LA-14395

Selection of 3013 Containers for Field Surveillance: LA-14310, Revision 1

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Selection of 3013 Containers for Field Surveillance: LA-14310, Revision 1

by

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ABSTRACT

This document is the fifth in a series of reports that document the binning, statistical sampling, and sample selection of 3013 containers for field surveillance.[1,2,3,39] Revisions to binning assignments documented in this report are primarily a result of new prompt gamma data. This report also documents changes to the random sample specification resulting from these binning changes and identifies and provides the rationale for the engineering judgment sample items for Fiscal Year (FY) 2008 and 2009. This revision also updates the changes to the previous surveillance sample resulting from changes to the order that specific containers undergo surveillance. This report will continue to be reviewed regularly and revised as needed to meet the requirements of the surveillance program.

BACKGROUND

The United States (U.S.) nuclear weapons program has generated large quantities of excess plutonium. This material must be safely stored pending final disposition. Requirements for packaging and storage of plutonium-bearing materials have been addressed in the Department of Energy (DOE) Standard, "Stabilization, Packaging, and Storage of Plutonium-Bearing Materials," DOE-STD-3013,[4] and are being implemented throughout the DOE complex. In order to ensure the safe long-term storage of plutonium in 3013-type containers, the 3013 standard directed that a surveillance plan be developed and used for monitoring the condition of these containers during storage. DOE has implemented an Integrated Surveillance Program (ISP)[5] that is designed to integrate individual sites into a corporate, cost-effective surveillance effort. The ISP consists of two programs: the Shelf-Life program to closely monitor the behavior of selected materials under laboratory conditions and the Field Surveillance program to destructively and nondestructively evaluate production 3013 containers and materials during storage.

The Surveillance and Monitoring Plan for DOE-STD-3013 materials[6] (S&M Plan) outlines a statistical sampling approach for the surveillance of 3013 packaged containers. In addition to the statistical sampling, other containers may be added to the surveillance containers based on engineering judgment.[3] For the statistical sampling portion of the program, the ISP Steering Committee has directed that, with a 99.9% probability, at least one from the worst 5% (99.9/5% criteria) of the pressure-generating or corrosive containers in a defined population is evaluated during the random portion of the surveillance program. To facilitate selection and surveillance, the 3013 containers are binned based on the mechanisms that could potentially challenge the container. The bins are defined as Innocuous, Pressure, and Pressure and Corrosion. During the binning process, containers that were not categorized well enough to be placed in one of the bins using a binning decision tree required a container-by-container Engineering Review (ER).

Section 1 of this report summarizes the results of an extensive effort to assign all of the current and projected 3013 containers in the DOE inventory to one of three bins (Innocuous, Pressure and Corrosion, or Pressure) based on potential failure mechanisms. Grouping containers into bins provides a framework to make a statistical selection of individual containers from the entire population for destructive and nondestructive field surveillance. The binning process consisted of three main steps. First, the packaged containers were binned using information in the Integrated Surveillance Program database and a decision tree. The second step was to assign those containers that could not be binned using the decision tree to a specific bin that uses container-by-container engineering review. The final step was to evaluate containers not yet packaged and assign them to bins using process knowledge. The technical basis for the decisions made during the binning process is included in Section 1. A composite decision tree and a summary table show all of the containers projected to be in the DOE inventory at the conclusion of packaging at all sites. Decision trees that provide an overview of the binning process and logic are included for each site.

Section 2 of this report describes the approach to the statistical selection of containers for surveillance and describes revisions based on the latest binning results that affected the total number of containers in each bin. The requirement of 99.9% probability of observing at least one of the worst 5% (99.9/5%) of the containers with a potential for degradation is used to determine the number of containers in the random sample for the Pressure and Corrosion and the Pressure bins. Sampling requirements for the Innocuous bin are not based on the 99.9/5% requirement; rather, they are based on evaluating the assumption of no significant degradation of, or variability between, containers relative to corrosion or pressure generation within the Innocuous bin.

Section 3 of this report focuses on the actual selection of 3013 containers for surveillance. Surveillance containers are identified by the year that the surveillance should be performed. In addition to the randomly selected containers, containers were selected from the entire population, based on engineering judgment for each surveillance year. The judgmental sampling targets containers with the greatest potential for gas generation and/or corrosion. The factors used for judgmental sample selection are documented in this section.

1.0 BINNING OF 3013 CONTAINERS FOR FIELD SURVEILLANCE

1.1 Binning Introduction

Binning of containers was first performed in FY 2005 according to the criteria defined in report LA-14184.[1] In FY 2006, revisions to the bin assignment of containers was necessary due to several changes in the binning philosophy from the original report[1] and the inclusion of new data. FY 2006 changes included the completion of the Savannah River Site (SRS) 3013 packaging effort, reanalysis of Rocky Flats Environmental Technology Site (Rocky Flats or RFETS) Fourier transform infrared spectroscopy (FTIR) moisture data, use of the best available moisture data in the binning decision, inclusion of additional prompt gamma analysis, revision of the prompt gamma fluoride concentration used to determine potentially corrosive containers to match the minimum detectible chloride concentration, inclusion of chemical analysis results from some Hanford and SRS containers, and revision of the criteria for a container to be considered Innocuous. Additional changes to binning in 2008 result from new prompt gamma data from Hanford, prompt gamma container surveillance at SRS and recalibration of the prompt gamma results. These changes are reflected in the revised binning decision trees, Figures 1.1 through 1.7, and are discussed in further detail below.

1.1.1 Changes and Additions since FY 2005

Previous changes to binning criteria documented in Revision 0 are described in Sections 1.1.1.1–1.1.1.3 below. Section 1.1.2 documents binning changes since Revision 0 was issued.

1.1.1.1 Changes to the Binning Philosophy

Better moisture data are now available for some of the Rocky Flats and Hanford containers (see Section 1.1.1.3 below). Reevaluation of the Rocky Flats FTIR data provided more accurate moisture results for all of the FTIR measurements.[7] Previously, in cases where the Thermo-gravimetric Analysis (TGA) result met the acceptance criteria, TGA was used as the certification moisture value and as the basis for the binning decision even when FTIR results were available. For cases where the FTIR result was used for certification, the reevaluated FTIR moisture value is considered more accurate. In both cases, the reevaluated FTIR result is now used for binning decisions.

Some Hanford convenience cans gained weight in storage before packaging into inner welded containers. In the original binning report,[1] these weight gains were not included in the ISP database[8] and were not part of the binning decisions. The current ISP database now includes the Hanford weight-gain data. The weight gain during interim storage has been added to the measured moisture result and is included in the database as the best estimate of moisture in the container. The assumption is that any weight gain during storage is attributed to the material adsorbing moisture.

The limit of detection for fluoride (0.1 wt%) by prompt gamma analysis is lower than for chloride (0.8 wt%). In addition, at a given concentration, chloride has a higher potential for causing corrosion of the container. This difference in detection limits places a disproportionately large number of low fluoride (<0.8 wt%) containers in the Pressure and Corrosion bin, thus diluting the bin population. Using the fluoride assumption in section 1.1.3 below, containers with less than 0.8 wt% fluorides have been removed from the Pressure and Corrosion bin.

Containers were previously considered to be Innocuous when they passed all tests in the decision tree and did not require an engineering review (Binning Decision Tree Gate 6 [BDT-6]). This allowed containers without prompt gamma or chemistry analysis to automatically be placed into the Innocuous bin. Containers without prompt gamma or chemistry analysis are now required to have an engineering review before they are considered innocuous. Also, containers with detected low fluoride are required to go though engineering review before being considered innocuous.

Revisions were made as to which material groups are considered corrosive by process knowledge. Process knowledge assumptions of which material groups contained chlorides and fluorides were validated using prompt gamma results and other historical information; the only material groups that are considered inherently corrosive are as follows:

- Hanford represented group[9] “Impure and scrap oxides from Rocky Flats” (1E) or “Impure and scrap Pu oxides with 30–80 wt% Pu PFP generated scrap oxides” (2B) that do not have prompt gamma analysis,
- Rocky Flats group[10] “Pyrochemical — byproduct oxides” (2B) or “Screenings from Pu oxidation — byproduct oxides” (2E),
- SRS materials from Rocky Flats origin that are identified as ARF material in the SRS group[11] “Metal oxidation from Rocky Flats (foundry oxide, 80–85 wt%)” (1A), and
- Containers from Lawrence Livermore National Laboratory (LLNL) with any portion of washed material in the container.

The LLNL containers are considered corrosive because many still showed significant amounts of chloride as measured by prompt gamma.[12] As a conservative approach, these containers are considered corrosive.

1.1.1.2 New Data

SRS has completed its 3013 packaging campaign. SRS packaged a total of 920 containers, which included 618 containers of metal and 302 containers of oxide. This is 120 containers less than what was projected in the original binning report[1] and includes two fewer metal containers and 118 fewer oxide containers.

Chemical analysis data for several Hanford and SRS containers have been added to the ISP database and are now available for use in binning decisions. Thirteen containers were identified from these data as having greater than 1,000 ppm chloride or greater than 8,000 ppm fluoride (analysis results reported in units of ppm are equivalent to results reported in µg/g in most cases).

More prompt gamma analyses have been completed and are available for binning decisions.[13] Additional prompt gamma results are available for SRS containers as required as part of the certification. Additional Hanford prompt gamma analyses were performed on containers that previously lacked prompt gamma results. Also, Rocky Flats containers that were part of the FY 2005 nondestructive surveillance program at SRS were remeasured by prompt gamma using 60-minute count times instead of the 15-minute count times originally used at Rocky Flats. The longer count time provided better lower detection limits for chloride and fluoride. These additional prompt gamma results are now used in place of process knowledge and previously available prompt gamma results for use in binning of these containers. In the case of the more sensitive analysis performed on Rocky Flats containers, prompt gamma analysis detected chloride in several containers where previous analysis showed none. In one case, chloride was not found in the 60-minute reanalysis but was detected in the original 15-minute analysis. In this case, the more conservative analysis (chloride present) is used.

1.1.1.3 Determination of Best Available Moisture Measurement

Moisture analysis methods vary in their accuracy to measure moisture exclusive of other effects. Loss on ignition (LOI) and TGA are generally recognized to be conservative because measured weight loss can be greater than the amount of water present. Coupling the TGA analysis with either FTIR or mass spectroscopy (MS) is more specific to the measurement of only the water in the sample.

LOI and TGA methods measure any weight change to the sample when heated to 1,000°C. Weight change can be due to loss of water or evaporation of salts or because of the oxidation of other materials present (e.g., carbon or uranium). The main difference between LOI and TGA is when the final weight of the sample is measured. For LOI analysis, the sample is weighed after cooling to room temperature (or generally below 100°C), but it is measured at 1,000°C when using TGA analysis. Readsorption of water during cooling of the LOI samples masks the actual weight loss of the sample, which is the basis for using a lower 0.05 wt% binning cutoff for the LOI analysis compared to 0.10 wt% for all other methods. LLNL uses a different process called whole-batch LOI in which the LOI of the entire batch is determined by heating the entire batch to over 1,000ºC, and then the reabsorbed moisture is estimated for the cooling-off period until it is packaged into a convenience can.

Because some containers were stored for significant amounts of time between sampling for moisture analysis and welding into inner containers, weight change (gain) during storage was interpreted as moisture adsorbed by the material. Where applicable, weight gain during storage is added to the moisture measurement (from any of the methods) and is used as a better representation of the moisture in a container than the moisture measurement alone.

Rocky Flats containers measured with FTIR analysis were subject to reevaluation of the moisture result because of changes in the way the FTIR baseline was measured and subtracted. The revised baseline subtraction improved the accuracy of the moisture result, and the recalculated result is considered better than the originally reported value.[7] A significant portion of the Rocky Flats containers used the TGA analysis as the certification value, but also had FTIR analysis results available. In these cases, the FTIR analysis (specifically, the recalculated FTIR analysis) is considered the most accurate or best moisture value.

For containers having more than one moisture value, the preferred analytical method is listed below in order of decreasing accuracy:

1. Recalculated FTIR analysis
2. FTIR or MS
3. TGA
4. LOI

In addition, if a convenience can show a storage weight gain, adding the weight gain to any of the above analyses is better than using an analysis alone. The ISP database contains all moisture measurement results for any container and has a pointer to the best available result.

1.1.2 Revision 1 Changes and Additions

Revision 1 to this document incorporates the following changes:

- With the completion of all of the Hanford prompt gamma measurements, some items required rebinning. Items in the Hanford 2B represented category sometimes had chlorine or fluorine present. From a binning standpoint, if prompt gamma showed chlorine or

>0.8% fluorine, then the item was placed in the Pressure and Corrosion bin; otherwise, it passed to the next criteria in the decision tree (Figure 1.1). In FY 2006 when rebinning took place, not all of the Hanford 2B items had prompt gamma analysis available and thus were conservatively placed in the Pressure and Corrosion bin (Binning Decision Tree Gate 4 for Hanford 2B items [BDT-4-H-2B]). Thirty-one items that were in the Pressure and Corrosion bin for lacking prompt gamma analysis were removed because new prompt gamma data for these containers do not show the presence of chlorine or fluorine.

- Additional prompt gamma measurements are performed on containers during Nondestructive Evaluation (NDE) analysis. Three of these measurements found chlorine where the baseline prompt gamma measurement found none. Based on this new data, these three containers were rebinned as Pressure and Corrosion.
- SRS removed two containers from the ISP that were repackaged, and the original container numbers were inadvertently left in the database.

1.1.3 Binning Assumptions

The following conditions are assumed and form the basis for all binning decisions:

- A container with plutonium metal without loosely adhering oxide is innocuous, based on historical and scientific data.[14-15]
- Chloride salts and high concentrations of fluoride salts are potentially corrosive to types 304 and 316 stainless steels.[16–17]
- Chloride poses greater risk of corrosion than fluoride at the same concentration.[18]
- Pressurization of containers in the Pressure and Corrosion bin is primarily caused from radiolysis of water to generate hydrogen gas (other gases may be generated but in minor amounts relative to hydrogen).[19]
- Pressurization of containers in the Pressure bin is due to a combination of factors, including the radiolysis of water to generate hydrogen gas and the generation of other gases such as O_2, N_2, NO_2, SO_2, CO_2, CO, and CH_4 (the mechanisms for generation of these other gases are not well understood but may contribute a substantial percentage of the total pressure).[19]
- The amount of water present directly affects the maximum potential pressure in a container from the radiolysis of water.[4]
- Containers with less than 0.8 wt% fluoride are assumed not to be in the worst 5% of the Pressure and Corrosion bin population, based on the fluoride level alone.
- Containers with chloride at levels below the prompt gamma detection threshold are assumed not to be in the worst 5% of the Pressure and Corrosion bin population.
- Containers with high-purity oxide containing less than 0.1 wt% water are assumed not to be in the worst 5% of the population based on pressure generation.

1.2 Binning Scope

Binning consisted of a three-tiered review of all 3013 containers with the primary objective of placing each container into one of the three bins for the purpose of surveillance.

Tier 1—Containers that have already been packaged and have been assigned to their appropriate surveillance bins based on information in the data package provided for each container using the binning decision tree Figure 1.1.

Tier 2—Containers from Rocky Flats, Hanford, SRS, and LLNL that are currently packaged and have failed the initial screening for immediate assignment to a surveillance bin required engineering review before they were assigned to an appropriate bin. Containers in this tier were individually reviewed before assignment to one of the three surveillance bins.

Tier 3—Items not yet packaged from LLNL and LANL. Some of these items can easily be binned based on being either metal or an oxide with greater than 85 wt% plutonium (Pu). The remainder required a somewhat subjective and conservative engineering review before assigning them to a bin for surveillance. Assigning items in this group to bins at this time only serves to provide total bin estimates for the purpose of defining the total number of samples required in the surveillance program.

1.3 Surveillance Bins

Containers in the 3013 inventory are initially sorted according to the potential failure mechanism that they may present: Pressure, Pressure and Corrosion, and Innocuous. Moisture is needed to create the potential for pressurization. A corrosive classification, although useful for isolating a failure mechanism, is tied to the pressure-generating classification because moisture is also needed to form the corrosive electrolyte and is identified by the classification of Pressure and Corrosion. The Innocuous bin is used for containers that have no potential for either pressurization or corrosion. Metals and high-purity oxides with low moisture are generally considered Innocuous.[14-15] These three bins or strata form the initial indicator populations that are used to sort containers for different levels of surveillance. Binning was accomplished using the decision tree shown in Figure 1.1. Information to facilitate the binning came primarily from the ISP database that contains all of the information from the Product Certification Databases (PCD) generated by the packaging sites as well as additional data from other sources such as small and large-scale testing or reevaluation of existing data present in the database (e.g., moisture data). The ISP database includes information such as process knowledge regarding the source of the material, moisture content of the material, prompt gamma analytical data taken after packaging, and chemical analysis data. The decision tree is set up to bin containers with Pu metal, Pu oxide with corrosive impurities, pure oxides (containing greater than 85 wt% Pu + Am + Np), and impure oxides with greater than a threshold moisture content using the database information. Impure oxides with less than the threshold moisture content (0.05 wt% LOI or 0.10 wt% TGA/FTIR/MS) were required to go through the process of ER before appropriate bin assignments could be made.

