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**REQUIREMENTS FOR DISCHARGE FROM NON TANK FARM
WASTE GENERATORS INTO THE DST SYS**

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CH2M HILL DOCUMENT CHANGE REQUEST FORM
(Direct Revision Only)

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Document Title	Requirements for Discharge from Non-Tank Farm Waste Generators into the Double-Shell Tank System				
Change Description	This revision removes the requirement for submittal of criticality data sheets (CDS) and operational parameter sheets (AOP), and removes hyperlink to Part A Permit Application. Document references have also been updated.				
Change Justification	CDS forms are no longer necessary for discharges into the DST system because verification of adherence with criticality safety limits and controls is now incorporated into the Compatibility Program and is formally documented in a Waste Compatibility Assessment. AOP forms are no longer necessary because analytical data are now required for each waste discharge from a non-Tank Farms waste generator. Hyperlinke no longer worked so it was removed, however, reference to information remians. Reference updates reflect current versions of source documents that were revised since the last revision of this document.				

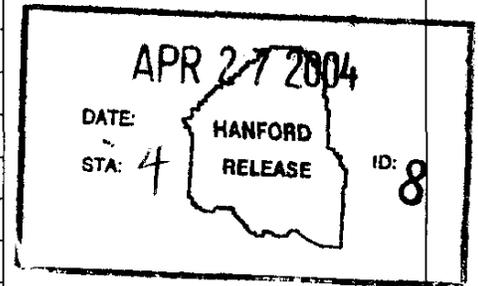
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REQUIREMENTS FOR DISCHARGE FROM NON-TANK FARM WASTE GENERATORS INTO THE DOUBLE-SHELL TANK SYSTEM

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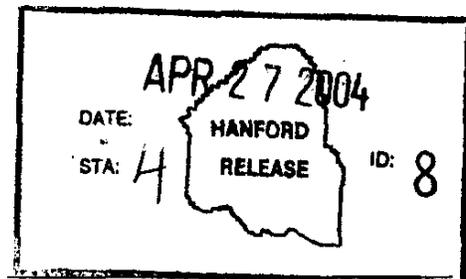
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**REQUIREMENTS FOR DISCHARGE FROM NON-TANK FARM
WASTE GENERATORS INTO THE DOUBLE-SHELL TANK
SYSTEM**

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**APPENDIX A: REQUIRED ANALYTES AND MDLS FOR DISCHARGE TO THE DST
SYSTEM**

LIST OF ACRONYMS

CH2M HILL	CH2M HILL Hanford Group, Inc.
Ci/L	curies per liter
CSR	Criticality Safety Representative
DCRT	double-contained receiver tank
DQO	Data Quality Objectives
DST	double-shell tank
ESA	Environmental Support and Assessment Organization
GEA	gamma energy analysis
g/l	grams per liter
ICD	interface control document
LCS	laboratory control standard
M	molarity (moles per liter)
MDL	method detection limit
N/A	not applicable
NCS	Nuclear Criticality Safety
ORP	U.S. Department of Energy, Office of River Protection
PCB	polychlorinated biphenyl
ppb	parts per billion
ppm	parts per million
Pu-eq	plutonium equivalent
PWTE	Process/Waste Transfer Engineering Organization
QA	quality assurance
QC	quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SpG	specific gravity
SST	single-shell tank
TF	Tank Farms
TFC	Tank Farm Contractor
TIC	total inorganic carbon
TOC	total organic carbon
TRU	transuranic
TSCA	Toxic Substances Control Act
WAP	Waste Analysis Plan
WSPS	Waste Stream Profile Sheet (form)

1.0 INTRODUCTION

1.1 Purpose

At the request of several Hanford Site organizations, this supporting document has been written to provide a compilation of requirements for waste discharges into the double-shell tank (DST) system from non-Tank Farms facility (non-TF) waste generators. Discharges into the DST system include transfers directly into DSTs, and into double-contained receiver tanks (DCRTs). Waste transfers through the 204-AR Waste Unloading Facility are not authorized at this time.

