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Notes/Comments:

Mr Zappe:

Here is the reference you requested.

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Attachment 5

"Nelson, Roger" <NelsonRa@wipp.carlsbad.nm.us> on 05/11/99 04:40:07 PM

To: Thomas Kiess
cc: "Mewhinney, Jim - DOE" <mewhinj@wipp.carlsbad.nm.us>, "Hunter, Kent - DOE" <hunterk@wipp.carlsbad.nm.us>, "Stroud, Butch - DOE" <stroudb@wipp.carlsbad.nm.us>
Subject: One-Page Summaries of Regulatory Drivers

On behalf of Kent Hunter, this message transmits a WORD '97 document containing 5 one-page summaries of the regulatory drivers for those characterization activities requested by the NAS in a conference call among WIPP and NAS on April 13, 1999.

 - OnePageSummaries.doc

Defense Determination for Transuranic Waste

The Land Withdrawal Act (LWA) and Section 213 of the DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (PL 96-164) allow only defense generated transuranic waste be disposed of at WIPP. The determination of waste eligibility is made in two steps:

1. the waste is first determined to generally agree with the transuranic waste definition.
2. the waste is then verified to have been generated by atomic energy defense activities.

To meet the transuranic waste definition, waste must contain more than 100 nanocuries of alpha-emitting transuranic isotopes with half-lives greater than 20 years, per gram of waste, and not be high-level waste or spent nuclear fuel. DOE has developed procedures to verify that waste sent to WIPP generally meets the transuranic waste definition.

To determine whether a particular waste stream was generated by atomic energy defense activities and that it is neither high-level waste nor spent nuclear fuel requires the use of acceptable knowledge (AK) documentation for the waste. There are no laboratory tests to aid in the defense waste determination since the DOE has, in some cases, identical materials that come from both defense and non-defense sources.

The following activities are classified as "defense:"

(a) naval reactors development;
(b) weapons activities including defense inertial confinement fusion;
(c) verification and control technology;
(d) defense nuclear materials production;
(e) defense nuclear waste materials and by-products management;
(f) nuclear waste and materials security and investigations: and
(g) research and development

QAPP Rev. 1 provides guidance on how defense waste determinations are made on a waste stream basis using acceptable knowledge. The *Carlsbad Area Office Interim Guidance on Ensuring That Waste Qualifies for Disposal at the Waste Isolation Pilot Plant* (February 1997) provides additional guidance on establishing that only TRU waste generated by atomic energy defense activities is certified for disposal at the WIPP.

Homogeneous Waste Sampling and Analysis

The RCRA regulations require that disposal sites verify the waste characterization of waste generators (40 CFR 264.13). Generator sites are better equipped for characterization (gloveboxes, etc.) and because WIPP was designed to start and stay clean, DOE has elected to not open or sample waste packages upon receipt. There is no regulatory requirement to conduct homogeneous waste sampling and analysis, however, in an effort to meet the intent of 40 CFR 264.13, WIPP has imposed additional characterization requirements on the waste generators. These requirements have been incorporated into WIPP's draft hazardous waste permit. There are no EPA (CCA) or NRC regulatory drivers for homogeneous waste sampling.

The draft WIPP hazardous waste permit requires that a statistical fraction of containers from each homogenous waste stream be sampled and analyzed for VOCs, Semi-volatile organic compounds (SVOCs) and metals. Homogeneous wastes are sampled in two ways: previously packaged waste is sampled by coring an existing container; newly generated waste is sampled as it is generated using a variety of standard techniques.

Analytical data from homogeneous samples is used to verify the EPA hazardous waste numbers for the waste stream as previously assigned by acceptable knowledge (AK). There are no operational decisions made based on this data. All waste shipped and disposed at WIPP is treated the same regardless of hazardous waste numbers assigned (or not assigned).

Homogeneous sampling and analysis is very expensive and directly exposes waste characterization operators and laboratory personnel to transuranic materials. Coring is especially challenging because the coring process must be conducted in an isolated chamber or glovebox to prevent the spread of radioactive dust. Sample handling is also challenging, given the widely varying amounts of transuranic materials present in the samples.

The WIPP system is very conservative in assigning EPA hazardous waste numbers by AK (numbers are generously assigned based on any evidence of a hazardous contaminant being present). Because of its intrusive nature, the DOE attempts to minimize the amount of homogeneous sampling and analysis done.

Headspace Gas Sampling and Analysis

The RCRA regulations require that disposal sites verify the waste characterization of waste generators (40 CFR 264.13). Generator sites are better equipped for characterization (gloveboxes, etc.) and because WIPP was designed to start and stay clean, DOE has elected to not open or sample waste packages upon receipt. There is no regulatory requirement to conduct headspace gas sampling and analysis, however, in an effort to meet the intent of 40 CFR 264.13, WIPP has imposed additional characterization requirements on the waste generators. These requirements have been incorporated into WIPP's draft hazardous waste permit. There are no EPA (CCA) regulatory drivers for headspace gas sampling and analysis.

The volatile organic compound (VOC) concentrations of waste disposed of at WIPP must be known in order to estimate the concentrations of the nine VOCs listed in Table 4-2 of the QAPP (Rev. 1). These data ensure that the WIPP disposal room average concentrations of these VOCs don't exceed the limits in Table 4-2. The requirement comes from the hazard analysis performed as part of the RCRA Part B Permit Application, and implemented by the draft WIPP hazardous waste permit. This analysis found that the only viable release mechanism for hazardous materials for the WIPP was through the "air pathway" during WIPP's operational phase. Modeling indicated that limiting the average concentrations of nine common VOCs in each disposal room at WIPP was sufficient to ensure compliance.

