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Subject: CROSSWALK TABLES OF SALTSTONE INVENTORY DATA BASES

REFERENCES:

1. Staub, A. V., "Saltstone Facility Basis Information for Consent Order of Dismissal Section III.7 Website Data - First Quarter 2009," LWO-WSE-2009-00095, Rev. 0, April 2009
2. Staub, A. V., "Inventory Determination in Saltstone Vaults 1 and 4," X-CLC-Z-00027, Rev. 1, June 2009.
3. Rosenberger, K. H., et. al., "Saltstone Performance Objective Demonstration Document," CBU-PIT-2005-00146, Rev. 0, June 2005.

SUMMARY

In order to facilitate external reviews of the Saltstone radiological inventory, two crosswalk tables have been created to show the types of input used as the bases of reporting for each individual radionuclide. Table 1 summarizes the bases for each quarterly inventory report published since 2007, while Table 2 addresses the engineering calculation that updated a larger set of radionuclides through 3/31/09.

BACKGROUND

Saltstone Engineering has been responsible for the development and publication of records that document the inventory of radionuclides disposed at the Saltstone Disposal Facility (SDF). Since 2007, this has involved quarterly publication of the inventories of 32 radionuclides processed during the preceding three months (see Ref. 1 for typical example) as well as an annual summary of a larger set of radionuclides disposed during the last fiscal year. The end-of-year summary data is typically used as input to the annual review of the Saltstone Radiological Performance Assessment (PA).

As the result of a 2009 review of SDF inventory, a re-evaluation of the quarterly inventory bases was performed and a new engineering calculation was issued that rebaselined the SDF inventory using the best available data. Because input data is taken from a variety of source documents, and since there is a

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difference in bases between the quarterly reports and Reference 2, this memo is intended to serve as a crosswalk between the various types of input documents and allow a reviewer to understand where the primary data sources are being utilized as well as determine whether data is based on material balance information, process knowledge, analytical sample results, or less-than-detection-limit values. In cases where the inventory discrepancies between the quarterly reports and Reference 2 are large, some discussion is provided to resolve the differences.

Table 1 attached below gives a breakdown of each quarterly inventory report published to date with 32 radionuclides plus total alpha. A letter was assigned to each data source and then the reports were reviewed by Saltstone Engineering to determine the basis of each radionuclide for each quarter. There is a nominal hierarchy of data that has been applied in reporting the various inventories. The Tank 50 material balance is updated on a month-by-month basis and is rebaselined routinely with the analytical results of the Tank 50 quarterly samples. This is expected to be the best representation of the actual waste, and data from the material balance is the primary source of input if available. The next most representative data are sample results from the waste tank which are above the limit of detection. These samples are taken each quarter and the data is applied as a constant over that three month timeframe. The third option is to use detection limits from the Tank 50 sample analytical methods. While this tends to overestimate inventory of a given radionuclide, this method is acceptable provided that the detection limit is sufficiently low that the radionuclide will not challenge regulatory limits. If the inventory assumed for performance objective demonstration is at a low enough level that reporting at detection limits causes an overly conservative inventory, process knowledge of the tank farm inventory will be used to calculate the amount disposed at the SDF. A fifth method exists of reporting daughter products in secular equilibrium at the activity of the parent radionuclide, and the accuracy of this inventory will correspond to the accuracy of the associated parent.

It should be noted that there are multiple possible reasons why a radionuclide might change from one reporting basis to another. Depending on the composition of the salt solution, a radionuclide might drop below detection limits. In some cases, analytical method development may have improved detection limits sufficiently to allow for quantification. A case-by-case discussion of this type for each radionuclide listed is beyond the scope of this memo.

Table 2 applies a similar methodology using the same coding system, but the set of radionuclides is expanded from 32 to 64. The 64 radionuclides in Table 2 correspond to the set of radionuclides addressed in Reference 3.

A comparison of the inventories determined by the quarterly reports against inventories determined by Reference 2 over the same time interval will show discrepancies in the data. In general, these discrepancies can be attributed to one of three reasons:

1. The sample data used in the initial quarterly report did not reflect the actual waste transferred to the SDF. This affects only the 4Q07 report, which reported several radionuclides based on an April 2007 sample of salt solution from Tank 50. This sample was taken after operation of the slurry pump, which suspended any insoluble sludge solids and any radionuclides that are partitioned in the sludge fraction. However, during the 4Q07 operation the feed to Saltstone was settled/decanted to ensure that no insoluble solids were transferred during operation. Thus

Reference 2 used an earlier waste sample taken when no tank slurrying was performed. This greatly reduces the inventory of several radionuclides during that timeframe.