This document incorporates Tank Farms (TF) requirements for non-TF waste generators from several governing documents including the DST Waste Analysis Plan (WAP), Compatibility Program Document, Data Quality Objectives (DQOs) and Interface Control Documents (ICDs). These requirements have been established to ensure that sufficient information about potential waste discharges into the DST system is available to adequately address TF Administrative Controls, Safety, Regulatory, Programmatic and Operational issues.

As requirements for waste discharges into the DST system change, this document will be updated to reflect those changes. However, wastes entering the DST system will be subject to the acceptance criteria in place at the time of the waste receipt.

1.2 Scope

The scope of this document is limited to TF requirements for non-TF waste generators associated with waste sampling, analysis and treatment. It does not include requirements associated with transfer scheduling, transfer route logistics or requirements associated with operation of associated transfer equipment (e.g., pumps, transfer lines, ventilation systems, etc.)

The requirements stated in this document help to ensure that information provided to the Tank Farm Contractor (TFC) is adequate for use in determining whether a non-TF waste generator waste stream is acceptable for discharge into the DST system. These requirements are neither intended to nor sufficient to give approval for acceptance of non-TF waste streams into the DST system. Determination whether a waste stream may be accepted for discharge into the DST system is made based on the results of a Compatibility Assessment, performed by Process/Waste Transfer Engineering (PWTE) using information provided by waste generators.

2.0 WASTE SAMPLING REQUIREMENTS

The TFC may request to observe directly, or have an independent party observe, the sampling of wastes intended for discharge into the DST system. For that purpose, the TFC must be notified at least five business days prior to a sampling event in order to assure appropriate scheduling and facility access requirements can be met.

The following waste sampling requirements must be completed prior to transfer. However, it is not necessary that all requirements be completed in the order listed.

1. At least 30 days prior to sampling, submit a Waste Sampling and Analysis Plan (SAP), or equivalent documentation to PWTE and to Environmental Support and Assessment (ESA) for approval. Changes to the SAP (or equivalent document) must be submitted to PWTE and ESA least 15 days prior to the effective date of the change.
2. The Waste Feed Engineering Organization must be notified at least five business days prior to sampling to allow adequate time to arrange for observation of the sampling event if necessary.
3. A minimum of two independent samples must be collected and maintained as independent samples for analysis. At least one of the samples must be of sufficient volume to allow for quality assurance (QA) and quality control (QC) analyses performed (i.e., laboratory control samples, spikes and duplicates).
4. Samples must be representative of the waste to be transferred into the DST system. In some cases it is acceptable, with prior approval, for non-TF waste generators to sample and analyze a waste stream and then to treat the waste, as necessary, to meet TF discharge criteria based on results of the initial analysis. Sampling and limited analysis and/or calculated concentrations of the post-treatment waste may be required for verification in accordance with the PWTE and ESA approved SAP.

3.0 WASTE ANALYSIS REQUIREMENTS

Waste stream verification data must be generated in accordance with the following waste analysis requirements prior to transfer. Submittal of waste stream verification data is discussed in Section 4.0 of this document.

Quality control acceptance criteria are listed in Table 3-1.

1. Laboratories performing analyses required for discharge into the DST system must maintain a QA Plan. The plan must meet the *Hanford Analytical Services Quality Assurance Requirements Documents* (DOE-RL 1998) baseline requirements for laboratory quality systems.
2. A minimum of two samples (or sample sets) must be collected and analyzed as independent samples for each required analyte. At least one set of sample analyses must include QA and QC analyses (i.e., laboratory control samples, spikes and duplicates).
3. If specified QA/QC requirements for analytical data listed in Table 3-1 are not met, the data will be evaluated on a case-by-case basis by PWTE to determine if it is adequate for use in determining waste compatibility.
4. As a minimum, analytes must include all those listed in Appendix A for each waste phase. Analytes noted as "liquid only" or "solid only" are required only for the specified phase analyzed. The analytes listed in Appendix A will allow for evaluation of each of the compatibility decision rules for waste transfer.

