added to the target analyte list if detected in a given waste stream, if they appear in the 20.4.1.200 NMAC (incorporating 40 CFR §261) Appendix VIII, and if they are reported in 25% of the waste containers sampled from a given waste stream. The headspace gas analysis method quality assurance objectives (QAOs) are specified in Section C3.

C-3a(2) Homogeneous and Soil/Gravel Waste Sampling and Analysis

Representative homogeneous and soil/gravel waste sampling and analysis shall be used by AMWTP to resolve the assignment of EPA HWNs for homogeneous and soil/gravel waste streams for which an AK Sufficiency Determination Request has not been approved by the CBFO. Sampling of homogeneous and soil/gravel wastes results in the collection of a sample that is used to resolve the assignment of EPA HWNs. Sampling is accomplished through coring or other EPA approved sampling, which is described in Section C1. For those waste streams defined as Summary Category Groups S3000 or S4000, debris that may also be present within these wastes is not sampled. The waste containers for sampling and analysis are randomly selected from the population of containers for the waste stream. The random selection methodology is specified in Section C2. Homogeneous and soil/gravel sampling and analysis shall be subjected to the CBFO's Audit and Surveillance Program (Attachment C6).

Totals or Toxicity Characteristic Leaching Procedure (TCLP) analyses for VOCs, semivolatile organic compounds (SVOCs), and RCRA-regulated metals (refer to Table C-3 and Table C-4) are used to determine waste parameters and to determine if a waste exhibits a TC for compounds specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. The results from these analyses are used to determine if a waste exhibits a TC. The mean concentration of TC contaminants is calculated for each waste stream such that it can be reported with an upper 90 percent confidence limit (UCL_{90}). The UCL_{90} values for the mean measured contaminant concentrations in a waste stream are compared to the specified regulatory levels in 20 NMAC 4.1.200 (incorporating 40 CFR §261 Subpart C), expressed as total/TCLP values, to determine if the waste stream exhibits a TC. A comparison of total analyses and TCLP analyses is presented in Appendix C3 of the WIPP RCRA Part B Permit Application, and a discussion of the UCL_{90} is included in Section C2. If TC wastes are identified, these will be compared to those determined by AK and TC waste numbers will be revised, as warranted. Refer to Section C4 for additional clarification regarding EPA HWN assignment and homogeneous solid and soil/gravel analytical results.

C-3a(3) Laboratory Qualification

Chemical analysis of AMWTP homogeneous solids/soils is performed by the INL/CCP Analytical Chemistry Laboratory (ACL) which is audited and certified as a separate program and qualified through participation in the Performance Demonstration Program (PDP). Required QAOs are specified in Section C3.

Analytical methods used by CCP (1) satisfy all of the appropriate QAOs, and (2) are implemented through laboratory-documented standard operating procedures. These analytical QAOs are discussed in detail in Section C3 of this document.

C-3b Acceptable Knowledge

AK is used in TRU mixed waste characterization activities in five ways:

- To delineate TRU mixed waste streams
- To assess whether TRU mixed wastes comply with the WIPP Hazardous Waste Permit TSDF-WAC
- To assess whether TRU-mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart C)
- To assess whether TRU mixed wastes are listed (20 NMAC 4.1.200, incorporating 40 CFR §261, Subpart D)
- To estimate waste material parameter weights.

AK is discussed in detail in Section C4, which outlines the minimum set of requirements and DQOs that are met by the AMWTP in order to use AK. In addition, Section C-5a(3) of this QAPjP describes the assessment of AK through the CBFO's Audit and Surveillance Program.

C-3c Radiography and Visual Examination

Radiography and VE are nondestructive qualitative and quantitative techniques used to identify and verify waste container contents as specified in Attachment C1. AMWTP performs RTR or VE on 100 percent of CH-TRU mixed waste containers in waste streams except for those waste streams for which the CBFO approves a Scenario 1 or Scenario 2 Determination Request. No RH-TRU mixed waste will be shipped to WIPP for storage or disposal without documentation of RTR or VE of 100 percent of the containers as specified in Attachment C1.

Radiography and/or VE are used, when necessary, to examine a waste container to verify its physical form. These techniques can detect observable liquid in excess of TSDF-WAC limits and containerized gases, which are prohibited for WIPP disposal. The prohibition of liquid in excess of TSDF-WAC limits and containerized gases prevents the shipment of corrosive, ignitable, or reactive wastes.

Radiography and/or VE are also used to verify that the physical form of the waste matches its waste stream description (i.e., Homogeneous Solids, Soil/Gravel, or Debris Waste [including uncategorized metals]). If the physical form does not match the waste stream description, the waste is designated as another waste stream and assigned the preliminary EPA HWNs associated with that new waste stream assignment. That is, if RTR and/or VE indicate that the waste does not match the waste stream description arrived at by AK characterization, a nonconformance report (NCR) is completed, the inconsistency is resolved as specified in Section C4, and the

NCR will be dispositioned as specified in Section C3-13 of this document. The proper waste stream assignment is determined (including preparation of a new WSPF), the correct EPA HWNs are assigned, and the resolution is documented. Refer to Attachment C4 for a discussion of AK and its verification process.

When VE is used, the detection of any liquid in non-transparent internal containers, detected from shaking the internal container, will be handled by assuming that the internal container is filled with liquid and adding this volume to the total liquid in the container being characterized using VE. The container being characterized using VE will be rejected and/or repackaged to exclude the internal container if it is over the WIPP Hazardous Waste Permit TSDF-WAC limits. When RTR is used, or VE of transparent containers is performed, if any liquid in internal containers is detected, the volume of liquid is added to the total for the container being characterized using RTR or VE.

Radiography, or the equivalent, will be used as necessary on the existing/stored waste containers to verify the physical characteristics of the TRU mixed waste correspond with its waste stream identification/waste stream Waste Matrix Code and to identify prohibited items. Radiographic examination protocols and QA/QC methods are provided in Section C1. Radiography and VE shall be subjected to the CBFO's Audit and Surveillance Program (Attachment C6).

C-3d Characterization Techniques and Frequency for Newly Generated and Retrievably Stored Waste

The AMWTP uses AK to delineate all TRU mixed waste containers into waste streams for the purposes of grouping waste for further characterization. The analyses performed may differ based on the waste stream and the physical form of the waste (i.e., heterogeneous debris waste cannot be sampled for totals analyses). Both retrievably stored and newly generated wastes are delineated in this fashion, though the types of AK used may differ. Section C-3b discusses the use of AK, sampling, and analysis in more detail. AK is discussed more completely in Section C4. Every TRU mixed waste stream will be assigned EPA HWNs based upon AK, and the AMWTP may resolve the assignment of EPA HWNs using headspace gas (Summary Category Group S5000 only) and solid sampling and analysis (Summary Category Groups S3000 and S4000 only).

In the CIS for each waste stream, the AMWTP will document its methods, and the findings from those methods, for determining the physical form of the waste and the presence or absence of prohibited items for both retrievably stored and newly generated waste.

Radiography and/or VE may be used to verify the physical form of retrievably stored TRU mixed waste. For newly generated waste, physical form and prohibited items may either be documented during packaging using VE or verified after packaging using RTR or VE.

For debris waste streams that do not have an AK Sufficiency Determination approved by the CBFO, containers selected in accordance with Attachment C2 from those waste streams are sampled and analyzed for VOCs in the headspace gas. Likewise, a statistically selected portion of homogeneous solids and soil/gravel waste stream are sampled and analyzed for RCRA regulated total VOCs, SVOCs, and metals when those waste streams do not have an AK Sufficiency Determination approved by CBFO. Sampling and analysis methods used for waste characterization are discussed in Section C-3a.

In the process of performing organic headspace and solid sample analyses, nontarget compounds may be identified. These compounds are reported as TICs. TICs reported in 25% of the samples and listed in 20 NMAC 4.1.200 (incorporating 40 CFR §261) Appendix VIII, are compared with AK data to determine if the TIC is in a listed hazardous waste in the waste stream. TICs identified through headspace gas analyses that meet the Appendix VIII list criteria and the 25 percent reporting criteria for a waste stream are added to the headspace gas waste stream target list, regardless of the hazardous waste listing associated with the waste stream. TICs subject to inclusion on the target analyte list that are TC parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, for TC and non-toxic F003 constituents, the AMWTP may take concentration into account when assessing whether to add an EPA HWN. TICs reported from the Totals VOC or SVOC analyses may be excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials or radiolytic degradation from AK documentation.

If the TIC associated with a total VOC or SVOC analysis cannot be identified as a component of waste packaging materials or as a product of radiolysis, the AMWTP will add these TICs to the list of hazardous constituents for the waste stream (and assign additional EPA listed HWNs, if appropriate). For TC compounds and non-toxic F003 constituents, the AMWTP may consider waste concentration when determining whether to change an EPA HWN. Refer to Attachment C3 for additional requirements on TIC identification.

Waste characterization solid sampling and analysis activities may differ for retrievably stored waste and newly generated waste. The waste characterization processes used by the AMWTP for both retrievably stored and newly generated waste streams will be evaluated during the CBFO audit of the site. The typical waste characterization data collection design for each type of waste is described in the following sections. Table C-1 provides a summary of hazardous waste characterization requirements for all TRU mixed waste characterization parameters.

Table C-5 summarizes the parameters, methods, and rationales for stored and newly generated TRU mixed wastes according to their waste forms.

TRU mixed waste that has been repackaged or treated may be shipped to the WIPP facility, but it shall retain the original waste stream's listed EPA HWN designation.

C-3d(1) Newly Generated Waste

The RCRA-regulated constituents in newly generated wastes will typically be documented at the time of generation based on AK for the waste stream. Newly generated TRU mixed waste characterization typically begins with the verification that the processes generating the waste have operated within established written procedures. Waste containers are delineated into waste streams using AK. AMWTP will document the methods used to delineate waste streams in the AK Record and AK Summary Report. Determination that the physical form of the waste (Summary Category Group) corresponds to the physical form of the assigned waste stream may be accomplished either using VE during packaging or by performing RTR as specified in Section C1-3 for retrievably stored waste. Instead of using a video/audio tape and a single operator, the VE method for newly generated waste (or repackaged retrievably stored waste) may use a second operator, who is equally trained to the requirements stipulated in Attachment C1 to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. If the second operator cannot provide concurrence, correct actions[b] are taken as specified in Attachment C3. The subsequent waste characterization activities depend on the assigned Summary Category Group, since waste within the Homogeneous Solids and Soils/Gravel Summary Category Groups may be characterized using different techniques than the waste in the Debris Waste Summary Category Group. The packaging configuration, type and number of filters, and rigid liner vent hole presence and diameter necessary to determine the appropriate DAC in accordance with Attachment C1, Section C1-1, may be documented as part of the characterization information collected during the packaging of newly generated waste or repackaging of retrievably stored waste for those containers of debris waste that will undergo HSGS and analysis.

C-3d(1)(a) Sampling of Newly Generated Homogeneous Solids and Soil/Gravel

When a Determination Request has not been approved by the CBFO, sampling and analysis of newly generated homogeneous solid and soil/gravel waste streams are conducted in accordance with the requirements specified in Attachment C1, Section C1-2. The number of newly generated homogeneous solid and soil/gravel waste containers to be sampled is determined using the procedure specified in Section C2-1, wherein a statistically selected portion of the waste will be sampled.

b. "Corrective Action" as used in the QAPjP does not mean corrective action as defined under HWA, RCRA, and their implementing regulations.

C-3d(2) Retrievably Stored Waste

All retrievably stored waste containers are first delineated into waste streams using AK. The AMWTP documents the methods used to delineate waste streams in the AK record and AK Summary Report in accordance with MP-TRUW-8.13, *Collection, Review, and Management of Acceptable Knowledge Documentation.* Retrievably stored waste containers may be examined using RTR or VE to determine the physical waste form (Summary Category Group), the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Groups (i.e., S3000, S4000, S5000).

The HSGS method provided in Attachment C1 is used, when necessary, to resolve the assignment of EPA HWNs to debris waste streams, as specified in Attachment C4.

A statistically selected portion of retrievably stored homogeneous solids and soil/gravel wastes are sampled and analyzed for total VOCs, SVOCs, and metals, when necessary. The sampling location selection methodology is described in Attachment C2. The sampling methods for these wastes are provided in Attachment C1.

The TC of retrievably stored homogeneous solids and soil/gravel wastes is determined using total analysis of TC parameters or TCLP. To determine if a waste exhibits a TC for compounds specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. Appendix C3 of the WIPP RCRA Part B Permit Application discusses comparability of totals analytical results to those of the TCLP method.

Representativeness of containers selected for HSGS and waste subjected to homogeneous solids and soil/gravel sampling and analysis will be validated by the AMWTP via examination of documentation that shows that random samples were collected. Because representativeness is a quality characteristic that expresses the degree to which a sample or group of samples represent the population being studied, the random sampling of waste streams ensures representativeness. The AMWTP procedure that addresses random selection is MP-TRUW-8.25, *Random Selection of Containers for Headspace Gas and Solids Sampling and Analysis.*

C-4 Data Verification and Quality Assurance

Data validation, usability, and reporting controls are used to ensure that the TRU mixed waste shipped to the WIPP facility for disposal meets WIPP-WAP requirements. Verification steps are taken at three levels: (1) the AMWTP data generation level, (2) the AMWTP project level, and (3) the CBFO level. The validation and verification process and requirements at each level are described in Section C3-10. The verification process at the CBFO level is also described in Section C-5.

C-4a Data Generation and Project Level Verification Requirements

C-4a(1) Data Quality Objectives

The waste characterization data obtained through implementation of the QAPjP will be used to ensure that the waste meets regulatory requirements and to ensure that TRU mixed waste is properly managed during the disposal phase. To satisfy the RCRA regulatory compliance requirements, the following DQOs are established in the WIPP-WAP:

- Acceptable Knowledge
  - To delineate TRU mixed waste streams.
  - To assess whether TRU mixed wastes comply with the applicable requirements of the WIPP Hazardous Waste Permit TSDF-WAC.
  - To assess whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart C).
  - To assess whether TRU mixed wastes are listed (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart D).
  - To estimate waste material parameters weights.
- Headspace Gas Sampling and Analysis
  - To identify VOCs and quantify the concentrations of VOC constituents in waste containers to resolve the assignment of EPA HWNs.
- Homogeneous Waste Sampling and Analysis
  - To compare upper 90% confidence level (UCL_{90}) values for the mean measured contaminant concentrations in a waste stream with specified TC levels in 20 NMAC 4.1.200 (incorporating 40 CFR §261), to determine if the waste is hazardous, and to resolve the assignment of EPA HWNs.
- Radiography
  - To determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that maybe used based on the Summary Category Groups (i.e., S3000, S4000, and S5000).

- Visual Examination
  - To determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Groups (i.e., S3000, S4000, or S5000).

Reconciliation of these DQOs by the SPM or CBFO-approved laboratories, as applicable, is addressed in Attachment C3. Reconciliation requires determining whether sufficient type, quality, and quantity of data have been collected to ensure the DQOs cited above can be achieved (refer to MP-TRUW-8.11, *Data Reconciliation*).

C-4a(2) Quality Assurance Objectives

The AMWTP or CBFO-approved laboratories, as applicable, demonstrate compliance with each QAO associated with the various characterization methods as presented in Attachment C3. The SPM or CBFO-approved laboratories, as applicable, perform a reconciliation of the data with the DQOs established in the WIPP-WAP. The SPM or CBFO-approved laboratories, as applicable, conclude that all of the DQOs have been met for the characterization of the waste stream prior to submitting a WSPF to the WIPP facility for approval (refer to Attachment C3). The following QAO elements are considered for each technique, as a minimum:

- Precision
  - Precision is a measure of the mutual agreement among multiple measurements.
- Accuracy
  - Accuracy is the degree of agreement between a measurement result and the true or known value.
- Completeness
  - Completeness is a measure of the amount of valid data obtained from a method compared to the total amount of data obtained that is expressed as a percentage.
- Comparability
  - Comparability is the degree to which one data set can be compared to another.
- Representativeness
  - Representativeness expresses the degree to which data represent characteristics of a population.

A more detailed discussion of the QAOs, including mathematical representation, where appropriate, can be found in Attachment C3, which describes the QAOs associated with each method of sampling and analysis.

C-4a(3) Sample Control

The AMWTP and CBFO-approved laboratories, as applicable, have implemented a sample handling and control program that includes the maintenance of field documentation records, proper labeling, and a chain-of-custody (COC) record. This QAPjP and CBFO-approved laboratory QAPjPs, as applicable, or procedures referenced in the QAPjP document this program and include COC forms to control the sample from the point of origin to the final analysis result reporting. Details of the AMWTP sample control program are provided in instruction INST-OI-16, *Drum Coring Operations*; INST-OI-73, *Manual Drum Coring Operations*; INST-OI-75, *Container-in-Container Sampling;* INST-OI-43, *HGAS Sampling and Analysis Operations*; MP-TRUW-8.34, *WIPP Sample Transfers*; and Attachment C1 of this QAPjP and are summarized below to include:

- Field documentation of samples including: point of origin, date of sample, container ID, sample type, analysis requested, and COC number
- Labeling and/or tagging including: sample numbering, sample ID, sample date, sampling conditions, and analysis requested
- COC control including: name of sample relinquisher, sample receiver, and the date and time of the sample transfer
- Proper sample handling and preservation.

C-4a(4) Data Generation

Batch Data Reports, in a format approved by the CBFO, are used by the AMWTP and CBFO-approved laboratories, as applicable, for reporting waste characterization data. This format is included in the AMWTP and CBFO-approved laboratory QAPjPs, as applicable, controlled electronic databases, and MP-TRUW-8.8, *Level 1 Data Validation*, which includes all of the elements required by this QAPjP for BDRs (refer to Attachment C3).

The CBFO performs audits of the AMWTP waste characterization program, as implemented by the AMWTP QAPjP, to verify compliance with the WAP and the DQOs in this QAPjP (See Attachment C6 for a discussion of the content of the audit program). The primary functions of these audits are to review AMWTP adherence to the requirements of this QAPjP and ensure adherence to the WAP characterization program. CBFO shall provide the results of the audit to NMED. If audit results indicate that the AMWTP is not in compliance with the requirements of this QAPjP, the CBFO will take appropriate action as specified in Attachment C6.

CBFO further requires all CBFO-approved laboratories analyzing WIPP waste samples to have established, documented QA/QC programs. CBFO annually evaluate these laboratories and their QA/QC programs as part of their participation in the CBFO PDP laboratory performance program. The CBFO audits of the laboratory verify that the laboratories analyzing waste have been properly audited. The laboratory's QA/QC program includes the following:

- Facility organization
- A list of equipment/instrumentation
- Operating procedures
- Laboratory QA/QC procedures
- QA review
- Laboratory records management.

C-4a(5) Data Verification

Batch Data Reports document the testing, sampling, and analytical results from the required characterization activities, and include documentation of required QA/QC activities. Data validation and verification at both the data generation level and the project level are performed before the required data are transmitted to the WIPP facility. Attachment C3 discusses the data validation process in more detail. NMED may request, through the CBFO, copies of any BDR, and/or the raw data validated by the AMWTP, to check the CBFO audit of the validation process.

C-4a(6) Data Transmittal

Batch Data Reports include information required by Section C3-10 and are transmitted by hard copy or electronically (provided a hard copy is available on demand) from the data generation level to the project level. The AMWTP transmits waste container information electronically via the Waste Data System (WDS)/WIPP Waste Information System (WWIS) in accordance with MP-TRUW-8.5, *TRU Waste Certification*. Data is entered into the WDS/WWIS in the exact format required by the database. Refer to Section C-5a(1) for WDS/WWIS reporting requirements and DOE/WIPP-09-3427, *Waste Data System User's Manual*, for WDS/WWIS data fields and format requirements.

Once a waste stream is characterized, the SPM also submits to the WIPP facility a WSPF (Figure C-1) accompanied by the CIS for the waste stream which includes reconciliation with DQOs (refer to Sections C3-12b[1] and C3-12b[2]). The WSPF, the CIS, and information from the WDS/WWIS are used as the basis for acceptance of waste characterization information on TRU mixed waste disposed at WIPP.

C-4a(7) Records Management

Records related to waste characterization activities performed by the AMWTP are maintained in the AMWTP site project files or at the WIPP Records Archive facility.

CBFO-approved laboratories forward testing, sampling, and analytical records along with BDRs, to the AMWTP site project files and to CBFO for inclusion in the WIPP facility operating record. Raw data obtained by testing, sampling, and analyzing TRU mixed waste in support of this QAPjP is identifiable, legible, and provides documentary evidence of quality. Refer to MP-DOCS-18.2, *Records Management,* for a detailed description of records.

An electronic records system, (the equivalent of a CBFO required Records Inventory and Disposition Schedule [RIDS]) has been prepared, approved, and implemented by the AMWTP. All records relevant to an enforcement action under the WIPP Permit, regardless of disposition, are maintained at the AMWTP until NMED determines that the records are no longer needed for enforcement action. The records will then be dispositioned as specified in the approved implementing procedure. All waste characterization data and related QA/QC records for TRU mixed waste to be shipped to the WIPP facility are designated as either Lifetime Records or Non-Permanent Records. Records that are designated as Lifetime Records are maintained for the life of the AMWTP waste characterization program plus six years or transferred for permanent archival storage to the WIPP Records Archive facility.

Waste characterization records designated as Non-Permanent Records are maintained for ten years from the date of (record) generation either at AMWTP or at the WIPP Records Archive facility and then dispositioned according to the requirements defined in MP-DOCS-18.2. If the AMWTP ceases to operate, all records will be transferred before closeout for management at the WIPP Records Archive facility. Table C-6 provides a listing of records designated as Lifetime Records and Non-Permanent Records. Classified information will not be transferred to WIPP. Although the AMWTP expects no classified information, a notation will be provided to CBFO indicating the absence of classified information. The AMWTP will identify appropriate disposition of classified information. Nothing in this QAPjP is intended to, nor should it be interpreted to, require the disclosure of any DOE classified information to persons without appropriate clearance to view such information.

C-5 CBFO Level Waste Stream Screening and Verification of TRU Mixed Waste

CBFO waste screening is a two-phased process. Phase 1 occurs prior to configuring shipments of TRU mixed waste. Phase II occurs after configuration of shipments of TRU mixed waste but before it is disposed at the WIPP facility. Figure C-3 presents Phase I and a portion of Phase II of the TRU mixed waste screening process. Attachment C7 presents the TRU mixed waste confirmation portion of Phase II activities.

C-5a Phase 1 Waste Stream Screening and Verification

The first phase of the waste screening and verification process occurs before TRU mixed waste is shipped to the WIPP facility. Before CBFO begins the process of accepting TRU mixed waste from the AMWTP, an initial audit of the AMWTP is conducted as part of the CBFO Audit and Surveillance Program. The RCRA portion of the AMWTP audit provides on-site verification of characterization procedures; BDR preparation; and recordkeeping to ensure that all applicable provisions of the WAP requirements are met. Another portion of the Phase 1 verification is the WSPF approval process. At the WIPP facility, this process includes verification that all of the required elements of the WSPF and the CIS are present and that the waste characterization information meet the acceptance criteria required for compliance with this QAPjP (Section C3-12b[1]).

After the AMWTP has prepared this QAPjP, which includes applicable WAP requirements, it is submitted to CBFO for review and approval. Once approved, a copy is provided to NMED for examination. The AMWTP will implement the specific parameters of the QAPjP after it is approved. An initial audit was performed after QAPjP implementation and prior to AMWTP being certified for shipment of waste to WIPP. Additional audits, focusing on the results of waste characterization, will be performed at least annually. CBFO has the right to conduct unannounced audits and to examine any records that are related to the scope of the audit. See Section C-5a(3) and Attachment C6 for further information regarding audits.

When the required waste stream characterization data have been collected by the AMWTP and the initial AMWTP audit has been successfully completed, the SPM will verify that the waste stream characterization meets the applicable QAPjP requirements as part of the project level verification (Section C3-10b). If the waste characterization does not meet the applicable requirements of the QAPjP, the mixed waste stream cannot be shipped until those requirements are met. The SPM will then complete a WSPF and submit it to CBFO, along with the accompanying CIS for that waste stream (Section C3-12b[1]). All data necessary to check the accuracy of the WSPF will be transmitted to CBFO for verification. This provides notification that the AMWTP considers that the waste stream (identified by the waste stream identification number) has been adequately characterized for disposal prior to shipment to WIPP. The CBFO compares headspace gas, radiographic, VE, and solid sampling/analysis data obtained subsequent to submittal and approval of the WSPF (and prior to submittal) with characterization information presented on this form. If CBFO determines (through the data comparison) that the characterization information is adequate, the WSPF will be approved. Prior to the first shipment of containers from the approved waste stream, the approved WSPF and accompanying CIS is provided to the NMED. If the data comparison indicates that analyzed containers have hazardous wastes not present on the WSPF, or a different Waste Matrix Code applies, the WSPF is in error and shall be resubmitted. Ongoing WSPF examination is discussed in detail in Section C-5a(2).

Audits of AMWTP are conducted as part of the CBFO's Audit and Surveillance Program (Attachment C6). The RCRA portion of the AMWTP site audit program provides on-site

verification of waste characterization procedure; BDR preparation; and record keeping ensuring that all applicable provisions of the WIPP-WAP requirements are met. As part of the waste characterization data submittal, the AMWTP also transmits the data on a container-by-container basis via the WDS/WWIS. This data submittal can occur at any time as the data are being collected, but will be complete for each container prior to shipment of that container. The WDS/WWIS will conduct internal edit/limit checks as the data is entered and made available to CBFO as supporting information for WSPF review. The initial WSPF check performed by CBFO will include WDS/WWIS data submitted by AMWTP for each waste container submitted for the WSPF review and the CIS. The CBFO will compare ongoing sampling/analysis characterization data obtained and submitted via the WDS/WWIS to the approved WSPF. If this comparison shows that containers have hazardous wastes not reported on the WSPF, or a different Waste Matrix Code applies, the data are rejected and the waste containers are not accepted for shipment until a new or revised WSPF is submitted to and approved by the CBFO.

If discrepancies regarding EPA HWN assignment or Waste Matrix Code designation arise as a result of the Phase 1 review, the AMWTP will be contacted and required to provide the necessary additional information to resolve the discrepancy before the waste stream is approved for disposal at the WIPP facility. If the discrepancy is not resolved, the waste stream will not be approved.

C-5a(1) WDS/WWIS Description

All generator/storage sites planning to ship TRU mixed waste to WIPP will supply the required data to the WDS/WWIS. The WDS/WWIS Data Dictionary includes all of the data fields, the field format, and the limits associated with the data as established by this QAPjP. The data will be subjected to edit and limit checks that are performed automatically by the database as defined in DOE/WIPP-09-3427.

The CBFO will coordinate the data transmission with AMWTP. Actual data transmission will use appropriate technology to ensure the integrity of the data transmissions. The CBFO requires the AMWTP to populate a data structure provided by the CBFO that contains the required data dictionary fields that are appropriate for the waste streams at the site. The CBFO will access the data via the Internet to ensure an efficient transfer of this data.

CBFO uses the WDS/WWIS to verify that all supplied data meet the edit and limit checks prior to shipment of TRU mixed waste to WIPP. The WDS/WWIS notifies the AMWTP if any of the supplied data fails to meet the requirements of the edit and limit checks via an appropriate error message. The AMWTP corrects the discrepancy with the waste or the waste data and re-transmit the corrected data prior to acceptance of the data by the WDS/WWIS. CBFO will review data reported for each container of each shipment prior to providing notification to the AMWTP that the shipment is acceptable. Read-only access is provided to NMED. Table C-7 contains a listing of the data fields contained in the WDS/WWIS that is required as part of this QAPjP.

The WDS/WWIS generates a Waste Emplacement Report, Shipment Summary Report, Waste Container Data Report, and a Change Log Report.

Access to the WDS/WWIS is controlled by CBFO based on approval from management. All data formally accepted by CBFO is protected from indiscriminate change and can only be changed by an authorized Data Administrator (DA).

C-5a(2) Examination of the Waste Stream Profile Form and Container Data Checks

CBFO verifies the completeness and accuracy of the WSPF (Section C3-12b[1]). Figure C-2 includes the waste characterization and waste stream approval process. The assignment of the waste stream description, Waste Matrix Code Group, and Summary Category Groups; the results of waste analyses, as applicable; the AK summary documentation; the method used for characterization; CBFO certification; and appropriate designation of EPA HWN(s) will be examined by CBFO. If the WSPF is inaccurate, efforts will be made to resolve discrepancies by contacting the AMWTP in order for the waste stream to be eligible for shipment to the WIPP facility. If discrepancies in the waste stream are detected at the AMWTP, the AMWTP will implement a non-conformance program in accordance with MP-Q&SI-5.4, *Identification of Nonconforming Conditions*, to identify, document, and report discrepancies (Attachment C3).

The WSPF will pass all verification checks by CBFO in order for the waste to be approved by CBFO for shipment to the WIPP facility. The WSPF check against waste container data will occur during the initial WSPF approval process (Section C-5a).

The EPA HWNs for the waste that appear on the WSPF will be compared to those in Table C-9 to ensure that only approved wastes are accepted for management, storage, or disposal at WIPP. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at WIPP as long as the WIPP Hazardous Waste Permit TSDF-WAC is met. The CIS will be reviewed by the CBFO to verify that the waste has been classified correctly with respect to the assigned EPA HWNs. Any analytical method used will be compared to those listed in Tables C-2, C-3, and C-4 to ensure that only approved analytical methods are used for analysis of the waste. CBFO verifies that the applicable requirements of the WIPP Hazardous Waste Permit TSDF-WAC have been met.

Waste data transferred via the WDS/WWIS after WSPF approval will be compared with the approved WSPF. Any container from an approved hazardous waste stream with a description different from its WSPF will not be managed, stored, or disposed at WIPP.

CBFO will also verify that three different types of data specified below are available for every container holding TRU mixed waste before that waste is managed, stored, or disposed at WIPP.

1. An assignment of the waste stream's waste description (by Waste Matrix Codes) and Waste Matrix Code Group;
2. A determination of ignitability, reactivity, and corrosivity; and
3. A determination of compatibility.

The verification of waste stream description will be performed by reviewing the WDS/WWIS for consistency in the waste stream description and WSPF. The CIS will indicate if the waste has been checked for the characteristics of ignitability, corrosivity, and reactivity. The final verification of waste compatibility is performed using Appendix C1 of the WIPP RCRA Part B Permit Application, the compatibility study.

Any container with unresolved discrepancies associated with hazardous waste characterization will not be managed, stored, or disposed at the WIPP facility until the discrepancies are resolved. If the discrepancies cannot be resolved, the CBFO will revoke the approval status of the waste stream, suspend shipments of the waste stream, and notify NMED. Waste stream approval will not be reinstated until the AMWTP demonstrates all corrective actions have been implemented and the AMWTP program is reassessed by CBFO.

C-5a(3) CBFO's Audit and Surveillance Program

An important part of CBFO's verification process is the CBFO's Audit and Surveillance Program. The focus of this audit program is compliance with the QAPjP and the WIPP Permit. This audit program addresses all AK implementation and waste sampling and analysis activities, from waste stream classification assignment through waste container certification, and ensures compliance with standard operating procedures and the QAPjP. Audits will ensure that containers and their associated documentation are adequately tracked throughout the waste handling process. Operator qualifications will be verified, and implementation of QA/QC procedures will be surveyed. A final report that includes AMWTP or CBFO-approved laboratory audit results and applicable WIPP-WAP-related corrective action report (CAR) resolution will be provided to NMED for approval.

Audits will be performed at least annually, including the possibility of unannounced audits (i.e., not a regularly scheduled audit).

C-5b Phase II Waste Shipment Screening and Verification

As presented in Figure C-3, Phase II of the waste screening and verification process begins with confirmation of the waste pursuant to Attachment C7 after waste shipments are configured. After the waste shipment has arrived at WIPP, CBFO screens the shipments to determine the completeness and accuracy of the EPA Hazardous Waste Manifest and land disposal restriction notice completeness. CBFO will verify there are no waste shipment irregularities and the waste containers are in good condition. Only those waste containers that are from shipments that have been confirmed pursuant to Attachment C7 and that pass all Phase II waste screening and verification determinations will be emplaced at WIPP. For each container shipped, the AMWTP provides the following information:

Hazardous Waste Manifest Information

- Generator/storage site name and EPA ID
- Generator/storage site contact name and phone number
- Quantity of waste
- List of up to six state and/or EPA HWNs in each line item
- List of all container IDs (Shipping Package serial number)
- Signature of authorized generator representative.

Specific Waste Container Information

- Waste Stream Identification Number
- List of EPA HWNs per container
- Certification date
- Shipping data (Assembly numbers, ship date, shipping category, etc.).

This information is also supplied electronically to the WDS/WWIS. The container-specific information is supplied as described in Section C-5a(1), and is supplied prior to shipment.

C-5b(1) Examination of the EPA Uniform Hazardous Waste Manifest and Associated Waste Tracking Information

Upon receipt of a TRU mixed waste shipment, CBFO will make a determination of EPA Uniform Hazardous Waste Manifest (UHWM) completeness. For CH-TRU mixed waste, the CBFO will then make a determination of waste shipment completeness by checking the unique, barcode identification number found on each container holding TRU mixed waste against the WDS/WWIS database after opening the Shipping Package.

For shipments in the RH-TRU 72B cask, the identification number of the single payload container is read during cask-to-cask transfer in the Transfer Cell and then checked against the WDS/WWIS database. For shipments in the CNS 10-160B cask, CBFO will make a determination of waste shipment completeness by checking the unique identification number found on each container holding TRU mixed waste in the Hot Cell against the WDS/WWIS database after unloading the cask.

Manifest discrepancies may be identified during manifest examination and container barcode WDS/WWIS data comparison. A manifest discrepancy is a difference between the quantity or type of hazardous waste designated on the manifest and the quantity or type of hazardous waste the WIPP facility actually receives. The AMWTP technical contact (as listed on the manifest) will be contacted to resolve the discrepancy. Errors on the manifest can be corrected by the WIPP facility with a verbal (followed by a mandatory written) concurrence by the AMWTP technical contact. All discrepancies that are unresolved within fifteen days of receiving the waste at the WIPP facility will be immediately reported to the NMED in writing by CBFO. If the manifest discrepancies have not been resolved within thirty days of waste receipt, the shipment will be returned to the AMWTP.

C-5b(2) Examination of the Land Disposal Restriction Notice

With the initial shipment of a TRU mixed waste stream, AMWTP will provide WIPP with a notice that the waste is not prohibited from land disposal (The Land Disposal Restriction [LDR] Notice). The Notice will be prepared per the requirements of 20 NMAC 4.1.800 (incorporating 40 CFR 268.7[a][4]). The LDR Notice information includes:

- EPA HWN(s) and manifest number of first shipment of a mixed waste stream
- Date the waste is subject to prohibition
- Statement that the waste is not prohibited from land disposal at WIPP.

This information is the applicable information taken from column "268.7(a)(4)" of the "Generator Paperwork Requirements Table" in 20.4.1.800 NMAC (incorporating 40 CFR 268.7[a][4]). Note that item "5" from the "Generator Paperwork Requirements Table" is not applicable since waste analysis data are provided electronically via WDS/WWIS and item "7" is not applicable, since waste designated by the Secretary of Energy for disposal at WIPP is exempted from the treatment standards.

CBFO will review the LDR notice for accuracy and completeness. The AMWTP will prepare this notice in accordance with the applicable requirements of 20.4.1.800 NMAC (incorporating 40 CFR 268.7[a][4]).

C-5b(3) Verification

This is a CBFO function.

C-6 CBFO's Waste Shipment Screening QA/QC

This is a CBFO function.

C-7 Records Management and Reporting

As part of the WIPP facility's operating record, data and documents associated with waste characterization and waste confirmation activity records are managed in accordance with MP-DOCS-18.2.

The storage of the AMWTP's copy of the manifest, LDR information, waste characterization data, WSPFs, waste confirmation activity records, and other related records are identified on an electronic records system, (the equivalent of a CBFO-required RIDS).

C-7a General Requirements

- Records are legible.
- Corrections are made with a single line through the incorrect information, and the date and initial of the person making the correction are added.
- Black ink is encouraged, unless a copy test has been conducted to ensure the other color ink will copy.
- Use of highlighters on records is discouraged.
- Records are reviewed for completeness.
- Records are validated by the cognizant manager or designee.

C-7b Records Storage

- Active records are stored when not in use
- Quality records are kept in one-hour (certified) fire-rated container or a copy of a record is stored separately (sufficiently remote from the original) in order to prevent destruction of both copies as a result of a single event such as fire or natural disaster
- Unauthorized access to the records is controlled by locking the storage container or controlling personnel access to the storage area.

C-8 Reporting

This is a CBFO function.

Table C-1. Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste[a].

