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7. Abstract

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This document identifies the estimated composition of the gases in the vapor space of each of the 177 waste tanks located at Hanford. The estimated composition covers both existing and postulated future conditions. This document also identifies the regulatory limits of the identified vapors and the applicable regulation, assesses gas/vapor treatment technologies and recommends those most suitable.

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**TANK VAPOR MITIGATION REQUIREMENTS
FOR HANFORD TANK FARMS**

Prepared For:

**Westinghouse
Hanford Company**

Under Task 08 of the P.O No. MJB-SWV-312057

Don Scott, PE, Task Lead

July, 1994

APPROVAL SHEET

TANK VAPOR MITIGATION REQUIREMENTS

FOR

HANFORD TANK FARMS

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i. Executive Summary

Los Alamos Technical Associates, Inc. (LATA) has been contracted, under Task 08 of the P.O. MJB-SVW-310257, to provide analysis of tank vapor mitigation requirements for Hanford farms. Mr. Don Scott led the LATA task team and was assisted by Messrs. Ashworth and Lane who functioned as principle investigators.

The task was conducted in two distinct parts:

- Part I: *Model of Constituent Concentration in Vapor Space*, and
- Part II: *Assessment of Vapor Space Control Technologies*.

Part I produced predictions of the gaseous and solid (particulate) constituent concentrations in the waste tank vapor space based on three operational scenarios:

- Quasi state of present static waste storage,
- Waste transfer (mainly liquids) via pumping, and
- Waste retrieval using sluicing or hydraulic mining.

The main objective of Part II was to use the maximum constituent concentrations developed in Part I as input for the assessment of the vapor mitigation study. Several established and emerging technologies have been evaluated and their relative strengths and weaknesses discussed. Proposed was a single ventilation exhaust train that should be capable of successful treatment of nearly all constituents considered individually.

The results of both studies have been evaluated from the standpoint of present Federal, State and local laws as well as other environmental and safety requirements by an attorney and an industrial hygienist.

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1.0 INTRODUCTION

The amount and composition of waste tank vapor is an important factor of the present tank farm operations. This issue will taken on even greater role during the waste retrieval phase that may start as soon as during fall or 1996 (DOE Undersecretary Gramely's Safety Initiative of September, 1993).

An initial stage of the vapor space sampling is underway at Hanford tank farms and some of the first results have been used as a guidance and cross-reference of the data evaluation conducted during Part I of this study. As this activity progresses, it is recommended to periodically update the spreadsheet generated under this contract and update some of the technical design parameters.

1.1 PURPOSE

There were two main objectives set forth for this study. The first was to prepare a workable model of vapor space constituents that may be present under the following two conditions:

- Present mode of tank farm operation (static state),
- Future mode of operations involving waste transfer and retrieval.

The second goal was to study the best available technologies presently available for the treatment of the tank vapor space, including constituents evacuation and treatment within the proposed exhaust ventilation system. Two major activities were conducted under this part of the study, namely:

- Systematize the results obtained from the vapor constituent modeling, and group the tank by their constituent contents and concentrations,
- Assess gas treatment technologies and select the one most suitable for vapor space mitigation, and outline a typical tank exhaust train capable of effective transport and treatment during future retrieval operations.

1.2 SCOPE

The scope of this study encompasses all one hundred and seventy-seven waste tanks at the Hanford Site, i.e., both single-shell and double-shell tank storage facilities. Calculation models have been developed using vapor liquid equilibria, tank farm measurements, and empirical correlations to estimate tank farm vapor space composition. By using the available WHC data on the waste composition and the mass stored a model input has been developed and implemented. As a direct result of the mathematical calculations obtained were numerous spread sheets for all individual waste storage tanks. The results have been summarized and the maxima identified for the major chemical components and radionuclides.

After having concluded the Part I of this study, Part II used the summary of the first part to serve as an input for the assessment of the vapor space control technologies. Nearly all major means of gas or particulate abatement have been studied and evaluated. A single, universally applicable waste tank exhaust train has been proposed and designated for future evaluation and further development.

1.3 METHODOLOGY USED

The most common method of creating the study input has been the thorough search of waste storage, stabilization, pre-treatment and retrieval literature pertaining to the Hanford operations. Also evaluated have been several sources of governmental regulations, laws and other requirements pertaining to the environmental, health and safety aspects of waste storage. The previous experience gained by LATA's engineers from conducting numerous technical studies and projects for Westinghouse Hanford Co. have also been helpful in enhancing this work.

The spread sheets have been designed using the Microsoft's EXCEL 5.0 for Windows. All possible constituents have been identified from existing sample data and the WHC TRAC data base and organized into the rows of the spread sheets. The computational columns, both open and hidden have been used to calculate the predicted concentrations of both gas components and radionuclides in the vapor space under several operational scenarios. These scenarios included the following schemes:

- Quasi state of static waste storage (Present operations),
- Waste pumping (especially supernatant liquid) into Receiver Storage Tanks (Waste transfer operations), and
- Waste retrieval by sluicing or water jet.

The spread sheet calculation algorithms are based on partition factors derived from WHC data base, by the application of the vapor-liquid equilibria during the change of the state and empirical correlation that apply to a hypothetical receiver tank. Summary tables have been developed to provide overview of the constituent concentration model.

The data summary have been evaluated for the occurrence and the concentration levels of various vapor constituents. The constituents with the greatest significance for vapor space impairment have been identified and their relative safety hazard or the immediate danger to health or life noted.

During the Phase II, the project team has initially reviewed the available waste storage, stabilization, pre-treatment and retrieval literature to collect data and evaluate various technical opinions that have emerged throughout the years of Hanford operations. The results of the literature search task have been summarized into a coherent write up and also tabulated.

The technological overview task studied numerous established and emerging technologies having reasonable potential for successful vapor space treatment. The equipment capabilities to reduce the concentrations or virtually eliminate various gases or particulate from the air stream have been identified and the relative effectiveness evaluated against the existing federal and state regulations and requirements. Finally, a single exhaust train has been pre-conceptualized, having the theoretical capability of removing all unwanted constituents from the HVAC system. The applicability of such an exhaust train should be universally valid for all existing tank farms during the present and future operations.

The logistics of the entire study process have been depicted in Figure 1-1.

Figure 1-1. Vapor-Space Control Study--Logistics and Flowsheet Diagram.

2.0 TECHNICAL DISCUSSIONS

2.1 DEFINITION OF MISSION REQUIREMENTS

This section defines the functional and system requirements of a system that will mitigate the air quality between the tank vapor-space and the discharge stack during the waste retrieval operations. These requirements and design criteria will govern the ensuing process of technology assessment and evaluation of the system suitability. The reader should also refer to Section 2.2 for more details on retrieval equipment operating requirements.

2.1.2 Functional Requirements

The following Functional Requirements have been identified:

- Assure that the air constituent concentration and radioactivity emissions from the discharge will comply with all federal, state and local laws and regulations,
- Continuously and remotely monitor performance of each individual component and the entire system,
- Streamline the component connections in order to minimize the pressure losses,
- Arrange the components such that the larger particles and vapor/gases of greater concentrations will be captured and collected first,
- Avoid frequent and rapid changes of air stream temperature,
- Design a common mounting platform to allow transfer of the system between tank farms and individual tanks,
- Connection to the tank should be simple, utilizing the existing risers as much as possible. Try to avoid creating the need for extra risers.
- The piping carrying the return condensate back to the tank(s) should be of a double-wall design (consideration could also be given to all ducts and equipment enclosures),
- Minimize the physical dimensions and the mass of the components, and
- Maintain the required tank OSR and OSD limits.