All analytes must be included unless permission to omit a specific analyte(s) is granted, in writing, from PWTE.

5. Method detection limits (MDLs) must be sufficiently low to allow compliance with compatibility decision rules to be determined. MDLs listed in Appendix A are based on analyte action levels.

If it is not possible to meet the listed MDL for an analyte, the data may still be acceptable for use in determining compliance with decision rules. Determination will be made by PWTE based on the reason(s) the MDL was not met and how close the values are to action levels.

For analytes that have no method detection limit listed, the lowest practical detection limit achievable for the waste matrix should be used. Specific detection limits for each analyte shall be specified in the approved SAP.

6. If the waste contains ≥ 1 % solids by weight, separate analyses for analytes identified in Appendix A as "solid only" are required for the solid phase of the waste. See Appendix A for list of required analyses.
7. If the waste contains ≥ 10 % by volume settled solids, separate analyses for all analytes are required for each phase (liquid and solid). See Appendix A for list of required analyses.

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8. If the waste contains ≥ 5 % by volume settled solids **OR** if the specific gravity of the waste is > 1.35 , additional information about the waste stream may be required for evaluation of the potential to plug waste transfer lines. See Appendix A for list of required analyses.
9. If the waste contains ≥ 0.5 % solids by weight, separate polychlorinated biphenyl (PCB) analyses are required for the solid phase in addition to the PCB analyses for the liquid phase.
10. The detection limits for total PCB or specific Aroclors shall be as low as reasonably possible, but must be ≤ 5 ppm for solids and ≤ 20 ppb for liquids.

Table 3-1. Quality Control Parameters

Analytes	Quality Control Acceptance Criteria		
	LCS % Recovery ^(a)	Spike % Recovery ^(b)	Duplicate RPD ^(c)
Al, Cr, Fe, La, Mn, Ni, Na, Pb, Se, Zr	80 - 120	75 - 125	≤20%
Cl ⁻ , F ⁻ , NO ₃ ⁻ , NO ₂ ⁻ , PO ₄ ³⁻	80 - 120	75 - 125	≤20%
NH ₃	80 - 120	75 - 125	≤20%
⁹⁰ Sr, ⁹⁰ Y	80 - 120	N/A	≤20%
²⁴¹ Am, ^{239/240} Pu	80 - 120	N/A	≤20%
²³³ U, ²³⁵ U	80 - 120	75 - 125	≤20%
¹³⁷ Cs	80 - 120	75 - 125	≤20%
Total U	80 - 120	75 - 125	≤20%
TOC	80 - 120	75 - 125	≤20%
PCB ^(d)	70 - 130	50 - 150	<30%
Total Alpha	70 - 130	70 - 130	≤20%
OH ⁻	80 - 120	N/A	≤20%
SpG	80 - 120	N/A	≤20%
%H ₂ O	N/A	N/A	≤20%
H ⁺ (as pH)	± 0.1 pH unit	N/A	N/A
Energetics (DSC/TGA)	80 - 120	N/A	≤30%
Density	N/A	N/A	≤20%
Separable Organics	N/A	N/A	N/A

Notes:

N/A = Not Applicable

- (a) LCS = Laboratory Control Sample. This sample is carried through the entire method. The accuracy of a method is usually expressed as the percent recovery of the LCS. The LCS is a matrix with known concentration of analytes processed with each preparation and analyses batch. It is expressed as percent recovery; i.e., the amount measured, divided by the known concentration, times 100.
- (b) For some methods, the sample accuracy is expressed as the percent recovery of a matrix spike sample. It is expressed as percent recovery; i.e., the amount measured, less the amount in the sample, divided by the spike added, times 100. One matrix spike is performed per analytical batch. Samples are batched with similar matrices. For other analytes, the accuracy is determined based on use of serial dilutions.
- (c) RPD = Relative Percent Difference between the samples. Sample precision is estimated by analyzing duplicates taken separately through preparation and analysis. Instrument analysis duplicates cannot be substituted except gamma energy analysis (GEA), which requires no preparation. Acceptable sample precision is usually <20% RPD if the sample result is at least 10 times the instrument detection limit.

$$\text{RPD} = ((\text{absolute difference between primary and duplicate})/\text{mean}) \times 100$$

- (d) Analysis of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260 may be used to determine total PCBs.

