IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY

ADVANCED MIXED WASTE TREATMENT PROJECT

Quality Assurance Project Plan (QAPjP)

BNFL INC.

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A. INTRODUCTION

The Advanced Mixed Waste Treatment Project (AMWTP) disposes of contact-handled transuranic (CH-TRU) waste 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, Attachment B, Waste Analysis Plan* (WIPP-WAP).

In this QAPjP, the term TRU waste includes TRU and TRU-mixed waste. The structure of this document parallels the structure of the WIPP-WAP, and the document complies with quality requirements of the United States (U.S.) Department of Energy (DOE) Carlsbad Area Office (CAO) *Quality Assurance Program Document* (QAPD) (CAO-94-1012).

A-1 Scope

This QAPjP applies only to contact-handled (CH) TRU waste and describes how the 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 identifies the quality of data necessary and the procedures developed by the AMWTP to attain and maintain quality. The SPM will review this QAPjP annually and revise the document, as necessary, to incorporate lessons learned during waste characterization activities and any changes made to source requirements documents (WIPP-WAP).

A-2 Overview

The AMWTP is designed, built, and operated by BNFL Inc. under a privatized, but non-commercial, contract with the United States (U.S.) Department of Energy (DOE) and is located at the Idaho National Engineering and Environmental Laboratory's (INEEL) Radioactive Waste Management Complex (RWMC).

The AMWTP plans to dispose of approximately 65,000 m^3 of CH-TRU waste at the WIPP. TRU waste to be 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 INEEL and DOE national waste streams. The majority of TRU waste within the TSA-RE is CH-TRU. Although some remote-handled TRU waste will be encountered during the retrieval operations, the remote-handled (RH) TRU waste will be segregated from the CH-TRU and will not be shipped to the WIPP for disposal by BNFL Inc.

Approximately 95% of the TRU waste stored at the RWMC contains hazardous waste regulated under the Resource Conservation and Recovery Act (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 facilities; preliminary characterization (nondestructive examination (NDE) and assay (NDA) systems; intrusive waste examination, sampling and analysis of waste forms), treatment, as appropriate, and transportation. Chemical analysis of homogeneous solids is performed at the INEEL Analytical Laboratories Department (ALD).

A-3 Description of the Site

The AMWTP is located in southeast corner of the INEEL. The INEEL, located approximately 30 miles west of Idaho Falls, encompasses 900 square miles. Facilities supporting characterization, treatment, certification, and transportation activities are located within the INEEL at the RWMC, and Idaho Nuclear Technology and Engineering Center (INTEC).

A-4 Project Description

Personnel characterize TRU waste on a waste stream basis. A waste stream is defined as waste material generated from a single process or activity similar in material, physical form, and hazardous constituents. The AMWTP personnel characterize TRU waste by obtaining chemical, radiological, and physical data per this QAPjP. Radiological data are obtained as described in Management Procedure (MP)-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*.

Once a waste stream, or an initial portion of the waste stream (i.e., waste stream lot), has been identified using acceptable knowledge (AK), characterization information must be developed in order to complete and submit the WIPP Waste Stream Profile Form (WSPF) to the U.S. DOE-Carlsbad Field Office (CBFO) for approval. Waste characterization methods used for completing the WSPF include AK, Headspace Gas Sampling (HSGS) and analysis, homogeneous solids waste sampling and analysis, radioassay (RA), real-time radiography (RTR), and visual examination (VE). Radioassay characterization is covered in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled 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 portions of the waste stream to verify consistency with the WSPF.

Personnel use the waste description nomenclature outlined in DOE/LLW-217, *DOE Waste Treatability Group Guidance*. The nomenclature includes three broad waste summary categories of waste:

- homogeneous solids (summary category S3000)
- soil/gravel (summary category S4000)
- debris waste (summary category S5000).

The Waste Summary Category describes the physical form of the waste and is used to determine characterization requirements. Waste Summary Categories are broken out into more specific categories referred to as Waste Matrix Codes.

Table B-1 is a summary of hazardous waste characterization requirements to be determined by the various characterization activities and the techniques to be used.

A-5 AMWTP Organizations and Responsibilities

The AMWTP TRU Waste Program organization, the project level positions, and their primary responsibilities are detailed in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste.*

A-6 Hierarchy of Documents

The program documents used for demonstrating compliance with CBFO requirements are described in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*.

A-7 Indoctrination and Training

The management of each organization is responsible for ensuring personnel assigned meet the training requirements stated in the WIPP-WAP. MP-TRUW-14.20, *AMWTP Training Implementation Matrix,* implements the training plan for AMWTP. MP-RTQP-14.4, *Personnel Qualification and Certification,* specifically addresses the requirements of the WIPP-WAP and this QAPjP for education, experience, training and qualification of AMWTP participants. MP-RTQP-14.4, *Personnel Qualification and Certification,* implements the minimum training and qualification requirements of Table B3-10.

A WIPP-WAP orientation class provides participants with information on scope, purpose and objectives of the program, and reference information on specific quality assurance objectives (QAOs) for their assigned tasks. MP-RTQP-14.4, *Personnel Qualification and Certification,* requires that all assigned personnel complete this indoctrination course.

Training and qualification requirements of AMWTP participants are identified in qualification packages or Individual Training Plans (ITPs). Qualification packages are established for facility personnel involved with mixed waste handling, management, and operations at the AMWTP. A qualification package measures education, training, or experience of an individual against standards or tests that demonstrate an individual is able to perform a function. The method used to qualify an individual is described in MP-RTQP-14.4, *Personnel Qualification and Certification.* An ITP is prepared in accordance with MP-RTQP-14.1, *Preparation and Administration of Individual Training Plans.* At a minimum, the ITP identifies the job/position description, qualifications, and minimum training requirements for achieving and maintaining required qualification and certification for the position. The ITP also serves as a checklist to ensure training record completeness.

MP-RTQP-14.6, *Job and Training Needs Analysis,* requires completion of job analyses for each job position responsible for TRU waste characterization tasks and activities. This position job analysis documents the assessment of the position description and the functions, tasks, and training involved in the job. The position job analysis yields requirements for the education and experience of assigned personnel and training needs assessment, which contains the training and qualification requirements for the position. The job analysis and training needs assessment are periodically reviewed to identify changes in requirements and additional necessary training.

Management evaluates the resumes of assigned personnel, and personnel who change positions or are assigned to short-term or temporary work. Management documents that personnel meet the education and experience requirements in MP-RTQP-14.4, *Personnel Qualification and Certification*, MP-TRUW-8.28, *Project Level Administrative Controls for Analytical Laboratory Department* and MP-ADMIN-1.6, *AMWTP Recruitment, Selection, and Hiring of Personnel*. Completion of the training and qualification requirements, as well as continuing training to ensure that job proficiency is maintained by participants, is reviewed by management and training program personnel to ensure personnel maintain proficiency.

B. WASTE ANALYSIS PLAN

Introduction and Highlights

The AMWTP disposes of TRU waste at the WIPP facility, and has developed this document to comply with the applicable requirements of the WIPP-WAP and the WIPP Waste Acceptance Criteria (WAC). In this document, the term TRU waste includes TRU and TRU-mixed waste.

TRU waste is designated as either CH or RH, based on the radiological dose rate at the surface of the waste container. RH-TRU wastes (i.e., TRU waste with a surface dose rate of 200 millirem per hour or greater) will be segregated from CH-TRU waste and will not be shipped to the WIPP facility for disposal by BNFL Inc. The hazardous components of the TRU waste to be shipped for disposal at the WIPP facility from AMWTP are designated in the *WIPP Hazardous Waste Permit, Attachment O*.

Retrievably stored waste is defined as TRU waste generated before New Mexico Environment Department (NMED) notifies the WIPP facility, by approval of the final audit report, that the characterization requirements of the WIPP-WAP have been implemented appropriately. Newly generated waste is defined as TRU waste that is generated after NMED approves the final audit report for AMWTP. Acceptable knowledge (AK) is assembled for both the retrievably stored and newly generated waste. Retrievably stored TRU waste will be characterized on an ongoing basis, as the waste is retrieved. Newly generated TRU waste is typically characterized as it is generated, although some characterization occurs post-generation. Waste characterization requirements for retrievably stored and newly generated TRU wastes differ, as discussed in Sections B-3d(l) and B-3d(2) of this document.

Characterization requirements for individual containers of TRU waste are specified on a waste stream basis. A waste stream is defined as waste material generated from a single process or from an activity that is similar in material, physical form, and hazardous constituents. 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.

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. Initially the Waste Matrix Code Groups are categorized into the three broad Summary Category Groups that are related to the final physical form of the wastes. Waste characterization requirements for these Summary Category Groups are specified separately in Section B-2 of this document. Each of the three broad groups is described below.

- S3000 - Homogeneous Solids
  Homogeneous solids, or solid process residues, 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 Code of Federal Regulations (CFR) §268.2[g] and [h])). Included in the series of solid process residues 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 solid process residues.

- 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. Soils/gravel are further categorized by the amount of debris included in the matrix.

- 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) 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 percent of any given category 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 B-3d).

All waste characterization activities specified in this QAPjP shall be carried out at the AMWTP and, as applicable, at the WIPP facility in accordance with the WIPP-WAP. CBFO will audit generator/storage site waste characterization programs and activities as described in Section B-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 B-3:

- 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 or to verify Radiography results
- Headspace-gas sampling to determine 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 contaminants of waste in containers
- Compilation of acceptable knowledge documentation into an auditable record.

Once the required waste characterization is complete, the AMWTP completes a WSPF to document the results of their characterization activities (Section B-1d). The WSPF and the Characterization Information Summary for the waste stream resulting from waste characterization activities shall be transmitted to the CBFO, reviewed for completeness, and screened for acceptance prior to loading any TRU mixed waste into the Contact Handled Packaging, as described in Section B-4. Only TRU waste that has been characterized in accordance with this WIPP-WAP and meets the Treatment Storage Disposal Facility (TSDF)-WAC will be accepted at the WIPP facility for disposal.

In the event CBFO requests detailed information on a waste stream, the AMWTP will provide a Waste Stream Characterization Package [Section B3-12b(3)]. For each waste stream, this package will include the WSPF, the Characterization Information Summary, and the complete AK summary. The Waste Stream Characterization Package will also include specific Batch Data Reports and raw analytical data associated with waste container characterization as requested by CBFO.

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

B-1a Waste Stream Identification

TRU 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 B-3b and B4. If AK for retrievably stored waste does not comply with these requirements (e.g., heterogeneous Debris Waste in Summary Category S5000), the waste is reexamined (and characterized) in the same manner as newly generated waste.

All of the waste within a waste stream may not be available for sampling and analysis at one time. In these instances, the waste streams may be divided into waste stream lots, per MP-TRUW-8.11, *Data Reconciliation,* based on staging, transportation or handling issues. Characterization activities are then undertaken on a waste stream lot basis as needed. A WSPF need not be submitted for subsequent waste lots unless warranted by the characterization information.

B-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 waste streams which have U. S. Environmental Protection Agency (EPA) Hazardous Waste Numbers (HWNs) already listed on the *WIPP Hazardous Waste Permit, Attachment O*. Some of the waste may also be identified by unique state hazardous waste codes which are acceptable at the WIPP as long as the TSDF-WAC criteria are met. The AWMTP will perform characterization of all waste streams as required by the WIPP-WAP. If new EPA HWNs are identified during the characterization process, those wastes will not be shipped for disposal to the WIPP facility until the EPA HWN has been added to the permit and WSPF.

B-1c Waste Prohibited at the WIPP Facility

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

- Liquid waste (waste shall contain as little residual liquid as is reasonably achievable by pouring, pumping and/or aspirating, and internal containers shall contain less than 1 inch or 2.5 centimeters of liquid in the bottom of the container). Total residual liquid in any payload container (e.g., 55-gallon drum or standard waste box) may not exceed 1 percent volume of that container. (Refer to MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*). (Payload Containers with U134 waste shall have no detectable liquid)

- Non-radionuclide pyrophoric materials (refer to MP-TRUW-8.1).

- Hazardous wastes not occurring as co-contaminants with TRU waste [non-mixed hazardous waste (refer to MP-TRUW-8.1)].

- Wastes incompatible with backfill, seal and panel closures materials, container and packaging materials, shipping container materials, or other wastes (refer to MP-TRUW-8.1).

- Wastes containing explosives or compressed gases (refer to MP-TRUW-8.1).

- Wastes with PCB concentrations equal to or greater than 50 parts-per-million (ppm) where the resulting concentration (i.e., below 50 ppm) is not the result of dilution, or leaks or spills of PCBs in concentrations over 50 ppm (refer to MP-TRUW-8.1).

- Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity [EPA HWNs D001, D002, or D003 (refer to MP-TRUW-8.1)].

- RH-TRU waste [waste with a surface dose rate of 200 millirem per hour or greater (refer to MP-TRUW-8.1)].

- Any waste container which does not have Volatile Organic Compounds (VOC) concentration values available for the headspace [refer to Section B-3a(1) of this document].

- Any waste container which has not undergone either radiographic examination or VE (refer to Section B-3c and Section Bl-3 of this document).

- Any waste container from a waste stream which has not been preceded by an appropriate, certified WSPF (refer to Section B-ld of this document and MP-TRUW-8.14, *Preparation of the Waste Stream Profile Forms).*

Before shipping a container holding TRU waste to the WIPP facility, the AMWTP examines the RTR or VE data records (refer to Section B-4) to verify that the container holds no unvented compressed gas containers and that residual liquid does not exceed 1 percent volume in any payload container. If discrepancies or inconsistencies are detected during the data form review, the RTR audio/videotape or the VE audio/videotape are reviewed to verify that the observed physical form of the waste is consistent with the waste stream description provided by the generator and to ensure that no prohibited items are present in the waste. (The AMWTP does not have classified waste and will not ship classified waste.) Section B-4 includes a description of the waste verification process that is 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. The compatibility of waste with packaging material, shipping containers, backfill, etc. is assessed by verification of the TRUCON Code (refer to MP-TRUW-8.1).

The WIPP-WAP limits the VOC concentrations in the headspace of waste containers to those which when averaged on a room basis, will ensure compliance with the performance standards. These limits apply at the WIPP facility but do not apply to the AMWTP, and are presented in Table B-2, Maximum Allowable VOC Room-Averaged Headspace Concentration Limits, as maximum allowable VOC room-averaged headspace concentration limits. There are no maximum allowable headspace gas concentration limits for individual containers, as some containers can exceed these values as long as container headspace averages in a disposal room do not. At the AMWTP, a container which has been analyzed and is reported to contain higher VOC concentrations than the averaged limits specified in Table B-2 may be approved for disposal by the WIPP Management & Operations (M&O) Contractor on a case-by-case basis. Approval for containers exceeding the averaged limits will be obtained through the WIPP Waste Information System (WWIS) exception process.

B-1d Control of Waste Acceptance

Every waste stream shipped to WIPP shall be preceded by a WSPF. The required WSPF information and the Characterization Information Summary elements are discussed in section B3-12b(1) and section B3-12b(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 Characterization Information Summary will be transmitted to CBFO for each waste stream. If continued waste characterization reveal discrepancies that identify different hazardous waste codes 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.

As stated in the introduction of this QAPjP, anytime CBFO requests additional information concerning a waste stream, the AMWTP will provide a Waste Characterization Package. The option to request additional information ensures that waste being offered for disposal is adequately characterized and accurately described in the WSPF.

B-1e Waste Generating Processes at the WIPP Facility (termed “derived waste”)

The requirements contained in Attachment B-1e of the WIPP-WAP are specific to the WIPP facility. Therefore these requirements have not been addressed in this document.

B-2 Waste Parameters

The following waste analysis parameters are characterized at the AMWTP:

- Confirmation of physical form and exclusion of prohibited items specified in Section B-1c.

- Toxicity characteristic contaminants listed in 20 NMAC 4.1.200 (incorporating 40 CFR, §261.24), Table 1 (excluding pesticides), as specified in the WIPP Hazardous Waste Permit, Attachment O.

- F-listed and P-listed solvents or waste (F00l, F002, F003, F004, F005, F006, F007, F009, P015) found in 20 NMAC 4.1.200 (incorporating 40 CFR §261.31).

- Hazardous constituents included in 20 NMAC 4.1.200 (incorporating 40 CFR §261) Appendix VIII as specified in Tables B-1, B-3, and B-4 as well as any other hazardous constituent identified through AK.

Tables B-1, B-3, B-4, and B-5 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.

B-3 Characterization Methods

The characterization techniques used by the AMWTP include AK, which incorporates confirmation by HSGS and analysis; radiography; and homogeneous waste sampling and analysis. All confirmation characterization activities are performed in accordance with this QAPjP. Table B-6, Summary of Parameters, Characterization Methods, and Rationale for CH Transuranic Waste, provides a summary of the characterization requirements for TRU waste.

TRU waste is characterized either in lots (Section B-1a) or batches (testing, sampling, analytical or on-line). 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. An analytical batch can be up to 20 samples (excluding laboratory QC samples), all of which shall be received by the laboratory within 14 days of the validated time of sample receipt of the first sample in the batch. For on-line integrated headspace-gas sampling/analytical systems, samples will be collected within a 12-hour period using the same on-line integrated sampling/analytical system. The analytical requirements are specified by the analytical method being used in the on-line system (e.g., FTIRS, GC/MS). Refer to Section B3 for additional clarification regarding the expected contents of Batch Data Reports.

B-3a Sampling and Analytical Methods

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

Headspace-gas samples are used to determine the types and concentrations of VOCs in the void volume of waste containers. VOC constituents are compared to those assigned by AK, and the AMWTP will assign hazardous waste codes, as warranted. This comparison may include as analysis of radiolytically derived VOCs. The AMWTP may also consider radiolysis when assessing the presence of listed waste and whether radiolysis would generate wastes which exhibit the toxicity characteristic. Refer to Section B4 for additional clarification regarding hazardous waste code assignment and headspace gas results.

Every TRU mixed waste container or statistically selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in this section, will be sampled and analyzed to determine the concentrations of VOCs in headspace gases. If composite samples are used, containers used in the composite sample must be from the same waste stream with no more than 20 containers being included in a single composite sample. Sampling protocols, equipment, and QA/QC methods for headspace-gas sampling are provided in Section B1. 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 batch data report 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 QAOs are specified in Section B3.

B-3a(1)(i) Reduced Sampling Requirements for Homogeneous Solid or Soil/Gravel Waste Streams with no VOC-Related Hazardous Waste Codes

Headspace gas sampling of homogeneous solid and soil/gravel wastes that have no VOC-related hazardous waste codes assigned may qualify for reduced headspace sampling if they meet the following criteria:

- The waste stream or waste stream lot must consist of more than 10 containers.
- The waste stream must be a homogeneous solid or soil/gravel waste stream that has no VOC-related hazardous waste codes assigned to it.
- The results of the solid sampling and analysis must confirm that no VOC-related hazardous waste codes should be assigned to the waste stream.

When a waste stream meets these conditions for reduced headspace gas sampling, the AMWTP randomly selects containers for headspace gas sampling and analysis using the statistical approach in Section B2-2b.

B-3a(1)(ii) Reduced Sampling Requirements for Thermally Treated Waste Streams

Headspace gas sampling of homogeneous solid and soil/gravel wastes that have undergone high-temperature thermal processes may qualify for reduced headspace sampling if they meet the following criteria:

- The waste stream or waste stream lot must consist of more than 10 containers
- The waste stream must have either been generated using a high-temperature thermal process or been subjected to a high-temperature thermal process after generation that results in the reduction of matrix-related VOCs in the headspace to concentrations below the Program Required Quantitation Limits (PRQLs) in Table B3-2.
- The site must have documentation demonstrating that high-temperature thermal processes were used.

If a waste stream meets these conditions for reduced headspace gas sampling, the AMWTP may choose to randomly select containers for headspace gas sampling and analysis using the statistical approach in Section B2-2b.

B-3a(2) Homogeneous Waste Sampling and Analysis

Sampling of homogeneous and soil/gravel wastes results in the collection of a sample that is used to confirm hazardous waste code assignment by AK. Sampling is accomplished through core or other EPA approved sampling, which is described in Section B1. 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 selected randomly from the population of containers for the waste stream. The random selection methodology is specified in Section B2.

As appropriate, Totals or Toxicity Characteristic Leaching Procedure (TCLP) analyses for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PCBs and RCRA-regulated metals (refer to Table B-4 and Table B-5) are used to determine waste parameters in soils/gravels and solids that may be important to the performance within the disposal system. To determine if a waste exhibits a toxicity characteristic 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 toxicity characteristic. The mean concentration of toxicity characteristic 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), expressed as total/TCLP values, to determine if the waste stream exhibits a toxicity characteristic. 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 B2. If toxicity characteristic (TC) wastes are identified, these will be compared to those determined by AK and TC waste codes will be revised, as warranted. Refer to Section B4 for additional clarification regarding hazardous waste code assignment and homogeneous solid and soil/gravel analytical results.

B-3a(3) Laboratory Qualification

The AMWTP conducts analyses using laboratories that are qualified through participation in the Performance Demonstration Program (PDP). Required QAOs are specified in Section B3.

Analytical methods used by the laboratories: 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 B3 of this document.

B-3b Acceptable Knowledge

AK is used in TRU waste characterization activities in three ways:

- To delineate TRU waste streams.
- To assess whether TRU heterogeneous debris wastes exhibit a toxicity characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261.24).
- To assess whether TRU wastes are listed (20 NMAC 4.1.200, incorporating 40 CFR §261.31).

AK is discussed in detail in Section B4, which outlines the minimum set of requirements that are met by the AMWTP in order to use AK. In addition, Section B-4b(1) of this QAPjP describes the verification of AK through sampling and analysis.

B-3c Radiography and Visual Examination

Radiography is a nondestructive qualitative and quantitative technique that involves X-ray scanning of waste containers to identify and verify waste container contents. VE consists of opening a container and physically examining its contents.

Radiography and/or VE are used to examine every waste container to verify its physical form. These techniques can detect liquid wastes and containerized gases, which are prohibited for WIPP disposal. The prohibition of liquids and containerized gases prevents the shipment of corrosive, ignitable, or reactive wastes.

Radiography and/or VE are also used to confirm 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 hazardous waste codes associated with that new waste stream assignment. That is, if radiography 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 and the inconsistency is resolved as specified in Section B4 of this document. The proper waste stream assignment is determined (including preparation of a new WSPF when necessary), the correct hazardous waste codes are assigned, and the resolution is documented. Refer to Section B4 for a discussion of AK and its confirmation process.

At the AMWTP, there are three specific reasons for utilizing VE as follows:

- VE performed to confirm radiography: VE that is performed as a confirmation of radiography data requires audio/videotaping. This VE is performed on a statistically selected subpopulation of waste containers that have already undergone radiography (refer to Section B2-1 for a discussion of the statistical selection of these waste containers and Section B1 for radiographic examination protocols).

- VE performed in lieu of radiography: VE that is performed in lieu of radiography (e.g., used for waste containers with lead liners) requires audio/videotaping. It is anticipated that some of the drums excavated from the TSA-RE will contain lead-liners. Lead-lined drums will be managed on a case-by-case basis, and, if appropriate, some of these drums may be segregated as RH-TRU waste.

- VE performed as a visual verification of AK: VE that is performed for newly generated waste or when repackaging retrievably stored waste does not require audio/videotaping. This activity requires two operators. The first operator sorts the contents of the incoming drums into new drums, and the second operator visually verifies the waste being packaged into the new drums [refer to Section B3-d(l)].

If AMWTP chooses to use VE in lieu of radiography, the detection, through shaking, of any liquid waste in non-transparent inner containers is handled by assuming that the container is filled with liquid and adding this volume to the total liquid in the payload container [e.g., 55-gallon drum or Standard Waste Box (SWB)].

The payload container would then be rejected and/or repackaged to exclude the container if it is over the TSDF-WAC limits.

When radiography is used, or visual examination of transparent containers is performed, if any liquid in inner containers is detected, the volume of liquid is added to the total for the payload container. Radiography, or the equivalent, is used on the existing/stored waste containers to verify that the physical characteristics of the TRU waste correspond with its waste stream identification/waste stream Waste Matrix Code, and to identify prohibited items. The results of radiography are verified through visual examination of a statistically selected subpopulation of TRU waste containers in each TRU waste summary category group as specified in Section B2. Radiographic examination protocols and QA/QC methods are provided in Section B1.

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

The AMWTP uses AK to delineate all TRU waste containers into waste streams for the purposes of grouping waste for further characterization. The analyses performed does not differ based on the waste stream, only on 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 B-3b discusses the use of AK, sampling, and analysis in more detail. AK is discussed more completely in Section B4. Every waste stream will be assigned hazardous waste codes based upon AK, and these hazardous waste codes are confirmed using headspace gas (all Summary Category Groups) and solid sampling and analysis (Summary Category Groups S3000 and S4000 only).

Radiography and/or VE are used to verify the physical form of retrievably stored TRU waste. For newly generated waste or repackaged retrievably stored waste, physical form and prohibited items are either verified during packaging (using the VE technique) or will be verified after packaging using radiography (or VE in lieu of radiography). Generator /storage sites may use either the VE technique or radiography separately or together, as long as 100% of the containers undergo confirmation of AK. Radiography and/or VE are also used in conjunction with AK to characterize heterogeneous debris wastes. Radiography and/or VE, and the associated information compiled from AK (e.g., age of the waste, generating process) are used to determine the RCRA-regulated constituents present in the waste. VE, the VE technique, and/or radiography shall be performed prior to any treatment designed to supercompact waste prior to shipment. It should be noted that no supercompacted waste will be shipped to the WIPP facility until approval for emplacement of supercompacted waste is received from the U.S. Environmental Protection Agency.

All waste containers (retrievably stored and newly generated) or randomly selected containers from waste streams that meet the condition for reduced headspace gas sampling listed in Section B-3a(1) are sampled and analyzed for VOCs in the headspace gas. A statistically selected portion of each homogeneous solids and soil/gravel waste stream is sampled and analyzed for RCRA regulated total VOCs, SVOCs, and Metals (see Section B2). Sampling and analysis methods used for waste characterization are discussed in Section B-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 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 toxicity characteristic parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these codes is not based on source. However, for toxicity characteristic and non-toxic F003 constituents, the AMWTP may take concentration into account when assessing whether to add a hazardous waste code. TICs reported from the Totals or Toxicity Characterization Leaching Procedure (TCLP) 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. Refer to Section B3 for additional information on TIC identification.

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 hazardous waste codes, if appropriate). For toxicity characteristic compounds and non-toxic F003 constituents, the AMWTP may consider waste concentration when determing whether to change a hazardous waste code. Refer to Section B3 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 data collection design for each type of waste is described in the following sections. Table B-1 provides a summary of hazardous waste characterization requirements for all TRU waste by waste characterization parameters.

Table B-6 summarizes the parameters, methods, and rationales for stored and newly generated CH-TRU wastes according to their waste forms.

It is acceptable to ship TRU waste which has been repackaged or treated to the WIPP facility. Repackaged or treated waste undergoes characterization required of newly generated waste except that solids sampling for repackaged or treated S3000 waste may be characterized as retrievable stored waste if the AMWTPdemonstrates that control charting cannot be applied effectively to the repackaging or treatment process. Repackaged waste also undergoes headspace gas analysis, and payload container headspace is sampled after repackaging, as long as the criteria specified in Section B1-1 are met. Treated waste shall retain e original waste stream's listed hazardous waste code designation.

B-3d(1)Newly Generated Waste

The RCRA-regulated constituents in newly generated wastes are documented at the time of generation based on AK for the waste stream. Newly generated TRU waste characterization begins with the verification that the processes generating the waste have operated within established written procedures. Waste containers are then delineated into waste streams using AK. Verification that the physical form of the waste (Summary Category Group) corresponds to the physical form of the assigned waste stream is accomplished either during packaging (using the VE technique) or by performing radiography as specified in Attachment B1-3 for retrievable stored waste. AMWTP may use either the VE technique or radiography, separately or together, as long as 100% of the containers undergo confirmation of AK. If the VE technique is used, it is different than the VE process described in Section B1-3b(3) and consists of the operator confirming that the waste is assigned to a waste stream that has the correct Summary Category Group for the waste being packaged. If a confirmation cannot be made, a NCR is completed and corrective actions are taken as specified in Section B3**.** The packaging configuration, type and number of filters, and rigid liner vent hole presence and diameter necessary to determine the appropriate drum age criteria (DAC) in accordance with Permit Attachment B1, Section B1-1, shall be documented as part of the characterization information collected during the packaging of newly generated waste or repackaging of retrievably stored waste.

Instead of using a video/audio tape as required with VE in support of radiography in Section B1-3b(3), the VE technique for newly generated waste (or repackaged retrievably stored waste) uses a second operator, who is equally trained to the requirements specified in Section B1, to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. If the second operator cannot provide concurrence, corrective actions are taken as specified in Section B3. The subsequent waste characterization activities depend on the assigned Summary Category Group, since waste within the Homogeneous Solids and Soils/Gravel Summary Category Groups is characterized using different techniques than the waste in the Debris Waste Summary Category Group. If retrievably stored waste is characterized in the same manner as newly generated waste due to unacceptable AK (see Section B-1a), the option to perform radiography in lieu of or in combination with the VE technique does not apply.

Containers of newly generated waste undergo headspace gas analysis for VOC concentrations prior to shipment in accordance with the requirements of B-3a(1). All containers of newly generated waste or newly generated waste containers randomly selected from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) will undergo headspace gas analysis for VOC prior to shipment. The headspace gas sampling method is provided in Section B1. Headspace gas data is used to confirm AK waste characterization as specified in Section B4.

B-3d(1)(a) Sampling of Newly Generated Homogeneous Solids

Newly generated mixed waste streams of homogeneous solids are randomly sampled a minimum of once per year for total VOCs, SVOCs, PCBs and metals. An initial ten-sample set, however, is collected to develop the baseline control chart. Sampling frequency of once per year is only allowed if a process has operated within procedurally established bounds without any process changes or fluctuations which would result in either a new waste stream or the identification of a new hazardous waste constituent in that waste stream. Otherwise, the waste is considered as process batches and each batch undergoes sampling and analysis.

Process changes and process fluctuations are determined using statistical process control charting techniques; these techniques require the ten-sample set and historical data for determining limits for indicator species and subsequent periodic sampling to assess process behavior relative to historical limits.

If the limits are exceeded, the waste stream is recharacterized, and the characterization is performed according to procedures required for retrievably stored waste (i.e., waste sampling frequency will be increased). The process for control charting technique is described in Section B2-4.

Also, as another control of waste generated from a particular process, the bounds for a waste generating process are established by specific written procedures for that process. Examples of parameter bounds that could affect a waste generated by a process are volumes of input material, change in the input material, and any other changes that would change the output of that process.