2.1.2 System Requirements

The following system requirements have been selected:

- Use proven technologies as much as possible,

- Minimize any interruption of the waste retrieval process,
- Allow normal conduct of tank farm operations,
- System design should be simple, easy to install, relocate, maintain, and, decontaminate,
- Minimize the potential for releasing hazardous materials and radioactive particles to the surrounding environment during handling or operating the system, as well as exposures to workers in accordance with the ALARA principles,
- Maximize the use of automatic controls to minimize the amount of necessary human interface,
- Minimize the cost and equipment production schedule,
- Maximize the safety margins and redundancy of the system, and
- Minimize the electrical and other utility requirements of the system.

2.2 PRELIMINARY VAPOR SPACE CONTROL TECHNOLOGIES EVALUATION

Based on the functional and system requirements outlined in Section 3.1, a preliminary evaluation of candidate technologies and associated components for a tank ventilation train was initiated. This evaluation considers the major vapor-space control requirements for eighteen Hanford Site tank farms comprising 177 DSTs/SSTs. Vapor-space constituent concentrations derived from the modeling analysis performed by the LATA project team, and discussed in Part 1 of this report, provided the quantitative basis for this task. However, several serious constraints that currently impede a more detailed evaluation of a tank ventilation system will be addressed.

The lack of pertinent information related to vapor/particulate concentrations within an active tank ventilation system during tank retrieval operations hampers selection of appropriate components for the tank ventilation system train. Final selection of tank retrieval method(s) to be used for the TWRS program, if different than pumping and sluicing techniques modeled in Subtask 1, may cause revision of the selected vapor treatment technology.

Limited availability of characterization data for tank vapor-space constituents contained within the DSTs/SSTs currently also precludes a comparison of the results of the current LATA modeling analysis with concurrent data derived from an ongoing tank vapor sampling/laboratory analysis program. Likewise, the very limited availability of pertinent experimental data to establish vapor/particulate mass loadings and particle size distributions for evaluation of candidate tank ventilation system components is also a very serious constraint at this time.

2.2.1 Tank Retrieval Methods

As previously discussed in Section 2, two retrieval methods were developed on a preliminary basis for inclusion in the spreadsheet model. For those DSTs/SSTs containing predominately pumpable liquids and slurries, waste transfer by means of in-tank transfer pump(s) to holding tank(s) prior to additional pretreatment and/or permanent disposal is an obvious choice. However, for DSTs/SSTs containing significant quantities of solids, primarily in the form of saltcake, alternative retrieval methods will be required. Retrieval operations for these tanks will probably entail a "mechanical mining" technique (e.g., drilling, cutting, sawing, etc.), or an intermediate pressure water jet sluicing (e.g., hydraulic mining) method to break up the solids prior to transfer of a water slurry by means of pumps.

The limited water sluicing method was selected for several reasons. Sluicing remains the only demonstrated means of waste retrieval (Krieg, 1990). It also affords a means of reducing the mass loading of respirable particulates into the vapor dome space of the tank, and, hence, into the tank exhaust system. Disadvantages of a limited sluicing technique include the following:

- (1) Sluicing adds additional liquid to the tank which, ultimately, must be treated as mixed waste.
- (2) If a pumpable liquid slurry cannot be obtained by sluicing, a mechanical mining system, including a hopper for solids will be required.

However, based on both laboratory and field investigations conducted by Bureau of Mines to study the effectiveness of medium-pressure (up to 30,000 psi) water jets in controlling the generation of airborne respirable dust during the hydraulic fragmentation of coal, a limited sluicing scenario was developed (Lohn and Frank, 1975).

The limited sluicing scenario assumes sufficient size reduction and dissolution of the saltcake is affected to allow pumping of the resultant slurry from the waste tank to another holding tank prior to subsequent pretreatment operations and/or LLW/HLV waste disposal operations.

Based upon the results of the underground tests from the above reference, an average particulate concentration for all laboratory samples was 0.60 mg/m^3 at a ventilation rate of about 1,000 cfm. If a single large concentration (2.56 mg/m^3 , suspected to be an erroneous measurement) is eliminated, the average is then 0.39 mg/m^3 . However, a particulate concentration of 0.5 mg/m^3 is recommended for vapor space loading for this scenario to be appropriately conservative. The Bureau of Mines study also indicated a particle size of $\leq 1.07 \mu\text{m}$ for about 75% of the particulates collected with the midjet impinger. A Coulter counter measured both the size distribution and the total particle count for all laboratory samples.

A total of 51 samples was collected. Pressures from 5,000 to 30,000 psi were used and the jets were traversed across the face at speeds from 26 to 720 ipm. The standoff distance (the distance from the nozzle to the coal face) was approximately 3 inches. Maximum flow rates per nozzle (0.06 in. diameter) were 10 gpm.

2.2.2 Vapor Space Mass Loading and Particulate Size Distribution

Particulate mass loadings and particle size distributions were roughly estimated from the results derived from a prior off-gas sampling status report for the Building 702A ventilation system (WHC Internal Memorandum, Tank Farm Process Technology Section to N.R. Kerr, 1989.) This report is the only reliable reference to tank ventilation system particulate sampling and analysis found during these current investigations.

The aging waste tanks are being ventilated by the 241-A-702 system comprised of condensers, de-entrainers and HEPA filters. All aging wastes originated from the first decontamination cycle of the PUREX process. The acid waste was neutralized with sodium hydroxide to 1M excess hydroxide. The resultant neutralized high-level waste was transferred from PUREX to one of the two operating aging waste tanks in the 241-AZ Tank Farm.

The sampling station was located at the isolation valve pit between the 241-A-401 condenser and the K1-5-2A de-entrainer. Thus sampling was performed at the condensation point of the gas stream. Results showed that the temperature of the saturated off-gas leaving the condenser, with the range between 76.8°F and 93.8°F, affected both the mass and the β -emission concentration (principally due to the presence of ^{137}Cs) in the gas stream. As the vapor discharge temperature of the condensate increased, so did the mass concentration in the off-gas. The mass concentration varied from 0.9 to 64.8 $\mu\text{g}/\text{m}^3$, averaging 16.5 $\mu\text{g}/\text{m}^3$. Beta concentration also increased with the increasing condenser discharge temperature, varying between 507 and 2,935 pCi/ m^3 . The gamma concentration in the off-gas varied between 408 and 1,294 pCi $^{137}\text{Cs}/\text{m}^3$, but there was apparent correlation with the condenser off-gas temperature.

The off-gas stream had two separate bi-modal mass size distributions; most of the mass loading and the β/γ activity was concentrated in the smaller size range of the aerodynamic diameter, between 0.05 and 0.4 μm . The average mass mean aerodynamic diameter (MMAD) of the particulate in the gas stream was 0.073 micron. The beta mean aerodynamic diameter (BMAD) of the particulate containing β -activity was 0.084 micron. The estimated mean of the larger diameter mass and beta distribution was about 2 μm . The ensuing statistical analysis indicated that the mean particle size was a function of the sample point in the duct. The larger particulate size was found in the center of the duct where both the air velocity and gas temperature was the highest.

