

ABSTRACT - DOE MODEL CONFERENCE - 1988 JAN

Mixed Waste Characterization and Certification at the Nevada Test Site

Teresa A. Kawamura, Reynolds Electrical & Engineering Co., Inc.
Robert L. Dodge, Reynolds Electrical & Engineering Co., Inc.
Peter K. Fitzsimmons, U.S. Department of Energy, Nevada Operations Office

The Radioactive Waste Management Project at the Nevada Test Site (NTS) was recently granted interim status by the state of Nevada to receive mixed waste. The RCRA Part B permit application has been revised and submitted to the state. Preliminary indications are that the permit will be granted. In conjunction with revision of the Part B permit application, pertinent DOE guidelines governing waste acceptance criteria and waste characterization were also revised. The guidelines balance the need for full characterization of hazardous constituents with ALARA precepts. Because it is not always feasible to obtain a full chemical analysis without undue or unnecessary radiological exposure of personnel, process knowledge is considered an acceptable method of waste characterization. A balance of administrative control and verification procedures, as well as careful documentation and high standards of quality assurance, are essential to the characterization and certification program developed for the NTS.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

ds

DISSEMINATION OF THIS DOCUMENT IS UNLIMITED

MASTER

MIXED WASTE CHARACTERIZATION AND CERTIFICATION AT THE NEVADA TEST SITE

**Teresa A. Kawamura
Robert L. Dodge
Peter K. Fitzsimmons**

ABSTRACT

The Radioactive Waste Management Project (RWMP) at the Nevada Test Site (NTS) was recently granted interim status by the state of Nevada to receive mixed waste (MW). The RCRA Part B permit application has been revised and submitted to the state. Preliminary indications are that the permit will be granted. In conjunction with revision of the Part B Permit application, pertinent DOE guidelines governing waste acceptance criteria (WAC) and waste characterization were also revised. The guidelines balance the need for full characterization of hazardous constituents with as low as reasonably achievable (ALARA) precepts. Because it is not always feasible to obtain a full chemical analysis without undue or unnecessary radiological exposure of personnel, process knowledge is considered an acceptable method of waste characterization. A balance of administrative controls and verification procedures, as well as careful documentation and high standards of quality assurance, are essential to the characterization and certification program developed for the NTS.

INTRODUCTION

In 1985, a Part B Permit application for development of a MW disposal site at the NTS was submitted by the U.S. Department of Energy/Nevada Operations Office (DOE/NV). The proposed MW facility would be located at the Area 5 Radioactive Waste Management Site (RWMS) and operated by Reynolds Electrical & Engineering Co., Inc. Defense Waste Management Department (DWMD) personnel. Interim status was granted by the state of Nevada in September 1987, and a revised Part B Permit application was submitted in September 1988. The first shipments of MW to the NTS are anticipated to begin arriving in early FY 1989.

One of the tasks facing DWMD personnel was development of MW acceptance criteria, as well as certification and characterization requirements. This paper explains the NTS waste certification and characterization program which attempts to balance the requirement to maintain ALARA radiation exposures, and attain complete waste characterization.

1.0 BACKGROUND

The RWMS was first developed in 1961 to dispose of radioactive low-level wastes (LLW) generated onsite as a result of the weapons testing program.

In 1978, operations were expanded to include disposal of LLW generated at offsite DOE installations. Department of Defense (DOD) wastes are also accepted on a case-by-case basis. To date, over 6.5 million cubic feet of LLW have been disposed of at the RWMS.

The RWMS is located in Area 5 of the NTS, approximately 75 miles north of Las Vegas. The climate is arid, with about five to six inches of annual precipitation. The water table is located approximately 800 feet below land surface, and travel times to groundwater have been modeled to be over 100,000 years. Low-level radioactive waste is disposed in trenches and pits using conventional shallow land disposal (SLD) technology. Mixed waste disposal operations, as described in the Part B Permit application, also will use SLD. Currently, an open pit, Pit 3, has interim status for disposal of MW. Disposal of LLW in this pit has ceased, reserving the remainder of the capacity for MW.

The DWMD also operates a bulk waste disposal facility in Area 3, used mainly for consolidation of wastes generated by aboveground nuclear weapons testing in the 1950s and early 1960s. Transuranic (TRU) wastes are retrievably stored at Area 5 pending shipment to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. The DWMD also has a greater confinement disposal (GCD) operation available for wastes which are not suited to SLD (such as high-specific-activity wastes).