1.4 General Binning Criteria

1.4.1 Initial Binning of Materials

The initial binning evaluation assigned containers with only Pu metal plus any associated metal impurities to the Innocuous bin (BDT-1), as illustrated by the decision tree (Figure 1.1). The second binning operation was to separate containers with a potential for corrosion (BDT-2, 3, 4). The primary constituent for causing corrosion is chloride salts or possibly fluoride-containing materials. Using information from the database, containers identified as containing either chloride (greater than 1,000 ppm) or fluoride (greater than 8,000 ppm) were placed in the Pressure and Corrosion bin. Identification of chloride or fluoride could be accomplished by chemical analysis (BDT-2), prompt gamma analysis (BDT-3), or process knowledge of the material (BDT-4). These methods for determining the presence of corrosive materials have varying degrees of accuracy and sensitivity. For example, using process knowledge alone, the 3013 container may or may not contain chlorides or fluorides. If items in the container originated from a process that used chlorides, it was placed in the Pressure and Corrosion bin unless there was additional analytical information to the contrary. If the chemical analysis showed chloride greater than 1,000 ppm or fluoride greater than 8,000 ppm or if the prompt gamma analysis detected either chloride (any positive detection) or fluoride greater than or equal to 0.8 wt% (8,000 ppm), the container was placed in the Pressure and Corrosion bin. The prompt gamma detection limit for chlorine is about 0.8 wt%, and the detection limit for fluorine is about 0.1 wt%.[12]

The third criterion, used for the binning of pure oxide material that showed no evidence for containing corrosive materials, was the final moisture content of the oxide (BDT-5). The DOE-STD-3013 sets the moisture limit for oxide materials at 0.5 wt%. However, the actual acceptance limit for moisture content varied from site to site, depending on the method for moisture analysis and the date the container was generated. To accommodate the different acceptance values for each site, a conservative moisture limit was established for binning of the pure oxide materials. Containers with an LOI result greater than 0.05 wt% were assigned to the Pressure bin. When moisture was measured by TGA, FTIR, or MS, a moisture limit of greater than or equal to 0.10 wt% was established for placing the container in the Pressure bin.

Containers with pure oxide with moisture content below these limits were placed in the Innocuous bin unless the fluoride or prompt gamma exception applied (BDT-6).

If a container successfully passed the screening test for Pressure and Corrosion as well as for Pressure, and had less than 85 wt% Plutonium (Pu) + Americium (Am) + Neptunium (Np), it required an ER to evaluate each container individually. Uranium was excluded from the prescreening process because its large measurement uncertainty could skew the binning results.

1.4.2 Binning of ER Materials

All containers selected for ER have been prescreened as described above (with the exception of those not yet packaged) using the logic diagram shown in Figure 1.1. All packaged containers have a Pu + Am + Np content of less than 85 wt% (or meet the low fluoride or prompt gamma exception) with no known chloride content from process knowledge or analytical analyses and have a moisture content of less than 0.05 wt% by LOI or less than 0.1 wt% by TGA and/or FTIR/MS. Uranium was excluded from the prescreening process because its large measurement uncertainty could skew the binning results. However, the presence of uranium was considered during the ER. The criteria for binning ER containers are listed below.

> **Criterion 1**: Containers with greater than 85 wt% Pu + Am + Np + U (total actinide) were placed in the Innocuous bin. These containers were reviewed on an individual basis to ensure that the material came from a historically pure stream so that the uranium measurement uncertainty could not cause an impure material to be binned as innocuous.
>
> **Criterion 2**: Containers with total actinide content between 80 and 85 wt% were reviewed on an individual basis. Those containers from a process that historically produced pure material with a moisture content of less than 0.05 wt% were placed in the Innocuous bin unless there was a suspected problem with the moisture analysis identified

through a nonconformance report (NCR) or other documented production comment. Containers not meeting the moisture criteria were placed in the Pressure bin.

The only exception to the 0.05 wt% criterion was for mixed plutonium-uranium oxide containers processed in the Stabilization Packaging Equipment (SPE) dry line at Hanford that had a TGA moisture value exceeding 0.05 wt%. The TGA results were reviewed on an individual basis to determine if excess weight loss occurred at high temperatures and could be attributed to oxygen loss from the uranium oxide and not water. For these cases, the container was placed in the Innocuous bin.

Criterion 3: Containers with a total actinide content of less than 80 wt% were placed in the Pressure bin. (Exceptions were oxide containers evaluated under Criterion 4.)

Criterion 4: Oxide containers produced by magnesium hydroxide precipitation from pure plutonium nitrate solutions represent a special class of items where the major impurity is magnesium oxide and prompt gamma indicates no other significant impurities.

> Hanford–Containers from Hanford packaged in the SPE (dry) line and having a TGA moisture content of less than 0.05 wt% were placed in the Innocuous bin. All others were placed in the Pressure bin.
>
> Rocky Flats–Containers from Rocky Flats must have a TGA value of less than 0.05 wt%, and the glovebox moisture content at the time of packaging must be less than 1,000 ppm. Containers meeting these criteria were placed in the Innocuous bin. All others were placed in the Pressure bin. Containers suspected to have originated from other than pure plutonium nitrate, e.g., Pu/U solutions, were evaluated using Criteria 1, 2, or 3.

Criterion 5: This criterion applied only to Rocky Flats containers; similar data are not available from other sites. During the moisture analysis using TGA/FTIR, evaluation of the FTIR data indicated the presence of hydrogen chloride (HCl) in some samples.[20] HCl was found to occur in three temperature ranges: 20°C–350°C, 350°C–670°C; and 670°C–1,000°C. However, only the HCl values in the low temperature range are important to the material storage temperatures because the material temperatures are not expected to exceed 350°C. A total of 36 containers with low temperature HCl have been found in the Rocky Flats inventory with four of those containers in the ER category. This analytical method is very sensitive and possibly subject to contamination from other chloride-bearing samples. However, taking a very conservative approach, all 36 containers were placed in the Pressure and Corrosion bin. It is probable that other sites have materials that would exhibit this property; but these could not be evaluated and were left in their predetermined bins.

1.5 Binning Results for 3013 Containers

1.5.1 Binning of Rocky Flats Containers

A total of 1,888 containers from Rocky Flats required binning (Table 1.1). Of this total, 1,548 containers were binned using the decision tree in Figure 1.1, and 340 containers were binned using the ER criteria described in section 1.4.2 above. Table 1.1 and Figure 1.3 summarize the binning results. The “ISP Sub Bin” column in Figure 1.1 refers to the decision criteria used to make the binning decision and is composed of three parts. The first part refers to the decision method used for binning, either BDT (binning decision tree) for containers that were directly binned or ER for containers that required individual review (see Figure 1.1). The second part refers to the decision block in the tree for containers starting with BDT or the ER criteria (see section 1.4.2) for containers starting with ER. The third part shows descriptors that specify the details of the decision as well as the binning result, "I" for Innocuous or "P" for Pressure where appropriate (e.g., "BDT-3-Cl-HCl" refers to containers that contained chlorine by prompt gamma analysis and also showed HCl by FTIR analysis that is part of ER Criteria 5, and "ER-C2-P (Low F)" refers to low fluoride containers individually reviewed using Criteria 2 but did not meet the criteria to be considered Innocuous and were therefore assigned to the Pressure bin).

Of the 340 ER containers reviewed, 167 were assigned to the Innocuous bin, 169 to Pressure, and 4 to Pressure and Corrosion. The composite binning of all 1,888 Rocky Flats 3013 containers dispositioned 808 containers to Innocuous, 718 to Pressure, and 362 to Pressure and Corrosion.

Table 1.1. Rocky Flats Binning Summary

ISP Bin	ISP Sub Bin	Total
Innocuous	BDT-1	581
	BDT-6	60
	ER-BDT-6-I (Low F)	11
	ER-BDT-6-I (No PG)	3
	ER-C1-I	34
	ER-C1-I (No PG)	3
	ER-C2-I	28
	ER-C2-I (Low F)	11
	ER-C2-I (No PG)	4
	ER-C4-I	73
Innocuous Total		808
Pressure	BDT-5	549
	ER-C1-P	6
	ER-C1-P (Low F)	1
	ER-C1-P (No PG)	2
	ER-C2-P	16
	ER-C2-P (Low F)	3
	ER-C2-P (No PG)	1
	ER-C3	106
	ER-C3 (Low F)	26
	ER-C3 (No PG)	1
	ER-C4-P	7
Pressure Total		718
Pressure and Corrosion	BDT-3-Cl	215
	BDT-3-Cl-HCl	32
	BDT-3-F	65
	BDT-3-F-HCl	2
	BDT-4-RF-2B	44
	ER-C5-HCl	3
	ER-C5-HCl (No PG)	1
Pressure and Corrosion Total		362
Rocky Flats Total		1,888

1.5.2 Binning of Hanford Containers

A total of 2,257 containers from Hanford required binning. Of this total, 1,944 containers were binned directly using the decision tree in Figure 1.1, and 313 containers were binned using the ER criteria listed in section 1.4.2. Since the publication of revision 0 of this document, Prompt gamma analysis was completed on 362 containers that were previously incomplete in the Hanford inventory. With the new prompt gamma data, 39 containers moved from the Pressure and Corrosion bin to either the Pressure or Innocuous bins. Table 1.2 and Figure 1.4 summarize the binning results.

Of the 313 ER containers reviewed, 189 were assigned to the Innocuous bin, 124 to Pressure, and none to Pressure and Corrosion. The composite binning of all 2,257 Hanford 3013 containers dispositioned 928 containers to Innocuous, 778 to Pressure, and 551 to Pressure and Corrosion.

1.5.3 Binning of LLNL Containers

LLNL anticipates producing a total of 285 containers (150 more than those estimated in Revision 0 of this document) containing both metal and oxide. As of October, 2007, 74 containers have been certified and entered into the ISP Database, and they are actively packaging new containers. Some of the oxide items containing chloride salts from pyrochemical processing were given an aqueous wash to remove the chloride. However, the prompt gamma spectra showed that at least 0.8 wt% chloride or fluoride still remains in some of the washed items.[12]

Table 1.2. Hanford Binning Summary

ISP Bin	ISP Sub Bin	Total
Innocuous	BDT-1	310
	BDT-6	429
	ER-BDT-6-I (Low F)	13
	ER-C1-I	47
	ER-C2-E-I	15
	ER-C2-I	52
	ER-C2-I (Low F)	2
	ER-C4-I	60
Innocuous Total		928
Pressure	BDT-5	654
	ER-C2-E-P	4
	ER-C2-P	28
	ER-C2-P (Low F)	10
	ER-C3	38
	ER-C3 (Low F)	39
	ER-C4-P	4
	ER-C4-P (Low F)	1
Pressure Total		778
Pressure and Corrosion	BDT-2-Cl	10
	BDT-2-F	3
	BDT-3-Cl	393
	BDT-3-F	91
	BDT-4-H-1E	54
Pressure and Corrosion Total		551
Hanford Total		2257

Binning decisions for both the packaged and the projected number of unpackaged containers were made using the binning decision tree (Figure 1.1). All containers produced from the chloride wash process were conservatively placed in the Pressure and Corrosion bin, based on post-washing prompt gamma results. Of the 211 unpackaged containers, 108 of them are metals and were placed into the Innocuous bin and 103 are oxides that received the most conservative evaluation and were placed in the Pressure and Corrosion bin. Table 1.3 and Figure 1.5 summarize the binning results.

The composite binning of all 285 processed and projected LLNL 3013 containers dispositioned 117 containers to Innocuous, nine to Pressure, and 159 to Pressure and Corrosion.

1.5.4 Binning of SRS Containers

A total of 918 containers from SRS required binning (a reduction of two from revision 0 of this document because of a correction to the original database). Of this total, 865 containers were binned directly using the decision tree (Figure 1.1), and 53 containers were binned using the ER criteria described in section 1.4.2. Table 1.4 and Figure 1.6 summarize the binning results.

A number of containers sent to SRS from Rocky Flats were assigned to the Pressure and Corrosion bin, based on process knowledge information provided by SRS that was not included in the database. These containers were from material in the ARF group that was processed as stabilization runs PS-212 through PS-271.

Of the 53 ER containers reviewed, 46 were assigned to the Innocuous bin, seven to Pressure, and none to Pressure and Corrosion. The composite binning of the 918 SRS 3013 containers dispositioned 744 containers to Innocuous, 103 to Pressure, and 71 to Pressure and Corrosion.

1.5.5 Binning of LANL Containers

Stabilization and packaging of oxides at LANL began in 2006 that produced approximately 40 convenience cans that were packaged into 3013 inner containers. Of those, none were able to meet all of the criteria for certification and will require restabilization and repackaging. For Revision 0 of this document, an estimate was made of the total number of 3013 containers to be produced using the Los Alamos National Laboratory Implementation Plan.[21] This plan was refined, the actual excess item inventory was evaluated using current 3013 material qualification

Table 1.3. LLNL Binning Summary for Certified Containers

ISP Bin	ISP Sub Bin	Current	New	Total
Innocuous	BDT-1	6	108	114
	BDT-6	1		1
	ER-C2-I	2		2
Innocuous Total		9	108	117
Pressure	ER-C3	5		5
	ER-C3 (Low F)	4		4
Pressure Total		9		9
Pressure and Corrosion	BDT-3-Cl	8	15	25
	BDT-3-F	2		
	BDT-4 (LLNL Washed)	46	88	134
Pressure and Corrosion Total		56	103	159
LLNL Total		74	211	285

and representation criteria, and a new estimate was defined as of October 2007. This new estimate is documented in Los Alamos report LA-UR-07-7151[37] and is reflected in Table 1.5. It was assumed that each 3013 container would hold approximately 3 kg of plutonium. To facilitate binning of the 3013 containers, the excess material has been placed into categories based on the type of processing the oxide will receive or the historical information available for each item that will be directly stabilized and packaged without additional processing. The material considered in this estimate does not include oxide from weapons-component reprocessing that may be packaged in 3013 containers.

A total of 268 containers from LANL are planned. The binning decision tree for LANL is shown in Figure 1.7 and dispositions 160 containers to Pressure and Corrosion. Of the remaining 108 containers, some will not pass the moisture criteria. An estimated split was made between Pressure and Innocuous that dispositioned 25 containers to Innocuous and 83 to Pressure.

1.6 Binning Summary

Binning results for all 3013 containers are shown in the summary decision tree (Figure 1.2) and summarized in Table 1.6. The results from a cursory evaluation of containers yet to be packaged are also included in this table to provide a preliminary picture of the distribution of the total 3013 containers expected to be in storage. It should be noted that the accuracy of the binning for containers not yet packaged varies with the quality of the information provided by the sites. If the final number of unpackaged containers varies from the estimated number, revisions to the sample specification defined in Section 2.0 may be required. Thus, a best estimate of the magnitude of the field surveillance program can be provided for planning purposes. Also included are the binning decision trees for each site (Figures 1.3 through 1.7). These decision trees reflect the data summarized in Table 1.6 and illustrate the inductive logic of the binning process.

Table 1.4. SRS Binning Summary

ISP Bin	ISP Sub Bin	Total
Innocuous	BDT-1	616
	BDT-6	82
	ER-BDT-6-I (Low F)	4
	ER-BDT-6-I (No PG)	22
	ER-C1-I	16
	ER-C2-I	4
Innocuous Total		744
Pressure	BDT-5	96
	ER-C2-P	1
	ER-C2-P (Low F)	2
	ER-C3	3
	ER-C3 (Low F)	1
Pressure Total		103
Pressure and Corrosion	BDT-3-Cl	18
	BDT-3-F	14
	BDT-4-SR-ARF	39
Pressure and Corrosion Total		71
SRS Total		918

Table 1.5. LANL Material Categories (Source LA-UR-07-7151)[37]

Process Group	Process Subgroup	Number of Items in LANL Inventory	Approximate Assay (%) Range	Estimated Number of 3013 Containers*
Oxalate Precipitation	Aqueous Chloride Process – New	781 †	>75% Pu †‡	108
	Aqueous Chloride Process – Existing	12	58%-88% Pu	6
	Aqueous Nitrate Process - New	150 †	>75% Pu †‡	18
	Aqueous Nitrate Process - Existing	22	64%-88% Pu	6
Oxalate Precipitation Total		972		138
Dissolution Residuals	Nitrate Heel	25	32%-88% Pu	6
	Chloride Heel	7	30%-45% Pu	2
Dissolution Residuals Total		32		8
Metal Oxidation	Pu/Np	29	43%-88% Pu	7
	Pyrochemical metal	31	30%-88% Pu	22
	Unknown source	53	30%-88% Pu	13
Metal Oxidation Total		113		42
Pyrochemical Oxide	Anode heel	8	82%-88% Pu	9
	ER	2	80% Pu	
	Unknown source	2	80% Pu	
Pyrochemical Oxide Total		12		9
Pu/U Oxide	Unknown source	34	10%-79% Pu, 0%-73% U	12
Pu/U Oxide Total		34		12
Misc. Compounds	Pu Fluoride	14	33%-87% Pu	2
Misc. Compounds Total		14		2
Prompt Gamma	Pure oxide from unknown process	107	85%-88% Pu	32
	Impure oxide from unknown process	138	30%-85% Pu	25
Prompt Gamma Total		245		57
LANL Site Total		1,415		268

† For the Aqueous Chloride and Aqueous Nitrate subgroups, the number of items shown is the number of items of feed to the process. The estimated assay is for the product oxide from the process.