4.0 DOCUMENTATION REQUIREMENTS

The following requirements must be completed prior to transfer. However, it is not necessary that all requirements be completed in the order listed.

1. To the extent possible, transmit annual waste volume projection to Flowsheet & Process Models Group for inclusion in The Single-Shell Tank Retrieval Sequence and Double-Shell Tank Space Evaluation (Kirch 2003).

Each year identified waste generators are sent a written request to submit the projected volumes of waste discharges to Tank Farms. Responses to this request are used to evaluate storage volume needs in the DST system. This pre-planning allows for waste generator support for waste discharges in light of scheduled Tank Farms projects and continuing operational activities.

2. If the proposed waste transfer is not included in the DST Space Evaluation, a written transfer request must be submitted to Waste Feed Engineering. The transfer request must include a description of the waste to be transferred (including process that generated the waste), the anticipated waste volume, associated process/flush water volumes needed to carry out the transfer, and anticipated date of transfer.

Note: Sampling requirements stated in section 2.0 of this document also apply.

3. A completed Waste Stream Profile Sheet (WSPS) is required for every waste stream discharged into the DST system. The WSPS form is maintained by PWTE and is accessible in the FORMS directory on \\AP016\HARMONY.

Note: Each WSPS expires within one year from the date of approval. The approval date of a WSPS is usually considered the issue date of the compatibility assessment based on that WSPS.

4. Waste stream verification data meeting the requirements specified in Section 3.0 of this document must be submitted to PWTE. PWTE shall compare the data to reported WSPS ranges to ensure the reported ranges for each analyte adequately bound the data.
5. Final versions of transfer requests, WSPSs and verification data must be submitted to PWTE at least **four (4) weeks** prior to the needed transfer date.

If the waste stream contains any waste that was not generated at the Hanford Site, final versions of transfer requests, WSPSs and verification data must be submitted to PWTE at least **six (6) months** prior to the needed transfer date.

6. Prior to transfer, a completed and signed WSPS Certification must be submitted to PWTE and ESA. The WSPS Certification form is maintained by PWTE and is accessible in the FORMS directory on \\AP016\HARMONY.

As resources allow, PWTE will support the review of draft submittals of generator supplied transfer documentation, however, it shall remain the responsibility of waste generators to ensure final transmittals of waste transfer documentation are complete and correct.

5.0 SPECIFIC WASTE STREAM CRITERIA

Waste streams from non-TF waste generators must meet the following requirements prior to discharge into the DST system.

1. The pH of the waste must be ≥ 8.0 .
2. The fissile material concentration in the waste must be < 0.04 g/l Pu-equivalent (Pu-eq). (See Knight 2004 for calculation)
3. For waste containing a fissile material concentration of more than 0.001 g/l Pu-eq, the sum of the subcritical mass fractions for insoluble neutron absorbers based on the minimum subcritical mass ratios listed in Table 5-1 shall be:
 - a. > 1 if the waste contains ≤ 50 grams Pu-eq
 - b. ≥ 2 if the waste contains > 50 grams Pu-eq

Table 5-1. Minimum Neutron Absorber/Pu-equivalent Subcritical Mass Ratios in Waste Discharges to the Tank Farms

Neutron Absorber (X)	Minimum Neutron Absorber/Pu-equivalent Subcritical Mass Ratio (X/Pu-eq)
Chromium (Cr)	135
Iron (Fe)	160
Manganese (Mn)	32
Nickel (Ni)	105

4. If any PCBs are detected in the waste, the waste must be classified as PCB remediation waste (40 CFR 761.3), analytical waste (40 CFR 761.64) or R&D waste (40 CFR 761.3), or documentation must be provided that the waste is not subject to Toxic Substances Control Act (TSCA) (40 CFR 761).
5. The waste must contain < 10 % by weight organic carbon.
6. The waste must meet the waste chemistry criteria specified in Table 5-2.