The maximum estimated tank concentrations of substances for which there exists a regulatory exposure limit has been summarized in Table 3-1. The most stringent applicable exposure standard has been used. These standards are listed in Federal Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1000 tables 2-1-A and 2.2, and the State of Washington General Occupational Health Standards of WAC 296-62-07515, Table 1. An employee's exposure to any substance listed in Table 1 shall be limited in accordance with the requirements outlined in WAC 296-62-07501 through 296-62-07513. All permissible exposure limits are time weighted averages (TWA) unless otherwise noted. The tank farm where the highest estimated concentration occurs is included in Table 2-1.

Table 2-1. DST/SST Constituent Regulatory Exposure Limits.

	Maximum Estimated Concentration (ppm)	Permissible Exposure Limit (ppm) ¹	Tank Farm
Ag	0.11	0.0023	T
Al	50.4	9.0	U
Ba	0.134	0.089	B
Be	0.0043	0.00136	AW
Bi	7.035	1.8	B
Cd	0.021	0.0005	B
Cr	1.4	0.24	SX
CrO ₄ (hexavalent)	0.447	0.021 (ceiling) ²	U
Cyclohexene	6763.5	300	AP
Dibutylphthalate	177	0.44	AN
F (as Fluoride)	22.62	0.1	TX
Fe	7.92	2.2	AX
Hg	0.125	0.006	AX
Na	278.25	1.2 (ceiling) ²	TX
NH ₃	23,600	25	AX
Ni	0.218	0.04	T
N ₂ O	880	30	C
OH (as NaOH)	15.4	1.2 (ceiling) ₂	C
Pb	0.072	0.006	B
Rh	0.003	0.0002	SY
SiO ₂ (amorphous silica)	15.218	1.93	TX
U	0.578	0.02	BX
ZrO (as Zr)	9.534	1.14	A

¹ Permissible Exposure Limits: Permissible exposure limits (PELs) refer to airborne concentrations of substances without regard to the use of respiratory protection and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the permissible limit, a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness. Permissible exposure limits refer to time-weighted concentrations for an 8-hour workday within a 40-hour workweek which shall not be exceeded. Time weighted average (TWA) is the employee's average airborne exposure to any 8-hour work shift of a 40-hour work week which shall not be exceeded.

² Ceiling Limit: Ceiling is the employee's exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time over a working day.

The following list identifies tank farms with postulated maximum concentrations in excess of the annual average emission concentration that would be compliant for non-DOE facilities. Current tank farm operations must limit the emission of these radionuclides. Retrieval operations must be designed and conducted to limit radionuclide emissions in the tank farms identified below as well as to comply with the ALARA policy. The radionuclide concentrations shown in parentheses are in the units of $\mu\text{Ci/L}$.

DST/SST Radionuclides Exceeding Non-Regulated Facility Standards.

Radionuclide	Tank Farm Exceeding Value
Am 241 (1.9E - 15)	All
Am 242m (2.0E - 15)	None/All table values 0
Am 243 (1.8E - 15)	AP, AW, A, AX, B, BX, BY, C, S, SX, T, TX, TY, U
CA (1.0E - 11)	A, AX, B, BX, BY, C, S, SX, T, TX, TY, U, AN, AP, AW, AZ
Cm 242 (5.3E - 14)	All except SY, AP, AW, AY
Cm 244 (3.3E - 15)	AN, AW, AX, A, AX, B, BX, BY, C, S, SX, T, TX, TY, U
Cm 243 (2.6E - 15)	AN, AP
Cs 137 (1.9E - 14)	All
CePr 144 (6.2E-13, Ce)	None
Co60 (1.7E - 14)	NOT AY, SY, TX, BY
Cs 134 (2.7E - 14)	NOT TY, AX, AY, SY
Eu 154 (2.3E - 14)	AP, AZ, A, AX, B, T, TY, S, SX, AN
H ₃ (1.5 E-9)	AN, AP, AW
I 129 (7.1E - 15)	NOT SY
Eu 155 (5.9E - 13)	AP, S, A, AX, B, T, TX, U
Nb 94 (7.1E - 15)	AN, AP
Nb 95 (2.2E - 12)	None
Np 237 (1.2E - 15)	NOT Ay, SY
Pm 147 (1.1E - 11)	AN, AW
Pu 238 (2.1E - 15)	NOT AY, SY
Pu 239/240 (2.0E - 15)	All
Pu 241 (1.0E - 13)	Not AP, AW, AY, SY
Ra 226 (3.3E - 15)	AP
RuRh 106 3.4E-13, Ru)	All
Ru 103 (2.6E - 12)	AP
Se 79 (1.1E - 13)	NOT AY, AZ, SY
Sn 113 (1.4E - 12)	AP
Sr 89/90 (1.8E - 12)	All
Sb 125 (1.6E - 13)	T, A, AX, B, C, S, SX, AP

DST/SST Radionuclides Exceeding Non-Regulated Facility Standards.

Radionuclide	Tank Farm Exceeding Value
Tc 99 (1.4E - 13)	All
U 234 (7.7E - 15)	SX, AP
U 235 (7.1E - 15)	AP
U 238 (8.3E - 15)	NOT AW, AY, SY
Y 90 (1.3E - 11)	None/All table values 0
Zr 95 (6.7E - 13)	None

2.3 SUMMARY OF DST/SST VAPOR/PARTICULATE CHARACTERIZATION

To establish basic requirements for a ventilation system exhaust train, maximum concentrations of tank vapor space constituents for each of the 177 DSTs/SSTs were developed from the modeling analysis results presented and discussed in Part 1 of this Final Report. These estimated concentrations are presented in Sub-Task 1 for the tanks in each of the six DST farms and the twelve SST farms. Note that all concentrations for the identified radionuclides are presented in units of $\mu\text{Ci/L}$. Similarly, vapor/gas constituent concentrations and particulate constituent concentrations are given in units of ppmv.

The maximum concentration for each of the identified analytes or constituents is given in the Sub-Task 1 database for three separate tank conditions. One set of values represents the maximum or peak concentration for each constituent, assuming that the tank waste is in a relatively stable (stagnant) condition, i.e., no waste mixing or waste transfer operations are being performed. The second set of values represents the maximum constituent concentrations derived from the modeling analysis under either of results for the two different waste retrieval options (previously discussed in Sections 2.1.1 and 3.2.1). The third set of values estimate the vapor phase composition of a hypothetical receiver tank.

Perusal of the data presented in Sub-Task 1 demonstrates that the higher of the two maximum constituent concentrations occurs for tanks undergoing waste retrieval operations. This data is supported, in part, by experimental observations on an operating DST with an active ventilation system (Kimura, 1987). The highest partition factors (ratio of vapor to liquid concentration) for Cs-137 in the system was observed in a tank having airlift circulators. Conversely, the lowest partition factors for Cs-137 and other radionuclides were observed in stagnant tanks not actively receiving wastes or having airlift circulators.

Prior to evaluating alternative technologies for the treatment and removal of vapor-space constituents, the extensive database compilation presented in Sub-Task 1 was reduced with further analysis to reflect maximum concentrations for the most significant constituents. This data is presented in Table 2-2 for 18 selected constituents in each of six DST farms and in Table 2-3 for 25 selected constituents in each of twelve SST farms.