‡ Oxide produced from the Aqueous Chloride and Aqueous Nitrate subgroups will vary in purity depending on how the processes are operated. For example, aqueous chloride solutions processed through solvent extraction before oxalate precipitation will result in a high purity oxide (>85%). If the solvent extraction step is bypassed, the resulting oxide is less pure (typically 75% – 85%, sometimes as low as 55%).

* Shaded items were known or assumed to contain chloride (or fluoride >0.8%) and are included in the Pressure and Corrosion bin.

Table 1.6. Binning of All DOE 3013-Type Containers

Site	Innocuous	Pressure	Pressure and Corrosion	Total
Rocky Flats Packaged	808 (227 oxide)	718**	362	1,888
Hanford Packaged	928 (618 oxide)	778**	551	2,257
LLNL Packaged as of 2006 Total planned	9 (3 oxide) 117 (3 oxide)	9** 9	56 159	74 285
SRS Packaged	744† (128 oxide)	103**	71	918†
LANL* Packaged as of 2006 Total planned	0 25 (oxide)	0** 83	0 160	0 268
Packages as of 2006 Total	2,489 (976 oxide) 2,622 (1,001 oxide)	1,608** 1,691	1,040 1,303	5,137 5,616

† SRS removed two metal items from the ISP.
* LANL estimates are from LA-UR-07-7151 and represent a best estimate as of October 2007.
** Number used to determine statistical sample size for Pressure bin.

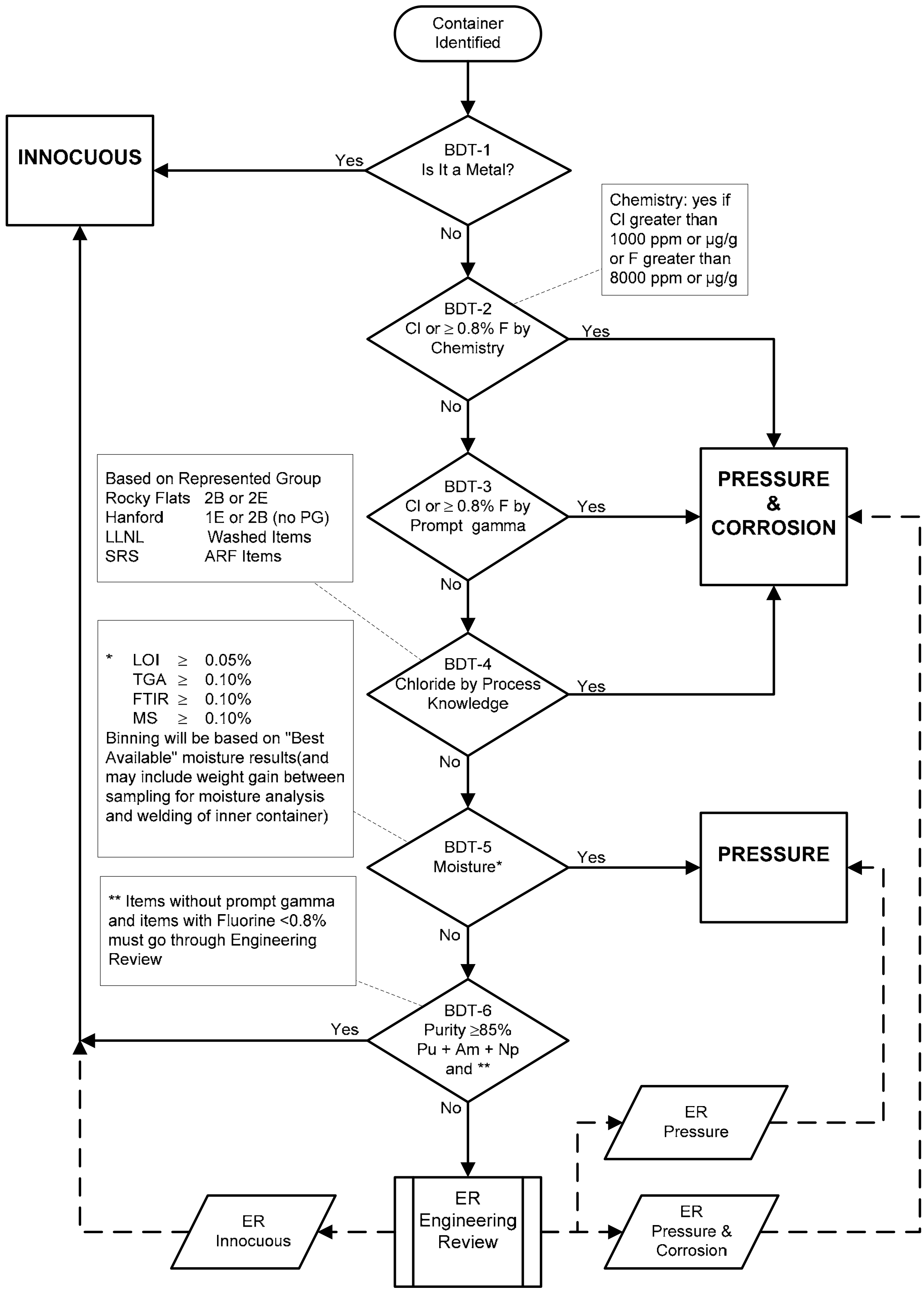

Figure 1.1. Generic decision tree for binning 3013 items for field surveillance.

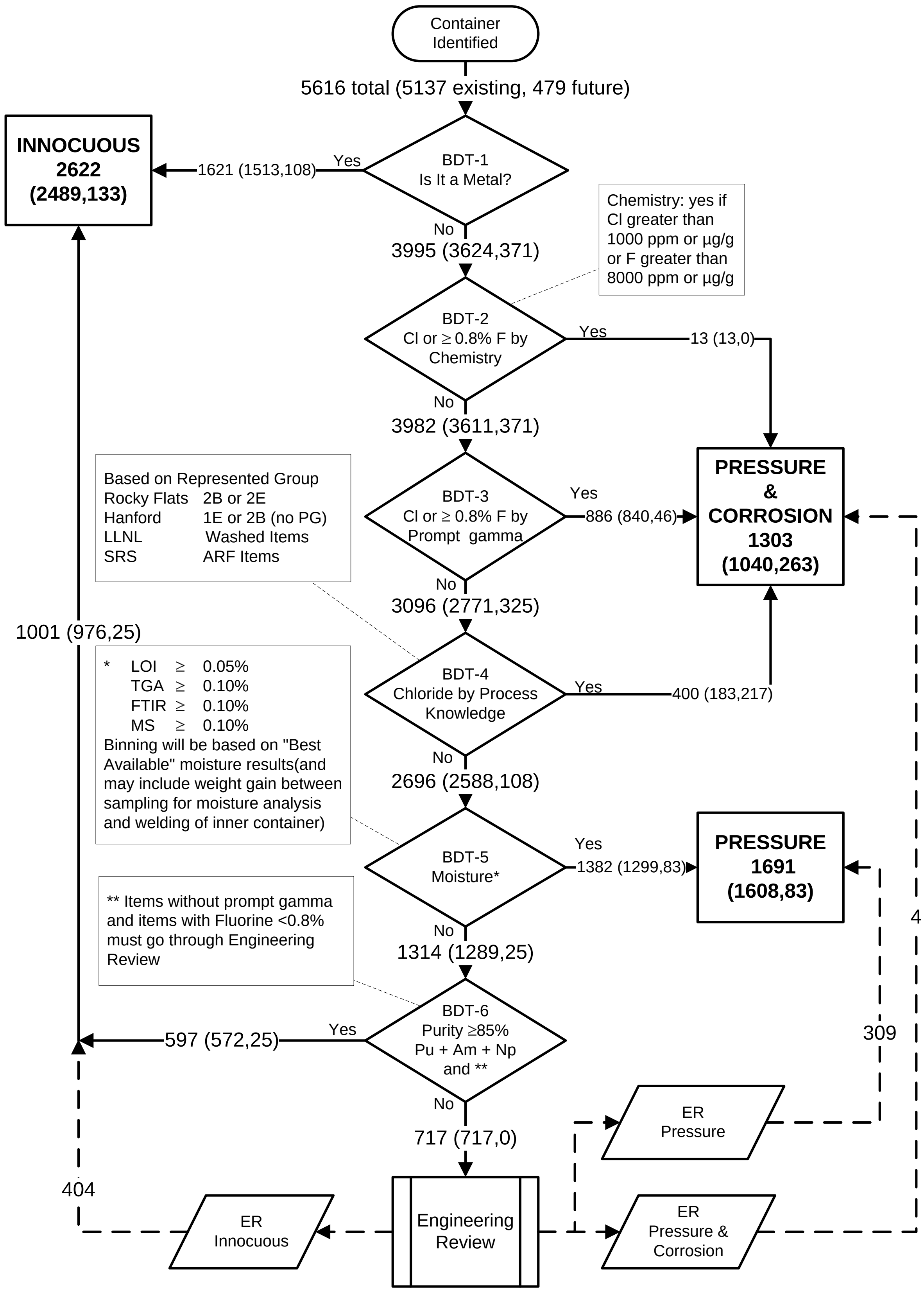

Figure 1.2. Composite binning decision tree for all 3013 surveillance items.

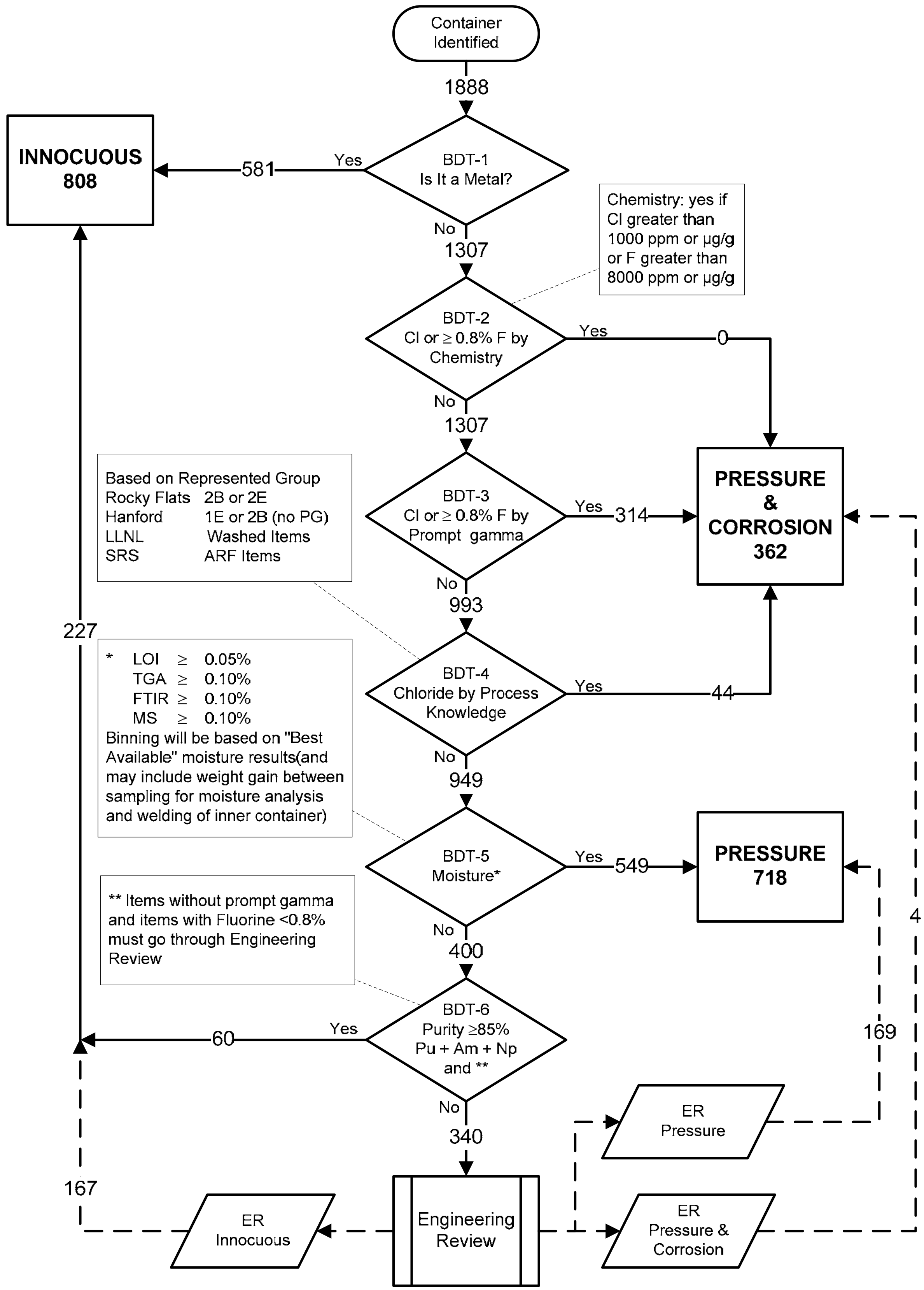

Figure 1.3. Rocky Flats Binning Decision Tree.

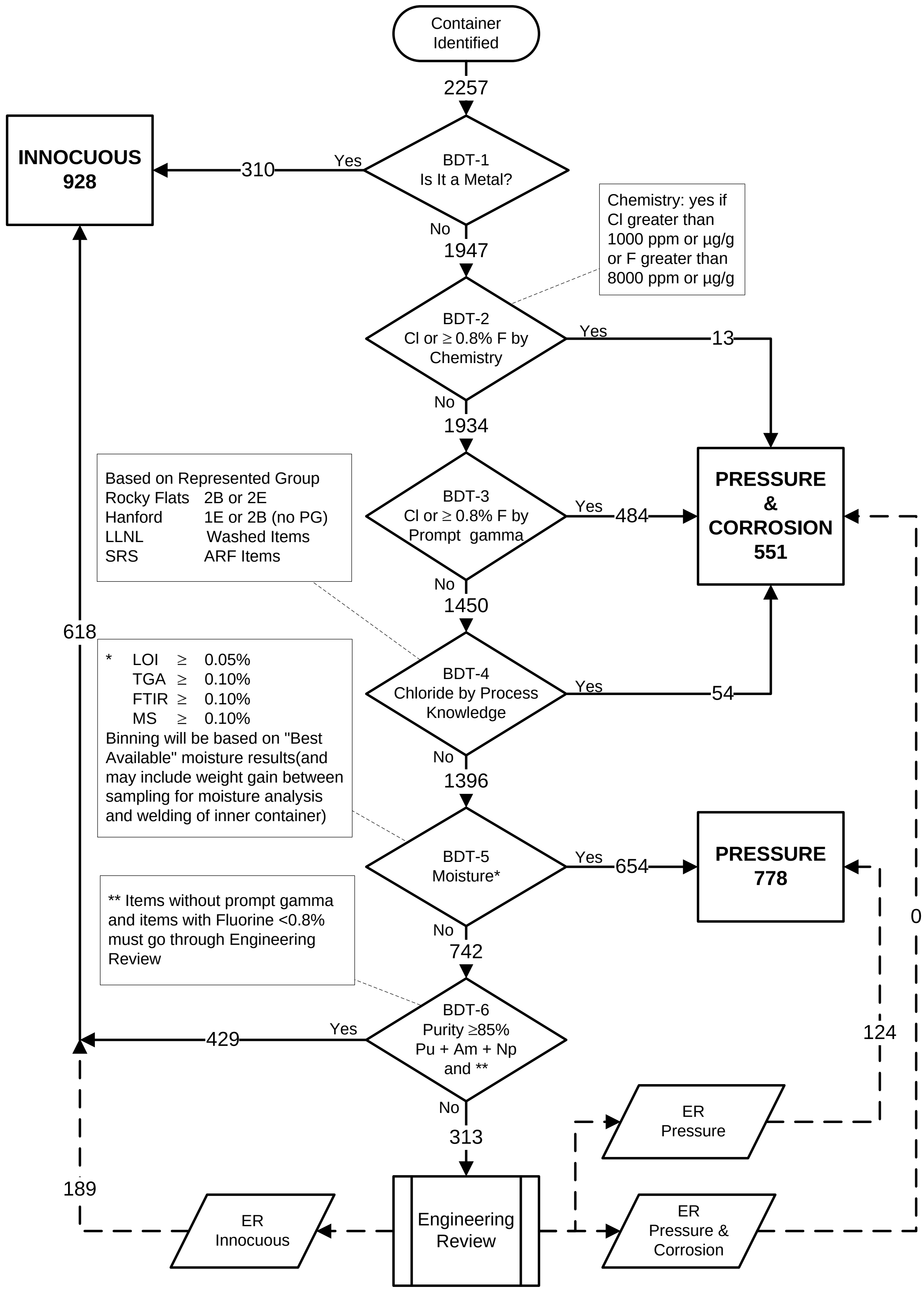

Figure 1.4. Hanford Binning Decision Tree.

