WASTE SOLIDIFICATION ENGINEERING

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Revision: 9

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Waste Acceptance Criteria

WASTE ACCEPTANCE CRITERIA FOR AQUEOUS WASTE SENT TO THE Z-AREA SALTSTONE PRODUCTION FACILITY (U)

July 2009

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Implementation:

E. Patten, Saltstone Facility Project Manager — Effective Date: 9/24/09

NOTE:

These waste acceptance criteria reflect new limits based on ESH-EPG-2005-00131, Changes to the Waste Influent Concentrations at the Z-Area Saltstone Industrial Wastewater Treatment Facility and Industrial Solid Waste Landfill (U), R. Campbell & K. Liner, WSRC, to B. Mullinax & J. Gilbo, SCDHEC, July 8, 2005.

SALTSTONE IMPLEMENTATION CHECKLIST

Action	Responsibility		Completed?	
	Generator	Receiver	Yes	No
Tank Farm WAC Revised and Approved	X		X	
Tank Farm WCP Revised and Approved	X		X	
Tank Farm LDD Reviewed for Impacts	X		X	
Saltstone SB Documents Revised and Approved		X	X	

Compensatory Actions If Any Actions Are Checked "No":

Generator Concurrence:

A. W. Wiggins, LW Process Chemistry Programs Manager — Date: 7/30/09

M. N. Borders, H-Tank Farm Facility Manager — Date: 7/30/09

Receiving Facility Concurrence:

D. S. Heath, Saltstone Operations Manager — Date: 7/30/09

REVISION HISTORY

Revision 9 (July 2009)	**Revision bars used** - Added Revision History section - Implementation Checklist: Added the Tank Farm WAC as a document to be reviewed for impacts - Table of Contents: Added title for Appendix 1 - Section 5.4.2: Replaced Table 3.6-11 with the Saltstone CHA Appendix D as the basis data for the Saltstone Haz Cat determination - Section 5.4.5: Corrected molecular weights of butanol and isopropanol in Table 4 - Section 5.4.7.2: Added three new chemical limits identified in new DSA revision - Section 7.0: Updated References 10 and 12 and added Reference 34 - Removed deleted references and renumbered remaining references - Appendix 1: Provided basis wording for WAC TARGET values for toluene and EDTA - Appendix 1: Corrected tributylphosphate chemical formula

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Requirement: This document meets the Saltstone requirement of the following:

- **Saltstone Specific Administrative Control (SAC) 5.6.2.1**

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1.0 PURPOSE

The Saltstone Facility is designed and permitted to immobilize and dispose of low-level radioactive and hazardous liquid waste (referred to as salt solution) remaining from the processing of radioactive material at the Savannah River Site (SRS). The Saltstone Facility, which is located in Z Area, was originally permitted to treat low-activity wastewater generated by the Effluent Treatment Project (ETP) and the In-Tank Precipitation (ITP) process (Ref. 1). In 2004 a notification letter (ESH-EPG-2004-00194) was transmitted to South Carolina Department of Health and Environmental Control (DHEC) to allow the Saltstone facility to treat a specific low-level waste stream generated in H Canyon (Ref. 2). In 2005 another notification letter (ESH-EPG-2005-00131) was transmitted to the South Carolina Department of Health and Environmental Control (DHEC) to update the state with regards to the SRS Interim Salt Processing campaign to remove low-level salt waste from high-level waste (HLW) storage tanks as described in the draft Section 3116 Determination of Salt Waste Disposal for SRS (Ref. 3). The low-level salt waste will be treated and disposed of at the Saltstone facility in order to maintain sufficient tank space for continued uninterrupted sludge processing at the Defense Waste Processing Facility (DWPF), to allow staging of salt solution prior to startup of the Salt Waste Processing Facility (SWPF) and to allow SWPF to operate at a higher capacity once it becomes operational.

In the interim period before SWPF begins processing, Decontaminated Salt Solution (DSS), similar in composition to the SWPF effluent, will be fed to Tank 50H and Saltstone through salt processing in the Actinide Removal Process (ARP) and the Modular Caustic Side Solvent Extraction Unit (MCU). The ARP facility removes alpha-emitting and strontium radionuclides from dissolved salt through contacting the salt stream with monosodium titanate (MST) and then removing the precipitated alpha and strontium solids in a crossflow filter at 512-S. The resultant filtered salt stream is sent to MCU for cesium removal. After the cesium is removed in MCU, the resultant decontaminated salt solution is transferred to Tank 50H for feed to Saltstone.

The low-activity wastewater streams from ETP, H Canyon and the HLW storage tanks will be stored in Tank 50H until they are pumped to the Saltstone Facility for treatment and disposal. Tank 50H is part of the H-Area Tank Farm. This document describes the Waste Acceptance Criteria that are required for the transfer of low-level aqueous waste from Tank 50H to the Saltstone Facility.

The Saltstone Facility (Z Area) consists of two facility segments: the Saltstone Production Facility (SPF), which receives and treats the salt solution to produce saltstone grout, and the Saltstone Disposal Facility (SDF), which consists of vaults used for the final disposal of the saltstone grout. Both the SPF and the SDF are located in Z Area. The SPF is permitted as a wastewater treatment facility per the South Carolina Department of Health and Environmental Control Regulations R.61-67. The SPF is exempted from Resource Conservation and Recovery Act (RCRA) permitting by the state of South Carolina due to the totally enclosed treatment facility exemption clause, as defined by South Carolina Hazardous Waste Management Regulations R.61-79.270.1(c)(2)(iv) and R.61-79.264.1(g)(5). The SDF is permitted as a solid waste landfill site, as defined by South Carolina Department of Health and Environmental Control Regulations R61-107.19.

Low-level aqueous waste meeting these WAC can be safely transferred, stored and treated in the SPF for subsequent disposal as saltstone in the SDF.

2.0 SCOPE

These WAC are applicable to any aqueous waste transferred from Tank 50H to the Saltstone Facility through an interarea transfer line that connects Tank 50H to the Salt Feed Tank (SFT) in Z Area during Interim Salt Disposition Project (ISDP) operations. As presently permitted by the SCDHEC, all transfers of aqueous waste to the Saltstone Facility shall come through the jacketed pipeline that connects Tank 50H to the SFT. Operation of Tank 50H and the interarea transfer line is controlled administratively by H-Area Tank Farm Operations. Saltstone Facility Operations assumes responsibility for the aqueous waste when it enters the SFT.

Except for salt solution transferred from Tank 50H, receipt of waste from outside Z Area is not presently within the scope of Saltstone Facility operations. Any waste treatment or disposal not in the present scope of Saltstone Facility operations requires prior approval by SCDHEC and DOE.

Transfer of aqueous waste from onsite or offsite waste generators to Saltstone by any means other than through Tank 50H is not allowed. H-Area Tank Farm Operations is responsible for waste transfers into and from Tank 50H. Waste to be placed into Tank 50H shall meet acceptance criteria specified by H-Area Tank Farm Operations. These WAC should be reviewed by facilities receiving waste prior to accepting transfers, if any portion of the aqueous waste is ultimately sent to the Saltstone Facility for treatment and disposal.

These WAC do not apply to the shipment of aqueous waste from onsite or offsite generators directly to the SDF or to any other SRS facilities for treatment, storage or disposal.

The material in Tank 48H is not presently within the scope of the Saltstone WAC. Transfers of Tank 48 material to Saltstone are prohibited by this WAC.

These WAC do not apply to solid waste (non-radioactive, mixed or LLW) that could be transferred to Z Area for disposal in the SDF. Normally, such waste is not sent to Z Area for disposal, but to E Area. The use of Z-Area vaults for disposal of solid waste generated outside of Z Area requires an Unreviewed Safety Question (USQ) evaluation, an Unreviewed Disposal Question (UDQ) evaluation, and approval of SCDHEC and DOE-SR.

This WAC also applies to wastes treated by the Deliquification, Dissolution and Adjustment (DDA) process associated with Tank 41H as of June 9, 2003 (approximately 1.23 million gallons). Per the January 23, 2007 approved DDA permit, the total amount of curies to be processed as part of this DDA treatment of Tank 41H and associated low level waste streams [e.g., waste in Tank 23H, Defense Waste Processing Facility recycle waste, Effluent Treatment Project waste, and H-Canyon low level waste] shall range from 1.0 to 1.7 million curies (Ref. 4).

3.0 TERMS AND DEFINITIONS

LIMIT: A type of acceptance criteria that, if not satisfied, will have an adverse impact on repository requirements [i.e., SCDHEC wastewater treatment and landfill permit requirements, or Documented Safety Analysis (DSA) assumptions]. Acceptance criteria designated as LIMITS must be met prior to transfer into Tank 50H or by blending in Tank 50H.

TARGET: A type of acceptance criteria that is set as a guideline to protect a LIMIT. Acceptance criteria designated as TARGETS will be monitored on a confirmatory basis (typically, quarterly, semi-annually or each salt batch). TARGETS are used to show compliance with regulatory requirements [maximum expected concentrations in permits, Performance Assessment (PA) / Special Analysis (SA) limits (including sum-of-fractions), vault flammability, hazard categorization (including sum-of-fractions) and DSA assumed concentrations] when sample results/calculations/process knowledge indicate a significant margin exists between the maximum expected value and the regulatory requirement.

4.0 RESPONSIBILITIES

4.1 Liquid Waste Operations (LWO) Process Chemistry Program Engineering is responsible for:

- Reviewing the Saltstone WAC and concurring with the Implementation Checklist.
- Preparing and maintaining a Waste Compliance Plan (WCP) that will ensure compliance with the Saltstone WAC and will serve as an agreement between H-Area Tank Farm Operations and Saltstone Operations for the transfer of aqueous waste from Tank 50H to the SPF.
- Adhering to the principles of minimizing waste generation when designing or modifying a process that treats or produces aqueous waste to be sent to the SPF.
- Developing the Tank 50H Material Balance / Isopar L DSS Blend Calculation and providing monthly updates to the Material Balance / Blend Calculation that will be independently reviewed and approved by WS Engineering to ensure that LIMITS / TARGETS are being met in Tank 50H.
- When required, developing requests for deviations from the requirements of the Saltstone WAC.

4.2 H-Area Tank Farm (HTF) Operations is responsible for:

- Reviewing the Saltstone WAC and concurring with the Implementation Checklist.
- Pulling all samples for wastes transferred to Saltstone; however, ensuring the proper analyses are conducted on the sample depends on the basis of the sample. Analyses which are only required by the permit (e.g., TCLP) are the responsibility of WS Engineering. Analyses which fulfill the requirements of acceptance criteria as well as permit requirements are the shared responsibility of WS Engineering and LWO Process Chemistry Program Engineering. Analyses which are needed to meet safety-related acceptance criteria not covered in the permit are the responsibility of LWO Process Chemistry Program Engineering.
- Establishing auditable programs that show compliance with the Saltstone WAC.
- Approving a WCP that serves as an agreement between HTF Operations and Saltstone Operations for the transfer of aqueous waste from Tank 50H to the SPF.
- Financing corrective actions required due to a failure by HTF Operations to conform to this WAC.

4.3 Waste Solidification (WS) Engineering is responsible for:

- Serving as owner of the Saltstone WAC.
- Reviewing and approving the WCP prepared by LWO Process Chemistry Program Engineering.
- Independently reviewing and approving that waste transfers meet the Saltstone Facility WAC.
- Ensuring that a sum-of-fractions calculation is performed to compare the radionuclide inventory in the waste stream to the SA limits.

- Reviewing and approving requests for deviations from the requirements of the Saltstone WAC.
- Assuring permit modifications required for continued operation(s) in Z Area are obtained.
- Reviewing the Saltstone WAC for adequacy and accuracy at least biannually.

4.4 WS Environmental Support is responsible for:

- Reviewing and approving the Saltstone WAC.
- Reviewing and approving requests for deviations from the requirements of the Saltstone WAC.
- Preparing and maintaining notification and certification statement(s) as required by SCHWMR R.61-79.268.9 for continued operations in Z Area.
- Making applicable notifications to SCDHEC.
- Maintaining applicable permits for continued operation(s) in Z Area.

4.5 Saltstone Operations is responsible for:

- Reviewing and approving the Saltstone WAC as well as ensuring compliance with the WAC.
- Meeting conditions for the treatment of salt solution and disposal of resulting saltstone grout, as defined in permits, DOE Orders, etc.
- Reviewing and approving the WCP prepared by LWO Process Chemistry Program Engineering.
- Reviewing and approving requests for deviations from the requirements of these WAC.
- Accepting aqueous waste for storage, treatment and disposal in Z Area.
- Producing and disposing of saltstone grout safely and efficiently.
- Financing corrective actions due to Saltstone Operations nonconformance with the Saltstone WAC or any permit conditions.

5.0 PROCEDURE

5.1 General Information

The SPF in Z Area is permitted by SCDHEC as a wastewater treatment facility that converts mixed aqueous waste into a saltstone grout that is not classified as hazardous waste. The SDF is a solid waste landfill facility permitted by SCDHEC for the disposal of solid waste. The SDF cannot be used for the disposal of hazardous waste, and the non-hazardous nature of saltstone grout must be certified by an EPA-certified laboratory by testing samples of solid saltstone using the Toxicity Characteristic Leach Procedure (TCLP).

Analyses that are required per the Permit are the responsibility of WS Engineering. Analyses that are required per the Permit and that fulfill other acceptance criteria as well are the shared responsibility of LWO Process Chemistry Program Engineering and WS Engineering. Analyses that are conducted to meet all other Saltstone waste acceptance criteria are the responsibility of the sending facility. The proposed sampling strategy for samples that will need to be pulled from Tank 50H is provided in Table 1 (Ref. 5).