The AMWTP procedures used to control waste generating processes contain the following information:

- Responsible organizations for implementing the requirements of the procedure
- Material inputs
- Waste streams generated
- Process controls and range of operation (bounds) that affect final hazardous waste determinations
- Rate and quantity of hazardous waste generated
- List of applicable operating procedures relevant to the hazardous waste determination

Events where procedurally established bounds are exceeded or any condition of normal operation is not being met could trigger an increased sampling frequency of a waste stream. As long as a process does not change outside of established bounds within a year, the waste generated by that process has the same characteristics, and therefore, a minimum of one sample is collected annually to verify the lack of variability of that waste stream.

The records generated by the process procedures will be examined weekly for indications of process changes or limits being exceeded that would change the hazardous constituents identified in the waste stream or add relevant prohibited materials. If these changes are discovered, the AMWTP will notify CBFO, and will not ship this waste to the WIPP for disposal until a follow-up sample of process waste is collected and analyzed to assess whether the container contents are within those identified on the WSPF. If the second analysis is not consistent with the WSPF information, all waste containers in question will be segregated and a new WSPF and waste generation procedures/bounds will be established. Records of the analysis will be available for examination by CBFO.

If the AMWTP changes a process, but determines that increased sampling is not required because the change will not affect waste generated by that process, the AMWTP notifies the CBFO in the form of a memorandum to the CBFO Waste Characterization Manager. The CBFO will concur with the decision to not increase the sampling frequency before any additional waste from that process is shipped.

The toxicity characteristics of newly generated homogeneous solids and soils/gravel waste streams are determined using total analysis of toxicity characteristic contaminants or TCLP. To determine if a waste exhibits a toxicity characteristic for compounds specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. The sampling methods for homogeneous solids and soil/gravel wastes are provided in Section B1.

B-3d(1)(b) Sampling of Newly Generated Soils/Gravels

Newly generated soils/gravel waste is generated primarily by remediation or decontamination and decommissioning (D&D) activities. Process controls for these types of waste cannot readily be defined and, therefore, sampling cannot follow that used for newly generated homogeneous waste. The number of newly generated soils/gravel waste containers to be sampled is determined using the procedure specified in Section B-3a(2), wherein a statistically selected portion of the waste is sampled. The AMWTP estimates the number of containers to be sampled within the waste stream based on the expected volume of the waste stream and whether SWB or 55-gallon drum containers will be used. Refer to Section B2 for additional information.

B-3d(2) Retrievably Stored Waste

All retrievably stored waste containers are first delineated into waste streams using AK. All retrievably stored waste containers are examined using radiography to confirm the physical waste form (Summary Category Group), to verify the absence of prohibited items, and to determine the waste characterization techniques to be used based on the Summary Category Groups (i.e., S3000, S4000, S5000). Repackaged retrievably stored waste, or any retrievably stored waste with inadequate AK, is characterized using either the retrievably stored or newly generated waste characterization process, whichever results in greater sampling requirements, Repackaged retrievably stored waste, or any retrievably stored waste with inadequate acceptable knowledge, will be characterized using either the retrievably stored or newly generated waste characterization process, whichever results in greater sampling requirements, unless it is demonstrated that control charting cannot be applied effectively. Solids sampling for repackaged or treated S3000 waste may be characterized as retrievably stored waste if the AMWTP demonstrate that control charting cannot be applied effectively to the repackaging or treatment process. This determination by the must be documented on the Characterization Information Summary and will be examined by the Permittees during audits (Permit Attachment B6). In this case, the minimum number of solid samples required for any S3000 waste stream or waste stream lot is the number of samples determined in accordance with Section B2-2a.

Radiographic results are compared to AK results to ensure correct Waste Matrix Code assignment and identification of prohibited items. If radiographic analysis does not confirm the physical waste form, waste is reassigned as specified in Section B-3c. The AMWTP may elect to substitute VE for radiographic analysis.

To confirm the results of radiography, a statistically selected number of the TRU waste container population undergoes VE by opening containers to inspect waste contents to verify radiography results. Section B2 contains the approach used to statistically select the number of drums to undergo VE. For homogeneous waste and soils/gravels selected for sampling, the containers opened for sampling may be used to help fulfill the VE requirements.

All retrievably stored containers or retrievably stored containers randomly selected from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) undergo headspace gas analysis for VOC concentrations. Retrievably stored waste that is repackaged will be subject to the DAC determination specified in Section B-3d(1). The headspace gas sampling method is provided in Section B1-1. All headspace gas data is used to confirm AK waste characterization, as specified in Section B4.

A statistically selected portion of retrievably stored homogeneous solids and soil/gravel wastes are sampled and analyzed for Total or VOCs, SVOCs, and Metals. The approach used to statistically select drums for homogeneous solids and soil/gravel wastes is different than the method used to select waste containers for VE. This method is included in Section B2-2. The sampling methods for these wastes are provided in Section B1.

The toxicity characteristic of retrievably stored homogeneous solids and soil/gravel wastes is determined using total analysis of toxicity characteristic parameters or TCLP. To determine if a waste exhibits a toxicity characteristic 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 VE 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 true 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 which address random selection is MP-TRUW-8.19, *RTR/VE Drum Selection* and MP-TRUW-8.25, *RCRA Statistical Sampling.*

B-4 Data Verification and Quality Assurance

Data validation, usability and reporting controls are used to ensure that the TRU 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 process and requirements at each level are described in
Section B3-10.

B-4a Data Generator and Site Project Level Requirements

B-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 with regard to regulatory compliance. To satisfy the RCRA regulatory compliance requirements, the following DQOs are established in the WIPP-WAP:

- Headspace Gas Sampling and Analysis
  - To identify VOCs and quantify the concentrations of VOC constituents in the total waste inventory to ensure compliance with the environmental performance standards of 20 NMAC 4.1.500 [incorporating 40 CFR, §264.601(c)], and to confirm hazardous waste identification by AK.
- 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 toxicity characteristic levels in 20 NMAC 4.1.200 (incorporating 40 CFR §261), to determine if the waste is hazardous, and to confirm hazardous waste identification by AK.
  - To report the average concentration of hazardous constituents in a waste stream, as specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261) Appendix VIII, with a 90 percent confidence interval, with all averages greater than Program Required Quantitation Limit (PRQL) considered a detection and subsequent assignment of the waste (if an adequate explanation for the constituent cannot be determined) as a hazardous waste, and to confirm hazardous waste identification by AK.
- Radiography
  - To verify the TRU waste streams by Waste Matrix Code for purposes of physical waste form identification and determination of sampling and analytical requirements, to identify prohibited items, and to confirm the waste stream delineation by AK.
- Visual Examination
  - To verify the TRU waste streams by Waste Matrix Code for purposes of physical waste form identification, determination of sampling and analytical requirements, and to identify prohibited items.
  - To provide a process check on a sample basis by verifying the information determined by radiography and to confirm the waste stream delineation by AK.

Reconciliation of these DQOs by the SPM is addressed in Section B3. 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*).

B-4a(2) Quality Assurance Objectives

The AMWTP demonstrates compliance with each QAO associated with the various characterization methods as presented in Section B3. The SPM performs a reconciliation at the Project Level of the data sets submitted by the various AMWTP organizations with the DQOs established in the WIPP-WAP. The SPM concludes 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 Section B3). 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.

A more detailed discussion of the QAOs, including mathematical representation, where appropriate, can be found in Section B3, which describes the QAOs associated with each method of sampling and analysis.

B-4a(3) Sample Control

The AMWTP has 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 the referenced procedures document the AMWTP sampling handling and control program. COC forms to control the sample from the point of origin to the final analysis result reporting are included in this QAPjP and INST-OI-16, *Drum Coring Operations*. Details of the AMWTP sample control program are provided in Section B1 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.

B-4a(4) Data Generation

Batch Data Reports, in a format approved by the CBFO, will be used by the AMWTP to report waste characterization data. The AMWTP utilizes formats for waste characterization batch data reports that include all of the elements required by the WIPP-WAP (refer to Section B3). These formats are defined in this QAPjP and detailed in referenced procedures. The required formats for the various batch data reports are specified and will include all of the elements required by the WIPP-WAP.

The CBFO requires all analytical laboratories analyzing WIPP waste characterization samples to have established, documented QA/QC programs. In addition, the AMWTP will conduct audits on laboratories analyzing waste. The laboratory's QA/QC program includes the following:

- Facility organization

- A list of equipment/instrumentation

- Operating procedures

- Laboratory QA/QC procedures

- Quality assurance review

- Laboratory records management

B-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. Section B3 discusses the data validation process in more detail. NMED may request, through the CBFO, copies of any Batch Data Report, and/or the raw data validated by the generator/storage sites, to check the CBFO' audit of the validation process.

B-4a(6) Data Transmittal

Batch Data Reports include information required by Section B3-10 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 WIPP Waste Information System (WWIS). Data is entered into the WWIS in the exact format required by the database (refer to Section B-4b for WWIS reporting requirements and the *WIPP Waste Information System User's Manual for use by Shippers/Generators for the WWIS data fields and format requirements*).

Once a waste stream is fully characterized, the SPM also submits to the WIPP facility a WSPF accompanied by the Characterization Information Summary for the waste stream which includes reconciliation with DQOs [refer to Section B3-12b(1)]. The WSPF, the Characterization Information Summary, and information from the WWIS is used as the basis for acceptance of waste characterization information on TRU mixed waste disposed at WIPP.

B-4a(7) Records Management

Contract laboratories forward testing, sampling, and analytical QA documentation along with batch data reports, to the AMWTP Records Storage Facility. Raw data obtained by testing, sampling, and analyzing TRU waste in support of this document is identifiable, legible, and provides documentary evidence of quality. Refer to MP-DOCS-18.2, *AMWTP Records Management* and MP-TRUW-8.28 Project Administrative Controls for the Analytical Laboratories Department for a detailed description of records management procedures.

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, will be 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 in the AMWTP Records Storage Facility for TRU 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. These records will then be offered to the WIPP facility for permanent archival of information of the records in the appropriate form, or transferred to the appropriate Federal Records Center (FRC). Waste characterization records designated as NonPermanent Records are maintained for ten years from the date of (record) generation and then dispositioned according to the requirements defined in MP-DOCS-18.2, *AMWTP Records Management*. If the AMWTP ceases to operate, all records will be transferred before closeout. Table B-7 provides a listing of records designated as Lifetime Records and Non-Permanent Records. Nothing in this QAPjP is intended to nor should it be interpreted to require the disclosure of any U.S. Department of Energy classified information to persons without appropriate clearance to view such information.

B-4b Waste Stream Screening and Verification of TRU Waste

After the AMWTP had prepared this QAPjP, it was submitted to CBFO for approval. After approval, the QAPjP was implemented and the program subjected to audit by CBFO prior to shipment of waste. 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.

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. If the waste characterization does not meet the applicable requirements of the QAPjP, the waste stream cannot be shipped until those requirements are met. The SPM will then complete a WSPF (Figure B-1) and submit it to CBFO, along with the accompanying Characterization Information Summary for that waste stream. 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. If the waste characterization does not meet the applicable requirements of the WIPP-WAP, the mixed waste stream cannot be managed, stored, or disposed of at WIPP until those requirements are met. If the 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 Characterization Information Summary will be provided to NMED. If the data comparison indicates the 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 B-4b(1)(ii) of the WIPP-WAP.

For subsequent shipments, the AMWTP will also transmit the data on a container basis via the WWIS prior to shipment of that container. 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. WWIS will conduct internal limit checks based on the approved WSPF. The WWIS automatically will notify 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 will correct the discrepancy with the waste or the waste data and re-transmit the corrected data prior to acceptance of the data by the WWIS. The CBFO will compare ongoing sampling/analysis characterization data obtained and submitted via the 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.

AMWTP will only have access to the data transmitted by AMWTP, and only until the data have been formally accepted by CBFO. After the data have been accepted, the data can only be changed by a WWIS Data Administrator.

If discrepancies arise as a result of the CBFO review of the WSPF or any other data, the AMWTP will be contacted by CBFO and required to provide the necessary additional information to resolve the discrepancy and resubmit the data before that waste stream or container is approved for disposal at the WIPP facility. NCRs will be issued as appropriate to identify, document, and report the discrepancy.

The Characterization Information Summary will indicate that the waste has been checked for the characteristics of ignitability, corrosivity, and reactivity.

At the AMWTP, the Hazardous Waste Manifest Information will include at a minimum:

- Generator/storage site name and EPA Idaho (ID)
- Generator/storage site contact name and phone number
- Quantity of waste
- List of the hazardous waste codes in the shipment
- List of all container IDs
- Signature of authorized generator representative.

Discrepancies may be identified during manifest examination and container bar-code 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.

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 Notice(LDR)]. The Notice will be prepared per the requirements of 20 NMAC 4.1.800 [incorporating 40 CFR 268.7(a)(4)]. At the AMWTP, the LDR Notice Information includes:

- EPA Hazardous Waste Number(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.

Table B-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) And VE (to Confirm RTR), or VE in lieu of RTR	**RTR/Visual Examination** (refer to Section B1-3 and Section B3-4) Retrievably Stored Waste INST-OI-12, Real Time Radiography Operations INST-OI-16, *Drum Coring Operations (VE section)*	**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 Verification of Acceptable Knowledge	Newly Generated Waste INST-OI-16, *Drum Coring Operations (VE section)* INST-OI-34, VE Operating Procedures & Data Reporting	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 Verification of Acceptable Knowledge	Repackaging of Retrievably Stored Waste INST-OI-16, *Drum Coring Operations (VE section)* INST-OI-34, VE Operating Procedures & Data Reporting	Repackaging of Retrievably Stored Waste MP-TRUW-8.8, Level I Data Validation MP-TRUW-8.9, Level II Data Validation
Summary Category Names S5000 Debris Waste	Retrievably Stored Waste Radiography (RTR) And VE (to Confirm RTR), or VE in lieu of RTR	Retrievably Stored Waste INST-OI-12, Real Time Radiography Operations INST-OI-34, VE Operating Procedures & Data Reporting	Retrievably Stored Waste MP-TRUW-8.8, Level I Data Validation MP-TRUW-8.9, Level II Data Validation
	Newly Generated Waste Visual Verification of Acceptable Knowledge	Newly Generated Waste INST-OI-34, VE Operating Procedures & Data Reporting	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 Verification of Acceptable Knowledge	Repackaging of Retrievably Stored Waste INST-OI-34, VE Operating Procedures & Data Reporting	Repackaging of Retrievably Stored Waste MP-TRUW-8.8, Level I Data Validation MP-TRUW-8.9, Level II Data Validation

Table B-1, Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste [a] (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Headspace Gas Sampling/Analysis **Gas Volatile Organic Compounds** Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform Cyclohexane [d] 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene (cis)-1,2-Dichloroethylene (trans)-1,2-Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[e] Hydrazine[f] 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 [d] 1,3,5-Trimethylbenzene [d] Xylenes Alcohols and Ketones Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	**Gas Analysis** Gas Chromatography/Mass Spectroscopy (GC/MS), EPA TO-14 or modified SW-846 8240/8260 GC/Flame Ionization Detector (FID), for alcohols and ketones, SW-846 8015	**Analysis** (refer to Section B1-1 and Section B3-5) INST-OI-13, Drum Vent/Headspace Gas Sample Operations	**Analysis** MP-TRUW-8.8, Level I Data Validation MP-TRUW-8.9, Level II Data Validation
Total Volatile Organic Compounds Acetone Benzene Bromoform Butanol Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroform 1,4-Dichlorobenzene [b] 1,2-Dichlorobenzene [b] 1,2-Dichloroethane 1,1-Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[e] Hydrazine[f] Isobutanol Methanol Methyl ethyl ketone Methylene chloride Pyridine[b] 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene trans-1,2-Dichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Trichlorofluoromethane 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethylene Vinyl chloride Xylenes	**Total Volatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8260 or 8240 GC/FID, SW-846 8015 Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Analysis** (refer to Section B3-6) ACMM-9260, *Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GS/MS)* ACMM-9441, *Determination of Nonhalongenated Volatile Organics by Gas Chromatography*	**Analysis** MCP-2008, *Analytical Data Recording, Review & Reporting* PLN-342, *Analytical Laboratories Department Quality Assurance Plan for the AMWTP* MP-TRUW-8.9, Level II Data Validation
Total Semivolatile Organic Compounds Cresols 1,4-Dichlorobenzene [c] 1,2-Dichlorobenzene [c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Polychlorinated biphenyls (i.e., Arochlors: 1016, 1221, 1232, 1242, 1248, 1254, 1260) Pentachlorophenol Pyridine [c]	**Total Semivolatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8250 or 8270 GC/ECD for PCBs , SW-846 8082 Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Analysis** (refer to Section B3-7) ACMM-9500, *Sample Preparation for Semi-volatile Compounds and Polychlorinated Biphenyls* ACMM-9270, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry* ACMM-9080, *Determination Polychlorinated Biphenyls (PCBs) by Gas Chromatography*	**Analysis** MCP-2008, *Analytical Data Recording, Review & Reporting* PLN-342, *Analytical Laboratories Department Quality Assurance Plan for the AMWTP* MP-TRUW-8.9, Level II Data Validation

Table B-1, Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste [a] (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Total or TCLP Metals Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc	**Total or TCLP 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)	**Analysis** (refer to Section B3-8) ACMM-8909, *Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel* ACMM-2901, *Determination of Metals by ICP-AES for TRU Waste Characterization* ACMM-2810, *Determination of Mercury by CVAA for TRU Waste Characterization*	**Analysis** MCP-2008, *Analytical Data Recording, Review & Reporting* PLN-342, *Analytical Laboratories Department Quality Assurance Plan for the AMWTP* MP-TRUW-8.9, Level II Data Validation
Homogeneous Solids and Soil/Gravel Sampling	**Homogeneous Solids and Soil/Gravel Sampling** EPA SW-846	**Sampling** (refer to Section B1-2 and Section B3-3) INST-0I-16, *Drum Coring*	**Sampling** MP-TRUW-8.8, Level I Data Validation MP-TRUW-8.9, Level II Data Validation
Nondestructive Assay (NDA)	**NDA** Refer to MP-TRUW-18.1, *AMWTP Certification of INEEL Contact-Handled Transuranic Waste*	**NDA** INST-OI-14, *Drum Assay Operations*	**NDA** MP-TRUW-8.8, Level I Data Validation MP-TRUW-8.9, Level II Data Validation

[a] Permit Attachment B
[b] Can also be analyzed as a semi-volatile organic compound.
[c] Can also be analyzed as a volatile organic compound.
[d] These three compounds are not included in the WIPP-WAP, but are included in the list of Flammable Volatile Organic Compounds specified in the TRUPACT-II SAR.
[e] Only required for homogeneous solids and soil/gravel from Los Alamos National Laboratory and Savanna River Site.
[f] Only required for homogeneous solids and soil/gravel from Oak Ridge National Laboratory and Savanna River Site.

Table B-2. Maximum allowable VOC room-averaged headspace concentration limits parts-per-million by volume (ppmv).

Compound	VOC Headspace Concentration Limits (ppmv) [a,b,c]
Carbon Tetrachloride	9625
Chlorobenzene	13000
Chloroform	9930
1,1-Dichloroethene	5490
1,2-Dichloroethane	2400
Methylene Chloride	100000
1,1,2,2-Tetrachloroethane	2960
Toluene	11000
1,1,1-Trichloroethane	33700

a. No headspace limits for other VOCs exist and no headspace limits for individual containers exist.

b. The limits identified in this table are specific to WIPP disposal operations. The limits identified in this table are not applicable to the storage of containers at the Site.

c. At the AMWTP, if an individual container has been analyzed and reported to contain VOC concentrations higher than specified in this table, the container may be approved for disposal by WIPP M&O Contractor on a case-by-case basis. Approval for containers exceeding the average limits will be obtained through the WWIS exception process.

Table B-3, Headspace Gas: Target Analyte List and Methods

PARAMETER	EPA SPECIFIED ANALYTICAL METHOD
Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform Cyclohexane [d] 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene (cis)-1,2-Dichloroethylene (trans)-1, 2- Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[b] Hydrazine [c] 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 [d] 1,3,5-Trimethylbenzene [d] Xylenes	EPA: Modified TO-14[a]; Modified 8240/8260 EPA - Approved FTIRS
Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	EPA: Modified TO-14[a]; Modified 8240/8260 Method 8015 EPA - Approved FTIRS

[a] U.S. Environmental Protection Agency (EPA), "Compendium Method TO-14, the Determination of Volatile Organic Compounds (VOC) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis," in Compendium of Methods for the Determination of Toxic Organic Compounds on Ambient Air. Research Triangle Park, North Carolina, Quality Assurance Division, Monitoring System Laboratory, U.S. EPA. The most current revision of the specified methods may be used.

[b] Required only for containers of homogeneous solids and soil/gravel waste from Los Alamos National Laboratory and Savannah River Site.

[c] Required only for containers of homogeneous solids and soil/gravel waste from Oak Ridge National Laboratory and the Savannah River Site.

[d] These three compounds are not included in the WIPP-WAP, but are included in the list of Flammable Volatile Organic Compounds specified in the TRUPACT-II SAR.

Table B-4, Required Organic Analyses and Test Methods Organized by Organic Analytical Groups

ORGANIC ANALYTICAL GROUP	REQUIRED ORGANIC ANALYSES	EPA SPECIFIED ANALYTICAL METHOD [a, e]
Nonhalogenated Volatile Organic Compounds (VOCs)	Acetone Benzene n-Butanol Carbon disulfide Ethyl benzene Ethyl ether Formaldehyde Hydrazine[b] Isobutanol Methanol Methyl ethyl ketone Toluene Xylenes	8015 8240 8260
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 8240 8260
Semivolatile Organic Compounds (SVOCs)	Cresols (o, m, p) 1,2-Dichlorobenzene[c] 1,4-Dichlorobenzene[c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Polychlorinated biphenyls (PCB)[d] Pentachlorophenol Pyridine[c]	8250 8270 8082 (for PCBs only)

[a] U.S. Environmental Protection Agency (EPA), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition.

[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 Methods 8240 and 8260.

[d] Transformer oils containing PCBs have been identified in a limited number of waste streams included in the organic sludges Waste Matrix Code. Therefore, only waste streams included in the solidified organics final waste form or which AK indicates may contain PCBs shall be analyzed for PCBs.

[e] 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 toxicity characteristic.

Table B-5, Summary of Sample Preparation and Analytical Methods for Metals

PARAMETERS	EPA SPECIFIED ANALYTICAL METHODS [a, b]
Sample Preparation	3051, or equivalent, as appropriate for analytical method
Total Antimony	6010, 6020, 7040, 7041, 7062
Total Arsenic	6010, 6020, 7060, 7061, 7062
Total Barium	6010, 6020, 7080, 7081
Total Beryllium	6010, 6020, 7090, 7091
Total Cadmium	6010, 6020, 7130, 7131
Total Chromium	6010, 6020, 7190, 7191
Total Lead	6010, 6020, 7420, 7421
Total Mercury	7471
Total Nickel	6010, 6020, 7520, 7521
Total Selenium	6010, 7740, 7741, 7742
Total Silver	6010, 6020, 7760, 7761
Total Thallium	6010, 6020, 7840, 7841
Total Vanadium	6010, 7910, 7911
Total Zinc	6010, 6020, 7950, 7951

[a] U.S. Environmental Protection Agency (EPA), 1996. "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.

[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 toxicity characteristic.

Table B-6, Summary of Parameters, Characterization Methods, and Rationale for CH Transuranic Waste
(For Both Retrievably 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	**Retrievably Stored** 100% radiography or visual examination **Newly Generated** Documentation and visual verification [c] or radiography. Applies to 100% of containers.	• Verify waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no free liquids, no incompatible wastes, no compressed gases)
		Headspace gases • Gas volatile organic compounds (VOCs)	100% gas sampling and analysis or statistical sampling [a, b] (see Table B-3)	• Quantify concentration of flammable VOCs • Determine potential flammability of transuranic (TRU) mixed waste headspace gases • Quantify concentrations of VOC constituents in headspace of containers • Ensure that environmental performance standards are not exceeded
		Hazardous constituents • TCLP or total metals • TCLP or total VOCs • TCLP or total semi-VOCs	Statistical sampling [b]	• Determine characteristic metals and organics • Determine total quantity of metals, VOCs, and semi-VOCs
S5000–Debris Waste	• Uncategorized metal (metal waste other than lead/cadmium) • Lead/cadmium waste • Inorganic nonmetal waste • Combustible waste • Graphite waste • Heterogeneous waste • Composite filter waste	Physical waste form	**Retrievably Stored** 100% Radiography Visual examination (statistical sample) [b] or visual examination **Newly Generated** Documentation and visual verification [c] or radiography. Applies to 100% of containers.	• Verify waste matrix • Demonstrate compliance with waste acceptance (e.g., no free liquids, no incompatible wastes, no compressed gases)
		Headspace gases • Gas VOCs	100% gas sampling and analysis	• Quantify concentration of flammable VOCs • Determine potential flammability of TRU waste headspace gases • Quantify concentrations of VOC constituents in headspace of containers • Ensure that environmental performance standards are not exceeded • Verify AK
		Hazardous constituents • TCLP or total metals • TCLP or total VOCs • TCLP or total semi-VOCs	Acceptable knowledge	• Determine characteristic metals and organics • Determine total quantity of metals, VOCs, and semi-VOCs

[a] Applies to certain waste streams that meet the conditions in Section B-3a(1).
[b] Number determined as specified in Section B2 of this document.
[c] Refer to the discussion in Section B4 of this document.

Table B-7, Required Program Records Maintained in AMWTP Project Files

LIFETIME RECORDS
· Field sampling data forms
· Field and laboratory chain-of-custody forms
· Test facility and laboratory batch data reports
· Waste Stream Characterization Package
· Sampling Plans
· Data reduction, validation, and reporting documentation
· Acceptable knowledge documentation
· Data reconciliation report
· Waste Stream Profile Form and Characterization Information Summary
NON-PERMANENT RECORDS
· Nonconformance documentation
· Variance documentation
· Assessment documentation
· Gas canister tags
· Methods performance documentation
· Performance Demonstration Program 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 examination (to confirm RTR), etc.)

Table B-8, 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]	
PCB Concentration	
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]	
ICV Closure Date	
DISPOSAL MODULE DATA	
Container ID [c]	
Disposal Date	
Disposal Location	

[a] This is not a complete list of the 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 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 breakup the assembly.

WIPP WASTE STREAM PROFILE FORM

Waste Stream Profile Number: (1)

Generator site name: (2) Technical contact: (3)

Generator site EPA ID: (2) Technical contact phone number: (3)

Date of audit approved by NMED: (4)

Title, version number, and date of documents used for WIPP-WAP certification: (4)

Did your facility generate this waste? ☐Yes ☐No If no, provide the name and EPA ID of the original generator: (5)

Waste Stream Information[1]

WIPP ID: (6) Summary Category Group: (7)

Waste Matrix Code Group: (8) Waste Stream Name: (9)

Description from the WTWBIR: (10)

(10)

Defense TRU Waste: ☐Yes ☐No Check one: ☐CH ☐RH

Number of SWBs (11) Number of Drums Number of Canisters (11)

Batch Data Report numbers supporting this waste stream characterization: (12)

List applicable EPA Hazardous Waste Codes:[2] (13)

Applicable TRUCON Content Codes: (14)

Acceptable Knowledge Information[1]

[For the following, enter supporting the documentation used (i.e., references and dates)]

Required Program Information

Map of site: (15)

Facility mission description: (15)

Description of operations that generate waste: (15)

(15)

Waste identification/categorization schemes: (15)

Types and quantities of waste generated: (15)

Correlation of waste streams generated from the same building and process, as appropriate: (15)

(15)

Waste certification procedures: (15)

Required Waste Stream Information

Area(s) and building(s) from which the waste stream was generated: (16)

Waste stream volume and time period of generation: (16)

Waste generating process description for each building: (16)

Process flow diagrams: (16)

Material inputs or other information identifying chemical/radionuclide content and physical waste form: (16)

(16)

Figure B-1, WIPP Waste Stream Profile Form (example only)

Which Defense Activity generated the waste: (check one) (16)

- ☐ 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

Supplemental Documentation

Process design documents: (17)
Standard operating procedures: (17)
Safety Analysis Reports: (17)
Waste packaging logs: (17)
Test plans/research project reports: (17)
Site databases: (17)
Information from site personnel: (17)
Standard industry documents: (17)
Previous analytical data: (17)
Material safety data sheets: (17)
Sampling and analysis data from comparable/surrogate Waste: (17)
Laboratory notebooks: (17)

Sampling and Analysis Information[2]

For the following, when applicable, enter procedure title(s), number(s) and date(s))

- ☐ Radiography: (18)
- ☐ Visual Examination: (18)
- ☐ **Headspace Gas Analysis**
  - VOCs: (19)
  - Flammable: (19)
  - Other gases (specify): (19)
- ☐ **Homogeneous Solids/Soils/Gravel Sample Analysis**
  - Total metals: (20)
  - PCBs: (20)
  - VOCs: (20)
  - Nonhalogenated VOCs: (20)
  - Semi-VOCs: (20)
  - Other (specify): (20)

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.

(21) _____ _____ _____

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, headspace gas analysis, and/or homogeneous solids/soils/gravel sample analysis were used to determine EPA Hazardous Waste Codes, attach signed Characterization Information Summary documenting this determination.