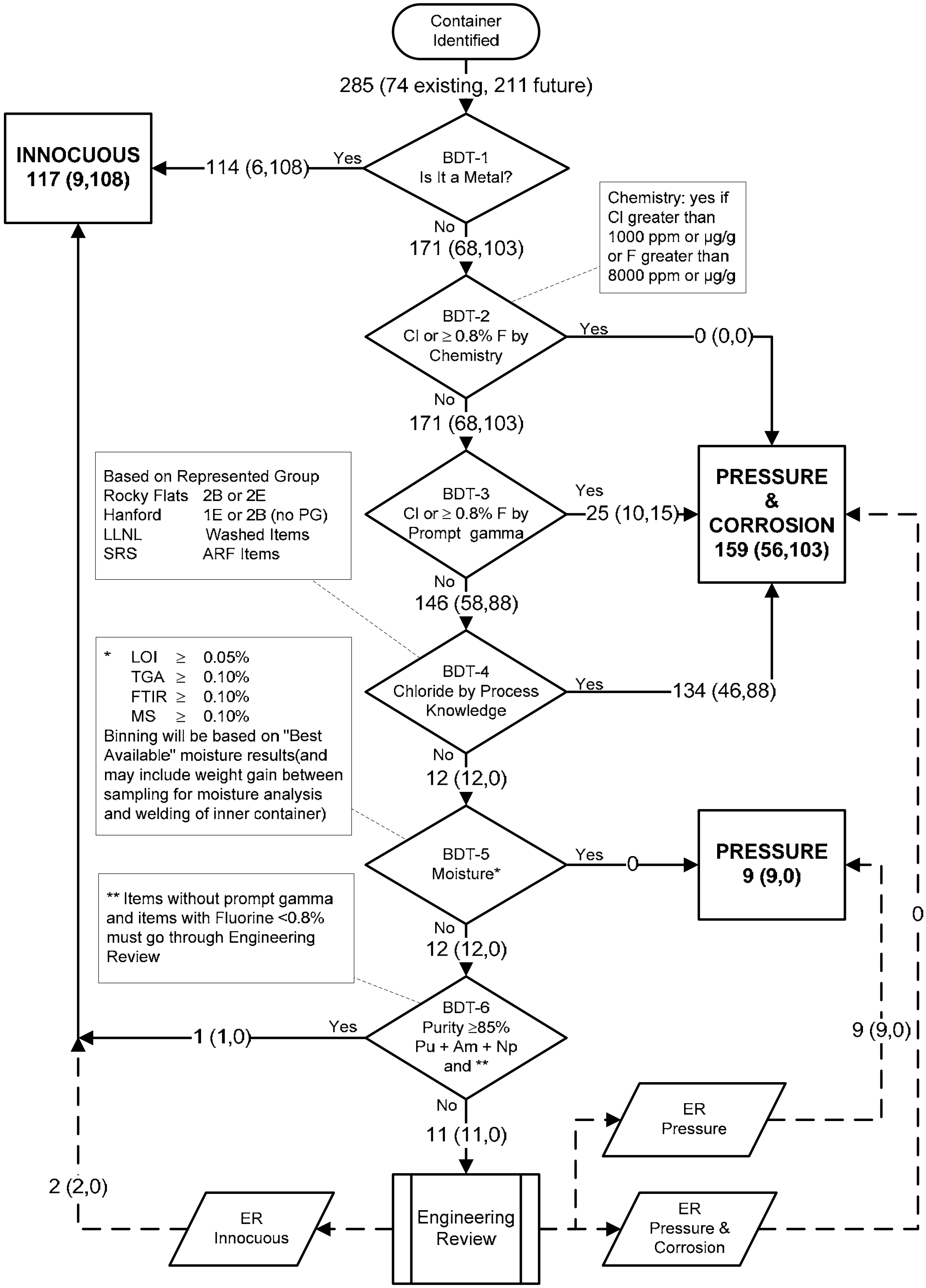

Figure 1.5. LLNL Binning Decision Tree.

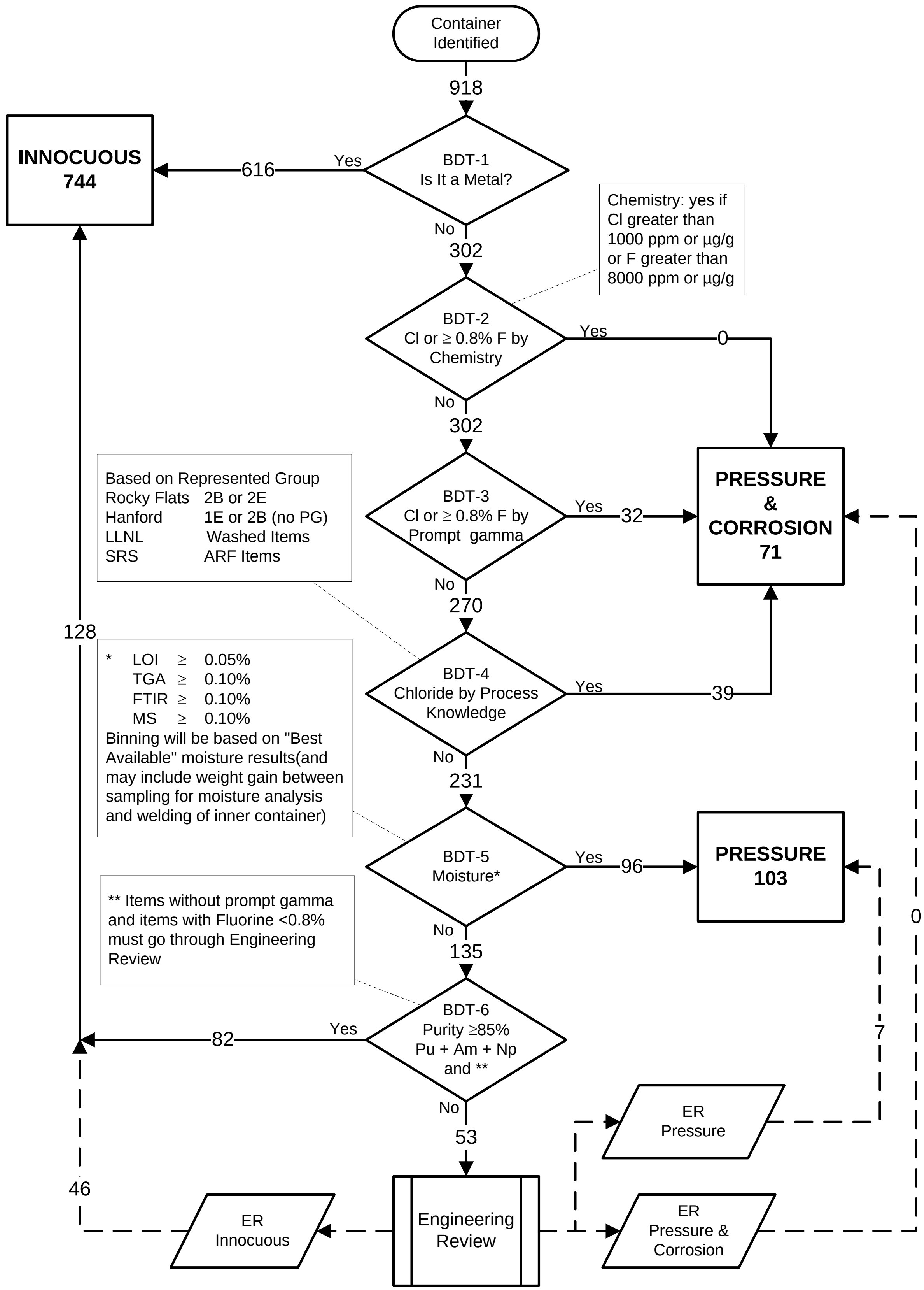

Figure 1.6. SRS Binning Decision Tree.

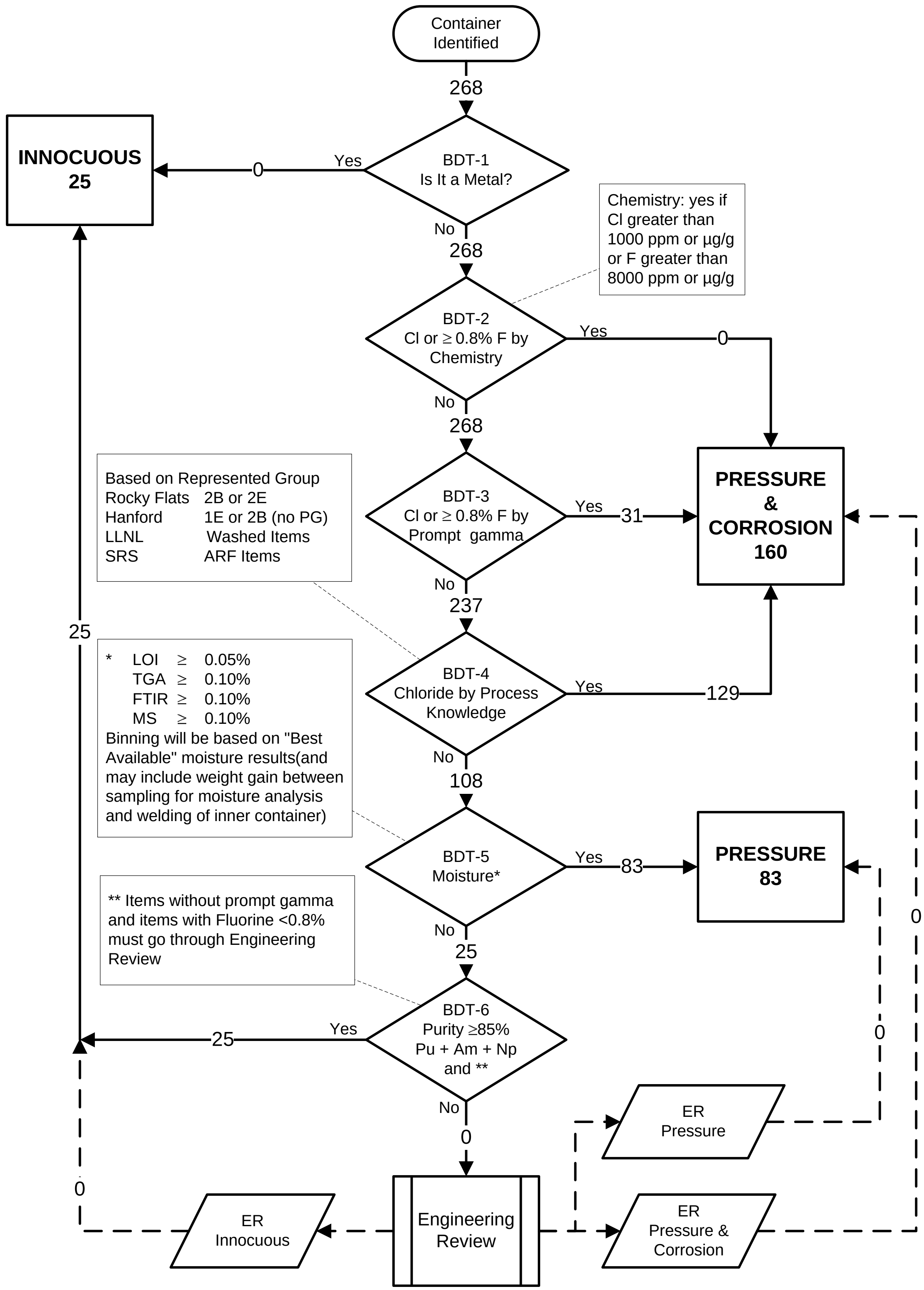

Figure 1.7. LANL Binning Decision Tree.

2.0 3013 SURVEILLANCE SAMPLING—THE STATISTICAL SAMPLE

2.1 Introduction

The requirement of 99.9% probability of observing at least one of the worst 5% (denoted as 99.9%/5%) is used to guide the statistical sampling process for the Pressure and Corrosion and Pressure bins. The hypergeometric distribution is used to determine the number of containers needed to meet this requirement.[22]

Using this criterion does not necessarily mean that containers have significant degradation. It simply means that (in theory) at the end of 50 years, all containers could be evaluated and ranked for their degree of degradation (higher rank, higher degradation). This ranking could take place even if there was very little, if any, degradation, and even if the containers varied little in terms of degradation. The 5% with the highest scores would be the "worst" 5%. It is not necessary to actually rank the containers to implement this statistical approach.

The main attribute of this approach is that it requires no assumptions about which containers or groups of containers are the "worst." The random sampling alone provides the specified degree of confidence (e.g., 99.9%) that at least one of the containers from the worst 5% will be observed. It should be noted that an important assumption of this approach is that a container has a valid assessment of its ultimate (50 years) degradation when it is examined.

The statistical calculations for the sample size are generally independent of population size if the population has over 500 items. However, the number of items in the worst 5% clearly depends on the population size.

The statistical sample for the Innocuous bin is based on the assumption that these containers will show no degradation; therefore, there will be almost no variability in the pressurization evaluations. A random sample of 10 containers from this bin is evaluated to test the assumptions of negligible variability and no degradation.

The statistical sample for the Pressure and Corrosion bin and Pressure bin gives a high level of confidence that at least one of the worst 5% of all containers in a bin will be observed in the samples selected. These samples also provide data for predicting the behavior of pressurization and corrosion for the entire population. However, the question remains, what if there are just a few "problematic containers" that are very different from the rest of the containers in the population? To address this issue, the statistical samples will be augmented with judgmental sampling. The judgmental sampling will use engineering judgment, results of the shelf-life studies, results of the statistical sampling, and other sources of information to target containers that could have the greatest potential for degradation. The combined approach of statistical and judgmental sampling is a powerful, cost-effective tool for ensuring the safe storage of the 3013 containers. The details of the judgmental sampling are described in Section 3 of this report.

2.2 Statistical Sample Selection

2.2.1 Sample Sizes

Based on the number of containers in the Pressure and Corrosion and Pressure bins given in Section 1, Table 1.6, the sample sizes of 128 containers for the Pressure and Corrosion bin and 130 containers for the Pressure bin meet the 99.9%/5% criterion.

The Pressure and Innocuous random NDE sampling campaigns began in 2005 and are scheduled to be completed in 2009.[6] The containers must be at least three years old at the time of evaluation. Therefore, the 130 containers in the Pressure random sample and the 10 containers in the Innocuous random sample must have been packaged as of June 2006.

The random sample was allocated proportionally to each packaging site. For example, for Hanford, the number of containers in the Pressure and Corrosion bin sample was

551(Hanford containers)/ 1303(total containers in bin) × 128 (total samples in bin) = 54(Hanford containers in the sample)

For the Pressure bin, the sample allocation to sites depends on the number of containers packaged in 2006, for LLNL

9(LLNL 2006 containers)/ 1608 (total 2006 containers in bin) ×130 (total samples in bin) = 1(LLNL in the sample)

Table 2.1 gives the distribution of sample sizes across the various sites for the Pressure and Corrosion and Pressure bins.

2.2.2 Sample Selection

Revision 0 describes the process that was used for binning and selecting the items for the random samples identified in that document. However, binning numbers changed in 2008 because of new Hanford prompt gamma analyses and revised numbers of containers from Los Alamos National Laboratory (LANL) and LLNL (Table 1.6). In the original binning assignments, many Hanford items defaulted to the Pressure and Corrosion bin because they did not have prompt gamma data, and process knowledge indicated the possibility of chlorine (Cl) or high fluorine (F) in the material. The 2008 prompt gamma results show that 34 of those items do not have Cl or high F and do not belong in the Pressure and Corrosion Bin. Some changes to bin assignments also resulted from a change in the prompt gamma calibration based on new data gathered in 2008 (5 items moved from Pressure and Corrosion to Pressure). Table 1.6 shows the new numbers of items for each bin. These changes resulted in changes to the random samples for both the Pressure and Pressure and Corrosion bins.

2.2.2.1 Pressure and Corrosion Bin Sample

The previous Pressure and Corrosion random sample had 131 items, more than required to meet the 99.9%/5% specification. The current sample has been reduced to the required 128 items. In addition, the number of items in the Pressure and Corrosion bin from the various sites changed. This resulted in the following adjustments to the Pressure and Corrosion random sample.