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Physical Waste Form Summary Category Names S3000 Homogeneous Solid S4000 Soil/Gravel	**RTR/Visual Examination** Retrievably Stored Waste Radiography (RTR) Visual Examination (VE)	**RTR/Visual Examination** (Refer to Section C1-3 and Section C3-4) Retrievably Stored Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	**RTR/Visual Examination** Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Newly Generated Waste Visual Examination Radiography (RTR)	Newly Generated Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Newly Generated Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Repackaging of Retrievably Stored Waste Visual Examination	Repackaging of Retrievably Stored Waste INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations* INST-FOI-17, *Facility Visual Examination Operations*	Repackaging of Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*

Table C-1. (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Summary Category Names S5000 Debris Waste	Retrievably Stored Waste Radiography (RTR) Visual Examination	Retrievably Stored Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Newly Generated Waste Radiography (RTR) Visual Examination	Newly Generated Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Newly Generated Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Repackaging of Retrievably Stored Waste Visual Examination	Repackaging of Retrievably Stored Waste INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Repackaging of Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*

Table C-1. (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Total Semivolatile Organic Compounds Cresols 1,4-Dichlorobenzene [c] 1,2-Dichlorobenzene [c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Pentachlorophenol Pyridine [c]	**Total Semivolatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8270 Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Sample Collection** INST-OI-16, *Drum Coring Operations* INST-OI-73, *Manual Drum Coring Operations* INST-OI-75, *Container-in-Container Sampling* **Analysis** (refer to Section C3) CCP-TP-187, *Sample Preparation for Semi-volatile Compounds* CCP-TP-185, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*	**Analysis** CCP-TP-188, *Analytical Data Recording, Review, and Reporting* MP-TRUW-8.9, *Level II Data Validation*
Total Metals Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc	**Total Metals Analysis** TCLP, SW-846 1311 ICP- MS, SW-846 6020, ICP Emission Spectroscopy, SW-846 6010 Atomic Absorption Spectroscopy , SW-846 7000 Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Sample Collection** INST-OI-16, *Drum Coring Operations* INST-OI-73, *Manual Drum Coring Operations* INST-OI-75, *Container-in-Container Sampling* **Analysis** (refer to Section C3-8) CCP-TP-183, *CCP Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel* CCP-TP-182, *CCP Determination of Metals by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) for TRU Waste Characterization* CCP-TP-181, *CCP Determination of Mercury by CVAA for TRU Waste Characterization*	**Analysis** CCP-TP-188, *Analytical Data Recording, Review, and Reporting* MP-TRUW-8.9, *Level II Data Validation*

a. Permit Attachment C
b. Required only for homogeneous solids and soil/gravel waste from Savannah River Site to resolve the assignment of EPA HWNs.
c. Required only for homogeneous solids and soil/gravel waste from Oak Ridge National Laboratory and Savannah River Site to resolve the assignment of EPA HWNs.
d. Can also be analyzed as a semi-volatile organic compound.
e. Can also be analyzed as a volatile organic compound
f. Required only to resolve the assignment of EPA HWNs to debris waste streams.
g. Required only to resolve the assignment of EPA HWNs to homogeneous sold and soil/gravel waste streams.

Table C-2. Headspace Target Analyte List and Methods[b].

PARAMETER	EPA SPECIFIED ANALYTICAL METHOD
Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform Cyclohexane [c] 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene (trans)-1, 2- Dichloroethylene Ethyl benzene Ethyl ether Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane 1,2,4-Trimethylbenzene [c] 1,3,5-Trimethylbenzene [c] Xylenes	EPA: Modified TO-14A or TO-15[a]; Modified 8260 EPA - Approved FTIRS
Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	EPA: Modified TO-14A or TO-15[a]; Modified 8260 Method 8015 EPA - Approved FTIRS

a., Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition (EPA 1999). The most current revision of the specified methods may be used.
b. Required only for debris waste when required to resolve the assignment of EPA HWNs.

Table C-3. Required Organic Analyses and Test Methods Organized by Organic Analytical Groups[e].

ORGANIC ANALYTICAL GROUP	REQUIRED ORGANIC ANALYSES	EPA SPECIFIED ANALYTICAL METHOD [a, d]
Nonhalogenated VOCs	Acetone Isobutanol Benzene Methanol n-Butanol Methyl ethyl ketone Carbon disulfide Toluene Ethyl benzene Xylenes Ethyl ether Formaldehyde Hydrazine[b]	8015 8260 8315A
Halogenated VOCs	Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dichloroethane 1,1-Dichloroethylene (trans)-1, 2- Dichloroethylene Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene 1,1,2-Trichloroethane 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl Chloride	8015 8260
SVOCs	Cresols (o, m, p) 1,2-Dichlorobenzene[c] 1,4-Dichlorobenzene[c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Pentachlorophenol Pyridine[c]	8270

a. , "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition. (EPA 1996)
b. Generator/Storage Sites will have to develop an analytical method for hydrazine. This method will be submitted to the CBFO for approval.
c. These compounds may also be analyzed as VOCs by SW-846 Method 8260.
d. TCLP (SW-846 Method 1311) may be used to determine if compounds in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C) exhibit a TC.
e. Required only to resolve the assignment of EPA HWNs.

Table C-4. Summary of Sample Preparation and Analytical Methods for Metals.

PARAMETERS	EPA SPECIFIED ANALYTICAL METHODS [a, b, c]
Sample Preparation	3051, or equivalent, as appropriate for analytical method
Total Antimony	6010, 6020, 7000, 7010, 7062
Total Arsenic	6010, 6020, 7010, 7061, 7062
Total Barium	6010, 6020, 7000, 7010
Total Beryllium	6010, 6020, 7000, 7010
Total Cadmium	6010, 6020, 7000, 7010
Total Chromium	6010, 6020, 7000, 7010
Total Lead	6010, 6020, 7000, 7010
Total Mercury	7471
Total Nickel	6010, 6020, 7000, 7010
Total Selenium	6010, 7010, 7741, 7742
Total Silver	6010, 6020, 7000, 7010
Total Thallium	6010, 6020, 7000, 7010
Total Vanadium	6010, 7000, 7010
Total Zinc	6010, 6020, 7000, 7010

a. "Test Methods for Evaluating Solid Waste," Laboratory Manual Physical/Chemical Methods, SW 846, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1996)

b. TCLP (SW-846 Method 1311) may be used to determine if compounds in 20 NMAC 4.1.200 (incorporating 40 CFR 261, Subpart C) exhibit a TC.

c. Required only for homogeneous solids and soil/gravel to resolve the assignment of EPA HWNs.

Table C-5. Summary of Parameters, Characterization Methods, and Rationale for Transuranic Waste (For Both Stored Waste and Newly Generated Waste Unless Otherwise Specified).

WASTE MATRIX CODE SUMMARY CATEGORIES	WASTE MATRIX CODE GROUPS	CHARACTERIZATION PARAMETER	METHOD	RATIONALE
S3000-Homogeneous Solids S4000-Soil/Gravel	• Solidified inorganics • Salt waste • Solidified organics •Contaminated soil/debris	Physical waste form	Acceptable Knowledge, Radiography and/or Visual Examination.	• Determine waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits,, no incompatible wastes, no compressed gases)
		Hazardous constituents • Listed • Characteristic	**Retrievably Stored** Acceptable Knowledge or Statistical Sampling [a] (see Tables C-3 and C-4) **Newly Generated** Statistical Sampling [a] (see Tables C-3 and C-4)	• Determine characteristic metals and organics • Resolve the assignment of EPA HWNs
S5000–Debris Waste	• Uncategorized metal (metal waste other than lead/cadmium) • Lead/cadmium waste • Inorganic nonmetal waste • Combustible waste • Graphite waste • Heterogeneous debris waste • Composite filter waste	Physical waste form	Acceptable Knowledge, Radiography and/or Visual Examination.	• Determine waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits, no incompatible wastes, no compressed gases)
		Hazardous constituents • Listed • Characteristic	Statistical Gas Sampling and Analysis[a] (See Table C-2)	• Resolve the assignment of EPA HWNs
		Hazardous constituents • Characteristic	Acceptable knowledge	• Determine characteristic metals and organics

a. Applies to waste streams that require sampling.

Table C-6. Required Program Records Maintained in AMWTP Project Files.

LIFETIME RECORDS
· Field sampling data forms · Field and laboratory COC forms · Test facility and laboratory batch data reports · Waste Stream Characterization Package · Sampling Plans · Data reduction, validation, and reporting documentation · AK documentation · Waste Stream Profile Form and Characterization Information Summary
NON-PERMANENT RECORDS
· Nonconformance documentation · Variance documentation · Assessment documentation · Gas canister tags · Methods performance documentation · PDP documentation · Sampling equipment certifications · Calculations and related software documentation · Training/qualification documentation · QAPjPs (generator/storage sites) documentation (all revisions) · Calibration documentation · Analytical raw data · Procurement documentation · QA procedures (all revisions) · Technical implementing procedures (all revisions) · Audio/video recording (radiography, visual, etc.)

Table C-7. Waste Data System/WIPP Waste Information System Data Fields[a].

CHARACTERIZATION MODULE DATA FIELDS b	
Container ID [c]	Total VOC Sample Date
Generator EPA ID	Total VOC Analysis Date
Generator Address	Total VOC Analyte Name [d]
Generator Name	Total VOC Analyte Concentration [d]
Generator Contact	Total Metal Sample Date
Hazardous Code	Total Metal Analysis Date
Headspace Gas Sample Date	Total Metal Analyte Name [d]
Headspace Gas Analysis Date	Total Metal Analyte Concentration [d]
Layers of Packaging	Semi-VOC Sample Date
Liner Exists	Semi-VOC Analysis Date
Liner Hole Size	Semi-VOC Analyte Name [d]
Filter Model	Semi-VOC Concentration [d]
Number of Filters Installed	Transporter EPA ID
Headspace Gas Analyte [d]	Transporter Name
Headspace Gas Concentration [d]	Visual Exam Container [e]
Headspace Gas Char. Method [d]	Waste Material Parameter [d]
Total VOC Char. Method [d]	Waste Material Weight [d]
Total Metals Char. Method [d]	Waste Matrix Code
Total Semi-VOC Char. Method [d]	Waste Matrix Code Group
Item Description Code	Waste Stream Profile Number
Haz. Manifest Number	
NDE Complete [e]	
CERTIFICATION MODULE DATA FIELDS	
Container ID [c]	Handling Code
Container type	
Container Weight	
Contact Dose Rate	
Container Certification date	
Container Closure Date	
TRANSPORTATION MODULE DATA	
Contact Handled Package Number	Ship Date
Assembly Number [f]	Receive Date
Container IDs [c, d]	
Inner Containment Vessel (ICV) Closure Date	
DISPOSAL MODULE DATA	
Container ID [c]	
Disposal Date	
Disposal Location	

a. This is not a complete list of the WDS/WWIS data fields.
b. Some of the fields required for characterization are also required for certification and/or transportation.
c. Container ID is the main relational field in the WDS/WWIS Database.
d. This is a multiple occurring field for each analyte, nuclide, etc.
e. These are logical fields requiring only a yes/no.
f. Required for 7 packs of 55-gal. drums, 4-packs of 85-gal drums, or 3-packs of 100-gal drums to tie all of the drums in that assembly together. This facilitates the identification of waste containers in a shipment without need to break up the assembly.

Table C-8. Waste Tanks Subject to Exclusion.

Hanford Site – 177 Tanks	
A-101 through A-106	C-201 through C-204
AN-101 through AN-107	S-101 through S-112
AP-101 through AP-108	SX-101 through SX-115
AW-101 through AW-106	SY-101 through SY-103
AX-101 through AX-104	T-101 through T-112
AY-101 through AY-102	T-201 through T-204
B-101 through B-112	TX-101 through TX-118
B-201 through B-204	TY-101 through TY-106
BX-101 through BX-112	U-101 through U-112
BY-101 through BY-112	U-201 through U-204
C-101 through C-112	
Savannah River Site – 51 Tanks	
Tank 1 through 51	
Idaho National Laboratory – 15 Tanks	
WM-103 through WM-106	WM-180 through 190

Table C-9. Listing of Permitted EPA Hazardous Waste Numbers.

EPA Hazardous Waste Numbers			
F001	D019	D043	U079
F002	D021	P015	U103
F003	D022	P030	U105
F004	D026	P098	U108
F005	D027	P099	U122
F006	D028	P106	U133*
F007	D029	P120	U134*
F009	D030	U002*	U151
D004	D032	U003*	U154*
D005	D033	U019*	U159*
D006	D034	U037	U196
D007	D035	U043	U209
D008	D036	U044	U210
D009	D037	U052	U220
D010	D038	U070	U226
D011	D039	U072	U228
D018	D040	U078	U239*

* Acceptance of U-numbered wastes listed for reactivity, ignitability, or corrosivity characteristics is contingent upon a demonstration that the wastes no longer exhibit the characteristic of reactivity, ignitability, or corrosivity.

WASTE STREAM PROFILE FORM

Waste Stream Profile Number: _____
Generator Site Name: _____ Technical Contract: _____
Generator Site EPA ID: _____ Technical Contact Phone Number: _____
Date of audit report approval by NMED: _____
Title, version number and date of documents used for WAP Certification: _____

Did your facility generate this waste? ☐Yes ☐No
If no, provide the name and EPA ID of the original generator: _____

WIPP ID: _____ Summary Category Group: _____
Waste Stream Name: _____
Description from the WTWBIR: _____

Defense Waste: ☐Yes ☐No Check one: ☐CH ☐RH
Number of SWBs _____ Number of Drums _____ Number of Canisters _____
Batch Data Report numbers supporting this waste stream characterization: _____
List applicable EPA Hazardous Waste Numbers [2] _____
Applicable TRUCON Content Numbers: _____
Acceptable Knowledge Information[1]
(For the following, enter supporting documentation used (i.e., references and dates))

Required Program Information

- Map of site: _____
- Facility mission description: _____
- Description of operations that generate waste: _____
- Waste identification/categorization schemes: _____
- Types and quantities of waste generated: _____
- Correlation of waste streams generated from the same building and process, as applicable: _____
- Waste certification procedures: _____

Required Waste Stream Information

- Area(s) and building(s) from which waste stream was generated: _____
- Waste stream volume and time period of generation: _____
- Waste generating process description for each building: _____
- Waste process flow diagrams: _____
- Material inputs or other information identifying chemical/radionuclide content and physical waste form: _____
- Waste material parameter estimates per unit of waste: _____
- Which Defense Activity generated the waste: (check one)

☐ Weapons activities including defense inertial confinement fusion
☐ Naval reactors development
☐ Verification and control technology
☐ Defense research and development
☐ Defense nuclear waste and material by products management
☐ Defense nuclear material production
☐ Defense nuclear waste and materials security and safeguards and security investigations

EXAMPLE

Figure B-1 (Example Only)
WASTE STREAM PROFILE FORM

Figure C-1.WIPP waste stream profile form (example only).

WASTE STREAM PROFILE FORM

Supplemental Documentation
Process design documents: _____
Standard operating procedures: _____
Safety Analysis Reports: _____
Waste packaging logs: _____
Test plans/research project reports: _____
Site data bases: _____
Information from site personnel: _____
Standard industry documents: _____
Previous analytical data: _____
Material safety data sheets: _____
Sampling and analysis data from comparable/surrogate waste: _____
Laboratory notebooks: _____

Confirmation Information[2]
(For the following, when applicable, enter procedure title(s), number(s), and date(s))

Radiography: _____

Visual Examination: _____

EXAMPLE

Waste Stream Profile Form Certification

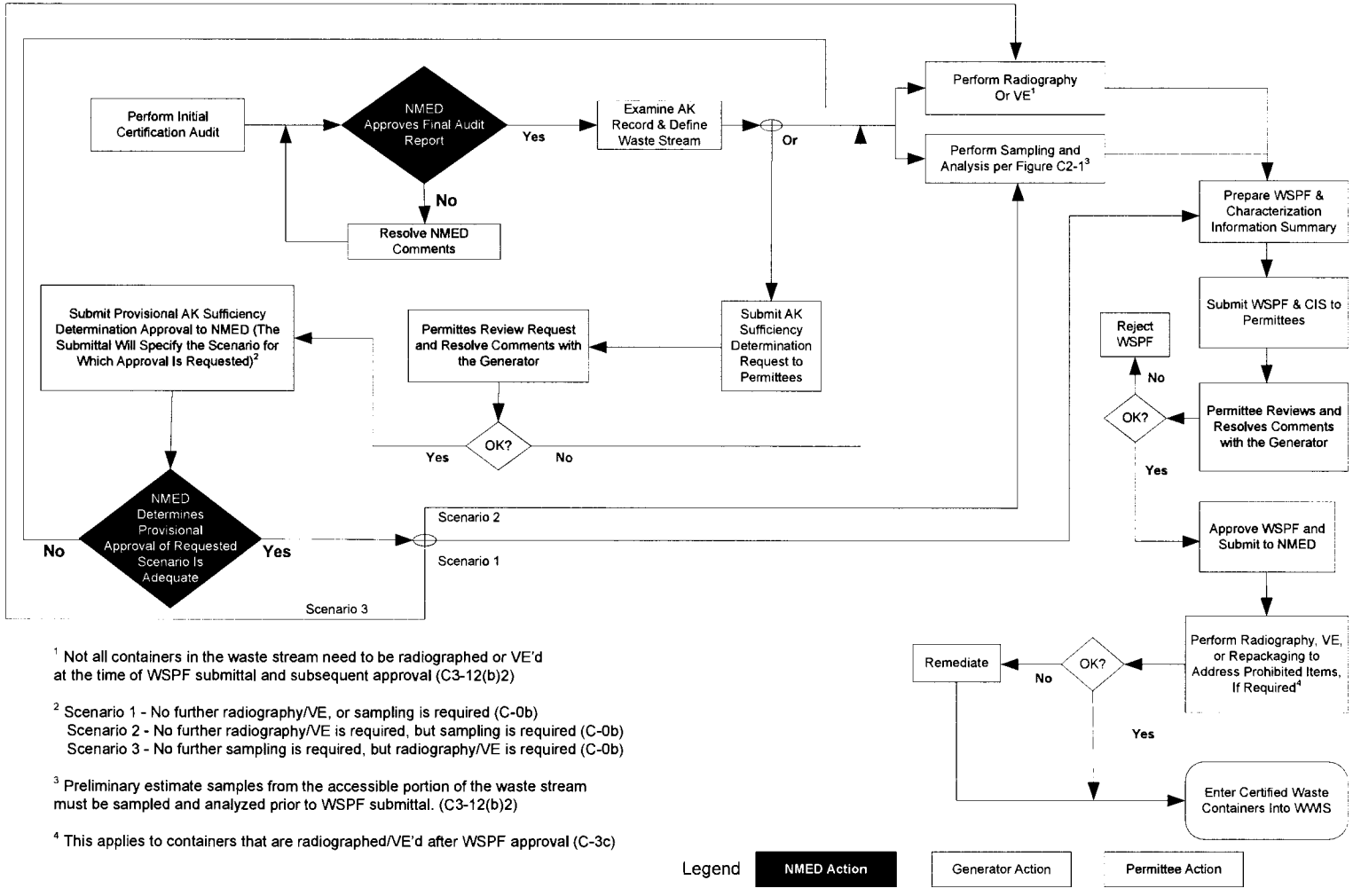
I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information,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

_____	_____	_____
Signature of Site Project Manager	Printed Name and Title	Date

NOTE:
(1) Use back of sheet or continuation sheets, if required.
(2) If, radiography, visual examination were used to confirm EPA Hazardous Waste Numbers, attach signed Characterization Information Summary documenting this determination.

Figure B-1 (Example Only) (Continued)
WASTE STREAM PROFILE FORM

Figure C-1. (continued)



[1] Not all containers in the waste stream need to be radiographed or VE'd at the time of WSPF submittal and subsequent approval (C3-12(b)2)

[2] Scenario 1 - No further radiography/VE, or sampling is required (C-0b)
Scenario 2 - No further radiography/VE is required, but sampling is required (C-0b)
Scenario 3 - No further sampling is required, but radiography/VE is required (C-0b)

[3] Preliminary estimate samples from the accessible portion of the waste stream must be sampled and analyzed prior to WSPF submittal. (C3-12(b)2)

[4] This applies to containers that are radiographed/VE'd after WSPF approval (C-3c)

Figure C-2. Waste characterization process.

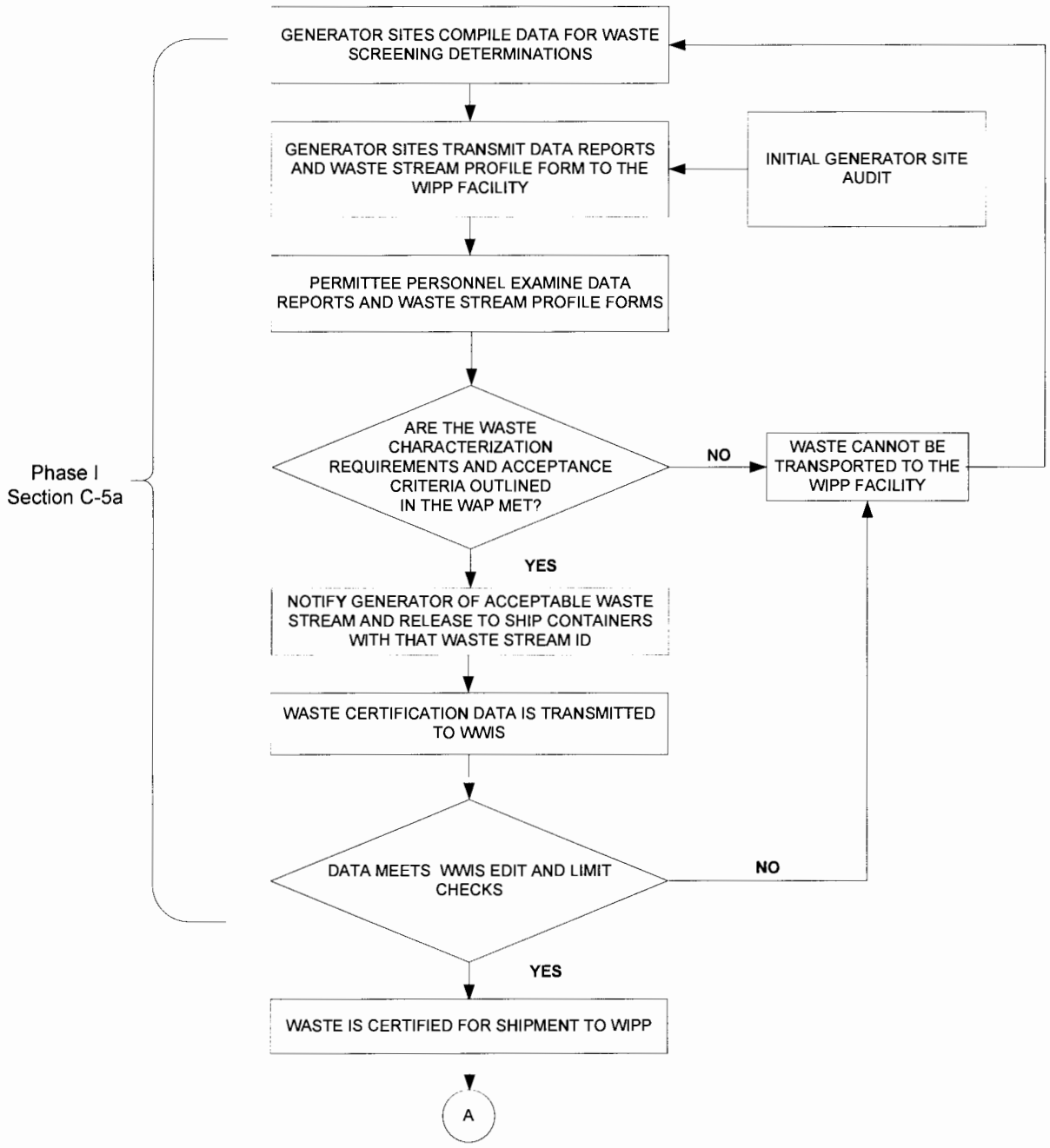


Figure C-3. TRU mixed waste screening and verification flow diagram.

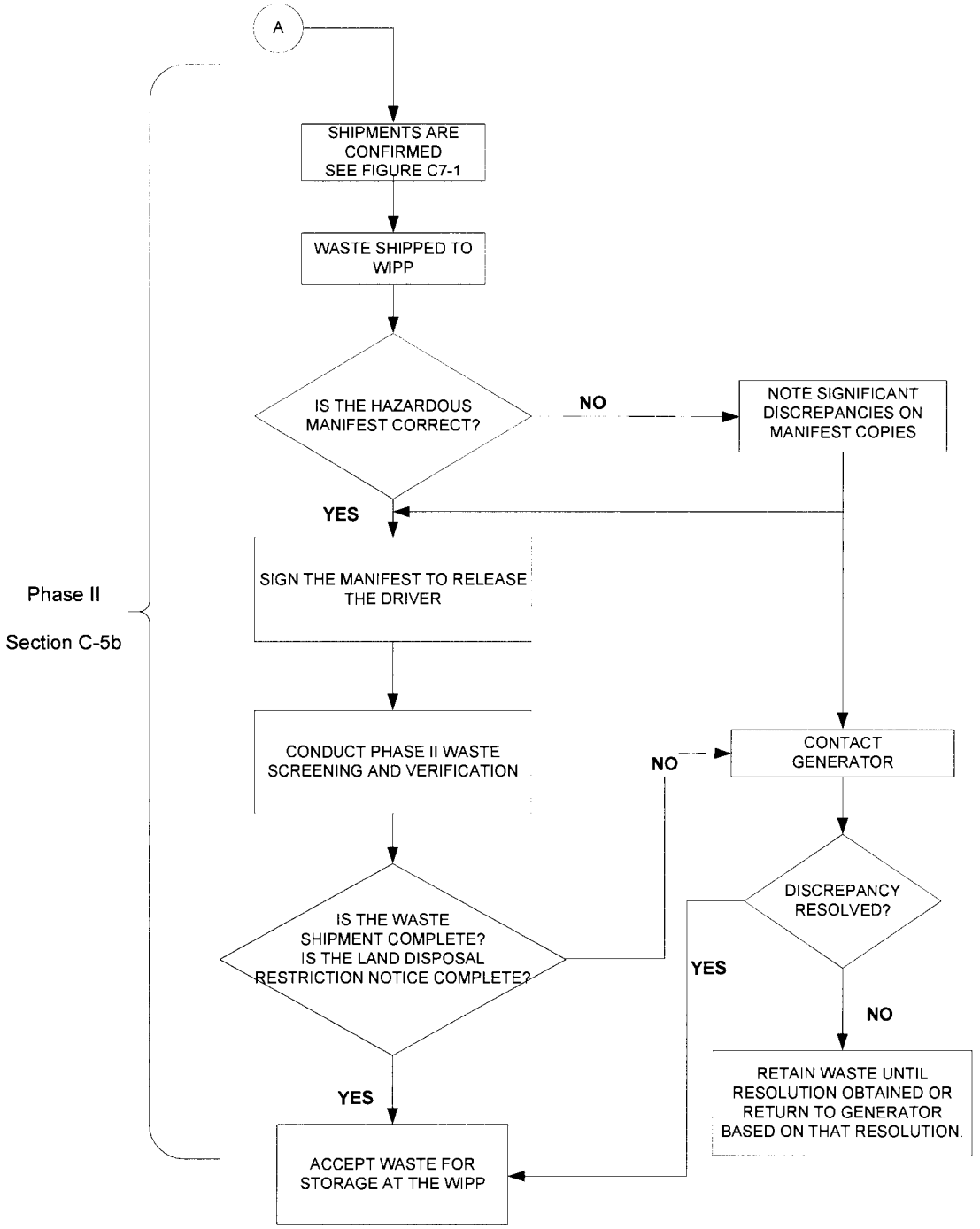


Figure C-3. (continued)

Attachment C1.
Waste Characterization Sampling Methods

The AMWTP uses the following methods as applicable for characterization of TRU mixed waste to be disposed of at the WIPP facility. These methods include requirements for HSGS, sampling of homogeneous solids and soil/gravel, and RTR or VE. Additionally, this section provides quality control (QC), sample custody, and sample packing and shipping requirements.

C1-1 Sampling of Debris Waste (Summary Category S5000)

Headspace gas sampling and analysis is used to resolve the assignment of EPA HWNs to debris waste streams.

The AMWTP on-line integrated HSGS operations are described in INST-OI-43 which list the specific activities and requirements necessary to prepare and test the sampling equipment to ensure sampling readiness and for obtaining the required field blank, field reference standard, and headspace samples. These activities and requirements assure that the sampling and analytical QA objectives are met.

C1-1a Method Requirements

Headspace gas sampling is performed in an appropriate radiation containment area on waste containers that are in compliance with the container equilibrium requirement (i.e., 72 hours at 18° C or higher).

For those waste streams without an AK Sufficiency Determination approved by the CBFO, containers are randomly selected from waste streams designated as summary category S5000 (debris waste) and are categorized under one of the sampling scenarios shown in Table C1-5 and depicted in Figure C1-1. If the container is categorized under Scenario 1, the applicable DAC from Table C1-6 must be met prior to headspace gas sampling. If the container is categorized under Scenario 2, the applicable Scenario 1 DAC from Table C1-6 must be met prior to venting the container and then the applicable Scenario 2 DAC from Table C1-7 must be met after venting the container. The DAC for Scenario 2 containers that contain filters or rigid liner vent holes other than those listed in Table C1-7 shall be determined using footnotes "a" and "b" in Table C1-7. Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. Containers categorized under Scenario 3 must be placed into one of the Packaging Configuration Groups listed in Table C1-8. If a specific packaging configuration cannot be determined based on the data collected during packaging and/or repackaging (Attachment C, Section C-3d[1]), a conservative default Packaging Configuration Group of 3 for 55-gallon drums, 6 for standard waste boxes (SWBs), standard large box 2s (SLB2s) and TDOPs, and 8 for 85-gallon and 100-gallon drums must be assigned, provided the drums do not contain pipe component packaging. If a container is designated as Packaging Configuration Group 4 (i.e., a pipe component), the headspace gas sample must be taken from

the pipe component headspace. Drums, TDOPs, SLB2s or SWBs that contain compacted 55-gallon drums containing a rigid liner may not be disposed of under any packaging configuration unless headspace gas sampling was performed before compaction in accordance with this QAPjP. The DAC for Scenario 3 containers that contain rigid liner vent holes that are undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) shall be determined using the default conditions in footnote "b" in Table C1-9. The DAC for Scenario 3 containers that contain filters that are either undocumented or are other than those listed in Table C1-9 shall be determined using footnote "a" in Table C1-9. Each of the Scenario 3 containers shall be sampled for headspace gas after waiting the DAC in Table C1-9 based on its packaging configuration (Note: Packaging Configuration Groups 4, 5, 6, 7, and 8 are not summary category group dependent, and 85-gallon drum, 100-gallon drum, SWB, SLB2s, and TDOP requirements apply when the 85-gallon drum, 100-gallon drum, SWB, SLB2, or TDOP is used for the direct loading of waste).

C1-1a(1) General Requirements

The determination of packaging configuration consists of identifying the number of confinement layers and the identification of rigid poly liners when present. AMWTP shall use either the default conditions specified in Tables C1-7 through C1-9 for retrievably stored waste or the data documented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) for determining the appropriate DAC for each container from which a headspace gas sample is collected. These drum age criteria are to ensure that the container contents have reached 90 percent of steady state concentration within each layer of confinement (Lockheed 1995, BWXT 2000). The following information must be reported in the headspace gas sampling documents for each container from which a headspace gas sample is collected:

- Sampling scenario from Table C1-5 and associated information from Table C1-6 and/or Table C1-7;
- The packaging configuration from Table C1-8 and associated information from Table C1-9 including the diameter of the rigid liner vent hole, the number of inner bags, the number of liner bags, the presence/absence of drum liner, and the filter hydrogen diffusivity;
- The permit–required equilibrium time; and
- The drum age.
- For supercompacted waste, both:
  - The absence of rigid liners in the compacted 55-gallon drums which have not been headspace gas sampled in accordance with this QAPjP prior to compaction, and

- The absence of layers of confinement must be documented in the WDS/WWIS if Packaging Configuration Group 7 is used.

For all retrievably stored waste containers, the rigid liner vent hole diameter must be assumed to be 0.3 inches unless a different size is documented during drum venting or repackaging. For all retrievably stored waste containers, the filter hydrogen diffusivity must be assumed to be the most restrictive unless container-specific information clearly identifies a filter model and/or filter diffusivity characteristic that is less restrictive. For all retrievably stored waste containers that have not been repackaged, AK shall not be used to justify any packaging configuration less conservative than the default (i.e., Packaging Configuration Group 3 for 55-gallon drums, 6 for SWBs, SLB2s, and TDOPs, and 8 for 85-gallon and 100-gallon drums). For information reporting purposes listed above, AMWTP may report the default packaging configuration for retrievably stored waste without further verification.

All waste containers with unvented rigid containers greater than 4 liters (exclusive of rigid poly liners) are subject to innermost layer of containment sampling or are vented prior to initiating drum age and equilibrium criteria. When sampling the rigid poly liner under Scenario 1, the sampling device must form an airtight seal with the rigid poly liner to ensure that a representative sample is collected (using a sampling needle connected to the sampling head to pierce the rigid poly liner, and that allows for the collection of a representative sample, satisfies this requirement). The configuration of the containment area and remote-handling equipment at each sampling facility are expected to differ. Headspace-gas samples will be analyzed for analytes listed in Table C3-2 of Attachment C3. If additional packaging configurations are identified, an appropriate Permit Modification will be submitted to incorporate the DAC using the methodology in INEEL-EXT-00-1207, *Determination of Drum Age Criteria and Prediction Factors Based on Packing Configuration* (Liekhus 2000). Consistent with the footnote "a" in Table C1-8, any waste container selected for headspace gas sampling that cannot be assigned a packaging configuration specified in Table C1-8, shall be assigned a conservative default packaging configuration.

Drum age criteria apply only to 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, SLB2s, and TDOPs. Drum age criteria for all other container types must be established through permit modification prior to performing headspace gas sampling.

AMWTP collects samples in SUMMA or equivalent canisters using standard headspace gas sampling methods that meet the general guidelines established by the EPA in the Compendium Method TO-14A or TO-15, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA 1999) or by using on-line integrated sampling/analysis systems. Samples will be directed to an analytical instrument instead of being collected in SUMMA® or equivalent canisters if a single-sample on-line integrated sampling/analysis system is used. If a multi-sample on-line integrated sampling/analysis system is used, samples will be directed to an integrated holding area that meets the cleaning requirements of C1-1c(1). The leak proof and inert nature of the integrated holding area interior surface has been demonstrated and

documented. Since samples will not be transported to another location when using on-line integrated sampling/analysis systems, the sample custody requirements of Section C1-4 and C1-5 do not apply. The same sampling manifold and sampling heads are used with on-line integrated sampling/analysis systems and all of the requirements associated with sampling manifolds and sampling heads will be met. When using an on-line integrated system, the sampling batch and analytical batch QC samples are combined as on-line batch QC samples as outlined in Section C1-1b.

Headspace gas sampling of waste drums at the AMWTP is conducted per INST-OI-43.

C1-1a(2) Manifold Headspace Gas Sampling

The headspace gas sampling protocol employs a multiport manifold capable of collecting multiple simultaneous headspace samples for analysis and QC purposes in accordance with INST-OI-43. The manifold can be used to collect samples in SUMMA or equivalent canisters or as part of an on-line integrated sampling/analysis system. The sampling equipment is leak checked and cleaned prior to first use and as needed thereafter. The manifold and sample canisters will be evacuated to 0.0039 inches (in.) (0.10 mm mercury [Hg]) prior to sample collection. Cleaned and evacuated sample canisters will be attached to the evacuated manifold before the manifold inlet valve is opened. The manifold inlet valve is attached to a changeable filter connected to either a side port needle sampling head capable of forming an airtight seal (for penetrating a filter or rigid poly liner when necessary), a drum punch sampling head capable of forming an airtight seal (capable of punching through the metal lid of a drum for sampling through the drum lid), or a sampling head with an airtight fitting for sampling through a pipe overpack container filter vent hole. Refer to Section C1-1a(4) for descriptions of these sampling heads.

The manifold is equipped with a purge assembly that allows applicable QC samples to be collected through all sampling components that may affect compliance with the QAOs. AMWTP will demonstrate and document the effectiveness of the sampling equipment design in meeting the QAOs. Field blanks are samples of room air collected in the sampling area in the immediate vicinity of the waste container to be sampled. If using SUMMA or equivalent canisters, field blanks will be collected directly into the canister without using the manifold.

The manifold, the associated sampling heads, and headspace gas sample volume requirements are designed to ensure that a representative sample is collected. The manifold internal volumes must be calculated and documented in field logbooks dedicated to headspace-gas sampling collection. The total volume of headspace gases collected during each sampling operation is determined by adding the combined volume of the canisters attached to the manifold and the internal volume of the manifold. The sample volume should remain small in comparison to the volume of the waste container. When an estimate of the available headspace gas volume in the drum can be made, less than 10 percent of that volume should be withdrawn. The manifold must consist of a sample side and a standard side. The sample side must be connected to the standard

side for cleaning and collecting equipment blanks and field reference standards. The sample side of the sampling manifold consists of the following major components:

- An applicable sampling head that forms a leak-tight connection with the headspace sampling manifold.

- A flexible hose that allows the movement of the sampling head from the purge assembly (standard side) to the waste container.

- A pressure sensor(s) pneumatically connected to the manifold. This manifold pressure sensor(s) is capable of measuring absolute pressure in the range from 0.05 millimeters mercury (mm Hg) to 1,000 mm Hg. Resolution for the manifold pressure sensors must be ± 0.01 mm Hg at 0.05 mm Hg. The manifold pressure sensor(s) must have an operating range from approximately 15° C to 40° C.

- Ports available for attaching sample canisters. If using canister-based sampling methods, a sufficient number of ports shall be available to allow simultaneous collection of headspace-gas samples and duplicates for VOC analyses. If using on-line integrated sampling/analysis system, only one port is necessary for the collection of comparison samples. Ports not occupied with sample canisters during cleaning or headspace-gas sampling activities require a plug to prevent ambient air from entering the system. In place of using plugs, the AMWTP may choose to install valves that can be closed to prevent intrusion of ambient air into the manifold. Ports have VCR fittings for connection to the sample canister(s) to prevent degradation of the fittings on the canisters and manifold.