Figure B-1, WIPP Waste Stream Profile Form (example only, continued)

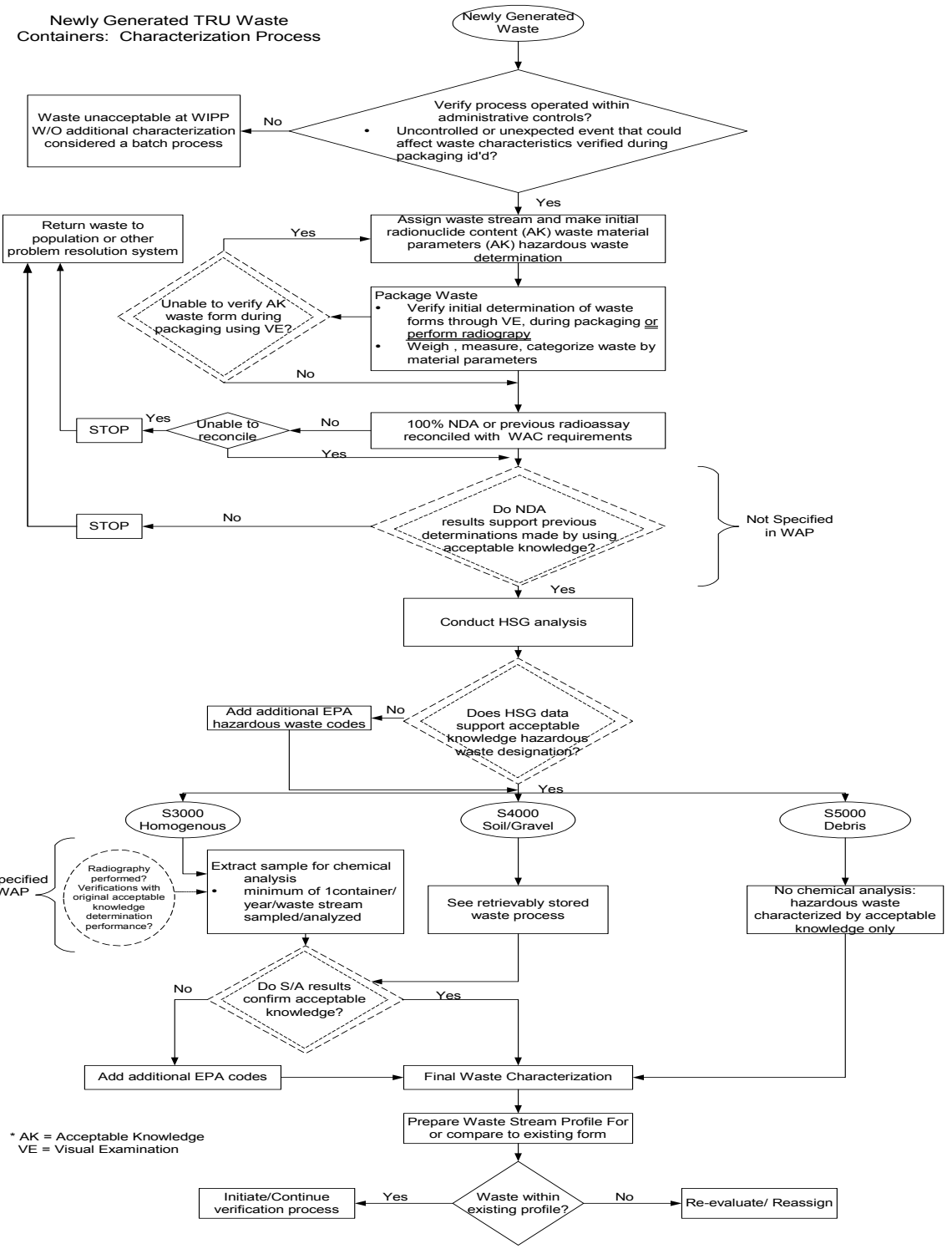


Figure B-2, Data Collection Design for Characterization of Newly Generated Waste

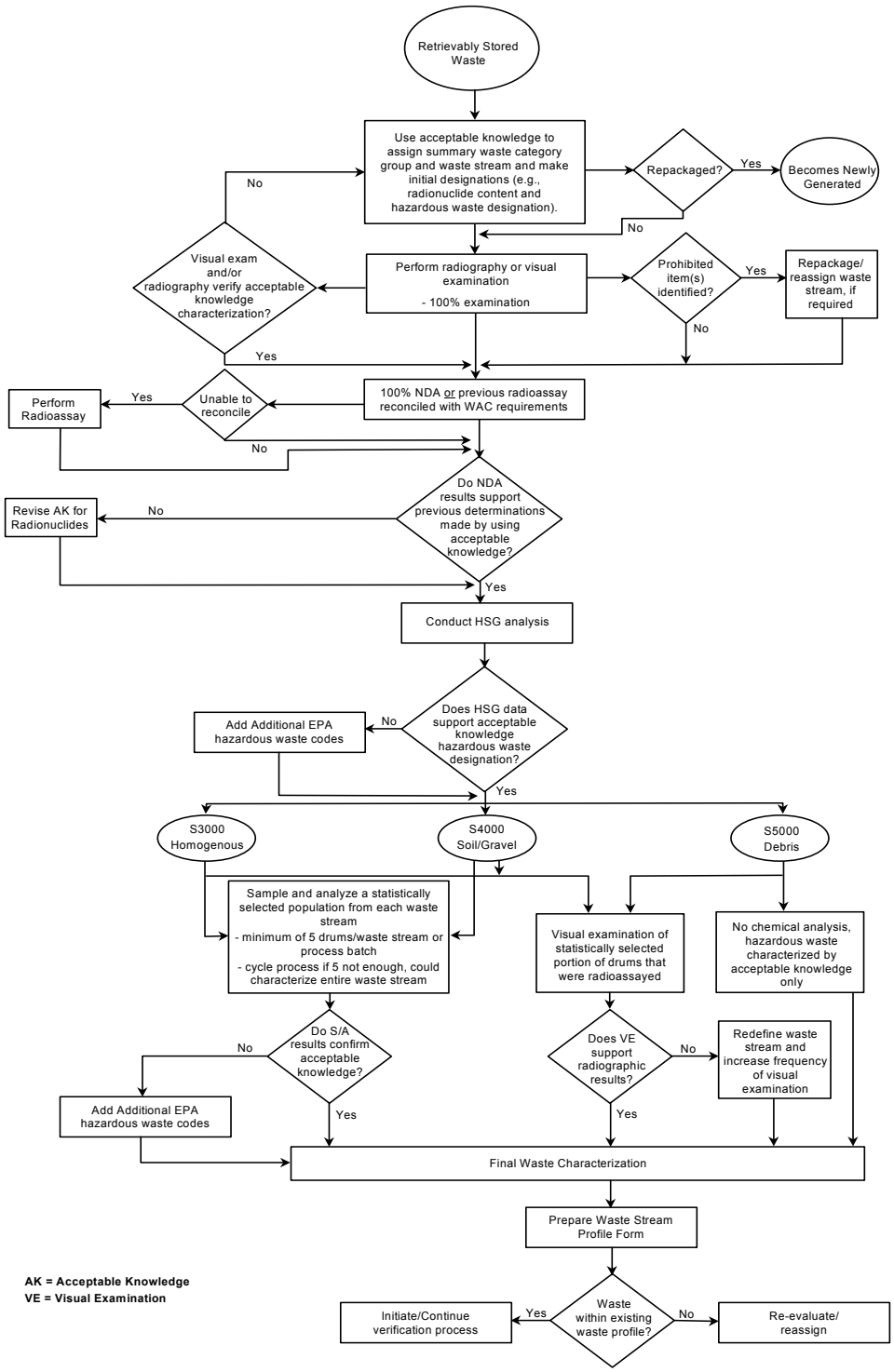


Figure B-3, Data Collection Design for Characterization of Retrievably Stored Waste

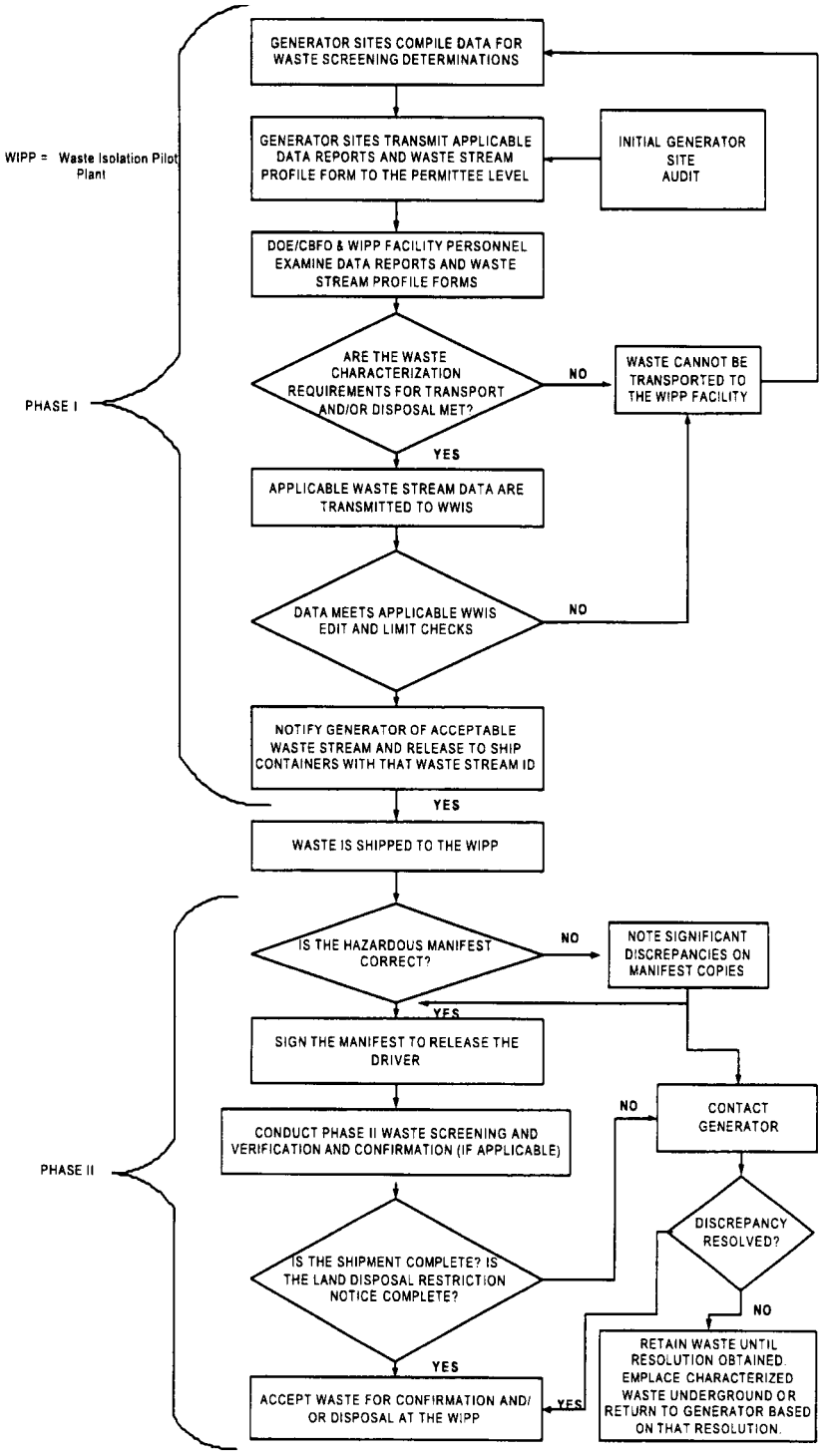


Figure B-4, TRU Mixed Waste Screening Flow Diagram

B1. WASTE CHARACTERIZATION SAMPLING METHODS

The AMWTP uses the following methods for the characterization of TRU waste to be disposed of at the WIPP facility. These methods include requirements for HSGS, sampling of homogeneous solids and soils/gravel, and radiography. Additionally, this section provides quality control, sample custody, and sample packing and shipping requirements.

B1-1 Headspace Gas Sampling and Analysis Using an On-Line System

The AMWTP utilizes an On-Line Integrated Headspace Gas Sampling and Analysis System.

The On-Line Integrated HSG Systems analyzes VOCs using the GC/MS method. The on-line system is operated in compliance with the requirements of the WIPP-WAP as presented in this document.

The On-Line Integrated HSG sampling operations are described in INST-OI-13, Drum Vent/Headspace Gas Sample Operations, 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.

B1-1a Method Requirements

HSG sampling is performed in an appropriate contamination area that meets the facility and the AMWTP radiological controls.

Before sampling, waste containers are in compliance with the container equilibrium requirement (i.e., 72 hours at 18°C or higher).

B1-1a(1) Summary Category S5000 Requirements

All waste containers or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling (Section B-3a(1); designated as summary category S5000 (Debris waste) shall be categorized under one of the sampling scenarios shown in Table B1-5 and depicted in Figure B1-1. If the container is categorized under Scenario 1, the applicable drum age criteria(DAC) from Table B1-6 must be met prior to headspace gas sampling. If the container is categorized under Scenario 2, the applicable Scenario 1 DAC from Table B1-6 must be met prior to venting the container and then the applicable Scenario 2 DAC from Table B1-7 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 B1-7 shall be determined using footnotes "a" and "b" in Table B1-7. 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 B1-8. If a specific packaging configuration cannot be determined based on the data collected during packaging and/or repackaging (Attachment B, Section B-3(d)(1), a conservative default Packaging Configuration Group of 3 for drums and 6 for Standard Waste Boxes (SWBs) 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. The DAC for Scenario 3 containers that contain rigid liner vent holes that are undocumented during packaging (Attachment B, Section B-3(d)(1), repackaging (Attachment B, Section B-3(d)(1), and/or venting (Section B1-1a[6][ii]) shall be determined using the default conditions in footnote "b" in Table 1-9. The DAC for Scenario 3 containers that contain filters that are either undocumented or are other than those listed in Table B1-9 shall be determined using footnote "a" in Table B1-9. Each of the Scenario 3 containers shall be sampled for headspace gas after waiting the DAC in Table B1-9 based on its packaging configuration (note: Packaging Configuration Groups 4, 5, and 6 are not summary category group dependent, and SWB requirements apply when the SWB itself is used for the direct loading of waste).

Drum age criteria apply only to 55-gallon drums and standard waste boxes. Drum age criteria for all other container types must be established through permit modification prior to acceptance of these containers.

B1-1a(2) Summary Category S3000/S4000 Requirements

All waste containers or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling (Section B-3a(1); designated as summary categories S3000 (Homogeneous solids) and S4000 (Soil/gravel) shall be categorized under one of the sampling scenarios shown in Table B1-5 and depicted in Figure B1-1. If the container is categorized under Scenario 1, the applicable DAC from Table B1-6 must be met prior to headspace gas sampling. If the container is categorized under Scenario 2, the applicable Scenario 1 DAC from Table B1-6 must be met prior to venting the container and then the applicable Scenario 2 DAC from Table B1-7 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 B1-7 shall be determined using footnotes "a" and "b" in Table B1-7. 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 B1-8. If a specific packaging configuration cannot be determined based on the data collected during packaging and/or repackaging (Attachment B, Section B-3(d)(1), a conservative default Packaging Configuration Group of 3 for drums and 6 for Standard Waste Boxes (SWBs) 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. The DAC for Scenario 3 containers that contain rigid liner vent holes that are undocumented during packaging (Attachment B, Section B-3(d)(1), repackaging (Attachment B, Section B-3(d)(1), and/or venting (Section B1-1a[6][ii]) shall be determined using the default conditions in footnote "b" in Table B1-10. The DAC for Scenario 3 containers that contain filters that are either undocumented or are other than those listed in Table B1-10 shall be determined using footnote "a" in Table B1-10. Each of the Scenario 3 containers shall be sampled for headspace gas after waiting the DAC in Table B1-10 based on its packaging configuration (note: Packaging Configuration Groups 4, 5, and 6 are not summary category group dependent, and SWB requirements apply when the SWB itself is used for the direct loading of waste).

B1-1a(3) 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 B1-7 through B1-10 for retrievably stored waste or the data documented during packaging (Attachment B, Section B-3(d)(1), repackaging (Attachment B, Section B-3(d)(1), and/or venting (Section B1-1a[6][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 B1-5 and associated information from Tables B1-6 and/or TableB1-7;
- the packaging configuration from Table B1-8 and associated information from Tables B1-9, or B1-10, 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 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, acceptable knowledge shall not be used to justify and packaging configuration less conservative than the default (i.e., Packaging Configuration Group 3 for drums and 6 for SWBs). For information reporting purposes listed above, AMWTP may report the default packaging configuration for retrievably stored waste without further confirmation.

All waste containers with unvented rigid containers greater than 4 liters (exclusive of rigid poly liners) are either 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). HSG samples are analyzed for the analytes listed in Table B3-2. Consistent with the footnote “a” in Table B1-8, any waste container that cannot be assigned a packaging configuration specified in Table B1-8, shall not be shipped to, or accepted for disposal at WIPP. If additional packaging configurations are identified, an appropriate Permit Modification will be submitted to incorporate the DAC using the methodology BWXT (2000).

Drum age criteria apply only to 55-gallon drums and standard waste boxes. Drum age criteria for all other container types must be established through permit modification prior to acceptance of these containers at WIPP.

The sampling manifold and sampling heads used with the On-Line Integrated HSG System and SUMMA® or equipment meet the appropriate general guidelines established in EPA's Compendium Method TO-14 as modified and amended in the WIPP RCRA Part B Permit, Attachment B, Waste Analysis Plan. Samples are directed to an analytical instrument instead of being collected in SUMMA or equivalent canisters when a single-sample on-line integrated manifold system is used. 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 B1-4 and B1-5 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. The HSG On-Line Integrated System utilize combined on-line batch QC samples as specified in Section B1-1b, Table B1-2, and Table B1-3.

HSG sampling of waste drums at the AMWTP is conducted per INST-OI-13, Drum Vent/Headspace Gas Sample Operations.

B1-1a(4)Manifold Headspace Gas Sampling

The HSG sampling protocol employs a multiport manifold capable of collecting samples from a single sample head or from in-line QC sample gas cylinders (blank/nitrogen and reference standard), and routing the sample directly to the GC/MS unit for analysis and QC purposes. The sampling equipment is leak checked and cleaned prior to first use and as needed thereafter. The manifold is evacuated to 0.0039 inches Hg (0.10 mm Hg) prior to sample collection. 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 puncturing the filter or rigid poly liner when necessary), or 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 lidThis filter/drum punch sampling head uses a combination drill/hollow stem sampling tube/carbon composite filter to penetrate the drum lid and liner without sparking. The filter/drum punch sampling head design allows for the collection of the headspace gas sample under the liner lid, and assembly is seated to provide a WIPP-WAP compliant filter for the drum.

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.

The manifold, associated sampling head, and headspace gas sample volume are designed to ensure the collection of representative samples. The manifold internal volume must be calculated and documented in a field logbook dedicated to headspace-gas sampling collection. Internal manifold and sample line volume is small in comparison to the volume of the headspace. The total volume of headspace gases collected during each sampling operation is obtained by adding the sampled volume with the manifold volume and is documented in design verification documentation.

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

- A sampling head with leak tight connections to the headspace sampling manifold.
- GC grade stainless steel tubing with sufficient flexibility to allow any necessary movement of the sampling head caused by compression of the waste container to the sample head.
- The headspace sampling manifold pressure sensor(s) is pneumatically connected to the headspace sampling manifold. The headspace sampling manifold pressure sensor(s) is capable of measuring absolute pressure in the range from 0.05 to 1,000 mm Hg. Its resolution is ± 0.01 mm Hg at 0.05 mm Hg. The pressure sensor(s) has an operating range from approximately 15° C to 50° C.

- The On-Line Integrated HSG System needs only one port for the collection of samples. All ports (inlet and outlet) utilize solenoid actuated, normally-closed valves to ensure an air-tight seal when the system not in use. All sampling ports and piping have VCR® fittings for connection to ensure air-tight connections and to prevent degradation of the fittings on the manifold.

- An oil vacuum pump is used to reduce the pressure in the headspace sampling manifold to less than or equal 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.

- The system was designed with a minimum distance between the sample head and the valve that isolates the pump from the manifold in order to minimize the dead volume in the manifold.

- The manifold is equipped with an PID (photoionization detector) capable of detecting the analytes listed in Table B3-2. The Organic Vapor Analyzer (OVA) measures total VOC concentration below the lowest headspace gas PRQL based on manufacturer's specifications. Detection of l,l,2-trichloro-l,2,2-trifluoroethane is not possible using the photoionization detector used. The OVA measurement is confirmed by the collection and GC/MS analysis of field blanks and as specified in the method requirements, equipment blanks to check for manifold cleanliness.

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

- A cylinder of compressed zero nitrogen 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-ppm total VOCs. The gases are metered into the standard side of the manifold using solenoid controlled valves that are corrosion proof and that do not allow for the introduction of manifold gas into the purge gas cylinders. 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 gases are used for evaluating the accuracy of the headspace sampling process. Field reference standard gas is delivered through a flow regulating two-stage stainless steel regulator. The field reference standard gas is certified by the manufacturer to contain analytes from Table B3-2 of Permit Attachment B3 at known concentrations.

- A humidifier filled with ASTM Dl 193-77 (ASTM 1983b) Type I or Type II water is connected to the headspace sampling manifold between the compressed gas cylinder and the sampling manifold. Dry gases flowing to the purge assembly pick up moisture from the humidifier. Moisture is added to the dry gases to assist with system cleaning between headspace gas sample collection and to condition equipment blanks and field reference standards.

- A purge assembly allows the sampling head (sample side) to be connected to the standard side of the manifold.

- A pressure regulator connected to the purge assembly monitors the gas flow rate through the purge assembly. The 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 allow samples of gas from the compressed gas cylinders to be collected near ambient pressures.

- An ambient-pressure sensor with a measurement range for the ambient barometric pressures is in the sampling/manifold location. It is kept in the sampling area during sampling operations. The ambient pressure sensor has a full range of at least 500 to 800 mm Hg and is 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.

- A temperature sensor with a minimum range of 18°C to 50°C is in the sampling/manifold location. The temperature sensor calibration is traceable to NIST, or equivalent, standards.

B1-1a(5)Direct Canister Headspace Gas Sampling

This Section is not applicable to the AMWTP.

B1-1a(6)Sampling Heads

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, seal the punched drum lid).

B1-1a(6)(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. 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 to the drum. 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 a nonconformance report shall be prepared, submitted, and resolved. Nonconformance procedures are outlined in Section B3.

- 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.

B1-1a(6)(ii) Sampling Through the Drum Lid by Drum Lid Punching

A HSG sample is collected through the drum lid at the time of drum punching (i.e., samples are not collected through the carbon filter). This sampling method and the overall system preserves the integrity of the drum to contain radionuclides and maintaining an air tight seal by the installation and seating of the sampling stem and carbon composite filter into the drum lid.

The process of sampling through the drum lid begins by raising the waste container up to the sample chamber seal and applying a minimum of 200 pounds force between the drum and the seal, which creates an airtight seal around the area to be penetrated. Seal integrity is tested by pumping the volume within the seal to 300 torr or less. The pressure transducer measures the seal housing chamber initial and final pressures over a 15 second period. An acceptable seal test has a leak rate of less than 50 torr per minute. To sample the drum headspace gas through the drum lid, the lid is breached using a sparkless drill/filter assembly. To assure that the sample collected is representative, all of the appropriate general method requirement for TRU waste characterization, sampling apparatus requirements, and QC requirements specified in EPA's Compendium Method TO-14 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 drum sampling system that come into contact with sample gases are purged with humidified nitrogen prior to sample collection.
- On-line blanks and on-line field reference standards are collected through all the components of the punch that contact the headspace gas sample.

- Once the drum lid has been breached and the filter seated, drill rotation ceases. This ensures liner penetration.

- Because pressure increases may occur during sealing of the drum punch to the drum lid, provisions are made to relieve potential drum pressure increases during drum-punch operations.

- 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 to the drum. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If, for any reason, headspace gas samples are collected from the drum headspace prior to venting the poly liner, the sample is not acceptable and a nonconformance report is prepared, submitted, and resolved. Nonconformance procedures are outlined in Section B3-13.

- During sampling, if the drum contains an existing carbon-composite filter, it is sealed to prevent outside air from entering the drum using a tested sealing cap and clamp mechanism.

- A flow indicating device, which monitors excess flow of purge gases (for system purge) is pneumatically connected to the drum punch assembly and controlled by means of the system's programmable logic control (PLC) software.

- The drum sampling system is firmly seated to the drum lid using a pneumatic lifting bladder; lifting the drum and creating a minimum of 200 pounds of seal force between the drum lid and seal. This is continuously monitored and adjusted by the PLC software.

- 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.

B1-1a(6)(iii) Sampling Through a Pipe Overpack Container Filter Vent Hole

This Section is not applicable to the AMWTP.

B1-1b Quality Control

For the On-Line Integrated HSG System, QC samples are collected and analyzed on a per on-line batch basis. 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-13, *Drum Vent/Head Space Sample Operations*. The analytical batch requirements are specified by the analytical method being used in the on-line system. Table B1-2 provides a summary of field QC sample frequency requirements, and Table B1-3 provides a summary of QC sample acceptance criteria.

For the On-Line Integrated HSG System, 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 on-line control sample replaces the field reference standard and laboratory control sample.
- 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 B1-3. A separate field blank is collected and analyzed for each on-line batch. However, 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.

The Site Quality Assurance Officer (SQAO) monitors and documents field QC sample results and fills out a nonconformance report if acceptance or frequency criteria are not met. The SPM also ensures appropriate corrective action is taken if acceptance criteria are not met.

B1-1b(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 (GC/FID) detection 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 B3-2. A nonconformance report is initiated and resolved if the final reported QC sample results do not meet the acceptance criteria.

B1-1b(2) Equipment Blanks

Equipment blanks shall be collected to assess cleanliness prior to first use after cleaning of all sampling equipment. On-line equipment/manifold blanks are 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. The SPM uses the on-line equipment/manifold 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 B3-2.

B1-1b(3) 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 on-line control sample 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 for VOC analysis contains a minimum of six of the analytes listed in Table B3-2 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 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, on-line control samples are collected through the system at a frequency of one per on-line batch. The QAOs for accuracy for each tested compound has a recovery of 70 to 130 percent. 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 Section B3. Field reference standard results are acceptable if the accuracy for each tested compound has a recovery of 70 to 130 percent.

B1-1b(4)Field Duplicates

Duplicates are collected sequentially and in accordance with Table B1-1. 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 is less than or equal to 25 for each tested compound found in concentrations greater than the PRQL in both duplicates.

B1-1c 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®. Stainless steel components are cleaned, passivated, or procured as GC-grade.

To minimize the potential for cross-contamination of samples, the headspace gas sampling manifolds and On-Line Integrated HSG System are cleaned and leak-checked prior to each sampling event. Procedures used for cleaning and preparing the manifold use the general guidelines that are appropriate for TRU waste characterization established by the EPA in the Compendium Method TO-14 and is discussed in INST-OI-13, *Drum Vent/Head Space Sample Operation.*

B1-1c(1)Headspace Gas Sample Canister Cleaning

This Section is not applicable to the AMWTP.

B1-lc(2)Sampling Equipment Initial Cleaning and Leak-Check

The on-line system and sampling heads that come into contact with headspace gas are thoroughly inspected and cleaned prior to assembly. The on-line system is purged with humidified nitrogen and leak checked after assembly. This cleaning is repeated if the on-line system is contaminated to the extent that the routine system cleaning is inadequate.

B1-1c(3)Sampling Equipment Routine Cleaning and Leak-Check

The on-line system and sampling head is cleaned and checked for leaks in accordance with the cleaning and leak check procedures described in EPA's Compendium Method TO-14. The cleaning procedure is conducted after headspace gas samples; after on-line duplicate collection; after on-line blank collection; and after the additional cleaning required for field reference standard (on-line control sample) collection has been completed.

VOCs are removed from the internal surfaces of the on-line system to levels that are less than or equal to three times the MDLs of the analytes listed in Table B3-2, as determined by analysis of an equipment blank or through use of an OVA. 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.

B1-1c(4)On-Line System Cleaning After Field Reference Standard Collection

The sampling system is specifically cleaned after a field reference standard has been collected. The HSG sampling system is designed to automatically flush/clean the entire system (evacuate and pressurize with humidified nitrogen) and adequately clean the system's internal surfaces for both the sample and standard side. After completing this protocol and prior to collecting another sample, the system cleaning verification using the OVA and leak check is also performed in accordance with INST-OI-13, *Drum Vent/Head Space Sample Operations*.

B1-1c(5)Sample Head Cleaning

To prevent cross-contamination, the needle, drill/filter assembly, airtight fitting , sample chamber and replaceable filter of the sampling heads are cleaned in accordance with INST-OI-13, *Drum Vent/Head Space Sample Operation,* procedures which use the cleaning procedures described in EPA in the Compendium Method TO-14 prior to use or reuse.

The sampling system is designed to automatically flush the entire system (evacuate and pressurize with humidified zero nitrogen) and adequately clean the system's internal surfaces. After completing this protocol and prior to collecting another sample, the system cleaning verification using the OVA and leak check is also performed.

B1-1d Equipment Calibration and Frequency

The manifold pressure sensor are certified prior to initial use and then periodically (annually or shorter frequency) as described in MP-CMNT-10.1, *Maintenance Management*, using NIST, or equivalent traceable standards. If necessary, the pressure indicated by the pressure 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 is calibrated once per day, prior to first use, or as necessary according to the manufacturer's specifications in accordance with INST-TRUW-8.2.1, *HSG Calibration*. If OVA calibration period is greater than one day, verification of calibration is performed each day. Calibration gases for the OVA are certified to contain isobutylene at the manufacturers recommended 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).

Analytical equipment is calibrated and verified as specified in Table B3-3 for Gas VOCs.

B1-2 Sampling of Homogeneous Solids and Soil/Gravel

This section describes the requirements for collecting samples of TRU waste classified as homogeneous solids and soils/gravels. Sampling protocols are based upon methods similar to those approved by EPA methods and American Society for Testing and Materials (ASTM) and are implemented in INST-OI-16, *Drum Coring Operations*.

Sampling protocols are designed for characterization of solid process residues and soils on a waste stream basis. They are also designed to ensure that representative samples of these wastes, including QC samples, are consistently collected and transferred to the responsible laboratory in a manner that maintains their full integrity.

The chosen strategy is designed to provide the analytical laboratories the minimum amount of required sample, to minimize sample handling and the quantity of investigation-derived waste. The waste is analyzed for the target analytes specified in Tables B3-4, B3-6, and B3-8.

Sampling methods not identified in this section shall not be used. If a sampling method is proposed for use which has not been identified in this section, the sampling method, protocol and detailed sampling plan shall be submitted to the SPM for submittal to the CBFO for approval. The CBFO will determine the need for permit modification and approval by NMED. As new methods are submitted to CBFO and approved by NMED, they will be added to this section.

B1-2a Methods Requirements

The methods used to collect samples of TRU 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. Homogeneous solids and soil/gravel samples are handled in accordance with the specifications presented in Table B1-4.

A sufficient number of samples are collected to adequately represent the waste being sampled. Debris waste (S5000) is not sampled, and debris that may be present in waste streams defined as Summary Category Groups S3000 or S4000 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 B1-2b.

B1-2a(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 B1-2b 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 the requirements in Section B1-2b. 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 sufficientiently transparent to allow visual examination 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 B1-2b.

- 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 have been cleaned in accordance with the requirements in Section B1-2(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 B1-2(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.

B1-2a(2)Sample Collection

Sampling of cores are 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 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, *Drum Coring Operations*. True random sampling involves the proper use of random numbers for identifying sampling locations. A sampling device such as the metal coring cylinder described in EPA's SW-846 Manual (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 B1-4. 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, polychlorinated biphenyls, 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. 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 B1-2(b). Sample sizes and handling requirements are outlined in Table B1-4.