Table 2-2. Selected Maximum DST Vapor Space Constituent Concentrations
(28 Tanks, 6 Tank Farms).

Constituent		Tank Farm						Comments
Symbol	Unit	AN	AW	AP	AY	AZ	SY	
Cs-137	$\mu\text{Ci/L}$	3.0E+01	4.7E+01	7.5E+01	7.3E+01	5.0E+02	2.9E+01	
Sr-89/90	$\mu\text{Ci/L}$	5.7E+00	9.2E-01	7.8E+00	7.6E+00	4.0E+00	2.9E-01	
Tc-99	$\mu\text{Ci/L}$	1.7E-02	2.4E-02	3.2E-03	9.1E-04	7.6E-02	1.9E-03	
Am-241	$\mu\text{Ci/L}$	7.0E-01	2.2E-04	7.9E-04	1.1E-03	9.9E-04	4.0E-04	
C-14	$\mu\text{Ci/L}$	8.4E-05	7.15E-04			8.0E-04		
Eu-154	$\mu\text{Ci/L}$	7.3E-02		1.2E-02		2.4E-01		
H ₃	$\mu\text{Ci/L}$	4.4E-04	4.7E-07	5.7E-04				
I-129	$\mu\text{Ci/L}$	7.3E-06	1.9E-05	2.3E-05	6.9E-06	3.0E-05		
NH ₃	ppm(V)	1.1E+03	9.2E+02	9.6E+03	4.0E+02		1.3E+03	
H ₂ O	ppm(V)	9.0E+04	6.4E+04	3.3E+04	2.5E+04	2.5E+04	1.2E+05	
EDTA	ppm(V)	2.2E-02					3.6E-04	
HEDTA	ppm(V)	2.5E-02						
IDA	ppm(V)	1.6E-01						
Cyclohexene	ppm(V)			6.8E+03				
2-Ethyl-1-Hexanol	ppm(V)						1.2E-02	
2-Butanone	ppm(V)						3.9E-02	
Na	ppm(V)	9.5E+00	3.1E+01	5.6E+00	2.0E+00	2.2E+01	1.1E+01	
Al	ppm(V)	1.7E+00	5.8E-01	3.0E-01	5.3E-02	7.2E-02	1.9E+00	

Table 2-3. Selected Maximum SST Vapor Space Con

CONSTITUENT							
Symbol	Unit	A	AX	B	BX	BY	
Cs-137	$\mu\text{Ci/L}$	3.4E+01	2.0E+01	3.7E+01	8.6E+00	1.4E+01	1.1
Sr-89/90	$\mu\text{Ci/L}$	1.2E+03	5.0E+00	4.1E+01	3.5E+00	7.0E+00	7.7
Tc-99	$\mu\text{Ci/L}$	1.0E-02	5.2E-03	1.3E-01	1.8E-01	1.2E-02	4.2
Am-241	$\mu\text{Ci/L}$	3.4E-01	1.9E-02	8.2E-03	2.2E-02	4.3E-03	1.1
C-14	$\mu\text{Ci/L}$	3.0E-01	1.6E-02	9.5E-02	1.6E-01	4.0E-03	2.7
CO-60	$\mu\text{Ci/L}$	9.3E-01	1.1E-02				1.8
Eu-154	$\mu\text{Ci/L}$	1.9E+00	1.4E-01	7.9E-03			
Eu-155	$\mu\text{Ci/L}$	5.9E-01	6.8E-02	2.0E-03			
I-129	$\mu\text{Ci/L}$			2.3E-04	3.7E-04		
Pu-241	$\mu\text{Ci/L}$	3.5E-01	1.5E-01	6.2E-02	3.5E-02	2.6E-03	6.4
Pu-239/240	$\mu\text{Ci/L}$	3.0E-01	4.3E-02	7.7E-02	7.8E-02	3.0E-03	4.8
CO	ppm(V)	4.5E+00	1.1E+00	2.4E+00	7.3E-01	3.5E+00	4.6
NH ₃	ppm(V)		1.8E-02	2.4E+04	7.0E+01	1.0E+01	3.7
OH	ppm(V)	4.6E+00	2.3E+00	1.2E+00	2.9E+00	1.7E+00	1.5
CH ₄	ppm(V)						1.6
H ₂ O	ppm(V)	1.8E+05	1.2E+05	8.8E+04	3.6E+04	1.1E+05	1.5
EDTA	ppm(V)	1.7E-01			1.2E-02		
HEDTA	ppm(V)	2.6E-1			1.9E-02		
Dodecane	ppm(V)			9.2E+00	1.1E+01		5.3
Tridecane	ppm(V)			3.1E+00	3.9E+00		
Tetradecane	ppm(V)			6.5E-01	8.4E-01		
Decane	ppm(V)	1.1E+01					
Undecane	ppm(V)				1.8E+05		
C ₅ H ₅ O ₇ ⁻	ppm(V)	7.0E-01	7.1E-02	4.4E+00	5.23E+00	3.3E+00	3.0
Na	ppm(V)	1.6E+01	4.5E+00	2.2E+01	4.1E+00	1.3E+01	7.3

Constituent Concentrations (149 Tanks, 12 Tank Farms).

TANK FARM							COMMENTS
	S	SX	T	TX	TY	U	
01	1.2E+01	1.3E-03	5.1E+00	4.8E+00	6.11E-01	7.5E+02	
00	1.5E+01	1.4E+03	6.2E+00	1.5E+01	5.1E+00	5.3E+00	
03	2.7E-02	7.5E+02	2.3E-03	1.5E-02	2.6E-02	8.2E-02	
02	1.4E-02	4.1E+00	3.3E-03		1.8E-03	3.2E-03	
02	1.4E-02	1.0E-02	3.0E-03	1.6E-02	8.1E-03	4.1E-02	
03		1.2E+00					
	6.2E-03	8.4E-01	2.4E-03			1.2E-02	
	4.8E-03					4.0E-03	
	1.9E-03				3.4E-03	1.4E-04	
02	5.4E-02	2.0E-02	7.6E-03	5.5E-02	9.2E-03	4.8E-03	
02	2.0E-01	1.6E+00	1.1E-02			8.4E-02	
00	3.2E+00	4.2E+00	1.9E+00	7.7E-01	4.6E-01	5.0E+01	
02							
01	3.8E+00	8.9E+00	3.8E-01	1.2E+00	1.8E+00	5.1E+00	
01							
04	9.8E+04	1.9E+05	3.8E+04	5.9E+04	5.0E+04	5.4E+04	
		1.5E-02		4.4E-02			
		2.9E-02		8.4E-02			
01			8.7E+00				
			2.9E+00				
			6.1E-01				
			1.1E+02				
			1.9E+05				
00	5.23+00	3.5E+00	3.8E-02	5.2E-01	2.3E-01	2.4E-02	
00	2.1E+01	3.0E+01	2.1E+00	2.8E+02	1.3E+01	7.9E+01	

In general, those constituents shown in Tables 2-2 and 2-3 were selected because they exhibit the highest maximum concentrations (ppmv for inorganic/organic chemicals) or the highest radioactivity levels ($\mu\text{Ci/L}$ for radionuclides) for each tank farm. Hence, those constituents listed in Tables 2-2 and 2-3 should have a correspondingly higher probability of significantly impacting the eventual design of the DST/SST ventilation system.