- Sample canisters are leak-free, stainless steel pressure vessels, with a chromium-nickel oxide (Cr-NiO) SUMMA-passivated interior surface, bellows valve, and a pressure/vacuum gauge. Equivalent designs, such as Silco Steel canisters, may be used so long as the leak proof and inert nature of the canister interior surface is demonstrated and documented. All sample canisters must have VCR fittings for connection to sampling and analytical equipment. The pressure/vacuum gauge must be mounted on each manifold. The canister must be helium-leak tested to 1.5×10^{-7} standard cubic centimeters per second (cc/s), have all stainless steel construction, and be capable of tolerating temperatures to 125° C. The gauge range is capable of operating in the leak test range as well as the sample collection range.

- A dry vacuum pump with the ability to reduce the pressure in the manifold to 0.05 mm Hg. A vacuum pump that required oil may be used, but precaution must be taken to prevent diffusion of oil vapors back to the manifold. Precautions may include the use of a molecular sieve and a cryogenic trap in series between the headspace sampling ports and the pump. The AMWTP systems use either an oil-free scroll vacuum pump or an oil vacuum pump to reduce the pressure in the headspace sampling manifold to 0.05 mm Hg. Precautions have been taken to prevent diffusion of oil vapors back to the manifold including the use of a non-interfering silicone-based lubricant, continuous pump operation and piping dimensioning from the pump to the manifold. Compliance is demonstrated by several months of operation and equipment blank analyses without indication of contamination due to oil diffusion.

- A minimum distance, based on the design of the manifold system, between the tip of the needle and the valve that isolates the pump from the manifold in order to minimize the dead volume in the manifold.

- If real-time equipment blanks are not available, the manifold must be equipped with an organic vapor analyzer (OVA) that is capable of detecting all analytes listed in Table C3-2. The OVA shall be capable of measuring total VOC concentrations below the lowest headspace program required quantitation limit (PRQL). Detection of 1,1,2-trichloro-1,2,2-trifluoroethane may not be possible if a photoionization detector is used. The OVA measurement shall be verified by the collection of equipment blanks at the frequency specified in Section C1-1 to check for manifold cleanliness.

- At the AMWTP, the manifold is equipped with GC/MS that is capable of measuring all analytes listed in Table C3-2. The GC/MS is capable of measuring total VOC concentration below the lowest headspace gas PRQL. The GC/MS measurement is confirmed by the collection of equipment blanks and as specified in C1-1 to check for manifold cleanliness.

The standard side of the sampling manifold consists of the following major components:

- A cylinder of compressed zero air, helium, argon, or nitrogen gas that is used to clean the manifold between samples and provide gas for the collection of equipment blanks or on-line blanks. The high-purity gas is certified by the manufacturer to contain less than one parts per million (ppm) total VOCs. The gases are metered into the standard side of the manifold using devices (solenoid controlled valves), that are corrosion proof and that do not allow for the introduction of manifold gas into the purge gas cylinders or generator. Alternatively, a zero air or nitrogen generator may be used, provided a sample of the zero air or nitrogen is collected and demonstrated to contain less than one ppm total VOCs. Zero air or nitrogen from a generator will be humidified. Gas quality is of ultra-high purity grade and metered by a two-stage stainless steel regulator.

- Cylinders of field reference standard gases or on-line control sample (OLCS) gases. These cylinders provide gases for evaluating the accuracy of the headspace sampling process. Each cylinder of field reference gas or OLCS gas has a flow regulating device. The field reference standard gas or OLCS gas is certified by the manufacturer to contain analytes from, Table C3-2 at known concentrations.

- A humidifier filled with American Society for Testing and Materials (ASTM) Type I or Type II water is connected and opened to the standard side of the manifold between the compressed gas cylinder and the purge assembly. Dry gases flowing to the purge assembly pick up moisture from the humidifier. Moisture is added to the dry gases to condition the equipment blanks and field reference standards and to assist with system cleaning between headspace gas sample collection or pre-humidified certified nitrogen cylinders are used.

NOTE: *Caution should be exercised to isolate the humidifier during the evacuation of the system to prevent flooding the manifold. In lieu of the humidifier, the compressed gas cylinders (e.g., zero air and field reference standard gas), may contain water vapor in the concentration range of 1,000 to 10,000 parts per million by volume (ppmv).*

- A purge assembly allows the sampling head (sample side) to be connected to the standard side of the manifold. The ability to make this connection is required to transfer gases from the compressed gas cylinders to the canisters or on-line analytical instrument. This connection is required for system cleaning.

- A flow indicating device or a pressure regulator connected to the purge assembly monitors the gas flow rate through the purge assembly. The flow rate or pressure through the purge assembly is monitored to assure excess flow during cleaning activities and during QC sample collection. Maintaining excess flow prevents ambient air from contaminating QC samples and allows samples of gas from the compressed gas cylinders to be collected near ambient pressures.

In addition to a manifold consisting of a sample side and a standard side, the area in which the manifold is operated contains sensors for measuring ambient pressure and ambient temperature as follows:

- An ambient-pressure sensor with a sufficient measurement range for the ambient barometric pressures expected at the sampling location. It must be kept in the sampling area during sampling operations. Resolution is 1.0 mm Hg or less and calibration performed by the manufacturer is based on National Institute of Standards and Technology (NIST), or equivalent, standards.

- The temperature sensor must have a sufficient measurement range for the ambient temperatures expected at the sampling location. The measurement range of the temperature sensor must be 18° C to 50° C. The temperature sensor calibration is traceable to NIST, or equivalent, standards.

C1-1a(3) Direct Canister Headspace Gas Sampling

This section is applicable to the AMWTP such that sampling and analysis may be performed by other contractors. Data generation level validation will be performed by a subcontractor. Project level validation will be performed by the AMWTP PLV&V groups.

This headspace-gas sampling protocol employs a canister-sampling system to collect headspace gas samples for analysis and QC purposes without the use of the manifold described above. Rather than attaching sampling heads to a manifold, in this method the sampling heads are attached directly to an evacuated sample canister.

Canisters shall be evacuated to 0.0039 in. (0.10 mm) Hg prior to use and attached to a changeable filter connected to the appropriate sampling head. The sampling head(s) must be capable of either punching through the metal lid of the drums (and/or the rigid poly liner when necessary) while maintaining an airtight seal when sampling through the drum lid, penetrating a filter or the septum in the orifice of the self-tapping screw, or maintaining an airtight seal for sampling through a pipe overpack container filter vent hole to obtain the drum headspace samples. Field duplicates must be collected at the same time, in the same manner, and using the same type of sampling apparatus as used for headspace-gas sample collection. Field blanks shall be samples of room air collected in the immediate vicinity of the waste-drum sampling area prior to removal of the drum lid. Equipment blanks and field reference standards must be collected using a purge assembly equivalent to the standard side of the manifold described above. These samples shall be collected from the needle tip through the same components (e.g., needle and filter) that the headspace-gas samples pass through.

The sample canisters, associated sampling heads, and the headspace-sample volume requirements ensure that a representative sample is collected. When an estimate of the available headspace-gas volume of the waste container can be made, less than 10 percent of that volume should be withdrawn. A determination of the sampling head internal volume shall be made and documented. The total volume of headspace gases collected during each headspace gas sampling operation can be determined by adding the volume of the sample canister(s) attached to the sampling head to the internal volume of the sampling head. Every effort shall be made to minimize the internal volume of sampling heads.

Each sample canister used with the direct canister method shall have a pressure/vacuum gauge capable of indicating leaks and sample collection volumes. Canister gauges are intended to be gross leak-detection devices, not vacuum certification devices. If a canister pressure/vacuum gauge indicates an unexpected pressure change, determination of whether the change is a result

of ambient temperature and pressure differences or a canister leak shall be made. This gauge shall be helium-leak tested to 1.5×10^{-7} standard cc/s, have all stainless steel construction, and be capable of tolerating temperatures to 125°C.

The SUMMA® or equivalent sample canisters as specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) shall be used when sampling each drum. These heads shall form a leak-tight connection with the canister and allow sampling through the drum-lid filter, through the drum lid itself and/or rigid poly liner when necessary (by use of a punch or self-tapping screw), using an airtight fitting to collect the sample through the filter vent hole of a pipe overpack container, or using a hollow side port needle. Figure C1-4 illustrates the direct canister-sampling equipment.

C1-1a(4) Sampling Heads

A sample of the headspace gas directly under the container lid, pipe overpack filter vent hole, or rigid poly liner shall be collected. Several methods have been developed for collecting a representative sample: sampling through the filter, sampling through the drum lid by drum punching, sampling through a pipe overpack container filter vent hole, and sampling through the rigid poly liner. The chosen sampling method shall preserve the integrity of the drum to contain radionuclides (e.g., replace the damaged filter, replace set screw in filter housing, and seal the punched drum lid). The AMWTP samples through the filter and preserves the integrity of the drum to contain radionuclides (e.g., replace the damaged filter, replace set screw in filter housing, and seal the punched drum lid).

C1-1a(4)(i) Sampling Through the Filter

To sample the drum-headspace gas through the drum's filter, the AMWTP uses, a side-port needle (e.g., a hollow needle sealed at the tip with a small opening on its side close to the tip) pressed through the filter and into the headspace beneath the drum lid in accordance with INST-OI-43. This permits the gas to be drawn into the manifold or directly into the canister(s). All of the general method requirements, sampling apparatus requirements, and QC requirements described in this section are met in addition to the following requirements that are pertinent to drum headspace-gas sampling through the filter:

- The lid of the drum's 90-mil poly rigid liner shall contain a hole for venting to the drum headspace. A representative sample cannot be collected from the drum headspace until the 90-mil poly-liner has been vented. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If the sample is collected by removing the drum lid, the sampling device shall form an airtight seal with the rigid poly liner to prevent the intrusion of outside air into the sample (using a sampling needle connected to the sampling head to pierce the rigid poly liner satisfies this requirement). If headspace-gas samples are collected from the drum headspace prior to venting the 90-mil rigid poly liner,

the sample is not acceptable and an NCR shall be prepared, submitted, and resolved. Nonconformance procedures are outlined in Attachment C3.

- For sample collection, the drum's filter shall be sealed to prevent outside air from entering the drum and diluting and/or contaminating the sample.

The sampling head for collecting drum headspace by penetrating the filter consists of a side- port needle, a filter to prevent particles from contaminating the gas sample, and an adapter to connect the side-port needle to the filter. To prevent cross contamination, the sampling head is cleaned or replaced after sample collection, after field-reference standard collection, and after field-blank collection. The following requirements shall also be met:

The housing of the filter shall allow insertion of the sampling needle through the:

- Filter element or a sampling port with septum that bypasses the filter element into the drum headspace.

- The side-port needle shall be used to reduce the potential for plugging.

- The purge assembly shall be modified for compatibility with the side-port needle.

C1-1a(4)(ii) Sampling Through the Drum Lid by Drum Lid Punching

Sampling through the drum lid at the time of drum punching or thereafter may be performed as an alternative to sampling through the drum's filter if an airtight seal can be maintained. To sample the drum headspace gas through the drum lid at the time of punching or thereafter, the lid is breached using an appropriate punch (sparkless drill/filter assembly). The punch forms an airtight seal between the drum lid and the manifold or direct canister sampling equipment. To assure that the sample collected is representative, all of the general method requirement, sampling apparatus requirements, and QC requirements specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) as appropriate, are met in addition to the following requirements:

- The seal between the drum lid and sampling head minimizes the intrusion of ambient air.

- All components of the sampling system that come into contact with sample gases are purged with humidified zero air, nitrogen, or helium prior to sample collection.

- Equipment blanks and field reference standards are collected through all the components of the punch that contact the headspace gas sample.

- Pressure is applied to the punch until the drum lid has been breached.

- Provisions are made to relieve excessive drum pressure increases during the drum-punch operations; potential pressure increases may occur during sealing of the drum punch to the drum lid.

- The lid of the drum's 90-mil rigid poly liner shall contain a hole for venting to the drum headspace. The drill filter assembly design ensures penetration of drum poly liners. A representative sample cannot be collected from the drum headspace until the 90-mil rigid poly liner has been vented. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If headspace gas samples are collected from the drum headspace prior to venting the poly liner, the sample is not acceptable and an NCR is prepared, submitted, and resolved. Nonconformance procedures are outlined in Section C3-13.

- During sampling, the drums filter, if present, is sealed to prevent outside air from entering the drum.

- While sampling through the drum lid using manifold sampling a flow indicating device or pressure regulator to verify flow of gases is pneumatically connected to the drum punch and operated in the same manner as the flow indicating device described in C1-1a(2).

- Equipment shall be used to adequately secure the drum-punch sampling system to the drum lid.

- If the headspace gas sample is not taken at the time of drum punching, the presence and diameter of the rigid liner vent hole shall be documented during the punching operation for use in determining an appropriate Scenario 2 DAC.

C1-1a(4)(iii) Sampling Through a Pipe Overpack Container Filter Vent Hole

This section is not applicable to the AMWTP.

Sampling through an existing filter vent hole in a pipe overpack container (POC) may be performed as an alternative to sampling through the POC's filter if an airtight seal can be maintained. To sample the container headspace-gas through a POC filter vent hole, an appropriate airtight seal shall be used. The sampling apparatus shall form an airtight seal between the POC surface and the manifold or direct canister sampling equipment. To assure that the sample collected is representative, all of the general method, sampling apparatus, and QC requirements specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) as appropriate, shall be met in addition to the following requirements:

- The seal between the POC surface and sampling apparatus shall be designed to minimize intrusion of ambient air.

- The filter shall be replaced as quickly as is practicable with the airtight sampling apparatus to ensure that a representative sample can be taken. Sites must provide documentation demonstrating that the time between removing the filter and installing the airtight sampling device has been established by testing to assure a representative sample.

- All components of the sampling system that come into contact with sample gases shall be cleaned according to requirements for direct canister sampling or manifold sampling, whichever is appropriate, prior to sample collection.

- Equipment blanks and field reference standards shall be collected through all the components of the sampling system that contact the headspace-gas sample.

- During sampling, openings in the POC shall be sealed to prevent outside air from entering the container.

- A flow-indicating device shall be connected to sampling system and operated according to the direct canister or manifold sampling requirements, as appropriate.

C1-1b Quality Control

For the manifold and direct canister sampling systems, field QC samples are collected on a per sampling basis. A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding QC samples), all of which shall be collected within 14 days of the first sample in the batch. For the on-line integrated sampling/analysis systems, QC samples shall be collected and analyzed on an on-line batch basis. Holding temperatures and container requirements for gas sample containers are provided in Table C1-1. An on-line batch is the number of headspace-gas samples collected within a 12-hour period using the same on-line integrated analysis system as described in INST-OI-43. The analytical batch requirements are specified by the analytical method being used in the on-line system. Table C1-2 provides a summary of field QC sample collection requirements, and Table C1-3 provides a summary of QC sample acceptance criteria.

For the on-line integrated sampling/analysis systems, the on-line batch QC samples serve as combined sampling batch/analytical batch QC samples as follows:

- The on-line blank replaces the equipment blank and laboratory blank.

- The OLCS replaces the field reference standard and laboratory control sample (LCS).

- The on-line duplicate replaces the field duplicate and laboratory duplicate.

The acceptance criteria for on-line batch QC samples are the same as for the sampling batch and analytical batch QC samples they replace. Acceptance criteria are shown in Table C1-3. A

separate field blank is collected and analyzed for each on-line batch. If the results of a field blank collected through the sampling manifold meets the acceptance criterion, a separate on-line blank need not be collected and analyzed for AMWTP systems that deliver samples directly to the GC/MS for analysis. For systems that collect samples temporarily in on-line passivated canisters, a separate on-line blank will be collected and analyzed to demonstrate canister cleanliness.

The SPM monitors and documents field QC sample results and fills out an NCR if acceptance or frequency criteria are not met. The SPM also ensures appropriate corrective action is taken if acceptance criteria are not met.

C1-1b(1) Field Blanks

Field blanks are collected to evaluate background levels of program-required analytes. Field blanks are collected prior to sample collection, and at a frequency of one per sampling batch. The SPM uses the field blank data to assess impacts of ambient contamination, if any, on the sample results. Field blank results determined by gas GC/MS or gas chromatography/flame ionization detection (GC/FID) are acceptable if the concentration of each VOC analyte is less than or equal to three times the method detection limit (MDL) listed in Table C3-2. An NCR is initiated and resolved if the final reported QC sample results do not meet the acceptance criteria.

C1-1b(2) Equipment Blanks

Equipment blanks shall be collected to assess cleanliness prior to first use after cleaning of all sampling equipment. On-line blanks are used to assess equipment cleanliness as well as analytical contamination. After the initial cleanliness check, equipment blanks collected through the manifold shall be collected at a frequency of one per sampling batch for VOC analysis or one per day, whichever is more frequent. If the direct canister method is used, field blanks may be used in lieu of equipment blanks. The SPM uses equipment blank data to assess impacts of potentially contaminated sampling equipment on the sample results. Equipment blank results determined by GC/MS or GC/FID are acceptable if the concentration of each VOC analyte is less than or equal to three times the MDL listed in Table C3-2.

C1-1b(3) Field Reference Standards

Field reference standards are used to assess the accuracy with which the sampling equipment collects VOCs samples into SUMMA or equivalent canisters prior to first use of the sampling equipment. The OLCS is used to assess the accuracy with which the sampling equipment collects VOC samples as well as an indicator of analytical accuracy for the on-line sampling system. Field reference standards contain a minimum of six of the analytes listed in Table C3-2 at concentrations within a range of 10 to 100 ppmv and greater than the MDL for each compound.

Field reference standards have a known valid relationship to a nationally recognized standard (e.g., NIST), if available. If NIST traceable standards are not available and commercial gases are

used, a Certificate of Analysis from the manufacturer documenting traceability is required. Commercial stock gases are not used beyond their manufacturer-specified shelf life.

After the initial accuracy check, field reference standards collected through the manifold are collected at a frequency of one per sampling batch and submitted blind to the analytical laboratory. For the direct canister method, field reference standards collection may be discontinued if the field reference standard results demonstrate the QAO for accuracy specified in Attachment C3. Field reference standard results are acceptable if the accuracy for each tested compound has a recovery of 70 to 130 percent.

C1-1b(4) Field Duplicates

Field duplicates are collected sequentially and in accordance with Table C1-1 to assess the precision with which the sampling procedure collects samples into SUMMA equivalent canisters. Field duplicates also serve as a measure of analytical precision for the on-line sampling system. Field duplicate results are acceptable if the relative percent difference (RPD) is less than or equal to 25 for each tested compound found in concentrations greater than the PRQL in both duplicates.

C1-1c Equipment Testing, Inspections, and Maintenance

All sampling equipment components that come into contact with headspace sample gas are constructed of relatively inert materials such as stainless steel or Teflon®. A passivated interior surface on the stainless steel components is recommended.

To minimize the potential for cross-contamination of samples, the headspace gas sampling manifold and sample canisters are properly cleaned and leak-checked prior to each headspace gas sampling event. Procedures used for cleaning and preparing the manifold and sample canisters are equivalent to those provided in EPA's Compendium Method TO-14A or TO-15 (EPA 1999). Cleaning requirements are presented below.

C1-1c(1) Headspace Gas Sample Canister Cleaning

SUMMA® or equivalent canisters used in these methods are subject to a rigorous cleaning and certification procedures prior to use in the collection of any samples. Guidance for the development of this procedure has been derived from Method TO-14A or TO-15 (EPA 1999). Specific detailed instructions are provided in INST-OI-43 for cleaning and certification of canisters.

Canisters are cleaned and certified on an equipment cleaning batch basis. An equipment cleaning batch is any number of canisters cleaned together at one time using the same cleaning method. A cleaning system, capable of processing multiple canisters at a time, composed of an oven (optional) and a vacuum manifold which uses a dry vacuum pump or cryogenic trap backed by an oil sealed pump used to clean SUMMA® or equivalent canisters. Prior to cleaning, a positive or negative pressure leak test is performed on all canisters. The duration of the leak test must be

greater than or equal to the time it takes to collect a sample, but no greater than 24 hours. For a leak test, a canister passes if the pressure does not change by a rate greater then ±2 pounds per square inch gauge (psig) per 24 hours. Any canister that fails will be checked for leaks, repaired, and reprocessed. One canister per equipment cleaning batch will be filled with humid zero air or humid high purity nitrogen and analyzed for VOCs. The equipment cleaning batch of canisters is considered clean if there are no VOCs above three times the MDLs listed in Table C3-2. After the canisters have been certified for leak-tightness and found to be free of background contamination, they are evacuated to 0.0039 in. (0.10 mm) Hg or less for storage prior to shipment. The AMWTP is responsible for canister cleaning and certification to maintain canister certification documentation and initiate the canister tags as required in Attachment C3.

C1-lc(2) Sampling Equipment Initial Cleaning and Leak-Check

The surfaces of all headspace-gas sampling equipment components that will come into contact with headspace gas is thoroughly inspected and cleaned prior to assembly. The manifold and associated sampling heads are purged with humidified zero air, nitrogen, or helium, and leak checked after assembly. This cleaning is repeated if the manifold and/or associated sampling heads are contaminated to the extent that the routine system cleaning is inadequate.

C1-1c(3) Sampling Equipment Routine Cleaning and Leak-Check

The manifold and associated sampling heads which are reused are cleaned and checked for leaks in accordance with the cleaning and leak check procedures described in EPA's Compendium Method TO-14A or TO-15 (EPA 1999). The procedure is conducted after headspace gas and field duplicate collection; after field blank collection, after field blanks are collected through the manifold; and after the additional cleaning required for field reference standard collection has been completed. The protocol for routine manifold cleaning and leak check requires that sample canisters be attached to the canister ports, or that ports be capped or closed by valves, and requires that the sampling head be attached to the purge assembly.

VOCs are removed from the internal surfaces of the headspace sampling manifold to levels that are less than or equal to three times the MDLs of the analytes listed in Table C3-2, as determined by analysis of an equipment blank or through use of an OVA. It is recommended that the headspace sampling manifold be heated to 150° Centigrade and periodically evacuated and flushed with humidified zero air, nitrogen, or helium. When not in use, the manifold shall be demonstrated clean before storage with a positive pressure of high purity gas (i.e., zero air, nitrogen, or helium) in both the standard and sample sides.

Sampling is suspended and corrective actions are taken when the analysis of an equipment blank indicates that the VOC limits have been exceeded or if a leak test fails. The SPM ensures that corrective action has been taken prior to resumption of sampling.

C1-1c(4) Manifold Cleaning After Field Reference Standard Collection

The sampling systems are specially cleaned after a field reference standard has been collected because the field reference standard gases contaminate the standard side of the headspace gas sampling manifold when they are regulated through the purge assembly. This cleaning requires the installation of a gas-tight connector in place of a sampling head, between the flexible hose and the purge assembly. This configuration allows both the sample and standard sides of the sampling system to be flushed (evacuated and pressurized) with humidified zero air, nitrogen, or helium which, combined with heating the pneumatic lines, should sweep and adequately clean the system's internal surfaces. After this protocol has been completed and prior to collecting another sample, the routine system cleaning and leak check (see previous section) shall also be performed in accordance with INST-OI-43.

C1-1c(5) Sample Head Cleaning

To prevent cross-contamination, the needle, airtight fitting or airtight seal, adapters, and filter of the sampling heads are cleaned in accordance with the cleaning procedures, INST-OI-43 which use the cleaning procedures described in EPA in the Compendium Method TO-14 (EPA 1988). After sample collection, a sampling head will be disposed of or cleaned in accordance with EPA's Compendium Method TO-14A or TO-15 (EPA 1999), prior to reuse. As a further QC measure, the needle, airtight fitting or airtight seal, and filter, after cleaning, should be purged with zero air, nitrogen, or helium and capped for storage to prevent sample contamination by VOCs potentially in the ambient air.

C1-1d Equipment Calibration and Frequency

The manifold pressure sensors are certified prior to initial use, then annually as described in MP-CMNT-10.5, *Calibration and Control of Measuring and Test Equipment Program*, using NIST traceable, or equivalent, standards. If necessary, the pressure indicated by the sensor is temperature compensated. The ambient air temperature sensor, if present, is certified prior to initial use, then annually, to NIST traceable, or equivalent, temperature standards.

The OVA shall be calibrated once per day, prior to first use, or as necessary according to the manufacturer's specifications Calibration gases are certified to contain known analytes from Table C3-2 at known concentrations. The balance of the OVA calibration gas is consistent with the manifold purge gas when the OVA is used (i.e., zero air, nitrogen, or helium).

The AMWTP HGAS units from Consonant Technology, Inc., do not employ an OVA, rather an automatic manifold capable of collecting samples from a single sampling probe, or from in-line QC sample gas cylinders, routes the sample to a manifold of canisters or directly to the GC/MS, for analysis of VOCs, hydrogen, and methane. Calibration and standardization are performed in accordance with INST-OI-43.

C1-2 Sampling of Homogeneous Solids and Soil/Gravel (Summary Categories S3000/S4000)

For those waste streams without an AK Sufficiency Determination approved by the CBFO, randomly selected containers of homogeneous solid and/or soil/gravel waste streams (S3000/S4000) shall be sampled and analyzed to resolve the assignment of EPA HWNs. For example, analytical results may be useful to resolve uncertainty regarding hazardous constituents used in a process that generated the waste stream when the hazardous constituents are not documented in the AK information for the waste.

This section describes the requirements for collecting samples of TRU mixed waste classified as homogeneous solids and soils/gravels. Sampling protocols are based upon methods similar to those approved by EPA methods and ASTM and are implemented in INST-OI-16, INST-OI-73, or INST-OI-75.

C1-2a Method Requirements

The methods used to collect samples of TRU mixed waste classified as homogeneous solids and soil/gravel from waste containers is such that the samples are representative of the waste from which they are taken. To minimize the quantity of investigation-derived waste, the laboratories conducting the analytical work will receive no more than is required for analysis, based on the analytical methods.

A sufficient number of samples are collected to adequately represent the waste being sampled. For those waste streams defined as Summary Category Groups S3000 and S4000, debris that may be present within these wastes is not sampled.

Samples of retrievably stored waste containers will be collected using appropriate coring equipment or other EPA approved methods to collect a representative sample. Newly generated wastes that are sampled from a process as it is generated may be sampled using EPA approved methods, including scoops and ladles that are capable of collecting a representative sample. All sampling and core sampling will comply with the QC requirements specified in C1-2b.

C1-2a(1) Core Collection

Coring tools are used to collect cores of homogenous solids and soil/gravel from waste containers, when possible, in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, to cut, lift the waste cuttings, and collect a core from the bore hole, is used to collect sample cores from waste containers. For homogenous solids and soil/gravel that are relatively soft, non-rotational coring tools may be used in lieu of a rotational coring tool.

The following requirements apply to the use of coring tools:

- Each coring tool shall contain a removable tube (liner) that is constructed of fairly rigid material unlikely to affect the composition and/or concentrations of target analytes in the sample core. Materials that are acceptable for use for coring device sleeves and end caps are polycarbonate, Teflon, or glass for most samples, and stainless steel or brass if samples are not to be analyzed for metals. The AMWTP uses polycarbonate sleeves and Teflon lined end caps that are cleaned in accordance with C1-2b prior to use. An equipment blank is taken prior to first use to ensure the absence of target analytes. Liner outer diameter is no more than 2 in. and no less than one in. Liner wall thickness is recommended to be no greater than 1/16 in. Before use, the liner is cleaned in accordance with the requirements in Section C1-2b. The liner fits flush with the inner wall of the coring tool and shall be of sufficient length to hold a core that is representative of the waste along the entire depth of the waste. The depth of the waste is calculated as the distance from the top of the sludge to the bottom of the drum (based on the thickness of the liner and the rim at the bottom of the drum).

- The liner material is sufficiently transparent to allow VE of the core after sampling. If sub-sampling is not conducted immediately after core collection and liner extrusion, then end caps constructed of material unlikely to affect the composition and/or concentrations of target analytes in the core (e.g., Teflon®) is placed over the ends of the liner. End caps shall fit tightly to the ends of the liner.

- A spring retainer is used with each coring tool when the physical properties of the waste are such that the waste may fall out of the coring tool's liner during sampling activities. The spring retainer is constructed of relatively inert material (e.g., stainless steel or Teflon) and its inner diameter shall not be less than the inner diameter of the liner. Before use, spring retainers are cleaned in accordance with the requirements given in Section C1-2b.

- Coring tools may have an air-lock mechanism that opens to allow air inside the liners to escape as the tool is pressed into the waste (e.g., ball check valve). If used, this air-lock mechanism shall also close when the core is removed from the waste container.

- After disassembling the coring tool, a device (extruder) to forcefully extrude the liner from the coring tool is used if the liner does not slide freely. All surfaces of the extruder that may come into contact with the core will be cleaned in accordance with the requirements in Section C1-2(b) prior to use.

- Coring tools are of sufficient length to hold the liner and have been constructed to allow placement of the liner leading edge as close as possible to the coring tools leading edge.

- All surfaces of the coring tool that have the potential to contact the sample core or sample media are cleaned in accordance with the requirements in Section C1-2(b) prior to use.

- The leading edge of the coring tools may be sharpened and tapered to a diameter equivalent to, or slightly smaller than, the inner diameter of the liner to reduce the drag of the homogenous solids and soil/gravel against the internal surfaces of the liner, thereby enhancing sample recovery.

- Rotational coring tools have a mechanism to minimize the rotation of the liner inside the coring tool during coring activities, thereby minimizing physical disturbance to the core.

- Rotational coring is conducted in a manner that minimizes transfer of frictional heat to the core, thereby minimizing potential loss of VOCs.

- Non-rotational coring tools shall be designed such that the tool's kerf width is minimized. Kerf width is defined as one-half of the difference between the outer diameter of one tool and the inner diameter of the tool's inlet.

C1-2a(2) Sample Collection

Sampling of cores is conducted in accordance with the following requirements:

- Sampling is conducted as soon as possible after core collection. If a substantial delay (i.e., more than 60 minutes) is expected between core collection and sampling, the core shall remain in the liner and the liner shall be capped at each end. If the liner containing the core is not extruded from the coring tool and capped, then two alternatives are permissible: (1) the liner shall be left in the coring tool and the coring tool shall be capped at each end, or (2) the coring tool shall remain in the waste container with the air-lock mechanism attached.

- Samples of homogenous solids and soil/gravel for VOC analyses are collected prior to extruding the core from the liner. These samples may be collected by collecting a single sample from the representative subsection of the core, or three sub-samples may be collected from the vertical core to form a single 15-gram (g) composite sample. Smaller sample sizes may be used if method PRQL requirements are met for all analytes. The sampling locations shall be randomly selected. If a single sample is used, the representative subsection is chosen by randomly selecting a location along the portion of the core (i.e. core length). If the three sub-sample method is used, the sampling locations shall be randomly selected within three equal-length subsections of the core along the long axis of the liner and access to the waste shall be gained by making a perpendicular cut through the liner and the core. The procedures to select, and record the selection, of random sampling locations is given in INST-OI-16, INST-OI-73, and INST-OI-75. True random sampling involves the proper use of random numbers for identifying sampling locations. The procedures used to select the random sampling locations will be subject to review as part of annual audits by the CBFO. A sampling device such as the metal coring cylinder described in EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Manual (EPA 1996), or equivalent, is immediately used to collect the sample once the core has been exposed to air.

Immediately after sample collection, the sample shall be extruded into 40-ml volatile organics analysis (VOA) vials (or other containers specified in appropriate SW-846 methods), the top rim of the vial visually inspected and wiped clean of any waste residue, and the vial cap secured. Sample handling requirements are outlined in Table C1-4. Additional guidance for this type of sampling can be found in SW-846.

- Samples of the homogenous solids and soil/gravel for semi-volatile organic compound and metals analyses are collected. These samples may be collected from the same sub-sample locations and in the same manner as the sample collected for VOC analysis, or they may be collected by splitting or compositing the representative subsection of the core. The representative subsection is chosen by randomly selecting a location along the portion of the core (i.e. core length). The procedures to select, and record the selection, of random sampling locations is given in INST-OI-16, INST-OI-73, and INST-OI-75. True random sampling involves the proper use of random numbers for identifying sampling locations. The procedures used to select the random sampling locations will be subject to review as part of annual audits by the CBFO. Guidance for splitting and compositing solid materials can be found in SW-846. All surfaces of the sampling tools that have the potential to come into contact with the sample shall be constructed of materials unlikely to affect the composition or concentrations of target analytes in the waste (e.g., Teflon). In addition, all surfaces that have the potential to come into contact with core sample media shall either be disposed or decontaminated according to the procedures found in Section C1-2(b). Sample sizes and handling requirements are outlined in Table C1-4.

Newly generated waste samples may be collected using methods other than coring, as discussed in Section C1-2a. Newly generated wastes samples will be collected as soon as possible after sampling, but the spatial and temporal homogeneity of the waste stream dictate whether a representative grab sample or composite sample shall be collected. As part of the site audit, CBFO will assess waste sampling to ensure collection of representative samples.

C1-2b Quality Control Requirements

QC requirements for sampling of homogeneous solids and soil/gravel include collecting co-located samples from cores or other sample types to determine precision; collection of equipment blanks to verify cleanliness of the sampling and coring tools and sampling equipment; and analysis of reagent blanks to ensure reagents, such as deionized and high pressure liquid chromatography (HPLC) water, are of sufficient quality. Coring and sampling of homogeneous solids and soil/gravel comply, at a minimum, with the QC requirements.

C1-2b(1) Co-located Samples

In accordance with the requirement to collect field duplicates required by the EPA methods found in SW-846, samples are collected to determine the combined precision of the coring and sampling procedures in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. The co-located core methodology is a duplicate sample collection methodology intended to collect

samples from a second core placed at approximately the same location within the drum when samples are collected by coring. Waste may not be amenable to coring in some instances. In this case, a co-located sample may be collected from a sample (e.g. scoop) collected from approximately the same location in the waste stream. A sample from each co-located core or waste sample collected by other means is collected side by side as close as feasible to one another, handled in the same manner, visually inspected through the transparent liner (if cored), and sampled in the same manner at the same randomly selected sample location(s). If the VE detects inconsistencies such as color, texture, or waste type in the waste at the sample location, another sampling location may be randomly selected, or the samples may be invalidated and co-located samples or cores may again be collected. Co-located samples, from either core or other sample type, shall be collected at a frequency of one per sampling batch or once per week, whichever is more frequent. A sampling batch is a suite of homogenous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which shall be collected within 14 days of the first sample in the batch.

C1-2b(2) Equipment Blanks

In accordance with SW-846 equipment blanks are collected from fully assembled sampling and coring tools (i.e., at least those portions of the sampling equipment that contact the sample) prior to first use after cleaning at a frequency of one per "equipment cleaning batch" in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. An equipment cleaning batch is the number of sampling equipment items cleaned together at one time using the same cleaning method. The equipment blank shall be collected from the fully assembled sampling or coring tool in the area where the sampling or coring tools are cleaned, prior to covering with protective wrapping and storage. The equipment blank is collected by pouring clean water (e.g., deionized water, HPLC water) down the inside of the assembled sampling or coring tool. The water is collected in a clean sample container placed at the leading edge of the sampling or coring tool and analyzed for the analytes listed in Tables C3-4, C3-6 and C3-8. The results of the equipment blank will be considered acceptable if the analysis indicates no analyte at a concentration greater than three times the MDLs listed in Tables C3-4 and C3-6 or in the Program Required Detection Limits (PRDLs) in Table C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling or coring tools shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank.

Equipment blanks for coring tools are collected from liners that are cleaned separately from the coring tools. These equipment blanks shall be collected at a frequency of one per equipment cleaning batch. The equipment blanks shall be collected by randomly selecting a liner from the equipment cleaning batch, pouring clean water (e.g., deionized water or HPLC water) across its internal surface, collecting the water in a clean sample container, and analyzing the water for the analytes listed in Tables C3-4, C3-6, and the analytes in Table C3-8. The results of the equipment blank analysis will be considered acceptable if the results indicate no analyte at a

concentration greater than three times the MDLs listed in Tables C3-4, C3-6, or the PRDLs in Table C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of liners shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank.

Sampling equipment (e.g., bowls, spoons, chisel, and VOC sub-sampler) is also to be cleaned. Equipment blanks are collected for the sampling equipment at a frequency of one per equipment cleaning batch. After the sampling equipment has been cleaned, one item from the equipment cleaning batch is randomly selected, and water (e.g., deionized water, HPLC water) is passed over its surface, collected in a clean container, and analyzed for the analytes listed in Tables C3-4, C3-6, and C3-8. The results of the equipment blank will be considered acceptable if the results indicate no analyte present at a concentration greater than three times the MDLs listed in Tables C3-4 and C3-6 and in the PRDLs in C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank. The above equipment blanks may be performed on a purchased batch basis for sampling equipment purchased sterile and sealed in protective packaging. Equipment blanks need not be performed for equipment purchased in sealed protective packaging accompanied by a certificate certifying cleanliness.

The results of equipment blanks are traceable to the items in the equipment cleaning batch that the equipment blank represents. All sampling items should be identified, and the associated equipment cleaning batch should be documented. The method of documenting the connection between equipment and equipment cleaning batches shall be documented. Equipment blank results for the coring tools, liners, and sampling equipment shall be reviewed prior to use. A sufficient quantity of these items should be maintained in storage to prevent disruption of sampling operations.

