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DATA QUALITY OBJECTIVES FOR THE B-CELL WASTE STREAM CLASSIFICATION SAMPLING

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Abstract: The data quality objectives are given for sampling the B-Cell rack waste stream in the 324 Building. The sampling effort is concentrated on determining a ration of Cs-137 to Sr-90 and Cs-137 to TRU. A logic path of the sampling effort is shown in the figure.

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DATA QUALITY OBJECTIVES FOR THE B-CELL WASTE STREAM CLASSIFICATION SAMPLING

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May 1998

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DATA QUALITY OBJECTIVES FOR THE B-CELL WASTE STREAM CLASSIFICATION SAMPLING

1.0 Introduction

This document defines the data quality objectives (DQOs) for sampling the B-Cell racks waste stream. The sampling effort is concentrated on determining a ratio of Cs-137 to Sr-90 and Cs-137 to transuranics (TRU). Figure 1.0 shows the logic path of sampling effort. The flow chart begins with sample and data acquisition and progresses toward a) statistical confidence and waste classification boundaries, b) management decisions based on the input parameters and technical methods available, and c) grout container volume/weight limits and radiation limits. The end result will be accurately classifying the B-Cell rack waste stream.

2.0 Data Quality Process

The following seven sections are recommended by the Environmental Protection Agency for preparing DQOs.

2.1 Problem Statement

Sample results from B-Cell currently indicate the metal waste stream could be characterized as remote handled TRU, however, there is insufficient data to confirm this characterization. Hence, it is necessary to acquire a representative number of samples from the B-Cell racks to better characterize the metal waste.

Current waste classification of the waste metal from B-Cell is based on the analyses of three smear samples taken during March 1998 and three smear samples taken during CY93 from rinsed material in the cell. An assumption based on process history was also a basis for the waste classification. It was known that significant amounts of Cs-137 and Sr-90 in volatile form was released from the radioactive liquid-fed ceramic melter (RLFCM) in 1984/85. Although analyses of melter feed stock present in the melter at the time of the release showed trace amounts of plutonium, it was assumed that the plutonium would not be in the volatile fraction released from the melter.

The volatile material released from the melter plated out on all exposed surfaces in the cell, forming a fixed contamination layer on those surfaces. The assumption was that transuranic isotopes were present in the removable contamination in the cell, but were not present in the fixed contamination present on the metal waste. Due to this assumption, the six samples used for waste designation examined only removable contamination present on the waste.

To validate the assumption that the fixed contamination present on the metal waste in the cell does not contain transuranics in sufficient quantities to warrant designation of the waste as TRU, samples of the metal waste with fixed contamination will be collected and analyzed. Data from this study, as well as additional smear data, will be used to classify the B-Cell waste stream. The data will be used to determine the waste characteristics, treatability, packaging and shipping requirements, and storage and disposal requirements. The additional data, will also identify the contamination constituents contained in this waste stream as well as provide a reliable ratio of Cs-137 to TRU isotopes, and Cs-137 to Sr-90. The sampling required includes radionuclide analyses. The accuracy of the sampling effort will be dependant on a statistically valid number of samples which will be analyzed with a known and proven precision to allow for the designation of the B-Cell waste material.

2.2 Identified Decision

The purpose of this sampling effort is to characterize the dispersible and fixed radioactive material adhered to the racks in B-Cell to determine the waste stream characteristics, treatability, packaging and shipping regulations, and storage and disposal regulations. The information required to make these decisions includes sampling the B-Cell racks and analyzing the samples for Cs-137, Sr-90, and TRU. Sample types will include smears, rinsate, and material coupons. Sample results will be used to establish reliable ratios of Cs-137 to Sr-90 and Cs-137 to TRU. Individual sample results will be reported with a known level of confidence.

The following questions must be answered by the sampling and analysis process:

A. What is the radiological characterization of the smearable and fixed components of radio-contamination on the B-Cell racks?

B. What is the confidence and representativeness of the results of the data collected based on the number and location of samples acquired from the sampling effort?

C. What is the volume/weight limit and the radiation limit such that a determination can accurately be made on designating the container as either low-level waste (LLW) or TRU?

Figure 1.0 details the flow path of the decision making process.

2.3 Decision Inputs

There are five distinct populations of metal waste present in B-Cell that may have different radioisotopic characteristics present in fixed contamination layers:

a) ungrouted waste in grout containers (although this material came primarily from demolished equipment racks, other material such as Tk 119 have been cut up and are present in the grout containers),

b) external surfaces of piping and tubing, tanks, and rack structural material on intact racks,

c) internal surfaces of structural material on intact racks,

d) internal surfaces of piping and tubing on intact racks, and

e) internal surfaces of tanks and vessels in intact racks.