2. The sample data used during the development of the quarterly reports was the most recent available at the time of publication, but subsequent sample data had become available by the time Reference 2 was prepared last year. Turnaround times for samples have exceeded three months at times, thus sometimes a sample might have been taken during the quarter of interest but results may not have been available until after the deadline for inventory reporting had passed. In such cases, the quarterly report would have used the most recent available data but subsequent calculations would have data that was more representative and up-to-date.

3. The quarterly reports determined inventory by assuming radionuclides present at extremely low concentrations were present at the limit-of-detection. Many of the radionuclides tracked for inventory exist in very small quantities in the SRS tank farms. For a subset of these radionuclides, reporting their inventory based on detection limits results in a disposal inventory that is higher than is believed to exist at SRS based on process knowledge of reactor and canyon operations. In cases where this occurred, Reference 2 used a different basis for reporting inventory that was based on process knowledge of the salt waste stored in the tanks and the transfers made from those tanks to the Saltstone Production Facility (SPF).

CONCLUSION

The attached tables describe the bases used for inventory determinations both in Reference 2 and in the quarterly reports.

Table 1: Quarterly Input Data Sources

	3Q07[2]	4Q07	1Q08	2Q08	1Q09	2Q09	3Q09	4Q09
H-3	A	A	A	A	A	A	A	A
C-14	A	A	A	A	A	A	A	A
Co-60	C[3]	B	B	B	B	B	B	B
Ni-59	C	C	C	C	C	C	C	C
Ni-63	A	A	A	A	A	A	A	A
Se-79	C	B	B	B	B	B	B	B
Sr-90	A	A	A	A	A	A	A	A
Y-90	E	E	E	E	E	E	E	E
Tc-99	A	A	A	A	A	A	A	A
Ru-106	C	C	C	C	C	C	C	C
Rh-106	E	E	E	E	E	E	E	E
Sb-125	B	B	B	B	B	B	B	B
Te-125m	E	E	E	E	E	E	E	E
I-129	A	A	A	A	A	A	A	A
Cs-134	C	C	C	C	C	C	C	C
Cs-137	A	A	A	A	A	A	A	A
Ba-137m	E	E	E	E	E	E	E	E
Ce-144	C	C	C	C	C	C	C	C
Pr-144	E	E	E	E	E	E	E	E
Pm-147	C	B	B	C	C	C	C	C
Eu-154	C	B	B	B	B	B	B	B
Np-237 (α) ($t_{1/2}$) > 5 yr	C	C	C	C	C	C	C	B
Pu-238 (α) ($t_{1/2}$) > 5 yr	B	B	B	B	B	B	B	B
Pu-239 (α) ($t_{1/2}$) > 5 yr	B	B	B	B	B	B	C	B
Pu-240 (α) ($t_{1/2}$) > 5 yr	C	B	B	B	B	B	C	B
Pu-241	A	A	A	A	A	A	A	A
Pu-242 (α) ($t_{1/2}$) > 5 yr	C[4]	C[4]	C[4]	C[4]	C[4]	D	D	C[1]
Am-241 (α) ($t_{1/2}$) > 5 yr	C[3]	B	B	B	B	B	B	B
Am-242m	C	B	B	B	B	B	B	B
Cm-242 (α)	C	B	B	B	B	B	B	B
Cm-244 (α) ($t_{1/2}$) > 5 yr	C[3]	B	B	B	B	B	B	B
Cm-245 (α) ($t_{1/2}$) > 5 yr	C[4]	C[4]	C[4]	C[4]	C[4]	D	D	C[1]
Total Transuranic Alpha Emitters with ($t_{1/2}$) > 5 years	A	A	A	A	A	A	A	A

A) Taken from Tank 50 Material Balance in WCS
B) Analytical result from most recent Tank 50 rad sample
C) Reported at detection limit from most recent Tank 50 rad sample
D) Calculated using PODD bases and transfer data
E) Concentration determined by parent radionuclide

Note 1: For the 4Q09, calculated inventory data was not available at the time of reporting. These values will be updated with the 1Q10 inventory report, and calculated data is expected to be available at that time.

Note 2: The 3Q07 report constitutes data from Dec 2006 and Feb-Mar 2007.

Note 3: The data in Table 2 for this time period is classified "B", and came from a subsequent Tank 50 sample analysis.

Note 4: The data in Table 2 for this time period is classified "D", and was reported based on calculation since the use of detection limits challenged the total analyzed radionuclide inventory.