The AMWTP may use certified clean disposable sampling equipment and discard liners and sampling tools after one use. As a result, cleaning and equipment blank collection is not required.

C1-2b(3) Coring Tool and Sampling Equipment Cleaning

Coring tools and sampling equipment must be cleaned in accordance with the following requirements:

- All surfaces of coring tools and sampling equipment that will come into contact with the samples are cleaned prior to use in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. All sampling equipment is cleaned in the same manner. Immediately following cleaning, sampling equipment and coring tools are assembled and sealed inside clean protective wrapping.

- Each reusable sampling or coring tool (e.g., drill heads, ball mills, sample splitters, etc.) have a unique identification number. Each number is referenced to the waste container on which it is used. This information is recorded in the field records. One sampling or coring tool from each cleaning batch is tested for cleanliness in accordance with the requirements specified above. The identification number of the sampling or coring tool from which the equipment blank is collected is recorded in the field records. The results of the equipment blank analysis for the equipment cleaning batch in which each sampling or coring tool was cleaned are submitted to the sampling facility with the identification numbers of all sampling or coring tools in the equipment cleaning batch. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank.

- Sample containers should be purchased pre-cleaned per EPA cleaning protocols. If sampling containers are not purchased pre-cleaned, they are cleaned in accordance with SW-846 criteria.

C1-2c Equipment Testing, Inspection, and Maintenance

Prior to initiation of sampling or coring activities, sampling and coring tools are tested in accordance with manufacturer specifications to ensure operation within manufacturer's tolerance limits. Other specifications specific to the sampling operations (e.g., operation of containment structure and safety systems) are also tested and verified as operating properly prior to initiating sampling activities. Coring tools shall be assembled, including liners, and tested. Air lock mechanism and rotation mechanism shall be inspected for free movement of critical parts. Sampling and coring tools found to be malfunctioning are repaired or replaced prior to use.

Coring tools and sample collection equipment shall be maintained in accordance with manufacturer's specifications. Clean sampling and coring tools and sampling equipment shall be sealed inside clean protective wrapping and maintained in a clean storage area prior to use. Sampling equipment shall be properly maintained to avoid contamination. A sufficient supply of spare parts should be maintained to prevent delays in sampling activities due to equipment down time. Records of equipment maintenance and repair are maintained in the field records.

Inspection of sampling equipment and work areas shall include the following:

- Sample collection equipment in the immediate area of sample collection is inspected daily for cleanliness. Visible contamination on any equipment (e.g., waste on floor of sampling area, hydraulic fluid from hoses) that has the potential to contaminate a waste core or waste sample is thoroughly cleaned upon its discovery.

- The waste coring and sampling work areas are maintained in a clean condition to minimize the potential for cross contamination between waste (including cores) and samples.

- Expendable equipment (e.g., plastic sheeting, plastic gloves, and pans) are visually inspected for cleanliness prior to use and properly discarded after each sample.

- Prior to removal of the protective wrapping from a coring tool designated for use, the condition of the protective wrapping is visually assessed. Coring tools with torn protective wrapping are returned for cleaning. Coring tools visibly contaminated after the protective wrapping has been removed shall not be used and shall be returned for cleaning or properly discarded.

- Sampling equipment is visually inspected prior to use. All sampling equipment that comes into contact with waste samples must be stored in a protective wrapping until use. Prior to removal of the protective wrappings from sampling equipment, the condition of the protective wrappings is visually assessed. Sampling equipment with torn protective wrapping should be discarded or returned for cleaning. Sampling equipment visibly contaminated after the protective wrapping has been removed shall not be used and shall be returned for cleaning or properly discarded.

- Cleaned sampling and coring equipment will be physically segregated from all equipment that has been used for a sampling event and has not been decontaminated.

C1-2d Equipment Calibration and Frequency

The scales used for weighing sub samples are calibrated as necessary to maintain scale operation within manufacture's specifications, and after repairs and routine maintenance. Weights used for calibration are traceable to nationally recognized standards. Calibration records are maintained in the field records.

C1-3 Radiography

Radiography has been developed to aid in the examination and identification of containerized waste. INST-OI-12, *Real-Time Radiography Operations (Drum)*, and INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)*, describe all activities required to achieve the radiography objectives in this QAPjP. INST-OI-12 and INST-OI-81 provide instructions specific to the radiography systems used at the site. For example, to detect liquids, some systems require the container to be rotated back and forth while other systems require the container to be tilted.

A radiography system (e.g., real-time radiography digital, digital radiography/computed tomography) normally consists of an X-ray producing device, an imaging system, an enclosure for radiation protection, a waste container handling system, an audio/video recording system, and an operator control and data acquisition station. Although these six components are required, it is expected there will be some variation within a given component between sites. The RTR system has controls or an equivalent process, which allow the operator to control image quality. On some radiography systems, it should be possible to vary the voltage, typically between 150 and 400 kilovolts to provide an optimum degree of penetration through the waste. The imaging system typically uses either a fluorescent screen or a low-light television camera or x-ray detectors to generate the image.

To perform RTR, the waste container is scanned while the operator views the television screen. A video and audio recording is made of the waste container scan and is maintained as a non-permanent record. A radiography data form is also used to document the Waste Matrix Code, to ensure that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits or compressed gases, and verify that the physical form of the waste is consistent with the waste stream description documented in the AK summary. Containers whose contents prevent full examination of the remaining contents shall be subject to VE unless the AMWTP certifies that VE would provide no additional relevant information for that container based on the AK information for the waste stream. Such certification will be documented in the AMWTP record.

For containers which contain classified shapes and undergo RTR, the RTR video and audio recording will be considered classified. The radiography data forms will not contain classified information.

The RTR system involves qualitative and semiquantitive evaluations of visual displays. Operator training and experience are the most important considerations for ensuring QCs in regard to the operation of the RTR system and for interpretation and disposition of radiography results. Only trained personnel are allowed to operate RTR equipment.

Standardized training requirements for RTR operators are based upon existing industry standard training requirements as detailed in the RTR qualification package in accordance with MP-RTQP-14.4, *Personnel Qualification and Certification.*

The AMWTP has developed a training program that provides RTR operators with both formal and on-the-job training (OJT). Radiography operators are instructed in the specific waste generating practices, typical packaging configurations, and associated waste material parameters expected to be found in each Waste Matrix Code at the site. The OJT and apprenticeship is conducted by an experienced, qualified RTR operator prior to qualification of the training candidate. Radiography operators are trained on the types of waste that are generated, stored, and characterized at the AMWTP. All of the radiography QC requirements specified in the WIPP-WAP are incorporated into the AMWTP training program and RTR operations to ensure data quality and comparability.

Radiography training programs are subject to the CBFO Audit and Surveillance Program.

One or more training containers with items (including prohibited items) common to the waste streams to be characterized and internal containers of various sizes are scanned semiannually by each operator. The audio and video media is then reviewed by a supervisor to ensure that operator's interpretations remain consistent and accurate. Imaging system characteristic are verified on a routine basis.

Independent replicate scans and replicate observations of the video output of the RTR process are performed under uniform conditions and procedures. Independent replicate scans are performed on one waste container per day or once per testing batch, whichever is less frequent, by a qualified radiography operator that was not involved in the original scan of the waste container. Independent observation of one scan (not the replicate scan) are also made once per day or once per testing batch, whichever is less frequent, by a qualified RTR operator that was not involved in the original scan of the waste container. A testing batch is a suite of waste containers undergoing RTR using the same testing equipment. A testing batch can be up to 20 waste containers without regard to waste matrix.

Oversight functions include periodic audio/video media reviews of accepted waste containers and shall be performed by qualified RTR operators that were not involved in the original scan of the waste containers. The results of this independent verification are available to the RTR operators who performed the original scans. The AMWTP SPM is responsible for monitoring the quality of the RTR data and calling for corrective action, when necessary.

C1-4 Visual Examination

The waste container contents may be verified directly by performing VE on the waste container contents. VE may be performed by physically examining the contents of waste containers to verify the Waste Matrix Code and to verify that the container is properly included in the appropriate waste stream.

VE is conducted on a waste container to identify and describe all waste items, packaging materials, and waste material parameters in the waste container.

VE activities are documented on video/audio media, or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting as specified in INST-OI-34, *Non-Facility Visual Examination Operations*, and INST-FOI-17, *Facility Visual Examination*. When VE is performed using a second operator, each operator performing the VE will observe for themselves the waste being placed in the waste container or the contents within the examined waste container when waste is not removed. The results of all VE are documented on manual VE data forms or electronically in WTS which are used to document the Waste Matrix Code, ensure that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and verify that the physical form of the waste is consistent with the waste stream description documented in the AK summary.

VE recorded on video/audio media shall meet the following minimum requirements:

- The video/audio media shall record the waste packaging event for the container such that all waste items placed into the container are recorded in sufficient detail and contain an inventory of waste items in sufficient detail that another trained VE operator can identify the associated waste material parameters.
- The video/audio media shall capture the waste container identification number.
- The personnel loading the waste container shall be identified on the video/audio media or on packaging records traceable to the loading of the waste container.
- The date of loading of the waste container will be recorded on the video/audio media or on packaging records traceable to the loading of the waste container.

VE performed using two generator site personnel shall meet the following minimum requirements:

- At least two generator site personnel who witnessed the packaging of the waste shall approve the data forms or packaging records attesting to the contents of the waste container.

- The data forms or packaging records shall contain an inventory of waste items in sufficient detail that another trained VE operator can identify the associated waste material parameters.

- The waste container identification number shall be recorded on the data forms or packaging records.

Although the AMWTP does not expect classified materials, VE video/audio media of containers which contain classified shapes are considered classified information. VE data forms or packaging records will not contain classified information.

Waste container packaging records may be used to meet the VE DQOs in Section C-4a(1). These records must meet the minimum requirements listed above for either VE recorded on video/audio media or VE performed by two operators, and shall be reviewed by operators trained and qualified to the requirements listed below. The operators will prepare data forms based on the VE records. VE batch data reports will be prepared, reviewed, and approved as described in Section C-4, and Attachment C-3.

Standardized training for VE has been developed. Personnel performing VE are instructed in the specific waste generating processes, typical packaging configurations, and the waste material parameters expected to be found in each Waste Matrix Code at the AMWTP. The training is site specific to include the various waste configurations at the AMWTP. For example, the particular physical forms and packaging configurations vary so operators are trained to examine the types of waste that are generated, stored, and characterized at the site. Training will include the following regardless of Summary Category Group:

- Identifying and describing the contents of a waste container by examining all items in waste containers of previously packaged waste

- Identifying when VE cannot be used to meet the DQOs.

VE personnel are requalified once every two years in accordance with MP-RTQP-14.4, *Personnel Qualification and Certification.*

The AMWTP designates visual examination experts (VEE). The VEE will be familiar with the waste generating processes that have taken place at the AMWTP and will also be familiar with all types of waste being characterized at the AMWTP. The VEE is responsible for the overall direction and implementation of the VE at the AMWTP. The VEE is selected based on experience and training in the types of waste being characterized. The VEE will receive training in the same elements as the VE personnel with both formal training and OJT. Qualification of a VEE is based on familiarity with waste generating processes, familiarity with the types of waste being characterized, and meeting the training requirements discussed above. The SPM evaluates personnel, using the above criteria, and designates VEEs accordingly. Consistent with other VE

personnel, the VEE will be requalified once every two years. VEE training requirements are detailed in the VEE qualification package in accordance with MP-RTQP-14.4.

C1-5 Custody of Samples

Chain of Custody (COC) on field samples (including field QC samples) is initiated immediately after sample collection or preparation (refer to INST-OI-16, INST-OI-73, and INST-OI-75). Sample custody is maintained by ensuring that samples are custody sealed during shipment to the laboratory. After samples are accepted by the analytical laboratory, custody is maintained by assuring the samples are in the possession of an authorized individual, in that individual's view, in sealed or locked container controlled by that individual, or in a secure controlled access location.

Sample custody is maintained until the sample is released by the SPM or until the sample is expended. The AMWTP COC includes provisions for each of the following:

- Signature of individual initiating custody control, along with date and time
- Documentation of sample numbers for each sample under custody. Sample numbers will be referenced to a specific sampling event description that will identify the sampler(s) through signature, the date and time of sample collection, type/number containers for each sample, sample matrix, preservatives (if applicable), requested methods of analysis, place/address of sample collection and the waste container number
- For off-site shipping, method of shipping transfer, responsible shipping organization or corporation, and associated air bill or lading number
- Signatures of custodians relinquishing and receiving custody, along with date and time of the transfer
- Description of final sample container disposition, along with signature of individual removing sample container from custody
- Comment section
- Documentation of discrepancies, breakage or tampering.

All samples and sampling equipment are identified with unique identification numbers. Sampling Coring tools and equipment are identified with unique equipment numbers to ensure that all sampling equipment, coring tools, and sampling canisters are traceable to equipment cleaning batches.

All samples are uniquely identified to ensure the integrity of the sample and can be used to identify the AMWTP and date of collection. Sample tags and labels identify at a minimum the following:

- Sample ID number
- Sampler initials and organization
- Ambient temperature and pressure (for gas samples only)
- Sample description
- Requested analyses
- Date and time of collection
- QC designation (if applicable).

C1-6 Sample Packing and Shipping

The samples are packaged by the AMWTP and transferred to the INL/CCP ACL. Sample containers are packed to prevent damage to the sampling container and to maintain the preservation temperature, if necessary. Department of Transportation (DOT) regulations are adhered to for shipment of the package.

When preparing SUMMA® or equivalent canisters for shipment, special care is taken with the pressure gauge and the associated connections. Metal boxes which have separate compartments or cardboard boxes with foam inserts are standard shipping containers. The chosen shipping container shall meet selected DOT regulations. Cold packs are added to the approved shipping container when it is necessary to maintain the preservation temperatures in the package.

Glass jars are wrapped in bubble wrap or similarly protected. The wrapped jars are placed in plastic bags inside of the shipping container so that the inside of the shipping container and the other samples in the shipping container are not contaminated in the event that one of the jars breaks. The plastic bag enables the receiving laboratory to prevent contamination of their shipping and receiving area. Plastic jars do not present a shipping problem.

Shipping containers contain appropriate blank samples to detect VOC cross-contamination. A DOT-approved cooler, or similar package, is used as a shipping container. When sample preservation temperatures must be maintained, an adequate number of cold packs are placed in the shipping container. If fill material is needed, the compatibility between the sample containers and the fill material is evaluated prior to use.

Sample containers are affixed with signed tamper proof seals or devices so that it is apparent if the sample integrity has been compromised and to ensure that the seal or device is traceable to the individual who affixed the seal. A seal is also placed outside the shipping container for the same reason. Sample custody documentation, with the signature of the current custodian showing sample custody release, is placed inside the shipping container. A seal is then placed on the outside of the shipping container, or the shipping container is locked, so that the integrity of the

custody of the sample inside the shipping container is evident. Transfer of sample custody is complete when the receiving custodian opens the shipping container and signs the sample custody documentation. The sample custody documentation serves to track the physical transfer of samples between the two custodians.

A UHWM is not required, since samples are exempted from the definition of hazardous waste under RCRA. All other shipping documentation specified in MP-TRUW-8.34 (i.e., bill of lading, site specific shipping documentation) is required.

Table C1-1. Gas Sample Requirements.

PARAMETER	Container [a]	HEADSPACE SAMPLE[b] MINIMUM VOLUME (ML)	HOLDING TEMPERATURES
VOCs	Summa® Canister	250 mil	0-40 ° C

a. Alternatively, canisters that meet QAOs may be used.
b. Alternatively, if available headspace is limited, a single 100 milliliter (mL) sample may be collected for determination of VOCs.

Table C1-2. Headspace Gas: Summary of Field Quality Control Sample Frequencies.

QC SAMPLES	MANIFOLD	DIRECT CANISTER	ON-LINE SYSTEMS
Field Blanks[a]	1 per sampling batch[d]	1 per sampling batch[d]	1 per on-line batch[f]
Equipment Blanks[b]	1 per sampling batch[d]	Once[e]	1 per on-line batch[f]
Field Reference Standards[c]	1 per sampling batch[d]	Once[e]	1 per on-line batch[f]
Field Duplicates	1 per sampling batch[d]	1 per sampling batch[d]	1 per on-line batch[f]

a. Analysis of field blanks for VOCs (Table C3-2), only, is required. For on-line integrated sampling/analytical systems, if field blank results meet the acceptance criterion, a separate on-line blank is not required.

b. One equipment blank or on-line equipment blank must be collected, analyzed for VOCs (Table C3-2), and demonstrated clean prior to first use of the headspace sampling equipment with each of the sampling heads, then at the specified frequency, for VOCs, only thereafter. Daily, prior to work, the sampling manifold, if in use, must be verified as clean.

c. One field reference standard or OLCS must be collected, analyzed, and demonstrated to meet the QAOs specified in Attachment C3 prior to first use, then at the specified frequency thereafter.

d. A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which must be collected within 14 days of the first sample in the batch.

e. One equipment blank and field reference standard must be collected after equipment purchase, cleaning, and assembly.

f. An on-line batch is the number of samples collected within a 12-hour period using the same on-line integrated sampling/analysis system. The analytical batch requirements are specified by the analytical method being used in the on-line system.

Table C1-3. Summary of Sampling Quality Control Sample Acceptance Criteria.

QC SAMPLES	ACCEPTANCE CRITERIA	CORRECTIVE ACTION [a]
Field Blanks	VOC amounts ≤ 3 × MDLs in Table C3-2 for GC/MS or GC/FID; ≤ PRQLs in Table C3-2 for FTIRS	Nonconformance if any VOC amount > 3 × MDLs in Table C3-2 for GC/MS or GC/FID; > PRQLs in Table C3-2 for FTIRS
Equipment Blanks	VOC amounts ≤ 3 × MDLs in Table C3-2 for GC/MS or GC/FID; ≤ PRQLs in Table C3-2 for FTIRS	Nonconformance if any analyte amount > 3 × MDLs in Table C3-2 for GC/MS or GC/FID; > PRQLs in Table C3-2 for FTIRS
Field Reference Standards Or On-Line Control Samples	70 - 130 percent recovery (%R)	Nonconformance if %R <70 or > 130
Field Duplicates Or On-Line Duplicates	RPD ≤ 25 %	Nonconformance if RPD > 25 %

a. Corrective action is only required if the final reported QC sample results do not meet the acceptance criteria.

MDL = Method detection limit
%R = Percent recovery
RPD = Relative percent difference

Table C1-4. Sample Handling Requirements for Homogeneous Solids and Soil/Gravel.

PARAMETER	SUGGESTED QUANTITY[a]	REQUIRED PRESERVATIVE	SUGGESTED CONTAINER	MAXIMUM HOLDING TIME[b]
VOCs	15 grams	Cool to 4 ° C	Glass Vial[c]	14 Days Prep/ 40 Days Analyze[d]
SVOCs	50 grams	Cool to 4 ° C	Glass Jar[e]	14 Days Prep/ 40 Days Analyze[d]
Metals	10 grams	Cool to 4 ° C	Plastic Jar[f]	180 Days[g]

a. Quantity may be increased or decreased according to the requirements of the analytical laboratory, as long as the QAOs are met.
b. Holding time begins at sample collection (holding times are consistent with SW-846 requirements).
c. 40-mL VOA vial or other appropriate containers shall have an airtight cap.
d. 40-day holding time allowable only for methanol extract – 14-day holding time for non extracted VOCs.
e. Appropriate containers should be used and should have Teflon® lined caps.
f. Polyethylene or polypropylene is preferred, glass jar is allowable.
g. Holding time for mercury analysis is 28 days.

NOTE: *Preservation requirements in the most recent version of SW-846 may be used if appropriate.*

Table C1-5. Headspace Gas Drum Age Criteria Sampling Scenarios.

Scenario	Description
1	A. Unvented 55-gallon drums without rigid poly liners are sampled through the drum lid at the time of venting. B1. Unvented 55-gallon drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. B2. Vented 55-gallon drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. C. Unvented 55-gallondrums with vented rigid poly liners are sampled through the drum lid at the time of venting.
2	55-gallon drums that have met the criteria for Scenario 1 and then are vented, but not sampled at the time of venting. [a]
3	Containers (i.e., 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, SLB2s.TDOPs, and pipe components) that are initially packaged in a vented condition and sampled in the container headspace and containers that are not sampled under Scenario 1 or 2.

a. Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. This requires the additional information required of each container in Scenario 3 (i.e., determination of packaging configuration), and such containers can only be sampled after meeting the appropriate Scenario 3 DAC.

Table C1-6. Scenario 1 Drum Age Criteria (In Days) Matrix.

Summary Category Group	DAC (days)
S5000	53

NOTE: *Containers that are sampled using the Scenario 1 DAC do not require information on the packaging configuration because the Scenario 1 DAC are based on a bounding packaging configuration. In addition, information on the rigid liner vent hole presence and diameter do not apply to containers that are sampled using the Scenario 1 DAC because they are unvented prior to sampling.*

Table C1-7. Scenario 2 Drum Age Criteria (In Days) Matrix.

	Summary Category Group S5000			
Filter H_2 Diffusivity [a]	**Rigid Liner Vent Hole Diameter (in)** [b]			
(mol/s/mod fraction)	0.30	0.375	0.75	1.0
1.9×10^{-6}	29	22	13	12
3.7×10^{-6}	25	20	12	11
3.7×10^{-5}	7	6	6	4

a. The documented filter H_2 diffusivity must be greater than or equal to the listed value to use the DAC for the listed filter H_2 diffusivity (e.g., a container with a filter H_2 diffusivity of 4.2×10^{-6} must use a DAC for a filter with a 3.7×10^{-6} filter H_2 diffusivity). If a filter H_2 diffusivity for a container is undocumented or unknown or is less than 1.9 × 10-6 filter H2 diffusivity, a filter of known H_2 diffusivity that is greater than or equal to 1.9×10^{-6} filter H_2 diffusivity must be installed prior to initiation of the relevant DAC period.

b. The documented rigid liner vent hole diameter must be greater than or equal to the listed value to use the DAC for the listed rigid liner vent hole diameter (e.g., a container with a rigid liner vent hole of 0.5 in. must use a DAC for a rigid liner vent hole of 0.375 in.). If the rigid liner vent hole diameter for a container is undocumented during packaging (Attachment C, Section C-3d[1]), repackaging (Attachment C, Section C-3d[1]), and/or venting (Section C1-1a[4][ii]), that container must use a DAC for a rigid liner vent hole diameter of 0.30 in.

NOTE: *Containers that are sampled using the Scenario 2 DAC do not require information on the packaging configuration because the Scenario 2 DAC is based on a bounding packaging configuration.*

Table C1-8. Scenario 3 Packaging Configuration Groups.

Packaging Configuration Group	**Covered S5000 Packaging Configuration Groups**
Packaging Configuration Group 1, 55-gal. drums [a]	• No layers of confinement, filtered inner lid [b] • No inner bags, no liner bags (bounding case)
Packaging Configuration Group 2, 55-gal. drums [a]	• 1 inner bag • 1 filtered inner bag • 1 liner bag • 1 filtered liner bag • 1 inner bag, 1 liner bag • 1 filtered inner bag, 1 filtered liner bag • 2 inner bags • 2 filtered inner bags • 2 inner bags, 1 liner bag • 2 filtered inner bags, 1 filtered liner bag • 3 inner bags • 3 filtered inner bags • 3 filtered inner bags, 1 filtered liner bag • 3 inner bags, 1 liner bag (bounding case)
Packaging Configuration Group 3, 55- gal. drums [a]	• 2 liner bags • 2 filtered liner bags • 1 inner bag, 2 liner bags • 1 filtered inner bag, 2 filtered liner bags • 2 inner bags, 2 liner bags • 2 filtered inner bags, 2 filtered liner bags • 3 filtered inner bags, 2 filtered liner bags • 4 inner bags • 3 inner bags, 2 liner bags • 4 inner bags, 2 liner bags (bounding case)
Packaging Configuration Group 4, pipe components	• No layers of confinement inside a pipe component • 1 filtered inner bag, 1 filtered metal can inside a pipe component • 2 inner bags inside a pipe component • 2 filtered inner bags inside a pipe component • 2 filtered inner bags, 1 filtered metal can inside a pipe component • 2 inner bags, 1 filtered metal can inside a pipe component (bounding case)

Table C1-8. (continued)

Packaging Configuration Group	Covered S5000 Packaging Configuration Groups
Packaging Configuration Group 5, Standard Waste Box, Standard Large Box 2 or Ten-Drum Overpack [a]	• No layers of confinement • 1 SWB liner bag (bounding case)
Packaging Configuration Group 6, Standard Waste Box, Standard Large Box 2 or Ten-Drum Overpack [a]	• Any combination of inner and/or liner bags that is less than or equal to 6 • 5 inner bags, 1 SWB liner bag (bounding case)
Packaging Configuration Group 7, 85-gallon drums and 100-gallon drums[a]	• No inner bags, no liner bags, no rigid liner, filtered inner lid (bounding case)b • No inner bags, no liner bags, no rigid liner
Packaging Configuration Group 8, 85-gallon drums and 100-gallon drums[a]	• 4 inner bags and 2 liner bags, no rigid liner, filtered inner lid (bounding case)b

a. If a specific Packaging Configuration Groups cannot be determined based on the data collected during packaging and/or repackaging, a conservative default Packaging Configuration Group of 3 for 55-gallon drums, 6 for SWBs, SLB2s and TDOPs, and 8 for 85-gallon and 100-gallon drums must be assigned provided the drums do not contain pipe component packaging. If pipe components are present as packaging in the drums, the pipe components must be sampled following the requirements for Packaging Configuration Group 4.

b. A "filtered inner lid" is the inner lid on a double lid drum that contains a filter.

Definitions:

Liner Bags. One or more optional plastic bags that are used to control radiological contamination. Liner bags for drums have a thickness of approximately 11 mils. Liner bags are typically similar in size to the container. SWB liner bags have a thickness of approximately 14 mils. TDOPs and SLB2s use SWB liner bags.

Inner Bags. One or more optional plastic bags that are used to control radiological contamination. Inner bags have a thickness of approximately 5 mils and are typically smaller than liner bags.

Table C1-9. Scenario 3 Drum Age Criteria (In Days) Matrix for S5000 Waste by Packaging Configuration Group.

Packaging Configuration Group 1

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Rigid Liner Vent Hole Diameter [b]				No Liner Lid	No Liner
	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole		
1.9×10^{-6}	131	95	37	24	4	4
3.7×10^{-6}	111	85	36	24	4	4
3.7×10^{-5}	28	28	23	19	4	4

Packaging Configuration Group 2

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Rigid Liner Vent Hole Diameter [b]				No Liner Lid	No Liner
	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole		
1.9×10^{-6}	175	138	75	60	30	11
3.7×10^{-6}	152	126	73	59	30	11
3.7×10^{-5}	58	57	52	47	28	8

Packaging Configuration Group 3

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Rigid Liner Vent Hole Diameter [b]				No Liner Lid	No Liner
	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole		
1.9×10^{-6}	199	161	96	80	46	16
3.7×10^{-6}	175	148	93	79	46	16
3.7×10^{-5}	72	72	67	62	42	10

Packaging Configuration Group 4

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Headspace Sample Taken Inside Pipe Component
$> 1.9 \times 10^{-6}$	152

Table C1-9. (continued)

Packaging Configuration Group 5	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWB/TDOP/SLB2**
> 7.4×10^{-6} (SWB)	15
3.33×10^{-5} (TDOP)	15
$6.60 \text{ X } 10^{-4}$ (SLB2)	21

Packaging Configuration Group 6	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWB/TDOP/SLB2**
> 7.4×10^{-6} (SWB)	56
3.33×10^{-5} (TDOP)	56
$6.60 \text{ X } 10^{-4}$ (SLB2)	56

Packaging Configuration Group 7			
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	**Inner Lid Filter Vent Minimum H_2 Diffusivity (mol/s/mol fraction)**		
	7.4×10^{-6}	**1.85×10^{-5}**	**9.25×10^{-5} [e]**
3.7×10^{-6}	13	7	2
7.4×10^{-6}	10	6	2
1.85×10^{-5}	6	4	2

Table C1-9. (continued)

Packaging Configuration Group 8	
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	**Inner Lid Filter Vent Minimum H_2 Diffusivity (mol/s/mol/fraction)**
	7.4×10^{-6}
3.7×10^{-6}	21

a. The documented filter H_2 diffusivity must be greater than or equal to the listed value to use the DAC for the listed filter H_2 diffusivity (e.g., a container with a filter H_2 diffusivity of 4.2×10^{-6} must use a DAC for a filter with 3.7×10^{-6} filter H_2 diffusivity). If a filter H_2 diffusivity for a container is undocumented or unknown or is less than 1.9×10^{-6} filter H_2 diffusivity, a filter of known H_2 diffusivity that is greater than or equal to 1.9×10^{-6} filter H_2 diffusivity must be installed prior to initiation of the relevant DAC period.

b. The documented rigid liner vent hole diameter must be greater than or equal to the listed value to use the DAC for the listed rigid liner vent hole diameter (e.g., a container with a rigid liner vent hole of 0.5 in. must use a DAC for a rigid liner vent hole of 0.375 in.). If the rigid liner vent hole diameter for a container is undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]), that container must use a DAC for a rigid liner vent hole diameter of 0.30 in.

c. The filter H_2 diffusivity for SWBs, SLB2s or TDOPS is the sum of the diffusivities for all of the filters on the container because SWBs, SLB2s and TDOPs have more than 1 filter.

d. Headspace sample taken between inner and outer drums lids. If headspace sample is taken inside the filtered inner drum lid prior to placement of the outer drum lid, then a DAC value of 2 days may be used. Footnote e is also applicable. Packaging Configuration Group 7 DAC values apply to drums with up to two lids.

e. While a DAC value of 2 days may be determined, containers must comply with the equilibrium requirements specified in Section C1-1a (i.e., 72 hours at 18°C or higher). The equilibrium requirement for headspace gas sampling shall be met separately.

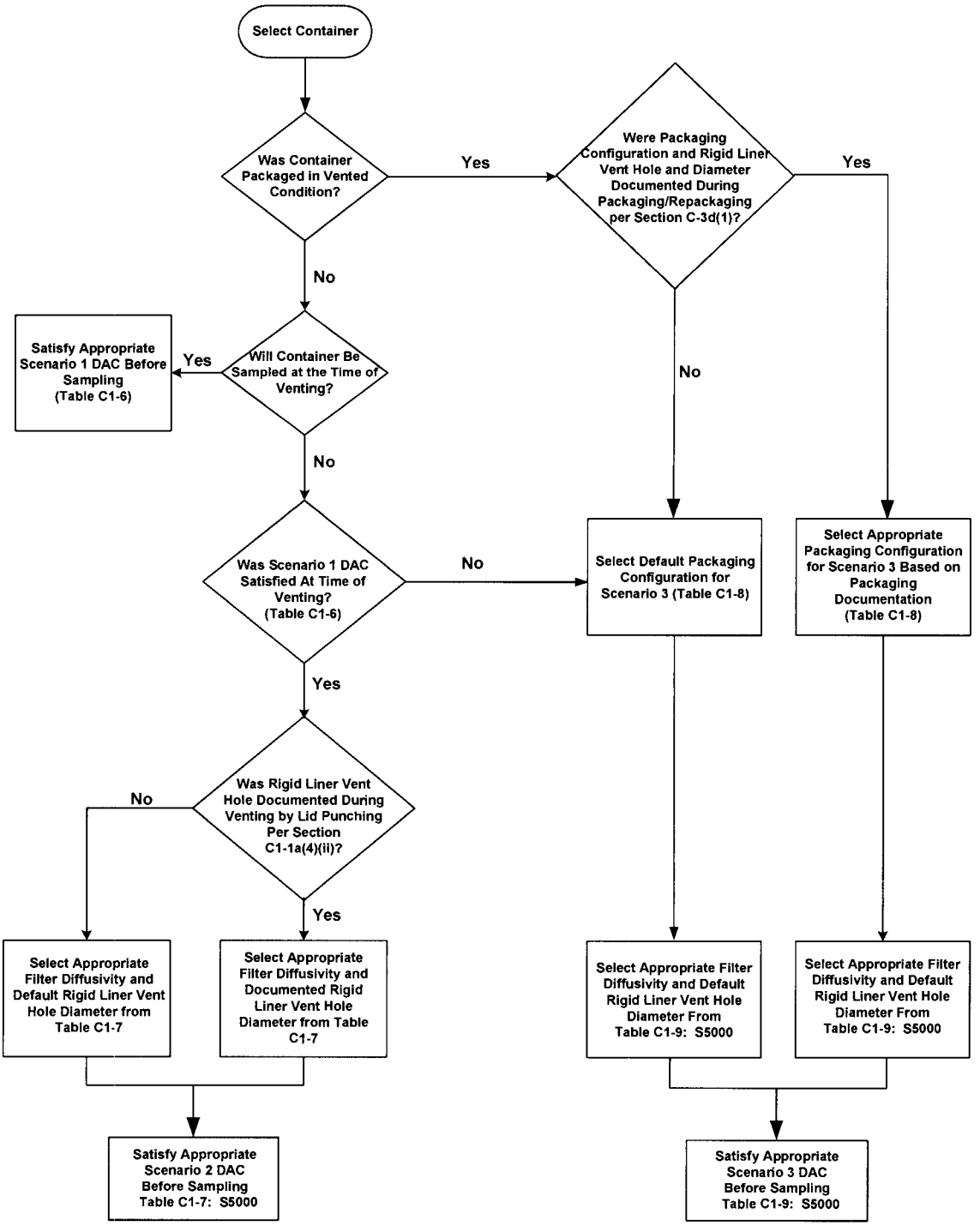


Figure C1-1. Headspace Gas Drum Age Criteria Sampling Scenario Selection Process.

Attachment C2.
Statistical Methods Used In Sampling and Analysis

The AMWTP uses the following statistical methods for sampling and analysis of TRU mixed waste, unless determined unnecessary by the CBFO as a result of an AK Sufficiency Determination. These statistical methods include methods for selecting waste containers for totals analysis, selecting waste containers for headspace gas sampling and analysis, and setting the upper confidence limit.

C2-1 Approach for Selecting Waste Containers for Statistical Sampling

C2-1a Statistical Selection of Containers for Totals Analysis

The statistical approach for characterizing retrievably stored and newly generated homogeneous solids and soil/gravel waste and repackaged or treated S3000 waste relies on using AK to segregate waste containers into relatively homogeneous waste streams. Using AK, the entire waste stream is classified as hazardous or nonhazardous rather than individual waste containers. Individual waste containers serve as convenient units for characterizing the combined mass of waste from the waste stream of interest. Once segregated by waste stream, random selection and sampling of the waste containers followed by analysis of the waste samples is performed to ensure that the resulting mean contaminant concentration provides an unbiased representation of the true mean contaminant concentration for each waste stream. The SPM verifies that the samples collected from within a waste stream were selected randomly in accordance with MP-TRUW-8.25.

An end use of analytical results for retrievably stored homogeneous solids and soil/gravel is for assigning the EPA HWNs associated with TCs (D-numbers) that apply to each mixed waste stream. The D-numbers are indicators that the waste exhibits the TC for specific contaminants under RCRA. The RCRA-toxicity determination is made on the basis of sampling and analysis of waste streams and on whether or not the waste stream includes F-number wastes. If a waste stream includes one or more RCRA F-numbers identified via AK, TC contaminants associated with the F-number waste(s) are not included in the RCRA-TC determination. That is, the F-numbers take precedence over RCRA-toxicity D-code, and the waste stream is assumed hazardous regardless of the concentration. Therefore, TCs contaminants associated with F-numbers for a waste stream is omitted from all calculations for determining the number of containers to sample because these wastes streams are assumed to be hazardous. In addition, each TC contaminant associated with the F-numbers is excluded from evaluation of analytical results to determine D-numbers. Contaminants of interest for the sampling, analysis, and RCRA-toxicity determination of a waste stream, then, exclude contaminants associated with F-numbers that have been assigned to the waste stream.

The sampling and analysis strategy is illustrated in Figure C2-1. Preliminary estimates of the mean concentration and variance of each RCRA regulated contaminant in the waste is used to determine the number of waste containers to select for sampling and analysis. Preliminary estimates are based on a minimum of five samples randomly from the waste stream. If the entire waste stream is not accessible for sampling, then a minimum of five preliminary samples will be selected randomly from the accessible population. As the rest of the waste stream is retrieved or generated, additional selected containers will be sampled as provided below and the analytical results will be reported to the CBFO. Samples collected to establish preliminary estimates that are selected, sampled, and analyzed using a CBFO-approved laboratory in accordance with applicable provisions of the WIPP-WAP may be used as part of the required number of samples to be collected. The applicability of the preliminary estimates to the waste stream to be sampled is justified and documented. The preliminary estimates are calculated in accordance with the following equations:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{(C2-1)}$$

$$s^2 = \frac{1}{n-1}\sum_{i-1}^{n}\left(x_i - \bar{x}\right)^2 \qquad \text{(C2-2)}$$

Where:

$\bar{x}$ = the calculated mean and

s^2 = the calculated concentration variance

n = the number of samples analyzed

x_i = the concentration determined in the ith sample

i = an index from 1 to n.

Based upon the preliminary estimates of $\bar{x}$ and s^2 for each chemical contaminant of concern, AMWTP estimates the appropriate minimum number of samples (n) to be collected for each contaminant using the following formula from SW-846 (EPA 1996):

$$n = \frac{t^2_{\alpha,n_0-1}\, s^2}{(RT - \bar{x})^2} \qquad \text{(C2-3)}$$

Where:

n_0 = the initial number of samples used to calculate the preliminary estimates

n = the calculated minimum number of required samples

$t_{\alpha,n-1}$ = the 90th percentile for the t distribution with n_0 -1 degrees of freedom

RT = the Regulatory Threshold of the contaminant (TC limit for toxicity characteristic wastes, PRQL for listed wastes).