2.0 REGULATIONS AND GUIDELINES

The cornerstone of the MW characterization and certification requirements is DOE/NV NVO-185, Nevada Test Site Defense Waste Acceptance Criteria and Certification Requirements. Revision 5 of this document (currently awaiting DOE/NV approval) will provide waste generators with specific waste acceptance and certification requirements for mixed, low-level, and TRU waste. Those requirements ensure that radioactive waste, accepted for disposal or storage at NTS, is in compliance with the U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA), draft DOE Order 5820.2A, "Radioactive Waste Management," and other DOE Orders, as deemed necessary. Packaging requirements, to ensure compliance with U.S. Department of Transportation (DOT) regulations, are also included in NVO-185.

Characterization and certification requirements, as well as WAC, are included in the Waste Analysis Plan section of the NTS RCRA Part B Permit application. Those requirements, along with the unique hydrogeologic environment at NTS, are the cornerstone of the DOE/NV waste management philosophy. U.S. Department of Energy/Nevada Operations Office personnel have been working closely with the state of Nevada on the MW issue. Preliminary indications are that the state is considering the NTS request for exemptions from groundwater monitoring, trench liners, and leachate collection. However, because the Part B Permit application was submitted recently, it is unknown if the application will be approved without modification.

3.0 WASTE CERTIFICATION AND CHARACTERIZATION PROGRAM

The approach taken by the RWMP places the burden of characterization and certification on the generator. Extensive onsite technical reviews of the generator's characterization and certification program will be conducted to ensure compliance with NTS requirements. A waste examination building with real-time radiography, assay, and package breaching capabilities is being developed at NTS. A chemical laboratory is being upgraded to provide for analysis of hazardous constituents in MW. Examination and analysis will be used for verification of generator waste analysis and certification programs; however, the burden of proving compliance with NTS criteria is still the responsibility of the waste generator.

3.1 Waste Acceptance Criteria

A limited range of MW will be accepted at the RWMS as restricted by the NTS WAC, which are summarized below.

1. Waste must not contain free liquids. Waste containing liquids must be solidified so that there is no free liquid during packaging, handling, transport, and disposal. Ion exchange resins must be dewatered and solidified to be considered as a solid waste. Liquid waste solidified by the urea-formaldehyde process is not accepted.
2. Fine particulate wastes must be immobilized so that the waste package contains no more than one weight percent of less-than-10-micrometer-diameter, or 15 weight percent of less-than-20-micrometer-diameter particles with radioactive contamination.
3. Radioactive gases must be stabilized or absorbed in charcoal. Compressed gases, including unpunctured aerosol cans, are not accepted for disposal.
4. Mixed waste concentrations must be less than those regulated under 40 CFR 268 Land Ban limits, unless waste is treated as specified under 40 CFR 268 (Subpart D).
5. Wastes that, if combined, could cause adverse chemical reactions (excessive heat, fire, explosion, toxic gases, or fumes) must not be combined in individual containers or be shipped together.
6. Where possible, waste shall be treated to reduce volume and provide a more stable waste form.
7. The following wastes are not accepted for disposal at NTS.
 - a. Cyanide- and sulfide-bearing wastes, in concentrations greater than ten percent by weight as CN- or S-, because of the chance of toxic fume generation if even mildly acidic conditions are encountered.

- b. Explosives, pyrophoric materials, or high-heat generators.
 - c. No materials with a PCB concentration greater than that accepted at municipal disposal facilities (under 40 CFR 761 Subpart D).
 - d. Pathogens, infectious wastes, or biological wastes.
 - e. F020, F021, F022, F023, F026, F027, or F028 wastes, unless treated to meet the treatment standards in 40 CFR 268.41.
 - f. Wastes containing chelating and/or complexing agents greater than one percent by weight, without undergoing special review and approval by the DOE/NV Manager and state of Nevada.
 - g. Bulk MW. Bulk waste must be compacted and packaged before shipment to the NTS.
8. Wastes must be placed in DOT approved containers and meet the NTS-specific package criteria of NVO-185. All shipping, handling, and manifesting must be in accordance with DOT and EPA regulations.
9. Reactive or ignitable waste that has not been treated, rendered, or mixed in accordance with 40 CFR 265.312, will be reviewed for acceptance. If accepted for disposal, incompatible waste must be identified by the most appropriate compatibility group listed in 40 CFR 265, Appendix V. Waste can only be treated according to EPA-approved methods.

3.2 Waste Certification Program

Waste generators must characterize and provide written certification that all wastes meet the prescribed WAC. Technical audits and inspections of the generators are performed to ensure that the certification programs comply with all WAC and applicable regulations. The objectives of certifying waste prior to acceptance at NTS is to ensure that the waste received matches the identity of the waste described on the accompanying shipping papers to meet the requirements of 40 CFR 264.13.