Because headspace gas sampling and analysis is required by the draft hazardous waste permit, these data are also used to verify the presence of hazardous VOCs identified by acceptable knowledge in order to confirm that the appropriate EPA hazardous waste numbers have been assigned to a waste stream.

The data are also used to verify that the concentration of flammable VOCs in a container headspace do not exceed 500 ppm. This requirement comes from the TRUPACT-II SARP and is intended to minimize the flammability hazard of TRU waste during transport. The main flammability hazard for most TRU waste comes from hydrogen generation that is carefully limited through sophisticated analytical and testing procedures described in the TRUPACT-II SARP

The CAO in QAPP Rev. 0 had required that the headspace of every waste container sent to WIPP be sampled and analyzed. This has proven to be an unnecessarily conservative approach in addition to being costly and hazardous for workers. Therefore the CAO changed the requirement for HSG sampling and analysis in QAPP Rev. 1 to allow statistical sampling of containers on a waste stream basis. (The fraction of containers sampled is determined using the principles described in SW-846, Chapter Nine.) QAPP Rev. 1 also reduced the number of VOC analytes required for analysis from 31 to 23; only those analytes with a clear regulatory driver in the RCRA regulations were retained. The current version of the draft WIPP hazardous waste permit requires that the headspace of 100% of the containers sent to WIPP be sampled and analyzed for VOCs. DOE has requested that this requirement be changed to be consistent with the QAPP Rev. 1. Implementation of QAPP Rev. 1 by the TRU waste sites is being planned.

Plutonium Content in Transuranic Waste

The amount of plutonium in transuranic waste sent to the WIPP for disposal is limited by the TRUPACT-II Safety Analysis Report for Packaging (SARP) which is approved by the NRC, and the WIPP Safety Analysis Report (SAR) which is approved by DOE. The Department of Transportation (DOT) also requires that the isotopes being shipped (at least 95% of the hazard) be identified on the shipping papers. Waste containers generally must meet the TRU waste definition of at least 100 nCi/g of alpha emitters with greater than a 20 year half-life. There are four limits in the SARP:

1. The SARP limits the fissile gram equivalents (FGEs) of Pu-239 in a container to 200 FGE for a 55-gallon drum or pipe-overpack, and 325 grams for a Standard Waste Box (SWB) or a Ten Drum Overpack (TDOP). It also limits the total TRUPACT-II loading to 325 grams unless loaded solely with pipe overpacks which based on geometry configuration control are limited to 2800 FGE (*i.e.*, 14 pipe-overpacks at 200 FGE each.)
2. The WIPP SAR limits untreated CH-TRU to 80 plutonium equivalent curies (PE-Ci) per 55-gallon drum or 130 PE-Ci per SWB. Overpacked or solidified waste containers may contain up to 1800 PE-Ci per container (based on health physics safety concerns).
3. The TRUPACT-II SARP limits the total thermal power (due to decay heat) in a TRUPACT-II to 40 watts (based on TRUPACT-II thermal analysis).
4. The TRUPACT-II SARP limits the decay heat in waste containers and in a TRUPACT-II based on gas generation concerns. These limits are generally lower than the one described in item 3 (based on containment analysis and <5% hydrogen limit).

Of these the first and fourth have been found to be the limiting condition for practically all transuranic waste based on the radionuclide mix of the waste. In waste where the predominant plutonium isotope is Pu-239, the FGE limit is limiting: in waste where the predominant plutonium isotope is Pu-238, the decay heat limit is limiting. Both limits have been conservatively derived.

The SARP requires that the error in radioassay measurements be added to the measured value for purposes of estimating the FGE and decay heat. Sites have an incentive to minimize the error in order to maximize the amount of waste in a shipment. This influences the counting times typically required.

In order to meet DOT requirements, radioassay is used to quantify the principal radionuclides present in the waste. In order to minimize the amount of waste less than 100 nCi/g being shipped to WIPP, DOE has imposed precision and accuracy requirements for radioassay at this activity. These measurements require sensitive instruments and relatively long count times for waste near the lower limit.

EPA has required that WIPP track the repository radionuclide inventory for specific isotopes. Because radioassay measurements are available, DOE meets this requirement through radioassay.

Radiography and Visual Examination

Real-time radiography (RTR) and visual examination (VE) are used to verify the physical characterization of transuranic waste that is performed primarily by acceptable knowledge (AK). The NRC requires physical characterization, as identified in the TRUPACT-II SARP, to verify the absence of prohibited items such as free liquids and compressed gases. In addition, the NRC specifically requires either radiography or a statistically based VE program for every payload container. The draft WIPP hazardous waste permit also requires that either RTR or the visual examination of all waste containers sent to WIPP be performed. Additionally, a fraction of the radiographed waste containers must be visually examined to verify the results of radiography.

RTR is also used to meet the draft WIPP hazardous waste permit requirement to assign containers to waste streams based on their physical and chemical forms. It may also be used to meet the EPA certification granted to WIPP, as implemented by the Compliance Certification Application (CCA) and the EPA Final Rule requires DOE to track the sum of the weights of cellulose, rubber, and plastics emplaced in WIPP.

Visual examination is used to verify the results of radiography for previously packaged waste, and to record the contents of containers as they are packaged. When used to verify radiography, a fraction of the containers are chosen for VE based on the number of containers radiographed on an annual basis. The VE results and the radiography results are compared to verify that the radiography results are correct. If not, corrective actions are taken. The number of VEs required is partially dependent on the success rate of radiography. A high success rate lowers the number of VEs required in subsequent years.

VE is costly and hazardous to workers because it requires opening waste containers and handling the contents. Given the high reliability and success rate of radiography, the CAO would like to phase out the requirement for continued VE verifications based on the data now being obtained. Also, more sensitive imaging techniques are being developed that will further establish RTR as the physical characterization method of choice.