The number of samples collected is based upon the largest n calculated for each of the contaminants of concern. The actual number of samples collected is adjusted as necessary to ensure that an adequate number of samples are collected to allow for acceptable levels of completeness.

Non-integer results of calculations for required sample size should be rounded up to the next integer. A minimum of five containers are sampled and analyzed in each waste stream. If there are fewer containers than the minimum or required number of samples in a waste stream, one or more randomly selected containers is sampled more than once to obtain the number of needed samples of the waste. Otherwise any one container may be selected for sampling only once.

The calculated total number of required waste containers will then be randomly sampled and analyzed using a CBFO-approved laboratory. Waste containers from the preliminary mean and variance estimates may be counted as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples.
- There is documented evidence that the method of sample collection in the preliminary estimate samples were identical to the methodology to be employed for the required samples.
- There is documented evidence that the method of sample analysis in the preliminary estimate samples were identical to the analytical methodology employed for the required samples.

- There is documented evidence that the validation of the sample analyses in the preliminary estimate samples were comparable to the validation employed for the required samples. In addition, the validated samples results shall indicate that all sample results were valid according to the analytical methodology.

If only a portion of a waste stream is accessible for sampling (e.g., the remainder of the waste stream will be recovered from storage at the generator/storage site, or only a portion of the waste stream has been repackaged, treated, or generated), the calculated number of samples will be randomly selected from the accessible portion of the waste stream. A minimum of five randomly selected samples will be obtained and analyzed from the accessible portion of the waste stream. The CBFO may approve the WSPF and authorize the AMWTP to begin shipping the waste stream to WIPP once the analytical data for the randomly selected samples from the accessible portion of the waste stream have been obtained.

The AMWTP will also randomly select the calculated number of sample locations from the waste stream as a whole. A minimum of five randomly selected sample locations will be selected from the waste stream as a whole. As those randomly selected locations (e.g., buried or newly generated waste containers), become accessible for sampling, samples will be obtained and analyzed.

For those waste streams where the population of the waste stream as a whole is indeterminate (e.g., continually generated waste streams from ongoing processes), or to facilitate waste processing, the AMWTP may divide the waste stream into lots. In this case, a minimum of five randomly selected sample locations will be selected from within each subsequent lot. As those randomly selected locations (e.g., buried or newly generated waste containers), become accessible, samples will be obtained and analyzed. As with sampling from the waste stream as a whole, the AMWTP may ship waste from the lot being generated or retrieved prior to completing sampling and analysis of the lot.

The AMWTP will use the data to update the UCL_{90} values for the waste stream as described in Section C2-2a and assign EPA HWNs as appropriate. The AMWTP will submit the analytical data from subsequent sampling to the CBFO for inclusion in the WIPP facility operating record. If changes to EPA HWNs are required as a result of subsequent sampling, the AMWTP will notify the CBFO and shipments of the affected waste stream shall be suspended until the CBFO approves a revised WSPF for the affected waste stream.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the AMWTP may assign EPA HWNs to a waste stream even if the calculated number of required samples is greater than the preliminary number of samples collected. For waste streams with calculated upper confidence limits below the regulatory threshold, the AMWTP shall collect the required number of samples if the AMWTP intends to establish that the constituent is below the regulatory threshold.

C2-1b Statistical Selection of Containers for Headspace Gas Analysis

Headspace gas sampling of a waste stream may be done on a randomly selected portion of containers in the waste stream in accordance with MP-TRUW-8.25. The minimum number of containers, *n*, that must be sampled is determined by taking an initial VOC sample from ten randomly selected containers. These samples are analyzed for all the target analytes using INST-OI-43. The standard deviation, *s*, is calculated for each of the nine VOCs in Part 4, Table 4.4.1. The value of *n* is determined as the largest number of samples (not to exceed the number of containers in the waste stream or waste stream lot) calculated using the following equation:

$$n_{VOC_i} = \frac{t^2_{\alpha,n-1} s^2_{eVOC_i}}{E^2_{VOC_i}} \qquad \text{(C2-4)}$$

Where:

n_{VOC_i} = the number of samples needed to representatively sample the waste stream for the VOC_i from Table 4.4.1

$t_{\alpha,n-1}$ = the 90th percentile for the *t* distribution with *n-1* degrees of freedom

s_{eVOCi} = the estimated standard deviation, based on the initial *n*-samples for VOC_i from Table 4.4.1

E_{VOCi} = the allowable error determined as 1 percent of the limiting concentration for VOC_i. from Table 4.4.1

Non-integer results of calculations for the required sample size should be rounded up to the next integer. A minimum of ten containers will be sampled and analyzed in each waste stream. If there is fewer than the minimum or required number of containers in a waste stream, then each container should be sampled once. The calculated total number of required waste containers will then be randomly sampled and analyzed. Waste container samples from the preliminary mean and variance estimates may be counted as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples.
- There is documented evidence that the method of sample collection in the preliminary estimate samples were identical to the methodology to be employed for the required samples.
- There is documented evidence that the method of sample analysis in the preliminary estimate samples were identical to the analytical methodology employed for the required samples.

- There is documented evidence that the validation of the sample analyses in the preliminary estimate samples were comparable to the validation employed for the required samples. In addition, the validated samples results shall indicate that all sample results were valid according to the analytical methodology.

The mean and standard deviation calculated after sampling *n* containers can be used to calculate a UCL_{90} for each of the headspace gas VOCs using the methodology presented in Section C2-2b.

If only a portion of a waste stream is accessible for sampling (e.g., the remainder of the waste stream will be recovered from storage or only a portion of the waste stream has been repackaged or treated), the calculated number of samples will be randomly selected from the accessible portion of the waste stream. A minimum of ten randomly selected samples will be obtained and analyzed from the accessible portion of the waste stream. The CBFO may approve the WSPF and authorize the AMWTP site to begin shipping the waste stream to WIPP once the analytical data for the randomly selected samples from the accessible portion of the waste stream has been obtained.

The AMWTP will also randomly select the calculated number of sample locations from the waste stream as a whole. A minimum of ten randomly selected sample locations will be selected from the waste stream as a whole. As those randomly selected locations (e.g., buried or newly generated waste containers), become accessible for sampling, samples will be obtained and analyzed.

For those waste streams where the population of the waste stream as a whole is indeterminate (e.g., continually generated waste streams from ongoing processes), or to facilitate waste processing, the AMWTP may divide the waste stream into lots. In this case, a minimum of ten randomly selected containers will be selected from within each subsequent lot. As those randomly selected containers (e.g., buried or newly generated waste containers) become accessible, samples will be obtained and analyzed. As with sampling from the waste stream as a whole, the AMWTP may ship waste from the lot being generated or retrieved prior to completing sampling and analysis of the lot.

The AMWTP will use the data to update the UCL_{90} values for the waste stream as described in Section C2-2b and assign EPA HWNs as appropriate. The AMWTP will submit the analytical data from subsequent sampling to the CBFO for inclusion in the WIPP facility operating record upon completion of project level data validation in Section C3-10b. If changes to EPA HWNs are required as a result of subsequent sampling, the AMWTP will notify the CBFO and shipments of the affected waste stream shall be suspended until the CBFO approves a revised WSPF for the affected waste stream.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the AMWTP may presumptively assign EPA HWNs to a waste stream even if the calculated number of required samples is greater than the preliminary number of samples collected. For waste streams with calculated upper confidence limits below the regulatory threshold, the AMWTP will collect the required number of samples if the site intends to establish that the constituent is below the regulatory threshold.

C2-2 Upper Confidence Limit for Statistical Sampling

C2-2a Upper Confidence Limit for Statistical Solid Sampling

Upon completion of the required sampling, final mean and variance estimates and the UCL_{90} for the mean concentration for each contaminant is determined. The observed sample n^* is checked against the preliminary estimate for the number of samples (n) to be collected before proceeding using the following equation:

$$n^* = \frac{t^2_{\alpha,n-1}\, s^2}{(RT - x)^2} \qquad \text{(C2-5)}$$

and the right-side terms in the equation are as defined in Section C2-1a.

If the observed sample n^* estimate results in greater than 20 percent or more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of n^* is an iterative process that follows the collection and analysis of any additional samples and continues until the difference between n^* and the previous sample size determination is less than 20 percent.

Once sufficient sampling and analysis has occurred, the waste characterization will proceed. The assessment is made at the 90-percent confidence level. The UCL_{90} for the mean concentration of each contaminant will be calculated using the following equation from OSWER 9285.6-10 (EPA 2002):

$$UCL_{90} = \bar{x} + \frac{(t_{\alpha,n-1}\, s)}{\sqrt{n}} \qquad \text{(C2-6)}$$

If the UCL_{90} for the mean concentration is less than the regulatory threshold limit (RTL), the waste stream is not required to be assigned the EPA HWN for the associated contaminant. If the UCL_{90} is greater than or equal to the RTL, the waste stream is assigned the EPA HWN for the associated contaminant.

Compliance with the requirements for comparison of the UCL_{90} to regulatory thresholds is achieved through the execution of procedure MP-TRUW-8.11.

C2-2b Upper Confidence Limit for Statistical Headspace Gas Sampling

A UCL_{90} concentration for each of the headspace gas VOCs is calculated from the sample data collected. The observed sample n^* is checked against the estimate for the number of samples (n) to be collected before proceeding, where: n* is:

$$n^* = \frac{t^2_{\alpha,n-1}\, s^2}{E^2} \qquad \text{(C2-7)}$$

where E is as defined in Section C2-1b and the remaining right-side terms in the equation are as defined in Section C2-1a. When composite headspace gas sample results are used, the mean, standard deviation, and t-statistic are based on the number of composite samples analyzed, rather than on the number of drums sampled.

If the observed sample n^* estimate results in greater than 20 percent or more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of n^* is an iterative process that follows the collection and analysis of any additional samples and continues until the difference between n^* and the previous sample size determination is less than 20 percent.

The UCL_{90} is then calculated using the UCL_{90} equation C2-6. In this case, the UCL_{90} is the 90 percent upper confidence limit for the mean VOC concentration, $\bar{x}$ is the calculated sample mean VOC concentration, and s is the calculated sample standard deviation. The value of $t_{(\alpha, n-1)}$ is found in Table 9-2 of Chapter 9 of SW-846.

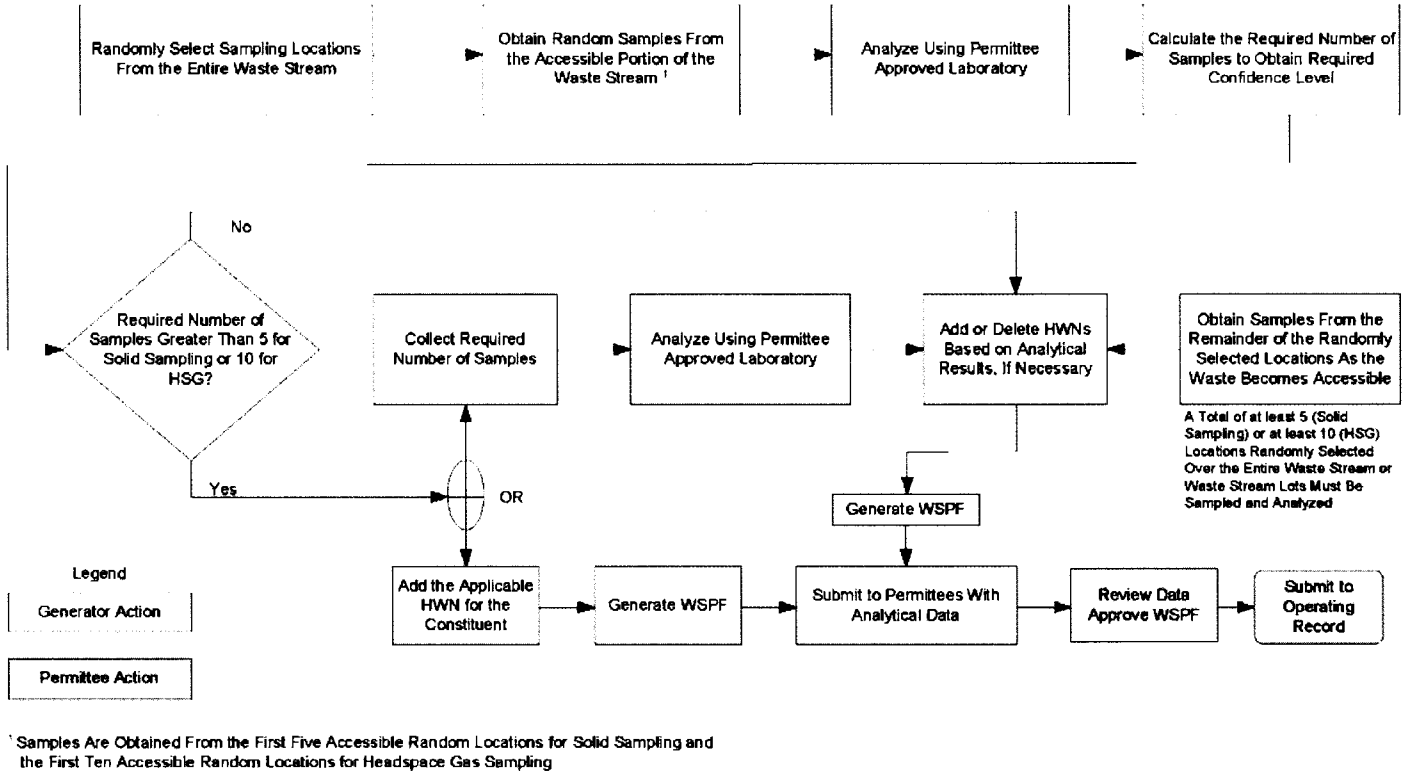


Figure C2-1. Approach for Solid and Headspace Gas Sampling and Analysis to Obtain Additional Waste Characterization Information.

Attachment C3. Quality Assurance Objectives and Data Validation Techniques for Waste Characterization Sampling and Analytical Methods

C3-1 Validation Methods

Validation of all data (qualitative as well as quantitative) is performed so that data used for WIPP compliance activities are of known and acceptable quality. Validation includes a quantitative determination of precision, accuracy, completeness, and MDL (as appropriate) for analytical data (headspace gas VOCs, total VOCs, SVOC, and metals data). Quantitative data validations are performed according to the conventional methods outlined below (equations in C3-1 through C3-8). These quantitative determinations are compared with the QAOs specified in Sections C3-2 through C3-9. Qualitative determination of comparability and representativeness is also performed.

The qualitative data or descriptive information generated by RTR and VE is not amenable to statistical data quality analysis. However, RTR and VE are complementary techniques yielding similar data to determine the waste matrix code. The waste matrix code is determined to ensure the container is properly included in the appropriate waste stream.

Data validation will be used to assess the quality of waste characterization data collected based upon project precision, accuracy, completeness, comparability, and representativeness objectives described below:

Precision

Precision is a measure of the mutual agreement among multiple measurements of a single analyte, either by the same method or by different methods. Precision is either expressed as the relative percent difference (RPD) for duplicate measurements or as the percent relative standard deviation (%RSD) for three or more replicate measurements. For duplicate measurements, the precision expressed as the RPD is calculated as follows:

$$RPD = \frac{(C_1 - C_2)}{\frac{(C_1 + C_2)}{2}} \times 100 \qquad \text{(C3-1)}$$

where C_1 and C_2 are the two values obtained by analyzing the duplicate samples. C_1 is the larger of the two observed values.

For three or more replicate measurements, the precision expressed as the %RSD is calculated as follows:

$$\%RSD = \frac{s}{\bar{y}} \times 100 \qquad \text{(C3-2)}$$

where s is the standard deviation and $\bar{y}$ is the mean of the replicate sample analyses.

The standard deviation, s, is calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n-1}} \qquad \text{(C3-3)}$$

where y_i is the measured value of the ith replicate sample analysis measurement, and n equals the number of replicate analyses.

Precision, associated with analytical equipment calibration, is also measured as the percent difference (%D) between multiple measurements of an equipment calibration standard is calculated as follows:

$$\%D = \frac{|C_1 - C_2|}{C_1} \times 100 \qquad \text{(C3-4)}$$

where C_1 is the initial measurement and C_2 is the second or other additional measurement.

Accuracy

Accuracy is the degree of agreement between a measured analyte concentration (or the average of replicate measurements of a single analyte concentration) and the true or known concentration. Accuracy is determined as the percent recovery (%R).

For situations where a standard reference material is used, the %R is calculated as follows:

$$\%R = \frac{C_m}{C_{srm}} \times 100 \qquad \text{(C3-5)}$$

where C_m is the measured concentration value obtained by analyzing the sample and C_{srm} is the "true" or certified concentration of the analyte in the sample.

For measurements where matrix spikes are used, the %R is calculated as follows:

$$\% R = \frac{S\text{-}U}{C_{sc}} \; x\, 100 \qquad \text{(C3-6)}$$

where S is the measured concentration in the spiked aliquot, U is the measured concentration in the unspiked aliquot, and C_{sc} is the actual concentration of the spike added.

Method Detection Limit (MDL)

The MDL is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL for all quantitative measurements (except for those using Fourier Transform Infrared Spectroscopy [FTIR]) is defined as follows:

$$MDL = t_{(n-1,1-\alpha=0.99)} \times s \qquad \text{(C3-7)}$$

where $t_{(n\text{-}1,\ 1\text{-}\square=\ .99)}$ is the t-distribution value corresponding to a 99% confidence level with n-1 degrees of freedom, n is the number of observations, and s is the standard deviation of replicate measurements.

Currently, the AMWTP has no plans to use FTIR; however, should FTIR be used for headspace-gas analysis, the MDL is defined as follows:

$$\text{MDL} = 3\text{s} \qquad \text{(C3-8)}$$

where s is the standard deviation. Initially, a minimum of seven samples spiked at a level of three to five times the estimated MDL and analyzed on non-consecutive days must be used to establish the MDLs. MDLs should be updated using the results of the LCS or OLCSs.

Completeness

Completeness is a measure of the amount of valid data obtained from the overall measurement system compared to the amount of data collected and submitted for analysis. Completeness must be expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Completeness, expressed as the percent complete (%C), is calculated as follows:

$$\%C = \frac{V}{n} \times 100 \qquad \text{(C3-9)}$$

where V is the number of valid sampling or analytical results obtained and n is the number of samples submitted for analysis.

Comparability

Comparability is the degree to which one data set can be compared to another. Comparability of data generated at different sites is ensured through the use of standardized, approved testing, sampling, preservation, and analytical techniques and by meeting the QAOs specified in Sections C3-2 through C3-9.

The comparability of waste characterization data shall be ensured through the use of data usability criteria (based on guidance provided by CBFO), which address, as appropriate, the following:

- Definition or reference of criteria used to define and assign data qualifier flags based on QAO results
- Criteria for assessing the usability of data impacted by matrix interferences
- Criteria for assessing the usability of data based upon positive and negative bias as indicated by QC data, of data qualifiers, and qualifier flags
- Criteria for assessing the usability of data due to:
    1. Severe matrix effects
    2. Misidentification of compounds
    3. Gross exceedance of holding times
    4. Failure to meet calibration or tune criteria
- Criteria for assessing the usability of data that does not meet minimum detection limit requirements.

Representativeness

Representativeness is the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that concerns the proper design of the sampling program.

The representativeness of waste containers from waste streams subjected to headspace gas and homogeneous solids and soil/gravel sampling and analysis is validated through documentation, that a true random sample with an adequate population was identified and collected consistent with Section C2-1. Since representativeness is a quality characteristic that expresses the degree to which a sample or group of samples represents the population being studied, the random selection of waste containers ensures representativeness at a Program level. The SPM documents that the selected waste containers from within a waste stream are randomly selected. Sampling personnel verify that proper procedures are followed to ensure that samples are representative of the waste contained in a particular waste container or a waste stream.

Identification of Tentatively Identified Compounds

In accordance with EPA SW-846 convention, identification of compounds detected by GC/MS methods that are not on the list of target analytes shall be reported. Both composited and individual container headspace gas, volatile analysis (TCLP/Totals), and semi-volatile (TCLP/Totals) analysis are subject to TIC reporting.

AMWTP and CCP procedures for identifying and reporting TICs when using GC/MS methods are based on guidance provided in EPA SW-846 Method 8260B and SW-846 Method 8270C. TIC evaluation for headspace gas is addressed in INST-OI-43. TIC evaluation for total VOC and SVOC analysis is addressed in CCP-TP-184, *CCP Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS)*, and CCP-TP-185, *CCP Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*. These procedures assign tentative identifications in accordance with the following SW-846 criteria:

- Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.
- The relative intensities of the major ions should agree within ± 20%.
- Molecular ions present in the reference spectrum should be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

- Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks.

- The reference spectra used for identifying TICs shall include, at minimum, all of the available spectra for compounds that appear in the 20.4.1.200 NMAC (incorporating 40 CFR Part 261) Appendix VIII list. The reference spectra may be limited to VOCs when analyzing headspace gas samples.

- TICs for headspace gas analysis that are performed through FTIR analyses shall be identified in accordance with the specifications of SW-846 method 8410.

TICs shall be reported as part of the analytical batch data reports for GC/MS Methods in accordance with the following minimum criteria:

- A TIC in an individual container headspace gas or solids sample shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria above and is present with a minimum of 10% of the area of the nearest internal standard.

- A TIC in a composited headspace gas sample that contains 2 to 5 individual container samples shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 2% of the area of the nearest internal standard.

- A TIC in a composited headspace gas sample that contains 6 to 10 individual container samples shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 1% of the area of the nearest internal standard.

- A TIC in a composited headspace gas sample that contains 11 to 20 individual container samples shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 0.5% of the area of the nearest internal standard.

TICs that meet the SW-846 identification criteria, are reported in 25% of all waste containers sampled from a given waste stream and that appear in the 20.4.1.200 NMAC (incorporating 40 CFR Part 261) Appendix VIII list will be compared to AK to determine if the TIC is a listed waste in the waste stream. TICs identified through headspace gas analyses that meet the Appendix VIII list criteria and the 25% reporting criteria for a waste stream will be added to the headspace gas waste stream target list regardless of the hazardous waste listing associated with the waste stream. TICs reported from the Totals VOC or SVOC analyses may be excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials, or radiolytic degradation from AK

documentation. If a listed waste constituent TIC cannot be attributed to waste packaging materials, radiolysis, or other origins, the constituent will be added to the target analyte list and new EPA HWNs will be assigned, if appropriate. TICs subject to inclusion on the target analyte list that are TC parameters shall be added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, for TC and nontoxic F003 constituents, the site may take concentration into account when assessing whether to add an EPA HWN. If a target analyte list for a waste stream is expanded due to the presence of TICs, all subsequent samples collected from that waste stream will be analyzed for constituents on the expanded list. The comparison to AK and the determination of whether or not to add the TIC to the target analyte list will be done in accordance with MP-TRUW-8.11and MP-TRUW-8.13.

C3-2 Headspace Gas Sampling

Quality Assurance Objectives

Headspace gas samples are collected in accordance with INST-OI-43. The precision and accuracy of container headspace gas sampling operations are assessed by analyzing field QC headspace gas samples. These samples must include equipment blanks, field reference standards, field blanks, and field duplicates. If the QAOs in this section are not met, then an NCR must be prepared, submitted, and resolved (see Section C3-13).

Precision

The precision of the headspace gas sampling and analysis operations is assessed by sequential collection of field duplicates for manifold sampling operations or simultaneous collection of field duplicates for direct canister sampling operations for VOC determination. Corrective actions must be taken if the RPD exceeds 25% for any analyte found greater than the PRQL in both of the duplicate samples.

Accuracy

A field reference standard is collected using headspace-gas sampling equipment to assess the accuracy of the headspace-gas sampling operation at a frequency of one field reference standard for every 20 containers sampled or per sampling batch. Corrective action must be taken if the %R of the field reference standard is less than 70 or greater than 130.

Field blanks are collected at a frequency of 1 field blank for every 20 containers or sampling batch sampled to assess possible contamination in the headspace gas sampling method. Equipment blanks must also be collected at a frequency of one equipment blank for each equipment cleaning batch to assess possible contamination in the equipment cleaning method. Corrective actions must be taken if the blank exceeds three times the MDLs listed for any of the compounds listed in Table C3-2.

Field reference standard and blanks are collected in accordance with INST-OI-43.

Completeness

Sampling completeness is expressed as the number of valid samples collected as a percent of the total number of samples collected for each waste stream. A valid sample is defined as a sample collected in accordance with approved sampling methods and the container was properly prepared for sampling (e.g., the poly liner was vented to the container headspace). The AMWTP shall achieve a minimum 90% completeness. The amount and type of data that may be lost during the headspace gas sampling operation cannot be predicted in advance. The AMWTP SPM or designee evaluates the importance of any lost or contaminated headspace gas samples and takes corrective action, as appropriate.

Comparability

Consistent use and application of uniform procedures and equipment, as specified in Attachment C1 and application of data usability criteria, should ensure that headspace gas sampling operations are comparable when sampling headspace at the different sampling facilities. The AMWTP takes corrective actions if uniform procedures, equipment, or operations are not followed without approved and justified deviations. In addition, the AMWTP sampling and analysis systems successfully participate in the PDP. INST-OI-43 describes the headspace sampling process at the AMWTP.

Representativeness

Specific headspace gas sampling steps to ensure samples are representative include:

- Selection of the correct DAC Scenario and waste packaging configuration and meeting DAC equilibrium times
- Sample canister cleaning and leak-check after assembly
- Sampling equipment cleaning or disposal after use
- Sampling equipment leak-check after sample collection
- Use of sample canisters with passivated internal surfaces
- Use of low-internal-volume sampling equipment
- Collection of samples with a low-sample volume to available headspace volume ratio (less than 10% of the headspace when the headspace can be determined)
- Careful and documented pressure regulation of sampling activities specified in Section C1-1

- Performance audits
- Collection of equipment blanks, field reference standard, field blanks, and field duplicates at the specified frequencies
- Manifold pressure sensors and temperature sensors calibrated before initial use and annually using NIST, or equivalent standards.

Failure to perform the checks at the prescribed frequencies results in corrective actions.

C3-3 Sampling of Homogeneous Solids and Soils/Gravel

Quality Assurance Objectives

This section presents QAOs to ensure sampling is conducted in a representative manner on a waste stream basis for containers containing homogeneous solids or soil/gravel. Samples are randomly collected in both the horizontal and vertical planes of each container's waste as described in INST-OI-16 and INST-OI-73. For waste containers that contain homogeneous solids or soils/gravel in smaller containers (for example, 1 gal poly bottles) within a waste container, one randomly chosen smaller container must be sampled from each drum in accordance with INST-OI-75.

Precision

Sampling precision is determined by collecting and sampling field duplicates (e.g., co-located cores or co-located samples as described in Section C1-2b[1]), once per sampling batch or once per week during the sampling operations, whichever is more frequent. A sampling batch is a suite of homogeneous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QA samples), all of which must be collected within 14 calendar days of the first sample in the batch. The RPD between collocated core samples is calculated and reported by the SPM or designee per MP-TRUW-8.17, *Co-Located Core Sampling Control Charts.*

The recommended method for establishing acceptance criteria for co-located cores and co-located samples is the F-Test method because the F-Test: (1) does not require potentially arbitrary groupings into batches, (2) is based on exact distributions, and (3) is more likely to detect a change in the process. When a sufficient number of samples are collected (25 to 30 pairs of collocated cores or samples), control charts of the RPD will be developed for each constituent and for each waste matrix or waste type (e.g. pyrochemical salts or organic sludges). The limits for the control chart will be three standard deviations above or below the average RPD. Once constructed, RPDs for additional co-located pairs will be compared with the control chart to determine whether or not the co-located cores are acceptable. Periodically, the control charts will be updated using all available data.

The statistical test will involve calculating the variance for co-located cores and samples by pooling the variances computed for each pair of duplicate results. The variance for the waste stream will be computed excluding any data from containers with co-located cores, because the test requires the variance estimate to be independent. All data must be transformed to normality prior to computing variances and performing the test. The test hypothesis is evaluated using the F distribution and the method for testing the difference in variances.

Accuracy

Sampling accuracy through the use of standard reference materials is not measured. Because waste containers containing homogeneous solids and soil/gravel with known quantities of analytes are not available, sampling accuracy cannot be determined. However, sampling methods and requirements described are designed to minimize sample degradation and hence maximize sampling accuracy.

Sampling accuracy as a function of sampling cross-contamination will be measured. Equipment blanks will be collected at a frequency of once per equipment cleaning batch. Corrective actions must be must be taken if the blank exceeds three times the MDLs (PRDLs for metals) listed for any of the compounds or analytes listed in Tables C3-4, C3-6, and C3-8. Equipment blanks will be collected from the following equipment types:

- Fully assembled coring tools
- Liners cleaned separately from coring tools
- Miscellaneous sampling equipment that is reused (bowls, spoons, chisels)

Completeness

Sampling completeness is expressed as the number of valid samples collected as a percent of the total samples collected for each waste stream. A valid sample is any sample collected from a randomly selected container using randomly selected horizontal and vertical planes in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. The AMWTP must achieve a minimum 90% completeness.

Comparability

Consistent use and application of uniform procedures, sampling equipment, and measurement units must ensure that sampling operations are comparable. Consistent application of data usability criteria will also ensure comparability. In addition, laboratories analyzing samples successfully participate in the PDP.

Representativeness

Specific steps to ensure representativeness of samples include the following for both waste containers and smaller containers:

- Coring tools and sampling equipment used are clean before sampling
- The entire depth of waste minus a defined approved safety factor is cored, and the core collected must have a length greater than or equal to 50% of the waste depth. This is called core recovery and is calculated as follows:

$$Core\ recovery\,(\%) = \frac{y}{x} \times 100 \qquad \text{(C3-10)}$$

  Where:

  x = waste depth in the container

  y = the length of the core collected from the waste

- Coring operations and tool selection should be designed to minimize alteration of the in-place waste characteristics. Minimal waste disturbance must be verified by visually examining the core and describing the observation (e.g., undisturbed, cracked, or pulverized) in the field logbook.

If core recovery is less than 50% of the depth of the waste, a second coring location is randomly selected. The core with the best core recovery is used for sample collection.

One randomly selected container within a container will be chosen if the drum contains individual containers.

C3-4 Non-Destructive Examination Methods

Quality Assurance Objectives

The QAOs for non-destructive examination (NDE) are detailed in this section. NDE can be either RTR or VE. In the event QAOs are not met, then corrective action is taken in accordance with MP-Q&SI-5.4. It should be noted that NDE does not have a specific MDL because it is primarily a qualitative determination. The objective of NDE is to determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used based on Summary Category Groups (i.e., S3000, S4000, S5000). All activities required to achieve these objectives are described in INST-OI-12 and INST-OI-81.

C3-4a Radiography

Data to meet these objectives are obtained from a video and audio recorded scan provided by trained and qualified RTR operators. Results are also recorded on a radiography data form. The precision, accuracy, completeness, and comparability objectives for RTR data are presented below.

Precision

Precision is maintained by reconciling any discrepancies between two RTR operators with regard to identification of the waste matrix code, liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits, and compressed gases through independent replicate scans and independent observations.

Additionally, the precision of RTR is verified prior to use by tuning precisely enough to demonstrate compliance with QAOs through viewing an image test pattern.

Accuracy

Accuracy is obtained by using a target to tune the image for maximum sharpness and by requiring operators to successfully identify 100 percent of the items required to meet the DQOs for radiography specified in Section C-4a(1) in a training container during their initial qualifications and subsequent requalification.

Completeness

A video and audio media recording of the RTR examination and a validated radiography data form is obtained for 100 percent of the waste containers subject to RTR. All video and audio recording and radiography data forms are subject to validation as indicated in Sections C3-10.

Comparability

The comparability of RTR data from different operators is enhanced by using standardized RTR procedures and operator qualification. Operator training requirements are detailed in the RTR qualification package in accordance with MP-RTQP-14.4.

C3-4b Visual Examination

Results are recorded on a VE data form. The precision, accuracy, completeness, and comparability objectives for VE data are presented below.

Precision

Precision is maintained by reconciling any discrepancies between the operator and the independent technical reviewer with regard to identification of the waste matrix code, liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits, and compressed gases.

Accuracy

Accuracy is maintained by requiring operators to pass a comprehensive examination and demonstrate satisfactory performance in the presence of the VEE during their initial qualification. VE operators shall be requalified every two years.

Completeness

A validated VE data form is obtained for 100 percent of the waste containers subject to VE.

Comparability

The comparability of VE data from different operators is enhanced by using standardized VE procedures and operator qualification. Operator training requirements are detailed in the VE qualification package in accordance with MP-RTQP-14.4.

C3-5 Gas Volatile Organic Compounds Analysis

Quality Assurance Objectives

The specified QAOs in Table C3-2 represent the required quality of data necessary to draw valid conclusions regarding program objectives. WIPP-WAP required limits, such as the PRQL associated with VOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of the data users. A summary of required QC samples and the associated acceptance criteria is included in Table C3-3. Key data quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed by analyzing duplicates, and replicate analyses of control samples, and PDP blind audit samples. The results from measurements on these QC samples are compared with the acceptance criteria in Tables C3-2. These QC measurements are used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Precision is initially assessed using analytical methods described in INST-OI-43.

Accuracy

Accuracy as %R is assessed for the laboratory operations by analyzing PDP blind-audit samples and LCSs. The results from these measurements are compared with the acceptance criteria in Table C3-2. These QC measurements are used to demonstrate acceptable method performance and trigger corrective action when control limits are exceeded.

Accuracy is initially assessed using INST-OI-43 by analyzing a minimum of seven replicate method performance samples.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations are performed and evaluated using the criteria specified in Table C3-3 as implemented in INST-OI-43. These criteria will be used to demonstrate acceptable calibration and trigger corrective action when control limits are exceeded.

Method Detection Limits (MDLs)

MDLs are expressed in units of nanograms (ng) for VOCs and must be less than or equal to those listed in Table C3-2. MDLs are determined based on the method described in Section C3-1 and in accordance with INST-OI-43, as applicable.

Program Required Quantitation Limit

The AMWTP demonstrates the capability to quantitate analytes at or below the PRQL given in Table C3-2. The AMWTP sets the concentration of at least one calibration standard below the PRQL. INST-OI-43 details the procedures for PRQL demonstration.

Completeness

Laboratory completeness shall be expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. A composited sample is treated as one sample for the purposes of completeness because only one sample is run through the analytical instrument. Valid results are defined as results that meet the data usability criteria based on application of the QC Criteria specified in Tables C3-2 and C3-3; and meet the detection limit, calibration, representativeness, and comparability criteria within this section and in Table C3-2.

Comparability

For VOC analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is achieved by using standardized methods and traceable standards and successful participation in the PDP.

Representativeness

Representativeness for VOC analysis is achieved by collection of sufficient numbers of samples using clean sampling equipment that does not introduce sample bias. Samples must be collected as specified in Attachment C1.

C3-6 Total Volatile Organic Compound Analysis

Total VOC analysis is performed for the AMWTP by the INL/CCP ACL.

Quality Assurance Objectives

The development of DQOs has resulted in the QAOs listed in Table C3-4. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. QAPjP-required limits, such as the PRQL associated with VOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or matrix spike duplicates (MSDs), replicate analyses of LCSs, and PDP blind audit samples. The results of these QC samples are compared with the acceptance criteria in Table C3-4. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy

Accuracy as %R is assessed for the laboratory operations by analyzing LCSs, matrix spikes, surrogate compounds, and PDP blind-audit samples. The results from these measurements for matrix spike samples are compared to the %R criteria listed in Table C3-4. Surrogates and internal standards are evaluated as specified in SW-846 method (EPA 1996) or Table C3-5. The QC measurements will be used to demonstrate acceptable method performance and to trigger corrective actions when control limits are exceeded.

Laboratory blanks are assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-5. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

GC/MS Tunes, initial calibrations, and continuing calibrations are performed and evaluated using criteria specified in Table C3-5 and the SW-846 method (EPA 1996). These criteria will be

used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Method Detection Limit

MDLs are expressed in milligrams per kilogram (mg/kg) for VOCs and must be less than or equal to those listed in Table C3-4. The detailed procedures for MDL determination are included in the laboratory procedures.

Program Required Quantitation Limit

Laboratories will quantitate analytes in samples at or below the PRQLs given in Table C3-4. Laboratories set the concentration of at least one calibration standard below the PRQL. The detailed procedures for MDL determination are included in the laboratory procedures.

Completeness

Laboratory completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results are defined as results that meet the data usability criteria based upon an application of the QC criteria specified in Tables C3-4 and C3-5 and meet the calibration, detection limit, representativeness, and comparability criteria within this section. Participating laboratories must meet the completeness criteria specified in Table C3-4.

Comparability

For VOC analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is ensured by consistent use of standardized SW-846 sample preparation and methods that meet the QAOs specified in Tables C3-4 and C3-5, traceable standards, and by successful participation in the PDP. AMWTP may use the most recent version of SW-846. Any changes to SW-846 methodology that results in the elimination of sample preparation or analytical methods must be addressed as a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for VOC analysis is achieved by collecting unbiased samples as addressed in Attachment C1.

C3-7 Total Semivolatile Organic Compound Analysis

Total SVOC analysis is performed for the AMWTP by the INL/CCP ACL.