The first element of the NTS certification program is the generator application to ship waste. This application includes general information such as generator name and address, EPA identification number, justification for shipment to NTS, packaging and shipping information, and a three-year forecast of expected waste volumes. The application must include a Waste Certification Program Plan (WCPP) which identifies items and activities for waste processing, treatment (if applicable), packaging, certifying, and shipping. The WCPP describes the measures the generator will take to assure that MW shipped to NTS meets NVO-185 requirements. The generator must also submit detailed waste characterization information identifying both chemical and radiological hazards associated with MW in order to assure safe disposal at the RWMS.

Detailed characterization data to be provided by the generator includes:

1. the number and location of samples collected;
2. the frequency of sample collection and analysis;
3. documentation that the number, location, and frequency of sample collection meets EPA requirements for collection of representative samples;
4. the methodology for collecting waste samples, and documentation that the sample collection methodology is appropriate for the type of waste being sampled, is an EPA-approved method, and will produce a representative sample;
5. a description of sample containers and labels, sample preservation procedures, and sample handling and transportation procedures;
6. a list of the laboratory analyses to be performed for each sample, analysis methods to be used, laboratory quality control procedures; and
7. results and interpretation of the laboratory analysis data.

Characterization activities focus on balancing the requirements for definitive chemical and physical characterization of materials containing both hazardous and radioactive constituents. There are circumstances where sampling and analysis are not feasible for waste characterization. Under these circumstances, techniques that rely primarily on knowledge of raw materials, processes, and materials balance are employed to characterize the wastes. Process knowledge is considered an acceptable characterization technique when at least one of the following conditions are met.

1. The waste stream is difficult to sample because of physical form. This primarily applies to pieces of metal, such as lead shielding, that contain hazardous constituents in their composition rather than as a residue that could be removed for testing.
2. Sampling and analysis of waste stream could result in unacceptable risks of radiation exposure (i.e., violate the ALARA precept of the DOE).
3. Waste is too variable to be characterized by one set of samples, such as drums containing protective clothing, rags, and absorbent.

Where sampling is not feasible, the generator may prepare a detailed description, including concentration ranges for constituents of concern, of input streams to the processes that generate the waste, as well as a description of the waste generation process and any subsequent treatment and handling activities that affect the waste's chemical and physical

characteristics. The generator must submit information and documentation sufficient to demonstrate compliance with NVO-185 WAC.

The second element of the waste certification process is the technical audit. A technical audit team, made up of DOE/NV and DWMD representatives, visits the generator site to audit generator implementation of their WCPP. It is required that the generator's WCPP be fully auditable with documentation supporting all phases of waste characterization, certification, packaging, and shipping. Unannounced surveillances and inspections of the generator facility may be performed at the discretion of DOE/NV, and verification sampling may be requested to ensure generator compliance with WAC. In addition, DOE/NV may also require that the generator supply representative samples for independent analysis. Prior to shipment, the generator is required to affix a certification statement to each package, certifying that the wastes contained in that package meet NVO-185 WAC.

The technical audit process is considered vital to the process of waste certification. High standards of quality assurance and thorough documentation are expected of the generator to ensure compliance with WAC, DOE Orders, and Nuclear Regulatory Commission (NRC) and EPA regulations. The certification program balances administrative controls, such as the technical audit, and verification procedures to obtain a high degree of certainty. As low as reasonably achievable precepts are taken into consideration by the certification program through the use of process knowledge to characterize waste.

No facility exists at present for breaching packages to perform verification; however, DOE/NV reserves the right to require verification by an independent laboratory. There are a limited number of laboratories which accept MW for analysis. Limits on radioactivity in MW samples are set on a case-by-case basis depending upon the potential radiation exposure and the nature of the chemical analysis required.

Waste examination capability is under development at NTS and an onsite laboratory is available for chemical analyses. To date, the laboratory has not been used for MW analysis. The laboratory is currently in the process of developing standards and procedures delineating acceptable levels of radiation. Should the DWMD wish to verify a generator's analysis for a waste stream which exceeds the laboratory's acceptable radiation levels, the sample will be sent to an outside laboratory if possible. In cases where there is no independent laboratory willing to perform required analyses, process knowledge will be the basis for determining whether a given waste stream meets the NTS WAC.

4.0 SUMMARY

The DOE/NV is implementing a stringent waste certification program at the NTS for all generators intending to ship MW. The program ensures all waste disposed at the NTS meets DOE/NV WAC and EPA waste analysis requirements. Verified process knowledge is an acceptable alternative to laboratory analysis in cases where the radioactivity of the MW limits the

analysis which can be performed on the waste. The WAC and the hydro-geological setting of the NTS provide the basis for the proposed Mixed Waste Management Unit design and requests for exemptions from the use of cell liners and groundwater monitoring.