Table 2: Input Data Sources for X-CLC-Z-00027

	Dec 2006 Additions	Feb 2007 Additions	Mar 2007 Additions	Oct 2007 Additions	Nov 2007 Additions	Dec 2007 Additions	Feb 2008 Additions	Mar 2008 Additions	April 2008 Additions	Jan 2009 Additions	March 2009 Additions	Additions Since Dec 2006
H-3	A	A	A	A	A	A	A	A	A	A	A	
C-14	A	A	A	A	A	A	A	A	A	A	A	
Na-22												D
Al-26												D
Co-60	B	B	B	B	B	B	B	B	B	B	B	
Ni-59	C	C	C	C	C	C	C	C	C	C	C	
Ni-63	A	A	A	A	A	A	A	A	A	A	A	
Se-79	C	C	C	B	B	B	B	B	B	B	B	
Sr-90	A	A	A	A	A	A	A	A	A	A	A	
Y-90	E	E	E	E	E	E	E	E	E	E	E	
Nb-94												D
Tc-99	A	A	A	A	A	A	A	A	A	A	A	
Ru-106	C	C	C	C	C	C	C	C	C	C	C	
Rh-106	E	E	E	E	E	E	E	E	E	E	E	
Sb-125	B	B	B	B	B	B	B	B	B	B	B	
Sb-126												D
Sb-126m												D
Te-125m	E	E	E	E	E	E	E	E	E	E	E	
Sn-126	B	B	B	C	C	C	B	B	B	B	B	
I-129	A	A	A	A	A	A	A	A	A	A	A	
Cs-134	C	C	C	C	C	C	C	C	C	C	C	
Cs-135	C	C	C	B	B	B	B	B	B	B	B	
Cs-137	A	A	A	A	A	A	A	A	A	A	A	
Ba-137m	E	E	E	E	E	E	E	E	E	E	E	
Ce-144	C	C	C	C	C	C	C	C	C	C	C	

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	Dec 2006 Additions	Feb 2007 Additions	Mar 2007 Additions	Oct 2007 Additions	Nov 2007 Additions	Dec 2007 Additions	Feb 2008 Additions	Mar 2008 Additions	April 2008 Additions	Jan 2009 Additions	March 2009 Additions	Additions Since Dec 2006
Pr-144	E	E	E	E	E	E	E	E	E	E	E	
Pm-147	C	C	C	B	B	B	C	C	C	C	C	
Sm-151	C	C	C	B	B	B	C	C	C	C	C	
Eu-152												D
Eu-154	C	C	C	B	B	B	B	B	B	B	B	
Eu-155	C	C	C	C	C	C	C	C	C	C	C	
Ra-226												D
Ac-227												D
Ra-228												D
Th-229												D
Th-230												D
Pa-231												D
Th-232	C	C	C	B	B	B	B	B	B	B	B	
Np-237	C	C	C	C	C	C	C	C	C	C	C	
U-232	C	C	C	C	C	C	B	B	B	B	B	
U-233												D
U-234												D
U-235	C	C	C	B	B	B	B	B	B	B	B	
U-236	B	B	B	B	B	B	C	C	C	C	C	
U-238	B	B	B	B	B	B	B	B	B	B	B	
Pu-238	B	B	B	B	B	B	B	B	B	B	B	
Pu-239	B	B	B	B	B	B	B	B	B	B	B	
Pu-240	C	C	C	B	B	B	B	B	B	B	B	
Pu-241	A	A	A	A	A	A	A	A	A	A	A	
Pu-242												D
Pu-244												D
Am-241	B	B	B	B	B	B	B	B	B	B	B	
Am-242m	C	C	C	B	B	B	B	B	B	B	B	
Am-243												D
Cm-242	C	C	C	B	B	B	B	B	B	B	B	
Cm-243												D
Cm-244	B	B	B	B	B	B	B	B	B	B	B	
Cm-245												D
Cm-247												D

	Dec 2006 Additions	Feb 2007 Additions	Mar 2007 Additions	Oct 2007 Additions	Nov 2007 Additions	Dec 2007 Additions	Feb 2008 Additions	Mar 2008 Additions	April 2008 Additions	Jan 2009 Additions	March 2009 Additions	Additions Since Dec 2006
Cm-248												D
Bk-249												D
Cf-249												D
Cf-251												D
Cf-252												D

A) Taken from Tank 50 Material Balance in WCS
B) Analytical result from most recent Tank 50 rad sample
C) Reported at detection limit from most recent Tank 50 rad sample
D) Calculated using PODD bases and transfer data
E) Concentration determined by parent radionuclide

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