Quality Assurance Objectives

The development of DQOs has resulted in the QAOs listed in Table C3-6. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. QAPjP-required limits, such as the PRQL associated with SVOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of Quality Control samples and associated acceptance criteria for this analysis is included in Table C3-7. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or MSDs, replicate analyses of LCSs and PDP blind audit samples. The results of these QC samples are compared with the acceptance criteria in Table C3-6. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy

Accuracy as %R is assessed for the laboratory operations by analyzing LCSs, matrix spikes, surrogate compounds, and PDP blind-audit samples. The results from these measurements for matrix spike samples are compared to the %R criteria listed in Table C3-6. Surrogates and internal standards are evaluated as specified in SW-846 method (EPA 1996) or Table C3-7. The QC measurements will be used to demonstrate acceptable method performance and to trigger corrective actions when control limits are exceeded.

Laboratory blanks are assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-7. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations are performed and evaluated using criteria specified in Table C3-7 and the SW-846 method (EPA 1996). These criteria will be used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Method Detection Limit

MDLs are expressed in mg/kg for SVOCs and must be less than or equal to those listed in Table C3-6. The detailed procedures for MDL determination are included in the laboratory procedures.

Program Required Quantitation Limit

Laboratories will quantitate analytes in samples at or below the PRQLs given in Table C3-6. Laboratories set the concentration of at least one calibration standard below the PRQL. The detailed procedures for MDL determination will be included in the site procedures.

Completeness

Laboratory completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results are defined as results that meet the data usability criteria based upon an application of the QC criteria specified in Tables C3-6 and C3-7 and meet the calibration, detection limit, representativeness, and comparability criteria within this section. Participating laboratories must meet the completeness criteria specified in Table C3-6.

Comparability

For SVOC analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is ensured by consistent use of standardized SW-846 sample preparation and methods that meet the QAOs specified in Tables C3-6 and C3-7, traceable standards, and by successful participation in the PDP. AMWTP may use the most recent version of SW-846. Any changes to SW-846 methodology that results in the elimination of sample preparation or analytical methods must be addressed as a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for SVOC analysis is achieved by collecting unbiased samples as addressed in Attachment C1.

C3-8 Total Metal Analysis

Total metal analysis is performed for the AMWTP by the INL/CCP ACL.

Quality Assurance Objectives

The development of DQOs has resulted in the QAOs listed in Table C3-8. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program

objectives. QAPjP-required limits, such as the PRQL associated with metals analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of Quality Control samples and the associated acceptance criteria for this analysis is provided in Table C3-9. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or laboratory MSDs, replicate analyses of LCSs, and PDP blind audit samples. The results of these QC samples are compared with the acceptance criteria in Table C3-8. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy

Accuracy is assessed through the analysis of laboratory matrix spikes, PDP blind-audit samples, serial dilutions, interference check samples, and LCSs. The results from these measurements for matrix spike samples are compared to the criteria listed in Tables C3-8 and C3-9. The QC measurements will be used to demonstrate acceptable method performance and to trigger corrective actions when control limits are exceeded.

Laboratory blanks and calibration blanks are assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-9. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

Mass Tunes (for ICP MS only), Standards Calibrations, Initial Calibration Verifications (ICVs), and continuing calibrations are performed and evaluated using the procedures and criteria specified in Table C3-9 and the SW-846 method (EPA 1996). These criteria will be used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Program Required Detection Limits

PRDLs, expressed in units of micrograms per liter (μg/L), are the maximum values for instrument detection limits (IDLs) permitted by the QAPjP. IDLs will be less than, or equal to, the PRDL for the method used to quantitate a specific analyte. The methods listed in Table C-5 will be used if the IDL meets this criterion. For high concentration samples, an exception to the above requirements will be made in cases where the sample concentration exceeds five times the IDL of the instrument being used. In this case, the analyte concentration may be reported even

though the IDL may exceed the PRDL. IDLs will be determined semiannually (i.e., every six months). Detailed procedures for IDL determination are included in the laboratory procedure.

Program Required Quantitation Limit

Laboratories will quantitate analytes in samples at or below the PRQLs in units of mg/kg wet weight given in Table C3-8. The PRDLs are set an order of magnitude less than the PRQLs (assuming 100 percent solid sample diluted by a factor of 100 during preparation). Laboratories set the concentration of at least one QC or calibration standard at or below the solution equivalent of the PRQL. The detailed procedures for MDL determination are included in the laboratory procedures.

Completeness

Laboratory completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results are defined as results that meet the data usability criteria based upon an application of the QC criteria specified in Tables C3-8 and C3-9 and meet the calibration, detection limit, representativeness, and comparability criteria within this section. Participating laboratories must meet the completeness criteria specified in Table C3-8.

Comparability

For metals analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is ensured by consistent use of standardized SW-846 sample preparation and methods that meet the QAOs specified in Tables C3-8 and C3-9, demonstrating successful participation in the PDP, and use of traceable standards. AMWTP may use the most recent version of SW-846. Any changes to SW-846 methodology that results in the elimination of sample preparation or analytical methods must be addressed as a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for metals analysis is achieved by collecting unbiased samples and the preparation of samples in the laboratory using representative and unbiased methods as addressed in Attachment C1.

C3-9 Acceptable Knowledge

AK documentation provides primarily qualitative information that cannot be assessed according to specific data quality goals used for analytical techniques. QAOs for analytical results are described in terms of precision, accuracy, completeness, comparability, and representativeness. Appropriate analytical and testing results may be used to augment the characterization of wastes based on AK (refer to Section C 4 and MP-TRUW-8.13). To ensure the AK process is

consistently applied, the AMWTP complies with the following data quality requirements for AK documentation:

- *Precision* - Precision is the agreement among a set of replicate measurements without assumption of the knowledge of a true value. The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of precision. However, the AK information is addressed by the independent review of AK information during internal and external audits.

- *Accuracy* - Accuracy is the degree of agreement between an observed sample result and the true value. The percentage of waste containers that require reassignment to a new waste matrix code and/or designation of different EPA HWNs based on sampling and analysis data and discrepancies identified by the CBFO during waste confirmation are reported as a measure of AK accuracy.

- *Completeness* - Completeness is an assessment of the number of waste streams or number of samples collected to the number of samples determined to be usable through the data validation process. The AK record must contain 100 percent of the required information (Section C4-3). The usability of AK information is assessed for completeness during audits.

- *Comparability* - Data are considered comparable when one set of data can be compared with another set of data. Comparability is ensured through sites meeting the training requirements and complying with the minimum standards outlined for procedures that are used to implement the AK process. Assignment of EPA HWNs will be made in accordance with Section C3-3b. This information will be provided to other sites that store or generate a similar waste stream.

- *Representativeness* - Representativeness expresses the degree to which sample data accurately and precisely represent characteristics of a population. Representativeness is a qualitative parameter that will be satisfied by ensuring the process of obtaining, evaluating, and documenting AK information is performed in accordance with the minimum standards established in Attachment C4. The AMWTP also assesses and documents the limitations of the AK information used to assign EPA HWNs (for example, purpose and scope of information, date of publication, type and extent to which waste parameters are addressed).

The AMWTP complies with the nonconformance notification and reporting requirements of Section C3-13 if the results of sampling and analysis specified in Attachment C are inconsistent with AK documentation.

The AMWTP addresses QC by tracking its performance with regard to the use of AK by: (1) assessing the frequency of inconsistencies among information, and (2) documenting AK inconsistencies identified through RTR, VE, headspace gas analyses, and solidified waste analyses. In addition, the AK process and waste stream documentation are evaluated through

internal assessments by QA organizations and assessments by auditors external to the organization.

C3-10 Data Review, Validation, and Verification Requirements

Procedures have been developed for the review, validation, and verification of data at the data generation level and the validation and verification of data at the project level. Data review determines if raw data is properly collected and ensures raw data are properly reduced. Data validation verifies that the data reported satisfies the requirements of the WIPP-WAP and is accompanied by signature release. Data verification authenticates that data as presented represent the sampling and analysis activities as performed and have been subject to the appropriate levels of data review. These requirements ensure that QAPjP records furnish documentary evidence of quality.

The AMWTP has implemented an electronic data processing system called the Waste Tracking System (WTS). Data are collected by the operator, entered into the WTS (automated or key entry), signed electronically, and promoted for data generation level review and validation. The data are progressively reviewed (on a batch basis) at the data generation level using paper/electronic data validation checklists. The reviews are performed in the sequence specified. If data are approved, the data are manually/automatically promoted to the next reviewer. If the data are rejected, the data are manually/automatically demoted to the data generator for problem resolution.

The following Batch Data Reports are used for data validation, verification, and QA activities:

- A Testing Batch Data Report or equivalent includes all data pertaining to RTR or VE for up to 20 waste containers without regard to waste matrix. Table C3-11 lists all of the information required in Testing Batch Data Reports (identified with an "X") and other information that is necessary for data validation, but is optional in Testing Batch Data Reports (identified with an "O").

- A Sampling Batch Data Report or equivalent includes all sample collection data pertaining to a group of no more than 20 samples headspace or homogeneous waste samples that were collected for chemical analysis. Table C3-12 lists all of the information required in Sampling Batch Data Reports (identified with an "X") and other information that is necessary for data validation, but is optional in Sampling Batch Data Reports (identified with an "O").

- An Analytical Batch Data Report or equivalent includes analytical data from the analysis of TRU mixed waste for up to 20 samples headspace or homogeneous waste samples. Analytical Batch Data Reports or equivalent that contain results for composited headspace gas samples must contain sufficient information to identify the containers that were composited for each composite sample and the sample volume that was taken from each waste container. Because Analytical Batch Data Reports are generated based on the number of samples analyzed, an Analytical Batch Data Report may contain results that are applicable to more than 20 containers depending on how many composite samples are part of the report, but may not exceed a total of 20 samples analyzed. Table C3-13 lists all of the information required in Analytical Batch Data Reports (identified with an "X") and other information that is necessary for data validation, but is optional in Analytical Batch Data Reports (identified with an "O").

  Raw analytical data need not be included in Analytical Batch Data Reports, but must be maintained in the site project files and be readily available for review upon request. Raw data may include all analytical bench sheet and instrumentation readouts for all calibration standard results, sample data, QC samples, sample preparation conditions and logs, sample run logs, and all re-extraction, re-analysis, or dilution information pertaining to the individual samples. Raw data may also include calculation records and any qualitative or semi-quantitative data collected for a sample and that has been recorded on a bench sheet or in a logbook.

- An On-line Batch Data Report or equivalent contains the combined information from the Sampling Batch Data Report and Analytical Batch Data Report that is relevant to the on-line method used.

C3-10a Data Generation Level

The following are the minimum requirements for raw data collection and management:

- All raw data are signed and dated in reproducible ink by the person generating it. Alternately, unalterable electronic signatures are used.

- All data are recorded clearly, legibly, and accurately in field and laboratory records (bench sheets and logbooks), and include applicable sample identification numbers (for sampling and analytical labs).

- Any changes to original data are lined out, initialed, and dated by the individual making the change. A justification for changing the original data is also included. The original data are not obliterated or otherwise disfigured so as not to be readable. Data changes are made by the individual who originally collected the data or an individual authorized to change the data.

- All data are transferred and reduced from field and laboratory records completely and accurately.
- All field and laboratory records are maintained as specified in Table C-6.
- Data are organized into a standard format for reporting purposes (Batch Data Report), as outlined in specific sampling and analytical procedures.
- All electronic and video data must be stored appropriately to ensure that waste container, sample, and associated QC data are readily retrievable. In the case of classified information, additional security provisions may apply that could restrict retrievability. The additional security provision will be documented in site procedures as outlined in the QAPjP in accordance with prevailing classified information security standards. AMWTP does not anticipate dealing with classified information, so no procedures have been developed.

Data review, validation, and verification at this level involve scrutiny and signature release from qualified independent technical reviewer(s) not involved in the generation or recording of the data under review, as specified below. Individuals conducting this data review, validation, and verification must use checklists that address all items included in this section. Checklists contain or reference tables showing the results of sampling, analytical, or on-line batch QC samples, as applicable. Checklists reflect review of all QC samples and QAO categories per criteria in Tables C3-2 through C3-9 (as applicable to the methods validated). Completed checklists are forwarded with Batch Data Reports to the project level. Analytical raw data must be available and reviewed by the data generation level reviewer. Nonconformance reports identified during data generation level validation and verification are documented per MP-Q&SI-5.4. All activities required to achieve these objectives are addressed in MP-TRUW-8.8 and CCP-TP-188, *Analytical Data Recording, Review, and Reporting*.

C3-10a(1) Independent Technical Review

The independent technical review (ITR) ensures by review of raw data that data generation and reduction are technically correct; calculations are verified correct; deviations are documented; and QA/QC results are complete, documented correctly, and compared against WIPP-WAP criteria. This review validates and verifies the work done by the originator.

One hundred percent of the Batch Data Reports receive an ITR. This review is performed by a trained and qualified individual who was not involved in the generation or recording of the data under review. This review shall be performed by an individual other than the data generator who is qualified to have performed the initial work. This review is performed as soon as practicably possible to determine and correct negative quality trends in the sampling or analytical process. However, at a minimum, the ITR is performed before any waste associated with data is shipped to WIPP, unless the data are being obtained from waste sampling and analysis as containers are being retrieved or generated after initial WSPF approval as described in Section C2-1. The reviewers release the data as evidenced by signature, and as a consequence ensure the following:

- Data generation and reduction were conducted in a technically correct manner per the method used (procedure with revision). Data were reported in the proper units and correct number of significant figures.

- Calculations have been verified by a valid calculation program, a spot check of verified calculation programs, and/or 100% check of all hand calculations. Values not verified to within rounding or significant difference discrepancies are rectified prior to completion of the ITR.

- The data were reviewed for transcription errors.

- The testing, sampling, or analytical data QA documentation for Batch Data Reports is complete and includes, as applicable, raw data, DAC and equilibrium calculations and times, calculation records, COC forms, calibration records (or references to an available calibration package), QC sample results, and copies or originals of the gas sample canister tags. Corrective action is taken to ensure all Batch Data Reports are complete and include all necessary raw data prior to completion of the ITR.

- QC sample results were within established control limits and, if not, the data were appropriately qualified per the data usability criteria. Data outside established control limits are qualified, as appropriate, assigned an appropriate qualifier flag, discussed in the case narrative, and included, as appropriate, in calculations for completeness. QC criteria that were not met are documented.

- Reporting flags (Table C3-14) were assigned correctly.

- Sample holding time and preservation requirements were met, or exceptions documented.

- Radiography tapes have been reviewed (independent observation) on a waste container basis once per testing batch, or once per day of operation, whichever is less frequent (Section C1-3). The RTR tapes are reviewed against the reported data on the radiography form to ensure the data are correct and complete.

- Field sampling records are complete. Incomplete or incorrect field sampling records are subject to resubmittal prior to completion of the ITR.

- QAOs have been met according to the methods outlined in Sections C3-2 through C3-9.

C3-10b Project Level

Data review, validation, and verification at this level involves scrutiny and signature release from the SPM or designee. MP-TRUW-8.9, *Level II Data Validation*, defines the project level validation and verification process. Any nonconformance identified during this process shall be documented on an NCR (Section C3-13).

The SPM shall ensure that a repeat of the data generation level review, validation, and verification is performed on the data for a minimum of one randomly chosen waste container quarterly (every three months). This exercise will document that the data generation level review, validation, and verification is being performed according to procedures.

C3-10b(1) Site Project Manager Review

The SPM review is the final validation that all of the data contained in Batch Data Reports from the data generation level are complete and have been properly reviewed as evidenced by signature release and completed checklists.

One hundred percent of the Batch Data Reports have an SPM or designee signature release. At a minimum, the SPM signature release is performed before any waste associated with data reviewed is shipped to WIPP, unless the data are being obtained from waste sampling and analysis as containers are being retrieved or generated as described in Section C2-1. This signature release ensures the following:

- The validity of the DAC assignment made at the data generation level based upon an assessment of the data collection and evaluation necessary to make the assignment.

- Testing batch QC checks (e.g., replicate scans, measurement system checks) were properly performed. Radiography data are complete and acceptable based on evidence of videotape review of one waste container per day or once per testing batch, whichever is less frequent, as specified in C1-3.

- Sampling batch QC checks (e.g., equipment blanks, field duplicates, and field reference standards) were properly performed, meets the established QAOs, and is within established data usability criteria.

- Analytical QC checks (e.g., laboratory duplicates, laboratory blanks, matrix spikes, MSDs, LCSs) were properly performed, meet the established QAOs, and are within established data usability criteria.

- On-line batch QC checks (e.g., field blanks, on-line blanks, on-line duplicates, on line control samples) were properly performed, meet the established QAOs, and are within established data usability criteria.

- Proper procedures were followed to ensure representative samples of headspace gas and homogeneous solids and soil/gravel were taken.

- Data generation level ITR, validation, and verification have been performed as evidenced by completed review checklists and by the appropriate signature releases.

- ITRs were not involved in the generation or recording of the data under review.

- Batch data review checklists are complete.

- Batch Data Reports are complete and data are properly reported (e.g., data are reported in the correct units, with the correct number of significant figures, and with qualifying flags).

- Verification that data are within established data assessment criteria and meet the applicable QAOs (Section C3-2 through C3-9).

C3-10b(2) Prepare SPM Summary and Data Validation Summary

To document the project level validation and verification described above, the SPM (or designee) prepares the Site Project Manager Summary and Data Validation Summary. These reports may be combined to eliminate redundancy. The SPM Summary includes a validation checklist for each Batch Data Report. Checklists for the SPM Summary are sufficiently detailed to validate all aspects of a Batch Data Report that affect data quality.

The Data Validation Summary provides verification that, on a per waste container or sample basis as evidenced by Batch Data Report reviews, all data have been validated per this QAPjP. The Data Validation Summary must identify each Batch Data Report reviewed (including all waste container numbers), describe how the validation was performed and whether or not problems were detected (e.g., nonconformance reports), and include a statement indicating all data are acceptable. Summaries include release signatures.

Once the data are approved through project level validation and verification or when the SPM decides the sample no longer needs to be retained, the SPM notifies the laboratories. Samples must be retained until this notification is received. Gas sample canisters may then be released from storage for cleaning, recertification, and subsequent reuse. Sample tags are removed and

retained in the files before recycling the canisters. If the SPM requests that samples or canisters be retained for future use (e.g., an experimental holding time study), the same sample identification and COC forms are used and cross-referenced to documentation specifying the purpose for sample or canister retention.

C3-10b(3) Prepare Waste Stream Characterization Package

In the event the CBFO request detailed information on a waste stream, the SPM will provide a Waste Stream Characterization Package. The SPM will ensure the Waste Stream Characterization Package (Section C3-12b[3]) will support waste characterization determinations.

C3-10c CBFO Level

Not applicable to the AMWTP; this section refers to WIPP.

C3-11 Reconciliation with Data Quality Objectives

Reconciling the results of waste testing and analysis with the DQOs provides a way to ensure data are of adequate quality to support the regulatory compliance programs. Reconciliation with the DQOs takes place at both the project and the CBFO levels. At the project level, reconciliation is performed by the SPM, and submitted to CBFO for review and approval. Reconciliation is performed as described in MP-TRUW-8.11, *Data Reconciliation*.

C3-11a Reconciliation at the Project Level

The SPM ensures all data generated and used in decision making meet the DQOs provided in Section C-4a(1). The SPM assesses whether data of sufficient type, quality, and quantity have been collected for each waste stream. The SPM determines if the variability of the data set is small enough to provide the required confidence in the results.

The SPM also determines if, based on the desired error rates and confidence levels, a sufficient number of valid data points have been determined (as established by the associated completeness rate for each sampling and analytical process). In addition, the SPM documents that random sampling of containers was performed for the purposes of waste stream characterization.

For each waste stream characterized, the SPM determines if sufficient data have been collected to determine the following WIPP-WAP-required waste parameters:

- Waste Matrix Code
- Waste material parameter weights
- If each container of waste contains TRU radioactive waste

- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for each VOC in the headspace gas of waste containers in the waste stream (if applicable)

- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for VOCs, SVOCs, and metals in the waste stream

- Whether the waste stream exhibits a TC (TCs) under 40 CFR Part 261, Subpart C

- Whether the waste stream contains listed waste found in 20.4.1.200 NMAC incorporating 40 CFR Part §261, Subpart D

- Whether the waste stream is classified as hazardous or nonhazardous at the 90% confidence level

- Whether an appropriate packaging configuration and DAC were applied and documented in the headspace gas sampling documentation, and whether the drum age was met prior to sampling

- Whether all TICs were appropriately identified and reported in accordance with the requirements of Section C3-1 before submittal of a WSPF for a waste stream or waste stream lot

- Whether the overall completeness, comparability, and representativeness QAOs were met for each analytical and testing procedure as specified in Sections C3-2 through C3-9 before submittal of a WSPF for a waste stream or waste stream lot

- Whether the PRQLs for all analyses were met before submittal of a WSPF for a waste stream or waste stream lot.

If the SPM determines insufficient data have been collected to make the determinations listed above, additional data collection efforts must be undertaken. The reconciliation of a waste stream is performed as described in Attachment C4, prior to submittal of the WSPF and CIS to CBFO for that waste stream. The AMWTP will not ship containers from a TRU waste stream for disposal until the SPM determines that the required waste parameters listed above have been met for the waste stream.

The SPM (or designee) uses MP-TRUW-8.11 as the statistical procedure (Attachment C2) to evaluate and report waste characterization data from the analysis of homogeneous solids and soils/gravel. This procedure, which calculates UCL_{90} values, assesses compliance with the DQOs in Section C-4a(1) as well as the RCRA regulations. It applies to all laboratory analytical data for total VOCs, total SVOCs, and total metals. For RCRA regulatory compliance (40 CFR 261.24), data from the analysis if the appropriate metals and organic compounds is expressed as TC

leaching procedure (TLCP) values or results are compared to the TC levels expressed as total values. These total values will be considered RTL values. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a TC analyte that would give the regulatory weight/volume concentration (in the TLCP extract), assuming 100-percent dissolution.

C3-11b Reconciliation at the CBFO Level

Not applicable to the AMWTP.

C3-12 Data Reporting Requirements

Data reporting requirements define the type of information and the method of transmittal for data transfer from the data generation level to the project level and from the project level to WIPP.

C3-12a Data Generation Level

Data is transmitted by hardcopy or electronically with WTS (a hardcopy is available on demand) from the data generation level to the project level. Transmitted data includes all Batch Data Reports and data review checklists. The Batch Data Reports and checklists contain all information required by the testing, sampling, and analytical techniques described in Attachments C1 through C6, as well as the signature releases to document the review, validation, and verification described in Section C3-10. All batch data reports and checklists are in approved formats, as provided in approved procedures.

Hard copy and/or electronic Batch Data Reports are forwarded to the SPM. All Batch Data Reports are assigned serial numbers and each page is numbered. The serial number used may be the same as the batch number.

QA documentation and records, including raw data, are maintained in testing, sampling, and analytical facility files or site project files in accordance with the document storage requirements presented in Attachment C. In addition, CBFO-approved laboratories shall forward testing, sampling, and analytical QA documentation along with Batch Data Reports to the Site Project Office (SPO) for inclusion in the site project files.

C3-12b Project Level

The SPO prepares a WSPF in accordance with MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*, for each waste stream certified for shipment to WIPP based on information obtained from AK and Batch Data Reports, if applicable. In addition, the Characterization Information Summary and Waste Stream Characterization Package (when requested by the CBFO) are prepared as appropriate and transmitted to WIPP electronically or by hard copy. The SPM verifies these reports are consistent with information found in analytical batch reports. Summarized testing, sampling, and analytical data are included with the Characterization

Information Summary. The contents of the WSPF, the Characterization Information Summary, and the Waste Stream Characterization Package are discussed in the following sections.

After approval of a WSPF and the associated Characterization Information Summary, the AMWTP maintains a cross-reference of container identification numbers to each Batch Data Report.

A Waste Stream Characterization package must be submitted when requested by the CBFO.

C3-12b(1) Waste Stream Profile Form

The WSPF is prepared in accordance with MP-TRUW-8.14. The WSPF (Figure C-1) includes the following information:

- Generator/storage site name
- Generator/storage site EPA ID
- Date of audit report approval by NMED (if obtained)
- Original generator of waste stream
- Whether waste is contact-handled or remote-handled
- The waste stream WIPP identification number
- Summary Category Group
- Waste Matrix Code Group
- Waste Material Parameter Weight Estimates per unit of waste
- Waste stream name
- Description of the waste stream
- Applicable EPA HWNs
- Applicable TRUCON codes
- A listing of AK documentation used to identify the waste stream
- The waste characterization procedures used and the reference and date of the procedure
- Certification signature of SPM, name, title, and date signed.

C3-12b(2) Characterization Information Summary

The Characterization Information Summary is prepared in accordance with MP-TRUW-8.14. The Characterization Information Summary includes the following elements:

- Data reconciliation with DQOs

- Headspace gas summary data listing the identification numbers of samples used in the statistical reduction, the maximum, mean, standard deviation, UCL_{90}, RTL, and associated EPA HWNs that must be applied to the waste stream

- Total metal, VOC, and SVOC analytical results for homogeneous solids and soil/gravel (if applicable)
- TIC listing and evaluation
- Radiography and VE summary to document that all prohibited items are absent in the waste (if applicable)
- A justification for the selection of RTR and/or VE as an appropriate method for characterizing the waste
- A complete listing of container identification numbers used to generate the WSPF, cross referenced to each Batch Data Report
- Complete AK summary including waste stream name and number, point of generation, waste stream volume (current and projected), generation dates, TRUCON codes, Summary Category Group, Waste Matrix Code(s), and Waste Matrix Code Group, other TRU Waste Baseline Inventory Report (TWBIR) information, waste stream description, areas of operation, generating processes, RCRA determinations (including determination for ignitability, corrosivity, and reactivity), and radionuclide information, all references used to generate the AK summary, and any other information required by Section C4-2b
- Method for determining Waste Material Parameter Weights per unit of waste
- List of any AK Sufficiency Determination requested for the waste stream
- Certification through AK or testing and/or analysis that any waste assigned the EPA HWN of U134 (hydrofluoric acid) no longer exhibits the characteristic of corrosivity. This is verified by ensuring that no liquid is present in U134 waste.

C3-12b(3) Waste Stream Characterization Package

The Waste Stream Characterization Package, which is prepared in accordance with MP-TRUW-8.14, consists of the following elements:

- Waste Stream Profile Form (Section C3-12b[1])
- Accompanying Characterization Information Summary (Section C3-12b[2])
- Complete AK summary (C3-12b[2])
- Batch Data Reports supporting the characterization of the waste stream and any others requested by the CBFO.

- Raw analytical data requested by the CBFO.

C3-12b(4) Waste Data System/WIPP Waste Information System (WDS/WWIS) Data Reporting

The WDS/WWIS Data Dictionary contains all of the data fields, the field format, and the limits associated with the data as established by the WIPP-WAP. These data are subject to edit and limit checks performed automatically by the database, as defined in the *Waste Data System User's Manual* (DOE 2009). If a container was part of a composite headspace gas sample, the analytical results from the composite sample must be assigned as the container headspace gas data results, including associated TICs for every waste container associated with the composite sample. The AMWTP coordinates the data transmission with WIPP in accordance with MP-TRUW-8.5, *TRU Waste Certification*.

C3-13 Nonconformances

The status of work and the QAPjP activities are monitored and controlled by the SPM, including nonconformance identification, documentation, and reporting. MP-TRUW-8.1, *Certification Plan for INL Transuranic Waste*, discusses specific nonconformance procedures and corrective action processes.

Nonconformances

Nonconformances are uncontrolled and unapproved deviations from an approved plan or procedure. Nonconforming items and activities are those that do not meet the WIPP-WAP requirements, procurement document criteria, or approved procedures and are addressed in MP-Q&SI-5.4. Nonconforming items are marked, tagged, or segregated and the affected personnel notified. Any waste container for which an NCR has been written will not be shipped to the WIPP facility unless the condition that led to the NCR for that container has been dispositioned in accordance with the CBFO Quality Assurance Program Document (QAPD).

Disposition of nonconforming items shall be identified and documented. MP-Q&SI-5.4 identifies the person(s) responsible for evaluating and dispositioning nonconforming items.

For each container selected for confirmation pursuant to Attachment C7, the confirmation team will examine the respective NCR documentation to verify NCRs have been dispositioned for the selected container.

Management at all levels will foster a "no-fault" attitude to encourage the identification of nonconforming items and processes. Nonconformances may be detected and identified by anyone performing WIPP-WAP activities, including:

- Project staff – during field operations, supervision of subcontractors, data validation and verification, and self-assessment

- Laboratory staff – during the preparation for and performance of laboratory testing; calibration of equipment; QC activities; laboratory data review, validation, and verification; and self-assessment
- QA personnel – during oversight activities or audits.

An NCR shall be prepared for each nonconformance identified. Each NCR shall be initiated by the individual(s) identifying the nonconformance. The NCR shall then be processed by knowledgeable and appropriate personnel. For this purpose, an NCR including, or referencing as appropriate, results of laboratory analysis, QC rests, audit reports, internal memoranda, or letters shall be prepared. The NCR must provide the following information:

- Identification of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Method(s) or suggestions for correcting the nonconformance (corrective action)
- Schedule for completing the corrective action
- An indication of the potential ramifications and overall usability of the data, if applicable
- Any approval signature specified in the site nonconformance procedures.

The SPM oversees the NCR process and is responsible for identifying and tracking all nonconformances and reports this information to CBFO. The SPM is also responsible for notifying project personnel of the nonconformance and verifying completion of the corrective action for nonconformances.

Nonconformance to DQOs

For any non-administrative nonconformance related to applicable requirements specified in this QAPjP, which are first identified at the SPM signature release level (i.e., a failure to meet a DQO), AMWTP will submit to CBFO a written notification within seven calendar days of identification and submit an NCR within thirty (30) calendar days of identification of the incident. The AMWTP will issue an NCR and implement corrective actions, which will be resolved prior to shipment.

C3-14 Special Training Requirements and Certifications

Before performing activities that affect QAPjP quality, all personnel receive indoctrination into the applicable scope, purpose, and objectives of the QAPjP and the specific QAOs of the assigned task. Personnel assigned to perform activities for the QAPjP have the education, experience, and training applicable to the functions associated with the work. Evidence of

personnel proficiency and demonstration of competence in the task(s) assigned is demonstrated and documented. All personnel designated to work on specific aspects of the QAPjP maintain qualification (that is, training and certification) throughout the duration of the work. Qualification requirements for personnel are documented in Individual Training Plans or qualification packages. Job performance is evaluated and documented at periodic intervals to ensure personnel maintain proficiency and record additions to training, as necessary per MP-RTQP-14.4.

Personnel involved in QAPjP activities receive continuing training to ensure job proficiency is maintained. The due date for required continued training courses and requalification shall be the end of the month of the anniversary date when the training was previously completed. Training includes both education in principles and enhancement of skills. Training records that specify the scope of the training, the date of completion, and documentation of job proficiency are maintained as QA Records. Maintenance of training records is addressed in MP-RTQP-14.19, *Training Records Administration.*

Analytical laboratory line management ensures analytical personnel are qualified to perform the analytical method(s) for which they are responsible. The minimum qualifications for certain specified positions for the WIPP-WAP are summarized in Table C3-10. Analytical laboratory personnel are trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan.*

An evaluation of personnel qualifications includes comparing and evaluating the requirements specified in the job/position description and the skills, training, and experience included in the person's current resume. This evaluation, done in accordance with MP-RTQP-14.1 and MP-RTQP-14.4, is also performed for personnel who change positions because of a transfer or promotion as well as personnel assigned to short-term or temporary work assignments that may affect the quality of the WIPP-WAP.

C3-15 Changes to Plans and Procedures

Controlled changes to WIPP-WAP related plans or procedures are made in accordance with the WIPP QAPD and managed through MP-DOCS-18.4, *Document Control.* The SPM shall review all non-administrative changes and evaluate whether those changes could impact DQOs specified in the permit. After AMWTP certification, any changes to WIPP-WAP related plans or procedures that could positively or negatively impact DQOs (i.e., those changes that require prior approval of the CBFO as defined in Section C5-2) shall be reported to the CBFO within five (5) days of identification by the project level review. The CBFO shall send NMED a monthly summary briefly describing the changes to plans and procedures identified pursuant to this section during the previous month.

Table C3-1. Waste Material Parameters and Descriptions.

Waste Material Parameter	Description
Iron-based Metal/Alloys	Iron and steel alloys in the waste excluding the waste container materials.
Aluminum-based Metals/Alloys	Aluminum or aluminum-based alloys in the waste materials.
Other Metals	All other metals found in the waste materials (for example, copper, lead, zirconium, tantalum, etc.).
Other Inorganic Materials	Nonmetallic inorganic waste, including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents.
Cellulosics	Materials generally derived from high polymer plant carbohydrates, for example, paper, cardboard, wood, cloth, etc.
Rubber	Natural or man-made elastic latex materials, for example, surgeon gloves, leaded rubber gloves, etc.
Plastics (Waste Materials)	Generally man-made materials, often derived from petroleum feedstock, for example, polyethylene, polyvinylchloride, etc.
Organic Matrix	Cemented organic resins, solidified organic liquids, and sludges.
Inorganic Matrix	Any homogeneous materials consisting of sludge, or aqueous-based liquids solidified with cement, calcium silicate, or other solidification agents; for example, waste water treatment sludge, cemented aqueous liquids, and inorganic particulates, etc.
Soils/gravel	Generally consists of naturally occurring soils which have been contaminated with inorganic waste materials.
Steel (Packaging Materials)	208-liter (L) (55-gal) drums.
Plastics (Packaging Materials)	90 mil polyethylene drum liner and plastic bags.

Table C3-2. Gas Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives.

Compound	Chemical Abstract Services (CAS) Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (ng)	PRQL (ppmv)	Completeness (%)
Benzene	71-43-2	≤25	70-130	10	10	90
Bromoform	75-25-2	≤25	70-130	10	10	90
Carbon tetrachloride	56-23-5	≤25	70-130	10	10	90
Chlorobenzene	108-90-7	≤25	70-130	10	10	90
Chloroform	67-66-3	≤25	70-130	10	10	90
1,1-Dichloroethane	75-34-3	≤25	70-130	10	10	90
1,2-Dichloroethane	107-06-2	≤25	70-130	10	10	90
1,1-Dichloroethylene	75-35-4	≤25	70-130	10	10	90
trans-1,2-Dichloroethylene	156-60-5	≤25	70-130	10	10	90
Ethyl benzene	100-41-4	≤25	70-130	10	10	90
Ethyl ether	60-29-7	≤25	70-130	10	10	90
Methylene chloride	75-09-2	≤25	70-130	10	10	90
1,1,2,2-Tetrachloroethane	79-34-5	≤25	70-130	10	10	90
Tetrachloroethylene	127-18-4	≤25	70-130	10	10	90
Toluene	108-88-3	≤25	70-130	10	10	90
1,1,1-Trichloroethane	71-55-6	≤25	70-130	10	10	90
Trichloroethylene	79-01-6	≤25	70-130	10	10	90
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	≤25	70-130	10	10	90
m-Xylene[c]	108-38-3	≤25	70-130	10	10	90
o-Xylene	95-47-6	≤25	70-130	10	10	90
p-Xylene[c]	106-42-3	≤25	70-130	10	10	90
Acetone	67-64-1	≤25	70-130	150	100	90
Butanol	71-36-3	≤25	70-130	150	100	90
Methanol	67-56-1	≤25	70-130	150	100	90
Methyl ethyl ketone	78-93-3	≤25	70-130	150	100	90
Methyl isobutyl ketone	108-10-1	≤25	70-130	150	100	90
Carbon disulfide[d]	75-15-0	≤25	70-130	10	10	90
Chloromethane[d]	74-87-3	≤25	70-130	10	10	90
1,2,4 – Trimethylbenzene[e]	95-36-3	≤25	70-130	10	10	90
1,3,5 – Trimethylbenzene[e]	108-67-8	≤25	70-130	10	10	90
Cyclohexane[e]	110-82-7	≤25	70-130	10	10	90

a. Criteria apply to PRQL concentrations.
b. Values based on delivering 10 mL to the analytical system.
c. These xylene isomers cannot be resolved by GC/MS and are reported as the m-p xylene total.
d. Chloromethane and carbon disulfide are compounds that have been added to the target list based on AK for certain waste streams.
e. These constituents have been added as target compounds on the Agilent system at the AMWTP for the purpose of supporting VOC flammability evaluations.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value), for GC/MS and GC/FID equals total number of ng delivered to the analytical system per sample.
PRQL = Program required quantitation limit (ppm/volume basis)

Table C3-3. Summary of Laboratory Quality Control Samples and Frequencies for Gas Volatile Organic Compound Analysis.