Grout formulation work to confirm that the Tank 50H salt solution when combined with the premix blend can make acceptable grout will be performed at SRNL. As given in Table 1, periodic grout formulation samples will be pulled from Tank 50H so that the grout recipe can be modified to compensate for changes in the salt, organic or solids content of the salt solution feed. In the future, grout qualification can potentially be completed with samples from the feed tanks to Tank 50H (e.g., Tank 49H, 23H and ETP) in place of the combined Tank 50H sample.

NOTE: The Regulatory Compliance samples pulled in Tank 50H should be characterized for both LIMIT and TARGET acceptance criteria in this WAC.

TABLE 1: Tank 50 Samples Needed for Saltstone (Ref. 5)

Sample Size Pulled (Projected)	Frequency Pulled	Requirement	Sample Size	Basis
4.4 liter	Vault Classification (every 5 yrs) or New Waste Stream (e.g., Tank 48)	Vault Classification	1 liter	Required every 5 years and for the New Waste Stream Permit. Evaluates the landfill requirements and effects on groundwater.
		Initial TCLP	500 ml	Initial Verification of non-hazardous nature of grout.
		Initial Grout Formulation	2.9 liter	Initial Verification that the grout will meet the processing requirements.
2 liter	Each Salt Batch (as required by WS Eng.)	Grout Formulation	2 liter	Verification that the grout will meet the processing requirements.
850 mL	Quarterly or Each Salt Batch (as required by WS Eng.)	Regulatory Compliance Liquid - Chemistry	350 mL	Compliance of liquid chemistry with permit tables. Also, used in Material Balance that will be used to generate quarterly reports to SCDHEC. 200mL of 350mL sample needed for organic analysis.
		Offsite TCLP	500 mL	Verification of non-hazardous nature of grout by EPA-certified laboratory.
500 mL	Semi-Annually or Each Salt Batch (as required by WS Eng.)	Regulatory Compliance Liquid - Radiological	500 mL	Compliance of liquid radionuclides with permit tables. Also, used in Material Balance that will be used to generate quarterly reports to SCDHEC.

These WAC are designed to assure that aqueous waste sent to the Saltstone Facility for treatment and disposal will:

- meet the conditions of acceptance specified in the Saltstone Facility safety basis and all permit conditions for treatment in the SPF and disposal in the SDF;
- produce saltstone that meets TCLP conditions needed to certify saltstone as non-hazardous waste, as required for disposal in the SDF;
- protect workers in the Saltstone Facility from unnecessary radiological and/or chemical hazards; and
- provide near-term and long-term protection of onsite personnel, offsite populations, the environment, and groundwater resources.

5.2 Applicability

These WAC are applicable to any mixed, low-level waste to be sent to the SPF from Tank 50H by current or future onsite or offsite generators of aqueous waste.

Because wastewater is transferred to the SFT through a pipeline that links the SPF to Tank 50H in the H-Area Tank Farm, these WAC always apply to any wastewater pumped into this pipeline.

These WAC do not apply to the production and disposal of failed equipment from Z-Area operations or other waste handling activities related to Z-Area operations. Separate Saltstone Facility procedures cover these operations.

5.3 Prerequisite Programmatic Waste Acceptance Criteria

5.3.1 Waste Characterization

LWO Process Chemistry Program Engineering shall have adequate knowledge and supporting documentation to demonstrate compliance with the WAC established in this procedure prior to the transfer of waste to the Saltstone Facility for treatment and disposal. Waste Characterization may be demonstrated by sampling and analysis or process knowledge. All sample results reported to demonstrate compliance must include the analytical uncertainty, and the uncertainty must be used in any subsequent calculations based on those results. If process knowledge is used as the means for compliance, conservatism should be applied to account for any uncertainties in the process knowledge. A means for periodic validation of process knowledge should be specified.

5.3.2 Waste Certification

Appropriate documentation demonstrating compliance with these WAC shall be provided by LWO Process Chemistry Program Engineering to WS Engineering to support subsequent certification of saltstone as suitable for LLW disposal in the Z-Area vaults. WS Engineering is responsible for maintaining the records that support certification of saltstone as suitable for disposal at the SDF, as defined in permits and in DOE Orders (Ref. 1, 6, 7).

5.4 Acceptance Criteria

NOTE: In cases where two or more criteria apply, the most restrictive acceptance criterion shall be met by the Tank Farm (e.g., chemical LIMITS to protect vault flammability are, in most cases, more restrictive than the chemical LIMITS to protect chemical consequences in the DSA). If these WAC cannot be met, a deviation may be granted if justified by the generator and determined by WS Engineering to be within the safety basis and permit conditions for waste treatment and disposal in Z Area. Instructions for WAC deviations are located in ENG.08 (Ref. 8). Approval by DOE and/or SCDHEC may also be required before such transfers can occur.

5.4.1 Inhalation Dose Potential

5.4.1.1 Criteria: The inhalation dose potential (IDP) for the material to be transferred shall have a total rem/gallon value less than or equal to 2.09E+05 rem/gallon.

5.4.1.2 Criteria Type: LIMIT (**Saltstone TSR SAC - 5.6.2.1**)

5.4.1.3 Computational Technique: The inhalation dose potential is based on the cumulative sum of a mixture of radionuclide dose conversion factors multiplied by the bounding radionuclide concentration.

5.4.1.4 Background: Based on the DSA, the following radionuclides are significant contributors to inhalation dose: Sr-90, Cs-137, Eu-154, Pu-241 and Total α (Ref. 9). In Table 2 below, the WAC IDP concentrations were set at 90% of the IDP curie balance concentrations for Sr-90, Cs-137, Eu-154 and Pu-241, and 94% of the IDP curie balance concentration for total alpha.

TABLE 2: Calculation of Inhalation Dose Potential WAC LIMIT

Radionuclide (Ref. 9)	**IDP Curie Balance Conc. (Ci/gallon) [pCi/mL] (Ref. 9)**	**WAC IDP Conc. (Ci/gallon) [pCi/mL]**	**Dose Conversion Factor (rem/Ci) (Ref. 9)**	**WAC Inhalation Dose Potential (rem/gallon)**
Sr-90	9.46E-02 [2.50E+07]	8.51E-02 [2.25E+07]	9.50E+04	8.08E+03
Cs-137	5.00E-01 [1.32E+08]	4.50E-01 [1.19E+08]	1.90E+04	8.55E+03
Eu-154	9.46E-03 [2.50E+06]	8.51E-03 [2.25E+06]	2.00E+05	1.70E+03
Pu-241	3.52E-03 [9.31E+05]	3.17E-03 [8.38E+05]	3.30E+06	1.05E+04
Total α	1.01E-03 [2.66E+05]	9.49E-04 [2.50E+05]	1.90E+08	1.80E+05
WAC LIMIT				**2.09E+05**

5.4.2 Hazard Categorization

5.4.2.1 Criteria: The material to be transferred shall have a sum of ratios less than 1 to protect the Hazard Category 3 (HC-3) status of the Saltstone Facility.

5.4.2.2 Criteria Type: LIMIT (**Saltstone TSR SAC - 5.6.2.1**)

5.4.2.3 Computational Technique: The sum of ratios must be less than 1.0 when compared to Hazard Category 2 thresholds.

5.4.2.4 Background: The radionuclides used in the Hazard Category determination are documented in Table D-1 of the Saltstone Facility Consolidated Hazards Analysis (CHA) (Ref. 10). The facility hazard categorization evaluated in the CHA is based on the bounding DSA concentration for each radionuclide or the maximum expected concentration of the radionuclide if there is no DSA concentration. NOTE: There are five daughter products included in the CHA Table D-1 (i.e., Y-90, Te-125m, Sb-126, Sb-125m and Pr-144) that do not have specific LIMIT/TARGET values in this WAC. However, the concentrations of these radionuclides are known and bounded by their parent radionuclide since they are in secular equilibrium.

5.4.3 LIMITS for Chemicals Impacting Vault Flammability

5.4.3.1 Criteria: The concentrations of Isopar L, tetraphenylborate (TPB) (including a mass limit) and ammonium given in Table 3 shall not be exceeded to protect the assumptions used in the vault explosion credibility calculation.

5.4.3.2 Criteria Type: LIMIT (**Saltstone TSR SAC - 5.6.2.1 – applies to Isopar L limit, TPB mass limit and ammonium limit**)

5.4.3.3 Background: In order to protect assumptions associated with Vault 4 flammability, the facility has set maximum WAC LIMITS on the following chemicals: Isopar L, TPB and ammonia (analyte measured is ammonium).

Salt solution from the MCU waste stream will contain Isopar L, which can be released under certain conditions to produce flammable vapors. The Isopar L concentration in salt solution shall be limited by the WAC to be less than or equal to 11 ppm.

The total mass of TPB to be received for future disposal in Vault 4 shall be limited to 4.24 kg to protect assumptions associated with flammable gas accumulation. Technical Report X-ESR-H-00137 (Ref. 11) estimates the residual mass of KTPB in Tank 50 in April 2008 to be 4.76 kg KTPB, which equates to 4.24 kg of TPB. The TPB limit ensures that no more than 4.15 kg of benzene can be generated in Vault 4. Further additions of TPB into Tank 50H are prohibited. Additionally, the facility has set a maximum WAC LIMIT on the concentration of TPB in the waste feed stream to the TPB detection limit (5.0 mg/L).

Volatile ammonia may be produced and released when slag and flyash (Saltstone dry feed chemicals) are mixed with salt solution. Additionally, cement and slag have the potential to release ammonia due to the grinding agents used in their production. Maintaining the ammonia concentration in salt solution less than 200 mg/L (or correspondingly, 212 mg/L for ammonium) is required to prevent exceeding ammonia's assumed contribution to Composite Lower Flammability Limit (CLFL).

TABLE 3: Acceptance Criteria LIMITS for Chemical Contaminants Impacting Vault Flammability

Chemical Name	Chemical Formula	Molecular Weight (grams/mole)	WAC LIMIT
Isopar L	----	163	1.10E+01 ppm **[SAC]**
Tetraphenylborate (TPB)	$B(C_6H_5)_4^-$	319.22	4.24E+00 kg total mass **[SAC]** and 5.00E+00 mg/L
Ammonium	NH_4^+	18.04	2.12E+02 mg/L **[SAC]**

5.4.4 Hydrogen Generation Rate

5.4.4.1 Criteria: The hydrogen generation rate for the salt solution to be transferred shall be less than 5.59E-08 ft^3 of hydrogen/hr/gal of salt solution in grout at 95ºC.

5.4.4.2 Criteria Type: LIMIT (**Saltstone TSR SAC - 5.6.2.1**)

5.4.4.3 Computational Technique: The hydrogen generation rate (HGR) at 0ºC shall be calculated from the radioactive decay heat using the following equation:

$$x_{RAD} = \frac{R_{\beta/\gamma} H_{\beta/\gamma} + R_{\alpha} H_{\alpha}}{10^6}$$

where:

$R_{\beta/\gamma}$ = amount of hydrogen generated per 10^6 British Thermal Unit (BTU) of heat added from beta or gamma decay

$H_{\beta/\gamma}$ = heat generated by beta and gamma decay

R_{α} = amount of hydrogen generated per 10^6 BTU of heat added from alpha decay

H_{α} = heat generated by alpha decay

The values of R_{α} and $R_{\beta/\gamma}$ are dependent on the concentrations of nitrate and nitrite in the waste and are given by the equations:

$$R_{\alpha} = 134.7 - 82.3 * (NO_{eff})^{1/3} - 13.6 * (NO_{eff})^{2/3} + 11.8 * (NO_{eff})$$

$$R_{\beta/\gamma} = 48.36 - 52.78 * (NO_{eff})^{1/3} + 14.1 * (NO_{eff})^{2/3} + 0.572 * (NO_{eff})$$

where:

NO_{eff} = the nitrate concentration plus one-quarter the nitrite concentration

The heat generated by alpha and beta/gamma decay is determined by the equations:

$$H_{\alpha} = \sum_{i} Q_i * A_i$$

$$H_{\beta/\gamma} = \sum_{j} Q_j * A_j$$

where:

H_{α}	=	total heat generated by alpha decay
Q_i	=	heat generated per curie for each isotope that decays by alpha
A_i	=	total activity of each isotope that decays by alpha
$H_{\beta/\gamma}$	=	total heat generated by beta or gamma decay
Q_j	=	heat generated per curie for each isotope that decays by beta or gamma
A_j	=	total activity of each isotope that decays by beta or gamma

5.4.4.4 Background: The HGR for a given waste depends on the radiation dose to the waste and the concentration of any hydrogen scavengers that may be present. Free ions of nitrate (NO_3) and nitrite (NO_2) are scavengers that serve to decrease the overall hydrogen gas. To account for the scavenging effect of both of these ions, the NO_{eff}, equal to the nitrate concentration plus one-half the nitrite concentration, is used in the HGR equation. During the production of Saltstone grout, reactions occur between nitrite and the slag which result in a reduction in the concentration of nitrite in salt solution. Therefore, the NO_{eff} shall be equal to the nitrate concentration plus one-quarter the nitrite concentration.

5.4.5 "Other Organics" Contribution to Vault Flammability

5.4.5.1 Criteria: The volatiles in salt solution other than Isopar L, benzene, ammonia and hydrogen shall contribute less than 10% to the Composite Lower Flammability Limit (CLFL) at peak CLFL concentrations. These "other organics" include butanol, tributylphosphate (TBP) (which decomposes to butanol), isopropanol, methanol and NORPAR 13.