The Hanford Pressure and Corrosion random sample decreased from 66 to 54, a reduction of 12 containers. RFETS went from 40 to 35 containers, a reduction of 5 items. SRS went from 8 items to 7 items, a reduction of one item. LANL went from 4 to 16 items, an increase of 12 items and LLNL went from 13 to 16 items, an increase of 3 items.

Table 2.1. Distribution of Sample Sizes in the Pressure and Corrosion and Pressure Bins across Sites

	Pressure And Corrosion	Pressure
Hanford	54	63
LLNL	16	1
Rocky Flats	35	58
SRS	7	8
LANL	16	0
TOTAL	128	130

The Table 2.2 below shows the items that were removed from the previous Pressure and Corrosion random sample (Appendix A, Revision 0). All of these items were removed randomly except those that are identified as in sub-bin 2B. These were no longer in the Pressure and Corrosion Bin based on the new prompt gamma information. One of the items, H001916 had already had a destructive evaluation. This item moved to the Pressure bin and is counted as a Pressure bin DE (but not as part of the random sample).

The Revision 0 Pressure and Corrosion sample also had to be adjusted to address the fact that items were moved out of the 2009 and 2010 samples. Items from 2010 and 2011 moved in to fill these losses, and the appropriate adjustments were made throughout the sample. The rule is 13 DE random sample containers are to be evaluated each year, with the exception of the last year.

The revised Appendix A, Table A-1, gives the containers for the current Pressure and Corrosion random sample. For those containers that have been packaged, it gives the container ID, site, current (FY 2008) bin assignment, reason for bin assignment as noted in the decision trees (FY 2008 Sub Bin), inner can date, and the fiscal year in which a Destructive Evaluation (DE) should be performed. Those that have not been packaged are identified as future items. They have been selected randomly by the order of packaging.

Table 2.2. Containers Removed from the Pressure and Corrosion Random Sample to Adjust for 2008 Binning Changes

Container ID	Site	FY06 Bin	FY06 Sub bin	Inner Can Date	DE Eval. Year
H002521	Hanford	Pressure and Corrosion	BDT-3-Cl	27-Jul-03	2010
H003720	Hanford	Pressure and Corrosion	BDT-3-Cl	31-Aug-03	2011
H003613	Hanford	Pressure and Corrosion	BDT-3-Cl	11-Sep-03	2011
H004046	Hanford	Pressure and Corrosion	BDT-3-Cl	5-Nov-03	2013
H004231	Hanford	Pressure and Corrosion	BDT-3-Cl	10-Dec-03	2015
H002809	Hanford	Pressure and Corrosion	BDT-3-Cl	1-Jan-04	2016
H003687	Hanford	Pressure and Corrosion	BDT-4-H-1E	28-Sept-03	2012
H002553	Hanford	Pressure and Corrosion	BDT-4-H-1E	28-Jul-03	2010
H003004	Hanford	Pressure and Corrosion	BDT-4-H-2B	10-Jul-03	2009
H001885	Hanford	Pressure and Corrosion	BDT-4-H-2B	17-Nov-02	2009
H001916	Hanford	Pressure and Corrosion	BDT-4-H-2B	22-Aug-02	2008
H002354	Hanford	Pressure and Corrosion	BDT-4-H-2B	11-Mar-03	2009
R610712	RFETS	Pressure and Corrosion	BDT-3-Cl	13-May-03	2010
R611189	RFETS	Pressure and Corrosion	BDT-3-Cl	11-Jun-03	2013
R611376	RFETS	Pressure and Corrosion	BDT-3-Cl	2-Jul-03	2016
R611328	RFETS	Pressure and Corrosion	BDT-3-Cl	26-June-03	2014
R611309	RFETS	Pressure and Corrosion	BDT-4-RF-2B	24-Jun-03	2015
S002220	SRS	Pressure and Corrosion	BDT-3-F	23-Dec-04	2016

All of these containers were selected using the "Random Sample," option in the statistical software, S-Plus,[23] except for the four Hanford items that moved out of the 2008/2009 sample based on new prompt gamma information.

2.2.2.2 Pressure Bin

The Pressure Bin random NDE sample was also adjusted to account for the change in bin assignments. In this case, the sample size for RFETS decreased by one, and the sample size for Hanford increased by two. The RFETS container removed from the sample was R611379. This item was removed for logistical reasons. The two Hanford items added to the sample were selected randomly from the 34 new Hanford items moving from the Pressure and Corrosion bin to the Pressure bin. The IDs for these two containers are H002354 and H003560. A LANL future Pressure bin container also left the sample because LANL did not have items packaged by 2006.

Appendix A contains the up-to-date listing of the items in the Pressure Bin random sample. As noted previously, the statistical sample for the Pressure Bin items that were packaged by 2006 is scheduled to be complete by the end of 2009.

2.2.2.2.1 Pressure Bin Sample for LANL

When LANL and LLNL finish packaging, a decision will be made as to the need for additional Pressure bin sampling. A possible approach will be to determine the 99.9%/5% sample sizes for each site, based on all Pressure bin items (e.g., those packaged by 2006 and those packaged after 2006). A proportional number of items from LANL and LLNL will be in this 99.9%/5% sample. This number of items will be randomly selected from the LANL and LLNL Pressure Bin items. The number of items in the final sample from the other sites will decrease accordingly (because there will be around 130 items total). Therefore, for the other sites, the current Pressure Bin random sample will be more than adequate to meet the 99.9/5% requirement.

2.2.2.3 Innocuous Bin

The material in the Innocuous bin containers is either plutonium metal or relatively pure plutonium oxide with low water content. It is not credible for plutonium metal packaged according to the 3013 standard to generate pressure except for the relatively low pressure of helium generated from alpha decay.[14] In addition, failure of the container from corrosion or metal-to-metal interaction between the plutonium metal and the storage container is also not credible.[15] For these reasons, the MIS Working Group concluded that the metals present no risk of pressurization or corrosion, and that the surveillance sample for the innocuous bin is focused on oxide containers only. This assumption will be further evaluated at LANL when a metal item packaged at Rocky Flats in a 3013 container is opened for programmatic use.

The ten oxide containers that make up the initial Innocuous bin random sample are shown in Table A.3. These ten containers were selected randomly from the oxide population of innocuous items packaged by 2006. The decision to do additional Innocuous bin sampling for LANL and LLNL will be based on surveillance results.

3.0 SELECTION OF 3013 CONTAINERS FOR FIELD SURVEILLANCE—STATISTICAL AND JUDGMENTAL SAMPLES

3.1 Introduction

Using the criterion described in Sections 1 and 2, 128 containers were needed from the Pressure and Corrosion bin and 130 containers from the Pressure bin for the statistical samples. The 128 containers from the Pressure and Corrosion bin will be destructively evaluated over a ten-year period that began in 2007. Each Pressure and Corrosion bin container will be evaluated using both NDE and DE measurements. The NDE began in Fiscal Year (FY) 2005.

The 130 containers from the Pressure bin will be evaluated using only NDE. These evaluations are concentrated over a five-year period that began in FY 2005 and will be completed in 2009. In addition, six containers from the Pressure bin were selected for DE analysis to validate the assumption that there is no corrosion occurring in Pressure bin containers. Two of these were analyzed in 2007 and three in 2008. One more is scheduled for 2009.

Packaging is ongoing at LANL and LLNL, so that a portion of the total population currently does not exist. In the Pressure and Corrosion bin, 1,040 of the projected 1,303 containers have been packaged. In the Pressure bin, 1,608 of the projected 1,691 containers have been packaged. Of the 128 containers in the statistical sample for the Pressure and Corrosion bin, 102 are packaged, and all of the 130 containers in the Pressure bin statistical sample are packaged.

The statistical sample is augmented with judgmental sampling to provide a powerful, cost-effective tool for ensuring the safe storage of the 3013 containers. The judgmental sampling uses engineering judgment, results of the shelf-life studies, comparison of the statistical sample to the population, packaging and stabilization data, and field surveillance results to identify additional containers for surveillance. The judgmental sample targets containers with the greatest potential for degradation and data gaps, if any, in the statistical sample.

3.1.1 Revision 1 Changes and Additions

This report, Revision 1, incorporates the following changes:

- As allowed for in Revision 0 of this document, several containers moved from one surveillance year to another as a result of logistical considerations. These changes are reflected in the FY 2005 through FY 2008 actual surveillance history as well as the future surveillance plans presented in FY 2009 and beyond. Additional changes may be required in the future and will be documented in any future revision to this document.
- Since Revision 0 of this report, the selection of engineering judgment samples for FY 2008 and 2009 was completed. The judgmental considerations that went into the selection of these samples are documented in sections 3.5.2 and 3.6.2, respectively.

3.2 NDE Samples for FY 2005

The following discussion presents the rationale that was used for the selection of containers for NDE in FY 2005. The FY 2005 NDE sample consists of a subset of the FY 2005 statistical sample and a judgmental sample. The containers in the judgmental sample were believed, on the basis of current data at the time of selection, to have the highest potential for pressurization and/or corrosion.

3.2.1 Summary of FY 2005 Container Selection

Table 3.1 lists the 52 containers that were selected for NDE in FY 2005. These met the minimum requirements of the ISP and included containers evaluated at Hanford (23), SRS (27 containers originally packaged at Rocky Flats), and LLNL (2). Ten additional containers were examined by Hanford in FY 2005 (Table 3.2).

It was originally believed that a few of the Hanford containers listed in Table 3.1 could not be accurately radiographed with the existing radiography system and software because they were what the facility calls "dead-zone-affected."[24–25] The facility requested that surveillance of these containers be deferred until software fixes were implemented. However, SRS expedited the development of a new software version that allowed multiple angle imaging of the container, allowing a best view to be selected. This version was successfully used on a test basis for these affected samples in FY05, preserving the integrity of the random sample.[26] This new version has been placed into service at Hanford, allowing any dead-zone-affected container to be radiographed.

3.2.2 Process for Selecting Statistical Containers for FY 2005

The containers in the statistical sample consisted of 25 containers from the Pressure bin random sample and 11 containers from the Pressure and Corrosion bin random sample based on the FY2005 bin assignments. The selection of containers from the random sample for NDE in FY 2005 was made by sorting containers from each site and each bin by age of the inner can weld date. Those older than the median age for a bin and a generation site were identified as possible candidates for selection. For each of these groups, the specified number of containers was selected randomly.

3.2.3 FY 2005 Selection of Containers Based on Engineering Judgment

The process for selecting containers for the judgmental sample in FY 2005 was twofold. The first step was a detailed comparison of the 3013 population to the 225 existing containers in the statistical sample to determine if there were any important properties of the population that are not represented adequately in the sample. A detailed analysis of the FY 2005 sample is documented in LA-UR-05-2193.[3] No significant gaps in sample coverage were identified in the sample versus the total population.

The second step consisted of a specification of those properties considered to be most important in terms of potential container pressurization and/or corrosion. Both of these steps involved considerable discussion during conference calls and meetings with the Materials Identification and Surveillance (MIS) Working Group and others. At the completion of the analyses and ensuing discussions, the MIS Working Group recommended containers for surveillance to the ISP Steering Committee, and the ISP Steering Committee approved the recommended NDE containers for FY 2005.[27]

Because no major data gaps were identified when the FY 2005 statistical sample was compared to the population,[3] the MIS working group decided that containers for judgmental sampling should be based on a worst-case analysis. That is, those containers with the greatest potential for pressurization and/or corrosion, based on current information at the time of selection, should be considered for NDE in FY 2005. Four criteria were used to identify worst-case candidates: high reported water content, HCl generation during moisture measurement, detection of high levels of SO_2 or CO_2 during moisture measurement, and those containers with the maximum estimated pressure generation.

Table 3.1. 3013 Containers Selected for NDE Surveillance in FY 2005

Surveillance Site	FY 2005 ISP Bin	FY 2006 ISP Bin	Surveillance Comment	3013 Container ID
Hanford	Innocuous	Innocuous	Random Sample	**H001189**
	Pressure	Pressure	Random Sample	**H001003**
				H001201
				H001295
				H001464
				H001542
				H001844
				H001892
				H001925
				H002019
				H002066
				H002615
				H002670
			Judgmental Sample. Maximum Estimated Pressure	**H003905**
			Judgmental Sample. Oldest containers with >10 grams H_2O	**H003733**
	Pressure and Corrosion	Pressure	Random Sample	**H001948**
		Pressure and Corrosion	Random Sample	**H001963**
				H002554
				H003625
				H003716
			Judgmental Sample. Highest CO_2	**H003312**
			Judgmental Sample. Oldest containers with >10 grams H_2O	**H001992**
				H003896
Hanford Total				**23**
LLNL	Pressure	Pressure	Random Sample	**L000206**
	Pressure and Corrosion	Pressure and Corrosion	Random Sample	**L000075**
LLNL Total				**2**
SRS (Rocky Flats)	Innocuous	Innocuous	Random Sample	**R601574**
	Pressure	Pressure	Random Sample	**R600212**
				R600361
				R600453
				R600483
				R600885
				R601356
				R601451
				R601456
				R601829
				R601941
	Pressure and Corrosion	Innocuous		**R602040**
				R602072
		Pressure	Random Sample	**R610192**
			Random Sample	
			Judgmental Sample. Oldest containers with >10 grams H_2O	
		Pressure and Corrosion	Random Sample	**H000906**
				R601722
				R601859
				R610098
				R610229
			Judgmental Sample. From HCl Plot	**R610697**
				R610735
				R610747
				R611398
			Judgmental Sample. Highest CO_2	**R610410**
			Judgmental Sample. Highest SO_2	**R610548**
			Judgmental Sample. Maximum Estimated Pressure Corrected H_2O	**R610751**
			Judgmental Sample. Maximum Estimated Pressure Uncorrected H_2O	**R610767**
SRS (Rocky Flats) Total				**27**
Grand Total				**52**

Table 3.2. Additional Hanford NDE Samples in FY 2005

FY 2005 ISP Bin	FY 2006 ISP Bin	Comment	3013 Container ID
Pressure and Corrosion	Pressure	From precipitation of Misc. Lab Solution/RL Request	H001181
		PFP Scrap Oxide/Highest Theoretical Pressure by TGA	H002444
	Pressure and Corrosion	Rocky Flats Oxide with Chloride (ARF)	H002565
			H002715
		ARF, Highest water by Mass Spec	H003710
		ARF, Second Highest water by Mass Spec	H003737
		ARF/Bad PG/Container sampled for MOX program	H004075
		ARF with High water	H002557
			H003392
		From precipitation of Misc. Lab Solution/Highest Water by Mass Spec	H001236

3.2.3.1 Water Content

For pressurization and/or corrosion to occur, water must be present. The 3013 Standard allows a maximum of 0.5 wt% of adsorbed water in a container. Using a criterion of the highest weight percent water was not sufficient to define the worst case for water content without taking into account the net weight of the container. Few containers had measured water content greater than ten grams. The four oldest containers with water content of around 10 grams or more were included in the judgmental sample (Table 3.1). The container certification moisture analysis was used for FY 2005 binning and the determination of grams of water for this analysis. As noted previously, binning criteria were changed for FY 2006, to use the best available moisture result. This resulted in many containers moving from the Pressure bin to the Innocuous bin.

3.2.3.2 HCl Generation

TGA-FTIR data that were collected at Rocky Flats for poststabilization verification of moisture content also showed HCl in the purge gas downstream of the sample during the heating of some container samples. These observations were first documented in LA-UR-04-0654.[20] The detection of HCl during these analyses is of interest because (1) it suggests a thermal mechanism for generation of a corrosive gas from stabilized material after packaging; (2) it may be a useful indicator of the presence of chlorine in stabilized material; and (3) it may reveal the presence of chemical forms of elemental chlorine and hydrogen that are of particular relevance in assessing corrosion risk.

Figure 3.1 shows the total detected HCl over the 225°C to 465°C TGA temperature range versus the detected H_2O over the full TGA range for all TGA-FTIR samples of stabilized material. Four of the five containers showing an unambiguous HCl signal were chosen for the judgmental sample. These include two of the three containers that released the most H_2O and two containers from among those that released the most HCl and that also released H_2O exceeding 0.1 wt%. The data points representing containers of interest for judgmental sampling are circled in Figure 3.1.