For example, ammonia (NH_3) maximum concentration levels range from 920 to 9,600 ppmv for five of the six DST farms as shown in Table 2-2. Similarly, ammonia concentrations, varying from 370 to 24,000 ppm, are exhibited in Table 2-3 for several of the SST farms. These maximum ammonia concentrations probably dictate the inclusion of ammonia removal/control in the ventilation exhaust train for the affected tank farms. Likewise, a high maximum concentration of methane gas (16 ppmv) is noted in Table 2-3 for the C farm. Therefore, these gases must be considered in the overall design and specification of the control component for the C tank farm.

Cs-137 maximum radioactivity levels also are shown to be consistently higher for both DST and SST farms as shown in Tables 2-3 and 2-4. I-129 has a significant vapor pressure was included in the list of significant constituents for both DST and SST farms because it is at normal temperature and it has a very long half-life of about 17 million years. Similarly, Tc-99 has a half-life of approximately 212,000 years. The remaining radionuclides shown in Tables 2-3 and 2-4 were included because they are considered toxic, high-level wastes (e.g., Am-241, Pu-241, Eu-154, Pu-239/40) and/or exhibited relatively high maximum radioactivity levels (e.g., Sr-89/90, C-14, Co-60).

Significant tritium (H-3) levels are noted in Table 2-3 for the AN, AW, and AP DST farms. Tritium would be present as tritiated water vapor in the vapor space for these tank farms.

A number of organic constituents were included in Tables 2-3 and 2-4 because they have been uniquely identified in relatively significant concentrations for a limited number of SST/DST farms.

2.4 ALTERNATIVE TECHNOLOGIES FOR VAPOR SPACE CONSTITUENTS TREATMENT AND REMOVAL

The ventilation system capabilities must be fully compatible with the expected waste retrieval methods (see sections 2.1.1 and 3.2.1). However, alternative methods of retrieval, i.e. certain forms of sluicing, or mechanical mining may be required. Specifically, some of the retrieval concepts for SST's could drastically alter the composition, mass loading, and particle distribution in the tank vapor-space, and, hence, the selection and design of the ventilation system components and their arrangement in the equipment train. It is expected that the particle separation processes may become the most effective means of particle/vapor collection in the tank exhaust system. Typical ranges of separation processes for either liquid or gas are shown in Figure 2-1.

The following components have been preliminarily selected from the roster of available technologies and their functions and relative merits of operations are discussed below. Supplementary information obtained from manufacturers and/or vendors of these prospective components during the conduct of this study is included in Appendix G of Part 2.

Figure 2-1. Typical Ranges of Various Separation Processes.

Particle Control Technologies For Both Gas & Liquid Phase

Part 1

Vapor Space Constituents Model

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LIST OF TERMS FOR PART 1

Å	Angstrom, 10^{-8} Centimeters
Ci	Curie unit of radiation
DCG	Derived concentration guide
DCRT	Double contained receiver tank
DL	Drainable liquid
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE-RL	Richland, WA Field Office of DOE
DST	Double-Shell Tank
EPA	U.S. Environmental Protection Agency
f	Fugacity
°F	Fahrenheit Temperature Scale
ft	Feet or Foot (basic unit of length in U.S. Engineering System of Measurements)
g	Gram
GPM	Gallons per Minute (Fluid volumetric flow)
H	Henry's Law constant
HLW	High Level Waste
hr	Hour (derived unit of time)
II	Interim Isolated
IS	Interim Stabilized
°K	Kelvin Temperature Scale
l	Liter
LATA	Los Alamos Technical Associates, Inc.
lbm	Pounds Mass
m	Meter, SI length unit
mg	Milligram
mole	Gram-formula weight (ionic), gram-molecular weight (molecules)
P	Pressure
pH	Power of hydrogen, $-\log_{10}[H^+]$
PI	Partially Interim Isolated
ppm	Parts per million
R	Universal gas constant
Receiver	Tank being pumped to during retrieval
rem	Rad equivalent man
°R	Rankine temperature scale
sec	SI time unit
SD	Supporting Document (WHC Engineering Standard)
SN	Supernatant
Source	The tank whose contents are being retrieved.
SST	Single-Shell Tank
TPA	"Tri-Party Agreement" (between EPA, DOE and State of Washington)

LIST OF TERMS FOR PART 1 (continued)

TRAC	Track Radioactive Components (spreadsheet estimates tank contents)
TWRS	Tank Waste Remediation Systems (operating group of WHC)
UNIFAC	UNiquac Functional-group Activity Coefficient (basic program)
UNIQUAC	Universal Quasichemical (basic program)
WHC	Westinghouse Hanford Company

Greek Letters

μ	Mu, micro or 10^{-6} prefix (also used as viscosity and chemical potential)
γ	Gamma, used for solubility (CVD model) and activity coefficient
ϕ	Phi, used for concentration in CVD model
ω	Omega, used for mass fraction in CVD model
ρ	Rho, used for density
σ	Sigma, used for Surface Tension

Organic Chemicals

DEHP	diethylhexylphthalate
DOEA	docos-13en-oic acid
EDTA	ethylenediaminetetraacetic acid
ED3A	ethylenediaminetriacetic acid
E2DTA	N-(ethylene)ethylenediaminetriacetic acid
HDBD	hydroxybutanedioic acid
HDC	Hexunecanoic Acid
HEDOA	N-(2-hydroxyethyl)-ethylenediamine 'N,N' diacetic acid
HEDTA	N-(2-hydroxyethyl)-ethylenediaminetriacetic acid
HEIDA	N-(2-hydroxyethyl)-iminodiacetic acid
IDA	iminodiacetic acid
MeEDDA	N-(methyl)ethylenediamine-N,N'-diacetic acid
MeHEDD'A	N-(2-hydroxyethyl)-n'-(Methyl)ethylenediamine 'N,N'-diacetic acid
MTA	methane tricarboxylic acid
NTA	nitrilotriacetic acid
PA	Phthalic Anhydride
TBP	Tri-n-butyl Phosphate

1.0 INTRODUCTION

Westinghouse Hanford Company has contracted Los Alamos Technical Associates to develop a listing of vapors and aerosols that are or may be emitted from the High Level Waste (HLW) tanks at Hanford. Mitigation requirements under Federal and State law, as well as DOE Orders, are included in the listing. The lists will be used to support permitting activities relative to tank farm ventilation system up-grades. This task is designated Task 108 under MJB-SWV-312057 and is an extension of efforts begun under Task 53 of Purchase Order MPB-SVV-032915 for Mechanical Engineering Support. The results of that task, which covered only thirty-nine tanks, are repeated here to provide a single source document for vapor mitigation requirements for all 177 HLW tanks.

2.0 PURPOSE AND SCOPE

The purpose of this task is to identify or predict vapors and particulates which may be emitted from the stored HLW, in the Hanford Tank Farms. Tank conditions are to include current operations and future retrieval operations. This task will determine the need for mitigation and will support permitting efforts. The final report may also be used to support Safety Analysis Reports, various ventilation system design projects, and HLW vapor documentation.