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Method Performance Samples	Seven samples initially and four semiannually	Meet method QAOs	Repeat until acceptable
Laboratory duplicates or on-line duplicates	One per analytical batch or on-line batch	RPD ≤ 25 [b]	Nonconformance if RPD > 25
Laboratory blanks or on-line blanks	Daily before sample analysis for GC/MS and GC/FID. Otherwise, daily prior to sample analysis and one (1) per analytical or on-line batch	Analyte amounts ≤ 3 × MDLs for GC/MS and GC/FID	Flag data if analyte > 3 × MDLs for GC/MS and GC/FID
Laboratory control samples or on-line control sample	One per analytical batch or on-line batch	70-130 %R	Nonconformance if %R < 70 or >130
Blind-audit Samples	Samples and frequency controlled by the Gas PDP Plan	Specified in the Gas PDP Plan	Specified in the Gas PDP Plan
GC/MS	BFB Tune Every 12 hours	Abundance criteria for key ions are met	Repeat until acceptable
GC/MS	Minimum 5-point intial calibration (minimum of 5 standards) Initially and as needed	%RSD of response factor for each target analyte <35	Repeat until acceptable
GC/MS	Continuing calibration every 12 hours	%D for all target analytes ≤30 of initial calibration	Repeat until acceptable
GC/FID	Minimum 3-point initial calibration (minimum of 3 standards) Initially as needed	Correlation coefficient ≥0.99 or %RSD <20 for each target analyte and the retention time of each target analyte within an acceptance criteria defined in this method	Repeat until acceptable
GC/FID	Continuing calibration every 12 hours	%RSD ≤15%	Repeat until acceptable

a. Corrective action per Section C3-13 when final reported QC does not meet the acceptance criteria.
b. Applies only to concentrations greater than the PRQLs listed in Table C3-2.

MDL = Method Detection Limit
QAO = Quality Assurance Objective
PDP = Performance Demonstration Program
PRQL = Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference
BFB = 4-Bromofluorobenzene
%D = Percent difference
%RSD = Percent relative standard deviation

Table C3-4. Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives.

Compound	CAS Number	Precision [a] (%RSD or RPD)	Accuracy [a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness (%)
Benzene	71-43-2	≤45	37-151	1	10	90
Bromoform	75-25-2	≤47	45-169	1	10	90
Carbon disulfide	75-15-0	≤50	60-150	1	10	90
Carbon tetrachloride	56-23-5	≤30	70-140	1	10	90
Chlorobenzene	108-90-7	≤38	37-160	1	10	90
Chloroform	67-66-3	≤44	51-138	1	10	90
1,4-Dichlorobenzene[c]	106-46-7	≤60	18-190	1	10	90
ortho-Dichlorobenzene[c]	95-50-1	≤60	18-190	1	10	90
1,2-Dichloroethane	107-06-2	≤42	49-155	1	10	90
1,1-Dichloroethylene	75-35-4	≤250	D-234 [d]	1	10	90
trans-1, 2-Dichloroethylene	156-60-5	≤50	60-150	1	10	90
Ethyl benzene	100-41-4	≤43	37-162	1	10	90
Methylene chloride	75-09-2	≤50	D-221 [d]	1	10	90
1,1,2,2-Tetrachloroethane	79-34-5	≤55	46-157	1	10	90
Tetrachloroethylene	127-18-4	≤29	64-148	1	10	90
Toluene	108-88-3	≤29	47-150	1	10	90
1,1,1-Trichloroethane	71-55-6	≤33	52-162	1	10	90
1,1,2-Trichloroethane	79-00-5	≤38	52-150	1	10	90
Trichloroethylene	79-01-6	≤36	71-157	1	10	90
Trichlorofluoromethane	75-69-4	≤110	17-181	1	10	90
1,1,2-Trichloro 1,2,2-trifluoroethane	76-13-1	≤50	60-150	1	10	90
Vinyl chloride	75-01-4	≤200	D-251 [d]	1	4	90
m-Xylene [h]	108-38-3	≤50	60-150	1	10	90
o-Xylene	95-47-6	≤50	60-150	1	10	90
p-Xylene[h,]	106-42-3	≤50	60-150	1	10	90
Acetone	67-64-1	≤50	60-150	10 [e]	100	90
Butanol	71-36-3	≤50	60-150	10 [e]	100	90
Ethyl ether	60-29-7	≤50	60-150	10 [e]	100	90
Formaldehyde[f]	50-00-0	≤50	60-150	10 [e]	100	90
Hydrazine[g]	302-01-2	≤50	60-150	10 [e]	100	90
Isobutanol	78-83-1	≤50	60-150	10 [e]	100	90
Methanol	67-56-1	≤50	60-150	10 [e]	100	90

Table C3-4. (continued).

Compound	CAS Number	Precision [a] (%RSD or RPD)	Accuracy [a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness (%)
Methyl ethyl ketone	78-93-3	≤50	60-150	10 [e]	100	90
Pyridine [c]	110-86-1	≤50	60-150	10 [e]	100	90

a. Applies to laboratory control samples, and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.
b. TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor or 20.
c. Can also be analyzed as an SVOC. If analyzed as an SVOC, the QAOs of Table C3-6 apply.
d. Detected; result must be greater than zero.
e. Estimate, to be determined.
f. Required only for homogeneous solids and soil/gravel waste from Savannah River Site, if analysis is require to resolve assignment of EPA HWNs.
g. Required only for homogeneous solids and soil/gravel waste from Oak Ridge National Laboratory and Savannah River Site, if analysis is required to resolve assignment of EPA HWNs.
h. These xylene isomers cannot be resolved by GC/MS and are reported as the m/p xylene total.

%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kg)
PRQL = Program required quantitation limit; calculated from the TC level for benzene assuming a 25 g sample, 0.5 L of extraction fluid, and 100% analyte extraction (milligrams per kg)
CAS = Chemical Abstract Service

Table C3-5. Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compound Analysis.

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Method performance samples	Seven samples initially and four semi-annually	Meet Table C3-4 QAOs	Repeat until acceptable
Laboratory duplicate[b]	One per analytical batch	Meet Table C3-4 Precision QAOs	Nonconformance if RPDs > values in Table C3-4
Laboratory blanks	One per analytical batch	Analyte concentrations ≤3 × MDLs	Nonconformance if analyte concentrations >3 × MDLs.
Matrix spikes[b]	One per analytical batch	Meet Table C3-4 accuracy QAOs	Nonconformance if %Rs are outside the range specified in Table C3-4.
Matrix spike duplicates	One per analytical batch	Meet Table C3-4 accuracy and precision QAOs	Nonconformance if RPDs >values and %Rs outside the range in Table C3-4.
Laboratory control samples	One per analytical batch	Meet Table C3-4 accuracy QAOs	Nonconformance if %R < 80 or > 120.
GC/MS Calibration	4-bromofluorobenzene (BFB) Tune every 12 hours 5-point (pt). Initial Calibration initially, and as needed	Abundance criteria met per method Calibrate per SW-846 Method requirements: %RSD for calibration check compounds (CCCs) ≤ 30, % RSD for all other compounds < 15%. Average relative response factor (RRF) used if %RSD ≤15; use linear regression if % RSD >15; R or R^2 ≥ 0.990 if using alternative curve System Performance Check Compound (SPCC) minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01	Repeat until acceptable
	Continuing calibration every 12 hours	%D ≤ 20 for CCC SPCC minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be > 50% and < 200% of last daily calibration	Repeat until acceptable
GC/FID Calibration	3-pt. Initial Calibration initially and as needed	Correlation coefficient ≥ 0.990 or %RSD ≤ 20 for all analytes	Repeat until acceptable
	Continuing calibration every 12 hours	%D or %Drift for all analytes ≤ 15 of expected values RT ± 3 standard deviations from initial RT calibration per applicable SW-846 method	

Table C3-5. (continued)

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples for a given matrix ± 3 standard deviations	Nonconformance if %R is less than (average %R-3 standard deviations) or greater than (average %R+3 standard deviations).
Blind-audit samples	Samples and frequency controlled by the solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

a. Corrective Action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedences.

b. Duplicate requirement may be satisfied using matrix spike duplicate; acceptance criteria apply only to concentrations greater than the PRQLs listed in Table C3-4.

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance demonstration program
%R = Percent recovery
RPD = Relative percent difference

Table C3-6. Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives.

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness %
Bis(2-Ethylhexyl)phthalate[e]	117-81-7	≤100	8-158	5	40	90
Cresols	1319-77-3	≤50	25-115	5	40	90
1,4-Dichlorobenzene[b,c]	106-46-7	≤86	20 – 124	5	40	90
ortho-Dichlorobenzene[c]	95-50-1	≤64	32 – 129	5	40	90
2,4-Dinitrophenol	51-28-5	≤119	D-172[d]	5	40	90
2,4-Dinitrotoluene	121-14-2	≤46	39 – 139	0.3	2.6	90
Fluoranthene[e]	206-44-0	≤80	26-137	5	40	90
Hexachlorobenzene	118-74-1	≤319	D-152[d]	0.3	2.6	90
Hexachloroethane	67-72-1	≤44	40 – 113	5	40	90
Nitrobenzene	98-95-3	≤72	35 – 180	5	40	90
Pentachlorophenol	87-86-5	≤128	14 – 176	5	40	90
Phenol[e]	108-95-2	≤55	5-112	5	40	90
Pyridine[c]	110-86-1	≤50	25-115	5	40	90

a. Applies to laboratory control samples, and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

b. TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.

c. Can also be analyzed as a VOC.

d. Detected; result must be greater than zero.

e. Site-specific target analyte

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent Recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kg)
PRQL = Program required quantitation limit; calculated from the TC level for nitrobenzene assuming a 100 g sample, 0.5 gal (2 L) of extraction fluid, and 100% analyte extraction (mg/kg)

Table C3-7. Summary of Laboratory Quality Control Samples and Frequencies for Semi-Volatile Organic Compounds Analysis.

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Method Performance Samples	Seven samples initially and four semiannually	Meet Table C3-6 QAOs	Repeat until acceptable
Laboratory duplicate[b]	One per analytical batch	Meet Table C3-6 Precision QAOs	Nonconformance if RPDs > values in Table C3-6
Laboratory blanks	One per analytical batch	Analyte concentrations ≤ 3 × MDLs	Nonconformance if analyte concentrations > 3 × MDLs
Matrix spikes	One per analytical batch	Meet Table C3-6 accuracy QAOs	Nonconformance if RPDs >values and %Rs outside the range specified in Table C3-6.
GC/MS Calibration	Decafluorotriphenylphosphine (DFTPP) Tune every 12 hours 5-pt. Initial Calibration initially, and as needed Continuing calibration every 12 hours	Abundance criteria met per method Calibrate per SW-846 Method requirements %RSD for CCC ≤ 30, %RSD for all other compound, ≤15% Average response factor (RRF) used if %RSD ≤15, use linear regression if >15; R or R^2 ≥ 0.990 if using alternative curve SPCC minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01 %D ≤ 20 for CCC SPCC minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be >50 % and <200% of last daily calibration	Repeat until acceptable
Gas Chromatography/Electron Capture Detection (GC/ECD) Calibration	5-pt. Initial Calibration initially and as needed	Correlation coefficient ≥ 0.990 or %RSD < 20 for all analytes	Repeat until acceptable
	Continuing calibration every 12 hours	%D or %Drift for all analytes ≤ 15 of expected values RT ± 3 standard deviations from initial RT calibration per applicable SW-846 method	Repeat until acceptable
Matrix spikes duplicates	One per analytical batch	Meet Table C3-6 accuracy and precision QAOs	Nonconformance if RPDs > values and %Rs outside the ranges specified in Table C3-6.
Laboratory control samples	One per analytical batch	Meet Table C3-6 accuracy QAOs	Nonconformance if %R <80 or >120
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples for a given matrix ± 3 standard deviations	Nonconformance if %R is less than (average %R-3 standard deviations) or greater than (average %R+3 standard deviations).
Blind-audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

a. Corrective Action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedences.
b. May be satisfied using matrix spike duplicate; acceptance criteria apply only to concentrations greater than the PRQLs in Table C3-6.

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance demonstration program
%R = Percent recovery
RPD = Relative percent difference

Table C3-8. Metals Target Analyte List and Quality Assurance Objectives.

Analyte	CAS Number	Precision (% RSD OR RPD)[a]	Accuracy (%R)[b]	PRDL[c] (µg/L)	PRQL[d] (mg/kg)	Completeness (%)
Antimony	7440-36-0	≤ 30	80-120	100	100	90
Arsenic	7440-38-2	≤ 30	80-120	100	100	90
Barium	7440-39-3	≤ 30	80-120	2000	2000	90
Beryllium	7440-41-7	≤ 30	80-120	100	100	90
Cadmium	7440-43-9	≤ 30	80-120	20	20	90
Chromium	7440-47-3	≤ 30	80-120	100	100	90
Lead	7439-92-1	≤ 30	80-120	100	100	90
Mercury	7439-97-6	≤ 30	80-120	4.0	4.0	90
Nickel	7440-02-0	≤ 30	80-120	100	100	90
Selenium	7782-49-2	≤ 30	80-120	20	20	90
Silver	7440-22-4	≤ 30	80-120	100	100	90
Thallium	7440-28-0	≤ 30	80-120	100	100	90
Vanadium	7440-62-2	≤ 30	80-120	100	100	90
Zinc	7440-66-6	≤ 30	80-120	100	100	90

a. ≤ 30 % control limits apply when sample and duplicate concentrations are ≥ 10 × IDL for ICP AES and AA techniques and ≥ 100 × IDL for Inductively Coupled Plasma – Mass Spectometry (ICP-MS) techniques. If less than these limits, the absolute difference between the two values shall be less than or equal to the PRQL.

b. Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material that has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

c. PRDL set such that it is a factor of 10 below the PRQL for 100% solid samples, assuming a 100 × dilution during digestion.

d. TCLP PRQL values are responded in units of mg/l and limits are reduced by a factor of 20.

CAS = Chemical abstract service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
PRDL = Program required detection limit (i.e., maximum permissible value for IDL) (micrograms per liter)
PRQL = Program required quantitation limit (milligrams per kg)

Table C3-9. Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis.

QC Samples	Minimum Frequency	Acceptance criteria	Corrective Actions [a]
Method performance samples	Seven (7) samples initially, and four (4) semiannually	Meet Table C3-8 QAOs	Repeat until acceptable
Laboratory blanks	One (1) per analytical batch	≤ 3 × IDL (≤ 5 × IDL for ICP-MS)[b]	Redigest and reanalyze any samples with analyte concentrations which are ≤ 10 × blank value and ≥ 0.5 × PRQL
Matrix spikes	One (1) per analytical batch	Meet Table C3-8 accuracy QAOs	Nonconformance if %R outside the range specified in Table C3-8.
Matrix spike duplicates	One (1) per analytical batch	Meet Table C3-8 accuracy and precision QAOs.	Nonconformance if RPDs > values and %Rs outside range specified in Table C3-8
ICP-MS Tune (ICP-MS Only)	Daily	4 Replicate %RSD ≤ 5 mass calibration within 0.9 amu; resolution < 1.0 amu full width at 10% peak height	Nonconformance if %RSD >5; mass calibrations > 0.9 amu; resolution >1.0 amu.
Initial Calibration 1 blank, 1 standard (ICP, ICP-MS), 3 standard, 1 blank (GFAA, FLAA), 5 standard, 1 blank (CVAA, HAA)	Daily	90-110 %R (80-120% for CVAA, GFAA, HAA, FLAA) for ICV solution. Regression coefficient (r) ≥ 0.995 for FLAA, CVA, GFAA, MAA	Correct problem and recalibrate; repeat initial calibration
Continuing calibration	Every 10 samples and beginning and end of run	90-110 % for continuing calibration verification solution. (80-120% for CVAA, GFAA, HAA, FLAA)	Correct problem and recalibrate; rerun last 10 samples
Serial dilution (ICP, ICP-MS)	One per analytical batch	5 × dilution must be ≤ 10 % D of initial value for sample > 50 × IDL	Flag Data if >10% and > 50 × IDL
Internal Standard Area Verification (ICP-MS)	Every Sample	Meet SW-846 Method 6020 criteria	Nonconformance if not reanalyzed at 5 × dilution until criteria are meet.
Interference Correction Verification (ICP, ICP-MS)	Beginning and end of run or every 12 hours (8 for ICP) whichever is more frequent	80-120% recovery for analytes NOTE: *Acceptance Criteria and Corrective Action apply only if interferents found in samples at levels greater than interference check standards (ICS) A Solution.*	Correct problem and recalibrate, nonconformance if not corrected

Table C3-9. (continued)

QC Samples	Minimum Frequency	Acceptance criteria	Corrective Actions [a]
Laboratory Control Samples	One (1) per analytical batch	Table C3-8 accuracy QAOs	Redigest and reanalyze for affected analytes; nonconformance if not reanalyzed
Blind-audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

a. Corrective action per Section C3-13 when final reported QC samples do not meet acceptance criteria. Nonconformance do not apply to matrix related exceedences.

b. Applies only to concentrations greater than the PRQLs listed in Table C3-8

IDL = Instrument Detection Limit
PDP = Performance Demonstration Program
PRQL = Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference

Table C3-10. Minimum Training and Qualification.

Personnel	Requirements[a]
Radiography Operators[c]	Site-specific training based on waste matrix codes and waste material parameters; requalification every two years.
GC Technical Supervisors[b] GC Operators[c]	B.S. or equivalent experience and six months previous applicable experience.
Gas Chromatography/Mass Spectrometry Operators[c] Mass Spectrometry Operators[c]	B.S. or equivalent experience and one year independent spectral interpretation or demonstrated expertise.
GC/MS Technical Supervisor[b] Mass Spectrometry Technical Supervisor[b] Atomic Absorption Spectroscopy Technical Supervisors[b] Atomic Absorption Spectroscopy Operators[c] Atomic Mass Spectroscopy Operators[c] Atomic Emission Spectroscopy Operators[c]	BS or equivalent experience and 1 year applicable experience
Atomic Mass Spectroscopy Technical Supervisor[b]	B. S. and specialized training in Atomic Mass Spectroscopy and two years applicable experience.
Atomic Emission Spectroscopy Technical Supervisors[b]	B. S. and specialized training in Atomic Emission Spectroscopy and two years applicable experience.

a. Based on requirements contained in US EPA Contract Laboratory Program Statement of Work for Organics Analysis (Document Number OLM 01.0) and Statement of Work for Inorganics Analysis (Document Number ILM 03.0).

b. Technical Supervisors are those persons responsible for the overall technical operation and development of a specific laboratory technique.

c. Operators are those persons responsible for the actual operation of analytical equipment.

Table C3-11.Testing Batch Data Report Contents.

Required Information	Radiography	Visual Examination	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Waste container number	X	X	
Waste stream name and/or number	O	O	
Waste Matrix Code	X	X	Summary Category Group included in waste matrix code
Implementing procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
Container type	O	O	Drums, standard waste box, ten drum overpack, etc.
Video media reference	X	X	Reference to video media applicable to each container. For visual examination of newly generated waste, video media not required if two trained operators review the contents of the waste container to ensure correct reporting.
Imaging check	O		
Camera check		O	
Audio check	O	O	
QC documentation	X	X	
Verification that the physical form matches the waste stream description and Waste Matrix Code.	X	X	Summary Category Group included in Waste Matrix Code.
Comments	X	X	Comments
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Verify absence of prohibited items	X	X	
Operator signature and date of test	X	X	2 signatures required for Visual Verification of Acceptable Knowledge
Data review checklists	X	X	All data checklists will be identified

Legend:

X – Required in batch data report
O – Information must be documented and traceable inclusion in batch data report is optional

Table C3-12.Sampling Batch Data Report Contents.

Required Information	Headspace Gas	Solid Sampling	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Waste stream name and/or number	O	O	
Waste Matrix Code		X	Summary Category Group included in Waste Matrix Code
Procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
Container number	X	X	
Container type	O	O	Drums, Standard Waste Box, Ten Drum Overpack, etc.
Sample matrix and type	X	X	
Analyses requested and laboratory	X	X	
Point of origin for sampling	X	X	Location where sample was taken (e.g., building number, room)
Sample number	X	X	
Sample Size	X	X	
Sample location	X	X	Location within container where sample is taken. (For HSG, specify what layer of confinement was sampled. For solids, physical location within container.)
Sample preservation	X	X	
Person collecting sample	X	X	
Person attaching custody seal	O	O	May or may not be the same as the person collecting the sample
Chain of Custody record	X	X	Original or copy is allowed
Sampling equipment numbers	X	X	For disposable equipment, a reference to the lot
Drum age	X		Must include all supporting determinative information, including but not limited to packaging date, equilibrium start time, storage temperature, and sampling date/time. If Scenario 3 is used, the packaging configuration, filter diffusivity, liner presence/absence, and rigid liner vent hole diameter used in determining the DAC must be documented. If Scenario 1 and 2 are used together, the filter diffusivity and rigid liner vent hole diameter used in determining the DAC must be documented. If default values are used for retrievably stored waste, these values must clearly be identified as such.
Cross-reference of sampling equipment numbers with associated cleaning batch numbers	O	X	As applicable to the equipment used for the sampling. For disposable equipment, a reference to the lot and procurement records to support cleanliness is sufficient
Equilibration time	X		
Verification of rigid liner venting	X		Only applicable to containers with rigid liners
Verification that sample volume taken is small in comparison to the available volume	X		Must include headspace gas volume when it can be estimated
Scale Calibration		O	
Depth of waste		X	For newly generated waste, if a sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.

Table C3-12. (continued)

Required Information	Headspace Gas	Solid Sampling	Comment
Calculation of core recovery		X	For newly generated waste, if a sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Co-located core description		X	For newly generated waste, if a sampling method other than coring is used, this is replaced by documentation that a QC sample has been taken.
Time between coring and subsampling		X	Only applicable to coring.
OVA calibration and reading	O		Only applicable to manifold systems. Must be done in accordance with manufacturer's specifications
Field Records	X	X	Must contain the following as applicable to the sampling method used: Collection problems, Sequence of sampling collection, Inspection of the solids sampling area, Inspection of the solids sampling equipment, Coring tool test, random location of sub-sample, canister pressure, and ambient temperature and pressure.
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Operator Signature and date and time of sampling	X	X	
Data review checklists	X	X	All data reviews checklists will be identified.

LEGEND:

X – Required in Batch Data Report.
O – Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table C3-13.Analytical Batch Data Report Contents.

Required Information	Headspace Gas	Solid Sampling	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Sample numbers	X	X	
QC designation for sample	X	X	
Implementing procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
QC sample results	X	X	
Sample data forms	X	X	Form should contain reduced data for target analytes and TICs
Chain of custody	X	X	Original or copy
Gas canister tags	X		Original or copy
Sample preservation	X	X	
Holding time		X	
Cross-reference of field numbers to laboratory sample numbers	X	X	
Date and time analyzed	X	X	
Verification of spectra used for results	O	O	Analyst must qualitatively evaluate the validity of the results based on the spectra, can be implemented as a check box for each sample
TIC evaluation	X	X	
Reporting flags, if any	X	X	Table C3-14 lists applicable flags
Report narrative	X	X	
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Operator signature and analysis date	X	X	
Data review checklists	X	X	All data review checklists will be identified

LEGEND:

X – Required in Batch Data Report.
O – Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table C3-14.Data Reporting Flags.

Data Flag	Indicator
B	Analyte detected in blank (organics/headspace gases)
B	Analyte blank concentration greater than or equal to 20 percent of sample concentration prior to dilution corrections (metals)
E	Analyte exceeds calibration curve (organics/headspace gases)
J	Analyte less than PRQL but greater than or equal to MDL (Organics/Headspace gases)
J	Analyte greater than or equal to IDL but less than 5 times the IDL before dilution correction (Metals)
U	Analyte was not detected and value is reported as the MDL (IDL for metals)
D	Analyte was quantitated from a secondary dilution, or reduced sample aliquot (organics/headspace gases)
Z	One or more QC samples do not meet acceptance criteria
H	Holding time exceeded

Attachment C4.
TRU Waste Characterization Using Acceptable Knowledge

C4-1 Introduction

The RCRA regulations codified in 40 CFR Parts 260 through 265, 268, and 270, and the New Mexico Hazardous Waste Management Regulations in 20 NMAC 4.1 Subparts 100 through 600, Subpart 800, and Subpart 900, authorize the use of AK in appropriate circumstances by waste generators, or treatment, storage, or disposal facilities to characterize hazardous waste. AK is described in Waste Analysis: *EPA Guidance Manual for Facilities That Generate, Treat, Store and Dispose of Hazardous Waste.* AK, as an alternative to sampling and analysis, can be used to meet all or part of the waste characterization requirements under the RCRA.

EPA's 1994 Waste Analysis Guidance Manual broadly defines the term "acceptable knowledge" to include process knowledge, whereby detailed information on the waste is obtained from existing published or documented waste analysis data or studies conducted on hazardous waste generated by processes similar to that which generated the waste, facility records of analysis performed before the effective date of RCRA, and waste analysis data obtained from generators of similar waste that send their wastes off-site for treatment, storage, or disposal (EPA 1994). If AMWTP determines that AK alone is insufficient to accurately characterize a waste, AMWTP may use RTR and/or VE, headspace gas sampling and analysis, and homogeneous waste sampling and analysis (specified in Attachment C1) to complete the waste characterization process and satisfy the requirements of the QAPjP. AK is used in TRU mixed waste characterization activities in five ways:

- To delineate TRU mixed waste streams
- To assess whether TRU mixed wastes comply with the applicable requirements of WIPP Hazardous Waste Permit TSDF-WAC
- To assess whether TRU mixed wastes exhibit a hazardous characteristic (20 NMAC 4.1.200, incorporating 40 CFR §261, Subpart C).
- To assess whether TRU mixed wastes are listed (20 NMAC 4.1.200, incorporating 40 CFR §261, Subpart D).
- To estimate waste material parameter weights.

Sampling and analysis may be performed to augment the characterization of wastes based on AK when an AK Sufficiency Determination has not been requested by AMWTP or, if requested, has not been granted by CBFO (see Section C4-3d). Sampling and analysis consists of RTR, VE, headspace gas, and homogeneous waste sampling and analysis. TRU mixed waste streams undergo applicable provisions of the AK process prior to management, storage, or disposal of the waste at WIPP.

C4-2 Acceptable Knowledge Documentation

The AMWTP AK information is presented in a logical sequence which progresses from general facility information (TRU mixed waste management program information) to the more detailed waste-specific information (TRU mixed waste stream information). Traceability of AK information for a selected container in the audited Waste Summary Category Group(s) will be examined during the CBFO audit of AMWTP. The consistent presentation of AK documentation among sites in auditable records[c] will allow the CBFO to verify the completeness and adequacy of AK for TRU mixed waste characterization during the audit process. AMWTP will implement the AK process as specified in this QAPjP to characterize TRU mixed waste and obtain sufficient waste characterization data to demonstrate compliance with the WIPP-WAP. This AK information applies at AMWTP to both the retrievably stored and newly generated waste streams. The AK process is described in MP-TRUW-8.13. The AMWTP does not develop AK baseline documents for off-site DOE CH-TRU wastes that are characterized and certified by another certified program, such as the CCP. AMWTP also does not develop AK baseline documents for waste that is received for characterization only.

The following sections include the information required to characterize TRU mixed waste using AK. The AMWTP will augment the required AK records with additional supporting information. If the required information is not available for a particular waste, the waste stream is not eligible for an AK Sufficiency Determination as specified in Section C4-3d.

C4-2a Required TRU Mixed Waste Management Program Information

TRU mixed waste management program information clearly defines waste categorization schemes and terminology, provides a breakdown of the types and quantities of TRU mixed waste that are generated and stored at the AMWTP, and describes how waste is tracked and managed at the AMWTP, including historical and current operations. Information related to TRU mixed waste certification procedures and the types of documentation (e.g., waste profile forms) used to summarize AK is also provided.

c. "Auditable Records" are those records which allow the CBFO to conduct a systematic assessment, analysis, and evaluation of the CBFO compliance with the WAP and the WIPP RCRA Permit.

The AMWTP will be involved in characterizing stored waste generated at multiple facilities and creating newly generated TRU mixed waste in the AMWTP processing facility. For each generator of waste the following general facility information shall be included as part of the AK written record:

- A map of the site with the areas and facilities involved in TRU mixed waste generation, treatment, and storage identified.
- Facility mission description as related to TRU mixed waste generation and management (e.g., nuclear weapons research may involve metallurgy, radiochemistry, and nuclear physics operations that result in specific waste streams).
- Description of the operations that generated TRU mixed waste at the site (e.g., plutonium recovery, weapons design, or weapons fabrication).
- Waste identification and category schemes used at the site (e.g., item description code [IDC], content codes).
- Types and quantities of TRU mixed waste generated, including historical generation through future projections.
- Correlation of waste streams generated for the same building and process, as appropriate (e.g., sludge, combustibles, metals, and glass).
- Waste certification procedures for retrievably stored and newly generated wastes to be sent to the WIPP facility.

C4-2b Required TRU Mixed Waste Stream Information

AK will be used to delineate waste streams. For each TRU mixed waste stream, the AMWTP compiles all process information and data that support the AK used to characterize that waste stream. The type and quantity of supporting documentation varies by waste stream depending on the process generation the waste and the site-specific requirements. At a minimum, the waste process information on each waste stream includes the following written information:

- Area(s) and building(s) from which the waste stream was or is generated.
- The waste stream volume and period of waste generation (e.g., 100 SWBs of retrievable stored waste generated from June 1977 through December 1977).
- Waste generating process for each building (e.g., batch waste stream generated during decommissioning operations of glove boxes), including processes associated with U134 waste generation, if applicable.

- Documentation regarding how the site has historically managed the waste, including the historical regulatory status of the waste (i.e., TRU mixed versus TRU non-mixed waste)

- Process flow diagrams (e.g., a diagram illustrating glove boxes from a specific building to a size reduction facility to a container storage area). In the case of research/development, analytical laboratory waste, or other similar processes where a process flow diagram cannot be created, a description of the waste generating process, rather than a formal process flow diagram, may be included if this modification is justified and the justification placed in the auditable record.

- Material inputs or other information that identifies the chemical content of the waste stream and the physical waste form (e.g., glove box materials and chemicals handled during glove box operations; events or processes that may have modified the chemical or physical properties of the waste stream after generation, data obtained through VE of newly generated waste that later undergoes RTR; information demonstrating neutralization of U134 [hydrofluoric acid] and waste compatibility).

The AK written record includes a summary that identifies all sources of waste characterization information used to delineate the waste stream. The basis and rationale for delineating each waste stream, based on the parameters of interest, is clearly summarized and traceable to referenced documents. Assumptions made in delineating each waste stream also are identified and justified.

If discrepancies exist between required information, the AMWTP may consider applying all EPA HWNs indicated by the information to the subject waste stream, but must assess and evaluate the information to determine the appropriate EPA HWNs consistent with RCRA requirements. Discrepancy resolution for the AK is described in MP-TRUW-8.13.

CBFO will obtain, at a minimum, procedures that comply with the following AK requirements:

- Procedures for identifying and assigning the physical waste form of the waste.

- Procedures for delineating waste streams and assigning Waste Matrix Codes.

- Procedures for resolving inconsistencies in AK documentation.

- Procedures for headspace gas sampling and analysis, VE and/or RTR, and homogeneous waste sampling and analysis, if applicable.

- For newly generated waste, procedures describing process controls used to ensure prohibited items (specified in the WIPP-WAP, Permit Attachment C) are documented and managed.

- Procedures to ensure RTR and VE include a list of prohibited items that the operator shall verify are not present in each container (e.g., liquid exceeding WIPP Hazardous Waste Permit TSDF-WAC limits, corrosives, ignitable, reactives, and incompatible wastes).

- Procedures to document how changes to Waste Matrix Codes, waste stream assignment, and associated EPA HWNs based on material composition are documented for any waste.

- Procedures that ensure the assignment of EPA HWNs is appropriate, consistent with RCRA requirements, and considers site historical waste management.

- Procedures for estimating waste material parameter weights.

C4-2c Additional Acceptable Knowledge Documentation

Additional AK information, as appropriate, is collected to augment required information and provide any other information obtained to further delineate waste streams. Adequacy of this information is assessed during audits (Section C4-3g). This information is included in the AK written record.

All additional specific, relevant AK documentation assembled and used in the AK process, whether it supports or contradicts any required AK documentation shall be identified and an explanation provided for its use (e.g., identification of a TC). Additional documentation may be used to further document the rationale for the hazardous characterization results. The collection and use of additional information shall be assessed during site audits to ensure that hazardous waste characterization is supported, as necessary, by such information. Similar to required information, if discrepancies exist between additional information and the required information, then the AMWTP may consider applying all EPA HWNs indicated by the additional information to the subject waste stream, but must assess and evaluate the information to determine the appropriate EPA HWNs consistent with RCRA requirements. All information considered must be documented and placed in the auditable record, including applicable discrepancy resolution documentation. Discrepancy resolution for the AK is described in MP-TRUW-8.13.

Additional AK documentation includes, but is not limited to, the following information:

- Process design documents (e.g., Title II Design).

- Standard operating procedures that may include a list of raw materials or reagents, a description of the process or experiment generating the waste, and a description of waste generated and how the wastes are managed at the point of generation.

- Preliminary and final safety analysis reports and technical safety requirements.

- Waste packaging records.

- Test plans or research project reports that describe reagents and other raw materials used in experiments.
- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).
- Information from site personnel (e.g., documented interviews).
- Standard industry documents (e.g., vendor information).
- Analytical data relevant to the waste stream, including results from fingerprint analyses, spot checks, routine verification sampling, or other processes that collect information pertinent to the waste stream. This may also include new information which augments required information (e.g., VE not performed in compliance with the WIPP-WAP, radiography screening for prohibited items).
- Material Safety Data Sheets (MSDSs), product labels, or other product package information.
- Sampling and analysis data from comparable or surrogate waste streams (e.g., equivalent nonradioactive materials).
- Laboratory notebooks that detail the research processes and raw materials used in an experiment.

C4-3 Acceptable Knowledge Training, Procedures, and Other Requirements

Consistency in using AK information to characterize TRU mixed waste is provided by use of the following: (1) compiling the required and additional AK documentation in an auditable record, (2) auditing AK records, and (3) WSPF approval and waste confirmation. This section specifies the qualification and training requirements, describes each phase of the process, specifies the procedures that AMWTP is required to develop to implement the requirements for using AK, and specifies the data quality requirements for AK.

C4-3a Qualifications and Training Requirements

To ensure compliance with the requirements for compiling assembling, evaluating, assessing and resolving discrepancies associated with AK, AMWTP AK personnel shall be trained in accordance with MP-RTQP-14.4.

The training requirements shall include the following subjects:

- WIPP-WAP in Permit Attachment C and the WIPP Hazardous Waste Permit TSDF-WAC specified in this QAPjP.

- State and Federal RCRA regulations associated with solid and hazardous waste characterization.
- Discrepancy resolution and reporting processes.
- Site-specific procedures associated with waste characterization using AK.

C4-3b Acceptable Knowledge Assembly and Compilation

Site-specific AK procedures address the following:

- A written procedure(s) outlining the specific methodology used to assemble AK records, including the origin of the documentation, how it will be used, and any limitations associated with the information (e.g., identify the purpose and scope of a study that included limited sampling and analysis data).
- A written procedure(s) to compile the required AK record.
- A written procedure(s) that ensures unacceptable wastes (e.g., reactive, ignitable, corrosive) are identified and segregated from TRU mixed waste populations sent to WIPP.
- A written procedure(s) to evaluate AK and resolve discrepancies. For example, if different sources of information indicate different hazardous wastes are present, then AMWTP includes all sources of information in its records and may choose to either conservatively assign EPA HWNs or assign only those numbers deemed appropriate and consistent with RCRA requirements. All information used to justify assignment of EPA HWNs must be placed in the auditable record. Further, the assignment of EPA HWNs is tracked in the auditable record to all required documentation.
- A written procedure(s) to identify hazardous wastes and assign the appropriate EPA HWNs to each waste stream. The following are minimum baseline requirements/standards that site-specific procedures include to ensure comparable and consistent characterization of hazardous waste:
  - Compilation of all of the required information in an auditable record.
  - Review of the compiled information and delineate waste streams. Delineation of waste streams must comply with the definition in Section C-0a and justify combining waste historically managed separately as TRU mixed and TRU non-mixed waste streams into a single waste stream.
  - Review of the compiled information to determine if the waste stream is compliant with the WIPP Hazardous Waste Permit TSDF-WAC.

- Review of the required information to determine if the waste is listed under 20 NMAC 4.1.200 (incorporating 40 CFR §261), Subpart D. All listed EPA HWNs are assigned unless AMWTP chooses to justify an alternative assignment and document the justification in the auditable record.

- Review of the required information to determine if the waste exhibits a hazardous characteristic or may contain hazardous constituents included in the TCs specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261), Subpart C. If a TC contaminant is identified and is not included as a listed waste, the AMWTP may evaluate available data and assign TC HWN consistent with RCRA requirements. All data examined to reach the HWN determination must be placed in the auditable record and must present a clear justification for the EPA HWN analyses.

- Review the compiled information to provide an estimate of material parameter weights for each container to be stored or disposed of at WIPP.

For newly generated wastes, procedures are implemented to characterize hazardous waste using AK prior to packaging the waste.

- Ensure that results of audits of the TRU mixed waste characterization programs at the site are available in the records.

- AMWTP will identify all process controls (implemented to ensure that the waste contains no prohibited items and to control hazardous waste content and/or physical form) that may have been applied to retrievably stored waste and/or may presently be applied to newly generated waste. Process controls are applied at the time of waste generation/packaging to control waste content, whereas any activities performed after waste generation/packaging to identify prohibited items, hazardous waste content, or physical form are waste characterization activities, not process controls. The AK record must contain specific process controls and supporting documentation identifying when these process controls are used to control waste content. See Section C-2 for programmatic requirements related to process controls.

C4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste Stream

MP-TRUW-8.13 provides an overview of the process for assembling AK documentation into an auditable record. The first step is to assemble all of the required AK information and any additional information regarding the materials and processes that generate a specific waste stream.