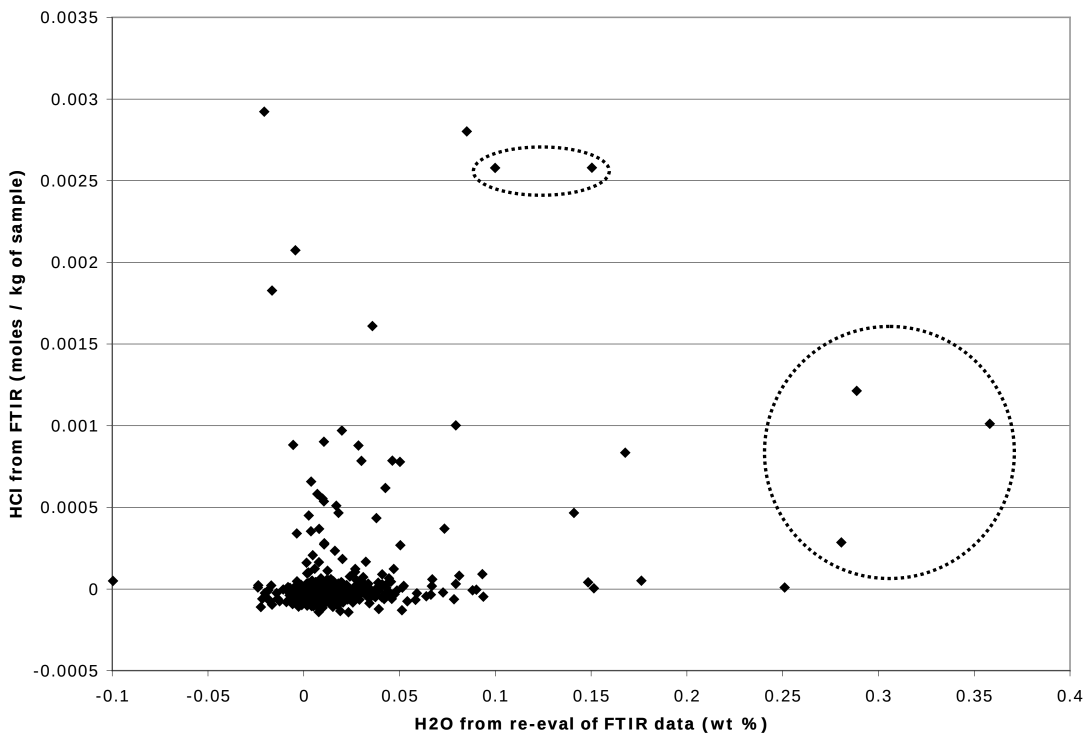

Figure 3.1. Detected HCl vs detected H_2O from TGA-FTIR analysis of items originating at Rocky Flats. Items of interest as judgmental samples are circled.

3.2.3.3 SO_2 and CO_2 Generation

TGA-FTIR data from Rocky Flats indicated a thermal release of CO_2 and SO_2 from some samples during poststabilization measurements. Calculations showed that CO_2 and SO_2 evolution can account for most of the mass loss in the subpopulation of Rocky Flats containers showing TGA mass loss greater than 0.3 wt%. About 5% of the 600 samples analyzed fall into this subpopulation. Potential pressure generation is the principal concern with regard to these gases. Neither gas was released in mole quantities exceeding the equivalent H_2 possible from 0.5 wt% H_2O. Furthermore, the temperatures at which these gases were generated in the TGA exceeded storage temperatures, with the exception of minor quantities. These points are discussed with regard to CO_2 in LA-UR-03-0811.[28]

Containers from Rocky Flats with the most CO_2 and SO_2 were selected for the judgmental sample. These containers are the two data points in the far top right in Figure 3.2. The Hanford container with the highest CO_2 was selected for the judgmental sample on the basis of TGA-MS data where the sample showed low water content but greater than 1 wt% total weight loss determined to be CO_2.

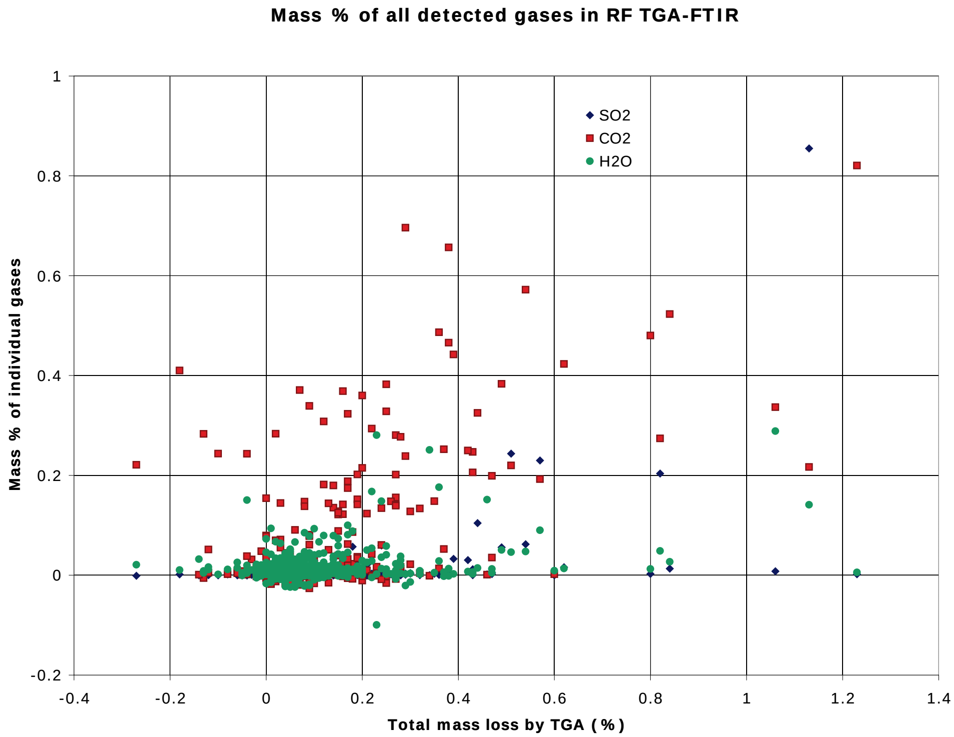

Figure 3.2. CO_2 and SO_2 generation during TGA-FTIR analysis of Rocky Flats items.

3.2.3.4 Estimated Container Pressure Rise

To identify containers with the greatest potential for pressurization, an algorithm was implemented to compute the pressure rise in containers known or suspected of containing chlorides. MIS items in the small-scale surveillance program that have chlorides present predominately generate hydrogen, but MIS items without chlorides generate other gases along with hydrogen.[19] Hydrogen is generated by radiolysis of water that is present in the material. Containers with the highest computed pressure rise were considered for engineering judgment.

Pressure rise was calculated using both the certification moisture value and the best available moisture value for each container. Container wattage, container weight, container volume, material assay (to calculate material density), and the worst-case G-value calculated from small-scale tests were also required for the calculation. Pressure rise was calculated using the date the inner container was welded as the starting time and February 1, 2005, as the date of the calculated pressure. Complete detail on the pressure rise calculation is included in LA-UR-05-2193.[3] This calculation was later revised to be more realistic, and the revised calculation is documented in the SRS report WSRC-STI-2008-00214.[38]

Based on the pressure rise calculations, two Rocky Flats containers were selected for judgmental sampling from the Pressure and Corrosion bin. One was based on the maximum uncorrected-moisture (certification moisture value) pressure rise, and one was based on the maximum corrected-moisture (best moisture value) pressure rise. One container was selected for judgmental sampling from the Hanford-generated material Pressure bin based on the maximum uncorrected-moisture pressure rise. Table 3.1 shows the final selections for NDE based on pressure-rise calculations.

3.2.4 Recommendation of the MIS Working Group

The MIS Working group provided a recommendation for the minimum number of containers on which each site should conduct NDE. This recommendation was based on comparisons of the random sample to the population, engineering review, and discussions among the MIS working group members, and was approved by the ISP Steering Committee. [27] Tables 3.1 and 3.2 contain the final list of NDE samples preformed in FY 2005.

3.3 NDE Samples for FY 2006

Sample selection for FY 2006 surveillance activities were identified in FY 2005 using the binning results from FY 2005.[1] The FY 2006 NDE sample consists of a random selection of containers from the remaining containers in the random sample and a judgmental sample. Engineering judgment considerations used for the FY 2006 sample were similar to the criteria used for FY 2005.

3.3.1 Summary of FY 2006 Container Selection

Table 3.3 lists the 45 containers selected for NDE in FY 2006. Of these, 25 (based on FY 2005 binning) were from the Pressure bin random sample, and 10 were from the Pressure and Corrosion bin random sample; all were selected randomly. Of the remaining 10, nine were judgmental sample containers, and one was from the Innocuous bin random sample. The number of containers evaluated by each site is as follows:

- Hanford—24 containers,
- SRS—20 containers (originally packaged at Rocky Flats), and
- LLNL—1 container.

These containers satisfy the FY 2006 selection criteria required by the ISP steering Committee for the DOE complex.[29] Two items, R611336 and R601882, were originally part of the random sample based on the FY 2005 binning results but changed bins as part of the FY 2006 rebinning effort and were no longer needed as samples. These two items underwent NDE evaluation before the rebinning effort and are now counted as additional samples in Table 3.4. All randomly selected containers were required to be at least three years old (from the inner-can weld date) by the end of June 2006. This list has the minimum number of containers necessary to meet the requirements of the ISP. Four additional Rocky Flats generated containers were examined by SRS in FY 2006 and 30 from Hanford (Table 3.4).

3.3.2 Judgmental Sample Selection for FY 2006

Three judgmental samples were selected from SRS. Two of the originally selected SRS (FY 2005) containers were under International Atomic Energy Agency (IAEA) control and could not be sampled in FY 2005. These containers were substituted with other containers for the FY 2005 surveillance while efforts were made to remove them from IAEA control. The deferred containers were added back into the FY 2006 sample as judgmental samples. One additional judgmental sample was selected from the containers showing HCl in the Rocky Flats FTIR moisture analysis.

Six judgmental samples were selected by the MIS working group from Hanford containers. Two were from pure button-line oxide (BLO) that had unusually high water content, one from oxide from impure solutions with high water content, and three from containers with chloride salt packaged in the RMC line with high water content.

Table 3.3. FY 2006 Surveillance Samples

Surveillance Site	FY 2005 ISP Bin	FY 2006 ISP Bin	Surveillance Comment	3013 Container ID
Hanford	Innocuous	Innocuous	Random Sample	**H003321**
	Pressure	Pressure	Random Sample	**H003062**
				H001386
				H002823
				H003833
				H002166
				H002180
				H002352
				H003779
				H002771
				H003049
				H003098
				H004649
			Judgmental Sample. Pure Oxide (BLO), high H_2O	**H001577**
				H002429
	Pressure and Corrosion	Pressure	Random Sample	**H003094**
			Judgmental Sample. Oxide from impure solutions, high H_2O	**H001181**
		Pressure and Corrosion	Random Sample	**H003807**
				H003598
				H002468
				H002869
			Judgmental Sample. With Cl salt, packaged in RMC, high H_2O	**H002565**
				H003181
				H003655
Hanford Total				**24**
LLNL	Pressure and Corrosion	Pressure and Corrosion	Random Sample	**L000172**
LLNL Total				**1**
SRS (Rocky Flats)	Pressure	Pressure	Random Sample	**H000891**
				R600183
				R600445
				R600498
				R600833
				R601309
				R601571
				R601997
				R602477
				R602662
				R610247
				R610601
				R610876
	Pressure and Corrosion	Pressure	Random Sample	**R610726**
		Pressure and Corrosion	Random Sample	**R610898**
				R611017
				R611328
			Judgmental Sample. FTIR shows HCl	**R610910**
			Judgmental Sample. Oldest Container > 10 gm. H_2O (Deferred FY05 sample)	**R600151**
			Judgmental Sample. Maximum Pressure Uncorrected H_2O (Deferred FY05 sample)	**R600793**
SRS (Rocky Flats) Total				**20**
Grand Total				**45**

Table 3.4. Additional NDE Samples in FY 2006

Site of origin	FY 2005 ISP Bin	FY 2006 ISP Bin	Comment	3013 Container ID
Rocky Flats	Innocuous	Pressure and Corrosion	Sample of opportunity	R611358
Rocky Flats	Pressure	Pressure	Sample of opportunity	R610465
Rocky Flats	Pressure and Corrosion	Pressure	Removed from random sample	R601882
Rocky Flats	Innocuous	Pressure	Removed from random sample	R611336
Hanford	Pressure	Pressure	Oxide from impure solution—High water	H001201
Hanford	Pressure	Pressure	Repeat from FY 2005	H001892
Hanford	Pressure	Pressure	Repeat from FY 2005	H002066
Hanford	Pressure and Corrosion	Pressure and Corrosion		H002380
Hanford	Pressure and Corrosion	Pressure and Corrosion		H002434
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF >9 grams water	H002509
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF with weight gain and like 011589A	H002534
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF with weight gain	H002624
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H002786
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H002809
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H002866
Hanford	Pressure and Corrosion	Pressure and Corrosion	C-line—high TGA	H003032
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003077
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003343
Hanford	Pressure and Corrosion	Pressure and Corrosion	C-line—high TGA	H003352
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003626
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003695
Hanford	Pressure and Corrosion	Pressure and Corrosion	Repeat from FY 2005	H003716
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF >9 grams water	H003896
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003931
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003940
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H003989
Hanford	Pressure and Corrosion	Pressure and Corrosion	Highest weight gain	H004099
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF with weight gain	H004102
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF >9 grams water	H004111
Hanford	Pressure and Corrosion	Pressure	Highest weight gain	H004117
Hanford	Pressure and Corrosion	Pressure and Corrosion	ARF with weight gain	H004153
Hanford	Pressure and Corrosion	Pressure and Corrosion	C-line—high TGA	H004179
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H004232
Hanford	Pressure and Corrosion	Pressure and Corrosion	Special sample—like 011589A	H004233

3.4 Surveillance Samples for FY 2007

Sample selection for FY 2007 surveillance activities was identified in FY 2006 using the revised binning results from FY 2006. The FY 2007 NDE sample consisted of a subset of the new FY 2006 statistical sample for the Pressure and Innocuous bins, minus the samples selected for FY 2005 and FY 2006 examination that were still in the random sample. The DE sample selection for FY 2007 consisted of random samples selected from the Pressure bin and Pressure and Corrosion bin statistical sample, and judgmental samples selected only from the Pressure and Corrosion bin. Random DE samples are required to be at least five years old at the time of evaluation. Engineering judgment considerations used for FY 2007 sample selection are discussed below.

3.4.1 Summary of FY 2007 Container Selection

Table 3.5 lists the 35 containers selected for evaluation in FY 2007. Of these, 25 were randomly selected from the Pressure bin random sample for NDE, three were selected from the Pressure and Corrosion bin random sample for DE (the only containers in the random sample meeting the age requirement), two from the Innocuous bin sample, and two from the Pressure and Corrosion bin based on engineering judgment. One additional Innocuous bin sample (H002097) was evaluated at Hanford at the end of FY 2007 that was originally scheduled for FY 2008. Two engineering judgment samples (R602498 and 611398) that were originally scheduled for FY2007 were deferred until FY 2008 (NDE) and FY 2009 (DE) to allow for safety documentation changes to be implemented to allow the puncture of containers with potentially flammable gas composition. The remaining two items were Pressure bin containers that will have DE. These two containers were NDE'd in the 2005 random selection for the Pressure bin and were selected by engineering judgment. Container H000841 replaced container R611379, which could not be processed because it had too high of a ^{235}U content to meet the criticality criteria for K-Area Interim Storage (KIS).

Hanford evaluated 14 containers by NDE, and SRS evaluated 14 containers by NDE and 7 containers by DE. These containers satisfy the FY 2007 selection criteria required by the ISP steering Committee for the DOE complex. All randomly selected NDE and DE containers were required to be at least three years old and five years old, respectively, (from the inner can weld date) by the end of June 2006. Sixteen additional containers were evaluated by Hanford in FY 2007 and are shown in Table 3.6.

3.4.2 Judgmental Sample Selection for FY 2007

Results from the FY 2005 container NDE tests indicated that no pressurization above the established action limits was observed.[26, 30–31] The maximum container pressure observed by SRS surveillance was less than 10 psi, and no container integrity issues were found.

Evaluation of the ongoing small-scale test program at LANL identified three MIS small-scale test samples that exhibit behavior that warrants further investigation. First, MIS item ARF-1085-223 (ARF-223) showed significant pitting corrosion of the small-scale test reactor with relatively high hydrogen generation.[32] Second, as of August 2006, MIS item C06032A had the highest total gas generation of all MIS small-scale test samples.[33] And third, MIS Item 011589A is generating both hydrogen and oxygen gas, which has reached flammable levels in the small-scale test reactor.[34-36]

Four judgmental samples were selected for DE analysis by members of the Engineering Review Team (a subset of the MIS working Group). Two are listed in Table 3.5 (R610697 and R610735) and two are listed in Table 3.7 (R602498 and R611398). One container (R610697) was selected based on similarity to MIS item ARF-223, one (R610735) based on similarity to C06032A, and two containers (R502498 and R611398) based on similarity to MIS item 011589A. A strict time limit is required because packaging is not imposed for judgmental samples; however, time is one of the factors used in the selection process.

