Application of Historical Y-12 Default Radiological Activity Values to Legacy Waste-9401

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ABSTRACT

In June of 2003, Bechtel Jacobs Company LLC tasked Pacific Western Technologies (PWT) to perform a comprehensive audit of the Facility Acceptance Testing/ Container Analysis Tool (FAT-CAT), which is currently administered, by Bechtel Jacobs Company LLC... During this audit, a finding was issued on the subject of assigning historic Y-12 default radiological activity values to radiological containers, having no radiological data. Analysis of default radiological values versus known real radiological values showed the default values to be conservative as a placeholder for containers with no known radiological values.

INTRODUCTION

Personnel involved in what is now the legacy waste project developed default radiological activity values in the 1990's. These values were derived from waste stream data, and were considered to be conservative enough to be applied to known radiological containers having no data associated with them. It was believed that these default numbers could be applied to the container, and would be a conservative "place holder" until real analyses could be performed. Therefore, a set of default numbers was developed for Y-12 waste, ORNL waste, and ETTP waste having no radiological data, and these numbers were assigned to the containers by various waste management personnel. Pacific Western Technologies' audit of 2003 questioned the basis of using Y-12 default radiological data, as well as the lack of proper documentation. Title 10 of the Code of Federal Regulations, Part 830.3 defines safety basis (SB) as "…the documented safety analysis and hazard controls that provide reasonable assurance that a DOE nuclear facility can be operated safely in a manner that adequately protects workers, the public, and the environment" (1). The contents of an SB are based upon the facility's purpose of operation, radiological inventory, and safety systems in place to mitigate any releases to the employees, general public and environment. Specifically, the radiological inventory is used for facility categorizations (e.g., Category 2, Category 3) and determining the material at risk (MAR) used in the associated nuclear safety analysis (NSA) calculations.

HISTORICAL DEVELOPMENT OF THE RADIOLOGICAL INVENTORY SYSTEM

The Department of Energy's Oak Ridge Reservation (DOE-ORR) is comprised of three plants: the East Tennessee Technology Park (formerly known as the K-25 Site); the Y-12 Plant; and the Oak Ridge National Laboratory (ORNL). Because these plants continue to have such distinct missions, the types of waste materials they produce and the information needed to track these waste materials also vary.

Nevertheless, these waste materials must be tracked and managed when they are generated in accordance with federal and local regulatory requirements. A generator must completely and accurately declare the characteristics of the waste in order for the waste management organization to be able to handle, store, treat, and dispose of the waste appropriately. (2) The generator must have a mechanism for communicating to the waste management organization that waste will be delivered to them, or it is available for pick up. In addition, all transportation and handling of the materials must be recorded, including repackaging, shipment, and disposal.

Over time, each plant developed its own waste tracking system resulting in collecting and reporting waste information differently. Compounding this issue was the variety of databases being used to manage the data. For example, the information was managed on servers, desktops, and web-based applications resulting in a compilation of several interrelated systems utilized for tracking the various types of waste generated at the DOE-ORR.

FAT-CAT AND WITS

For the purposes of this paper, the radiological inventories of waste disposition facilities are maintained using the Facility Acceptance Testing - Container Analysis Tool (FAT-CAT), which extracts its data from the Waste Information Tracking System (WITS) database The database was deployed in three phases beginning in late 1997 with the conversion of the K-25 Waste Tracking and Reporting System to WITS, followed by the conversion of the Y-12 waste tracking system in early 1998, and conversion of the ORNL waste tracking system in mid-1999. The Waste Information Tracking System (WITS) is designed as a model-driven, production-quantity application to provide cradle-to-grave tracking of waste. The information contained in WITS is comprised of project information obtained from requests for disposal (RFDs); sampling and analysis results; waste characterization; storage; repackaging; transportation and/or disposition. The information is used to assess and ensure quality, safety, and regulatory compliance of waste management activities. The WITS database is comprehensive enough to support the collection of information used in managing the following types of waste that includes, but is not limited to low-level radioactive waste, transuranic waste, Resource Conservation and Recovery Act (RCRA)/mixed wastes, Toxic Substances Control Act (TSCA) waste, and spent nuclear fuel.