5.4.5.2 Criteria Type: LIMIT (**Saltstone TSR SAC - 5.6.2.1**)

5.4.5.3 Computational Technique: In addition to Isopar L, benzene (via decomposition of TPB) and ammonia, the following organics may be present in the salt solution feed to Saltstone: butanol, TBP, isopropanol, methanol and NORPAR 13. LWO Process Chemistry Program Engineering must verify that these five volatiles contribute less than 10% to the CLFL at the time the vault is at its peak percent of CLFL in one of two methods:

(a) Ensure that the concentrations of the five organics are less than the WAC values given in Table 4.

OR

(b) Perform an analysis consistent with S-CLC-Z-00067 (Ref. 12) to show that the CLFL contribution of the five organics remains below 10%.

TABLE 4: Concentrations of "Other Organics" Impacting Vault Flammability

Chemical Name	Chemical Formula	Molecular Weight (grams/mole)	WAC Concentrations (mg/L)
Butanol	C_4H_9OH	74.12	0.75
Tributylphosphate	$(C_4H_9O)_3PO$	266.32	1.0
Isopropanol	C_3H_7OH	60.09	0.25
Methanol	CH_3OH	32.04	0.25
NORPAR 13	----	187	0.1

5.4.5.4 Background: Calculation S-CLC-Z-00067 (Ref. 12) determined that the "other organics" in the salt solution (i.e., butanol, TBP, isopropanol, methanol and NORPAR 13) do not contribute greater than 10% of the CLFL based on reasonable conservative assumptions. This waste acceptance criterion ensures that the contribution from these five organics remain within the DSA analysis (Ref. 13). Calculations performed to ensure compliance shall be performed consistent with the E7 Manual, which requires verification/checking.

5.4.6 Nuclear Criticality Safety

5.4.6.1 Criteria: The concentrations of U-233, U-235, Pu-241 and Total α given in Attachment 8.3 shall not be exceeded to protect the fissile material inputs in the Saltstone Nuclear Criticality Safety Evaluation (NCSE).

5.4.6.2 Criteria Type: LIMIT (**Saltstone TSR SAC - 5.6.2.1**)

5.4.6.3 Background: The nuclear criticality safety-related LIMITS given in Attachment 8.3 are based on the fissile material activity limits (pCi/mL) for U-233, U-235, Pu-239 and Pu-241 included in the Saltstone NCSE (Ref. 23). (The Pu-239 concentration is bounded by Total α, and therefore Total α is included in Attachment 8.3 to ensure the assumed Pu-239 concentration in the NCSE is met.) As long as these LIMITS in Attachment 8.3 are met, there are no credible criticality scenarios identified for activities involved with the processing and disposal of salt solution at the Saltstone Facility.

5.4.7 Chemical Criteria LIMITS

5.4.7.1 Criteria: The LIMIT concentrations of the chemicals shown in Attachment 8.1 shall not be exceeded. NOTE: Known chemicals not included in Attachments 8.1 and 8.2 but greater than or equal to 0.5 mole per liter shall not be transferred to Saltstone without formal review and authorization by WS Engineering, WS Environmental Support, and Saltstone Operations.

Additionally, the following criteria must be met:

- Only aqueous waste can be transferred to the Saltstone Facility.

- The transfer of waste to the Saltstone Facility that contains or would be capable of generating toxic gases, vapors, or fumes (excluding tritium) in quantities harmful to persons during normal transport, storage, handling, treatment, or disposal operations in Z Area is prohibited.

- The transfer of any waste to the Saltstone Facility that is classified as a listed waste, as designated by South Carolina Hazardous Waste Management Regulations or the EPA, is strictly prohibited unless prior approval by SCDHEC and DOE is granted.

- The transfer of aqueous waste to the Saltstone Facility that would result in the saltstone being classified as hazardous waste, as designated by South Carolina Hazardous Waste Management Regulations or the EPA, is strictly prohibited.

5.4.7.2 Criteria Type: LIMIT **(Saltstone TSR SAC - 5.6.2.1 applies to 11 chemicals whose concentrations are significant to chemical consequences in the DSA accident analyses: aluminate (bounded by aluminum), ammonium, carbonate, hydroxide, nitrate, nitrite, oxalate, selenium, butanol, isopropanol and phenol).**

5.4.7.3 Background: Concentrations of hazardous contaminants, volatile contaminants, and other chemical contaminants listed in Attachment 8.1 shall be at or below the LIMITS specified in order to transfer aqueous waste to the Saltstone Facility (Ref. 1, 13-22, 24).

Waste known to contain hazardous contaminants, volatile contaminants or chelating agents that are not specifically listed in Attachment 8.1 require formal review and authorization by WS Engineering, WS Environmental Support, and Saltstone Operations, before such waste can be transferred to the Saltstone Facility (Ref. 6, 13, 14, 21, 22, 24).

Formal review and authorization by WS Engineering, WS Environmental Support, and Saltstone Operations is required in order to transfer waste that contains known non-hazardous contaminants that are not listed in Attachments 8.1 and 8.2, if the concentration of a contaminant is greater than or equal to 0.5 mole per liter. These non-hazardous contaminants include, but are not limited to, the following chemicals commonly found in SRS waste streams: formate ($HCOO^-$), cerium (Ce), cesium (Cs), magnesium (Mg), neodymium (Nd), ruthenium (Ru), titanium (Ti), and zirconium (Zr).

*[**NOTE:** The level of 0.5 mole per liter is based on technical judgment for the concentration of a contaminant that is easily detected and could require testing and/or reformulation to assure saltstone is acceptable.]*

The mercury concentration in all aqueous waste sent to Tank 50H must be less than 260 mg/kg, which is the LDR limit for mercury in accordance with SCHWMR R.61-79.268.40.

5.4.8 Chemical Criteria TARGETS

5.4.8.1 Criteria: The TARGET concentrations of the chemicals shown in Attachment 8.2 shall not be exceeded.

5.4.8.2 Criteria Type: TARGET

5.4.8.3 Background: Exceedance of TARGET chemical concentrations does not require a WAC deviation. However, WS Engineering, WS Environmental Support, and Saltstone Operations shall be notified when the concentration of any chemical contaminant in waste to be transferred exceeds the TARGETS shown in Attachment 8.2.

5.4.9 Radionuclide Criteria LIMITS

5.4.9.1 Criteria: The LIMIT concentrations of the radionuclides shown in Attachment 8.3 shall not be exceeded. NOTE: Known radionuclides not included in Attachments 8.3 and 8.4 but having an activity concentration greater than or equal to 1.25E+04 pCi/mL shall not be transferred to Saltstone without formal review and authorization by WS Engineering, WS Environmental Support, and Saltstone Operations.

5.4.9.2 Criteria Type: LIMIT

5.4.9.3 Background: Appendix 1 provides the bases for the acceptance criteria of radionuclides identified in the Permit (Ref. 2), the Documented Safety Analysis (Ref. 13), the 2005 Special Analysis for Vault 4 (Ref. 25), and major radioactive contaminants identified in the Tank Farm (Ref. 26). Formal review and authorization by WS Engineering, WS Environmental Support, and Saltstone Operations is required for the transfer of waste known to contain a radionuclide that is not specifically listed in Attachments 8.3 and 8.4, if the radionuclide concentration in the waste stream is greater than or equal to 1.25E+04 pCi/mL (10 nCi/g).

The transfer of aqueous waste to the Saltstone Facility that would produce solid saltstone classified as TRU waste or HLW waste is prohibited (Ref. 1, 6, 13, 14, 27).

5.4.10 Radionuclide Criteria TARGETS

5.4.10.1 Criteria: The TARGET concentrations of the radionuclides shown in Attachment 8.4 shall not be exceeded.

5.4.10.2 Criteria Type: TARGET

5.4.10.3 Background: Exceedance of TARGET radionuclide concentrations does not require a WAC deviation. However, WS Engineering, WS Environmental Support, and Saltstone Operations shall be notified when the concentration of any radionuclide contaminant in waste to be transferred exceeds the TARGETS shown in Attachment 8.4.

The disposal of waste in the Saltstone Disposal Facility vaults is controlled via a Performance Assessment document (Ref. 28). The PA has been updated via a Special Analysis (SA) to establish limits for radionuclides that would potentially provide a dose to the public via groundwater, air, radon or intruder scenarios (Ref. 25). The SA lists those radionuclides of concern and is based on each individual isotope giving the maximum permitted dose. Therefore, a sum-of-fractions calculation must be performed to compare the radionuclide inventory in the waste stream to the SA limits. The SA limits are provided in Appendix 1 for sum-of-fractions calculations. If the sum-of-fractions exceeds 1.0, an Unreviewed Disposal Question Evaluation (UDQE) will have to be performed before the waste stream can be disposed of in the vaults (Ref. 29).

5.4.11 General Processing Criteria

5.4.11.1 Criteria: Transfers into the Saltstone Facility shall meet the known processing constraints given in Table 5.

5.4.11.2 Criteria Type: LIMIT

5.4.11.3 Background: See Basis section in Table 5.

TABLE 5: Saltstone Processing Criteria WAC LIMITS

Processing Criterion	Basis
pH > 10	Corrosion Control
2.5 M < [Na^+] < 7.0 M	This range represents a nominal salt concentration in the feed stream. Grout formulation work will be completed on each new salt batch (or as required) and the water-to-premix ratio will be determined during this testing.
10°C < Temperature < 40°C	If the feed material is less than 10°C, then the probability of exceeding the solubility of salt contaminants increases. At feed temperatures above 40°C, grout quality is reduced. Processing with feed below 40°C ensures that the grout mixture does not exceed 95°C (i.e., would create steam cured grout, forms cracks in the saltstone).
Total Insoluble Solids < 1.88E+05 mg/L (15 wt. %)	This suspended solids concentration is the design basis of the Salt Feed Tank agitator.
Homogeneous & Consistent Feed	The Saltstone Facility requires a homogeneous and consistent feed due to the complexity of the grout formulation.

5.4.12 Gamma Shielding

5.4.12.1 Criteria: The specific gamma source strength value of 9.05E+01 mR/hr/gallon shall not be exceeded unless additional RCO controls or shielding is added. Also, the concentration for Cs-137 shall meet the LIMIT set in Attachment 8.3.

5.4.12.2 Criteria Type: LIMIT

5.4.12.3 Computational Technique: The specific gamma source strength value is based on the cumulative sum of a mixture of radionuclide specific gamma dose constants multiplied by the radionuclide concentration.

5.4.12.4 Background: The gamma source strength value provides a common means for comparing the radionuclide distribution assumed in the Saltstone design basis and the variable radionuclide feed being sent to Tank 50H and Saltstone. Significant gamma sources used for Saltstone shielding criteria include Co-60, Sb-125, Cs-134, Cs-137 and Eu-154 (Ref. 9). Saltstone DSA accident analyses assumed a Cs-137 concentration of 0.5 Ci/gal whereas Saltstone shielding calculations assume 0.2 Ci/gal (Ref. 9). The higher Cs-137 concentration assumed in the DSA accident analyses equates to a specific gamma source strength value of 2.17E+02 mR/hr/gal. Verification that the Saltstone WAC LIMITS of 9.05E+01 mR/hr/gal and Cs-137 concentration of 0.18 Ci/gal are met ensures compliance to the limits assumed in the Saltstone DSA Accident Analyses.

In Table 6 below, the WAC shielding concentrations were set at 90% of the shielding curie balance concentrations assumed in the Saltstone shielding calculations.

TABLE 6: Calculation of Gamma Source Strength WAC LIMIT

Radionuclide (Ref. 9)	**Shielding Curie Balance Conc. (Ci/gallon) [pCi/mL] (Ref. 9)**	**WAC Shielding Conc. (Ci/gallon) [pCi/mL]**	**Gamma Dose Constant (mR/hr/Ci) (Ref. 9)**	**WAC Gamma Source Strength (mR/hr/gal)**
Co-60	4.73E-03 [1.25E+06]	4.26E-03 [1.13E+06]	1.37E+03	5.84E+00
Sb-125	9.46E-03 [2.50E+06]	8.51E-03 [2.25E+06]	6.08E+02 (Includes Te-125m)	5.17E+00
Cs-134	4.73E-03 [1.25E+06]	4.26E-03 [1.13E+06]	9.99E+02	4.26E+00
Cs-137	2.00E-01 [5.28E+07]	1.80E-01 [4.75E+07]	3.82E+02	6.88E+01
Eu-154	9.46E-03 [2.50E+06]	8.51E-03 [2.25E+06]	7.56E+02	6.43E+00
WAC LIMIT				**9.05E+01**

5.5 Administrative Controls

5.5.1 Waste Forecasts

To assure adequate storage, treatment and disposal capacity will be available for future operation of the Saltstone Facility, the Planning and Integration Technology (PIT) team will be used to provide projected waste forecasts (Ref. 6, 26).

5.5.2 Waste Compliance Plan

A Waste Compliance Plan (WCP) prepared by LWO Process Chemistry Program Engineering that describes the controls or procedures imposed by HTF Operations (responsible for Tank 50H operations) to meet these WAC shall be prepared for review and approval by WS Engineering and Saltstone Operations. The WCP serves as the primary agreement between H-Tank Farm and Saltstone to assure waste compositions comply with the WAC (Ref. 6).