Table 3.5. DE and NDE Samples For FY 2007

Surveillance Site ID	FY06 ISP Bin	Sample Method	Sample Type	Surveillance Comment	3013 Container ID
Hanford	Innocuous	NDE	Random	ER - No F (Scheduled for FY2008)	H002097
	Pressure	NDE	Random	Random sample >3 yr old	H001373
					H001517
					H001527
					H001955
					H002145
					H002148
					H002153
					H002221
					H002716
					H003665
					H004304
					H004331
					H004590
Hanford Total					14
SRS (Rocky Flats)	Innocuous	NDE	Random	Random sample >3 yr old	H000872
					R610009
	Pressure	DE	Random	Random sample >5 yr old	R600885†
					R601722†
		NDE	Random	Random sample >3 yr old	H000841
					H000895
					R600320
					R600944
					R601318
					R601450
					R601569
					R602483
					R602804
					R610351
					R610809
	Pressure and Corrosion	DE	Judgmental	Like ARF-223, (Also from HCl plot)	R610697
				Like C06032A, (Also from HCl plot)	R610735
			Random	Random sample >5 yr old	R600719
					R601285
					R601957
SRS (SRS)	Pressure	NDE	Random	Random sample >3yr old	S001669
SRS Total					21
Grand Total					35

† R600885 and R601722 were nondestructively evaluated in FY 2005.

Table 3.6. Additional NDE samples in FY 2007

Site of origin	FY 2008 ISP Bin	Comment	3013 Container ID
Hanford	Pressure	From sol/pure/high water	H001178
		From sol/impure/high water	H001209
		From sol/impure/high water	H001277
		From sol/impure/high water	H001289
		From sol/impure/high water	H001294
		From sol/impure/high water	H001479
	Pressure and Corrosion	ARF/High water	H003335
		ARF/High water	H003340
		ARF/High water	H003607
		PFP scrap/high water	H003744
		ARF/High water	H003749
		PFP scrap/high water	H003870
		ARF/High water	H003895
		ARF/High water	H003944
		ARF with weight gain	H004153
		Special sample—like 011589A	H003626
Hanford Total			16

The two containers selected for DE analysis from the Pressure bin statistical sample were identified using engineering judgment (Appendix A—Table A-2) and meeting the requirement that they would be at least five years old by June 30, 2007.

3.5 Surveillance Samples for FY 2008

Sample selection for FY 2008 surveillance activities was identified in FY 2007 using the revised binning results from FY 2006. The FY 2008 NDE sample selection was as defined in Revision 0 of this report with the exception that the Hanford Innocuous item H002097 was examined at Hanford at the end of FY 2007 because of shipping limitations. The FY 2008 DE sample consisted of the samples identified in Revision 0 of this report with the substitution of two items scheduled for FY 2008 that were moved to FY 2009 (H001885 and H001941). H001885 was subsequently removed as a random sample based on FY2008 rebinning activities (see Table 2.2). These samples were replaced with one item scheduled for FY 2009 (H003409) and one from FY 2010 (H002750). The DE sample selection for FY 2008 consisted of random samples selected from the Pressure bin and Pressure and Corrosion bin statistical sample, and judgmental samples selected only from the Pressure and Corrosion bin. Random DE samples are required to be at least five years old at the time of evaluation. Engineering judgment considerations used for FY 2008 sample selection are discussed below.

3.5.1 Summary of FY 2008 Container Selection

Table 3.7 on the next page lists the 44 containers selected for evaluation in FY 2008. Of these, 27 were from the Pressure bin (24 NDE random sample items, two DE random sample items and one additional pressure bin DE item, H001916, that was not part of the random sample), one from the Innocuous bin random sample, and 16 were from the Pressure and Corrosion bin (four were judgmental samples and 12 from the random sample).

After rebinning in FY 2008, H001916 was rebinned from the Pressure and Corrosion bin to the Pressure bin based on new prompt gamma data. This item had already undergone DE analysis as one of the Pressure and Corrosion bin random samples. The DE results for this container will be counted as one of the Pressure bin DE sample items.

All FY 2008 containers were evaluated at SRS. All randomly selected NDE and DE containers were required to be at least three years old and five years old, respectively, (from the inner can weld date) by the end of June 2008.

3.5.2 Judgmental Sample Selection for FY 2008

Two judgmental samples were selected for FY 2008. Both containers were packaged at Hanford, but contained chloride salt bearing material that had originally been shipped to Hanford from RFETS. H002534 was a container of RFETS material that gained weight between sampling and packaging. H002573 was also a container of RFETS material, but it was identified as being similar to MIS item ARF-223, which caused pitting in its shelf-life container. The two judgmental samples deferred in FY 2007 were also evaluated in FY 2008.

3.6 Surveillance Samples for FY 2009

Sample selection for FY 2009 surveillance activities was identified in FY 2008 using the revised binning results from FY 2008. The FY 2009 NDE sample selection was as defined in Revision 0 of this report with the following exceptions: One, the LANL Pressure sample was removed from the sample because there were no certified 3013 containers as of June 30, 2006. Second, container H000841 was used as a replacement sample for R611379 in FY 2007. Third, to maintain 130 total samples, containers H002354 and H003560 were added to the Pressure bin sample. The FY 2009 DE sample consists of a subset of the FY 2008 revised Pressure and Corrosion bin random samples, and judgmental samples selected only from the Pressure and Corrosion bin. One Pressure bin DE sample was selected using engineering judgment from the Pressure bin random sample. Random DE samples are required to be at least 5 years old at the time of evaluation. Engineering judgment considerations used for FY 2009 sample selection are discussed below.

3.6.1 Summary of FY 2009 Container Selection

Table 3.8 below lists the 46 containers selected for evaluation in FY 2009. Of these, 24 were NDE samples randomly selected from the Pressure bin random sample, two NDE samples from the Innocuous bin random sample, 11 DE samples from the Pressure and Corrosion bin random sample, Eight DE engineering judgment samples, and one Pressure bin DE sample.

SRS is scheduled to evaluate all but one of the 46 containers in FY 2009. One of the DE samples (H003328) is scheduled to be shipped from Hanford to LANL for head space gas sampling and then the material will be restabilized and repackaged into a new 3013 container. The empty container (H003328) will then be shipped to SRS for further DE analysis. This list is the minimum necessary to meet the requirements of the ISP. Additional containers may be evaluated as necessary by each site based on site-specific needs.

Table 3.7. DE, NDE, and Additional Samples For FY 2008

Packaging Site ID	FY08 ISP Bin	Sample Method	Sample Type	Surveillance Comment	3013 Container ID
Hanford	Innocuous	NDE	Random	No - ER	H002034
	Pressure	DE	Additional	Moved from the P&C bin to the Pressure bin - Becomes Pressure bin DE sample for FY09	H001916
			Random		H002088
		NDE	Random		H001198 H001221 H001803 H001920 H001936 H001968 H002039 H002258 H002291 H004695
	Pressure and Corrosion	DE	Judgmental	ARF with weight gain	H002534
				Judgmental -like ARF-223, high TGA	H002573
			Random		H001992 H002750 H003157 H003409
Hanford Total					19
RFETS	Pressure	DE	Random	Random sample >3 yr old	R601318
		NDE	Random		R600330 R600503 R600565 R600802 R600927 R601106 R601577 R601627 R602223 R602577
	Pressure and Corrosion	DE	Random		H000898 R602731 R610298 R610324 R610327 R610578 R610584 R610679
		NDE	Judgmental	Potentially like 011589A (Deferred from FY07)	R611398
				Most Like 011589A (Deferred from FY07)	R602498
RFETS Total					21
SRS	Pressure	NDE	Random		S001543 S001579 S001682 S001750
SRS Total					4
Grand Total					44

Table 3.8. DE and NDE Samples For FY 2009

Surveillance Site ID	ISP Bin	FY08 Sample Method	FY 08 Sample Type	Surveillance Comment	3013 Container ID
Hanford	Pressure	DE	Random		H003119
		NDE	Random		H001614 H001917 H002354 H002385 H002444 H003166 H003560 H003593 H003684 H003709 H003809 H003824
	Pressure and Corrosion	DE	Judgmental	ARF >9 grams water	H002509 H004111
				Evaluated at LANL Item with over 0.5% moisture	H003328
				Highest weight gain	H004099
				Low Cl and some Mg; Higher moisture	H002657
				With Cl salt, packaged in RMC, high H_2O	H002565
			Random		H001941 H002195 H002200 H002554 H002667
				Rocky Flats Oxide with Chloride (ARF)	H002715
Hanford Total					25
RFETS	Pressure	NDE	Random		H000529 H000861 R600219 R601887 R602729 R610062 R610152 R610984 R611284
	Pressure and Corrosion	DE	Judgmental	Potentially like 011589A (Also from HCl Plot)	R611398
				Most Like 011589A	R602498
			Random		R610558 R610573 R610700 R610764 R610806
RFETS Total					16
SRS	Innocuous	NDE	Random		S001178 S001756
	Pressure	NDE	Random		S001671 S001780 S002226
SRS Total					5
Grand Total					46

3.6.2 Judgmental Sample Selection for FY 2009

In 2008, test work being performed by the MIS program indicated that there is a potential for stress corrosion cracking (SCC) under certain conditions. Six judgmental containers were selected for FY 2009 as part of the SCC test plan. H002509, H002565, and H004111 were selected because they are chloride bearing and have high indicated total water content. H004099 was selected because it had the highest weight gain between sampling and packaging. H002657 was selected to evaluate a container with low chloride content, but with high water content. H003328 is chloride bearing and has a water content greater than 0.5 wt%; therefore, it exceeds the moisture content allowed by the 3013 Standard. This container will have DE performed at LANL.

3.7 Surveillance in FY 2010 and Beyond

The recommended schedule for evaluation of all random samples is shown in Appendix A. The schedule is based on the minimum time since packaging and the surveillance rates specified in the Surveillance and Monitoring Plan.[6] Containers in the Pressure and Corrosion bin should be evaluated destructively according to the schedule in Table A-1. Sites may change the order that the random samples listed in Table A-1 are selected for examination, as long as (1) they adhere to the 5 year minimum age for DE, and (2) they notify the MIS working group that they have changed the order. As indicated in Tables A-2 and A-3, the NDE of the random samples in the Pressure bin and Innocuous bin will be complete in 2009. After evaluation of surveillance data from these random samples and results from MIS shelf-life items, a decision will be made on how many additional surveillance items will be needed from these bins for the future years.

In addition, LLNL continues to package containers, and LANL has recently begun packaging. Pressure Bin containers packaged after 2006 were not eligible for sample selection because they will not meet the 3-year age restriction in 2009. Additional sampling of Pressure Bin containers will be reevaluated in future revisions of this document. The evaluation criteria will include, but not be limited to (1) final results from NDE evaluations of the sample, (2) results from MIS shelf-life items, and (3) final packaging and binning results from LLNL and LANL.

Judgmental samples for 2010 and beyond will be selected for either NDE or DE, based on results from field surveillances and MIS work. Any additional judgmental samples identified in the future will be documented in a letter from the MIS working group to the ISP Steering Committee and will be included in any future revisions to this document.

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APPENDIX A:

RANDOM SAMPLE BASED ON FY 2008 REBINNING

Table A-1. Pressure and Corrosion Bin Random DE Sample Items

DE Eval. Year	Container ID	Site (Packaged)	FY08 ISP Bin	FY08 ISP Sub Bin	Inner Can Date
2007	R600719	RFETS	Pressure and Corrosion	BDT-4-RF-2B	1/14/2002
	R601285	RFETS	Pressure and Corrosion	BDT-3-Cl	5/14/2002
	R601957	RFETS	Pressure and Corrosion	BDT-3-Cl	2/19/2002
2008	H000898	RFETS	Pressure and Corrosion	BDT-3-F	12/18/2002
	H001992	Hanford	Pressure and Corrosion	BDT-3-F	9/11/2002
	H002750	Hanford	Pressure and Corrosion	BDT-3-Cl	7/8/2003
	H003157	Hanford	Pressure and Corrosion	BDT-3-F	10/21/2002
	H003409	Hanford	Pressure and Corrosion	BDT-3-Cl	6/24/2003
	R602731	RFETS	Pressure and Corrosion	BDT-4-RF-2B	10/10/2002
	R610298	RFETS	Pressure and Corrosion	BDT-3-Cl	1/13/2003
	R610324	RFETS	Pressure and Corrosion	BDT-3-Cl	2/26/2003
	R610327	RFETS	Pressure and Corrosion	ER-C5-HCl (No PG)	1/2/2003
	R610578	RFETS	Pressure and Corrosion	BDT-3-Cl	4/8/2003
	R610584	RFETS	Pressure and Corrosion	BDT-3-F	4/7/2003
	R610679	RFETS	Pressure and Corrosion	BDT-3-F	4/18/2003
2009	H001941	Hanford	Pressure and Corrosion	BDT-3-F	10/1/2002
	H002195	Hanford	Pressure and Corrosion	BDT-3-Cl	2/3/2003
	H002200	Hanford	Pressure and Corrosion	BDT-3-F	2/4/2003
	H002554	Hanford	Pressure and Corrosion	BDT-3-Cl	7/24/2003
	H002667	Hanford	Pressure and Corrosion	BDT-3-Cl	7/15/2003
	H002715	Hanford	Pressure and Corrosion	BDT-3-Cl	8/5/2003
	R610558	RFETS	Pressure and Corrosion	BDT-3-F	4/14/2003
	R610573	RFETS	Pressure and Corrosion	BDT-3-Cl	4/15/2003
	R610700	RFETS	Pressure and Corrosion	BDT-3-F	4/18/2003
	R610764	RFETS	Pressure and Corrosion	BDT-3-Cl	4/22/2003
	R610806	RFETS	Pressure and Corrosion	BDT-3-Cl	4/16/2003
2010	H002447	Hanford	Pressure and Corrosion	BDT-3-Cl	5/12/2003
	H002567	Hanford	Pressure and Corrosion	BDT-4-H-1E	7/23/2003
	H002728	Hanford	Pressure and Corrosion	BDT-3-Cl	6/25/2003
	H002786	Hanford	Pressure and Corrosion	BDT-3-Cl	7/9/2003
	H003077	Hanford	Pressure and Corrosion	BDT-3-Cl	6/5/2003
	H003367	Hanford	Pressure and Corrosion	BDT-3-Cl	6/18/2003
	H003704	Hanford	Pressure and Corrosion	BDT-3-Cl	9/21/2003
	H003710	Hanford	Pressure and Corrosion	BDT-3-Cl	9/4/2003
	R610627	RFETS	Pressure and Corrosion	BDT-3-Cl	5/13/2003
	R610785	RFETS	Pressure and Corrosion	BDT-3-Cl	4/30/2003
	R610826	RFETS	Pressure and Corrosion	BDT-3-Cl	5/13/2003
	R610853	RFETS	Pressure and Corrosion	BDT-3-Cl	5/12/2003
	R611131	RFETS	Pressure and Corrosion	BDT-3-Cl	6/3/2003

Table A-1. Pressure and Corrosion Bin Random DE Sample Items (continued)