The WITS database information enables sharing of information (e.g., generator, type of

waste, point of origin, charge number) across departments and organizations, thus addressing the waste tracking and management information needs for various users. For example, waste coordinators, field technicians, sampling crew supervisors, facility technicians, data analysts, shipping coordinators, and project managers can access the same storage facility inventory data. The movement of waste containers (e.g., facility to facility, plant to plant, and ultimate disposition) is recorded in WITS using hand-held barcode readers that permit rapid inventory, and summarize relevant container information such as location, history, and regulatory status.(3)

Ideally, the radiological inventory, which is comprised of isotopic data for each container, is maintained in the WITS database. However, the official repository record for isotopic data of each container is the Request for Disposal (RFD). The RFD is a separate set of paperwork for recording specific container information (e.g., contents, type of waste, weight, volume, etc.). (4) Historically, neither WITS nor the RFDs were required to contain isotopic data. However, there have been attempts to populate WITS with this information from the RFDs. For example, newly generated waste information and characterization data (e.g., non-destructive analysis [NDA]) are being added to the RFD files. Still, there are containers that: a) do not have any isotopic data, b) have unsupported isotopic data, or c) have inconsistent isotopic data in WITS and the RFDs.

DISCOVERY OF NON-CONSERVATIVE DEFAULT VALUES

Nuclear Facility Safety Manager Mark McHugh developed a paper describing different types of uncertainties associated with radiological inventories at Bechtel Jacobs facilities.(1) During development of this paper, he investigated the use of historic default radiological values, and discovered that the default values used for ETTP legacy waste were non-conservative. The discovery of non-conservative values used for ETTP containers presents a question of what numbers to assign to ETTP generated legacy radiological waste that has no radiological values on the associated paperwork.

JUSTIFICATION FOR APLLICATION OF THE Y-12 DEFAULT VALUES

As mentioned before, occasionally, it will be necessary to apply historic default activities to containers with unknown or no radiological values. Since the historic ETTP values were found to be non-conservative, waste from Y-12 with applied default data was compared to containers with known radiological values in storage.

THE FAT-CAT TOOL

FAT-CAT is a database that extracts container specific radiological values, totals the numbers by isotope, and then assigns a sum of fractions to the container based on the Category 2 limit for each isotope. The activity limit fraction for all containers is summed for a total facility sum of fractions. This sum of fractions is then compared to the facility limit, which is required to be < 1 . The FAT-CAT tool has a function that when the facility storage data is accessed, FAT-CAT prints out the top fifty contributing containers to the facility fraction (sum of fractions) by radiological activity.

COMPARISON USING THE FAT-CAT TOOL

Historically, containers from Y-12 that had no radiological data associated with them were assigned a conservative placeholder value, to insure compliance for nuclear facility safety, until sampling or analysis could be performed to properly characterize the container, for disposition. Each 96 cubic foot container having no radiological values associated with it was assigned a value of 5.25E-4 Cat 2 threshold quantity (TQ). A threshold quantity is the amount of nuclear material by isotope that is allowed in a facility. This threshold is used to limit offsite exposure and consequences in case of an emergency. This number was embedded in the WITS program approximately 18 years ago, with no obtainable reference to its derivation. (2) The Fat-Cat tool has the ability to look at facility fractions, based on their container contributions to this fraction. Also, a list of the top fifty contributing containers to the facility limit is displayed on the main FAT-CAT compliance page. Therefore, it is very simple to compare the default place holder versus the actual fractions of containers in a given facility. Given facility "X" with a total of 783 containers stored in it, the top 50 contributing containers all had sum of fraction numbers < the historic default fraction. This is a very quick way to compare the default number against the actual calculated values for containers with real radiological values, and insure that a conservative number is assigned to containers with no know radiological values, until real data can be applied.

The Y-12 default data was compared to these top fifty containers in each facility, and found to be conservative. Since the comparison was only made against the top fifty contributors of each facility, the Y-12 default value is deemed to be ultra-conservative, as the default activity would be more conservative than any other of the containers in storage not evaluated. Additionally, much of the legacy waste at ETTP came from Y-12, further justifying the use of the Y-12 default values.

CONCLUSION

Use of the historic Y-12 default activity is justified when deemed necessary. Actual characterization such as sampling, dose to curie conversion, etc. should be performed to most accurately characterize waste for disposition.(3) For containers having no known radiological values, that are being stored in radiological facilities, a conservative default sum of fractions should be applied to each container. Using the Fat-Cat Tool to compare default data versus the top 50 contributing facility fraction containers is a simple quality control tool used to insure compliance with the facility safety basis requirements for a category 2 nuclear facility.

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