5.5.3 Documentation

NOTE: Sufficient information must be included in monthly summaries to enable calculation of the overall waste composition for the total volume of waste transferred to the Saltstone Facility. Concentrations of contaminants may be based on direct analysis of waste in Tank 50H, direct analysis of influents to Tank 50H, calculations combining process knowledge and analysis of influents to a waste generator's process, calculations based on process knowledge, calculations based on transfers into and out of Tank 50H, calculations based on analyses provided by the Saltstone Facility, or any combination of these methods.

As a minimum, LWO Process Chemistry Program Engineering and/or HTF Operations shall:

- Retain auditable records for at least 3 years of any chemical, radiological and/or calculational analyses that are used to prepare documents that describe the composition of waste transferred to the Saltstone Facility (Ref. 6, 13, 27, 30, 31).
- Provide a Tank 50H Material Balance monthly update to WS Engineering for any month in which a transfer is made to the Saltstone Facility. The volume(s) and composition(s) of all transfers from Tank 50H to the Saltstone Facility that were made within the month shall be covered by the update. Sufficient information shall be provided in the update to demonstrate all individual transfers are in compliance with the acceptance criteria documented in this WAC (Ref. 6, 13, 27, 30, 31).
- Perform an Isopar L Blend Calculation to specify the allowable total volume of DSS that is authorized for transfer from MCU to Tank 50H to ensure that the Isopar L LIMIT will not be exceeded (Ref. 13). Representative batch sampling and analysis at MCU shall occur to support the material balance and blend calculations (Ref. 13).

- Assure, prior to each transfer from Tank 50H, that analyses (sampling, calculation, process knowledge, or combination) of current Tank 50H contents and applicable uncertainties are available to WS Engineering and Saltstone Operations (Ref. 1, 6, 13, 14, 31).
- Assist WS Engineering and Saltstone Operations in obtaining samples from Tank 50H for analysis associated with LIMIT and TARGET acceptance criteria in this WAC and the confirmatory samples to fulfill permit requirements for saltstone production and disposal (Ref. 1, 13, 14).
- Complete all analyses and/or calculations described in the Waste Compliance Plan.

6.0 RECORDS

Records are generated in accordance with operations procedures and will be considered quality assurance records and maintained in accordance with Procedure Manual 1Q, Quality Assurance Manual, QAP-17-1, "Quality Assurance Records Management" and Procedure Manual 1B, Management Requirements and Procedures.

7.0 REFERENCES

1. "SCDHEC Permit #18,801-IW, Final Approval to Place in Operation Saltstone Facility Modifications," USDOE/WSRC Savannah River Site, Aiken, SC 29808 (September 2003; February 2, 2004; October 6, 2005; November 21, 2006; January 29, 2007)
2. ESH-EPG-2004-00194, Notification of Changes to Waste Influent Concentrations at the Z-Area Saltstone Industrial Wastewater Treatment Facility and Industrial Solid Waste Landfill
3. ESH-EPG-2005-00131, Changes to the Waste Influent Concentrations at the Z-Area Saltstone Industrial Wastewater Treatment Facility and Industrial Solid Waste Landfill
4. Modified Permit for the Savannah River Site (SRS) Z-Area Saltstone Disposal Facility, Facility ID No. 025500-1603, Aiken County, January 23, 2007
5. CBU-PIT-2005-00014, Rev. 0, Sampling Integration Document for Tank 50 Point of Compliance Transfers to Saltstone
6. DOE Order 435.1, Radioactive Waste Management
7. "NESHAP Construction and Operation Permission for DWPF Facilities (S-Area, Z-Area)," U.S. Environmental Protection Agency Region IV, 345 Courtland St., Atlanta, GA 30365 (April 25, 1988)
8. ENG.08, Rev. 2, Waste Acceptance Criteria, Waste Compliance Plan, and Special Waste Compliance Plan
9. N-CLC-Z-00012, Rev. 1, Gamma Source Strength and Inhalation Dose Potential for Saltstone Processing
10. WSRC-TR-2001-00574, Rev. 10, Saltstone Facility Consolidated Hazard Analysis
11. X-ESR-H-00137, Rev. 0, Estimated Residual Mass of Potassium Tetraphenylborate in the Heel of Tank 50H
12. S-CLC-Z-00067, Rev. 3, Maximum Amount of Isopar L to Remain Below the Lower Flammability Limit
13. WSRC-SA-2003-00001 Rev. 6, Saltstone Facility Documented Safety Analysis
14. WSRC-OX-89-15-001 (Rev. 5), Transfer of Salt Solution from Tank 50H to Saltstone
15. DPST-88-372, Recommended Salt Solution Feed Specifications for Z Area (Revised)
16. DPST-88-559, Organics in TCLP Extracts of Saltstone
17. DPST-89-314, Guidance on Z-Area Salt Solution Toxic Metal Concentrations Based on EP Toxicity Tests for Saltstone
18. DPST-89-342, EP Toxicity Results for Simulated Saltstone Made in the Z-Area Plant
19. WSRC-RP-89-1375, Revised Mercury Limit for Z-Area Salt Solution Based on Groundwater Protection Criteria
20. DPST-85-417, Estimated Composition of Decontaminated Salt Solution Feed to Saltstone," Internal Report

21. WSRC-RP-91-262, Setting Properties of DWPF Saltstone Made from Reference Solution Containing Monarch Cleaner
22. WSRC-RP-93-1185, Evaluation of the Effects of Tributylphosphate (Defoaming Agent) in Z-Area Saltstone
23. N-NCS-Z-00001, Rev. 6, Nuclear Criticality Safety Evaluation for Z-Area
24. ESH-FSG-910942, Receipt of Additional Cleaning Agents in the Z-Area Saltstone Manufacturing Facility
25. WSRC-TR-2005-00074, Rev. 0, Special Analysis: Revision of Saltstone Vault 4 Disposal Limits (U)
26. CBU-PIT-2005-00013, Rev. 3, Radionuclide Concentrations in Saltstone
27. South Carolina Hazardous Waste Regulation, R.61-79.261
28. WSRC-RP-92-1360, Rev. 0, Radiological Performance Assessment for the Z-Area Saltstone Disposal Facility and Addenda
29. Saltstone Facility Admin Procedures Manual SW24, SSF-ENG-2002, Rev. 1, Saltstone Facility Unreviewed Disposal Question
30. HPM-88-092, "Decontaminated Salt Solution Specification Model," S. A. Thomas to R. L. Hooker, April 18, 1988
31. SCDEHEC Permit #17,424-IW, F & H Area High Level Radioactive Waste Tank Farms (Latest Revision)
32. CBU-PIT-2005-00095, Rev. 0, Chemical Concentrations in Salt Solution Feed to the Saltstone Facility from DDA and ARP/MCU Salt Batches
33. CBU-PIT-2005-00178, Rev. 0, HLW Inventories of Additional Radionuclides identified in the 2005 Saltstone Special Analysis

Attachment 8.1: Acceptance Criteria LIMITS for Chemical Contaminants in Aqueous Waste Transferred to Z Area

Chemical Name	Chemical Formula	Molecular Weight (grams/mole)	WAC LIMIT (mg/L)	Basis [2]
Solvated Ions				
Ammonium [1]	NH_4^+	18.04	7.13E+03 **[SAC]**	75% of DSA Value
Carbonate	CO_3^{2-}	60.01	1.45E+05 **[SAC]**	75% of DSA Value & Permit Max.
Chloride	Cl^-	35.45	9.68E+03	75% of DSA Value & Permit Max.
Fluoride	F^-	19.00	4.94E+03	75% of DSA Value & Permit Max.
Hydroxide	OH^-	17.01	1.91E+05 **[SAC]**	75% of DSA Value & Permit Max.
Nitrate	NO_3^-	62.01	5.29E+05 **[SAC]**	75% of DSA Value & Permit Max.
Nitrite	NO_2^-	46.01	2.59E+05 **[SAC]**	75% of DSA Value & Permit Max.
Oxalate	$C_2O_4^{2-}$	88.02	3.30E+04 **[SAC]**	75% of DSA Value
Phosphate	PO_4^{3-}	94.97	3.56E+04	75% of DSA Value
Sulfate	SO_4^{2-}	96.06	6.89E+04	75% of DSA Value & Permit Max.
RCRA Hazardous Metals				
Arsenic	As	74.92	7.50E+02	75% of DSA Value & Permit Max.
Barium	Ba	137.3	7.50E+02	75% of DSA Value & Permit Max.
Cadmium	Cd	112.4	3.75E+02	75% of DSA Value & Permit Max.
Chromium	Cr	52.00	1.50E+03	75% of DSA Value & Permit Max.
Lead	Pb	207.2	7.50E+02	75% of DSA Value & Permit Max.
Mercury [3]	Hg	200.6	3.25E+02	LDR Restraint
Selenium	Se	78.96	4.50E+02 **[SAC]**	90% of DSA Value & Permit Max.
Silver	Ag	107.9	7.50E+02	75% of DSA Value & Permit Max.
Other Metals				
Aluminum	Al^{3+}	26.98	1.41E+05 **[SAC]**	75% of Permit Max.
Organic Compounds				
Butanol [1] & Isobutanol [1]	C_4H_9OH	74.12	2.25E+03**[SAC]**	75% of DSA Value
Isopropanol [1]	C_3H_7OH	60.09	2.25E+03**[SAC]**	75% of DSA Value
Phenol	C_6H_5OH	94.11	7.50E+02 **[SAC]**	75% of DSA Value
Isopar L [1]	----	163	1.50E+02 ppm [4]	75% of DSA Value
Total Organic Carbon	----	----	5.00E+03	83% of Permit Max.
Tetraphenylborate (TPB) [1]	$B(C_6H_5)_4^-$	319.22	7.50E+02	75% of DSA Value

Footnote 1: The WAC LIMITS given above are based on bounding DSA concentrations for accident consequence analysis. However, to protect assumptions associated with flammable gas accumulation in Vault 4, more restrictive concentrations have been set on these identified chemicals - see Tables 3 and 4.

Footnote 2: The Permit maximum expected concentrations are concentrations that are not expected to be exceeded. However, exceedance of a Permit Max expected concentration is not a regulatory violation. According to SCDHEC Permit #18,801-IW, Special Condition #2, if the influent chemical concentration changes appreciably from those identified in the Permit Engineering Report, SCDHEC must be immediately notified with a follow up report within 30 days addressing the change in the salt solution characteristics and its effect on the Saltstone disposal area (Ref. 1).

Footnote 3: The mercury limit is 260 mg/kg (LDR limit). The mercury WAC LIMIT stated in the table of 325 mg/L assumes an aqueous waste density is 1.25 g/mL. The waste meets the WAC criteria as long as the LDR limit is met in Tank 50H (i.e., concentration and density of waste correspond to a value below the LDR).

Footnote 4: The WAC LIMIT for Isopar L is given in ppm not mg/L.

Attachment 8.2: Acceptance Criteria TARGETS for Chemical Contaminants in Aqueous Waste Transferred to Z Area

The chemicals listed in this attachment are included in the DSA but are not considered significant contributors to accidents analyzed in the DSA at their current DSA concentrations. The expected maximum concentration of these chemicals in the influent to Saltstone is at least an order of magnitude less than the DSA value (Ref. 32). The concentrations of these chemicals will be determined on a confirmatory (quarterly) basis in Tank 50H. If a TARGET concentration is exceeded, then WS Engineering will reevaluate the TARGET concentration for the chemical and supply a new TARGET value to ensure the individual chemical concentration limit is protected for the vault.

Chemical Name	Chemical Formula	Molecular Weight (grams/mole)	WAC TARGET (mg/L)	Basis [4]
Other Metals				
Boron	B	10.81	9.00E+02	75% of DSA Value & Permit Max.
Cobalt	Co	58.93	9.00E+02	75% of DSA Value & Permit Max.
Copper	Cu	63.55	9.00E+02	75% of DSA Value & Permit Max.
Iron	Fe	55.85	6.00E+03	75% of DSA Value & Permit Max.
Potassium	K	39.10	3.67E+04	75% of DSA Value
Lithium	Li	6.94	9.00E+02	75% of DSA Value & Permit Max.
Manganese	Mn	54.94	9.00E+02	75% of DSA Value & Permit Max.
Molybdenum	Mo	95.94	9.00E+02	75% of DSA Value & Permit Max.
Nickel	Ni	58.70	9.00E+02	75% of DSA Value & Permit Max.
Silicon	Si	28.09	1.29E+04	75% of DSA Value
Strontium	Sr	87.62	9.00E+02	75% of DSA Value & Permit Max.
Zinc	Zn	65.38	9.75E+02	75% of DSA Value & Permit Max.
Organic Compounds				
Benzene [1]	C_6H_6	78.11	3.75E+02	75% of DSA Value
Methanol [2]	CH_3OH	32.04	2.25E+02	75% of DSA Value
Tributylphosphate (TBP) [2]	$(C_4H_9O)_3PO$	266.32	3.00E+02	75% of DSA Value
Toluene [3]	$C_6H_5CH_3$	92.13	3.75E+02	75% of DSA Value
EDTA [3]	----	292.25	3.75E+02	75% of DSA Value
NORPAR 13		187	1.0E-01	100% of Vault Flammability Value

Footnote 1: The only source of benzene is from the decomposition of TPB.

Footnote 2: The WAC TARGETS given above are based on bounding DSA concentrations for accident consequence analysis. However, to protect assumptions associated with flammable gas accumulation in Vault 4, more restrictive concentrations have been set for methanol and TBP - see Table 4.