Newly generated waste samples may be collected using methods other than coring, as discussed in Section B1-2a. 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.

B1-2b Quality Control Requirements

Quality control (QC) requirements for homogeneous waste sampling include collecting co-located samples from cores or other sample types to determine precision, collection 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 quality control requirements in Sections Bl-2b(l), B1-2b(2), and B1-2b(3).

B1-2b(1)Co-located Samples

In accordance with the requirement to collect field duplicates required by the Environmental Protection Agency (EPA) methods found in SW-846, samples are collected to determine the combined precision of the coring and sampling procedures. 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 visual examination 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.

B1-2b(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". 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 B3-4, B3-6 and the PRDLs, and B3-8. 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 B3-4 and B3-6 or in the Program Required Detection Limits (PRDLs) in Table B3-8. 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 B3-4, B3-6, and the analytes in Table B3-8 of Permit Attachment B3. 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 B3-4, B3-6, or the PRDLs in Table B3-8 of Permit Attachment B3. 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, VOC sub-sampler) are 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, 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 B3-4, B3-6, and B3-8. 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 B3-4 and B3-6 and in the PRDLs in B3-8. 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.

B1-2b(3)Coring Tool and Sampling Equipment Cleaning

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

- All surfaces of sampling equipment or tools that will come into contact with the samples are cleaned prior to use. All items of sampling equipment and tools are cleaned in the same manner. Immediately following cleaning, equipment and tools are assembled and sealed inside clean protective wrapping (plastic bags).

- 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 was 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 was 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 site 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.

B1-2c 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, if present, 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 in accordance with INST-CMNT-10.1.2, *Maintenance Management System*.

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

- Sample collection equipment in the immediate area of sample collection are 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 sample is thoroughly cleaned upon its discovery. Inspection records are maintained in the field databank or appropriate data sheet.

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

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

- 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 are 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.

B1-2d Equipment Calibration and Frequency

The scales used for weighing 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.

B1-3 Radiography

Radiography is a nondestructive technique that involves X-ray scanning of waste containers to identify and verify waste container contents. Radiography requirements are prescribed in INST-OI-12, Real Time Radiography Operations. The objectives of the radiography are as follows:

- Verify Waste Matrix Code;

- Estimate waste material parameter weights;

- Verify the waste stream description; and

- Verify prohibited items (refer to section B-1c).

B1-3a Methods Requirements

Radiography at the AMWTP aids in the examination and identification of containerized waste. All activities required to achieve radiography objectives are described in the AMWTP QAPjP and Operating Instructions (OIs). These documents include instructions specific to the radiography system(s) used at the AMWTP.

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 acquistion station. The radiography system at the AMWTP has controls which allow the operator to vary the voltage, thereby controlling image quality. It is possible to vary the voltage between 150 and 400 kilovolts to provide an optimum degree of penetration through the waste.

To perform radiography, the waste container is scanned while the operator views the video monitor. An audio/video tape or equivalently non-alterable media 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 and estimated waste material parameter weights of the waste. The estimated waste material parameter and weights are determined by compiling an inventory of waste items, residual materials, and packaging materials. The items on this look-up table provide an estimate of waste material parameter weights. Containers whose contents prevent full examination of the remaining contents, shall be subject to visual examination unless the AMWTP certifies that visual examination would provide no additional relevant information for that container.

Radiography is conducted in accordance with INST-OI-12, Real Time Radiography Operations.

Waste containers whose packaging configuration or contents prevent full radiography examination of the remaining contents (e.g., lead-lined drums) must be subjected to VE in lieu of radiography. If radiography indicates that the waste does not match the waste stream description a nonconformance report (NCR) is initiated in accordance with MP-Q&SI-5.4, *Identification of Nonconforming Conditions*. If a prohibited nonconforming item is discovered in a waste container, the container is rejected and disposition for special case handling in the Waste Tracking System.

B1-3b Quality Control

The radiography system involves qualitative and semiquantitive evaluations of visual displays. Operator training and experience are the most important considerations for assuring quality controls in regard to the operation of the radiography system and for interpretation and disposition of radiography results. Only trained and qualified radiography operators are allowed to operate radiography equipment.

Standardized training and qualification requirements for radiography operators are based upon existing industry standard training requirements and comply with the training and qualification requirements of the WIPP-WAP as detailed in the MP-RTQP-14.4, *Personnel Qualification and Certification*.

The AMWTP has developed a training program that provides radiography operators with both formal and on-the-job (OJT) training. Radiography operators shall be 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 shall be conducted by an experienced, qualified radiography 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 radiography operations to ensure data quality and comparability.

The training program contains the following elements. The elements of the radiography training program include formal and OJT, as presented below. These elements are addressed in MP-RTQP-14.4, *Personnel Qualification and Certification*.

B1-3b(1)Formal Training

- Project Requirements
- State and Federal Regulations
- Basic Principles of Radiography
- Radiographic Image Quality
- Radiographic Scanning Techniques
- Application Techniques
- Radiography of Waste Forms
- Standards, Codes, and Procedures for Radiography
- Site-Specific Instruction

B1-3b(2)On-the-Job Training

- System Operation
- Identification of Packaging Configurations
- Identification of Waste Material Parameters
- Weight and Volume Estimation
- Identification of Prohibited Items

Radiography test drums contain items common to the waste streams to be generated and stored at the AMWTP. Test drum(s) representative of the Waste Matrix Codes for the WSPFs are examined and successfully identified as part of the radiography operator qualification process. The test drums are divided into layers with varying packing densities that are representative of the waste streams. Test drums are representative of the waste matrix codes for which Waste Stream Profile Form approval is sought, are examined and successfully identified prior to waste stream shipment. The following is a list of required elements of a radiography test drum:

- A punctured aerosol can
- Pigtails on poly liners (horsetail bag)
- Pair of coveralls
- Empty bottle
- Irregular shaped pieces of wood
- Empty one-gallon paint can
- Full container
- Aerosol can with fluid
- One-gallon bottle with three tablespoons of fluid
- One-gallon bottle with one cup of fluid (upside down)
- Leaded glove or leaded apron
- Wrench

These items shall be successfully identified by the operator as part of the qualification process. Qualifications of radiography operators shall, at a minimum, encompass the following requirements:

- Successfully pass a comprehensive exam based upon training enabling objectives. The comprehensive exam will address all of the radiography operations, documentation, characterization and procedural elements stipulated in this QAPjP.

- Perform a practical capability demonstration in the presence of appointed site radiography subject matter expert. The person will be an experienced radiography operator who is also qualified as an OJT trainer.

Requalifications of operators are based on evidence of continued satisfactory performance (primarily audio/video tape reviews) and shall be done at least every two years . Unsatisfactory performance will result in disqualification. Unsatisfactory performance is defined as the misidentification of a prohibited item in a training drum or a score of less than 80% on the comprehensive exam. Retraining and demonstration of satisfactory performance are required before a disqualified operator is again allowed to operate the radiography system.

A training drum with internal containers of various sizes is scanned biannually by each operator. The audio/video tape or equivalent 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 radiography process is 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. 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 radiography operator other than the individual who performed the first examination. A testing batch is a suite of waste containers undergoing radiography 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/videotape reviews of accepted waste containers by a qualified radiography operator other than the operator who dispositioned the waste container . The results of this independent verification are available to the radiography operator. The AMWTP SQAO is responsible for monitoring the quality of the radiography data and calling for corrective action, when necessary.

B1-3b(3)Visual Examination

As an additional QC check or in lieu of radiography, the waste container contents are verified directly by performing VE on the waste container contents using MP-TRUW-8.19, *RTR/VE Drum Selection*). VE is performed on a statistically determined portion of waste containers to verify the results of radiography. With the exception of items or conditions that could pose a hazard to VE personnel, the radiography results are not made available until after the VE is completed. This verification includes the Waste Matrix Code and waste material parameter weights. This verification is performed through a comparison of radiography and VE examination results. The Waste Matrix Code is determined and waste material parameter weights are estimated to confirm that the container is properly included in the appropriate waste stream. The VE results are validated per Section B3-10 and the results transmitted to the RTR facility.

Visual examination is conducted to describe all contents of a waste container and includes estimated or measured weights of the contents. The description clearly identifies all discernible waste items, residual materials, packaging materials, or (waste material parameter). Visual examination experts that are experienced and trained, assess the need to open individual bags or packages of waste. If individual bags/packages are not opened estimated weights are recorded.

Estimated weights are established through the use of historically derived waste weight tables and an estimation of the waste volumes. It may not be possible to see through inner bags because of discoloration, dust, or because inner containers are sealed. In these instances, documented AK is used to identify the Waste Matrix Code and estimated waste material parameter weights. If AK is insufficient for individual bags/packages, actual weights of waste items, residual materials, packaging materials, or waste material parameters are recorded. VE activities are documented on VE data forms and/or the WTS. In addition, VE for confirmation of radiography results is documented on audio/videotape recording and on VE data forms as specified in INST-OI-34, VE Operating Procedures & Data Reporting or INST-OI-16, *Drum Coring Operations.*

Visual examination consists of a semi-quantitative and qualitative evaluation of the waste container contents and is recorded on audio/video tape. Standardized training for VE has been developed to include both formal classroom training and OJT. 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 OJT and apprenticeship is conducted by an operator experienced and qualified in VE prior to qualification of the candidate. Visual examination personnel are requalified once every two years. Refer to MP-RTQP-14.4, *Personnel Qualification and Certification*, for specific requirements for qualification and requalification of VE operators.

The elements of the VE training program are presented below:

B1-3b(4)Formal Training

- Project Requirements
- State and Federal Regulations
- Application Techniques
- Site-Specific Instruction

B1-3b(5)On-the-Job Training

- Identification of Packaging Configurations
- Identification of Waste Material Parameters
- Weight and Volume Estimation
- Identification of Prohibited Items

The AMWTP designates visual examination experts (VEE). The VEE is selected based on experience and training in the types of waste being characterized. 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 visual examination at the AMWTP. The VEE will receive training in the same elements as the visual examination personnel with both formal training and on-the-job training. 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. VEEs selected will meet the qualification and training requirements specified in MP-RTQP-14.4, *Personnel Qualification and Certification.*

If the waste is homogeneous, the VEE may decide that a limited VE involving a confirmation of the radiography data is appropriate. If the waste is heterogeneous the VEE may decide a full VE by opening bags and segregating waste is warranted. Various degrees of segregation are possible based on the VEE's judgment and availability of AK data. The decision making criteria for this decision is for the VEE to assess the subject waste using AK information, training, and past experience with the subjet waste stream to determine the extent of examination necessary. The VEE's decisions are documented on the VE data form.

A description of the waste container contents is recorded on a VE data form and/or the WTS. The description clearly identifies all waste material parameters and provides enough information to estimate weights of waste material parameters. In cases where bags are not opened, a brief written description of the contents of the bags and an estimate of the amount of each waste type in the bags must be provided. The basis of all decision made by the VEE will be documented. The written records of VE are supplemented with the audio/videotape recording. All work will be conducted in accordance with INST-OI-34, *VE Operating Procedure & Data Reporting* or INST-OI-16, *Drum Coring Operations.*

B1-4 Custody of Samples

Chain-of-Custody on field samples (including field QC samples) is initiated immediately after sample collection or preparation (refer to INST-OI-16, *Drum Coring Operations*). 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 in accordance with MCP-2002, *Analytical Sample Management* by assuring samples are as follows:

- in the possession of an authorized individual; or
- in that individual's view; or
- 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 Chain of Custody includes provisions for each of the following:

- Signature of individual initiating custody control, along with data 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)

B1-5 Sample Packing and Shipping

Samples are packaged at the AMWTP and shipped to the ALD. In the event that analytical facilities are not at the site, the samples will be packaged and shipped to an off-site laboratory. 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.

A uniform Hazardous Waste Manifest is not required, since samples are exempted from the definition of hazardous waste under RCRA.

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 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 shipping container and signs the sample custody documentation. The sample custody documentation serves to track the physical transfer of samples between the two custodians.

Table B1-1, Gas Sample Requirements

PARAMETER	HEADSPACE SAMPLE MINIMUM VOLUME (ML)	HOLDING TEMPERATURE
VOCs	250[a,b]	0-40 ° C

[a] Alternatively, if available headspace is limited, 100 mL samples may be collected for determination of volatiles.
[b] Alternatively, canisters, that meet QAOs may be used.

Table B1-2, 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]
Sampling Equipment Blanks[b] Or On-Line Equipment Blanks[b]	1 per sampling batch[d]	Once[e]	1 per on-line batch[f]
Field Reference Standards Or On-Line Control Samples[c]	1 per sampling batch[d]	Once[e]	1 per on-line batch[f]
Field Duplicates Or On-Line 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 B3-2), only, is required. For on-line integrated sampling/analytical systems, if field blank results meet the acceptance criteria, a separate on-line blank is not required.
[b] One equipment blank or on-line equipment blank must be collected, analyzed for VOCs (Table B3-2), and demonstrated as 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 on-line control sample must be collected, analyzed, and demonstrated to meet the QAOs specified in Table B3-2 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 B1-3, Headspace Gas: Summary of Field Quality Control Sample Acceptance Criteria

QC SAMPLES	ACCEPTANCE CRITERIA	CORRECTIVE ACTION [a]
Field Blanks	VOC amounts ≤ 3 x MDLs in Table B3-2 for GC/MS or GC/FID; ≤ PRQLs in Table B3-2 for FTIRS	Nonconformance if any VOC amount > 3 x MDLs in Table B3-2 for GC/MS or GC/FID; > PRQLs in Table B3-2 for FTIRS
Sampling Equipment Blanks	VOC amounts ≤ 3 x MDLs in Table B3-2 for GC/MS or GC/FID; ≤ PRQLs in Table B3-2 for FTIRS	Nonconformance if any analyte amount > 3 x MDLs in Table B3-2 for GC/MS or GC/FID; > PRQLs in Table B3-2 for FTIRS
Field Reference Standards Or On-Line Control Samples	70 - 130 %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 recover
RPD = Relative percent difference

Table B1-4, Sample Handling Requirements for Homogeneous Solids and Soil/Gravel

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

[a] Quantity may be increased or decreased according to the requirements of the analytical laboratory, as long as the QAOs are met.
[c] Holding time begins at sample collection (holding times are consistent with SW-846 requirements).
[d] 40-mL VOA vial or other appropriate containers shall have an airtight cap.
[e] 40-day holding time allowable only for methanol extract - 14-day holding time for non-extracted VOCs.
[f] Appropriate containers (e.g., opaque glass container) should be used and should have Teflon® lined caps.
[g] Analysis for PCBs is required only for waste streams in waste matrix code S3220 (organic sludges) or for waste forms indicated by AK.
[h] Polyethylene or polypropylene is preferred, glass jar is allowable.
[i] 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 B1-5
HEADSPACE GAS DRUM AGE CRITERIA SAMPLING SCENARIOS

Scenario	Description
1	A. Unvented drums without rigid poly liners are sampled through the drum lid at the time of venting. B1. Unvented drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. B2. Vented drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. C. Unvented drums with vented rigid poly liners are sampled through the drum lid at the time of venting.
2	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., drums, SWBs, 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 B1-6
SCENARIO 1 DRUM AGE CRITERIA (in days) MATRIX

Summary Category Group	DAC (days)
S3000/S4000	127
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 B1-7
SCENARIO 2 DRUM AGE CRITERIA (in days) MATRIX

	Summary Category Group S3000/S4000				Summary Category Group S5000			
Filter H_2 Diffusivity [a]	**Rigid Liner Vent Hole Diameter (in) [b]**				**Rigid Liner Vent Hole Diameter (in) [b]**			
(mol/s/mod fraction)	0.30	0.375	0.75	1.0	0.30	0.375	0.75	1.0
1.9×10^{-6}	36	30	23	22	29	22	13	12
3.7×10^{-6}	30	25	19	18	25	20	12	11
3.7×10^{-5}	13	11	11	11	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 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 (Attachment B, Section B-3(d)1), repackaging (Attachment B, Section B-3(d)1), and/or venting (Section B1-1a[6][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 are based on a bounding packaging configuration.

TABLE B1-8
SCENARIO 3 PACKAGING CONFIGURATION GROUPS

Packaging Configuration Group	Covered S3000/S4000 Packaging Configuration Groups	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)	• 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 (bounding case) • 1 filtered liner bag	• 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]	• 1 inner bag, 1 liner bag • 1 filtered inner bag, 1 filtered liner bag • 2 inner bags	• 2 liner bags • 2 filtered liner bags • 1 inner bag, 2 liner bags

	• 2 filtered inner bags • 2 liner bags (bounding case) • 2 filtered 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)	• 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)
Packaging Configuration Group 5, Standard Waste Box [a]	• No layers of confinement • 1 SWB liner bag (bounding case)	• No layers of confinement • 1 SWB liner bag (bounding case)

Packaging Configuration Group 6, Standard Waste Box [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)	• 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)

[a] If a specific Packaging Configuration Groups cannot be determined based on the data collected during packaging (Attachment B, Section B-3(d)1) and/or repackaging (Attachment B, Section B-3(d)1), a conservative default Packaging Configuration Group of 3 for 55-gal. drums and 6 for SWBs must be assigned provided the 55-gal. drums do not contain pipe component packaging. If pipe components are present as packaging in the 55-gal. 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. SWB liner bags have a thickness of approximately 14 mils. Liner bags are typically similar in size to the container.

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 B1-9
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

Packaging Configuration Group 5	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWB**
$> 7.4 \times 10^{-6}$	15

Packaging Configuration Group 6	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWB**
$> 7.4 \times 10^{-6}$	56

[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 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 (Attachment B, Section B-3(d)1), repackaging (Attachment B, Section B-3(d)1), and/or venting (Section B1-1a[6][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 is the sum of the diffusivities for all of the filters on the container because SWBs have more than 1 filter.

TABLE B1-10
SCENARIO 3 DRUM AGE CRITERIA (in days) MATRIX FOR S3000 AND S4000 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}	213	175	108	92	56	18
3.7×10^{-6}	188	161	105	90	56	17
3.7×10^{-5}	80	80	75	71	49	10

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}	283	243	171	154	107	34
3.7×10^{-6}	253	225	166	151	106	31
3.7×10^{-5}	121	121	115	110	84	13

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

Packaging Configuration Group 5	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	Headspace Sample Taken Inside SWBS
$> 7.4 \times 10^{-6}$	15

Packaging Configuration Group 6	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWBS**
$> 7.4 \times 10^{-6}$	56

[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 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 (Attachment B, Section B-3(d)1), repackaging (Attachment B, Section B-3(d)1), and/or venting (Section B1-1a[6][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 is the sum of the diffusivities for all of the filters on the container because SWBs have more than 1 filter.

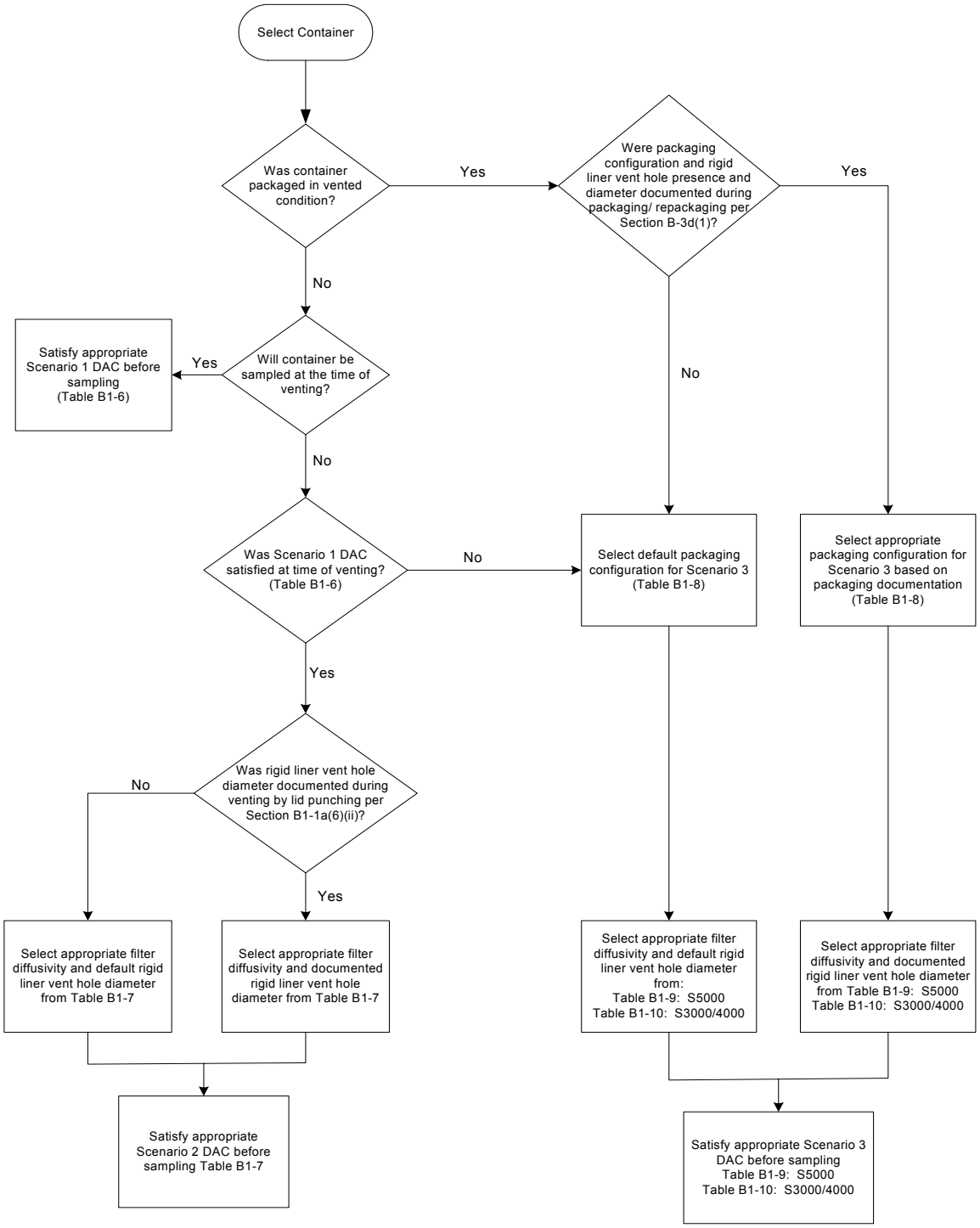


Figure B1-1, Headspace Gas Drum Age Criteria Sampling Scenario Selection Process

AMWTP
Waste Characterization Facility
Chain of Custody

COC No.

Sampling Location AMWTP	Analytical Location INEEL	Sampling Batch No.	Sample Matrix SOLID

Container ID	IDC	Sample ID	Sample Date	Sample Time	Size	Weight	VOC	NHVOC	Semi VOC	PCB	Metals	Comments
All samples are preserved by cooling to 4 +/- 2 Degrees C												

Sampler Initiating Custody:_____

Print Name: Signature: TID: Date/Time:

Relinquished by:	Date	Time
Received by:	Date	Time
Relinquished by:	Date	Time
Received by:	Date	Time

Relinquished by:	Date	Time
Received by:	Date	Time
Relinquished by:	Date	Time
Received by:	Date	Time

Discrepancies:

Figure B1-2, Example of the AMWTP Chain-of-Custody for Homogeneous Solids and Soil/Gravel Samples

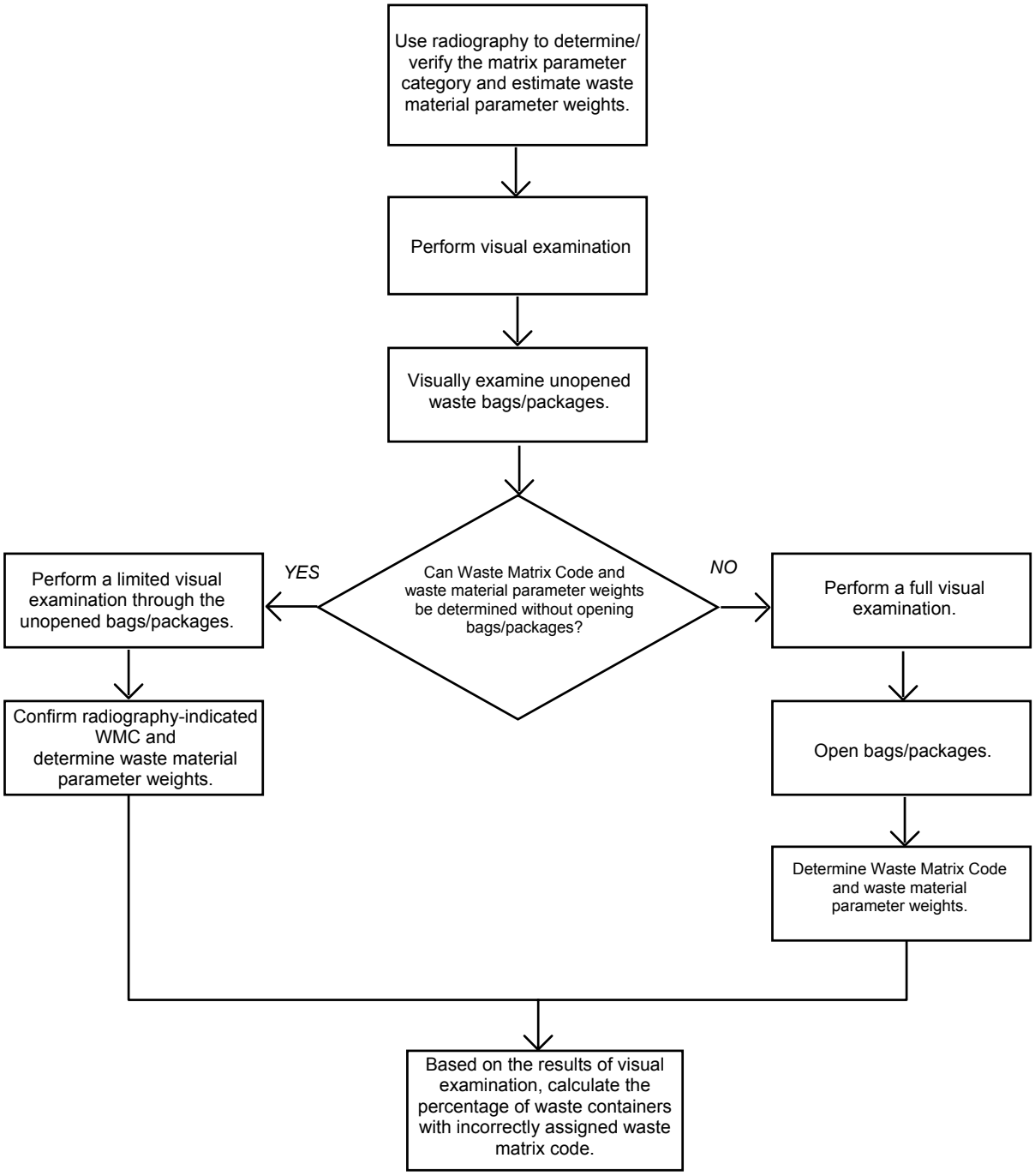


Figure B1-3, Overall Programmatic Approach to Visual Examination of the Waste for Confirmation of RTR

B2. STATISTICAL METHODS USED IN SAMPLING AND ANALYSIS

The AMWTP uses the following statistical methods for sampling and analysis of TRU waste. These statistical methods include methods for selecting waste containers for visual inspection, selecting retrievably stored waste containers for totals analysis, setting the upper confidence limit, and control charting for newly generated waste stream sampling.

B2-1 Approach for Statistically Selecting Waste Containers for Visual Examination (to confirm RTR)

As a QC check on the radiographic examination of waste containers, a statistically selected portion of the certified waste containers is opened and visually examined. The data from VE are used to verify the waste matrix code, waste material parameter weights, and absence of prohibited items as determined by radiography.

The data obtained from the visual examination are also used to determine, with acceptable confidence, the percentage of miscertified waste containers from the radiographic examination. Miscertified containers are those that radiography indicates meet the WAC for the WIPP and the TRUPACT-Il Authorized Methods for Payload Control but that VE indicates do not meet these criteria.

Initially, the AMWTP will use an eleven-percent (11%) miscertification rate to calculate the number of waste containers to undergo VE until an AMWTP-specific miscertification rate is established. The AMWTP will establish a site-specific miscertification rate is by characterizing at least fifty containers in a single summary category group at the initial 11% miscertification rate. The results of this initial characterization then serve as the site-specific miscertification rate until reassessed as described below.

The site-specific miscertification rate is applied initially to each summary category group to determine the number of containers in that summary category group requiring visual examination, as specified in Table B2-1. However, a summary category group specific miscertification rate is determined when either six months have passed since radiographic characterization commenced on a given summary category group, or at least 50% of a given summary category group has undergone radiographic characterization, whichever occurs first. The summary category group is then subject to the VE requirements of this reevaluated summary category group miscertification rate to ensure that the entire summary category group is appropriately characterized.

Table B2-1 provides the number of waste containers per summary category group that undergo VE for various miscertification rates and waste container population sizes using a hypergeometric sampling approach. A miscertification rate of 1% is used for any waste stream-specific miscertification rate calculated to be less than 1%.

The site-specific miscertification rate is reassessed annually by calculating a drum-weighted average of all historic summary category group miscertification rates. Each summary category group miscertification rate is rounded off to the nearest integer value before being used to calculate the new site-specific miscertification rate. A miscertification rate of 1% is used for any site-specific miscertification rate calculated to be less than 1%.

The number of waste containers requiring VE (as identified in Table B2-1) utilizes a hypergeometric approach and is based on a 90 percent confidence that the actual miscertification rate (for the population) is less than the 90 percent upper confidence level (UCL), and also an 80 percent confidence that the UCL will be less than 14 percent if the actual miscertification rate is the same as the targeted percent of miscertified waste containers (column heading of Table B2-1). Thus, there is only a 10 percent probability that the UCL will be below 14 percent in the case where the actual miscertification rate is 14 percent or greater. Also, there is only a 20 percent probability that the UCL will be above 14 percent in the case where the actual miscertification rate is the same as the targeted percent.

The hypergeometric approach to determining the number of containers to undergo VE is dependant upon the defined estimate of the allowable proportion of containers that were miscertified and information on previous percentages of containers that were miscertified. The rationale and details of this methodology are discussed further in Attachment B2 of the WIPP-WAP, and compliance with the requirements for statistically selection waste containers for VE is achieved through the execution of site-specific procedure MP-TRUW-8.19, *RTR/VE Drum Selection*.