Of the five populations, it is not expected that the internal surfaces of structural material (such as rack legs made of piping, and structural members made of channel) will have significant quantities of fixed contamination because they were not directly exposed to either process solutions or volatile airborne fractions from the melter (population 'c'). The remaining internal surfaces (populations 'd' and 'e') are expected to have lower concentrations of radiocontamination that external surfaces which were exposed to the B-Cell processes (e.g., FRG log production).

Three types of samples are required: smears, rinsate, and rack material coupons. Analytical procedures will be performed on selected samples and will include: gamma energy analysis (GEA), alpha energy analysis (AEA), and Sr-90 analysis.

It is expected that the number of samples collected will provide a basis for demonstrating a thorough understanding of the B-Cell waste material, its radio-characteristics, and enable accurate waste classification. It will also provide the means by which packaging and shipping regulations will be applied.

2.4 Study Boundaries

The B-Cell racks will constitute the samples. Of the five sample populations, the externally contaminated material (population 3.b) is expected to set the limiting factors for the ratios of Cs-137 to TRU and Cs-137 to Sr-90. The remaining populations will provide useful data, however, it is not expected that these populations will be more restrictive than the externally contaminated material.

Random samples will be taken from the lower, middle, and upper sections of the racks to ensure representative sampling. The samples will be moved to C-Cell for segregation, and sampling and analysis preparation. All the samples will be remote handled until they are brought out of the cells. Enough samples will be collected to provide a statistical representative result for each sample type: smears, rinsate and rack material coupons. More information about the sample boundaries and acquisition is detailed in the sampling plan (e.g., sample size, volume, etc).

Samples will be identified with a unique sample number. They will also be protected through chain-of-custody requirements to ensure the samples are tracked from the time they are acquired to the time the analyses are complete. Constraints to obtaining samples include the ability to get cutting equipment inside the rack to secure a sample, loosing the sample because it falls to the floor, and removing samples once cut.

2.5 Decision Rule

Once the samples have been analyzed, the waste characteristics, treatability, packaging and shipping requirements, and storage and disposal requirements may be determined. The contamination characteristics will include a radionuclide breakdown of the contaminants and the ratios of Cs-137 to TRU and Cs-137 to Sr-90.

Waste will be classified based on the results of the sampling (e.g., LLW or TRU). Packaging and shipping requirements will also be determined from the type and dimensions of the waste form. Volume/Weight and radiation limits will be established for the grout containers based on the chosen method for determining the grout container total activity (a data based waste classification). These limits will be used to decide the appropriate waste classification of the container: i) If both the volume/weight limit and the radiation limit are maintained then the shipment will be LLW, ii) If either the volume/weight limit or the radiation limit is exceeded then the shipment will potentially not be LLW. This is shown in Figure 1.0.

2.6 Acceptable Error Limits

Sample results will be reported with a minimum of one standard deviation (68%).

Based on the acquired data, a volume/weight limit and a radiation limit will be established for the grout containers. These limits will be derived based on the sample analytical data and will include a margin of safety based on the variability of the data. The samples will have known results: sample geometries (volume and area). Cleaning the removable layer will be conducted in the same manner as will be normal practice in the cell to ensure representative results. A linkage is made to the total volume/weight and radiation limits by utilizing the sample geometry and radioactivity data and the know volume to density ratio of the rack material. Based on the grout container properties (volume/weight and radioactivity), the result will be knowing that the material is actually identified, designated and shipped correctly and properly with a particular confidence level.

2.7 Optimization

In order to meet the intent of this Data Quality Objective document, a sampling plan will be developed to ensure meeting the sampling goals and consistency and reproducibility in the sampling effort. A work plan is required including a prejob briefing. Additionally, approved laboratory procedures for radioactive analyses will be employed and will meet applicable standards. Each sample item taken will be uniquely identified and inscribed, and additionally will have a physical description in the sample log sheet. All samples prepared will be uniquely identified and witnessed to ensure quality control. While in C-Cell, B-Cell samples will have C-Cell dedicated equipment to ensure no cross contamination occurs from C-Cell. Additionally, samples will be brought in on 'work trays' and will remain segregated from other C-Cell activities while in the cell.

The results of the sampling effort will be used to determine the Cs-137 to Sr-90 and Cs-137 to TRU ratios. The ratios will be used to develop well defined volume/weight and radiation limits. The limits will be triggers for determining the designation of individual grout containers.

3.0 Reference

EPA, 1993, "Guidance for Planning for Data Collection in Support of Environmental decision Making Using the Data Quality Objectives Process," EPA QA/G-4, U.S. Environmental Protection Agency, Washington, DC.

Figure 1.0 B-Cell Sampling Data Quality Objective Process