Footnote 3: The vault flammability calculation (S-CLC-Z-00067) assumes no toluene and EDTA in the salt solution. Detection of these two chemicals above the minimum detection level requires immediate notification of WS Engineering.

Footnote 4: The Permit maximum expected concentrations are concentrations that are not expected to be exceeded. However, exceedance of a Permit Max expected concentration is not a regulatory violation. According to SCDHEC Permit #18,801-IW, Special Condition #2, if the influent chemical concentration changes appreciably from those identified in the Permit Engineering Report, SCDHEC must be immediately notified with a follow up report within 30 days addressing the change in the salt solution characteristics and its effect on the Saltstone disposal area (Ref. 1).

Attachment 8.3: Acceptance Criteria LIMITS for Radioactive Contaminants in Aqueous Waste Transferred to Z Area

The radionuclides listed in this attachment are limited by the bases listed (i.e., NRC Class, DSA, Permit or NCSE). Material to be transferred to Tank 50H must meet these LIMITS prior to transfer or by blending in Tank 50H. Note: Co-60 will not exceed its NRC limit as long as the Gamma Shielding WAC LIMIT is met – see WAC Section 5.4.12.

Radionuclide	WAC LIMIT (pCi/mL)	Basis
H-3	5.63E+05	90% of DSA Value & Permit Max. (NRC Class A)
C-14	1.13E+05	90% of DSA Value & Permit Max. (NRC Class A)
Ni-63	1.13E+05	90% of DSA Value & Permit Max. (NRC Class A)
Sr-90	2.25E+07	90% of DSA Value and Permit Max.
Tc-99	4.22E+05	90% of Permit Max. (NRC Class A)
I-129	1.13E+03	90% of Permit Max. (NRC Class A)
Cs-137	4.75E+07	90% of Cs-137 Conc. Limit in Shielding Calcs
U-233	1.13E+04 **[SAC]**	90% of DSA Value (NCSE)
U-235	1.13E+02 **[SAC]**	90% of DSA Value (NCSE)
Pu-241	8.38E+05 **[SAC]**	90% of DSA Value (NRC Class A, NCSE)
Total α [1]	2.50E+05**[SAC]**	94% of Permit Max. (NRC Class C, NCSE)

Footnote 1: The Total α WAC LIMIT bounds all alpha emitting isotopes (TRU, Radium Isotopes, Uranium Isotopes, Thorium Isotopes, and Protactinium Isotopes) except for U-233 and U-235 which have lower WAC LIMITS due to criticality concerns.

Attachment 8.4: Acceptance Criteria TARGETS for Radioactive Contaminants in Aqueous Waste Transferred to Z Area

Many of the radionuclides listed in this attachment have TARGET acceptance criteria to protect the Special Analysis (SA) curie limits for Vault 4 (Ref. 25). Other radionuclides have TARGET concentration levels to protect the DSA and permit values. The basis for each WAC TARGET is given below and is also provided in further detail in Appendix 1.

The concentrations of these radionuclides will be determined on a confirmatory basis in Tank 50H – at least semiannually. If a TARGET concentration is exceeded, then WS Engineering will reevaluate the TARGET concentration for the radionuclide to ensure the regulatory requirement is protected.

Radionuclide	WAC TARGET (pCi/mL)	Basis [1]
Na-22	1.25E+04	90% of DDA Max. Expected Conc.
Al-26	2.88E+03	90% of DSA Value
Co-60	1.13E+06	Gamma Shielding
Ni-59	1.13E+05	90% of DSA Value & Permit Max.
Se-79	1.90E+04	Special Analysis
Nb-93m	2.85E+06	Special Analysis
Nb-94	1.53E+04	90% of DSA Value
Mo-93	1.18E+07	Special Analysis
Ru-106	1.13E+06	90% of DSA Value & Permit Max.
Sb-125	2.25E+06	Gamma Shielding
Sn-126	1.80E+04	90% of DSA Value and Permit Max.
Cs-134	1.13E+06	Gamma Shielding
Cs-135	1.13E+06	90% of DSA Value & Permit Max.
Ce-144	1.13E+05	90% of DSA Value
Pm-147	5.63E+06	90% of DSA Value & Permit Max.
Sm-151	2.25E+04	90% of DSA Value & Permit Max.
Eu-152	7.28E+01	90% of DDA Max. Expected Conc.
Eu-154	2.25E+06	Gamma Shielding & IDP
Eu-155	1.13E+04	90% of DSA Value & Permit Max.
Ra-226	7.97E+03	Special Analysis
Th-229	1.63E+05	Special Analysis
Th-230	6.26E+03	Special Analysis
Th-232	2.88E+03	90% of DSA Value
U-232	1.71E+05	Special Analysis
U-234	1.13E+04	90% of DSA Value
U-236	1.13E+04	90% of DSA Value
U-238	1.13E+04	90% of DSA Value
Np-237	2.50E+05	94% of DSA Value
Pu-238	2.50E+05	94% of DSA Value
Pu-239	2.50E+05	94% of DSA Value
Pu-240	2.50E+05	94% of DSA Value
Pu-242	2.50E+05	94% of DSA Value
Pu-244	7.02E+04	Special Analysis
Am-241	2.50E+05	94% of DSA Value
Am-242m	3.68E-01	90% of DDA Max. Expected Conc.
Am-243	2.50E+05	94% of DSA Value
Cm-242	1.13E+04	90% of DSA Value
Cm-244	2.50E+05	94% of DSA Value
Cm-245	2.25E+05	90% of Permit Max.

Footnote 1: The Permit maximum expected concentrations are concentrations that are not expected to be exceeded. However, exceedance of a Permit Max expected concentration is not a regulatory violation. According to SCDHEC Permit #18,801-IW, Special Condition #2, if the influent radionuclide concentration changes appreciably from those identified in the Permit Engineering Report, SCDHEC must be immediately notified with a follow up report within 30 days addressing the change in the salt solution characteristics and its effect on the Saltstone disposal area (Ref. 1).

X-SD-Z-00001, Rev. 9

Waste Acceptance Criteria for Aqueous Waste Sent to the Z-Area Saltstone Production Facility (U)

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APPENDIX 1:

Bases for Radiological and Chemical WAC, DSA, Permit and Special Analysis Criteria at the Saltstone Facility

Note: For references included in this Basis section, see Section 7.0 (References).