B2-2 Approach for Statistically Selecting Retrievably Stored Waste Containers for Total (or TCLP) Analysis

B2-2a Statistical Selection of Containers for Totals Analysis

The statistical approach for characterizing retrievably stored homogeneous solids and soil/gravel waste and repackaged or treated S3000 waste that the AMWTP demonstrates is not suitable for control charting using sampling and analysis 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, *Homogeneous Solids and Soils/ Gravel Sampling Plan*.

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

The sampling and analysis strategy is illustrated in Figure B2-1. 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. The preliminary estimates are made by obtaining a preliminary number of samples from the waste stream or from previous sampling from the waste stream. Preliminary estimates are based on samples from a minimum of 5 waste containers. Samples collected to establish preliminary estimates that are selected, sampled, and analyzed 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 for the mean, variance and the appropriate number of samples (*n)* to be collected for each contaminant is calculated in accordance with the equations presented in Section B2-2a of the WIPP-WAP.

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.

All calculations are rounded up to the nearest integer. A minimum of five containers are sampled and analyzed in each waste stream. If there are fewer than the minimum of the required number of containers in a waste stream, one or more containers is sampled more than once to obtain the 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. 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.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the AMWTP may assign hazardous waste codes to a waste stream. 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.

B2-2b Statistical Selection of Containers for Headspace Gas Analysis

When a waste stream meets the conditions for representative headspace gas sampling as discussed in Section B-3a(1), headspace gas sampling of that waste stream may be done on a randomly selected portion of containers in the waste stream. The minimum number of containers, *n*, that must be sampled is determined by taking an initial VOC sample from 10 randomly selected containers. These samples are analyzed for all the target analytes. The standard deviation, *s,* is calculated for each of the nine VOCs in Module IV, Table IV.D.1 of the WIPP Hazardous Waste Permit. 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 equations B2-8 in the WIPP-WAP

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 B2-3b.

B2-3 Upper Confidence Limit for Statistical Sampling

B2-3a 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 equation presented in Section B2-3a of the WIPP-WAP.

If the observed sample *n** estimate results in greater than 20 percent 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 continues until the difference between *n** and the previous sample determination is less than 20 percent.

Once sufficient sampling and analysis has occurred, the waste characterization will proceed. The assessment is made with 90 percent confidence. The UCL_{90} for the mean concentration of each contaminant will be calculated in accordance with the equation presented in Section B2-3a of the WIPP-WAP.

If the UCL_{90} for the mean concentration is less than the regulatory threshold limit, the waste stream is not assigned the hazardous waste code for this contaminant. If the UCL_{90} is greater than or equal to the regulatory threshold limit, the waste stream is assigned the hazardous waste code for this contaminant.

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

B2-3b Upper Confidence Limit for Statistical Headspace Gas Sampling

If a waste stream meets the conditions for representative headspace gas sampling in Section B-3a(1), 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 using the equation presented in Section B2-3b of the WIPP-WAP.

If the observed sample n* estimate results in greater than 20 percent 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 continues until the difference between n* and the previous sample determination is less than 20 percent.

Then, the UCL_{90} is calculated using the UCL_{90} equation presented in Section B2-3a of the WIPP-WAP. In this case, the UCL_{90} is the 90 percent upper confidence VOC concentration, x is the $\bar{x}$ calculated mean VOC concentration and s is the standard deviation. The value of $t(\alpha, n-1)$ is taken from Table 9-2 of Chapter 9 of SW-846. When composite sample headspace gas sample results are used, the mean, standard deviation, and t-statistic are based on the number of composite samples analyzed, rather than the number of containers sampled.

The calculated UCL_{90} concentration for each headspace gas VOC is then assigned to those containers in the waste stream not selected for headspace gas sampling. If the calculated UCL_{90} concentration is less than the applicable MDL, the MDL for the VOC is assigned to each unsampled container instead of the UCL_{90} concentration. Compliance with the requirements for calculations and comparisons for the UCL_{90} to regulatory threshold is achieved through MP-TRUW-8.11, *Data Reconciliation.*

B2-4 Control Charting for Newly Generated Waste Stream Sampling

For newly generated waste streams that AMWTP characterizes using control charts, significant process changes and process fluctuations associated with newly generated waste is determined using statistical process control (SPC) charting techniques; these techniques require historical data for determining limits for indicator species, and subsequent periodic sampling to assess process behavior relative to historical limits. SPC is performed on waste prior to solidification or packaging for ease of sampling. If the limits are exceeded for any toxicity characteristic parameter, the waste stream is recharacterized, and the characterization is performed according to procedures required in the WIPP-WAP.

A Shewhart control chart (Gilbert 1987) is a control chart for means that can be used for checking whether current data are consistent with past data and whether shifts or trends in means have occurred. The control chart for means is constructed of a center line and upper and lower control limits that are based on the mean and standard deviation of historical data for the process. If a current sample mean from the process lies within the limits, the process is said to be "in control", or consistent with historical data. If the current mean exceeds the limits, the process has likely changed from historical periods.

Logical sets of historical data are used for the construction of limits in this application. The sets originate from initial characterization of the waste stream (if available), from characterization of a different lot of the same waste stream, or from a similar retrievably stored waste stream. At a minimum, a logical set includes ten representative sample values collected and analyzed from the newly generated waste stream. The data used for construction of the limits is justified. The underlying assumptions for control charts are that the data are independent and normally distributed with constant mean μ and constant variance σ^2. The statistical tests for normality are conducted and data transformation to normality performed, if necessary. Transformations take place prior to any calculations that use the data.

Each limit is constructed such that there is a 90 percent confidence that the true mean does not exceed a limit. One-sided control limits are used because once a waste stream has been determined to be RCRA-hazardous, the limit exceedance of interest is on the lower side; that is when the process may become nonhazardous. Likewise, once a waste stream has been determined not to be RCRA-hazardous, the limit exceedance of interest is on the upper side; that is when the process may become RCRA-hazardous. Whether or not exceeding the limit would result in a change in the RCRA-hazardous nature of the waste stream depends on how close the observed control limits are to RCRA limits.

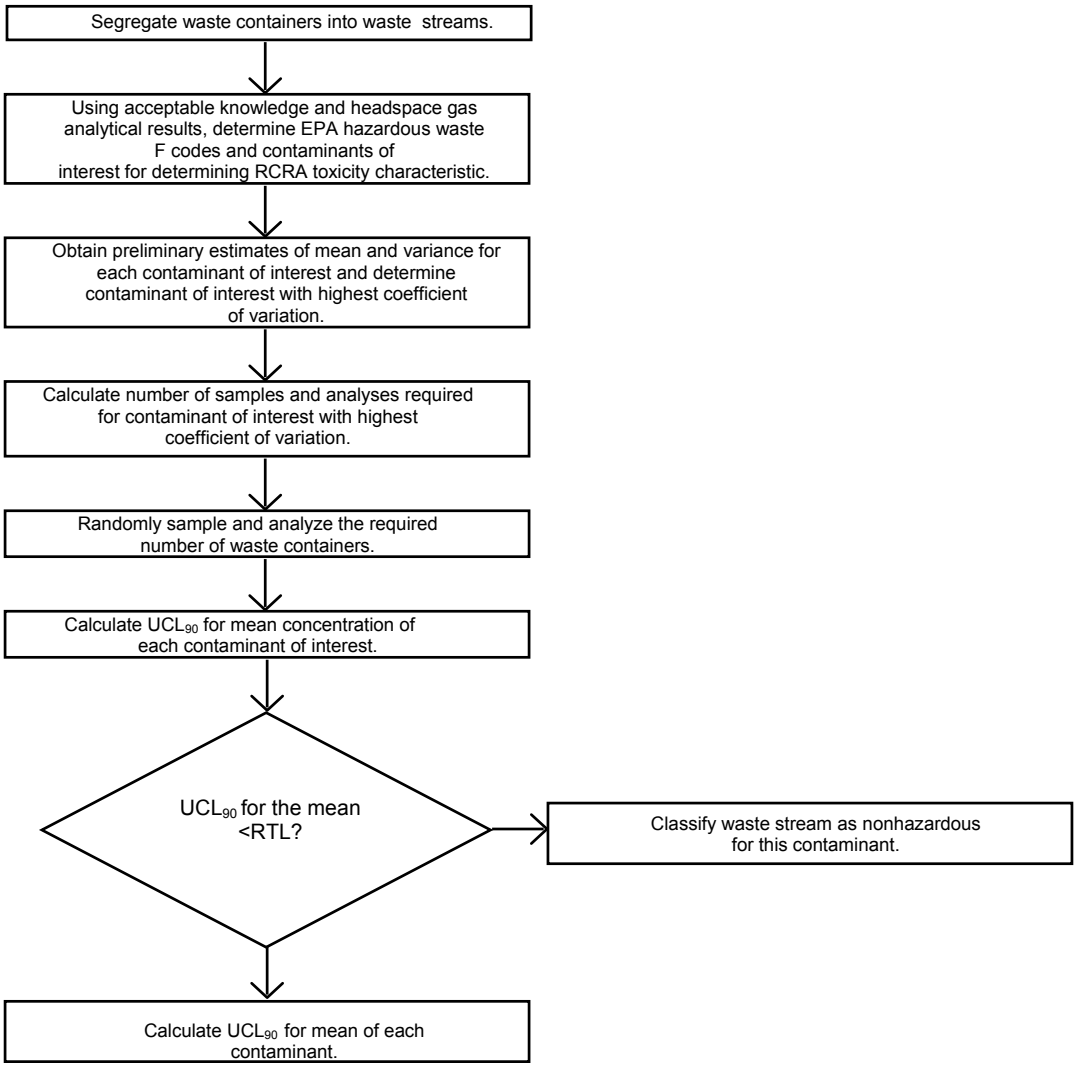
Current process data is collected and averaged for comparison to the control limit for the mean. The collection period and number of samples included in the average are dependent on the waste stream characteristics. A small number of samples will reflect more of the process variability and there will potentially be more limit exceedance. If two or three samples are collected for the mean in the required annual (or batch) sampling of a relatively homogeneous waste stream, limit exceedances may not occur. If the waste stream is less homogeneous, it is necessary to collect more samples to meet the required confidence limit.

Periodically it is necessary to update the control limit for a process. An update is performed that includes all historical data if there is no evidence of a trend in the process or a shift in the mean for the process. If there has been a shift in the mean, only more recent data that reflects the shift is used. Control limits are based on at least ten data points that are representative of the process and do not exhibit outliers or a trend with time.

Table B2-1, Number of Waste Containers Requiring Visual Examination

ANNUAL NUMBER OF WASTE CONTAINERS PER SUMMARY CATEGORY GROUP UNDERGOING CHARACTERIZATION	NUMBER OF WASTE CONTAINERS REQUIRING VISUAL EXAMINATION BASED ON PERCENT OF WASTE CONTAINERS MISCERTIFIED TO WIPP-WAC BY RADIOGRAPHY IN PREVIOUS YEAR(S)													
	1% or less	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14% or greater
50 or less	22[a]	22	22[a]	22	29[a]	29	41[a]	41	46[a]	46	50[a]	50	50[a]	50
100	15	24	24	33	33	41	48	62	69	81	87	96	100	100
200	15	26	26	35	44	52	68	83	105	126	152	176	196	200
300	15	26	26	35	44	53	70	94	116	153	202	247	287	300
400	15	26	26	36	45	62	79	103	134	178	235	316	377	400
500	16	26	26	36	45	63	80	104	143	196	268	364	465	500
1000	16	27	27	36	46	64	81	114	162	239	359	568	848	1000
1500	16	27	27	37	46	64	81	123	171	257	416	701	1176	1500
2000	16	27	27	37	46	64	90	123	172	266	441	795	1453	2000

[a] Number of containers for the higher even-number percent of miscertified containers is used because an odd percent implies a noninteger number of containers are likely to be miscertified.



RTL = Regulatory Threshold Limit
UCL_{90} = Upper 90-percent One-sided Confidence Limit

Figure B2-1, Statistical Approach to Sampling and Analysis of Waste Streams of Retrievably Stored Homogeneous Solids and Soil/Gravel

B3. QUALITY ASSSURANCE OBJECTIVES AND DATA VALIDATION TECHNIQUES FOR WASTE CHARACTERIZATION SAMPLING AND ANALYTICAL METHODS

B3-1 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 method detection limit (as appropriate) for analytical data (headspace gas VOCs, total VOCs, SVOC, and metals analysis). Results of these determinations are compared with the QAOs specified in Sections B3-2 through B3-9. Qualitative determination of comparability and representativeness is also performed.

Information generated by radiography and VE is qualitative data and is not amenable to statistical data quality analysis. However, radiography and VE are complementary techniques yielding similar data to determine the waste matrix code and waste material parameter weights of waste present in a container. VE results are used to verify the waste material parameter weights of waste present in the container. VE results are used to verify the waste matrix code and waste material parameter weights determined by radiography. The waste matrix code is determined and the waste material parameter weights are estimated to verify 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:

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

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:

$$\%RSD = \frac{s}{\bar{y}} \times 100$$

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:

$$s = \sqrt{\frac{\sum_{i=1}^{n} \left(y_i - \bar{y}\right)^2}{n-1}}$$

where y_i is the measured value of the i^{th} 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:

$$\%D = \frac{\left|C_1 - C_2\right|}{C_1} \times 100$$

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:

$$\%R = \frac{C_m}{C_t} \times 100$$

where C_m is the measured concentration value obtained by analyzing the sample and C_t 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:

$$\%R = \frac{S - U}{C_{sa}} \times 100$$

where S is the measured concentration in the spiked aliquot, U is the measured concentration in the unspiked aliquot, and C_{sa} 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 is defined as follows:

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

where $t_{(n\text{-}1,\ 1\text{-}a\ =\ .99)}$ is the *t*-distribution value appropriate to a 99% confidence level and a standard deviation estimate 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:

MDL = 3s

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 laboratory control sample or on-line control samples.

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:

$$\%C = \frac{V}{n} \times 100$$

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

Valid sampling and analysis results are those meeting one of the following criteria:

- No NCRs are associated with the result
- Any NCRs associated with the result do not result in rejection of the sampling or analytical work.

Comparability

Comparability is the degree to which one data set can be compared to another. Comparability of data generated at different sites is assured through the use of standardized, approved testing, sampling, preservation, and analytical techniques and by meeting the QAOs specified in Sections B3-2 through B3-9.

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 quality control 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 visual examination and homogeneous solids and soil/gravel sampling and analysis is validated through documentation, and this confirms a true random sample with an adequate population was collected. 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 or summary category, as applicable, 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.

Nonconformance to Data Quality Objectives (DQOs)

WIPP will be notified within five (5) calendar days of identification that a non-administrative nonconformance has been identified at the SPM signature release level [i.e., failure to meet data quality objective (DQO)]. and will receive a nonconformance report within thirty (30) calendar days of identification of the incident.

Procedures contain specific QC requirements to ensure the data generated meet the DQOs. Reported data that do not meet DQOs are treated as a nonconformance and reported to CBFO as described in MP-Q&SI-5.4, *Identification of Nonconforming Conditions*, and MP-Q&SI-5.3, *Corrective Action* and MP-TRUW-8.28, *Project Level Administrative Controls for Analytical Laboratory Department*. The AMWTP will implement corrective actions that remedy the nonconformance prior to shipment to WIPP.

Identification of Tentatively Identified Compounds (TICs)

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

AMWTP and ALD 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-13, Drum Vent/Headspace Gas Sample Operations. TIC evaluation for total VOC and SVOC analysis is addressed in ACMM-9260, *Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS)* and ACMM-9270, *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 $\pm$ 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 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 contain 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 to10 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 hazardous waste codes will be assigned, if appropriate. TICs subject to inclusion on the target analyte list that are toxicity characteristic parameters shall be added to the target analyte list regardless of origin because the hazardous waste designation for these codes is not based on source. However, for toxicity characteristic and nontoxic F003 constituents, the site may take concentration into account when assessing whether to add a hazardous waste code. If a target analyte list for a waste stream is expanded due to the presence of TICs, all 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-8.11, *Data Reconciliation* and MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation.*

B3-2 Headspace Gas Sampling (HSGS)

Quality Assurance Objectives

HSGS occurs from the headspace within each drum of TRU mixed waste or randomly selected containers from waste streams that meet the conditions for reduced gas sampling (as defined in Section B-3a(1)) destined for WIPP. Headspace gas samples are collected in accordance with INST-OI-13, *Drum Vent/Head Space Sample Operations.*

Precision and accuracy of drum HSGS operations are assessed by analyzing QC samples that consist of field and equipment blanks, field duplicates, and field reference standards. If the QAOs in this section are not met, then an NCR must be prepared, submitted, and resolved (see Section B3-13). Table B1-2 summarizes the field QC sample collection requirements and Table B1-3 summarizes the QC sample acceptance criteria.

Precision

The precision of HSGS and analysis are assessed by collection of sequential on-line duplicates for an on-line integrated sampling analysis system or simultaneous collection, should AMWTF choose to use direct canister sampling. The RPD is calculated for each on-line sample/duplicate pair and compared with the criterion of less than or equal to 25%. If the RPD exceeds the criterion and the analyte concentration exceeds its PRQL, an NCR must be prepared, submitted, and resolved (see Section B3-13).

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 for every 20 drums sampled or per sampling batch. The %R for each analyte is calculated and compared with the acceptance criteria of 70-130%, inclusive. If a %R is outside the criteria, an NCR must be prepared, submitted, and resolved (see Section B3-13).

Field blanks are collected using the HSGS equipment at a frequency of 1 field blank every 20 drums sampled or sampling batch sampled to assess the accuracy of the HSGS methods. 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. For field blanks and on-line blanks, the concentration of each target analyte must be less than or equal to three times the program-required MDL. If the concentration of any target compound listed in Table B3-2 is outside the criteria, an NCR must be prepared, submitted, and resolved (see Section B3-13).

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. The completeness can also be expressed as the number of valid samples collected as a percent of the total number of drums for each waste stream. A valid sample is defined as a sample collected per approved sampling methods from a drum that was properly prepared for sampling (the poly liner was vented to the drum headspace). The SQAO verifies a minimum 90% completeness is achieved on each data package. The amount and type of data that may be lost during the HSGS operation cannot be predicted in advance. The AMWTP SQAO 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 Section B1 and application of data usability criteria, ensure HSGS 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 on-line integrated sampling system and laboratories analyzing samples successfully participate in the PDP.

Representativeness

Specific HSGS 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 B1-1
- 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.
- OVA calibrated daily, prior to use, or as necessary according manufactures specifications.

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

B3-3 Sampling of Homogeneous Solids and Soils/Gravel

Quality Assurance Objectives (QAOs)

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, *Drum Coring Operations*. 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.

Precision

Sampling precision is determined by collecting and sampling field duplicates (e.g., co-located cores or co-located samples as described in Section B1-2b(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), collected within 14 calendar days of the first sample in the batch. The RPD between collocated core samples is calculated and reported by the SQAO 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 collocated 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 drums 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 B3-4, B3-6, and B3-8. 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 drum using randomly selected horizontal and vertical planes per INST-OI-16, *Drum Coring Operations*. 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:

$$Core\ recovery\ (\%) = \frac{y}{x} \times 100$$

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 corre 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 and a core collected. The core with the best core recovery is used for sample collection.

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

B3-4 Radiography

Quality Assurance Objectives

The QAOs for radiography are detailed in this section. It should be noted that radiography does not have a specific MDL because it is primarily a qualitative determination. The objective of radiography is to verify the Waste Matrix Code, identify prohibited items for each waste container, and estimate each waste material parameter weight (Table B3-1). All activities required to achieve these objectives are described or incorporated by reference in this QAPjP and INST-OI-12, *Real Time Radiography System Operations.*

Data to meet these objectives are obtained from an audio/videotaped (or equivalent media) scan provided by trained and qualified radiography operators. Results are also recorded on an radiography data form. The precision, accuracy, completeness, and comparability objectives for radiography data are described in the following sections.

In the event QAOs are not met, an NCR is issued per MP-Q&SI-5.4, *Identification of Nonconforming Conditions,* and corrective action is taken per MP-Q&SI-5.3, *Corrective Action*.

Precision

The qualitative determinations made during radiography do not lend themselves to the statistical evaluation of precision because of the nature of the inspection. As a measure of precision, the SQAO or designee calculates and reports the RPD between the estimated waste material parameter weights (Table B3-1) as determined by radiography and these same parameters as determined by VE.

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

Accuracy

The programmatic accuracy at which the waste matrix code and waste material parameter weights can be determined, is documented through the VE of a randomly-selected statistical portion of waste containers (See Section B2-1). The SQAO or designee calculates and reports the miscertification rate of waste containers that require assignment to a different waste matrix code or are found to contain prohibited items after VE as a measure of radiography accuracy. The miscertification rate is used to determine the number of drums subject to confirmatory VE.

Completeness

An audio/videotape (or equivalent media) of the radiography examination and a validated radiography data form is obtained for 100% of the retrievably stored waste containers subject to radiography. All audio/videotape (or equivalent media) and radiography data forms are subject to validation as indicated in Sections B3-10.

Comparability

Using standardized radiography procedures and operator qualification enhances the comparability of radiography data. Operator training requirements are outlined in Section B1-3b. radiography operators comply with the training and qualification requirements specified in MP-RTQP-14.4, *Personnel Qualification and Certification.*

B3-5 Gas Volatile Organic Compounds Analysis

Quality Assurance Objectives

The specified QAOs in Table B3-2 represent the required quality of data necessary to draw valid conclusions regarding program objectives. WIPP-WAP-related limits, such as the program required quantitation limits (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 are included in Table B3-3. Key data quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed by analyzing laboratory duplicates and replicate analyses of laboratory control samples, and PDP blind-audit samples. The results of these QC samples are compared with the acceptance criteria in Tables B3-2. 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-TRUW-8.2.1, *HSG Calibration*, by analyzing a minimum of seven replicate method performance samples. The %RSD is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-3**.** The %RSD must comply with these criteria before the procedure can be used to analyze WIPP samples. Continuing method precision performance is demonstrated semiannually through analysis of at least four method performance samples. The %RSD must be within the Table B3-3 acceptance criteria. If these criteria are not met, corrective action is performed. Further analyses cannot be performed until acceptable method precision is demonstrated.

An on-line duplicate is analyzed with every on-line batch. Calculating the RPD between the sample and the duplicate results assesses the precision within an on-line batch. For target compounds with concentrations exceeding their PRQL, the RPD must comply with the criteria in Table B3-3. If the RPD is not within the criteria, an NCR is prepared and corrective action taken.

The AMWTP also analyzes PDP blind-audit samples. If notified by CBFO that the precision of the PDP analyses is not acceptable, corrective action is taken.

Accuracy

Accuracy as %R is assessed for the analytical methods by analyzing PDP blind-audit samples and laboratory control samples. The results from these measurements are compared with the acceptance criteria in Table B3-2. 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-TRUW-8.2.1, *HSG Calibration,* by analyzing a minimum of seven replicate method performance samples. The average percent recovery (%R) is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-2. The %R must comply with these criteria before the method can be used to analyze WIPP samples. Continuing method accuracy performance is demonstrated semiannually through analysis of at least four method performance samples. The %R must meet Table B3-3 acceptance criteria. If these criteria are not met, corrective action is initiated. Further analyses cannot be performed until acceptable accuracy is demonstrated through additional replicate analyses of method performance samples.

At least one on-line control sample (OLCS) per analytical batch is analyzed to assess method accuracy within the batch. The %R of the OLCS must meet the acceptance criteria in Table B3-3. Whenever possible, samples associated with a failed OLCS are reanalyzed after corrective action is taken. If a noncompliant OLCS is associated with reported sample data, an NCR is prepared.

The AMWTP also analyzes PDP blind-audit samples. If notified by CBFO that the PDP analyses is not acceptable, corrective action is taken.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations are performed and evaluated using INST-OI-13, Drum Vent/Headspace Gas Sample Operations, and criteria specified in Table B3-3. 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 B3-2. MDLs are determined as described in INST-TRUW-8.2.1, *HSG Calibration*.

Program Required Quantitation Limit

The AMWTP demonstrates the capability to quantitate at or below the PRQL by setting the analyte concentrations of at least one calibration standard below the PRQLs in Table B3-2. Standard preparation requirements are provided in INST-TRUW-8.2.1, *HSG Calibration*. Analysis is performed in accordance with INST-OI-13, *Drum Vent/Head Space Sample Operations.*

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 B3-2 and B3-3; and meet the detection limit, calibration, representativeness, and comparability criteria within this section.

Comparability

Comparability of analytical data is ensured by consistent use of uniform procedures based on standardized methods, use of standards and QC samples with documented traceability to recognized national standards (for example, NIST), and successful participation in the Gas PDP.

Representativeness

Representativeness 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 B1.

B3-6 Total Volatile Organic Compound Analysis

Total VOC analysis is performed at the Analytical Laboratories Department (ALD).

Quality Assurance Objectives

The specified QAOs in Table B3-4 represent the required quality of data necessary to draw valid conclusions. A summary of required QC samples and the associated acceptance criteria is included in Table B3-5. Acceptable method performance is demonstrated using the matrix-independent QC samples in Table B3-5. Corrective actions are triggered when these control limits are exceeded. Method performance in specific sample matrices is evaluated using the matrix-dependent QC samples in Table B3-5; data are qualified if control limits are exceeded but nonconformance reporting is not required.

Precision

Precision is assessed through the analysis of laboratory duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. The results of these QC samples are compared with the acceptance criteria in Table B3-4. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Precision is initially assessed using analytical methods ACMM-9260, *Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS),* and ACMM-9441, *Determination of Nonhalogenated Volatile Organics by Gas Chromatography,* by analyzing a minimum of seven replicate method performance samples. The %RSD is calculated for the replicate analyses and compared to the acceptance criteria in Table B3-5. The %RSD must comply with these criteria before the procedure can be used to analyze WIPP samples. Continuing method precision performance is demonstrated semiannually through analysis of at least four method performance demonstration samples. The %RSD must be within the Table B3-5 acceptance criteria. If these criteria are not met, corrective action is taken. Further analyses cannot be performed until acceptable precision is demonstrated through additional replicate analyses of method performance samples.

A matrix spike and matrix spike duplicate (MSD) pair is analyzed with every analytical batch. As allowed by Table B3-5, the MSD is used in lieu of a laboratory duplicate. The precision within an analytical batch is assessed by calculating the RPD between the matrix spike and MSD results. The RPD must comply with the acceptance criteria in Table B3-5. If the RPD is not within the criteria, corrective action is taken. If the poor precision is traced to the sample matrix, sample data are flagged with a "Z", per Section B3-12. An NCR is not required when the problem is traced to the matrix.

The ALD also analyzes PDP blind-audit samples. If notified that the precision of the PDP analyses is not acceptable, corrective action is taken per the *PDP Plan for the RCRA Constituent Analysis of Solidified Wastes* (Solid PDP Plan) (DOE/CAO-95-1077).

Accuracy

Accuracy as %R is assessed for the analytical methods by analyzing laboratory control samples, matrix spikes, surrogate compounds, and PDP blind-audit samples. The results from these measurements for laboratory control samples and matrix spike samples are compared with the %R criteria in Table B3-4. Surrogates and internal standards are evaluated as specified in SW846 or Table B3-5. The QC measurements independent of matrix will be used to demonstrate acceptable method performance. Corrective actions are triggered when control limits are exceeded.

Accuracy is initially assessed using analytical methods ACMMs-9260 and -9441 by analyzing a minimum of seven replicate method performance samples. The average %R is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-5. The %R must comply with the criteria before the procedure can be used to analyze WIPP samples. Continuing method accuracy performance is demonstrated semiannually through analysis of at least four method performance samples. The %R must be within the Table B3-5 acceptance criteria. If these criteria are not met, corrective action is taken. Further analyses cannot be performed until acceptable accuracy is demonstrated through additional replicate analyses of method performance samples.

At least one LCS is analyzed with each analytical batch. Method accuracy within the analytical batch is assessed by calculating the %R for the LCS compounds. The %Rs must comply with the acceptance criteria in Table B3-5. If the %R is not within the acceptance criteria and the 14-day preparation-to-extraction holding time has not been exceeded, the associated samples may be reprepared and reanalyzed. If a noncompliant LCS is associated with reported sample data, an NCR is initiated.

Accuracy for a specific sample matrix is assessed by analysis of a matrix spike/MSD sample pair in every analytical batch and calculation of the %R for the MS and the MSD. The %Rs must comply with the acceptance criteria in Table B3-5. If MS/MSD matrix, sample data are flagged with a "Z" qualifier per Table B3-5. An NCR is not required when the problem is traced to the matrix.

A minimum of one laboratory blank is analyzed per analytical batch to demonstrate acceptable levels of laboratory contamination. Laboratory blanks are carried through the entire sample preparation and analysis process. If analytes are detected in a laboratory blank (see Table B3-14) the associated sample data are flagged with a B qualifier. Laboratory blank results are compared with the acceptance criteria in Table B3-5, and an NCR is initiated if acceptance criteria are exceeded.

Surrogate compounds (system monitoring compounds) are added to each sample to monitor system performance in specific sample matrices. Surrogate compound percent recoveries are calculated and compared with the acceptance criteria in Table B3-5. Corrective measures defined in EPA SW-846 Methods 8260 and 8000 are followed in case of surrogate failure. Surrogate compound data that do not meet the acceptance criteria are flagged with a "Z" flag. Because surrogate compound recovery is influenced by sample matrix, NCRs are not initiated for surrogate failures.

The laboratory also analyzes PDP blind-audit samples. If notified that the accuracy of the PDP analyses is not acceptable, corrective action is taken per the Solid PDP Plan.

Calibration

Tunes, initial calibrations, and continuing calibrations are performed per Table B3-5 and applicable EPA SW-846 methods for GC/MS and GC. These criteria will be used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Method Detection Limit

MDLs are determined for each analytical method initially, then semiannually. MDLs are expressed in milligrams per killogram (mg/kg) for VOCs. Procedures for determining MDLs are included in ACMMs-9260 and -9441, and are based on the requirements in Section B3-1. The measured MDLs are compared with the required MDLs in Table B3-4. If the MDLs are not met, corrective action is taken and the MDLs redetermined. Analyses do not proceed until the MDL criteria are met.

Program Required Quantitation Limit

The ALD demonstrates capability to quantitate analytes in samples at or below the Table B3-4 PRQLs by setting the analyte concentrations of at least one calibration standard below their respective PRQLs. Procedures for preparing calibration standards are included in ACMMs-9260 and –9441.

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 an application of the QC criteria specified in Tables B3-4 and B3-5 and meet the calibration, detection limit, representativeness and comparability criteria within this section. Completeness is calculated at the project level during SQAO review per MP-TRUW-8.9, Level II Data Validation.