The scope of this task covers the HLW storage tanks at Hanford, but specifically excludes the double contained receiver tanks (DCRT's), diversion boxes, railcar unloading facilities, and other tank farm support facilities. It includes an initial estimation of vapor components currently within the waste or tank headspace, an estimation of future vapor components based on various retrieval scenarios, and a listing of regulatory mitigation requirements. It also contains information on document searches, data organization, data reliability, remaining gaps and weaknesses, retrieval scenario description, industrial hygiene review, interpreting and justifying applicability of models, and WHC review.

3.0 TANK FARM OPERATIONS AND HISTORY

Since 1944, radioactive wastes from the reprocessing of irradiated uranium fuels for the recovery of plutonium and uranium have been stored as alkaline slurries in underground tanks. Between 1943 and 1986, 177 tanks have been constructed for this purpose, ranging in capacity from approximately 55,000 gallons to 1.14 million gallons. Six additional tanks are planned for construction in the near future. The tanks are grouped in 18 Tank Farms in the 200 East and 200 West Areas of Hanford. The first 149 tanks were constructed of reinforced concrete with a steel lining on the floor and sidewalls. These tanks are either 75 or 20 feet in diameter with differing depths, and have capacities ranging from 55 thousand gallons to 1 million gallons. These tanks are now known as Single Shell Tanks (SST). Eighty-three of the SSTs are located in the 200 West Area in six Tank Farms, while the remaining 66 tanks are grouped into six Tank Farms in the 200 East Area.

The 28 remaining tanks, built since 1968, were constructed with two separate steel tanks contained within a reinforced concrete shell. Provisions for leak detection within the annular space between the primary and secondary steel tanks were included in the design. These tanks are known as Double Shell Tanks (DST), and each has a capacity of 1.14 million gallons. Three of them are located in the 200 West Area; the rest are in the 200 East Area.

Because the wastes stored in the SSTs and DSTs contain radionuclides and potentially hazardous non-radioactive chemicals, the Wyden Amendments (*Public Law 101-510, Section 3137*) were passed by Congress to address tank safety concerns. These amendments required the Secretary of Energy to identify those tanks at Hanford which may have a potential for release of waste due to uncontrolled increases in temperature or pressure. The 54 tanks that have been identified to have this potential fall into four categories: 24 tanks that produce or appear to have the potential to produce significant quantities of hydrogen; 24 tanks that contain significant quantities of ferrocyanide; 8 tanks that contain significant quantities of organics (3 of these 8 tanks also fall into the hydrogen or ferrocyanide categories); and one tank that is a high heat producer. These tanks are identified as the Watch List tanks.

Single Shell Tanks

The 149 Single Shell Tanks were in active service from 1944 to 1973 primarily to support the bismuth phosphate process (T and B Plants), the Tributyl Phosphate (TBP) process (Uranium Recovery Plant), REDOX, and the early days of PUREX and Z Plant operations. None of the SSTs have received waste since 1980. Waste types sent to the SSTs have included:

- Dilute complexed waste (DC)
- Double Shell Slurry Feed (DSSF)
- Non-complexed Waste (NCPLX), from REDOX operations between 1952 and 1966

Nearly half of these tanks are either suspected of or confirmed to be leaking, with the first leak being confirmed in 1958 (104-U). An ongoing program to transfer the supernatant and drainable liquids to the newer Double Shell Tanks has continued since the early seventies.

Since waste management operations have been so complex, discerning individual tank contents based only on process knowledge is not feasible. For instance, many of the SSTs are set up in cascades of two or more tanks, where process waste was introduced into the first tank and overflowed into adjacent connected tanks. This resulted in a heavy layer of sludge in the first tank and the lighter components being collected in the downstream tanks. As the processing chemistry was improved, much of the stored waste was reprocessed to recover uranium, cesium, and additional plutonium. The cesium scavenging operations at the UO_3 , T and B Plants resulted in the introduction of ferrocyanide compounds to the waste contents in some of the tanks. To reduce the volume of the waste, four evaporators were constructed (two in 200 West and two in 200 East) to remove excess water. Some of the evaporator bottoms were initially returned to the SSTs. Finally, 1) routine intertank transfers were used to provide storage space where needed to support production operations, which blended wastes, 2) tanks were not completely emptied prior to refilling, 3) only limited mixing of wastes within the tank could be accomplished and 4) quick response conditions, such as a leaking tank, caused wastes to be transferred to more than one tank. To preclude the inadvertent addition of waste to the SSTs and to reduce the risk of further environmental degradation, a number of steps are being taken to physically isolate the tanks from the piping network and from each other. Techniques such as salt well pumping and jet pumping are being used to remove all drainable liquids for transfer to the DSTs. As these operations are completed, the tanks are designated Interim Isolated (II), Interim Stabilized (IS), and Partially Interim Isolated (PI).

Double Shell Tanks

With the exception of 241-SY Tank Farm, all of the Double Shell Tanks are located in the 200 East Area. All twenty-eight of the DSTs have active ventilation systems, and six are on the Watch List for hydrogen. Although originally intended to support PUREX operations, the tanks in the 200 East Area also contain evaporator bottoms from 242-A, B Plant waste, transfers from the single shell tanks, and water from N Reactor and 300 Area operations. In the 200 West Area, the three tanks in 241-SY contain wastes from Z Plant, the evaporators and the single shell tanks. The DSTs were designed to accept and have received:

- Neutralized cladding removal waste (NCRW) from reprocessing N Reactor fuel
- Waste from the Plutonium Finishing Plant (PFP)
- Double shell slurry feed (DSSF) from drainable liquids in the SST's and the evaporators
- Double shell slurry (DSS)
- Complexant concentrates (CC)
- Concentrated phosphate (CP) from N Reactor decontamination
- Miscellaneous decontamination liquids and organic wash wastes from PUREX operations
- Aging Waste.

4.0 SAMPLE DATA AND DATA QUALITY

Wastes stored in the tank farms have been periodically sampled as needed throughout tank farm operations. The radioactive nature of tank farm wastes, however, limited the amount and scope of earlier analytical data to include only information that was essential to operations at the time. High dose rate wastes have typically been handled in small quantities to reduce the exposure to tank farm and laboratory personnel.

The advent of the more recent core sampling program, proposed waste treatment processes, the implementation of hazardous waste regulations, and recently surfacing safety questions have all contributed to increased efforts to obtain more sample data from the tank farms. Analytical equipment, techniques and capabilities have also changed over the life of the tank farms. As a result, tank farm characterization data range from sketchy to fairly detailed, depending on the purpose of the sample and the available analytical techniques. Very little information is available for direct analysis of tank farm vapors. Much more common are samples from tank liquids and solids.

Several methods have been used to obtain tank farm samples, ranging from a "bottle on a string" approach to comprehensive core sampling, which involves pushing or drilling a sampler probe through the waste. A core sample consists of a set of vertical segments of the waste, taken at successive intervals, to generate a vertical profile of a tank. The segments are then analyzed separately or blended together before analysis. Solids are frequently separated from liquids and analyzed separately. The extent of the analyses performed on the waste depends on requests made to the laboratory and the laboratory's capabilities.