Comparison of Radiological Concentrations for Saltstone

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
H-3 NRC Class A = 6.26E+07	5.63E+05	6.26E+05 (501)	6.26E+05	1.04E+13 (5.5E+11)	The permit max. concentration and DSA source term for H-3 are set equal to 1% of the NRC Class A landfill limit of 6.26E+07 pCi/mL. This value is used to keep the vault emissions < 0.1 mrem/yr. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration and DSA value.	1.08E+05 [Ref. 26]
C-14 NRC Class A = 1.25E+06 NRC Class C = 1.25E+07	1.13E+05	1.25E+05 (100)	1.25E+05	8.35E+08 (4.4E+07)	The permit max. concentration and DSA source term for C-14 are set equal to 10% of the NRC Class A landfill limit of 1000 nCi/g (1.25E+06 pCi/mL) to protect the 2005 SA limit. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration and DSA value.	2.09E+03 [Ref. 26]
Na-22	1.25E+04	None	None	1.48E+17 (7.8E+15)	In the 2005 SA, Na-22 is listed as a potential radionuclide in the SRS high-level waste. However, analytical data/process knowledge shows that the total activity of Na-22 to be sent to Saltstone (5.05E+03 Ci) [Ref. 26] is well below the 2005 SA total curie limit (7.8E+15 Ci) [Ref. 25]. There are no DSA or permit max. concentrations for Na-22. The WAC TARGET is set to a value equal to 90% of the DDA maximum expected concentration value, which is the concentration assumed in the Saltstone Facility Hazard Categorization.	1.39E+04 [Ref. 26]
Al-26	2.88E+03	None	3.20E+03	3.04E+03 (1.6E+02)	In the 2005 SA, Al-26 is listed as a potential radionuclide in the SRS high-level waste. However, analytical data/process knowledge shows that the total activity of Al-26 to be sent to Saltstone (2.35E+01 Ci) [Ref. 26] is well below the 2005 SA total curie limit (1.6E+02 Ci) [Ref. 25]. Also, the total Al inventory in the waste is 2.1E+06 kg, yielding 14 pCi/mg Al. At the permit maximum chemical concentration of 188 mg/mL, Al (~7 mole Al/L), the maximum calculated concentration of Al-26 would be 2.6E+03 pCi/mL. The DSA has an Al-26 limit of 3.20E+03 pCi/mL. Solubility considerations limit Al (as sodium aluminate) to less than 81 mg/mL. As a result, there is no permit max. concentration for Al-26. The WAC TARGET is set to a value equal to 90% of the DSA value, which is the concentration assumed in the Saltstone Facility Hazard Categorization.	5.81E+01 [Ref. 26]
Cl-36	Not Required	None	None	9.87E+19 (5.2E+18)	In the 2005 SA, Cl-36 is listed as a potential radionuclide in the SRS high-level waste. Assuming all the chlorine in the waste tanks is Cl-36 and using the maximum analytical value reported for chlorine in the supernatant waste, the total curies of Cl-36 is conservatively estimated to be 3.80E+08 Ci [Ref. 33], which is well below the 2005 SA total curie limit (5.2E+18 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cl-36.	4.20E+09 [Ref. 33]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
K-40	Not Required	None	None	6.07E+04 (3.2E+03)	In the 2005 SA, K-40 is listed as a potential radionuclide in the SRS high-level waste. Estimates based on neutron reaction conservatively bound the total activity of K-40 to be less than 1.94E+03 Ci [Ref. 33], which is below the 2005 SA total curie limit (3.2E+03 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for K-40.	2.14E+04 [Ref. 33]
Co-60 NRC Class A = 1.09E+09	Gamma Shielding WAC LIMIT (TARGET = 1.13E+06)	1.25E+06 (1000)	1.25E+06	1.10E+11 (5.8E+09)	The permit max. concentration and DSA source term for Co-60 are set at a maximum assumed value of 1.25E+06 pCi/mL (1000 nCi/g), which is ~0.1% of the NRC Class A landfill limit of 1.09E+09 pCi/mL. Co-60 (assuming the DSA concentration) has been identified as a significant contributor in the gamma shielding WAC LIMIT [Ref. 9]. The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	2.12E+03 [Ref. 26]
Ni-59	1.13E+05	1.25E+05 (100)	1.25E+05	4.75E+18 (2.5E+17)	The permit max. concentration and DSA source term for Ni-59 are set at a maximum assumed value of 1.25E+05 pCi/mL (100 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	3.17E+01 [Ref. 26]
Ni-63 NRC Class A = 5.48E+06 NRC Class C = 1.10E+09	1.13E+05	1.25E+05 (100)	1.25E+05	None	The permit max. concentration and DSA source term for Ni-63 are set at a maximum assumed value of 1.25E+05 pCi/mL (100 nCi/g), which is 2.3% of the NRC Class A landfill limit of 5.48E+06 pCi/mL. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration and DSA value.	3.62E+03 [Ref. 26]
Se-79	1.90E+04	1.25E+05 (100)	1.25E+05	1.90E+04 (1.0E+03)	The permit max. concentration and DSA source term for Se-79 are set at a maximum assumed value of 100 nCi/g. The WAC TARGET is set to the 2005 SA curie concentration target of 1.90E+04 pCi/mL [Ref. 25].	1.45E+02 [Ref. 26]
Kr-85	Not required	None	None	5.13E+12 (2.7E+11)	In the 2005 SA, Kr-85 is listed as a potential radionuclide in the SRS high-level waste. However, based on the production path for Kr-85 documented in Reference 33, Kr-85 is not expected in SRS waste. As a result, there are no DSA, permit or WAC LIMITS/TARGETS for Kr-85.	<< SA Conc. [Ref. 33]
Rb-87	Not required	None	None	9.68E+10 (5.1E+09)	In the 2005 SA, Rb-87 is listed as a potential radionuclide in the SRS high-level waste. Based on irradiated reactor assembly data, it is estimated there is 2.26E-01 Ci of Rb-87 in the Tank Farm [Ref. 33], which is significantly below the SA total curie limit (5.1E+09 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Rb-87.	<< SA Conc. [Ref. 33]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Sr-90 NRC Class A = 6.26E+04 NRC Class C = 1.10E+10	2.25E+07 and IDP WAC LIMIT	2.50E+07 (20,000)	2.50E+07	4.56E+17 (2.4E+16)	The permit max. concentration and DSA source term for Sr-90 are set at a maximum assumed value of 2.50E+07 pCi/mL. This level is about 0.23% of the NRC Class C landfill limit of 1.10E+10 pCi/mL. Sr-90 (assuming the DSA concentration) has been identified as a significant contributor in the IDP acceptance criterion [Ref. 9]. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration and DSA value.	3.46E+05 [Ref. 26]
Y-90	Not required	2.50E+07 (20,000)	2.50E+07	None	The permit max. concentration and DSA source term for Y-90 are set at a maximum assumed value of 2.50E+07 pCi/mL. The activity of Y-90 is bounded by the activity of its parent radionuclide Sr-90. Therefore, there is no WAC LIMIT/TARGET for Y-90.	3.46E+05 [Ref. 26]
Nb-93m	2.85E+06	None	None	2.85E+06 (1.5E+05)	In the 2005 SA, Nb-93m is listed as a potential radionuclide in the SRS high-level waste. The total Nb-93m inventory cannot be estimated until the Mo-93 inventory has been quantified (Nb-93m is produced via electronic capture of Mo-93) [Ref. 33]. There are no DSA or permit limits for Nb-93m. The WAC TARGET is set to the 2005 SA curie concentration target of 2.85E+06 pCi/mL [Ref. 25].	TBD [Ref. 33]
Nb-94	1.53E+04	None	1.70E+04	1.90E+04 (1.0E+03)	In the 2005 SA, Nb-94 is listed as a potential radionuclide in the SRS high-level waste. The DSA source term is approximately 90% of the 2005 SA curie concentration target of 1.90E+04 pCi/mL [Ref. 25]. The WAC TARGET is set equal to 90% of the DSA source term.	1.42E-03 [Ref. 26]
Mo-93	1.18E+07	None	None	1.18E+07 (6.2E+05)	In the 2005 SA, Mo-93 is listed as a potential radionuclide in the SRS high-level waste. An estimate of the Mo-93 inventory will be provided once neutron flux data is available for the Hallum research reactor fuel [Ref. 33]. There are no DSA or permit limits for Mo-93. The WAC TARGET is set to the 2005 SA curie concentration target of 1.18E+07 pCi/mL [Ref. 25].	TBD [Ref. 33]
Tc-99 NRC Class A = 4.69E+05 NRC Class C = 4.69E+06	4.22E+05	4.69E+05 (375)	4.69E+06	7.02E+14 (3.7E+13)	The DSA source term is set equal to the NRC Class C landfill limit of 4.69E+06 pCi/mL. The permit max. concentration is set equal to the NRC Class A landfill limit of 4.69E+05 pCi/mL. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration.	5.39E+04 [Ref. 26]
Ru-106	1.13E+06	1.25E+06 (1000)	1.25E+06	None	The permit max. concentration and DSA source term are set at a maximum assumed value of 1.25E+06 pCi/mL (1000 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	3.72E+03 [Ref. 26]
Rh-106	Not required	1.25E+06 (1000)	Included as part of Ru-106 activity	None	Because the half-life of Rh-106 is so short compared to its parent, the dose of Rh-106 is accounted for in the dose of its parent radionuclide Ru-106. Therefore, there are no specific DSA or WAC LIMITS/TARGETS set for Rh-106. The permit max. concentration is set at a maximum assumed value of 1000 nCi/g.	3.72E+03 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Pd-107	Not required	None	None	8.35E+17 (4.4E+16)	In the 2005 SA, Pd-107 is listed as a potential radionuclide in the SRS high-level waste. Based on irradiated reactor assembly data, it is estimated there is 4.11E+02 Ci of Pd-107 in the Tank Farm [Ref. 33], which is significantly below the SA total curie limit (4.4E+16 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Pd-107.	<< SA Conc. [Ref. 33]
Ag-108m	Not required	None	None	1.08E+05 (5.7E+03)	In the 2005 SA, Ag-108m is listed as a potential radionuclide in the SRS high-level waste. The amount of Ag-108m generated by the (n, gamma) reaction as well as ratioing with Sb-125 and applying a solubility factor yields an upper bounding inventory of 9.21E+03 Ci [Ref. 25], which is slightly higher than the 2005 SA total curie limit (5.7E+03 Ci) [Ref. 25]. However, because 99% of the Ag-108m is in the sludge phase, the supernatant Ag-108m inventory will be less than the SA vault limit [Ref.33]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Ag-108m.	< SA Conc. [Ref. 33]
Sb-125	Gamma Shielding WAC LIMIT (TARGET = 2.25E+06)	2.50E+06 (2000)	2.50E+06	2.66E+18 (1.4E+17)	The permit max. concentration and DSA source term are set at a maximum assumed value of 2.50E+06 pCi/mL (2000 nCi/g). Sb-125 (assuming the DSA concentration) has been identified as a significant contributor in the gamma shielding acceptance criterion [Ref. 9]. The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	1.51E+04 [Ref. 26]
Te-125m	Not required	2.50E+06 (2000)	2.50E+06	None	The permit max. concentration and DSA source term are set at a maximum assumed value of 2.50E+06 pCi/mL (2000 nCi/g). Because the half-life of Te-125m is short compared to its parent, the activity of Te-125m is bounded by the activity of its parent radionuclide Sb-125. Therefore, no specific WAC LIMIT/TARGET is set for Te-125m.	3.69E+03 [Ref. 26]
Sn-126	1.80E+04	2.00E+04 (16)	2.00E+04	2.28E+04 (1.2E+03)	In the 2005 SA, Sn-126 is listed as a potential radionuclide in the SRS high-level waste. The permit max. concentration and DSA source term are set at a maximum assumed value of 2.00E+04 pCi/mL (16 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	7.34E+02 [Ref. 26]
Sb-126	Not required	2.00E+04 (16)	2.00E+04	None	The permit max. concentration and DSA source term are set at a maximum assumed value of 2.0E+04 pCi/mL (16 nCi/g). Because the half-life of Sb-126 is short compared to its parent, the activity of Sb-126 is bounded by the activity of its parent radionuclide Sn-126. Therefore, no specific WAC LIMIT/TARGET is set for Sb-126.	7.34E+02 [Ref. 26]
Sb-126m	Not required	2.00E+04 (16)	2.00E+04	None	The permit max. concentration and DSA source term are set at a maximum assumed value of 2.0E+04 pCi/mL (16 nCi/g). Because the half-life of Sb-126m is short compared to its parent, the activity of Sb-126m is bounded by the activity of its parent radionuclide Sn-126. Therefore, no specific WAC LIMIT/TARGET is set for Sb-126m.	1.03E+02 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
I-129 NRC Class A = 1.25E+04 NRC Class C = 1.25E+05	1.13E+03	1.25E+03 (1)	1.25E+05	4.18E+03 (2.2E+02)	The DSA source term is set equal to the NRC Class C landfill limit. The permit max. concentration is set equal to 10% of the NRC Class A landfill limit of 1.25E+04 pCi/mL. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration.	2.91E+01 [Ref. 26]
Cs-134	Gamma Shielding WAC LIMIT (TARGET = 1.13E+06)	None	1.25E+06	7.78E+20 (4.1E+19)	The DSA source term is set at a maximum assumed value of 1.25E+06 pCi/mL (1000 nCi/g). Cs-134 (assuming the DSA concentration) has been identified as a significant contributor in the gamma shielding acceptance criterion [Ref. 9]. The WAC TARGET is set to a value equal to 90% of the DSA value.	1.07E+05 [Ref. 26]
Cs-135	1.13E+06	1.25E+06 (1000)	1.25E+06	1.54E+15 (8.1E+13)	The permit max. concentration and DSA source term are set at a maximum assumed value of 1.25E+06 pCi/mL (1000 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	1.81E+02 [Ref. 26]
Cs-137 NRC Class A = 1.56E+06 NRC Class C = 7.20E+09	4.75E+07 and Gamma Shielding and IDP WAC LIMIT	6.25E+07 (50,000)	1.32E+08	1.14E+08 (6.0E+06)	The DSA source term for Cs-137 is set at a maximum assumed value of 0.5 Ci/gal (1.32E+08 pCi/mL), which is about 1.8% of the NRC Class C landfill limit of 7.20E+09 pCi/ml. The permit max. concentration is set at a maximum assumed value of 0.24 Ci/gal (6.25E+07 pCi/mL). Cs-137 has been identified as a significant contributor in both the gamma shielding acceptance criterion (assuming 0.2 Ci/gal) and the IDP acceptance criteria (assuming 0.5 Ci/gal) [Ref. 9]. The WAC LIMIT is set to a value equal to 90% of the 0.20 Ci/gal concentration value assumed in the gamma shielding calculation.	5.31E+07 [Ref. 26]
Ba-133	Not required	None	None	2.28E+11 (1.2E+10)	In the 2005 SA, Ba-133 is listed as a potential radionuclide in the SRS high-level waste. However, as discussed in Reference 33, the amount of Ba-133 generated by various reactions in SRS waste is very small. As a result, there are no DSA, permit or WAC LIMITS/TARGETS for Ba-133.	<< SA Conc. [Ref. 33]
Ba-137m	Not required	6.25E+07 (50,000)	Included as part of Cs-137 activity	None	Because the half-life of Ba-137m is so short compared to its parent, the dose of Ba-137m is accounted for in the dose of its parent radionuclide Cs-137. Therefore, there are no specific DSA or WAC LIMITS/TARGETS set for Ba-137m. The permit max. concentration is set to a value of 6.25E+07 pCi/mL (50,000 nCi/g).	5.02E+07 [Ref. 26]
Ce-144	1.13E+05	None	1.25E+05	None	The DSA source term is set at a maximum assumed value of 1.25E+05 pCi/mL (100 nCi/g). The WAC TARGET is set to a value equal to 90% of the DSA value.	3.06E+01 [Ref. 26]
Pr-144	Not required	None	1.25E+05	None	The DSA source term is set at a maximum assumed value of 1.25E+05 pCi/mL (100 nCi/g). Because the half-life of Pr-144 is short compared to its parent, the activity of Pr-144 is bounded by the activity of its parent radionuclide Ce-144. Therefore, no specific WAC LIMIT/TARGET is set for Pr-144.	3.06E+01 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Pm-147	5.63E+06	6.25E+06 (5000)	6.25E+06	None	The permit max. concentration and DSA source term are set at a maximum assumed value of 6.25E+06 pCi/mL (5000 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	2.22E+04 [Ref. 26]
Sm-151	2.25E+04	2.50E+04 (20)	2.50E+04	None	The permit max. concentration and DSA source term are set at a maximum assumed value of 2.50E+04 pCi/mL (20 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	1.67E+04 [Ref. 26]
Eu-152	7.28E+01	None	None	1.21E+08 (6.4E+06)	In the 2005 SA, Eu-152 is listed as a potential radionuclide in the SRS high-level waste. Estimates conservatively bound the concentration of Eu-152 to be 8.08E+01 pCi/mL [Ref. 26], which is several orders of magnitude below the 2005 SA curie concentration target of 1.21E+08 pCi/mL [Ref. 25]. There are no DSA or permit max. concentrations for Eu-152. The WAC TARGET is set to a value equal to 90% of the DDA maximum expected concentration value, which is the concentration assumed in the Saltstone Facility Hazard Categorization.	8.08E+01 [Ref. 26]
Eu-154	Gamma Shielding and IDP WAC LIMITS (TARGET = 2.25E+06)	2.50E+06 (2000)	2.50E+06	2.29E+09 (1.2E+08)	The permit max. concentration and DSA source term are set at a maximum assumed value of 2.50E+06 pCi/mL (2000 nCi/g). Eu-154 (assuming the DSA concentration) has been identified as a significant contributor in both the gamma shielding and IDP acceptance criteria [Ref. 9]. The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	5.86E+03 [Ref. 26]
Eu-155	1.13E+04	1.25E+04 (10)	1.25E+04	2.09E+20 (1.1E+19)	In the 2005 SA, Eu-155 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Eu-155 to be sent to Saltstone (2.57E+02 Ci) [Ref. 26] is well below the 2005 SA total curie limit (1.1E+19 Ci) [Ref. 25]. The permit max. concentration and DSA source term are set at a maximum assumed value of 1.25E+04 pCi/mL (10 nCi/g). The WAC TARGET is set to a value equal to 90% of the permit max. concentration and DSA value.	7.69E+02 [Ref. 26]
Pb-210	Not required	None	None	7.40E+12 (3.9E+11)	In the 2005 SA, Pb-210 is listed as a potential radionuclide in the SRS high-level waste. Based on the decay chain of Ra-226, it is estimated there is 5.6E+00 Ci of Pb-210 in the Tank Farm [Ref. 33], which is significantly below the 2005 SA total curie limit (3.9E+11 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Pb-210.	<< SA Conc. [Ref. 33]
Bi-207	Not required	None	None	5.88E+06 (3.1E+05)	In the 2005 SA, Bi-207 is listed as a potential radionuclide in the SRS high-level waste. However, as discussed in Reference 33, the amount of Bi-207 generated by various reactions in SRS waste is very small. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Bi-207.	<< SA Conc. [Ref. 33]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Ra-226 (α)	7.97E+03	None	None	7.97E+03 (4.2E+02)	In the 2005 SA, Ra-226 is listed as a potential radionuclide in the SRS high-level waste. The WAC TARGET is set to a value equal to the 2005 SA curie concentration target of 7.97E+03 pCi/mL [Ref. 25].	2.49E+01 [Ref. 26]
Ra-228	Not required	None	None	7.02E+09 (3.7E+08)	In the 2005 SA, Ra-228 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Ra-228 to be sent to Saltstone (1.04E-01 Ci) [Ref. 26] is well below the 2005 SA total curie limit (3.7E+08 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Ra-228.	4.36E-04 [Ref. 26]
Ac-227	Not required	None	None	1.67E+09 (8.8E+07)	In the 2005 SA, Ac-227 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Ac-227 to be sent to Saltstone (1.91E-05 Ci) [Ref. 26] is well below the 2005 SA total curie limit (8.8E+07 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Ac-227.	8.32E-05 [Ref. 26]
Th-228 (α)	Not required	None	None	3.61E+20 (1.9E+19)	In the 2005 SA, Th-228 is listed as a potential radionuclide in the SRS high-level waste. Based on decay chains, it is estimated there is 3.55E+00 Ci of Th-228 in the Tank Farm [Ref. 33], which is significantly below the 2005 SA total curie limit (1.9E+19 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Th-228.	<< SA Conc. [Ref. 33]
Th-229 (α)	1.63E+05	None	None	1.63E+05 (8.6E+03)	In the 2005 SA, Th-229 is listed as a potential radionuclide in the SRS high-level waste. The WAC TARGET is set to a value equal to the 2005 SA curie concentration target of 1.63E+05 pCi/mL [Ref. 25].	3.22E-01 [Ref. 26]
Th-230 (α)	6.26E+03	None	None	6.26E+03 (3.3E+02)	In the 2005 SA, Th-230 is listed as a potential radionuclide in the SRS high-level waste. The WAC TARGET is set to a value equal to the 2005 SA curie concentration target of 6.26E+03 pCi/mL [Ref. 25].	1.02E-01 [Ref. 26]
Th-232 (α)	2.88E+03	None	3.20E+03	3.04E+03 (1.6E+02)	In the 2005 SA, Th-232 is listed as a potential radionuclide in the SRS high-level waste. The DSA source term for Th-232 is set at a maximum assumed value of 3.20E+03 pCi/mL. The WAC TARGET is set to a value equal to 90% of the DSA value.	4.36E-04 [Ref. 26]
Pa-231 (α)	Not required	None	None	4.18E+05 (2.2E+04)	In the 2005 SA, Pa-231 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Pa-231 to be sent to Saltstone (5.32E-05 Ci) [Ref. 26] is well below the 2005 SA total curie limit (2.2E+04 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Pa-231.	2.31E-04 [Ref. 26]
U-232 (α)	1.71E+05	None	None	1.71E+05 (9.0E+03)	In the 2005 SA, U-232 is listed as a potential radionuclide in the SRS high-level waste. The WAC TARGET is set to the 2005 SA curie concentration target of 1.71E+05 pCi/mL [Ref. 25].	8.66E-03 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	WAC LIMIT/TARGET pCi/mL	Permit Max. Concentration pCi/mL (nCi/g)	DSA Rev 6 Source Term pCi/mL	SA 10,000 yr Mean Target pCi/mL (Vault Limit in Ci)	Basis	DDA Max. Expected Concentration pCi/mL
U-233 (α)	1.13E+04	None	1.25E+04	2.66E+05 (1.4E+04)	The DSA source term is set at a maximum assumed value of 1.25E+04 (10 nCi/g) to protect the NCSE [Ref. 23]. The WAC LIMIT is set to a value equal to 90% of the DSA value.	1.13E+02 [Ref. 26]
U-234 (α)	1.13E+04	None	1.25E+04	8.54E+04 (4.5E+03)	The DSA source term is set at a maximum assumed value of 1.25E+04 (10 nCi/g). The WAC TARGET is set to a value equal to 90% of the DSA value.	3.70E+02 [Ref. 26]
U-235 (α)	1.13E+02	None	1.25E+02	1.90E+06 (1.0E+05)	The DSA source term is set at a maximum assumed value of 1.25E+02 (0.1 nCi/g) to protect the NCSE [Ref. 23]. The WAC LIMIT is set to a value equal to 90% of the DSA value.	3.65E-01 [Ref. 26]
U-236 (α)	1.13E+04	None	1.25E+04	6.07E+09 (3.2E+08)	The DSA source term is set at a maximum assumed value of 1.25E+04 (10 nCi/g). The WAC TARGET is set to a value equal to 90% of the DSA value.	1.25E+01 [Ref. 26]
U-238 (α)	1.13E+04	None	1.25E+04	1.25E+06 (6.6E+04)	The DSA source term is set at a maximum assumed value of 1.25E+04 pCi/mL (10 nCi/g). The WAC TARGET is set to a value equal to 90% of the DSA value.	3.83E+00 [Ref. 26]
Np-237 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	Bounded by Pu-239	1.27E+06 (6.7E+04)	The dose contribution due to Np-237 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Np-237 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	3.01E+01 [Ref. 26]
Pu-238 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	Bounded by Pu-239	2.47E+08 (1.3E+07)	The dose contribution due to Pu-238 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Pu-238 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	2.13E+05 [Ref. 26]
Pu-239 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	2.66E+05	2.66E+11 (1.4E+10)	The DSA source term for Pu-239 is set equal to 2.66E+05 pCi/mL (213 nCi/g, the NRC Class C limit for total alpha) in order to bound the consequences of all transuranic alpha emitters. This value also protects the NCSE. Pu-239 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	2.64E+03 [Ref. 26]
Pu-240 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	Bounded by Pu-239	5.69E+13 (3.0E+12)	The dose contribution due to Pu-240 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Pu-240 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	6.08E+02 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Pu-241 NRC Class A = 9.31E+05 NRC Class C = 9.31E+06	8.38E+05 and IDP WAC LIMIT	9.31E+05 (745)	9.31E+05	1.90E+11 (1.0E+10)	The permit max. concentration and DSA source term for Pu-241 are set equal to the NRC Class A landfill limit of 9.31E+05 pCi/mL (745 nCi/g). This Pu-241 concentration is assumed in the NCSE [Ref. 23] as well as in the IDP calculation [Ref. 9], where Pu-241 is a significant contributor. The WAC LIMIT is set to a value equal to 90% of the DSA value to protect these bases.	1.40E+04 [Ref. 26]
Pu-242 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	Bounded by Pu-239	9.30E+11 (4.9E+10)	The dose contribution due to Pu-242 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Pu-242 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	1.17E-01 [Ref. 26]
Pu-244 (α) ($t_{1/2}$ > 5 yr)	7.02E+04	None	None	7.02E+04 (3.7E+03)	In the 2005 SA, Pu-244 is listed as a potential radionuclide in the SRS high-level waste. The WAC TARGET is set to a value equal to the 2005 SA curie concentration target of 7.02E+04 pCi/mL [Ref. 25].	1.22E-03 [Ref. 26]
Am-241 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	Bounded by Pu-239	6.45E+09 (3.4E+08)	The dose contribution due to Am-241 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Am-241 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	5.97E+02 [Ref. 26]
Am-242m	3.68E-01	5.00E+05 (400)	None	1.86E+08 (9.8E+06)	In the 2005 SA, Am-242m is listed as a potential radionuclide in the SRS high-level waste. The permit max. concentration is set at a maximum assumed value of 5.00E+05 pCi/mL (400 nCi/g). The WAC TARGET is set to a value equal to 90% of the DDA maximum expected concentration value, which is the concentration assumed in the Saltstone Facility Hazard Categorization. Am-242m is not a significant contributor to gamma shielding or IDP [Ref. 9].	4.09E-01 [Ref. 26]
Am-243 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	None	Bounded by Pu-239	5.69E+06 (3.0E+05)	The dose contribution due to Am-243 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Am-243 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The WAC TARGET is set at a value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	2.69E-01 [Ref. 26]
Cm-242 (α) NRC Class A = 5.32E+06 NRC Class C = 5.32E+07	1.13E+04	5.00E+05 (400)	1.25E+04	4.75E+10 (2.5E+09)	The DSA source term is set at a maximum assumed value of 1.25E+04 pCi/mL (10 nCi/g). The permit max. concentration for Cm-242 is set equal to approximately 10% of the NRC Class A landfill limit of 5.32E+06 pCi/mL. The WAC TARGET is set to a value equal to 90% of the DSA value.	3.41E-01 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Cm-243 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	1.33E+11 (7.0E+09)	In the 2005 SA, Cm-243 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Cm-243 to be sent to Saltstone (2.67E-02 Ci) [Ref. 26] is well below the 2005 SA total curie limit (7.0E+09 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cm-243.	1.58E-01 [Ref. 26]
Cm-244 (α) ($t_{1/2}$ > 5 yr)	IDP WAC LIMIT (TARGET = 2.50E+05)	2.50E+05 (200)	Bounded by Pu-239	2.09E+16 (1.1E+15)	The dose contribution due to Cm-244 in the DSA accident analysis is bounded by setting the [Pu-239] at 2.66E+05 pCi/mL (213 nCi/g). Cm-244 concentration is bounded by the total alpha term in the IDP WAC LIMIT. The permit max. concentration and the WAC TARGET are set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha.	2.37E+02 [Ref. 26]
Cm-245 (α) ($t_{1/2}$ > 5 yr)	2.25E+05	2.50E+05 (200)	None	1.59E+08 (8.4E+06)	In the 2005 SA, Cm-245 is listed as a potential radionuclide in the SRS high-level waste. The permit max. concentration is set at a maximum assumed value of 2.50E+05 pCi/mL (200 nCi/g), which is 94% of the NRC Class C limit for total alpha. The WAC TARGET is set at a value equal to 90% of the permit max concentration. Cm-245 is not a significant contributor to gamma shielding or IDP [Ref. 9].	2.34E-02 [Ref. 26]
Cm-246 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	1.58E+14 (8.3E+12)	In the 2005 SA, Cm-246 is listed as a potential radionuclide in the SRS high-level waste. Based on irradiated reactor assembly data, it is estimated there is 1.29E-02 Ci of Cm-246 in the Tank Farm [Ref. 33], which is significantly below the 2005 SA total curie limit (8.3E+12 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cm-246.	<< SA Conc. [Ref. 33]
Cm-247 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	4.75E+05 (2.5E+04)	In the 2005 SA, Cm-247 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Cm-247 to be sent to Saltstone (5.15E-12 Ci) [Ref. 26] is well below the 2005 SA total curie limit (2.5E+04 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cm-247.	3.04E-11 [Ref. 26]
Cm-248 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	8.73E+08 (4.6E+07)	In the 2005 SA, Cm-248 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Cm-248 to be sent to Saltstone (5.36E-12 Ci) [Ref. 26] is well below the 2005 SA total curie limit (4.6E+07 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cm-248.	3.17E-11 [Ref. 26]
Bk-249	Not required	None	None	9.30E+08 (4.9E+07)	In the 2005 SA, Bk-249 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Bk-249 to be sent to Saltstone (6.31E-19 Ci) [Ref. 26] is well below the 2005 SA total curie limit (4.9E+07 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Bk-249.	2.32E-18 [Ref. 26]