Procedures are implemented to establish AK records in compliance with the following criteria:

- AK information is compiled in an auditable record, including a road map for all applicable information.
- The overview of the facility and TRU mixed waste management operations in the context of the facility's mission is correlated to specific waste stream information.
- The method for documenting correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities are described in MP-TRUW-8.13. For newly generated waste, the rate (or schedule) and quantity of waste to be generated will be defined.
- A reference list shall be provided that identifies documents, databases, QA protocols, and other sources of information that support the AK information.

Container inventories for TRU mixed waste currently in retrievable storage can be found in the WTS. These container inventories will be delineated into waste streams by correlating the container identification to all of the required AK information and any additional AK information.

C4-3d AK Sufficiency Determination Request Contents

AMWTP may submit an AK Sufficiency Determination Request to meet all or part of the waste characterization requirements. The Determination Request shall include, at a minimum:

- Identification of the scenario for which the approval is sought (Section C-0b)
- A complete AK Summary that addresses the following technical requirements:
  - Executive Summary;
  - Waste Stream Identification Summary; including a demonstration that the waste stream has been properly delineated and meets the QAPjP definition of waste stream (Attachment C, Introduction);
  - Mandatory Program Information (including, but not limited to, facility location and description, mission, defense waste assessment, spent nuclear fuel and high-level waste assessment, description of waste generating processes, research/development [as necessary], facility support operations [as applicable], types and quantities of TRU waste generated, correlation of waste streams to buildings/processes, waste identification and categorization, physical form identifiers);
  - Mandatory Waste Stream Information (including, but not limited to, Area and Building of Generation, waste stream volume/period of generation (including, for newly generated waste, the rate and quantity of waste to be generated), waste generating activities, types

of waste generated, material input related to physical form and identification of percentage of each waste material parameter in the waste stream, chemical content information including hazardous constituents and hazardous waste identification, prohibited item content (including documented evidence that the waste meets the WIPP Hazardous Waste Permit TSDF-WAC Sections 2.3.3.1 through 2.3.3.10), waste packaging, presence of filter vents, number of layers of confinement);

- Types of additional information gathered;
- Container specific data (if available and relevant); and
- A complete reference list including all mandatory and additional information

- An AK roadmap (defined as a cross reference between mandatory programmatic and mandatory waste stream information, with references supporting these requirements)
- A complete reference list including all mandatory and additional documentation.
- Additional relevant information for the required programmatic and waste stream data addressed in the AK Summary, examples of which are presented in Section C4-2c.
- Identification of any mandatory requirements supported only by upper tier documents (i.e., there is insufficient supporting data).
- Description or other means of demonstrating that the AK process described in the QAPjP was followed (for example, AK personnel were appropriately trained; discrepancies were documented, etc).
- Information showing that the AMWTP has developed a written procedure for compiling the AK information and assigning EPA HWNs as required in Section C4-3b;
- Information showing that the AMWTP has assessed the AK process (e.g. internal audits, Section C4-3b).

The CBFO will evaluate the Determination Request for completeness and technical adequacy as specified in Attachment C.

C4-3e Requirements for Re-Evaluating AK Information

AK includes information regarding the physical form of the waste, the base materials composing the waste, and the process that generates the waste. Waste characterization sampling and analysis (i.e., RTR or VE, headspace-gas sampling and analysis, and homogeneous waste sampling and analysis) may be used to augment AK information.

The WSPF and CIS (including the AK summary) will be reviewed for each waste stream prior to CBFO approval of the WSPF. The CBFO review will ensure that the submitted AK information was collected under procedures that ensure implementation of the QAPjP, provides data sufficient to meet the DQOs in Section C-4a(1), and allow the AMWTP to demonstrate compliance with the waste analysis requirements of the QAPjP. A detailed discussion of the CBFO's waste stream review and approval process is provided in Section C-1d.

The AMWTP has established procedures for reevaluating AK if the results of waste confirmation indicate that the waste to be shipped does not match the approved waste stream, or if data obtained from RTR or VE for waste streams without an AK Sufficiency Determination exhibit this discrepancy. These procedures describe how the waste is reassigned, AK reevaluated, and appropriate EPA HWNs assigned. If the reevaluation requires that the Waste Matrix Code be changed for the waste stream or the waste does not match the approved waste stream, the following minimum steps are taken to reevaluate AK. This process is implemented in MP-TRUW-8.13.

- Review existing information based on the container identification number and document all differences in EPA HWN assignments.
- If differences exist in the EPA HWNs that were assigned, reassess and document all required AK information (Section C4-3b) associated with the new designation.
- Reassess and document all sampling and analytical data associated with the waste.
- Verify and document that the reassigned Waste Matrix Code was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the waste material parameter identified during RTR or VE.
- All changes to AK records are recorded.
- If discrepancies exist in the AK information for the revised Waste Matrix Code, the segregation of the affected portion of the waste stream is documented, and the actions necessary to fully characterize the waste are defined.

The base materials that compose TRU heterogeneous debris (S5000) waste (e.g., lead, stainless steel, and glass) are well established and potential TCs can be determined without destructive sampling and analysis based on AK. The AMWTP will assign a Waste Matrix Code and waste stream to each container of waste using AK. The AMWTP will assign the TC HWN consistent with RCRA requirements. If a TC hazardous constituent is identified during AK, the potential assignment of an EPA HWN must be evaluated and the results placed in the AK record. Procedures describe how additions to EPA HWNs based on material composition are documented, as necessary (refer to Section C4-3b).

The AMWTP uses AK to identify spent solvents associated with each TRU mixed waste stream or waste stream lot. Headspace gas data is then used to resolve the assignment of EPA F-listed HWNs to debris waste streams when waste streams do not have an AK Sufficiency Determination approved by the CBFO. AMWTP will assign F-listed HWNs (20 NMAC 4.1.200, incorporating 40 CFR §261.31) by evaluating the average concentrations of each VOC detected in container headspace gas for each waste stream or waste stream lot using the UCL_{90}.

The UCL_{90} for the mean concentration is compared to the PRQL for the constituent. If the UCL_{90} for the mean concentration exceeds the PRQL, the AK information is reevaluated and the potential source of the solvents is determined. Documentation is provided to support any determination that F-listed organic constituents are associated with packaging materials, radioanalysis, or other uses not consistent with solvent use. If the source of the detected F-listed solvents cannot be identified, the appropriate spent solvent EPA HWN is conservatively applied to the waste stream. In the case of applicable TC VOCs and non-toxic F003 constituents, AMWTP may assess whether the head space gas concentration would render the waste non-hazardous for those characteristic and change the initial AK determination accordingly. This process is described by MP-TRUW-8.11 and MP-TRUW-8.13.

EPA hazardous wastes numbers associated with S3000 and S4000 waste streams is assigned based on the results of the Total/TCLP analysis of a representative homogeneous waste sample when waste streams do not have an AK Sufficiency Determination approved by CBFO. If the Total or TCLP results indicate that the concentration of a characteristic waste or non-toxic constituent of an F003 waste is below regulatory levels, the EPA HWN assigned initially by AK may be changed. If an F-listed waste constituent is detected the appropriate EPA HWN is applied.

If the site determines that the source of the F-listed constituent is a spent solvent used in the process or is determined to be the result of mixing a listed waste with a solid waste during waste packaging, or applicable TC constituents or non-toxic F003 wastes are present in excess of regulatory levels, then the AMWTP will either: (1) assign the applicable listed EPA HWN to the entire waste stream, or (2) segregate the drums containing detectable concentrations of the solvent into a separate waste stream and assign applicable EPA HWNs. The AMWTP documents, justifies, and consistently delineates waste streams and assign EPA HWNs as required in this QAPjP, and must consider all generator-specific waste streams and EPA HWN assignments. The AMWTP must also consider site-specific permit requirements and other state-enforced agreements in this analysis.

To determine the mean concentration of solvent VOCs, all headspace gas data or homogeneous waste data for a waste stream or waste stream lot (i.e., the portion of the waste stream that is characterized as a unit) are used, including data qualified with a 'J' flag (i.e., less than the PRQL but greater than the MDL) or qualified with a 'U' flag (i.e., undetected). For data qualified with a U flag, one-half the MDL is used in calculating the mean concentration. Because listed wastes are not defined based on concentration, the AMWTP will not remove listed EPA HWNs assigned using AK if listed hazardous constituents are not detected in the headspace gas or solids/soil analysis.

TRU mixed headspace gases and homogeneous waste matrices may contain one or two constituents (e.g., carbon tetrachloride and 1,1,1-trichloroethane) at concentrations that are orders of magnitude higher than the other target analytes. In these cases, samples shall be diluted to remain within the instrument calibration range for the elevated constituents. Sample dilution results in elevated MDLs for the constituents with elevated concentration. Only the concentrations of detected constituents will be used to calculate the mean for the purpose of assigning F-listed EPA HWNs. Because the presence or absence of F listed solvents cannot be assigned based on the artificially high MDLs that are caused by sample dilution, data flagged as 'U' and showing an elevated MDL will not be used in calculating the mean concentration. The above process is described by MP-TRUW-8.11and MP-TRUW-8.13.

C4-3f Acceptable Knowledge Data Quality Requirements

The DQOs for sampling and analysis techniques are provided in Attachment C3. Analysis results are used to augment the characterization of wastes based on AK. To ensure that the AK process is consistently applied, the AMWTP complies with the data quality requirements for AK documentation described in Attachment C3.

The AMWTP addresses QC by tracking its performance with regard to the use of AK by: (1) assessing the frequency of inconsistencies among information, and (2) documenting the results of waste discrepancies identified by AMWTP during waste characterization or the CBFO during waste confirmation using RTR, review of RTR audio/video recordings, VE, or review of VE records. In addition, the AK process and waste stream documentation is evaluated through internal assessments by AMWTP QA organizations.

C4-3g Audits of Acceptable Knowledge

CBFO will conduct an initial audit prior to certifying AMWTP for shipment of TRU mixed waste to the WIPP facility. This initial audit will establish an approved baseline that will be reassessed annually. Those audits verify compliance with the WIPP-WAP, ensure the consistent compilation, application, and interpretation requirements of AK information throughout the DOE complex, and evaluate the completeness and defensibility of site-specific AK documentation related to hazardous waste determinations.

The QA organization performs a periodic independent audit, or several small scope audits, of AMWTP activities in accordance with MP-M&IA-17.2, *Independent Assessment*. QA AK audit checklists include the elements listed below for review during the periodic audit, and the AMWTP provides information as requested by QA to satisfy the AK audit/surveillance requirements:

- Documentation of the process used to compile, evaluate, and record AK is available and implemented.
- Personnel training and qualifications are documented.
- All of the required AK documentation specified in Section C4-2 has been compiled in an auditable record.
- All the required procedures specified in Section C4-3 have been developed and implemented, including but not limited to
  - A procedure exists for assigning EPA HWNs as referenced in Section C4-3b(5)
  - A procedure exists for resolving discrepancies in AK documentation in accordance with Section C4-3b.
- Results of other audits of the TRU mixed waste characterization programs at AMWTP are available in site records.

Attachment C5.
Quality Assurance Project Plan Requirements

C5-1 Quality Assurance Project Plans

The AMWTP has developed and implemented this QAPjP to address the applicable requirements specified in the WIPP-WAP. This QAPjP will be submitted and approved by the CBFO to ensure that it includes the qualitative or quantitative criteria to ensure that waste characterization activities are being performed satisfactorily.

The AMWTP uses standard operating procedures for all activities which affect the quality of the waste characterization program elements specified in this QAPjP. For the purposes of the QA program, the term *standard operating procedure* refers to any site-specific implementing document. Compliance with standard operating procedures ensures that tasks are performed in a consistent manner that results in achieving the quality required for the QA program. Throughout this QAPjP, site-specific documents are referenced that detail how each of the required elements of the characterization program are performed.

C5-2 Document Review, Approval, and Control

The preparation, issuance, and change to documents that specify quality requirements or prescribe activities affecting quality for the transuranic mixed characterization program elements specified in this QAPjP are controlled to ensure the correct and current documents are used and referenced. QAPjPs include a document control number consisting of a unique document identification number, current revision number, date, and page number which will be placed on the individual pages of the document. Qualified and independent individuals will review all quality documents for the waste characterization program prior to approval and issuance. There will be appropriate QAPjP approval that is indicated by a signature and date page included in the front of each document. AMWTP compliance with the WIPP-WAP requirements for document review, approval, and control is defined in Section 4 of MP-TRUW-8.1 and MP-DOCS-18.4. The CBFO approves this QAPjP and other program documents defining performance criteria or data quality.

Table C5-1. Minimum requirements for review, approval, implementation, and control of QAPjP.

	RESPONSIBLE PARTY				
	Manager, CBFO QA	CBFO Director National TRU Program	DOE-ID	AMWTP SPM	AMWTP QA Manager
Review/Approval	X	X	X	X	X
Implementation				X	X
Change Approval	X	X	X	X	X
Change Control				X	X

Table C5-1 presents the minimum requirements for review, approval, and implementation of the QAPjP. The QAPjP will be reviewed for technical adequacy, completeness, and correctness, and the inclusion of requirements established by the WIPP-WAP.

Revisions to documents that implement the requirements of the QAPjP will be denoted by including the current revision number on the document's title page, the revised signature page, and each page that has been revised. Only revised pages need to be reissued although the entire document may be reissued. Changes to documents, other than those defined as editorial changes or minor changes, will be reviewed and approved by the same functional organizations that performed the original review and approval, unless other organizations are specifically designated in accordance with approved procedures. Editorial or minor changes may be made without the same level of review and approval as the original or otherwise changed document. The following items are considered editorial or minor changes:

- Correcting grammar or spelling (the meaning has not changed)
- Renumbering sections or attachments
- Updating organizational titles
- Changes to nonquality-affecting schedules
- Revised or reformatted forms, providing the original intent of the form has not been altered
- Attachments marked "Example," "Sample," or exhibits that are clearly intended to be representative only.

A change in an organizational title accompanied by a change in the responsibilities is not considered an editorial change. Changes to the text shall be clearly indicated in the document. AMWTP shall provide CBFO with the final issued QAPjP.

CBFO ensures that QAPjPs include a detailed description of the reporting and approval requirements for changes to approved QA document and SOPs, including procedures for implementing changes to these documents. All members of the AMWTP site project staff are responsible for reporting any obsolete or superseded information to the SPM. All site-specific changes are evaluated and approved by the AMWTP SPM and QA Manager before implementation. The SPM notifies the appropriate personnel and the affected documents are revised as necessary. The SPM also is responsible for notifying the DOE field office of the changes. The SPM will contact CBFO for approval prior to implementing changes that affect performance criteria or data quality, such as sample handling and custody requirements, sampling and analytical procedures, QAOs, calibration requirements, or QC sample acceptance criteria to ensure compliance with the WAP (Attachment C).

Attachment C6.
Audit and Surveillance Program

C6-1 Introduction

The CBFO Audit and Surveillance Program shall ensure that: (1) the operators of each site and CBFO-approved laboratory that plan to transport TRU mixed waste to the WIPP facility conduct sampling and analysis of wastes in accordance with the current WIPP-WAP, and (2) the information supplied by each site to satisfy the waste screening and acceptability requirements of Section C-4 of the WAP is being managed properly. The CBFO will conduct these audits and surveillances at each site and CBFO approved-laboratory performing these activities in accordance with a standard operating procedure. Only personnel with appropriate DOE clearances will have access to classified information during audits. Classified information will not be included in audit reports and records.

Deficiencies may be identified during audits. A deficiency is any failure to comply with an applicable provision of the WAP. During audit interviews or audit meetings, AMWTP or CBFO-approved laboratory personnel may be advised of deficiencies identified within their areas of responsibility to establish a clear understanding of the identified condition.

AMWTP or CBFO-approved laboratory personnel will be given the opportunity to correct any deficiency that can be corrected during the audit period. Deficiencies and observations will be documented and included as part of the final audit report. Those items that have been resolved during the audit (isolated deficiencies that do not require a root cause determination or actions to preclude recurrence), will be verified prior to the end of the audit, and the resolution will be described in the audit report. Those items that affect the quality of the program, and/or the data generated by that program, which are required by the WIPP-WAP will be documented on a CAR and included as part of the final audit report. The CAR will be entered into the CBFO CAR tracking system and tracked until closure. RCRA-related items will be uniquely identified by the AMWTP or CBFO-approved laboratory during self-audits will be evaluated during the CBFO's audit and surveillance program and tracked in the CBFO tracking systems.

If a discrepancy is identified during a CBFO audit, the audit team may prepare a CAR. The AMWTP will review the CAR, evaluate the extent and cause of the deficiency, and provide a response to CBFO indicating the remedial actions and action taken to preclude recurrence. CBFO will review the response and, if acceptable, communicate the acceptance to AMWTP. After all corrective actions have been completed, the CBFO may schedule and perform a verification visit to assure that corrective actions have been completed and are effective.

AMWTP will submit a corrective action plan to CBFO to eliminate the deficiency stated on the CAR, including a resolution of the acceptability of any data generated prior to the resolution of the corrective action.

The corrective action response will include a discussion of the investigation performed to determine the extent and impact of the deficiency, a description of the remedial actions taken, determination of root cause, and actions to preclude recurrence. This process is described in MP-Q&SI-5.4 and MP-Q&SI-5.3.

The AMWTP will respond to any deficiencies and observations within thirty days after receipt of any CARs and indicate the corrective action taken or to be taken. If the corrective action has not been completed, the response will indicate the expected date the action will be completed. CARs applicable to WAP requirements will be resolved prior to shipment.

C6-2 Internal Management Assessments and Independent Surveillances

AMWTP personnel schedule and conduct management assessments of the TRU mixed waste characterization activities in accordance with MP-M&IA-17.1, *Management Assessments.* AMWTP QA schedule and conduct formal internal independent assessment in accordance with MP-M&IA-17.2, *Independent Assessment.*

When a deficiency is identified by the audit team the assessment team member who identified the deficiency prepares a CAR in accordance with MP-Q&SI-5.3.

The corrective action response will include a discussion of the investigation performed to determine the extent and impact of the deficiency, a description of the remedial actions taken, determination of root cause, and actions to preclude recurrence.

Attachment C7.
TRU Waste Confirmation

Introduction

This section of the QAPjP describes the actions that CBFO will take to approve and accept waste for and disposal at the WIPP, including waste confirmation activities. Discussion of the CBFO actions that are relevant to AMWTP will be included here.

CBFO demonstrates compliance with the Permit by ensuring that the waste characterization processes performed by AMWTP produce data compliant with the WIPP-WAP and through the waste screening and verification processes. Verification occurs at three levels: (1) the data generation level, (2) the project level, and (3) the CBFO level. The CBFO also examines a representative subpopulation of waste prior to shipment to confirm that the waste contains no ignitable, corrosive, or reactive waste; and that assigned EPA HWNs are allowed by the WIPP RCRA Permit. The waste confirmation activities described herein occur prior to receipt of TRU mixed waste at WIPP.

C7-1 Permittee Confirmation of TRU Mixed Waste

Waste confirmation is defined in Part 1 as the activities performed by the CBFO to satisfy the requirements in Section 310 of Public Law 108-447. Waste confirmation occurs after waste containers have been certified for disposal at WIPP.

C7-1a Permittee Confirmation of a Representative Subpopulation of the Waste

CBFO will confirm that the waste contains no ignitable, corrosive, or reactive waste through RTR or the use of VE of a statistically representative subpopulation of the waste. Prior to shipment to WIPP, waste confirmation will be performed on randomly selected containers from each CH and RH-TRU mixed waste stream shipment.

Waste confirmation encompasses ensuring that the physical characteristics of the TRU mixed waste correspond with its waste stream description and that the waste does not contain liquid in excess of TSDF-WAC limits or compressed gases.

Noncompliant waste identified during waste confirmation will be managed as described in Section C7-2.

CBFO randomly selects at least 7% of each waste stream shipment for waste confirmation. This equates to a minimum of one container from each fourteen containers in each waste stream in each designated shipment.

For each container selected for confirmation, the confirmation team will examine the respective NCR documentation to verify NCRs have been dispositioned for the selected container as required in Section C3-13.

C7-1a(1) Confirmation Training Requirements

This section does not apply to the AMWTP

C7-1b Radiography Methods Requirements

This section describes the portion of the CBFO confirmation program that applies to the AMWTP.

For containers that have been characterized using RTR by the AMWTP in accordance with the method in Attachment C1, Section C1-3, the CBFO may perform confirmation by review of the AMWTP's RTR audio/video recordings.

Independent replicate scans and replicate observations of the video output of the RTR process shall be performed under uniform conditions and procedures. Independent replicate scans will be performed on one waste container per day or once per shipment, whichever is less frequent, by a qualified RTR operator other than the individual who performed the first examination. When confirmation is performed by review of audio/video recorded scans produced by the AMWTP as specified in Section C1-3, independent observations will be performed on two waste containers per shipment or two containers per day, whichever is less frequent.

C7-1c Visual Examination Methods Requirements

This section describes the portion of the CBFO confirmation program that applies to the AMWTP.

VE may also be used as a waste confirmation method by the CBFO. VE shall be conducted by the CBFO in accordance with written standard operating procedures to describe the contents of a waste container. VE shall be conducted to identify and describe all waste items, packaging materials, and waste material parameters. VE may be used by the CBFO to examine a statistically representative subpopulation of the waste certified for shipment to WIPP to confirm that the waste contains no ignitable, corrosive, or reactive waste. This is achieved by confirming that the waste contains no liquid in excess of TSDF-WAC limits or compressed gases, and that the physical form of the waste matches the waste stream description documented on the WSPF. During packaging, the waste container contents are directly examined by trained personnel. This form of waste confirmation may be performed by the CBFO at AMWTP. VE may be documented on video and audio media, or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. When VE is performed using a second operator, each operator performing the VE shall observe for themselves the waste being placed in the waste container or the contents within the examined

waste container when waste is not removed. The results of all VE shall be documented on VE data forms which are used to document (1) the Waste Matrix Code, (2) that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and (3) that the physical form of the waste is consistent with the waste stream description documented on the WSPF.

In order to keep radiation doses as low as reasonably achievable at the AMWTP, the CBFO may use their own trained VE operators to perform VE for waste confirmation by reviewing VE data forms, waste packaging records, and may use the audio/video media. The confirmation team shall document their review of the AMWTP VE data on confirmation data forms.

If the AMWTP documents VE using audio/video media in accordance with Section C1-4, the confirmation team must use the audio/video to perform confirmation. If the waste confirmation team performs waste confirmation by review of audio/video media, the audio/video record of the VE must be sufficiently complete to confirm the Waste Matrix Code and waste stream description, and verify the waste contains no liquid in excess of TSDF-WAC limits or compressed gases. AMWTP VE video/audio media subject to review by the CBFO shall meet the following minimum requirements:

- The video/audio media shall record the waste packaging event for the container such that all waste items placed into the container are recorded in sufficient detail and shall contain an inventory of waste items in sufficient detail that a trained CBFO VE operator can identify the associated waste material parameters.
- The video/audio media shall capture the waste container identification number.
- The personnel loading the waste container shall be identified on the video/audio media or on packaging records traceable to the loading of the waste container.
- The date of loading of the waste container will be recorded on the video/audio media or on packaging records traceable to the loading of the waste container.

VE audio/video media of containers that contain classified shapes shall be considered classified information.

If the AMWTP did not document VE using audio/video media, the CBFO may use their own trained VE operators to perform VE for waste confirmation by reviewing VE data forms or packaging records prepared by the generator during their packaging of the waste. To be acceptable, the AMWTP VE data forms or packaging records must be signed by two AMWTP personnel who witnessed the packaging of the waste and must provide sufficient information for the CBFO to determine that the waste container contents match the waste stream description on the WSPF and the waste contains no liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits or compressed gases. AMWTP VE forms or packaging records subject to review by CBFO shall meet the following minimum requirements:

- At least two generator site personnel shall approve the data forms or packaging records attesting to the contents of the waste container.
- The data forms or packaging records shall contain an inventory of waste items in sufficient detail that a trained CBFO VE operator can identify the associated waste material parameters.
- The waste container identification number shall be recorded on the data forms or packaging records.
- VE video media of containers that contain classified shapes shall be considered classified information. VE data forms will not contain classified information.

C7-2 Noncompliant Waste Identified During Waste Confirmation

This section describes the portion of the CBFO confirmation program that applies to the AMWTP.

If the CBFO identifies noncompliant waste during waste confirmation at AMWTP (i.e., the waste does not match the waste stream description documented in the WSPF or there is liquid in excess of TSDF-WAC limits or compressed gases), the waste will not be shipped.

The CBFO will suspend further shipments of the affected waste stream and issue a CAR to the AMWTP. Shipments of affected waste streams will not resume until the CAR has been closed.

As part of the corrective action plan in response to the CAR, the AMWTP will evaluate whether the waste characterization information documented in the CIS and/or WSPF for the waste stream must be updated because the results of waste confirmation for the waste stream indicated that the TRU mixed waste being examined did not match the waste stream description. AMWTP will thoroughly evaluate the potential impacts on waste that has been shipped to WIPP. The CBFO will evaluate the potential that prohibited items were shipped to WIPP and what remedial actions should occur, if any. The results of these evaluations will be provided to NMED before shipments of affected waste stream resume. If the CIS and/or WSPF require revision, shipments of the affected waste stream shall not resume until the revised waste stream waste

characterization information has been reviewed and approved by the CBFO. If AMWTP certifies noncompliant waste more than once during a running 90-day period, the CBFO will suspend acceptance of AMWTP's waste until the CBFO find that all corrective actions have been implemented and the site complies with all applicable requirements of the WIPP-WAP.

D. RECORDS PROCESSING

Record Description	Classification
MP-TRUW-8.2, Case file	Nonpermanent WIPP / ENV1-J-1 Destroy 75 years after submittal

E. REFERENCES

E-0 AMWTP Documents

INST-FOI-17, *Facility Visual Examination Operations*

INST-FOI-20, *Supercompactor and Post-Compaction Operations*

INST-OI-12, *Real-Time Radiography Operations (Drum)*

INST-OI-16, *Drum Coring Operations*

INST-OI-34, *Non-Facility Visual Examination Operations*

INST-OI-43, *HGAS Sampling and Analysis Operations*

INST-OI-73, *Manual Drum Coring Operations*

INST-OI-75, *Container-in-Container Sampling.*

INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)*

LST-RTQP-03, *WIPP Training Requirements List*

MP-CMNT-10.5, *Calibration and Control of Measuring and Test Equipment Program*

MP-DOCS-18.2, *Records Management*

MP-DOCS-18.4, *Document Control*

MP-M&IA-17.1, *Management Assessment*

MP-M&IA-17.2, *Independent Assessment*

MP-Q&SI-5.3, *Corrective Action*

MP-Q&SI-5.4, *Identification of Nonconforming Conditions*

MP-RTQP-14.1, *Preparation and Administration of Training Plans*

MP-RTQP-14.4, *Personnel Qualification and Certification*

MP-RTQP-14.19, *Training Records Administration*

MP-TRUW-8.1, *Certification Plan for INL Transuranic Waste*

MP-TRUW-8.5, *TRU Waste Certification*

MP-TRUW-8.8, *Level I Data Validation*

MP-TRUW-8.9, *Level II Data Validation*

MP-TRUW-8.11, *Data Reconciliation*

MP-TRUW-8.13, *Collection, Review, and Management of Acceptable Knowledge Documentation*

MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*

MP-TRUW-8.17, *Co-Located Core Sampling Control Charts*

MP-TRUW-8.25, *Random Selection of Containers for Headspace Gas and Solids Sampling and Analysis*

MP-TRUW-8.34, *WIPP Sample Transfers*

PD-CMNT-01, Nuclear Maintenance Management Program Description

E-1 CCP Analytical Laboratory Department Documents

CCP-QP-002, *CCP Training and Qualification Plan*

CCP-TP-181, *CCP Determination of Mercury by CVAA for TRU Waste Characterization*

CCP-TP-182, *CCP Determination of Metals by ICP AES for TRU Waste Characterization*

CCP-TP-183, *CCP Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel*

CCP-TP-184, *CCP Volatile Organic Compounds by Gas Chromatography Mass Spectrometry*

CCP-TP-185, *CCP Semivolatile Organic Compounds by Gas Chromatograph Mass Spectrometry*

CCP-TP-186, *CCP Determination of Nonhalogenated Volatile Organics by Gas Chromatography*

CCP-TP-187, *CCP Sample Preparation for Semivolatile Organic Compounds*

CCP-TP-188, *CCP Analytical Data Recording, Review, and Reporting*

E-2 External References

15 USC 2601–2692, "The Toxic Substances Control Act of 1976."

20 NMAC 4.1, 2009, "Hazardous Waste Management," Title 20, New Mexico Administrative Code, Chapter 4, Part 1, Sections 200, 300, 500, and 800, March 2009.

40 CFR 240, 2010, "Guidelines for the Thermal Processing of Solid Wastes," Code of Federal Regulations, Office of the Federal Register, July 2010.

40 CFR 261, 2011, "Identification and Listing of Hazardous Waste," Code of Federal Regulations, Office of the Federal Register, July 2011.

40 CFR 262, 2011, "Standards Applicable to Generators of Hazardous Waste," Code of Federal Regulations, Office of the Federal Register, July 2011.

40 CFR 264, 2011, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Code of Federal Regulations, Office of the Federal Register, July 2011.

40 CFR 268, 2010, "Land Disposal Restrictions," Code of Federal Regulations, Office of the Federal Register, July 2010.

ASTM, 1983a, "Test Method for Chemical Composition of Gases by Mass Spectrometry," ASTM D2650-83, American Society for Testing and Materials, 1983.

ASTM, 1983b, "Type II Water Dl 193-77," American Society for Testing and Materials, 1983.

ASTM, 1993, "Standard Practice for Reducing Samples of Aggregate to Testing Size, Method B Quartering," ASTM C702-93, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials, 1993.

ASTM 1998, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," ASTM D4547-98, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials, 1998.

CBFO:OCT:KWW:VW:05-1164:UFC:5822, "Method for Reporting HSC in 100 Gallon Drums Containing Supercompacted 55-Gallon Drums with Rigid Liners," Carlsbad Field Office.

Connolly, M.J., et al. (Lockheed Idaho Technologies Company), 1995, *Position for Determining Gas Phase Volatile Organic Compound Concentrations in Transuranic Waste Containers*, INEL-95/0109, Rev. 1, 1995.

DOE/CAO-94-1005, "Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report," U.S. Department of Energy- Carlsbad Area Office, Current Revision.

DOE/CBFO-94-1012, "Quality Assurance Program Document," U.S. Department of Energy-Carlsbad Field Office, Current Revision.

DOE/CBFO-95-1076, "Performance Demonstration Program Plan for Analysis of Simulated Headspace Gases," U.S. Department of Energy-Carlsbad Field Office, Current Revision.

DOE/CBFO-95-1077, "Performance Demonstration Program Plan for RCRA Constituent Analysis of Solidified Wastes," U.S. Department of Energy-Carlsbad Field Office, Current Revision.

DOE/LLW-217, "DOE Waste Treatability Group Guidance," U.S. Department of Energy-Idaho National Laboratory, January 1995.

DOE/WIPP-02-3122, "Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant," U.S. Department of Energy-Carlsbad Field Office, June 13, 2011.

DOE/WIPP-09-3427, "Waste Data System User's Manual," U.S. Department of Energy-Carlsbad Field Office, 2009.

EPA, 1980, "A Method for Determining the Compatibility of Hazardous Wastes," EPA/600/2-80-076, California Department of Health Services and the U.S. Environmental Protection Agency, Office of Research and Development, 1980.

EPA, 1988, "Compendium Method TO-14–The Determination of Volatile Organic Compounds (VOC) in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analyses. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air," Research Triangle Park, NC, Quality Assurance Division, Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, June 1988.

EPA, 1992, "EPA Specifications and Guidance for Contaminant-Free Sample Containers," Directive No. 9240.0-5A, U.S. Environmental Protections Agency, Office of Solid Waste and Emergency Response, December 1992.

EPA, 1994a, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, a Guidance Manual," OSWER 9938.4-03, U.S. Environmental Protections Agency, Office of Solid Waste and Emergency Response, April 1994.

EPA, 1994b, "EPA Laboratory Guidelines for Evaluating Organics Analyses," EPA/540/R/94/082, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, December 1994.

EPA, 1994c, "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses," EPA/540/R/94/083, U.S. Environmental Protections Agency, December 1994.

EPA, 1995, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition, Final Update I and Final Update II, U.S. Environmental Protections Agency, Office of Solid Waste and Emergency Response, 1995.

EPA, 1996, "Test Methods for Evaluating Solid Waste, Laboratory Manual Physical/Chemical Methods," SW-846, Third Edition, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 1996.

EPA, 1997, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Rev. 2, Third Edition, including Final Update III, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 1997.

EPA, 1999, "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air," EPA/625/R-96/010b, U.S. Environmental Protections Agency, January 1999.

EPA, 2002, "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites," OSWER 9285.6-10, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, December 2002.

Liekhus, K. J., S.M. Djordjevic, M. Devarakonda, and M.J. Connolly (Idaho National Laboratory), 2000, *Determination of Drum Age Criteria and Prediction Factors Based on Packaging Configurations,* INEEL/EXT-00-1207, October 2000.

NMED, 1999, "Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Final Permit," New Mexico Environment Department, Permit No. NM4890139088-TSDF, October 27, 1999.

NRC Docket No. 71-9218, 2001, "Safety Analysis Report for the TRUPACT-II Shipping Package (SARP)," U.S. Nuclear Regulatory Commission, May 2001.

Public Law 102-386, Title 1, 1992, "Federal Facility Compliance Act," U.S. Environmental Protection Agency, October 6, 1992.

RCRA, Part B Permit, 1997, "Application for the Waste Isolation Pilot Plant," Revision 6.5, U.S. Department of Energy, 1997.

F. GLOSSARY

F-0 Acronyms and Abbreviations

ACL	Analytical Chemistry Laboratory
AK	acceptable knowledge
AMWTP	Advanced Mixed Waste Treatment Project
ASTM	American Society for Testing and Materials
BDR	Batch Data Report
BFB	4-bromofluorobenzene
°C	degrees Celsius
%C	percent complete
CAR	corrective action report
CAS	Chemical Abstract Services
CBFO	Carlsbad Field Office
CCC	calibration check compounds
CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	contact-handled
CH-TRU	contact-handled transuranic
CIS	Characterization Information Summary
COC	chain-of-custody
CVAA	Cold Vapor Atomic Absorption Spectrometry
%D	percent difference
DA	Data Administrator
DAC	drum age criteria
DFTPP	decafluorotriphenylphosphine
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	Data Quality Objective

EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FRC	Federal Records Center
FTIR	Fourier Transform Infrared Spectroscopy
g	gram
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detection
GC/FID	Gas Chromatography/Flame Ionization Detection
GC/MS	Gas Chromatography/Mass Spectrometry
HPLC	high pressure liquid chromatography
HSGS	headspace gas sampling
HWN	EPA hazardous waste number
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma- Mass Spectometry
ICS	interference check standards
ICV	initial calibration verification
IDC	item description code
IDL	instrument detection limit
INL	Idaho National Laboratory
INST	instruction
ITR	independent technical review
kg	kilogram
L	liter
LCS	Laboratory Control Sample
LDR	land disposal restrictions
µg/L	micrograms per liter
MDL	method detection limit
mg/kg	milligrams per kilogram
mL	milliliter
mm	millimeter
mm Hg	millimeters mercury
MP	management procedure
MSD	matrix spike duplicate

NCR	nonconformance report
NDA	nondestructive assay
NDE	nondestructive examination
ng	nanogram
NIST	National Institute of Standards and Technology
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OLCS	on-line control sample
OSHA	Occupational Safety and Health Administration
OJT	on-the-job training
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
PDP	Performance Demonstration Program
POC	pipe overpack container
ppm	parts per million
ppmv	parts per million by volume
PRDL	Program Required Detection Limit
PRQL	Program Required Quantitation Limit
psig	pounds per square inch gauge
pt	point
QA	quality assurance
QAO	Quality Assurance Objective
QA/QC	Quality Assurance/Quality Control
QAPD	Quality Assurance Program Document
QAPjP	Quality Assurance Project Plan
QC	quality control
r	regression coefficient
%R	percent recovery
%RSD	percent relative standard deviation
RA	radioassay
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RH	remote-handled
RIDS	Records Inventory and Disposition Schedule
RPD	relative percent difference
RRF	relative response factor
RT	retention time
RTL	Regulatory Threshold Limit
RTR	real-time radiography
RWMC	Radioactive Waste Management Complex

SLB2	standard large box 2
SPCC	system performance check compound
SPM	Site Project Manager
SPO	Site Project Office
SVOC	semi-volatile organic compound
SW-846	EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
SWB	standard waste box
TC	Toxicity Characteristic
TCLP	Total or Toxicity Characteristic Leaching Procedure
TDOP	Ten-Drum Overpack
TIC	tentatively identified compound
TRU	transuranic
TRUCON	TRUPACT-II Content Codes (DOE 1992)
TRUPACT-II	Transuranic Package Transporter Model II
TSA-RE	Transuranic Storage Area-Retrieval Enclosure
TSCA	Toxic Substance Control Act
TSDF	Treatment Storage Disposal Facility
TWBIR	TRU Waste Baseline Inventory Report
UCL_{90}	upper 90% confidence level
UHWM	Uniform Hazardous Waste Manifest
VE	visual examination
VEE	Visual Examination Expert
VOA	volatile organic analysis
VOC	volatile organic compound
WAC	waste acceptance criteria
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WIPP-WAP	Waste Analysis Plan for the Waste Isolation Pilot Plant, Attachment C of the WIPP Hazardous Waste Facility Permit
WSPF	Waste Stream Profile Form
WTS	Waste Tracking System
WWIS	WIPP Waste Information System