Comparability

Comparability of analytical data is ensured by consistent use of uniform procedures based on standardized EPA SW-846 sample preparation and methods that meet the QAOs specified in Tables B3-4 and B3-5, use of standards and QC samples with documented traceability to recognized national standards (for example, NIST) and successful participation in the Solid 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 modification.

Representativeness

Representativeness for VOC analysis is achieved by collecting unbiased samples as addressed in Section B1-2.

B3-7 Total Semivolatile Organic Compound Analysis

Total SVOC analysis is performed at the Analytical Laboratories Department (ALD).

Quality Assurance Objectives

The QAOs in Table B3-6 represent the required quality of data necessary to draw valid conclusions regarding program objectives. WIPP-WAP required limits, such as PRQLs, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of required QC samples and the associated acceptance criteria for this analysis is included in Table B3-7. Corrective actions are triggered when these control limits are exceeded. Method performance in specific sample matrices is evaluated using the matrix-dependent QC samples in Table B3-7; data are qualified if control limits are exceeded but nonconformance reporting is not required. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. The results of these QC samples are compared with the acceptance criteria in Table B3-6. The QC measurements independent of matrix will be used to demonstrate acceptable method performance. Corrective actions are triggered when control limits are exceeded.

Precision is initially assessed using analytical methods ACMM-9270, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry* and ACMM-9080, *Determination of Polychlorinated Biphenyls (PCBs) by Gas Chromatography*, by analyzing a minimum of seven replicate method performance samples. The %RSD is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-7. The %RSD must comply with these criteria before the procedure can be used to analyze WIPP samples. Continuing method precision performance is demonstrated semiannually through analysis of at least four method performance samples. The %RSD must be within the Table B3-7 acceptance criteria. If these criteria are not met, corrective action is taken. Further analyses cannot be performed until acceptable precision is demonstrated through additional replicate analyses of method performance samples.

A matrix spike and MSD pair is analyzed with every analytical batch. As allowed by Table B3-7, the matrix spike duplicate is used in lieu of a laboratory duplicate. The precision within an analytical batch is assessed by calculating the RPD between the matrix spike and MSD results. The RPD must comply with the acceptance criteria in Table B3-7. If the RPD is not within the criteria, corrective action is taken. If the poor precision is traced to the sample matrix, sample data are flagged with a "Z" per Section B3-12. An NCR is not required when the problem is traced to the matrix.

The ALD also analyzes PDP blind-audit samples. If notified that the precision of the PDP analyses is not acceptable, corrective action is taken per the Solid PDP Plan.

Accuracy

Accuracy as %R is assessed for the analytical methods by analyzing laboratory control samples, matrix spikes, surrogate compounds, and PDP blind-audit samples. The results from these measurements for laboratory control samples and matrix spikes samples are compared to the %R criteria listed in Table B3-6. Results of surrogates and internal standards are evaluated as specified in the SW-846 method (EPA 1996) or Table B3-7. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy is initially assessed using analytical methods ACMMs-9270 and -9080 by analyzing a minimum of seven replicate method performance samples. The average %R is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-7. The %R must comply with these criteria before the procedure can be used to analyze WIPP samples. Continuing method accuracy performance is demonstrated semiannually through analysis of at least four method performance samples. The %R must be within the Table B3-7 acceptance criteria. If these criteria are not met, corrective action is taken. Further analyses cannot be performed until acceptable accuracy is demonstrated through additional replicate analyses of method performance samples.

At least one LCS is analyzed with each analytical batch. Method accuracy within the analytical batch is assessed by calculating the %R for the LCS compounds. The %Rs must comply with the acceptance criteria in Table B3-7. If the %R is not within the acceptance criteria and the 14-day preparation–to-extraction holding time has not been exceeded, the associated samples may be reprepared and reanalyzed. If a noncompliant LCS is associated with reported sample data, an NCR is prepared.

Accuracy for a specific sample matrix is assessed by analysis of a matrix spike/MSD sample pair in every analytical batch and calculation of the %R for the matrix spike and the MSD. The %Rs must comply with the acceptance criteria in Table B3-7. If MS/MSD %Rs do not meet the criteria, and the poor accuracy is traced to the sample matrix, sample data are flagged with a "Z" qualifier per Table B3-7. An NCR is not required when the problem is traced to the matrix..

A minimum of one laboratory blank is analyzed per analytical batch to demonstrate acceptable levels of laboratory contamination. Laboratory blanks are carried through the entire sample preparation and analysis process. If analytes are detected in a laboratory blank (see Table B3-14), the associated sample data are flagged with a B qualifier. Laboratory blank results are compared with the acceptance criteria in Table B3-7, and an NCR is initiated if acceptance criteria are exceeded.

Surrogate compounds (system monitoring compounds) are added to each sample to monitor system performance in specific sample matrices. Surrogate compound percent recoveries are calculated and compared with the acceptance criteria in Table B3-7. Corrective measures defined in EPA SW-846 Methods 8270 and 8000 are followed in case of surrogate failure. Surrogate compound data that do not meet the acceptance criteria are flagged with a "Z" flag. Because surrogate compound recovery is influenced by sample matrix, NCRs are not prepared for surrogate failures.

The ALD also analyzes PDP blind-audit samples. If notified that the accuracy of the PDP analyses is not acceptable, corrective action is taken per the Solid PDP Plan.

Calibration

Tunes, initial calibrations, and continuing calibrations are performed and evaluated per Table B3-7 for GC/MS and GC. These criteria will be used to demonstrate acceptable calibration and trigger corrective action when control limits are exceeded.

Method Detection Limit

MDLs are determined for each analytical method initially, then semiannually. MDLs are expressed in mg/kg for SVOCs. Procedures for determining MDLs are included in ACMMs-9270 and -9080 and are based on the requirements in Section B3-1. The measured MDLs are compared with the required MDLs in Table B3-6. If the MDLs are not met, corrective action is taken and the MDLs redetermined. Analyses do not proceed until the MDL criteria are met.

Program Required Quantitation Limit

The ALD demonstrates capability to quantitate analytes in samples at or below the Table B3-6 PRQLs by setting the analyte concentrations of at least one calibration standard below their respective PRQLs. Procedures for preparing calibration standards are included in ACMMs-9270 and -9080.

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 specify data usability criteria based on application of the QC criteria specified in Tables B3-6 and B3-7 and that meet the calibration, detection limit, representativeness and comparability criteria specified within this section. Completeness is calculated at the project level during SQAO review per MP-TRUW-8.9, Level II Data Validation.

Comparability

Comparability of analytical data is ensured by consistent use of uniform procedures based on standardized methods that meet the QAOs specified in Tables B3-6 and B3-7, use of standards and QC samples with documented traceability to recognized national standards (for example, NIST), and successful participation in the Solid PDP. The most current version of SW-846 methods are consistent with QAO requirements. 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.

ACMM-9270 uses GC/MS for the analysis of all SVOC target analytes except PCBs. This method is based on EPA SW-846 Method 8270C. Samples are prepared for SVOC analysis using an ultrasonic extraction method based on EPA SW-846 Method 3550A. This extraction procedure is documented in ACMM-9500, *Sample Preparation for Semivolatile Organic Compounds and Polychlorinated Biphenyls.* ACMM-9080 is a Gas Chromatography/Electron Capture Detection (GC/ECD) method based on EPA SW-846 Method 8082 and is used for analysis of PCBs. Samples are prepared for analysis using an ultrasonic extraction method based on EPA SW-846 Method 3550A, followed by solvent exchange to hexane and florisil cleanup based on EPA SW-846 Method 3620B.

Representativeness

Representativeness for SVOC analysis is achieved by collecting unbiased samples, addressed in Section B1-2.

B3-8 Total Metal Analysis

Total metals analysis Total SVOC analysis is performed at the Analytical Laboratories Department (ALD).

Quality Assurance Objectives

The specified QAOs in Table B3-8 represent the required quality of data necessary to draw valid conclusions regarding AMWTP objectives. A summary of required QC samples and the associated acceptance criteria are included in Table B3-9. Corrective actions are triggered when these control limits are exceeded. Method performance in specific sample matrices is evaluated using the matrix-dependent QC samples in Table B3-9; data are qualified if control limits are exceeded but nonconformance reporting is not required.

Precision

Precision is assessed through the analysis of laboratory sample duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. The results of QC samples are compared with the acceptance criteria in Table B3-8.

Precision is initially assessed using analytical methods ACMM-2901, *Determination of Metals by ICP-AES for TRU Waste Characterization*, and ACMM-2810, *Determination of Mercury by CVAA for TRU Waste Characterization,* by preparing and analyzing a minimum of seven replicate method performance samples. The %RSD is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-9. The %RSD must comply with the criteria before the procedures can be used to analyze WIPP samples. Continuing method precision performance is demonstrated semiannually through analysis of at least four method performance samples. The %RSD must be within the Table B3-9 acceptance criteria. If these criteria are not met, corrective action is taken. Further analyses cannot be performed until acceptable precision is demonstrated through additional replicate analyses of method performance samples.

A matrix spike and MSD pair is analyzed with every analytical batch. As allowed by Table B3-9, the MSD is used in lieu of a laboratory duplicate. The precision within an analytical batch is assessed by calculating the RPD between the matrix spike and MSD results. The RPD must comply with the acceptance criteria in Table B3-9. If the RPD is not within the criteria, corrective action is taken. If the poor precision is traced to the sample matrix, sample data are flagged with a "Z" per Section B3-12. An NCR is not required when the problem is traced to the matrix.

The ALD also analyzes PDP blind-audit samples. If notified that the precision of the PDP analyses is not acceptable, corrective action is taken per the Solid PDP Plan.

Accuracy

Accuracy as %R is assessed for the analytical methods by analyzing laboratory control samples, matrix spikes, serial dilutions, interference check samples, and PDP blind-audit samples. The results from these measurements are compared with the acceptance criteria in Table B3-8 and Table B3-9. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Laboratory blanks and calibration blanks shall be assessed to determine possible laboratory contamination and are evaluated as specified in Table B3-9. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Accuracy is initially assessed using analytical methods ACMMs-2901 and -2810 by preparing and analyzing a minimum of seven replicate method performance samples. The average %R is calculated for the replicate analyses and compared with the acceptance criteria in Table B3-9. The %R must comply with these criteria before the procedure can be used to analyze WIPP samples. Continuing method accuracy performance is demonstrated semiannually through analysis of at least four method performance samples. The %RSD must be within the acceptance criteria in Table B3-9. If these criteria are not met, corrective action is taken. Further analyses cannot be performed until acceptable precision is demonstrated through additional replicate analyses of method performance samples.

At least one LCS is analyzed with each analytical batch. Method accuracy within the analytical batch is assessed by calculating the %R for the LCS compounds. The %Rs must comply with the acceptance criteria in Table B3-9. If a solid LCS material having established statistical control limits is used, those statistical control limits are used to evaluate the LCS method accuracy requirement. If the %R is not within the acceptance criteria and the holding time has not been exceeded, the associated samples may be reprepared and reanalyzed. If a noncompliant LCS is associated with reported sample data, an NCR is prepared.

Accuracy for a specific sample matrix is assessed by analysis of a matrix spike/MSD pair in every analytical batch and calculation of the %R for the matrix spike and MSD results. The %R must comply with the acceptance criteria in Table B3-9. If %R is not within the acceptance criteria, corrective action is taken. If the poor accuracy is traced to the sample matrix, sample data are flagged with a "Z" per Section B3-12. An NCR is not required when the problem is traced to the matrix.

A minimum of one laboratory blank is analyzed per analytical batch to monitor potential bias in sample results due to laboratory contamination. Laboratory blanks are carried through the entire sample preparation and analysis process. Laboratory blanks results are compared to the acceptance criteria in Table B3-9. If laboratory blank concentrations exceed the acceptance criteria, any associated sample having analyte concentrations less than or equal to the ten times the blank concentration and greater than or equal to half the PRQL must be redigested and reanalyzed. An NCR is initiated if redigestion and analysis are not performed.

For Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) analyses (ACMM-2901), serial dilution and interference check samples are analyzed and the accuracy of the results is assessed. The %D between the results from a sample and serial dilution is calculated to provide an indication of matrix effects on instrument accuracy. If the %D values do not meet the criteria in Table B3-9, a matrix effect is inferred and the data are flagged with a "Z". An NCR is not required because the problem is due to the matrix. The %R for target compounds in the interference check sample is calculated and compared with the criteria in Table B3-9. If the %R values do not meet acceptance criteria, the problem must be corrected and the affected samples reanalyzed. If data are reported from an analytical run with unacceptable %R values, an NCR must be prepared.

The ALD also analyzes PDP blind-audit samples. If notified that the accuracy of the PDP analyses is not acceptable, corrective action is taken per the Solid PDP Plan.

Calibration

Initial calibration/verifications and continuing calibration verifications (CCVs) are performed and evaluated using methods and criteria in Table B3-9 and the EPA SW-846 method. These criteria will be used to demonstrate acceptable calibration and trigger corrective action when control limits are exceeded.

Program Required Detection Limits

PRDLs are the maximum values for instrument detection limit (IDL) permissible for program support under the WIPP-WAP. The Instrument Detection Limits (IDLs) for each target metal is determined initially, then semiannually by procedures included in ACMMs-2901 and -2810. IDLs are expressed in units of micrograms per liter (µg/L). IDLs must be less than or equal to the PRDLs in Table B3-8 for the method used to quantitate a specific analyte. For high concentration samples, an exception to the requirements may 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. Analyses do not proceed until the IDL criteria are met.

Program Required Quantitation Limits

The ALD shall demonstrate the capability of analyte quantitation at or below the (Table B3-8) PRQLs in units of mg/kg wet weight. The ALD meets the PRQL requirement by setting the analyte concentrations of at least one QC or calibration standard at or below the solution concentration equivalent of the PRQL. Procedures for preparing calibration standards are included in ACMMs-2901 and -2810.

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 specified in Tables B3-8 and B3-9 and meet the calibration, detection limit, representativeness, and comparability criteria specified within this section. Completeness is calculated at the project level during SQAO review per MP-TRUW-8.9, *Level II Data Validation.*

Comparability

Comparability of analytical data is ensured by consistent use of uniform procedures based on standardized methods that meet the QAOs specified in Tables B3-8 and B3-9, use of standards and QC samples with documented traceability to recognized national standards (for example, NIST),and successful participation in the Solid PDP. The most current version of SW-846 methods may be used if they are consistent with QAO requirements. 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.

ACMM-8909, *Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel*, uses microwave digestion for sample preparation for ICP-AES analysis. This method is based on EPA SW-846 Method 3051. ACMM-2901, which uses ICP-AES to determine metals concentrations in digested samples, is based on EPA SW-846 Method 6010B. ACMM-2810 is used for mercury sample preparation and analysis, and is based on EPA SW-846 Method 7471A.

Representativeness

Representativeness for metals analysis is achieved by collecting unbiased samples and preparation of samples in the laboratory using representative and unbiased methods as addressed in Section B1-2.

B3-9 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 are used to confirm the characterization of wastes based on AK (refer to Section B4-4). 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 hazardous waste codes based on the reevaluation of AK and sampling and analysis data 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% of the required information (B4-3). 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 in procedures that are used to implement the AK process. Assignment of hazardous waste codes will be made per Section B4-4. 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 per Section B-4. The AMWTP also assesses and documents the limitations of the AK information used to assign hazardous waste codes (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 B3-1 if the results of confirmatory analytical techniques in Section B 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 the results of AK confirmation through radiography, 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. MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation,* contains the site-specific procedure for AK.

B3-10 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 confirms 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 WIPP-WAP 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 by the independent reviewer, technical supervisor and QA Representative using paper/electronic data validation checklists. The reviews are performed in the sequence specified. If data are approved, the data are automatically promoted to the next reviewer. If the data are rejected, the data are manually/automatically demoted to the data generator for problem resolution.

Data batches approved by data generation level QA are promoted to the project level and the progressive review process is repeated by the SQAO or designee and the SPM or designee. The SQAO and the SPM completes manual/electronic data validation/verification checklists. The SPM or designee assembles a WSPF that is transmitted to WIPP with the appropriate characterization data in WWIS.

Once an approved WSPF is in place for a waste stream, the data are promoted through Certification and Transportation levels of review and approval and transferred to WWIS via WTS.

Four types of Batch Data Reports are validated at the project level as follows:

- A Testing Batch Data Report or equivalent includes all data pertaining to radiography or VE for up to 20 waste containers without regard to waste matrix. Table B3-11 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 B3-12 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 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 B3-13 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. For on-line integrated headspace-gas sampling/analytical systems, samples will be collected within a 12-hour period using the same on-line integrated sampling/analysis system.

The AMWTP batch numbers are assigned using a the following standard numbering convention. The conventions shall be formatted as follows:

XXXyy-nnnnnm
Where XXX = batch type indicator as follows
RTR = radiography testing batch
ASY = Assay testing batch
VVE = Visual Examination testing batch
HSA = Headspace Analytical
HSG = On-line HSG sampling batch
MHS = Manual HSG sampling batch
SSC = Solid Sampling (coring) batch
SSA = Solid Sampling analytical batch
yy = Calendar year (01 for 2001)
nnnnn = a number that starts with 00001 at the beginning of each calendar year, and increases sequentially for each batch.
m = method indicator (if needed)
Typical examples:- ASY01-00071 HSG02-11111

B3-10a 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 (if not readily apparent). 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 B-7.
- Data are organized into a standard format for reporting purposes (Batch Data Report), as outlined in specific sampling and analytical procedures.

Data review, validation, and verification at this level involve scrutiny and signature release from qualified independent technical reviewer(s), technical supervisor(s) or designee, and a QA Representative or designee 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 B3-2 through B3-9 (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; however, it need not be included in the Batch Data Report. Nonconformances 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, *Level I Data Validation* and *MCP-2008, Analytical Data Recording, Review, and Reporting.*

B3-10a(1)Independent Technical Review (ITR)

The independent technical review 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 all of the work done by the originator.

All (100%) of the Batch Data Reports receive a documented ITR. This review is 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. The ITR review and signature release 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 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 before ITR completion.
- 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 before ITR completion.
- 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.
- Reporting flags (Table B3-14) were assigned correctly.
- Sample holding time and preservation requirements were met, or exceptions documented.

- Radiography audio/video recordings were reviewed (independent observation) on a waste container basis once per testing batch, or once per day of operation, whichever is less frequent (Section B1-3b(2)). The radiography audio/videotape (or equivalent media) recordings 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 before ITR completion.

B3-10a(2)Technical Supervisory Signature Release

The technical supervisor review ensures that the independent technical review was performed completely, that the Batch Data Report is complete, and verifies that the results are technically reasonable. This review validates and verifies that the characterization performed in this area is ready for QA Representative review.

All (100%) of the Batch Data Reports receive technical supervisory (or designee) signature release for each testing batch, sampling batch, analytical and on-line batches. The technical supervisory signature release occurs as soon as practicably possible after the ITR to determine and correct negative quality trends in the sampling or analytical process. However, at a minimum, the technical supervisory signature release is performed before any waste associated with the data is shipped to WIPP. This release ensures the following:

- The data are technically reasonable based on the technique used

- All data received ITR with the exception of radiography audio/videotape (or equivalent media) recordings, which receive periodic technical reviews as specified in Section B1-3b(2).

- The testing, sampling, or analytical data QA documentation for Batch Data Reports is complete and includes, as appropriate, raw data, DAC and equilibrium times, calculation records, COC forms, calibration records, QC sample results, and original or copies of the gas sample canister tags

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

- Field sampling records are complete.

B3-10a(3) QA Representative Signature Release

The data generation level QA review ensures that Batch Data Report is complete, that QC checks meet the acceptance criteria, and that the appropriate QAOs have been met. This review verifies and validates that the characterization results meet the program QA/QC, that instrument performance criteria have been met, and that QAOs for the subject characterization area have been met. The QA review may be conducted by the Technical Supervisor, using a separate checklist.

All (100%) of the batch data reports receive Data Generation Level QA Representative or designee signature release. The QA Representative signature release occurs as soon as practicably possible after the technical supervisory signature release to determine and correct negative quality trends in the sampling or analytical process. However, at a minimum, the QA Representative signature release is performed before any waste associated with data reviewed is shipped to the WIPP facility. This release ensures the following:

- Independent technical and technical supervisory reviews were performed as evidenced by the appropriate signature releases
- QA documentation for the Batch Data Report is completed as appropriate for the point of data generation
- Sampling and laboratory QC checks were properly performed, and QC criteria that were not met are documented
- QAOs have been met according to methods out-lined in Section B3-11.

B3-10b Project Level

Data review, validation, and verification at this level involves scrutiny and signature release from the SPM or designee and the SQAO 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.

The SPM and the SQAO 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.

B3-10b(1)SQAO Signature Review and Release of Batch Data Reports

The SQAO review ensures that the Batch Data Reports received from the data generation are complete, validates and verifies that the QC checks were done properly and meet program criteria, and ensures that the QAOs have been met.

All (100%) of the Batch Data Reports receive SQAO or designee signature release. The SQAO signature release occurs as soon as practicably possible to determine and correct negative quality trends in the sampling or analytical process.

However, at a minimum, the SQAO signature release is performed before any waste associated with data reviewed is shipped to WIPP. This signature release ensures the following:

- Batch Data Reports are complete and data are properly reported (i.e., data are reported in correct units, and with correct qualifying flags)
- Sampling batch QC checks (e.g., equipment blanks, field duplicates, field reference standards) were properly performed, meet the established QAOs, and are within established data usability criteria
- 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 B1-3b(2).
- Analytical QC checks (e.g., laboratory duplicates, laboratory blanks, matrix spikes, matrix spike duplicates, laboratory control samples) were properly performed, meet the established QAOs, and are within established data usability criteria
- On-line 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 for headspace gas and homogeneous solids and soil/gravel were taken

B3-10b(2)SPM Signature Release of Batch Data Reports

The Site Project Manager review is the final validation that all of the data contained in Batch Data Reports have been properly reviewed as evidenced by signature release and completed checklists.

All (100%) of the Batch Data Reports have an SPM or designee signature release. The SPM signature release occurs as soon as practicably possible after the SQAO signature release to determine and correct negative quality trends in the sampling or analytical process. However, at a minimum, the SPM signature release is performed before any waste associated with data reviewed is shipped to WIPP. This signature release ensures the following:

- Data generation level independent technical, technical supervisory, and QA representative (or designee) review, validation, and verification have been performed as evidenced by completed review checklists and by the appropriate signature releases.
- 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 B3-11).
- The Site Project Manager or designee shall determine the validity of the drum age criteria (DAC) assignment made at the data generation level based upon an assessment of the data collection and evaluation necessary to make the assignment.

B3-10b(3)Prepare SQAO Summary and Data Validation Summary

To document the project level validation and verification described above, the SQAO (or designee) prepares the Site Project QA Officer Summary, and the SPM (or designee) prepares a Data Validation Summary. These reports may be combined to eliminate redundancy, or incorporated into the SQAO and SPM checklists. The SQAO Summary includes a validation checklist for each Batch Data Report. Checklists for the SQAO Summary are sufficiently detailed to validate all aspects of a Batch Data Report that affect data quality.

The Data Validation Summary provides confirmation that, on a per waste container 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., nonconformances), 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 or designee 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.

B3-10b(4) Prepare Waste Stream Characterization Package

In the event the CBFO request detailed information on a waste stream, AMWTP will provide a Waste Stream Characterization Package. The SPM can require each characterization area, data generation level technical supervisor/QA officer to assist in preparation and review of the Waste Stream Characterization Package (Section B3-12b(2)) as necessary to ensure the package will support the SPM's waste characterization determinations.

B3-10c CBFO Level

Not applicable to the AMWTP, this section refers to WIPP.

B3-11 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 or designee, and submitted to CBFO for review and approval. Reconciliation is performed as described in MP-TRUW-8.11, *Data Reconciliation.*

B3-11a Reconciliation at the Project Level

The SPM ensures all data generated and used in decision making meet the DQOs provided in Section B-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, 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)
- Potential flammability of TRU waste headspace gases
- 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 under 40 CFR Part 261, Subpart C
- Whether the waste stream is classified as hazardous or nonhazardous at the 90% confidence level
- Whether a sufficient number of waste containers were visually examined (as a QC check on radiography) to determine with a reasonable level of certainty that the UCL_{90} for the miscertification rate is less than 14%
- Whether an appropriate packaging configuration and Drum Age Criteria (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 per the requirements of Section B3-1 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 per Sections B3-2 through B3-9 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 before submittal of the WSPF. For subsequent shipments, data reconciliation is done on all containers or samples prior to shipment to the WIPP.

The SPM (or designee) uses MP-TRUW-8.11, *Data Reconciliation*, as the statistical procedure (Section B2) to evaluate and report waste characterization data from the analysis of homogeneous solids and soils/gravel. This procedure assesses compliance with the DQOs in Section B-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 toxicity characteristic leaching procedure (TLCP) values or results are compared to the TC levels expressed as total values. These total values will be considered regulatory threshold limit (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.

B3-11b Reconciliation at the CBFO' Level

Not applicable to the AMWTP; this section refers to CBFO.

B3-12 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.

The AMWTP utilizes WTS for data validation, reporting and WWIS transfer. Validation performed on any solid sampling and analysis at the ALD utilizes both paper and electronic data reporting and validation. All batches can be transmitted at any level in paper form upon request.

B3-12a Data Generation Level to the Project Level

At the AMWTP, data reporting is accomplished electronically with WTS to the extent possible. Data are transmitted by hard copy or electronically (hard copy is available on demand) from the data generation level to the project level (SPO). The Batch Data Reports and checklists used contain the information required by the testing, sampling, and analytical techniques described in Sections B1 through B6, as well as the signature releases to document the review, validation, and verification described in B3-10. All batch data reports and checklists will be approved formats, as provided in approved procedures.

Hard copy reports are transmitted to the AMWTP Document Control. Electronic reports through WTS are transmitted after generation level electronic signature release to the SQAO. After review by the SQAO, all Batch Data Reports are forwarded to the SPM or designee. All hard copy reports are assigned serial numbers and each page is numbered. Transmitted data include all testing, sampling, and analytical Batch Data Reports, and data review checklists.

Data generating organizations are responsible for ensuring that correct and current characterization information is forwarded to the SPO if changes to reported data are identified. This responsibility includes modifying all data packages or database records impacted by the changed characterization information.

QA documentation and records, including raw data, are maintained in either testing, sampling, and analytical facility files, or site project files per the document storage requirements presented in Section B. In addition to Batch Reports, ALD forwards sampling and analytical QA documentation to the SPO. Contract waste characterization facilities shall forward testing, sampling, and analytical QA documentation along with Batch Data Reports to the SPO for inclusion in the paper files.

B3-12b Project Level to CBFO Level

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. In addition, the site project office 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. The SQAO 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 Report.

A Waste Stream Characterization package must be submitted when requested by the CBFO.

B3-12b(1) Waste Stream Profile Form (MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms)*

The WSPF (Figure B-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
- The waste stream WIPP identification number
- Summary Category Group
- Waste Matrix Code Group
- Waste stream name
- Description of the waste stream
- Applicable EPA hazardous waste codes
- 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.

B3-12b(2) Characterization Information Summary (MP-TRUW-8.14, *Preparation of the Waste Stream Profile Forms*)

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 hazardous waste codes that must be applied to the waste stream.
- Total metal, VOC, and SVOC analytical results for homogeneous solids and soil/gravel (if applicable), and demonstration that control charting cannot be applied effectively, if this option is implemented.
- TIC listing and evaluation, and verification that AK was confirmed
- Radiography and VE summary to document prohibited items are not present and to confirm AK, and documentation and justification for the use of radiography in lieu of or in combination with visual examination/visual examination technique for newly generated waste.
- A complete listing of container identification numbers used to generate the WSPF, cross referenced to each Batch Data Report
- Complete (current and projected) AK summary including waste stream name and number, point of generation, waste stream volume, 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 B4-2b.
- Certification through acceptable knowledge or testing and/or analysis that any waste assigned the hazardous waste number of U134 (hydrofluoric acid) no longer exhibits the characteristic of corrosivity. This is confirmed by assuring that no liquid is present in U134 waste.

B3-12b(3) Waste Stream Characterization Package (MP-TRUW-8.14, *Preparation of the Waste Stream Profile Forms*)

The Waste Stream Characterization Package consists of the following:

- Waste Stream Profile Form (Section B3-12b(1))
- Accompanying Characterization Information Summary (Section B3-12b(2)
- Complete AK summary (B3-12b(2))
- Batch Data Reports supporting the confirmation of AK as well as others requested by the CBFO.
- Raw analytical data requested by the permit.

B3-12b(4)WIPP Waste Information System (WWIS) Data Reporting

The 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 *WIPP Waste Information System User's Manual for Use by Shippers/Generators*. 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-8.16, *WWIS Data Transfer.*

B3-13 Nonconformances

Work activities are monitored and controlled by the SPM and the SQAO which includes nonconformance identification, documentation, and reporting, as well as the monitoring of NCRs and Corrective Action Reports (CARs). MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*, discusses specific nonconformance procedures and corrective action processes.

Nonconformances are uncontrolled and unapproved deviations from an approved plan or procedure. Nonconforming items and activities that do not meet the WIPP-WAP requirements, procurement document criteria, or approved procedures are addressed in MP-Q&SI-5.4, *Identification of Nonconforming Conditions* and are discussed in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*. Nonconforming items are marked, tagged, or segregated and the affected personnel notified. Nonconforming items are identified, documented, and corrected in accordance with the CBFO QAPD.

Disposition of nonconforming items shall be identified and documented. MP-Q&SI-5.4, *Identification of Nonconforming Conditions,* identifies the person(s) responsible for evaluating and dispositioning nonconforming items.

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

A nonconformance report shall be prepared for each nonconformance identified. Each nonconformance report shall be initiated by the individual(s) identifying the nonconformance. The nonconformance report shall then be processed by knowledgeable and appropriate personnel. For this purpose, a nonconformance report including, or referencing as appropriate, results of laboratory analysis, QC rests, audit reports, internal memoranda, or letters shall be prepared. The nonconformance report 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 the data, if applicable
- An approval signatures specified in the site nonconformance procedures

The SQAO oversees the nonconformance reporting process and is responsible for identifying and tracking all nonconformances and report this information to CBFO. Documentation of nonconformances is made available to the SPM, who is responsible for notifying project personnel. Completion of the corrective action for nonconformances is verified by the SQAO.

The CBFO will be notified within five (5) calendar days of identification that a non-administrative nonconformance has been identified at the SPM signature release level [(i.e., failure to meet data quality objective (DQO)] and will receive a nonconformance report within thirty (30) calendar days of identification of the incident. A corrective action process will be implemented and the NCR will be resolved prior to shipment.