The majority of the data used in estimating tank vapor compositions in this study came from two inventory documents: Oscarson & Tusler, 1993, and Wastren, Inc, 1993. These documents contain a compilation of sample and analytical data that occupy several file drawers in the 2750E Building in the 200 East Area. The source material varies from internal memos and letters to formal supporting documents. Both of the 1993 inventory documents use the existing sample data to estimate tank inventory. They do not contain any information regarding the reliability of the sample data or the quality assurance programs in place at the times the samples were taken. They also do not describe how the samples were taken, from what locations in the tank the samples were taken, the methods of sample transport and storage used, or age of the samples when analyzed.

Some, but not all, of this information is occasionally found in the individual references. An evaluation of each reference is beyond the scope of this report. (Additional information surrounding the analyses and quality assurance work is likely located in formal laboratory notebooks, tank farm logbooks, and operating reports.) The lack of discussion in the references regarding quality assurance requirements does not mean that the data are not useful, since the analytical results are generally indicative of the composition of material present in the waste, although the data may not be representative of the average tank composition. (There is vertical variation in waste composition due to layering of different waste types and crystallization that occurred during storage.) It may not be possible to estimate the range of error associated with each piece of information, particularly with older sample data.

Additional data relating to tank waste and vapor composition, and partition coefficients are located in reports prepared by the Pacific Northwest Laboratory and by Westinghouse personnel. Some of these documents contain comments by the researchers about sample ages and containers being unsuitable for the requested analyses. Comments like these were noted in this report. More recent documentation contains information associated with quality assurance activities. One reference contains only 15 to 20 pages of data, with the balance of about 800 pages containing analytical procedures and quality assurance activities.

Wastes were not simply pumped to a tank and stored there. During routine tank farm operations, the tanks may have been filled and emptied several times with wastes from entirely different sources. In earlier operations, waste was cascaded from tank to tank and was often transferred from one tank farm to another. (Double shell tank fill histories are shown graphically in Oscarson's double shell tank inventory report. A similar compilation of SST fill histories has not been found). In addition, the wastes have been concentrated, separated, reprocessed and otherwise treated as the process chemistry became better understood. Although no new waste was added to single shell tanks after 1980, many of these tanks have had supernatant or interstitial liquid removed to the double shell tank farms via salt well pumping (also called stabilization). The complex nature of tank farm operations over the last fifty years makes it difficult to apply the available data on a tank-by-tank basis. Additional uncertainty is introduced by using liquid and solids sample data to estimate vapor composition. While the sample data may no longer strictly apply to a given tank it was taken from, the waste is still located within the tank farms and will be present for retrieval.

5.0 GOVERNING CODES AND REGULATIONS

Discharges to the atmosphere are primarily regulated by provisions adopted pursuant to the Clean Air Act. Standards that limit atmospheric discharge and that are applicable to tank farm operations include those found in 40 CFR 50, National Primary and Secondary Ambient Air Quality Standards; 40 CFR 60, New Source Performance Standards; and 40 CFR 61, National Emission Standards for Hazardous Air Pollutants. The State of Washington also regulates air quality. These standards can be found in the Washington Administrative Code (WAC) 173-400, 173-403, 173-460, 173-480 and 246-247. For discussions concerning applicability of both federal and state air quality regulations to tank farm operations please see Appendix B.

In addition to air quality, both the Occupational, Safety and Health Administration (OSHA) and DOE regulate exposure to airborne hazards. OSHA regulations primarily concern exposure to hazardous chemicals and can be found in 29 CFR 1910 Subpart Z. OSHA limits are located in Table Z-1-A and Z-2. The limits apply to specific compounds and physical forms.

DOE Orders provide exposure limits to protect the environment, public and occupational workers. The DOE Orders of concern in this area are 5400.5, Radiation Protection of the Public and Environment and 5480.11, Radiation Protection for Occupational Workers.

6.0 TECHNICAL BASIS AND SPREADSHEET DATA DISCUSSION

This section includes assumptions and bases used, the formulas used for vapor phase estimates for liquids and solids in the current configuration, and the formulas used for vapor phase estimates for liquids and solids in the retrieval configuration. It also includes a reproduction and explanation of the master spreadsheet used to estimate tank vapors. Three models were used to model the tanks' vapor space composition where appropriate, for current; future source tank during retrieval; and future receiver tank during retrieval. The models are summarized below:

- Current tank vapor space composition is modeled using conservative data from actual testing. The model uses a conservative ratio of airlift mixed tanks to stagnant tanks. This model produces conservative results since the ratio comprises the results of a tank with two airlifts (Kimura data) to a stagnant tank and used the same ratio to a tank with 22 airlifts (Bendixsen data).
- Future source liquid tank vapor space composition is modeled using conservative data from actual testing. The model uses either conservative values determined from airlift mixed tanks for liquid filled tanks or vapor space data from hydraulic sluicing of tanks containing solids. It is assumed that these values will not be exceeded during retrieval activities. Hydraulic sluicing data was used if the results were higher than the liquid model predicted. Otherwise, the liquid model was used.
- Future receiver tank vapor space composition is modeled using a spill height empirical model using the Archimedes number (ARCH). This model assumes that the spill height of the receiver is the same as the spill height as the source tank.

6.1 INTRODUCTION

Vapor components from the waste can be transported by several physical mechanisms that may occur simultaneously and may be either on-going processes or short term events. These mechanisms include convective mass transport, diffusion, and entrainment. Chemical reactions within the tank, including radiolytic degradation products, will tend to maintain the components in the liquid phase (i.e., volatile liquids are present and must diffuse out of the liquid. This implies that chemical reactions are producing them.) Components absorbed onto solids can also be released as a result of retrieval operations. In addition, if dry retrieval is selected, the tank vapor space may also have unknown quantities of "salt dust".

The Tank Farm vapor phase chemical composition can be estimated via direct sample results or estimated via solution composition and the physical conditions inside the tank. Since most tank samples did not include vapor phase samples, this Section focuses on methods based on the solution compositions and physical conditions inside the single and double shell tanks.

Five representative classes of material were considered during this estimation.

- Non-volatile dissolved and undissolved solid components; inorganic salts (e.g., NaNO_3), chelating compounds (e.g., EDTA), organic salts (e.g., sodium citrate), oxidized metals and other non-volatile compounds.
- Dissolved gases, e.g. NH_3 , CH_4 , and N_2O in liquids.
- Dissolved liquids in liquids, e.g., ketones, alkanes, etc.
- Vapors adsorbed on wet solids.
- Two phase liquid solutions.

Estimates of equilibrium vapor phase components, y_i , are based on:

$$y_i = f(x_i, T, pH, I) \quad (1)$$

The relation above indicates that the vapor composition (y_i) is a function of liquid composition (x_i), Temperature (T), ionic strength (I), and pH. The vapor composition may also be a function of other variables depending on the system and tank activities and are described later.

Some of the estimation methods were developed and presented within this section but were not used. They are retained for potential use in future estimates when additional data may be available or appropriate tank conditions are found to exist.

6.2 ASSUMPTIONS

The following is a list of assumptions and bases used to estimate Tank Farm vapor phase compositions. These assumptions are general in nature and apply to all of the tanks. Additional assumptions specific to a tank are included on each spreadsheet, when applicable.