Table 5-2 Tank Farm Waste Chemistry Limits

[NO ₃] range	Variable	Temperature Range		
		T < 167 °F	167 °F ≤ T ≤ 212 °F	T > 212 °F
[NO ₃] ≤ 1.0 M	[OH]	0.010 M ≤ [OH] ≤ 8.0 M	0.010 M ≤ [OH] ≤ 5.0 M	0.010 M ≤ [OH] ≤ 4.0 M
	[NO ₂]	0.011 ≤ M [NO ₂] ≤ 5.5 M	0.011 ≤ M [NO ₂] ≤ 5.5 M	0.011 ≤ M [NO ₂] ≤ 5.5 M
	$\frac{[NO_3]}{([OH] + [NO_2])}$	< 2.5	< 2.5	< 2.5
1.0 M < [NO ₃] ≤ 3.0 M	[OH]	0.1 ([NO ₃]) ≤ [OH] < 10 M	0.1([NO ₃]) ≤ [OH] < 10 M	0.1([NO ₃]) ≤ [OH] > 4 M
	[OH] + [NO ₂]	≥ 0.4 ([NO ₃])	≥ 0.4 ([NO ₃])	≥ 0.4 ([NO ₃])
[NO ₃] > 3.0 M	[OH]	0.3 M ≤ [OH] < 10 M	0.3 M ≤ [OH] < 10 M	0.3 M ≤ [OH] < 4 M
	[OH] + [NO ₂]	≥ 1.2 M	≥ 1.2 M	≥ 1.2 M
	[NO ₃]	≤ 5.5 M	≤ 5.5 M	≤ 5.5 M

6.0 ADDITIONAL REQUIREMENTS

In addition to the requirements in Section 2.0 through Section 5.0 of this document, keep the following in mind.

1. Transfers to Tank Farms must be scheduled through the Waste Feed Operations Field Deployment Organization.

Waste entering the DST system **must not** contain any dangerous waste code that is not included in the DST system dangerous waste permit application (DOE 1999).

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APPENDIX A

Required Analytes and MDLs for Discharge to The DST System		
Analyte	Method Detection Limit (MDL)	Notes
$^{239/240}\text{Pu}$	0.0001g/l	
^{233}U	0.0001g/l	
^{235}U	0.0001g/l	
^{238}U	0.0001g/l	Optional credited absorber if fissile concentration > 0.001 g/l
Total U		
^{90}Sr		Y^{90} is assumed equal to Sr^{90} concentration
^{137}Cs		
^{241}Am		
PCBs (Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260)	≤ 5 ppm solid, and ≤ 20 ppb liquid	
NH_3	0.1 g/l	
Na	1 g/l	
TOC	1 g/l	
NO_2	0.05 g/l	
NO_3	0.1 g/l	
Al		
La		Solid only
Pb		Solid only
Se		Solid only
Zr		Solid only
SpG		
% H_2O		
% Solids (by volume)		
DSC		
Separable Organic		
OH	0.01 g/l	
pH	± 0.1 pH unit	
Total Alpha		
PO_4	0.1 g/l	
Cl		
F		Solid only
Cr		Required if fissile concentration > 0.001 g/l

Required Analytes and MDLs for Discharge to The DST System		
Analyte	Method Detection Limit (MDL)	Notes
Fe		Required if fissile concentration > 0.001 g/l
Ni		Required if fissile concentration > 0.001 g/l
Mn		Required if fissile concentration > 0.001 g/l
Caustic demand		As required for waste adjustment
Solids density		Solid only
Slurry density		May be required if waste contains $\geq 5\%$ by volume settled solids or if the specific gravity of the waste is > 1.35.
Flow rate		
Particle size mass distribution		
Solids settling velocity		
Particle diameter		
Viscosity		
Maximum temperature		

DISTRIBUTION SHEET

To Distribution	From Process/Waste Transfer Engineering	Page 1 of 1
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