Radionuclide NRC Limits in pCi/mL	**WAC LIMIT/TARGET** **pCi/mL**	**Permit Max. Concentration pCi/mL (nCi/g)**	**DSA Rev 6 Source Term** **pCi/mL**	**SA 10,000 yr Mean Target pCi/mL** **(Vault Limit in Ci)**	**Basis**	**DDA Max. Expected Concentration pCi/mL**
Cf-249 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	2.47E+06 (1.3E+05)	In the 2005 SA, Cm-249 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Cm-249 to be sent to Saltstone (4.79E-11 Ci) [Ref. 26] is well below the 2005 SA total curie limit (1.3E+05 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cm-249.	1.76E-10 [Ref. 26]
Cf-250 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	5.88E+16 (3.1E+15)	In the 2005 SA, Cf-250 is listed as a potential radionuclide in the SRS high-level waste. Based on irradiated reactor assembly data, it is estimated there is 8.01E-07 Ci of Cf-250 in the Tank Farm [Ref. 33], which is significantly below the 2005 SA total curie limit (3.1E+15 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cf-250.	<< SA Conc. [Ref. 33]
Cf-251 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	3.42E+07 (1.8E+06)	In the 2005 SA, Cf-251 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Cf-251 to be sent to Saltstone (1.64E-12 Ci) [Ref. 26] is well below the 2005 SA total curie limit (1.8E+06 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cf-251.	6.02E-12 [Ref. 26]
Cf-252 (α) ($t_{1/2}$ > 5 yr)	Not required	None	None	1.20E+14 (6.3E+12)	In the 2005 SA, Cf-252 is listed as a potential radionuclide in the SRS high-level waste. Analytical data/process knowledge shows that the total activity of Cf-252 to be sent to Saltstone (5.32E-14 Ci) [Ref. 26] is well below the 2005 SA total curie limit (6.3E+12 Ci) [Ref. 25]. Therefore, there are no DSA, permit or WAC LIMITS/TARGETS for Cf-252.	1.95E-13 [Ref. 26]
Total Alpha Emitters ($t_{1/2}$ > 5 yr) NRC Class A = 2.66E+04 NRC Class C = 2.66E+05 (NRC Limits apply to TRU total alpha)	2.50E+05	2.66E+05 (213)	None	None	The permit max. concentration is set at a value of 213 nCi/g. This value is equal to 100% of the NRC Class C limit. The WAC LIMIT is set to a value equal to 94% of the permit max. concentration. The total alpha WAC LIMIT protects the assumed Pu-239 concentration in the NCSE [Ref. 23] as well as assumptions in the DSA accident analyses that the total transuranic alpha-emitter concentration in the salt solution is $\leq$213 nCi/g.	N/A

Comparison of Chemical Concentrations for Saltstone

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Solvated Ions				
Aluminate [$Al(OH)_4^-$]	Bounded by Aluminum	6.62E+05	6.62E+05	The permit maximum concentration and the DSA bounding concentration are a factor of 2.0 greater than the maximum-recorded value in the Tank 29 saltcake. No specific WAC LIMIT is set because the aluminate conc. is bounded by the WAC LIMIT for aluminum. The Tank Farm DSA value of 1.90E+05 mg/L was not selected because it was too restrictive.
Ammonium [NH_4^+]	2.12E+02	None	9.50E+03	The DSA bounding concentration is a factor of 5.0 greater than the maximum-recorded WCS value. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no maximum permit concentration is specified. The WAC LIMIT for accident chemical consequence is set at 7.13E+03 mg/L (see Attachment 8.1). However, there is a more restrictive WAC LIMIT to protect vault flammability of 2.12E+02 mg/L (see Table 3).
Carbonate [CO_3^{2-}]	1.45E+05	1.93E+05	1.93E+05	The permit maximum concentration and the DSA bounding concentration are a factor of 3.0 greater than the maximum-recorded value in the Tank 29 saltcake. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 9.00E+04 mg/L was not selected because it was too restrictive.
Chloride [Cl^-]	9.68E+03	1.29E+04	1.29E+04	The permit maximum concentration and the DSA bounding concentration are a factor of 3.0 greater than the maximum-recorded value in the Tank 29 saltcake. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 1.06E+04 mg/L was not selected because it was too restrictive.
Formate [$HCOO^-$]	Not required	None	1.00E+04	The DSA bounding concentration is a factor of 5.0 greater than a maximum assumed concentration of 2000 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Fluoride [F^-]	4.94E+03	6.58E+03	6.58E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 5.0 greater than the maximum-recorded WCS value. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 1.90E+03 mg/L was not selected because it was too restrictive.
Hydroxide [OH^-]	1.91E+05	2.55E+05	2.55E+05	The DSA bounding concentration and the permit maximum concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration.