DE Eval. Year	Container ID	Site (Packaged)	FY08 ISP Bin	FY08 ISP Sub Bin	Inner Can Date
2011	H002592	Hanford	Pressure and Corrosion	BDT-4-H-1E	7/31/2003
	H003337	Hanford	Pressure and Corrosion	BDT-3-Cl	10/12/2003
	H003526	Hanford	Pressure and Corrosion	BDT-3-Cl	8/25/2003
	H003565	Hanford	Pressure and Corrosion	BDT-3-Cl	9/7/2003
	H003625	Hanford	Pressure and Corrosion	BDT-3-Cl	9/3/2003
	H003711	Hanford	Pressure and Corrosion	BDT-3-Cl	9/7/2003
	L000075	LLNL	Pressure and Corrosion	BDT-4 (LLNL Washed)	1/16/2003
	L000178	LLNL	Pressure and Corrosion	BDT-4 (LLNL Washed)	7/23/2003
	R610960	RFETS	Pressure and Corrosion	BDT-3-Cl	5/15/2003
	R610974	RFETS	Pressure and Corrosion	BDT-3-Cl-HCl	5/21/2003
	R610989	RFETS	Pressure and Corrosion	BDT-3-Cl	6/4/2003
	R611338	RFETS	Pressure and Corrosion	BDT-3-Cl-HCl	5/22/2003
	S001721	SRS	Pressure and Corrosion	BDT-3-Cl	5/28/2004
2012	H003326	Hanford	Pressure and Corrosion	BDT-3-Cl	10/5/2003
	H003652	Hanford	Pressure and Corrosion	BDT-3-Cl	9/14/2003
	H003898	Hanford	Pressure and Corrosion	BDT-3-Cl	10/28/2003
	H004010	Hanford	Pressure and Corrosion	BDT-3-Cl	11/17/2003
	H004012	Hanford	Pressure and Corrosion	BDT-3-Cl	11/5/2003
	H004024	Hanford	Pressure and Corrosion	BDT-4-H-1E	11/14/2003
	H004048	Hanford	Pressure and Corrosion	BDT-3-Cl	11/4/2003
	L000196	LLNL	Pressure and Corrosion	BDT-4 (LLNL Washed)	10/2/2003
	L000202	LLNL	Pressure and Corrosion	BDT-4 (LLNL Washed)	12/5/2003
	R610906	RFETS	Pressure and Corrosion	BDT-3-Cl	6/6/2003
	R611019	RFETS	Pressure and Corrosion	BDT-3-Cl-HCl	6/6/2003
	R611068	RFETS	Pressure and Corrosion	BDT-3-Cl-HCl	6/5/2003
	S001150	SRS	Pressure and Corrosion	BDT-4-SR-ARF	10/18/2004
2013	H003307	Hanford	Pressure and Corrosion	BDT-3-Cl	12/10/2003
	H003910	Hanford	Pressure and Corrosion	BDT-3-Cl	11/19/2003
	H003970	Hanford	Pressure and Corrosion	BDT-3-Cl	11/13/2003
	H004014	Hanford	Pressure and Corrosion	BDT-4-H-1E	11/17/2003
	H004100	Hanford	Pressure and Corrosion	BDT-3-Cl	11/19/2003
	H004104	Hanford	Pressure and Corrosion	BDT-3-Cl	11/20/2003
	H004164	Hanford	Pressure and Corrosion	BDT-3-Cl	11/23/2003
	L000223	LLNL	Pressure and Corrosion	BDT-3-Cl	2/12/2004
	R610913	RFETS	Pressure and Corrosion	BDT-3-Cl	6/11/2003
	R611207	RFETS	Pressure and Corrosion	BDT-3-Cl	6/11/2003
	R611402	RFETS	Pressure and Corrosion	BDT-3-Cl	6/20/2003
	S002160	SRS	Pressure and Corrosion	BDT-4-SR-ARF	10/31/2004
	S002288	SRS	Pressure and Corrosion	BDT-3-Cl	10/23/2004
2014	Future	LANL	Pressure and Corrosion	Future LANL (5th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (10th P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (58th P&C)	
	H004152	Hanford	Pressure and Corrosion	BDT-3-Cl	11/23/2003
	H004173	Hanford	Pressure and Corrosion	BDT-3-Cl	12/4/2003
	H004213	Hanford	Pressure and Corrosion	BDT-3-Cl	12/7/2003
	H004220	Hanford	Pressure and Corrosion	BDT-4-H-1E	12/10/2003
	H004248	Hanford	Pressure and Corrosion	BDT-3-Cl	12/8/2003
	H004251	Hanford	Pressure and Corrosion	BDT-3-Cl	12/10/2003

Table A-1. Pressure and Corrosion Bin Random DE Sample Items (continued)

DE Eval. Year	Container ID	Site (Packaged)	FY08 ISP Bin	FY08 ISP Sub Bin	Inner Can Date
	L000172	LLNL	Pressure and Corrosion	BDT-4 (LLNL Washed)	7/3/2003
	R610728	RFETS	Pressure and Corrosion	BDT-4-RF-2B	6/18/2003
	R611417	RFETS	Pressure and Corrosion	BDT-3-Cl	6/25/2003
	S002132	SRS	Pressure and Corrosion	BDT-4-SR-ARF	11/3/2004
2015	Future	LLNL	Pressure and Corrosion	Future LLNL (63rd P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (64th P&C)	
	H002826	Hanford	Pressure and Corrosion	BDT-3-Cl	1/20/2004
	H002862	Hanford	Pressure and Corrosion	BDT-3-F	1/14/2004
	H003052	Hanford	Pressure and Corrosion	BDT-4-H-1E	12/29/2003
	H003064	Hanford	Pressure and Corrosion	BDT-3-Cl	1/8/2004
	H003276	Hanford	Pressure and Corrosion	BDT-3-Cl	1/1/2004
	H003313	Hanford	Pressure and Corrosion	BDT-3-Cl	12/12/2003
	H004219	Hanford	Pressure and Corrosion	BDT-3-Cl	12/14/2003
	R611101	RFETS	Pressure and Corrosion	BDT-3-Cl-HCl	7/8/2003
	R611306	RFETS	Pressure and Corrosion	BDT-4-RF-2B	6/30/2003
	S002116	SRS	Pressure and Corrosion	BDT-3-Cl	11/13/2004
	S002250	SRS	Pressure and Corrosion	BDT-3-F	1/8/2005
2016	Future	LANL	Pressure and Corrosion	Future LANL (18th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (27th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (34th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (35th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (41st P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (44th P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (73rd P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (80th P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (90th P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (94th P&C)	
	H003181	Hanford	Pressure and Corrosion	BDT-4-H-1E	1/8/2004
	H003280	Hanford	Pressure and Corrosion	BDT-3-F	1/21/2004
	H003312	Hanford	Pressure and Corrosion	BDT-4-H-1E	12/23/2003
2017	Future	LANL	Pressure and Corrosion	Future LANL (54th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (67th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (71st P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (74th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (78th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (84th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (90th P&C)	
	Future	LANL	Pressure and Corrosion	Future LANL (148th P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (102nd P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (116th P&C)	
	Future	LLNL	Pressure and Corrosion	Future LLNL (143rd P&C)	
Grand Total					128

Note: Sixteen containers from LANL and ten from LLNL have not been specified as of August, 2008. LANL currently forecasts 160 Pressure and Corrosion containers, and LLNL estimates that they will produce another 159 containers. The remaining LANL and LLNL random sample containers will be selected from these containers based on the order generated as shown above.

Table A-2. Pressure Bin Random NDE Sample Items

NDE Eval. Year	Container ID	Site (Packaged)	FY08 ISP Bin	FY08 ISP Sub Bin	Inner Can Date
2005	H000906	RFETS	Pressure	ER-C3 (Low F)	4-Mar-2003
	H001003	Hanford	Pressure	BDT-5	20-Dec-2001
	H001201	Hanford	Pressure	BDT-5	15-May-2002
	H001295	Hanford	Pressure	BDT-5	20-Nov-2001
	H001464	Hanford	Pressure	ER-C3	28-Jul-2002
	H001542	Hanford	Pressure	BDT-5	13-Nov-2002
	H001844	Hanford	Pressure	BDT-5	12-Nov-2002
	H001892	Hanford	Pressure	BDT-5	29-Oct-2002
	H001925	Hanford	Pressure	BDT-5	25-Nov-2002
	H001948	Hanford	Pressure	BDT-5	1-Oct-2002
	H002019	Hanford	Pressure	BDT-5	1-Oct-2002
	H002066	Hanford	Pressure	BDT-5	29-Oct-2002
	H002615	Hanford	Pressure	BDT-5	5-Jan-2003
	H002670	Hanford	Pressure	BDT-5	30-Dec-2002
	L000206	LLNL	Pressure	ER-C3	22-Dec-2003
	R600212	RFETS	Pressure	BDT-5	26-Apr-2002
	R600361	RFETS	Pressure	BDT-5	3-Apr-2002
	R600453	RFETS	Pressure	BDT-5	9-May-2002
	R600483	RFETS	Pressure	BDT-5	11-Apr-2002
	R600885	RFETS	Pressure	BDT-5	27-Feb-2002
	R601356	RFETS	Pressure	BDT-5	3-Jun-2002
	R601451	RFETS	Pressure	BDT-5	17-Oct-2001
	R601456	RFETS	Pressure	BDT-5	13-Nov-2001
	R601722	RFETS	Pressure	BDT-5	20-Feb-2002
	R601829	RFETS	Pressure	BDT-5	9-Jan-2002
	R601941	RFETS	Pressure	BDT-5	28-Jan-2002
	R602040	RFETS	Pressure	BDT-5	15-Feb-2002
	R602072	RFETS	Pressure	BDT-5	22-Jan-2002
2006	H000891	RFETS	Pressure	ER-C4-P	6-Feb-2003
	H001386	Hanford	Pressure	BDT-5	18-Jul-2002
	H002166	Hanford	Pressure	BDT-5	23-Jan-2003
	H002180	Hanford	Pressure	BDT-5	23-Jan-2003
	H002352	Hanford	Pressure	BDT-5	3-Apr-2003
	H002771	Hanford	Pressure	BDT-5	22-Jun-2003
	H002823	Hanford	Pressure	BDT-5	28-Dec-2003
	H003049	Hanford	Pressure	BDT-5	11-Jun-2003
	H003062	Hanford	Pressure	BDT-5	13-Jan-2004
	H003094	Hanford	Pressure	ER-C3	13-Jan-2004
	H003098	Hanford	Pressure	BDT-5	17-Jun-2003
	H003779	Hanford	Pressure	BDT-5	6-Oct-2003
	H003833	Hanford	Pressure	BDT-5	5-Oct-2003
	H004649	Hanford	Pressure	BDT-5	25-Sep-2001
	R600183	RFETS	Pressure	BDT-5	2-Nov-2001
	R600445	RFETS	Pressure	BDT-5	3-Apr-2002
	R600498	RFETS	Pressure	BDT-5	11-Mar-2002
	R600833	RFETS	Pressure	BDT-5	11-Apr-2002
	R601309	RFETS	Pressure	ER-C2-P	26-Jul-2002
	R601571	RFETS	Pressure	BDT-5	7-May-2002
	R601997	RFETS	Pressure	BDT-5	19-Aug-2002
	R602477	RFETS	Pressure	BDT-5	4-Oct-2002
	R602662	RFETS	Pressure	ER-C3	27-Aug-2002

Table A-2. Pressure Bin Random NDE Sample Items (continued)

NDE Eval. Year	Container ID	Site (Packaged)	FY08 ISP Bin	FY08 ISP Sub Bin	Inner Can Date
	R610247	RFETS	Pressure	ER-C3	11-Feb-2003
	R610601	RFETS	Pressure	ER-C3	31-Mar-2003
	R610726	RFETS	Pressure	BDT-5	28-Apr-2003
	R610876	RFETS	Pressure	ER-C3	9-May-2003
2007	H000841	RFETS	Pressure	ER-C1-P	12-Feb-1999
	H000895	RFETS	Pressure	BDT-5	21-Jan-2003
	H001373	Hanford	Pressure	BDT-5	24-Jun-2002
	H001517	Hanford	Pressure	BDT-5	7-Aug-2002
	H001527	Hanford	Pressure	BDT-5	25-Jul-2002
	H001955	Hanford	Pressure	BDT-5	16-Dec-2002
	H002145	Hanford	Pressure	BDT-5	27-Jan-2003
	H002148	Hanford	Pressure	BDT-5	20-Jan-2003
	H002153	Hanford	Pressure	BDT-5	6-Mar-2003
	H002221	Hanford	Pressure	BDT-5	4-Feb-2003
	H002716	Hanford	Pressure	ER-C2-P (Low F)	27-Aug-2003
	H003665	Hanford	Pressure	BDT-5	14-Sep-2003
	H004304	Hanford	Pressure	BDT-5	15-Jan-2004
	H004331	Hanford	Pressure	ER-C3	21-Jan-2004
	H004590	Hanford	Pressure	BDT-5	7-Sep-2001
	R600320	RFETS	Pressure	BDT-5	11-Mar-2002
	R600885[†]	RFETS	Pressure	BDT-5	27-Feb-2002
	R600944	RFETS	Pressure	BDT-5	15-Apr-2002
	R601318	RFETS	Pressure	BDT-5	20-May-2002
	R601450	RFETS	Pressure	BDT-5	18-Sep-2001
	R601569	RFETS	Pressure	BDT-5	10-Sep-2001
	R601722[†]	RFETS	Pressure	BDT-5	20-Feb-2002
	R602483	RFETS	Pressure	BDT-5	31-Jul-2002
	R602804	RFETS	Pressure	BDT-5	3-Oct-2002
	R610351	RFETS	Pressure	ER-C3	9-Jan-2003
	R610809	RFETS	Pressure	ER-C3	16-Apr-2003
	S001669	SRS	Pressure	BDT-5	7-Jun-2004
2008	H001198	Hanford	Pressure	ER-C4-P	29-Jul-2002
	H001221	Hanford	Pressure	BDT-5	20-May-2002
	H001803	Hanford	Pressure	BDT-5	4-Nov-2002
	H001920	Hanford	Pressure	BDT-5	12-Nov-2002
	H001936	Hanford	Pressure	BDT-5	26-Nov-2002
	H001968	Hanford	Pressure	BDT-5	17-Nov-2002
	H002039	Hanford	Pressure	BDT-5	30-Jan-2003
	H002088[†]	Hanford	Pressure	BDT-5	6-Nov-2002
	H002258	Hanford	Pressure	BDT-5	6-Feb-2003
	H002291	Hanford	Pressure	ER-C2-P	9-Apr-2003
	H004695	Hanford	Pressure	BDT-5	2-Sep-2001
	R600330	RFETS	Pressure	BDT-5	11-Nov-2001
	R600503	RFETS	Pressure	BDT-5	2-Apr-2002
	R600565	RFETS	Pressure	BDT-5	10-May-2002
	R600802	RFETS	Pressure	BDT-5	5-Mar-2002
	R600927	RFETS	Pressure	BDT-5	9-Apr-2002
	R601106	RFETS	Pressure	BDT-5	11-Apr-2002
	R601318[†]	RFETS	Pressure	BDT-5	20-May-2002
	R601577	RFETS	Pressure	BDT-5	6-Feb-2002
	R601627	RFETS	Pressure	BDT-5	13-Sep-2001
	R602223	RFETS	Pressure	BDT-5	2-May-2002

Table A-2. Pressure Bin Random NDE Sample Items (continued)

NDE Eval. Year	Container ID	Site (Packaged)	FY08 ISP Bin	FY08 ISP Sub Bin	Inner Can Date
	R602577	RFETS	Pressure	BDT-5	16-May-2002
	S001543	SRS	Pressure	BDT-5	23-Feb-2004
	S001579	SRS	Pressure	BDT-5	23-Jan-2004
	S001682	SRS	Pressure	BDT-5	20-Jul-2004
	S001750	SRS	Pressure	BDT-5	6-Jul-2004
2009	H000529	RFETS	Pressure	ER-C3	18-Feb-2003
	H000861	RFETS	Pressure	ER-C3 (Low F)	12-Feb-2003
	H001614	Hanford	Pressure	BDT-5	22-Jan-2003
	H001917	Hanford	Pressure	BDT-5	14-Oct-2002
	H002354	Hanford	Pressure	BDT-5	11-Mar-2003
	H002385	Hanford	Pressure	ER-C2-E-P	21-May-2003
	H002444	Hanford	Pressure	BDT-5	20-May-2003
	H003119[†]	Hanford	Pressure	BDT-5	18-Jan-2000
	H003166	Hanford	Pressure	ER-C2-P	23-Dec-2003
	H003560	Hanford	Pressure	BDT-5	25-Sep-2003
	H003593	Hanford	Pressure	BDT-5	24-Sep-2003
	H003684	Hanford	Pressure	ER-C3	10-Sep-2003
	H003709	Hanford	Pressure	BDT-5	21-Sep-2003
	H003809	Hanford	Pressure	ER-C2-P	6-Oct-2003
	H003824	Hanford	Pressure	ER-C2-P	3-Nov-2003
	R600219	RFETS	Pressure	BDT-5	9-Oct-2002
	R601887	RFETS	Pressure	BDT-5	1-Aug-2002
	R602729	RFETS	Pressure	BDT-5	1-Oct-2002
	R610062	RFETS	Pressure	BDT-5	9-Oct-2002
	R610152	RFETS	Pressure	ER-C3	17-Jan-2003
	R610984	RFETS	Pressure	ER-C3	16-May-2003
	R611284	RFETS	Pressure	ER-C3	26-Jun-2003
	S001671	SRS	Pressure	BDT-5	30-Jul-2004
	S001780	SRS	Pressure	BDT-5	28-Aug-2004
	S002226	SRS	Pressure	ER-C2-P (Low F)	9-Jan-2005

[†] Containers were selected for DE evaluation. These five containers appear twice in this list, once when NDE was performed and once for DE. There are 130 distinct items in the Pressure random sample.

Note: In addition to the five random DE samples shown in this table, H001916 is an additional item that is counted as one of the six Pressure bin DE sample items.

Table A-3. Innocuous Bin Random Sample

Container ID	Site	FY06 Bin	FY06 Sub bin	Inner Can Date	Evaluation Date
H001189	Hanford	Innocuous	ER-C4-I	5/9/2002	2005
R601574	RFETS	Innocuous	BDT-6	8/4/2002	2005
R610192	RFETS	Innocuous	ER-C2-I (Low F)	3/7/2003	2005
H003321	Hanford	Innocuous	BDT-6	11/2/2003	2006
H000872	RFETS	Innocuous	ER-C2-I (Low F)	12/30/2002	2007
H002097	Hanford	Innocuous	BDT-6	12/26/2002	2007
R610009	RFETS	Innocuous	ER-C2-I	11/11/2002	2007
H002034	Hanford	Innocuous	BDT-6	10/20/2002	2008
S001178	SRS	Innocuous	ER-C1-I	12/20/2004	2009
S001756	SRS	Innocuous	BDT-6	9/14/2004	2009

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