B3-14 Special Training Requirements and Certifications

Before performing activities that affect WIPP-WAP quality, all personnel receive indoctrination into the applicable scope, purpose, and objectives of the WIPP-WAP and the specific QAOs of the assigned task. Personnel assigned to perform activities for the WIPP-WAP 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 WIPP-WAP 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, prepared in accordance with MP-TRQP-14.1, *Preparation and Administration of Individual Training Plans,* and MP-RTQP-14.4, *Personnel Qualification and Certification.* 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 Qualification and Certification.*

Personnel involved in WIPP-WAP activities receive continuing training to ensure job proficiency is maintained. 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. Continuing training for WIPP-WAP activities 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 in accordance with MP-TRUW-8.28, *Project Level Administrative Controls for Analytical Laboratory Department*. The minimum qualifications for certain specified positions for the WIPP-WAP are summarized in Table B3-10. MP-RTQP-14.19, *Training Records Administration,* contains the requirements for maintaining records of the qualification, training, and demonstration of proficiency. MP-RTQP-14.4, *Personnel Qualification and Certification,* also identifies the responsible person(s) for ensuring all personnel maintain proficiency in the work performed and identify any additional training that may be required.

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-14.6, *Job and Training Needs Analysis*, 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.

B3-15 Changes To Plans and Procedures

Controlled changes to WIPP-WAP related plans or procedures are managed through MP-DOCS-18.4, *Document Control* and MP-TRUW-8.28, *Project Level Administrative Controls for Analytical Laboratory Department*. The SPM and the SQAO 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 B5-2) 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 B3-1
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-L (55-gal) drums.
Plastics (Packaging Materials)	90 mil polyethylene drum liner and plastic bags.

Source: DOE/CAO-94-1005, Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report (BIR) (DOE/CAO, 1995b)

TABLE B3-2
GAS VOLATILE ORGANIC COMPOUNDS TARGET ANALYTE LIST AND QUALITY ASSURANCE OBJECTIVES

Compound	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
cis-1,2-Dichloroethylene	156-59-2	≤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

[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.

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 nanograms delivered to the analytical system per sample.
PRQL = Program required quantitation limit (parts per million/volume basis)

TABLE B3-3
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 duplicates	RPD $\leq$ 25 [b]	Nonconformance if RPD > 25
Laboratory blanks or on-line duplicates	Daily before sample analysis for GC/MS and GC/FID. Otherwise, daily prior to sample analysis and one (1) per analytical or on-line	Analyte amounts ≤ 3 x MDLs for GC/MS and GC/FID	Flag data if analyte > 3 x 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

a. Corrective action per Section B3-13 when final reported QC do not meet the acceptance criteria.

b. Applies only to concentrations greater than the PRQLs listed in Table B3-2.

BFB	=	4-bromofluorobenzene
MDL	=	Method Detection Limit
QAO	=	Quality Assurance Objective
PDP	=	Performance Demonstration Program
PRQL	=	Program Required Quantitation Limit
pt	=	point
%R	=	Percent Recovery
RPD	=	Relative Percent Difference
RT	=	Retention Time

TABLE B3-4
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	60-151	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
meta-Xylene [f, g]	108-38-3	≤50	60-150	1	10	90
ortho-Xylene[g]	95-47-6	≤50	60-150	1	10	90
para-Xylene[f, g]	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
Isobutanol	78-83-1	≤50	60-150	10 [e]	100	90
Methanol	67-56-1	≤50	60-150	10 [e]	100	90
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

TABLE B3-4

VOLATILE ORGANIC COMPOUNDS TARGET ANALYTE LIST AND QUALITY ASSURANCE OBJECTIVES (continued)

Footnotes for Table B3-4:

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 B3-6 apply.

d.) Detected; result must be greater than zero.

e.) Estimate, to be determined.

f.) 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)
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
CAS = Chemical Abstract Service

TABLE B3-5
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 B3-4 QAOs	Repeat until acceptable
Laboratory duplicate	One per analytical batch	Meet Table B3-4 Precision QAOs	Nonconformance if RPDs > values in Table B3-4
Laboratory blanks	One per analytical batch	Analyte concentrations ≤3 x MDLs	Nonconformance if analyte concentrations >3 x MDLs.
Matrix spikes	One per analytical batch	Meet Table B3-4 accuracy QAOs	Flag the data with a "Z" if matrix-related exceedence; otherwise issue a nonconformance if %R is outside the range specified in Table B3-4.
Matrix spike duplicates[b]	One per analytical batch	Meet Table B3-4 accuracy and precision QAOs	Flag the data with a "Z" if matrix-related exceedence; otherwise issue a nonconformance if RPDs >values and %Rs outside the range in Table B3-4.
Laboratory control samples	One per analytical batch	Meet Table B3-4 accuracy QAOs	Nonconformance if %R < 80 or > 120°. [C]

TABLE B3-5

SUMMARY OF LABORATORY QUALITY CONTROL SAMPLES AND FREQUENCIES FOR VOLATILE ORGANIC COMPOUND ANALYSIS (continued)

GC/MS Calibration	BFB Tune every 12 hours 5-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; linear or quadratic regression used if % RSD >15; r ≥ 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 Continuing calibration every 12 hours	Correlation coefficient ≥ 0.99 or %RSD for response factors ≤ 20 for all analytes %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 Repeat until acceptable

TABLE B3-5

SUMMARY OF LABORATORY QUALITY CONTROL SAMPLES AND FREQUENCIES FOR VOLATILE ORGANIC COMPOUND ANALYSIS (continued)

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 B3-13 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 applies only to concentrations greater than the PRQLs listed in Table B3-4.

c. Nonconformance needed only if accuracy requirements in Table B3-4 not achieved.

See Section E-1 for acronyms.

TABLE B3-6
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 %
Cresols	1319-77-3	≤50	25-115	5	40	90
1,4-Dichlorobenzene[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[e]	5	40	90
2,4-Dinitrotoluene	121-14-2	≤46	39 - 139	0.3	2.6	90
Hexachlorobenzene	118-74-1	≤319	D-152[e]	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
Polychlorinated Biphenyls (PCBs)						
Aroclor 1016[d]	12674-11-2	≤33	50 - 114	5	40	90
Aroclor 1221[d]	11104-28-2	≤110	15 - 178	5	40	90
Aroclor 1232[d]	11141-16-5	≤128	10 - 215	5	40	90
Aroclor 1242[d]	53469-21-9	≤49	39 - 150	5	40	90
Aroclor 1248[d]	12672-29-6	≤55	38 - 158	5	40	90
Aroclor 1254[d]	11097-69-1	≤62	29 - 131	5	40	90
Aroclor 1260[d]	11096-82-5	≤56	8 - 127	5	40	90
Pentachlorophenol	87-86-5	≤128	14 - 176	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. PCBs; required only for Waste Matrix Code S3220 (organic sludges) or as indicated by AK.

e. Detected; result must be greater than zero

MDL = Method detection limit (maximum permissible value)

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 B3-7
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 B3-6 QAOs	Repeat until acceptable
Laboratory duplicate	One per analytical batch	Meet Table B3-6 Precision QAOs	Nonconformance if RPDs > values in Table B3-6
Laboratory blanks	One per analytical batch	Analyte concentrations ≤ 3 x MDLs	Nonconformance if analyte concentrations > 3 x MDLs
Matrix spikes	One per analytical batch	Meet Table B3-6 accuracy QAOs	Nonconformance if RPDs >values and %Rs outside the range specified in Table B3-6.
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, RRF used if %RSD ≤15, use linear or quadratic regression if % RSD >15; r ≥ 0.990 if using alternative curve System Performance Check Compound (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 Repeat until acceptable
GC/ECD 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	Repeat until acceptable
Matrix spikes duplicates [b]	One per analytical batch	Meet Table B3-6 accuracy and precision QAOs	Nonconformance if RPDs or %Rs are outside the ranges specified in Table B3-6.
Laboratory control samples	One per analytical batch	Meet Table B3-6 accuracy QAOs	Nonconformance if %R <80 or >120[C]
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

TABLE B3-7

SUMMARY OF LABORATORY QUALITY CONTROL SAMPLES AND FREQUENCIES FOR SEMI-VOLATILE ORGANIC COMPOUNDS ANALYSIS (continued)

a. Corrective Action per Section B3-13 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 in Table B3-6.

c. Nonconformance needed only if accuracy requirements in Table B3-6 not achieved.

See Section E-1 for acronyms.

TABLE B3-8
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 x IDL for ICP-AES and AA 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. Program Required Detection Limit (PRDL) set such that it is a factor of 10 below the PRQL for 100% solid samples, assuming a 100 x dilution during digestion.

d. TCLP PRQL values are responded in units of mg/l and limits are reduced by a factor of 20.

See Section E-1 for acronyms.

TABLE B3-9
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 B3-8 QAOs	Repeat until acceptable
Laboratory blanks	One (1) per analytical batch	≤ 3 x IDL (≤ 5 x IDL for ICP-MS)	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 B3-8 accuracy QAOs	Nonconformance if %R outside the range specified in Table B3-8.
Matrix spike duplicates	One (1) per analytical batch	Meet Table B3-8 accuracy and precision QAOs.	Nonconformance if RPDs > values and %Rs outside range specified in Table B3-8
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 initial calibration verification solution. Regression coefficient ≥ 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)	One per analytical batch	5 × dilution must be ≤ 10 % D of initial value for sample > 50 × IDL	Flag Data with a "Z" if >10% D and > 50 × IDL

TABLE B3-9
SUMMARY OF LABORATORY QUALITY CONTROL SAMPLES AND FREQUENCIES FOR METALS ANALYSIS (continued)

QC Samples	Minimum Frequency	Acceptance criteria	Corrective Actions [a]
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 ICS A Solution	Correct problem and recalibrate, nonconformance if not corrected
Laboratory Control Samples	One (1) per analytical batch	Table B3-8 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 B3-13 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 B3-8

See Section E-1 for acronyms.

IDL = Instrument Detection Limit
PDP = Performance Demonstration Program
PRQL = Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference

TABLE B3-10
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.
GC/MS Operators[c]	B.S. or equivalent experience and one year independent spectral interpretation or demonstrated expertise.
GC/MS Technical Supervisors	B.S. or equivalent experience and one year applicable experience.
Atomic Absorption Spectroscopy Technical Supervisors[b] Atomic Absorption Spectroscopy Operators[c]	B.S. or equivalent experience and one year applicable experience.
Atomic Emission Spectroscopy Operators[c]	B.S. or equivalent experience and one year 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 B3-11
TESTING BATCH DATA REPORT CONTENTS

Required Information	Radiography	Visual Examination as QC Check on Radiography	Visual Verification of Acceptable Knowledge	Comment
Batch Data Report Date	X	X	X	
Batch number	X	X	X	
Waste container number	X	X	X	
Waste stream name and/or number	O	O	O	
Waste Matrix Code	X	X	X	Summary Category Group included in waste matrix code
Implementing procedure (specific version used)	X	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	O	Drums, Standard Waste Box, Ten Drum Overpack, etc.
Videotape reference	X	X		Reference to Videotape(s) applicable to each container.
Imaging check	O			
Camera check		O		
Audio check	O	O		
QC check of scales		O	O	Available documented evidence calibrated scale(s) were used. Only applicable if items are weighed during the visual examination.
QC documentation	X	X	X	
Description of liners and layers of confinement (if possible)	X	X	X	
Indication of vented rigid liners	X	X	X	Only required for containers with rigid liners. If radiography is used to verify, then include in Testing Batch Data Report.
Description of container contents	X	X	X	Provide enough detail for verification of estimated weights for the 12 waste material parameters.

Required Information	Radiography	Visual Examination as QC Check on Radiography	Visual Verification of Acceptable Knowledge	Comment
Verification that the physical form matches the waste stream description and Waste Matrix Code.	X	X	X	Summary Category Group included in Waste Matrix Code.
Indication of sealed containers > 4L	X	X	X	
Amount of free liquids	X	X	X	
Estimated weights for the 12 waste material parameters	X	X	X	Table B3-1 lists waste material parameters.
Container gross weight	X	X	X	
Container empty weight	O	O	O	Established, documented empty container weights can be used.
Comments	X	X	X	
Reference to or copy of associated NCRs, if any	X	X	X	Copies of associated NCRs must be available.
Visual examination expert decisions		X		Only applicable if visual examination expert is consulted during visual examination.
Verify absence of prohibited items	X	X	X	
Operator signature and date of test	X	X	X	2 signatures required for Visual Verification of Acceptable Knowledge
Signature of visual examination expert and date		X		When visual examination expert is consulted.
Data review checklists	X	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 B3-12
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
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
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 retrievable stored waste, these values must clearly be identified as such.

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	

TABLE B3-12 (continued)
SAMPLING BATCH DATA REPORT CONTENTS

Required Information	Headspace Gas	Solid Sampling	Comment
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.
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.
Collocated 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 B3-13
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	
Confirmation 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 B3-14 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 B3-14
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

B4 TRU Waste Characterization Using Acceptable Knowledge

B4-1 Introduction

The RCRA regulations codified in 40 CFR Parts 260 through 265, 268, and 270, and the New Mexico Hazardous Waste Management Regulations in Title 20 New Mexico Administrative Code, Chapter 4, Part 1, (20 NMAC 4.1) Subparts I through VI, Subpart VIII, and Subpart IX, 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.

AK includes a number of techniques used to characterize transuranic (TRU) waste, such as process knowledge, records of analysis acquired prior to RCRA, and other supplemental sampling and analysis data (EPA, 1994). Radiography and/or visual examination, headspace gas sampling and analysis, and homogeneous waste sampling and analysis (specified in Permit Attachment B 1) are used to acquire supplemental sampling and analysis data to meet the requirements of the WAP. AK is used in TRU waste characterization activities in three ways:

- To delineate TRU waste streams.
- To assess if TRU heterogeneous debris wastes exhibit a toxicity characteristic (20 NMAC 4.1.200, incorporating 40 CFR §261.24).
- To assess if TRU wastes are listed (20 NMAC 4.1.200, incorporating 40 CFR §261.31).

Sampling and analysis is performed to confirm AK and to update and modify initial AK assessments. Sampling and analysis includes radiography, visual examination, headspace gas, and homogeneous waste sampling and analysis. TRU waste streams undergo applicable provisions of the AK process prior to management, storage, or disposal of the waste at WIPP.

B4-2 Acceptable Knowledge Documentation

The AMWTP AK information progresses from general facility information (TRU waste management program information) to the more detailed waste-specific information (TRU waste stream information). This AK information applies at AMWTP to both the retrievably stored and newly generated waste streams. The process used to control and develop the general facility and waste stream information is described in MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation.*

The following sections include the information required for characterization of TRU waste using AK. The AMWTP will supplement the required AK records with additional information as necessary. If the required information is not available for a particular waste, supplemental information is obtained. In this case, the waste is characterized as newly generated waste, and the characterization process for newly generated waste is presented in Section B-3d(l) of this document.

B4-2a Required TRU 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.

The AMWTP will be involved in characterizing stored waste generated at multiple facilities and creating newly generated waste in the AMWTP processing facility. For each generator of waste the following general facility information shall be maintained:

- A map of the site with the areas and facilities involved in TRU waste generation, treatment, and storage identified.
- Facility mission description as related to TRU waste generation and management.
- Description of the operations that generated TRU waste at the site.
- Description of waste identification and category schemes used at the site (IDC, control code).
- Types and quantities of TRU 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.

B4-2b Required TRU Waste Stream Information

AK will be used to delineate waste streams. For each TRU mixed waste stream, the process information and data that support the AK used to characterize that waste streams will be compiled and documented. 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.
- Descriptions of the waste generating process for each building, including processes associated with U134 waste generation, if applicable.
- Process flow diagrams (In the event that a process flow diagram cannot be created, a description of the waste generating process, rather than a formal process flow diagram, will be used to satisfy this requirement. The use of the waste generating process description will be justified, and the justification will be 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; data obtained through visual examination of newly generated waste that later undergoes radiography; information demonstrating neutralization of U134 [hydrofluoric acid] and waste compatibility, etc.).

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 are identified between required information in the source documentation, the AMWTP will apply all hazardous waste codes indicated by the information to the subject waste stream unless an alternative assignment can be justified. Inconsistencies are resolved using supplemental information from interviews, phone contacts, or other correspondence. A (discrepancy report) documenting resolution to the discrepancy is maintained as a quality record in the AK files. Discrepancy resolution for the AK is described in MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation.*

Procedures listed in Section B4-3b comply with the following AK requirements:

- Procedures for identifying and assigning the physical waste form of the waste:
  - INST-OI-12, Real Time Radiography Operations
  - INST-OI-34, VE Operating Procedures & Data Reporting
  - INST-OI-16, *Drum Coring Operations*
  - MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*

- Procedures for delineating waste streams and assigning Waste Matrix Codes:
  - MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*
  - MP-TRUW-8.11, *Data Reconciliation*
- Procedures for resolving inconsistencies in AK documentation:
  - MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*
  - MP-TRUW-8.11, *Data Reconciliation*
- Procedures for confirming AK information through headspace gas sampling and analysis, visual examination and/or radiography, and homogeneous waste sampling and analysis:
  - MP-TRUW-8.13, Collection, Review, Confirmation, and Management of Acceptable Knowledge Documentation
  - INST-OI-12, Real Time Radiography Operations
  - INST-OI-34, VE Operating Procedures & Data Reporting
  - INST-OI-16, *Drum Coring Operations*
  - INST-OI-13, *Drum Vent/Head Space Sample Operations*
  - ACMM-9260, *Volatile Organic Compounds by Gas Chromatography Mass Spectrometry*
  - ACMM-9441, *Determination of Nonhalogenated Volatile Organics by Gas Chromatography*
  - ACMM-9500, *Sample Preparation for Semivolatile Organic Compounds and PCBs*
  - ACCM-9270, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*
  - ACMM-9080, *Determination Polychlorinated Biphenyls (PCBs) by Gas Chromatography*
  - ACMM-8909, *Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel*
  - ACMM-2901, *Determination of Metals by ICP-AES for TRU Waste Characterization*
  - ACMM-2810, *Determination of Mercury by CVAA for TRU Waste Characterization*

- Procedures describing management controls used to ensure prohibited items (specified in the WIPP-WAP, Permit Attachment B) are documented and managed:

  — INST-OI-12, Real Time Radiography Operations

  — INST-OI-34, VE Operating Procedures & Data Reporting

  — INST-OI-16, *Drum Coring Operations*

- Procedures to ensure radiography and visual examination include a list of prohibited items that the operator shall verify are not present in each container of waste (e.g., liquids exceeding TSDF-WAC limits, corrosives, ignitable, reactives, and incompatible wastes):

  — INST-OI-12, Real Time Radiography Operations

  — INST-OI-34, VE Operating Procedures & Data Reporting

  — INST-OI-16, *Drum Coring Operations*

- 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:

  — MP-TRUW-8.13, Collection, Review, Confirmation, and Management of Acceptable Knowledge Documentation

  — MP-TRUW-8.11, *Data Reconciliation*

- Procedures for newly generated waste shall describe how AK is confirmed using either the visual examination technique or radiography (or VE in lieu of radiography) and procedures shall also describe the criteria for selecting either radiography or VE to ensure there is documentation and adequate justification of the process selected:

  — MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*

  — INST-OI-16, *Drum Coring Operations*

  — INST-OI-12, Real Time Radiography Operations

  — INST-OI-34, VE Operating Procedures & Data Reporting

B4-2c Supplemental Acceptable Knowledge Documentation

Supplemental AK information, as appropriate, is collected to support required TRU waste stream information. This supplemental information is included in the AK written record. Supplemental AK documentation that may be used (if available) in addition to the required information specified above include, but are 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 logs.
- 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, or routine verification sampling. This may also include new information acquired apart from the confirmatory process which supplements required information (e.g., visual examination not performed in compliance with the WIPP-WAP).
- Material Safety Data Sheets, product labels, or other product package information.
- Sampling and analysis data from comparable or surrogate waste streams (e.g., residues, equivalent nonradioactive materials).
- Laboratory notebooks that detail the research processes and raw materials used in an experiment.

All specific, relevant supplemental AK documentation assembled and used in the AK process, whether it supports or contradicts any required AK documentation, is identified and an explanation provided for its use (e.g., identification of a toxicity characteristic). Supplemental documentation may be used to further document the rationale for the hazardous characterization results.

Similar to required information, if discrepancies exist between supplemental information and the required information, then the AMWTP applies all hazardous waste codes indicated by the supplemental information to the subject waste stream. Alternatively, the AMWTP may choose to justify an alternative assignment and document the justification in the auditable record. Discrepancy resolution for the AK is described in MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation*.

B4-3 Acceptable Knowledge Training, Procedures and Other Requirements

A three phase process is used to characterize TRU waste by means of AK information: 1) compiling the required and supplemental AK documentation in an auditable record, 2) confirming and updating knowledge information using radiography and/or VE, and headspace gas and homogeneous waste sampling and analysis, and 3) auditing AK records.

B4-3a 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, *Personnel Qualification and Certification*.

The training requirements shall include the following subjects:

- WIPP-WAP in permit Attachment B and the Treatment, Storage and Disposal Facility Waste Acceptance Criteria specified in this permit.
- 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.

B4-3b Acceptable Knowledge Assembly, Compilation, and Confirmation Procedures and Required Administrative Controls

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). Refer to Section B4-3b(l) of this document.

- A written procedure(s) to compile the required AK record. Refer to Section B4-3b(2) of this document.

- A written procedure(s) that ensures unacceptable wastes (e.g., reactive, ignitable, corrosive) are identified and segregated from TRU waste populations sent to WIPP. Refer to Section B4-3b(3) of this document.

- A written procedure(s) to evaluate AK and resolve discrepancies. If different sources of information indicate different hazardous wastes are present, then AMWTP includes all sources of information in its records and conservatively assign all potential hazardous waste codes unless AMWTP chooses to justify an alternative assignment and document the justification in the auditable record. The assignment of hazardous waste codes is tracked in the auditable record to all required documentation. Refer to Section B4-3b(4) of this document.

- A written procedure(s) to identify hazardous wastes and assign the appropriate hazardous waste codes 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 required information to determine if the waste is listed under 20 NMAC 4.1.200 (incorporating 40 CFR §261), Subpart D. All listed hazardous waste codes 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 contains hazardous constituents included in the toxicity characteristics specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261), Subpart C. If a toxicity characteristic contaminant is identified and is not included as a listed waste, the toxicity characteristic code is assigned unless data are available that demonstrate that the concentration of the constituent in the waste is less than the toxicity characteristic regulatory level. When data are not available, the toxicity characteristic hazardous waste code for the identified hazardous constituent is applied to the mixed waste stream.

For newly generated wastes, procedures are implemented to characterize hazardous waste using AK prior to packaging the waste. Refer to Section B4-3b(5) of this document.

- A written procedure(s) for the confirmation of AK in accordance with Section B4-3(d). Refer to Section B4-3d of this document.

- A written procedure(s) that provides a cross-reference to the applicable waste summary category group (i.e., S3000, S4000, and S5000) to verify all of the required confirmation data has been evaluated and the proper hazardous waste codes have been assigned. Refer to Section B4-3b(7) of this document.

- Ensure that results of other audits of the TRU waste characterization programs at the site are available in the records. Refer to Section B4-3b(8) of this document.

The AMWTP uses administrative control to ensure that prohibited items are documented and managed in accordance with the following elements [see Section B4-3b(9)]:

- Identify the organization(s) responsible for compliance with administrative controls.

- Identify the oversight procedures and frequency of actions to verify compliance with administrative controls.

- Develop on-the-job training specific to administrative control procedures.

- Ensure that personnel may stop work if noncompliance with administrative controls is identified.

- Develop a nonconformance process that complies with the requirements in Section B3 of the WIPP-WAP 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 population(s), and the reassessment and recertification of those waste.

B4-3b(l)Procedures Used to Assemble the Acceptable Knowledge Record

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 are as follows:

- MP-TRUW-8.13, Collection, Review, Confirmation, and Management of AK Documentation. [This procedure provides instructions for compiling, reviewing, and managing AK. Waste stream summaries based on AK records are maintained and controlled based on this procedure. A Document Change Request (DCR) is used to provide an auditable record of changes that occur to the waste stream summaries.]

B4-3b(2)Procedures Used to Compile the Acceptable Knowledge Record

The written procedure used to compile the required AK record is
MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation.*

B4-3b(3)Procedures Used to Ensure Unacceptable Waste is Identified and Segregated

Written procedure(s) that ensure unacceptable waste (refer to Section B- 1 c) is identified and segregated from TRU waste populations to be sent to WIPP are as follows:

- INST-OI-12, Real Time Radiography Operations
- INST-OI-34, VE Operating Procedures & Data Reporting
- INST-OI-16, *Drum Coring Operations*

B4-3b(4)Procedures Used to Evaluate Acceptable Knowledge, Resolve Discrepancies, Assign Hazardous Waste Numbers, etc.

Written procedure(s) to evaluate AK and resolve discrepancies, assign hazardous waste codes, and preparation of an auditable record of required documentation are as follows:

- MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*
- MP-TRUW-8.11, *Data Reconciliation*

B4-3b(5)Procedures Used to Identify Hazardous Waste

Written procedure(s) to identify hazardous wastes and assign the appropriate hazardous waste codes to each waste stream are as follows:

- MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*
- MP-TRUW-8.11, *Data Reconciliation*

B4-3b(6)Procedures Used to Confirm Acceptable Knowledge and to Re-Evaluate Acceptable Knowledge

The written procedure(s) for the conformation of AK in accordance with Section B4-3(d) is:

- MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*
- INST-OI-12, Real Time Radiography Operations
- INST-OI-34, VE Operating Procedures & Data Reporting
- INST-OI-16, *Drum Coring Operations*

The written procedure used when the characterization of a waste must be changed (e.g., changes to WMCs, waste steam assignment, EPA HWNs, etc.):

- MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation.*

B4-3b(7)Procedures Used to Cross-Reference to the Applicable Waste Summary Category Group

The written procedure that provides the method for developing the cross-reference to the applicable waste summary category group (i.e., S3000, S4000, S5000) and to verify all of the required confirmation data has been evaluated and the proper hazardous waste codes have been assigned is:

- MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation*

B4-3b(8)Procedures Used to Ensure that Audit Results are Available

The written procedure that ensures that the results of other audits of the TRU waste characterization program at AMWTP are available in the records is MP-M&IA-17.2, Independent Assessments.

B4-3b(9)Procedures Used for Administrative Control

The following minimum elements are addressed in site-specific documentation associated with administrative controls:

- The organization(s) responsible for compliance with administrative controls (which includes oversight and frequency of actions to verify compliance with administrative controls) have been identified in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*.

- On-the-job training specific to administrative control procedures has been developed as specified in the MP-RTQP-14.6, *Job and Training Needs Analysis*.

- Personnel may stop work if noncompliance with administrative controls is identified in MP-Q&SI-5.3, *Corrective Action*.

- A nonconformance processes has been developed that complies with the requirements in Section B3 of the WIPP-WAP and documents and establishes corrective actions. As part of the corrective action process, the potential time frame of the noncompliance will be assessed along with the potentially affected waste population(s), and the impact on certification of those waste. This process is described in MP-Q&SI-5.4, *Identification of Nonconforming Conditions*, MP-Q&SI-5.3, *Corrective Action* and MP-TRUW-8.28, *Project Level Administrative Controls for Analytical Laboratory Department*.

B4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste Stream

MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation* 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 supplemental 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 (refer to Sections B4-3b(l) and B4-3b(2) for a listing of these procedures).

- The overview of the facility and TRU waste management operations in the context of the facility's mission is correlated to specific waste stream information (refer to Section B4-3b(1) for a listing of these procedures).

- 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, *Collection, Review, Confirmation and Management of AK Documentation*. 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, Quality Assurance protocols, and other sources of information that support the AK information. The creation and management of this lot is defined by MP-TRUW-8.13, *Collection, Review, Confirmation, and Management of AK Documentation.*

Container inventories for TRU 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 supplemental AK information.

B4-3d Requirements for Confirmation of Acceptable Knowledge

Acceptable knowledge characterization results shall be confirmed for both retrievably stored and newly generated waste. All retrievably stored waste shall be characterized using radiography or visual examination to confirm the Waste Matrix Code and waste stream and certify compliance with WIPP-WAP (Permit Attachment B). If AMWTP repackages its retrievably stored waste, either the visual examination technique prior to or during waste packaging or radiography (VE in lieu of radiography) after waste packaging shall be used to confirm acceptable knowledge information . MP-TRUW-8.13 defines the process the AMWTP uses to confirm AK. The procedures used for this confirmation of AK are listed in Section B4-3b(b).

For newly generated waste, that the AMWTP elects to confirm AK during packaging, the AMWTP has written procedures to document the confirmation of AK information with the visual examination technique prior to or during waste packaging (refer to Section B4-3b(6)). MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation* illustrates the process the AMWTP uses to confirm AK for newly generated waste. The procedures used for this AK confirmation are presented in Section B4-3b(6).

The following minimum requirements are addressed in site-specific procedures:

- scope (i.e., waste streams) and purpose (refer to the procedures listed in Section B4-3b(l));
- responsible organization(s) (responsible organizations are presented within each procedure listed in Section B4-3b);
- administrative process controls [refer to the procedures listed in Section B4-3b(9)];
- material inputs to process [refer to the procedures listed in Section B4-3b(l)];
- process controls and range of operation that affect final hazardous waste characterization [refer to the procedures listed in Sections B4-3b(5) and B4-3b(6)];
- rate and quantity of the hazardous waste generated (refer to Section B4-3c);
- list of applicable operating procedures relevant to the hazardous waste characterization [refer to the procedures listed in Section B4-3b(5)];
- process knowledge verification sampling, (i.e., headspace gas sampling and/or homogeneous waste annual sampling) [refer to procedures listed in Section B4-3b(6)]; and,
- reporting and records management [refer to the procedures listed in Section B4-3b(8)].

B4-3d(1)Re-Evaluation Based on Radiography and Visual Examination

The AMWTP has established procedures for reevaluating AK if radiography or visual examination results in the assignment of a different Waste Matrix Code [e.g., Plastic/Rubber (S5310) versus Paper/Cloth (S5330)]. These procedures, as listed in B4-3b(4) and B4-3b(6), describe how the waste is reassigned, AK reevaluated, and appropriate hazardous waste codes assigned. If a waste must be assigned to a different Waste Matrix Code based on radiography or visual examination, the following minimum steps are taken to reevaluate AK. This process is implemented in MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation:*

- Existing information is reviewed based on the container identification number and all differences in hazardous waste code assignments are documented.