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Solvated Ions (cont.)				
Nitrate [NO_3^-]	5.29E+05	7.05E+05	7.05E+05	The permit maximum concentration and the DSA bounding concentration are a factor of 3.0 greater than the maximum-recorded WCS value. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 5.27E+05 mg/L was not selected because it was too restrictive.
Nitrite [NO_2^-]	2.59E+05	3.45E+05	3.45E+05	The permit maximum concentration and the DSA bounding concentration are a factor of 3.0 greater than the maximum-recorded value in Tank 2 supernate. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 2.30E+05 mg/L was not selected because it was too restrictive.
Oxalate [$C_2O_4^{2-}$]	3.30E+04	None	4.40E+04	The DSA bounding concentration is set equal to the value selected for the Tank Farm DSA. There is no established ground-water standard and its concentration is expected to be well below 0.5M so no maximum permit concentration is specified. The WAC LIMIT is set at 75% of the DSA value.
Phosphate [PO_4^{3-}]	3.56E+04	None	4.75E+04	The DSA bounding concentration is set equal to the value selected for the Tank Farm DSA. There is no established ground-water standard and its concentration is expected to be well below 0.5M so no maximum permit concentration is specified. The WAC LIMIT is set at 75% of the DSA value.
Sulfate [SO_4^{2-}]	6.89E+04	9.19E+04	9.19E+04	The permit maximum concentration and the DSA bounding concentration are a factor of 3.0 greater than the maximum-recorded WCS value. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 4.80E+04 mg/L was not selected because it was too restrictive.
RCRA Hazardous Metals				
Arsenic [As]	7.50E+02	1.00E+03	1.00E+03	The permit maximum concentration and the DSA bounding concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value.
Barium [Ba]	7.50E+02	1.00E+03	1.00E+03	The permit maximum concentration and the DSA bounding concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value.

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
RCRA Hazardous Metals (cont.)				
Cadmium [Cd]	3.75E+02	5.00E+02	5.00E+02	Based on experimental data (DPST-89-314), in order for the saltstone to pass TCLP, the maximum allowed cadmium concentration in the salt solution is 500 mg/L. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value. The Tank Farm DSA value of 3.00E+02 mg/L was not selected because it was too restrictive.
Chromium [Cr]	1.50E+03	2.00E+03	2.00E+03	The permit maximum concentration and the DSA bounding concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value.
Lead [Pb]	7.50E+02	1.00E+03	1.00E+03	The permit maximum concentration and the DSA bounding concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value.
Mercury [Hg]	3.25E+02	5.00E+02	5.00E+02	The permit maximum concentration and the DSA bounding concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equivalent to the LDR limit of 260 mg/kg.
Selenium [Se]	4.50E+02	5.00E+02	1.00E+03	The DSA bounding concentration is set equal to the value selected for the Tank Farm DSA. Based upon experimental data (DPST-89-314), the selenium concentration must be < 600 mg/L in order for the grout to pass TCLP. The permit maximum concentration is set at 500 mg/L to protect this value. The WAC LIMIT is set to a value equal to 90% of the permit max. concentration.
Silver [Ag]	7.50E+02	1.00E+03	1.00E+03	The permit maximum concentration and the DSA bounding concentration are set equal to the value selected for the Tank Farm DSA. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value.
Other Metals				
Aluminum [Al]	1.41E+05	1.88E+05	1.88E+05	The permit maximum concentration and DSA bounding concentration are a factor of 2.0 greater than the maximum-recorded value in the Tank 29 saltcake. The WAC LIMIT is set to a value equal to 75% of the permit max. concentration and DSA value.

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Other Metals (cont.)				
Boron [B]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Calcium [Ca]	Not required	None	3.68E+03	The DSA bounding concentration is a factor of 5.0 greater than the maximum-recorded WCS value. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Cerium [Ce]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Cesium [Cs]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Cobalt [Co]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Copper [Cu]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Iron [Fe]	6.00E+03	8.00E+03	8.00E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than a maximum assumed concentration of 2000 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Potassium [K]	3.67E+04	None	4.89E+04	The DSA bounding concentration is a factor of 5.0 greater than the maximum-recorded value in Tank 2 supernate. The WAC TARGET is set to a value equal to 75% of the DSA value.
Lithium [Li]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Other Metals (cont.)				
Magnesium [Mg]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Manganese [Mn]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Molybdenum [Mo]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Neodymium [Nd]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Nickel [Ni]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Ruthenium [Ru]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Silicon [Si]	1.29E+04	None	1.72E+04	The DSA bounding concentration is a factor of 5.0 greater than the maximum-recorded WCS value. The WAC TARGET is set to a value equal to 75% of the DSA value.
Sodium [Na]	Processability WAC LIMIT 2.5M<[Na]<7.0M	4.56E+05	4.56E+05	In order to meet saltstone processability restraints, the maximum sodium WAC LIMIT is set at 7.0 moles/L, while the minimum sodium WAC LIMIT is set at 2.5 moles/L. The permit maximum concentration and DSA bounding concentration are a factor of 3.0 greater than the maximum-expected value.
Strontium [Sr]	9.00E+02	1.20E+03	1.20E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum assumed concentration of 300 mg/L. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.

Chemical Name	WAC LIMIT /TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Other Metals (cont.)				
Titanium [Ti]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Zinc [Zn]	9.75E+02	1.30E+03	1.30E+03	The permit maximum concentration and the DSA bounding concentration are a factor of 4.0 greater than the maximum recorded WCS value. The WAC TARGET is set to a value equal to 75% of the permit max. concentration and the DSA value.
Zirconium [Zr]	Not required	None	1.20E+03	The DSA bounding concentration is a factor of 4.0 greater than a maximum assumed concentration of 300 mg/L. There is no established ground-water standard and its concentration is expected to be well below 0.5M, so no waste acceptance criterion or maximum permit concentration is specified.
Suspended Hydrated-Sludge Solids				
Aluminum hydroxide [$Al(OH)_3$]	Not required	None	1.93E+04	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Barium sulfate [$BaSO_4$]	Not required	None	1.59E+02	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Chromium (III) hydroxide [$Cr(OH)_3$]	Not required	None	1.59E+02	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Iron (III) hydroxide [$Fe(OH)_3$]	Not required	None	2.06E+04	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Lead carbonate [$PbCO_3$]	Not required	None	1.59E+02	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Lead sulfate [$PbSO_4$]	Not required	None	3.19E+02	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Suspended Hydrated-Sludge Solids (cont.)				
Manganese dioxide [MnO_2]	Not required	None	1.08E+04	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Mercuric oxide [HgO]	Not required	None	2.07E+03	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Nickel hydroxide [$Ni(OH)_2$]	Not required	None	5.26E+03	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Silicon dioxide [SiO_2]	Not required	None	3.19E+03	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Silver (I) hydroxide [AgOH]	Not required	None	1.59E+02	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Uranyl hydroxide [$UO_2(OH)_2$]	Not required	None	3.19E+02	The DSA bounding concentration is equal to the value selected for the Tank Farm DSA times a factor of 1.59. There is no permit maximum concentration or waste acceptance criterion.
Total Insoluble Solids	1.88E+05 (15 wt%)	1.88E+05 (15 wt%)	None	The permit maximum concentration and the WAC LIMIT were selected based upon the design capacity of the SFT agitator and operational experience.
Organic Compounds				
Benzene [C_6H_6]	3.75E+02	None	5.00E+02	The DSA benzene concentration was set at 500 mg/L to bound the chemical consequences in the accident analysis. The source of benzene is from the decomposition of TPB. The WAC TARGET is set to a value equal to 75% of the DSA value.
Butanol & Isobutanol [C_4H_9OH]	"Other Organics" Contrib. to Vault Flammability WAC LIMIT (Butanol TARGET = 7.5E-01)	None	3.00E+03	The DSA concentration reflects the original bounding concentration in the Saltstone JCO. The WAC LIMIT for accident chemical consequence is set at 2.25E+03 mg/L (Attachment 8.1). However, there is a more restrictive WAC TARGET for butanol to protect vault flammability of 7.5E-01 mg/L (see Table 4).

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Organic Compounds (cont.)				
Isopropanol [C_3H_7OH]	"Other Organics" Contrib. to Vault Flammability WAC LIMIT (TARGET = 2.5E-01)	None	3.00E+03	The DSA concentration reflects the original bounding concentration in the Saltstone JCO. The WAC LIMIT for accident chemical consequence is set at 2.25E+03 mg/L (Attachment 8.1). However, there is a more restrictive WAC TARGET to protect vault flammability of 2.5E-01 mg/L (see Table 4).
Methanol [CH_3OH]	"Other Organics" Contrib. to Vault Flammability WAC LIMIT (TARGET = 2.5E-01)	None	3.00E+02	The DSA concentration reflects the original bounding concentration in the Saltstone JCO. The WAC TARGET for accident chemical consequence is set at 2.25E+02 mg/L (Attachment 8.2). However, there is a more restrictive WAC TARGET to protect vault flammability of 2.5E-01 mg/L (see Table 4).
Phenol [C_6H_5OH]	7.50E+02	None	1.00E+03	The DSA concentration reflects the original bounding concentration in the Saltstone JCO. Experience has shown that this value adequately bounds the organic concentration in the salt solution. The WAC LIMIT is set to a value equal to 75% of the DSA value.
Tetraphenylborate [$B(C_6H_5)_4^-$]	4.24E+00 kg total mass and 5.00E+00 mg/L	7.00E+02	1.00E+03	The 1000 mg/L DSA value reflects the original bounding concentration in the Saltstone JCO. The permit maximum concentration is set to a value equal to 70% of the DSA value. The WAC LIMIT for accident chemical consequence is set at 7.50E+02 mg/L (Attachment 8.1). In order to protect assumptions associated with flammable gas accumulation in Vault 4, there is a mass WAC LIMIT of 4.24 kg on the total mass of TPB to be disposed of in Vault 4 (see Table 3). Additionally, the facility has set a maximum WAC LIMIT on the concentration of TPB in the waste feed stream to the TPB detection limit (5.0 mg/L).
Toluene [$C_6H_5CH_3$]	3.75E+02	None	5.00E+02	A bounding DSA value of 500 mg/L was selected to equal the bounding concentration selected for benzene. There is no permit maximum concentration. The WAC TARGET is set to a value equal to 75% of the DSA value.
Tributylphosphate [$(C_4H_9O)_3PO$]	"Other Organics" Contrib. to Vault Flammability WAC LIMIT (TARGET = 1.0E+00)	None	4.00E+02	The DSA concentration reflects the original bounding concentration in the Saltstone JCO. The WAC TARGET for accident chemical consequence is set at 3.00E+02 mg/L (Attachment 8.2). However, there is a more restrictive WAC TARGET to protect vault flammability of 1.0E+00 mg/L (see Table 4).

Chemical Name	WAC LIMIT/TARGET (mg/L)	Permit Max. Concentration (mg/L)	DSA Rev 6 Bounding Concentration (mg/L)	Basis
Organic Compounds (cont.)				
EDTA	3.75E+02	None	5.00E+02	The DSA concentration reflects the original bounding concentration in the Saltstone JCO. Experience has shown that this value adequately bounds the organic concentration in the salt solution. There is no permit maximum concentration. The WAC TARGET is set to a value equal to 75% of the DSA value.
Total Organic Carbon (minus formate & oxalate)	5.00E+03	6.00E+03	None	The permit maximum concentration (6.00E+03 mg/L) was selected based upon operational experience and discussions with SRNL personnel. The WAC LIMIT is set to a value equal to 83% of the permit max. concentration.
Isopar L	1.10E+01 ppm (not mg/L)	None	2.00E+02 ppm (not mg/L)	The Saltstone DSA concentration reflects the value assumed in the Tank Farm DSA for MCU operations (Isopar L carry-over). There is no permit max concentration. The WAC LIMIT for accident chemical consequence is set at 1.50E+02 ppm (Attachment 8.1). However, there is a more restrictive WAC LIMIT to protect vault flammability of 1.1E+01 ppm (see Table 3).
NORPAR 13	"Other Organics" Contrib. to Vault Flammability WAC LIMIT (TARGET = 1.0E-01)	None	None	There are no DSA (related to accident chemical consequence) or permit maximum concentrations. However, NORPAR 13 has been identified as a volatile organic that could impact vault flammability and therefore a WAC TARGET of 0.1 mg/L has been established (see Table 4).