- If differences exist in the hazardous waste codes that were assigned, the information is reassessed, and all required AK information (Section B4-3b) associated with the new designation will be documented.

- All sampling and analytical data associated with the waste is reassessed and documented.

- The reassignment of the Waste Matrix Code is documented and verified (e.g., verification that the waste was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the physical form of waste (waste material parameter) identified during radiography or visual examination).

- All changes to AK records are recorded.

- If discrepancies exist in the AK information for the reassigned Waste Matrix Code, the segregation of this container is documented, and the actions necessary to fully characterize the waste are defined.

B4-3d(2)TRU Heterogeneous Debris

The base materials that compose TRU heterogeneous debris (S5000) waste (e.g., lead, stainless steel, glass) are well established and potential toxicity characteristics 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.

In lieu of confirmatory sampling and analytical or other data to the contrary, the AMWTP assigns toxicity characteristic EPA HWNs based on the presence of constituent, regardless of the quantity or concentration. Radiography or VE are used to confirm the WMC and the waste stream identified using AK. If the waste stream designation is so detailed that the specific components cannot be differentiated by radiography (e.g., a waste stream based on a specific type of plastic), this waste stream confirmation will not be performed and instead this omission shall be explained in the auditable record. Procedures describe how discrepancies in the Waste Matrix Code are recorded and additions to hazardous waste codes based on material composition are documented, as necessary [refer to Section B4-3b(5), (6), and (7)].

B4-3d(3)Head Space Gas Sampling

Headspace gas sampling and analysis is conducted on all TRU waste or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling in Section B-3a(1), to be sent to the WIPP facility. Headspace gas data is used to confirm the presence or absence of volatile organic compounds (VOCs) identified using AK.

Headspace gas sampling and analysis and data review is conducted on TRU waste containers according to INST-OI-13, *Drum Vent/Head Space Sample Operations*, and MP-TRUW-8.8, *Level I Data Validation*.

The AMWTP uses AK to identify spent solvents associated with each TRU waste stream or waste stream lot. Headspace gas data is then used to confirm AK concerning the presence or absence of F-listed solvents and concentration of applicable toxicity characteristic constituents. AMWTP confirms the assignment of F-listed hazardous waste codes (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} (refer to Section B2-3).

The UCL_{90} for the mean concentration is compared to the program required quantitation limit (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 constituent 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 can not be identified, the appropriate spent solvent hazardous waste code is conservatively applied to the waste stream. In the case of applicable toxicity characteristic 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, *Data Reconciliation* and MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation*.

B4-3d(4)Homogeneous Solids and Soil/Gravel

Hazardous wastes associated with S3000 and S4000 waste streams is verified based on the results of the Total/TCLP analysis of a representative homogeneous waste sample. If discrepancies between the results obtained from homogeneous waste sampling and analysis and headspace gas sampling and analysis exist (i.e., a VOC is detected in the solidified waste but not in the headspace), the most conservative results are used to verify AK and assign hazardous waste codes, as applicable. 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 hazardous waste code assigned initially by AK may be changed as part of the confirmatory process. If an F-listed waste constituent is detected and the source cannot be identified and justified, the appropriate hazardous waste code is applied.

If the confirmatory process 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 toxicity characteristic constituents or non-toxic F003 wastes are present in excess of regulatory levels. then the AMWTP will either: 1) assign the applicable listed hazardous waste code to the entire waste stream, or 2) segregate the drums containing detectable concentrations of the solvent into a separate waste stream and assign applicable hazardous waste codes. The AMWTP documents, justifies, and consistently delineates waste streams and assign hazardous waste codes based on site-specific permit requirements and other state-enforced agreements.

To determine the mean concentration of solvent VOCs, all headspace gas data and 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 method detection limit [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 hazardous waste codes assigned using AK if listed hazardous constituents are not detected in the headspace gas or solids/soil analysis.

TRU 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 non-detected target analytes in these cases. Only the concentrations of detected constituents will be used to calculate the mean for the purpose of assigning F-listed hazardous waste codes. Because the presence or absence of F-listed solvents can not be confirmed 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-8.11, *Data Reconciliation* and MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation.*

The overall sampling and analysis strategy for homogeneous solids and soil/gravel is illustrated in Figure B2-5 of this document. Specific instructions and methods used to perform the RCRA characterization of retrievably stored homogeneous solids and soil/gravel, as specified in the WIPP-WAP, are presented in MP-TRUW-8.25, *RCRA Statistical Sampling* and the specific sampling and analysis procedures.

B4-3e Acceptable Knowledge Data Quality Requirements

The DQOs for sampling and analysis techniques are provided in Attachment B3 of this document. Analytical results are used to confirm the characterization of wastes based on AK. AK includes records; past sampling and analytical data; material inputs to the waste generating process; and the production and waste handling procedures used over the time period during which the waste was generated. The purpose of AK documentation is to provide a clear and convincing argument about the characteristics of the waste. To ensure that the AK process is consistently applied, the AMWTP complies with the quality requirements presented below for AK documentation.

Precision

Precision is the agreement of a set of replicate measurements without assumption of the knowledge of a true value. The qualitative determinations of AK, such as compiling and assessing knowledge documentation, do not lend themselves to statistical evaluation of precision. Therefore, precision requirements are not established for AK.

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 WMC or designation of different EPA HWNs based on the re-evaluation of AK or on obtaining sampling and analysis data will be reported as a measure of AK accuracy as required by MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation.*

Completeness

Completeness is an assessment of the number of waste streams or number of samples collected to the number of samples determined to be useable through the data validation process. The AK record contains 100 percent of the information specified in Section B4-2 and is documented according to MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation.*

Comparability

Data are considered comparable when one set of data can be compared to another set of data. Comparability is ensured through meeting the training requirements and complying with the minimum standards in the procedures that are used to implement the AK process. The AMWTP has assigned WMCs, assigned EPA HWNs, and identified the physical form of waste (waste material parameter) in accordance with Section B4-3b(5) and (7). AK information regarding the waste shall be provided to other sites who store or generate a similar waste stream.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a population. Representativeness is a qualitative parameter that will be satisfied by ensuring that the process of obtaining, evaluating, and documenting AK information is performed in accordance with the minimum standards established in Section B4-3b. The AMWTP has also assessed and documented the limitations of the AK information used to assign EPA HWNs (e.g., purpose and scope of information, date of publication, type and extent to which waste parameters are addressed and limitation of information in identifying hazardous waste).

The AMWTP addresses quality control 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 AK confirmation through radiography or VE, headspace gas analyses, and homogeneous waste analyses. In addition, the AK process and waste stream documentation is evaluated through internal assessments by quality assurance organizations and assessments by auditors or observers external to the organization (i.e., CBFO, NMED, EPA).

Audits of Acceptable Knowledge

CBFO will conduct an initial audit prior to certifying AMWTP for shipment of TRU 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 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 Assessments.* 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 B4-2 has been compiled in an auditable record.
- All the required procedures specified in Section B4-3 have been developed and implemented, including but not limited to
  - A procedure exists for assigning hazardous waste codes as referenced in Section B4-3b(5).
  - A procedure exists for resolving discrepancies as referenced in Section B4-3b(4) and (6).
  - A procedure exists for confirming AK information through: a) radiography or VE, b) headspace gas sampling and analysis, and c) homogeneous waste sampling as referenced in Section B4-3b(6).
- Results of other audits of the TRU waste characterization programs at AMWTP are available in site records.

B4-4 Additional Final Confirmation of Acceptable Knowledge at the WIPP Facility

Prior to shipping waste, the AMWTP provides all of the required data associated with waste stream characterization, including summary AK information, radiography or VE, headspace gas sampling and analysis, and homogeneous solids and soil/gravel sampling and analysis results to the WIPP facility for review. In addition, the AMWTP designates the assigned hazardous waste codes for the waste stream on the WSPF.

As part of the reconciliation of DQOs (refer to Section B3-l0), the AMWTP tracks and reports changes to hazardous waste characterizations. If data consistently indicate that discrepancies with AK information are identified by the AMWTP (and were subsequently reconciled), the AMWTP reassesses the materials and processes that generate the waste, resubmits WSPF information, and implement the corrective action system. If review of a WSPF and associated waste characterization data reveal nonconformance with AK requirements (i.e., Project Level nonconformance), the waste will not be shipped to the WIPP facility until the corrective actions have been implemented and the requirements of the WAP have been met.

Any drum with unresolved discrepancies associated with hazardous waste characterization will not be shipped to WIPP until the discrepancies are resolved. The AMWTP will reassess the material and processes that generate the waste, and headspace-gas sampling and analysis, radiography or visual examination, and homogeneous waste sampling and analysis results. All shipments of the subject waste stream will cease until the corrective actions, as necessary, have been implemented and the discrepancy resolved.

B5 QUALITY ASSURANCE PROJECT PLAN REQUIREMENTS

B5-1 Site-Specific Quality Assurance Project Plan

The AMWTP has developed and implemented this QAPjP to addresses the applicable requirements specified in the WIPP-WAP. This QAPjP includes the qualitative or quantitative criteria to ensure that waste characterization activities are being performed satisfactorily. The organizations and positions responsible for the implementation of the qualitative and quantitative criteria are identified in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste.* Throughout this QAPjP, site-specific documents are referenced that detail how each of the required elements of the characterization program are performed.

The AMWTP utilizes procedures to ensure tasks are performed in a consistent manner that results in achieving the quality required for the quality assurance program. The pertinent procedures are identified throughout the text of this QAPjP.

Procedures include the following sections:

- Purpose/Scope: The purpose and scope of the procedure.
- References: Documents referenced in the procedure (as necessary).
- Definitions: Definitions of terms used in procedure (as necessary).
- Procedure: Step by step instructions to accomplish the tasks covered by the procedure.
- Records: Identifies any records resulting from the procedure.
- Exhibits: Figures and tables used in procedure (as necessary).
- Appendices: As necessary.

B5-2 Document Review, Approval, and Control

The preparation, issuance, and change to documents that specify quality requirements or prescribe activities affecting quality for the characterization program are controlled to ensure the correct and current documents are used and referenced. All quality documents for the characterization program will be reviewed prior to issuance by qualified and independent individuals. AMWTP compliance with the WIPP-WAP requirements for document review, approval, and control is defined in Section 4 of MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*. The CBFO approves this QAPjP and other program documents defining performance criteria or data quality. These documents are identified in MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste.*

Table B5-1, Minimum requirements for review, approval implementation, and control of QAPjP, presents the minimum requirements for review, approval, and implementation of the QAPjP. The QAPjP review will consider the technical adequacy, completeness, and correctness, and the inclusion of requirements established by the WIPP-WAP.

Table B5-1. Minimum requirements for review, approval, implementation and control of QAPjP.

	RESPONSIBLE PARTY				
	Manager, CBFO QA	Team Leader, National TRU Program	DOE-ID	AMWTP SPM	AMWTP SQAO
Review/Approval	X	X	X	X	X
Implementation				X	
Change Approval	X	X	X	X	X
Change Control				X	

Revisions to documents that implement the requirements of the WAP will be denoted by including the current revision number on the documents 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 designed 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.

All members of the project staff are responsible for reporting any obsolete or superseded information to the SPM. All site-specific changes shall be evaluated and approved by the SPM and SQAO or designee before implementation. The SPM shall notify the appropriate personnel and the affected documents shall be revised as necessary. The SPM is responsible for notifying the DOE field office of document changes.

B6 AUDIT AND SURVEILLANCE PROGRAM

B6-1 CBFO Audit Conduct

If a discrepancy is identified during a CBFO audit, the audit team may prepare a Corrective Action Report (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. After all corrective actions have been complete, the CBFO may schedule and perform a verification visit to assure that corrective actions have been completed and are effective.

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.

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.

Only personnel with appropriate U.S. Department of Energy clearances will have access to classified information during audits. Classified information will not be included in audit reports and records.

B6-2 Internal Management Assessments and Independent Surveillances

AMWTP personnel schedule and conduct management assessments of the TRU 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 Assessments.

When a deficiency is identified by the audit team, the assessment team member who identified the deficiency prepares a Corrective Action Report (CAR) in accordance with MP-Q&SI-5.3, *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.

C. RECORDS PROCESSING

Record Description	Classification
MP-TRUW-8.2	Lifetime/QA

D. REFERENCES

D-1 AMWTP Documents

Bechtel BWXT Idaho, LLC (BWXT), 2000, Determination of Drum Age Criteria and Prediction Factors Based on Packaging Configurations, INEEL/EXT-2000-01207, October 2000, Liekhus, K.J., S.M. Djordjevic, M. Kevarakonda, and M.J. Connolly, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho.

INST-CMNT-10.1.2, *Maintenance Management System*

INST-OI-12, *Real Time Radiography Operations*

INST-OI-13, *Drum Vent/Headspace Gas Sample Operations*

INST-OI-14, *Drum Assay Operations*

INST-OI-16, *Drum Coring Operations*

INST-OI-34, VE Operating Procedures & Data Reporting

INST-TRUW-8.2.1, HSG Calibration

MP-CMNT-10.1, *Maintenance Management*

MP-DOCS-18.2, *AMWTP Records Management*

MP-DOCS-18.4, *Document Control*

MP-M&IA-17.1, *Management Assessments*

MP-M&IA-17.2, *Independent Assessments*

MP-Q&SI-5.3, *Corrective Action*

MP-Q&SI-5.4, *Identification of Nonconforming Conditions*

MP-RTQP-14.4, *Personnel Qualification and Certification*

MP-RTQP-14.6, *Job and Training Needs Analysis*

MP-RTQP-14.19, *Training Records Administration*

MP-TRUW-8.1, *Certification Plan for INEEL Contact-Handled Transuranic Waste*

MP-TRUW-8.11, *Data Reconciliation*

MP-TRUW-8.13, *Collection, Review, Confirmation and Management of AK Documentation*

MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*

MP-TRUW-8.16, *WWIS Data Transfer*

MP-TRUW-8.17, *Co-located Core Sampling Control Charts*

MP-TRUW-8.19, *RTR/VE Drum Selection*

MP-TRUW-8.25, *RCRA Statistical Sampling*

MP-TRUW-8.28, *Project Level Administrative Controls for Analytical Laboratory Department*

MP-TRUW-8.8, *Level I Data Validation*

MP-TRUW-8.9, *Level II Data Validation*

ALD Documents

ACMM-2810, *Determination of Mercury by CVAA for TRU Waste Characterization*
ACMM-2901, *Determination of Metals by ICP-AES for TRU Waste Characterization*
ACMM-8909, *Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel*
ACMM-9080, *Determination of Polychlorinated Biphenyls (PCB) by Gas Chromatography*
ACMM-9260, *Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC?MS)*
ACMM-9270, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*
ACMM-9441, *Determination of Nonhalogenated Volatile Organics by Gas Chromatography*
ACMM-9500, *Sample Preparation for Semivolatile Organic Compounds and Polychlorinated Biphenyls*
MCP-2002, *Analytical Sample Management*
MCP-2008, *Analytical Data Reporting, Review, and Reporting*
PLN-342, *Analytical Laboratories Department Quality Assurance Plan for the AMWTP*

D-2 External References

40 CFR Part 261. October 1994. Identification and Listing of Hazardous Waste. Code of Federal Regulations, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 262. Code of Federal Regulations, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

20 NMAC 4.1 New Mexico Hazardous Waste Management Regulations, Title 20, New Mexico Administrative Code, Chapter 4, Part 1, Sections 200, 300, 500, and 800

ASTM. 1983a. Test Method for Chemical Composition of Gases by Mass Spectrometry, ASTM D2650-83, American Society for Testing and Materials

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DOE/CAO-97-2273, WIPP Waste Information System User's Manual for Use by Shipper's/Generators, U.S. Department of Energy, Carlsbad Area Office (DOE/CAO), Carlsbad, New Mexico.

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E. GLOSSARY

E-1 Acronyms and Abbreviations

ACMM	Analytical Chemistry Methods Manual
AK	Acceptable Knowledge
ALARA	as low as reasonably achievable
ALD	Analytical Laboratories Department
AMWTF	Advanced Mixed Waste Treatment Facility
AMWTP	Advanced Mixed Waste Treatment Project
ASTM	American Society for Testing and Materials
BFB	4-bromofluorobenzene
BNFL Inc.	British Nuclear Fuel Limited Incorporated
BIR	Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report (DOE 1995b)
C	degrees Celsius
%C	percent complete
CAO	Carlsbad Area Office
CAR	Corrective Action Report
CAS	chemical abstract services
CBFO	Carlsbad Field Office
CCC	calibration check compounds
CCV	continuing calibration verification
CFR	Code of Federal Regulations
CH	contact-handled
CH-TRU	contact-handled transuranic
COC	Chain-of-Custody
CVAA	Cold Vapor Atomic Absorption Spectrometry
%D	percent difference
D&D	Decommissioning & Decontamination
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
FRS	Field Reference Sample
FTIRS	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
HSGS	Headspace Gas Sampling
HWN	hazardous waste number

HWMA	Hazardous Waste Management Act
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICS	interference check standards
ICV	initial calibration verification
ID	Idaho
IDC	Item Description Code
IDL	Instrument Detection Limit
INEL	Idaho National Engineering Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
INST	instruction
INTEC	Idaho Nuclear Technology and Engineering Center
ITR	Independent Technical Review
kg	kilogram
L	liter
LCS	Laboratory Control Sample
LDR	Land Disposal Restrictions
LLW	low-level waste
µg/L	micrograms per liter
M&O	management and operations
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
mm Hg	millimeters mercury
MMDDYY	Month-Day-Year Format
MP	Management Procedure
MSD	matrix spike duplicate
MSDS	Material Safety Data Sheet
nCi/g	nanocuries per gram
NCR	Nonconformance Report
NDA	Nondestructive Assay
NDE	nondestructive examination
NDT	Nondestructive Testing
ng	nanogram
NIST	National Institute of Standards and Technology
NMED	New Mexico Environment Department
NRC	Nuclear Regulatory Commission
OLCS	on-line control sample
OSHA	Occupational Safety and Health Administration
OJT	on-the-job training
PA	Performance Assessment
PCB	Polychlorinated biphenyl
PDP	Performance Demonstration Program
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
QPP	Quality Program Plan
r	regression coefficient
%R	percent recovery
RA	Radioassay
RCRA	Resource Conservation and Recovery Act
RCT	Radiation Control Technician
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
%RSD	percent relative standard deviation
RWMC	Radioactive Waste Management Complex
SARP	Safety Analysis Report for the TRUPACT-II Shipping Package
SME	Subject Matter Expert
SOP	Standard Operating Procedure
SPCC	System performance check compound
SPM	Site Project Manager
SPO	Site Project Office
SQAO	Site Quality Assurance Officer
SVOC	Semivolatile organic compound
SW-846	EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
SWB	Standard Waste Box
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TCO	Transportation Certification Official
TDOP	Ten Drum Overpack
TIC	Tentatively Identified Compound
TID	Tamper Indicating Device
TRAMPAC	TRUPACT-II Authorized Methods for Payload Control (Nuclear Packaging Inc. 1992, Appendix 1.3.7)
TRU	Transuranic

TRUCON	TRUPACT-II Content Codes (DOE 1992)
TRUPACT-II	Transuranic Package Transporter Model II
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
VTSR	validated time of sample receipt
WAC	waste acceptance criteria
WCO	Waste Certification Official
WIPP	Waste Isolation Pilot Plant
WIPP-WAC	Waste Isolation Pilot Plant-Waste Acceptance Criteria
WIPP-WAP	Waste Analysis Plan for the Waste Isolation Pilot Plant, Attachment B of the WIPP Hazardous Waste Facility Permit
WSPF	Waste Stream Profile Form
WTS	Waste Tracking System
WWIS	WIPP Waste Information System

E-2 Definitions

Absolute Pressure. Pressure measured relative to absolute zero pressure.

Accuracy. The degree of agreement between a measured value and an accepted reference or the true value. Accuracy is determined as the percent recovery (%R).

Analyte. The element, ion, or compound the analysis seeks to determine; the element of interest.

Analytical Batch. A suite of samples of a similar matrix (that is, gas or solid) processed as a unit, using the same analytical method, within a specific time period. An analytical batch can be up to 20 samples (excluding laboratory QC samples), all of which must be received by the laboratory within 14 days of the validated time of sample receipt (VTSR) of the first sample of the batch.

Analytical Method. Defines the sample preparation and/or instrumentation procedure that must be performed to estimate the quantity of one or more analytes in a sample.

Analytical Sample. Any solution or media introduced into an instrument on which an analysis is performed, excluding instrument calibration, initial calibration verification, initial calibration blank, continuing calibration verification, and continuing calibration blank. Note the following are all defined as analytical samples: TRU waste samples, duplicate samples, spiked samples, laboratory control samples, and field and manifold blanks.

Audit. A planned and documented independent assessment to determine by investigation, examination, or evaluation of objective evidence, the adequacy of, and compliance with established procedures, instructions, drawings, and other applicable documents, and the effectiveness of implementation. An audit should not be confused with surveillance or inspection activities performed for the sole purpose of process control or product acceptance.

Base Materials. Those materials that make up individual items in debris waste. Base materials may include, but are not limited to: glass, metals, or organic compounds.

Calibration. (A) The process of establishing the accuracy of measurement and test equipment; (B) the check or correction of accuracy of a measuring instrument to ensure proper operational characteristics (see "counter"); (C) the comparison of a measurement standard or item of test and measurement and test equipment of unknown accuracy to a standard or instrument of known accuracy to detect, correlate, report, or eliminate by adjustment, any variation (deviation) in the accuracy of the item being compared; (D) the establishment of a curve relating the measurement and test equipment response to analyte amount or concentration based on analyses with analytes of known amount or concentration.

Calibration Blank. An analyte-free matrix used to establish zero-response during calibration.

Chain-of-Custody (COC). A set of procedures established to ensure sample and data integrity is maintained.

Comparability. A qualitative parameter expressing the confidence with which one data set can be compared with another.

Completeness. The percentage of measurements made that are judged to be valid measurements. The completeness goal is to generate a sufficient amount of valid data based on Program needs.

Container. DOT-approved container (serialized white drum or metal box) for shipping radioactive or mixed waste via TRUPACT-II.

Continuing Calibration. Analytical standards run periodically to verify the calibration of the analytical system.

Control Limits. A range within which specified measurement results must fall to be compliant. Control limits may be mandatory, requiring corrective action if exceeded, or advisory, requiring that noncompliance data be flagged.

Corrective Action. Measures taken to rectify conditions adverse to quality and, where necessary, to preclude repetition.

Curie (Ci). A unit of radioactivity equal to 3.7×10^{10} disintegrations per second; a nanocurie (nCi) is 10^{-9}Ci or 37 disintegrations per second.

Data Quality Objectives (DQOs). Qualitative and quantitative statements derived from the outputs of the first six steps of the DQO Process.. DQOs: 1) clarify the study objective, 2) define the most appropriate type of data to collect, 3) determine the most appropriate conditions from which to collect the data, and 4) specify tolerable limits on decision errors be used as the basis for establishing the quantity and quality of data needed to support compliance decisions. DQOs are used to develop a scientific and resource-effective data collection design.

Data Reduction. Operations necessary to correct data from raw to final form, as required by the customer.

Equipment Blanks. Samples of high purity gas or water used to establish cleanness of sampling equipment. They are collected after the equipment has been cleaned and before sampling. These blanks are useful in documenting adequate cleaning of sampling equipment.

Equipment Cleaning Batch. A number of sampling equipment items cleaned together at one time using the same cleaning method.

Field Blank. A background sample collected in the field in the immediate vicinity of the sample collection location; field blanks accompany sample containers through collection, shipment to the analytical laboratory, and storage before analysis and are used to identify any contamination from field conditions.

Field Duplicate. Two separate, independent samples collected from the same source, as closely as possible to the same place and time, stored in separate containers, independently labeled and independently analyzed to document the precision of the sampling and analysis process.

Field Sample. A portion of material received for analysis contained in single or multiple containers and identified by a unique DOE Sample Number.

Field Reference Sample (FRS). Standard samples of known concentration of target analytes, introduced through the sampling equipment, to identify any bias in the sampling process.

Headspace. For any volume contained by a drum, 55-gal poly bag, or innermost layer of confinement, the total contained volume minus the volume occupied by the waste material. "Headspace" is also used to refer to the gases contained in this volume.

Holding Time. The maximum time allowed between time of sample collection and time of preparation or analysis.

Independent Assessment. A QA program assessment conducted by an independent group or organization, having authority and freedom from the line organization, to evaluate the scope, status, adequacy, programmatic compliance, and implementation effectiveness of the quality assurance program.

Item Description Code (IDC). A three-character numeric code that describes each waste form matrix.

Instrument Detection Limit (IDL). The minimum signal that the instrument can detect with 99% confidence that the analyte concentration is greater than 0.

Innermost Layer of Confinement. Within a waste container, a plastic bag closest to a waste source that may be a source of VOCs and/or hydrogen and methane and has a minimum of 1 L of headspace.

Laboratory Duplicate. A second aliquot portion of a sample treated and analyzed identically to the original; used to determine the precision of the method.

Laboratory Blank. An analyte-free matrix to which all reagents are added in the same volumes or proportions used in sample processing; used to document contamination resulting from laboratory sample preparation and the analytical process.

Laboratory Control Sample. A standard of known composition used to indicate method accuracy. Laboratory control samples are analyzed using the same analytical methods employed for the Program samples received.

Lot. When all waste within a waste stream is not available for sampling and analysis at one time, the waste stream may be divided into waste stream lots based on staging, transportation, or handling issues. Characterization activities are then undertaken on a waste stream lot basis. A WSPF is not submitted for subsequent waste stream lots unless warranted by the characterization information.

Management Assessment. A self determination of managerial effectiveness in establishing and implementing quality assurance program plans that conform to U.S. DOE policy requirements. It is based on an analysis of functional appraisals, internal audits, and other information, and on the application of appropriate criteria. It is a review and evaluation of management performance covering all QA and management responsibilities to ensure proper QA program balance.

Management Controls. Methods used to ensure work is performed compliant with applicable regulations and program requirements. Examples of management controls include, but are not limited to, procedures, training, radiological posting, established time limits, and storage practices.

Waste matrix code. A collection of descriptive titles, definitions, and associated numerical codes used to classify mixed waste at DOE facilities. Waste matrix codes are defined in DOE/LLW-217, *DOE Waste Treatability Group Guidance*.

Method Detection Limit (MDL). The minimum concentration of a substance that can be measured and reported for a given method with 99% confidence that the analyte concentration is greater than 0.

Needle Assembly Batch. Assembly of the sampling needle components used for manual sample collection with SUMMA® canisters. Equipment blanks are collected using randomly selected assemblies analyzed for contaminants. Cleanness certification of the needle assembly batch is based on the analytical results of the equipment blanks.

Nonconformance. A deficiency in meeting program requirements that renders the quality of an item or sample unacceptable or indeterminate. Nonconforming program data are final reported data that do not meet QA objectives.

Nondestructive Assay (NDA). the measurement of radioactivity and/or radionuclide specific activity determined without destroying the material.

Nondestructive Testing (NDT). Groups of tests, such as RTR, that evaluate an item conformance without destroying it or modifying the physical state of the sample.

Packaging. Flexible containment materials, for example, plastic bags (Program-specific material definition).

Performance Assessment (PA). A determination of the long-term performance of WIPP disposal system per the requirements of the U.S. Environmental Protection Agency Standard 40 CFR Part 191, Subparts B and C.

Percent Difference (%D). The difference between an initial measurement and a subsequent one, expressed as a percentage of the initial measurement.

Program-Required Detection Limit (PRDL). Minimum level of analyte detection acceptable under the WIPP-WAP.

Precision. A measurement of mutual agreement among individual measurements of the same property, made under prescribed similar conditions; often expressed in terms of standard deviation or relative percent difference (RPD).

Procedure/Instruction. A written, formally approved and controlled, step-by-step sequence of detailed actions to be followed to perform a given task.

Program-Required Quantitation Limit (PRQL). Minimum level of analyte quantitation acceptable under the WIPP-WAP.

QA. Planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily and safely in service.

QC. A routine application of procedures for controlling a process.

Quality Assurance Objectives. The characteristics of data associated with data ability to satisfy a given purpose or objective. The characteristics of major importance are accuracy, precision, completeness, comparability and representativeness.

Radioassay (RA). Assay methods used to identify and quantify radionuclides in TRU waste.

Representativeness. The degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition.

Radiation Technician (RT). Job title of personnel who provide radiation protection through controls and monitoring of areas, items, and personnel.

Real-time Radiography (RTR). A radiographic method that allows simultaneous remote imaging for the viewing of waste package contents.

Sample. A portion of material for analysis contained in a single container and identified by a unique sample number.

Sample Number. A unique sample identification number; appears on all sample reports that document information or results derived from that sample.

Sampling Batch. A suite of samples of a similar matrix (that is, gas or solid) collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding filed QC samples), all of which must be collected within 14 days of the first sample in the batch. Also refer to "Analytical Batch."

SUMMA®. A stainless-steel pressure vessel with SUMMA® passivated interior surfaces for collection and stable storage of gas samples and many specific organic compounds.

TRUPACT-II Standard Waste Box (SWB). A container for solid radioactive waste.

Transportation Certification Official (TCO). The person who certifies that the shipment meets transportation requirements of EPA, WIPP-WAC, DOE, and DOT.

Tamper Indicating Device (TID). A device that may be used on packages to reveal violations of containment integrity.

Testing Batch. A suite of waste containers undergoing radiography or radioassay using the same testing equipment. A testing batch can be up to 20 waste containers without regard to waste matrix.

TRU Waste. Without regard to source or form, waste contaminated with alpha-emitting TRU radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram (nCi/g) at the time of assay.

TRUCON. TRUPACT-II Content Codes document developed to show wastes characterized and grouped together for controlling the payload (authorized contents) in a TRUPACT-II, (refer to DOE WIPP 89-004).

TRUPACT-II. An NRC approved Type-B shipping container for shipping TRU radioactive waste.

Validate. To confirm or corroborate that data resulting from a characterization process are usable.

Waste Container. Container that holds waste items.

Waste Package. Individual items placed into waste collection boxes and drums.

Waste Stream. Waste material generated from a single process or activity similar in material, physical form, and hazardous constituents.

Waste Type. The classification system describing the physical types of waste, solidified inorganics (Waste Type I), solid inorganics (Waste Type II), solidified organics (Waste Type III,) and solid organics (Waste Type IV) per the Safety Analysis Report for the TRUPACT-II Shipping Package (SARP) (NRC Docket No 71-9218).

Waste Certification Official (WCO). The person who affirms by signature that waste meets all WIPP-WAC criteria for offsite shipment.