- The vapor composition is estimated from the liquid composition, when no vapor analysis data are available.
- The estimates for volatiles are based on the assumption that the systems (i.e., liquid-vapor, liquid-vapor-solid) are at equilibrium. The equilibrium estimates are worse case, i.e., the predicted equal vapor phase concentrations are higher than would occur in an actively vented tank. However, estimates from mass transfer models appear low compared to sample results. A paper presented in Tucson Arizona on ammonia and other gases predicted ammonia at 34 ppm in a 241-C tank (Post 1993) but the sample result was 340 ppm.
- Henry's law constants are normally applicable to a single component in solution. However, at sufficient dilution, the influence of the other species is thought to be negligible. Therefore, although this is an unexplored area, Henry's law constants are used without adjustments for the effects of other salts but are adjusted for temperature.

- No references indicate how well the sample data represent the contents of the whole tank. Many tanks are known to have layers of differing types of waste.
- Non-volatiles were modeled via partition factor (PF or K_p) based on tank farm measurements and experimental evidence. The generation and transport of particulates are functions of many variables and no mathematical models were determined.
- Where tanks include separate solid and liquid phases, estimates are based on the liquid analyses when available.
- The retrieval method is assumed to be pumping from a liquid containing tank to a tank with the same freeboard height. Sluicing is assumed to be used for tanks containing significant amounts of solids (e.g., the SSTs). Tank vapor compositions during retrieval could be significantly higher (or lower) depending on the actual retrieval method used.
- The estimated vapor composition during retrieval consists of two estimates: the source tank and the receiver tank. In both cases the same volatile components will exist and equal the current estimates. The particle concentration differs for each case based on the data and models used in the sections that follow (i.e., a particle model for current, future source and future review) .
- Viscosities were determined assuming entire tank contents are composed of varying concentrations of Na_2CO_3 , NaOH , and NaNO_3 . Solid content of 40 volume % was used, unless otherwise known, to predict the tanks viscosity. This should err on the conservative side since most of the tanks have higher solids content than 40 volume % and the correlation used inversely proportional to viscosity. The viscosity model used has good agreement with tank farm data when actual volume % solids are used.
- The current tank state vapor estimation is actually a bounding value of the worst case numbers available for stagnant unmixed tanks. This bounding value is the worst case stagnant tank value for ^{137}Cs found by Kimura (Kimura 1987) and is a factor of 36 below the future estimate for the source tank during retrieval. If a tank is agitated (e.g., SY-101), the future source value is recommended for current estimates.
- Retrieval estimates are for singular tanks only. No attempt was made to account for intermixing of the waste, if more than one tank is retrieved at a time.
- Since an unknown reaction mechanism is producing hydrogen, ammonia, nitrogen, and nitrous oxide in 101-SY, similar reactions are probably occurring in other tanks. In addition, ammonia is probably being produced in tanks where nitrates and/or nitrites are present with aluminum and/or zinc (Cotton and Wilkinson). There was no attempt to integrate chemical reaction source terms with any of the models.

- Most of the data included total organic carbon (TOC) as gC/l. Accurate vapor predictions are not possible on unspiciated TOC data since volatilities of organics vary greatly. The values in the spreadsheets for TOC utilize a representative partition factor, but actual vapor concentrations of specific species may be very different from the estimates.
- Other specific assumptions are listed in the text that follows.

6.3 CONTRIBUTORS TO VAPOR COMPOSITION FROM LIQUIDS IN SOURCE TANK

6.3.1 Dissolved and Undissolved Non-Volatiles

The non-volatiles are expected to have very low vapor pressures. Therefore transport via sublimation is negligible. However, entrainment does occur by various mechanisms (e.g., mechanical agitation, airlifts, circulators, etc.). The vapor composition of non-volatiles is estimated via a "partition factor" which is a "mass transfer" distribution coefficient for the amount in the vapor phase for a given amount in the liquid phase:

$$y_i = PF x_i = K_i X_i \quad (2)$$

where y_i is the component in the vapor and x_i is the component in solution. It is common in Chemical Engineering practice to use K_i instead of PF where K_i is the distribution coefficient (partition factor, PF). The partition factor, K_i (a mass transfer distribution coefficient), for entrainment is dependent on the degree of surface perturbations and solution properties (e.g., viscosity, density, surface tension, ventilation velocity, etc.). Entrainment is the mechanical pick-up of small spheres of the liquid phase and their transport into the vapor phase. Usually the water in the spheres evaporates, while the dissolved component crystallizes and forms small dust particulates. The dissolved and undissolved solutes are transported, presumably at the same concentration as the liquid phase. Entrainment can be predicted by the nature and energy of the perturbations, e.g., air flow pattern and velocity. If detailed knowledge of the perturbations are not available, measurements are required for a given system.

Entrainment for non-volatile radionuclides has been measured by Kimura (Kimura 1987). The highest partition factors measured were for Tank 102-AW during airlift circulator operations. This result is expected as the energy added due to the airlift should increase the generation and transport of particulates. Kimura's worst case factors are shown in Table 6-1.

Westinghouse Hanford personnel (Bendixsen, 1990) used Kimura's work as a starting point to determine partition coefficients to develop a Process Flow Diagram for the A-702 ventilation system (which ventilates the 241-AZ and AZ Tank Farms. These tank farms include aging waste tanks equipped with 22 airlift circulators each). When data were not available, 1×10^7 , a conservative value, was used (note that they defined the partition factor inversely). The estimates assumed the conservative approach and used the highest K_i 's from the two sets of data, Kimura's and Bendixsen's. Table 6-1 summarizes the results of their work in determining distribution coefficients. Kimura's partition factor is the highest found during airlift operation.

Table 6-1. Partition Factors.

Specie	Partition Factor (Kimura with Airlift)	Partition Factor (Bendixsen) K_i^{-1}	K_i (Bendixsen)
Chloride		1.60E+08	6.25E-09
Chromium		4.50E+07	2.22E-08
^{137}Cs	1.02×10^{-9}	1.50E+08	6.67E-09
Fluoride		1.70E+08	5.88E-09
^{129}I		7.20E+04	1.39E-05
Lead		1.00E+07	1.00E-07
NO_3/NO_2		1.30E+08	7.69E-09
^{103}Ru		1.00E+07	1.00E-07
^{106}Ru	6.7×10^{-10}	6.40E+08	1.56E-09
^{125}Sb		1.00E+07	1.00E-07
^{113}Sn		1.00E+07	1.00E-07
^{90}Sr		1.50E+09	6.67E-10
Sulfate		9.00E+07	1.11E-08
Tritium (tritiated water)		6.60E+03	1.52E-04

The partition factors from Bendixsen are used to model tank farm vapor space composition during retrieval of liquids. This is based on the assumption that the magnitude of agitation during retrieval via pumping will not exceed the agitation during airlift circulation.

Kimura's data indicates that the worst case stagnant tank partition factor is a factor of 36 below the worst case partition factor during airlift operations. Therefore, partition factors for the current estimates of vapor space composition of stagnant tanks (no agitation) is taken to be a factor of 36 below the estimates during liquid tank retrieval.

6.3.2 Dissolved Gases

At equilibrium, the fugacities of each phase are equal (see notes on equilibria in Appendix C and fugacity definition in Section 8.0):

$$f_{i,vapor} = f_{i,liquid} \quad (3)$$

If the vapor is assumed an ideal solution, then

$$f_{i,vapor} = y_i P_{tot} \quad (4)$$

where y_i = the mole fraction in the vapor phase
 P_{tot} = the total system pressure
 f = fugacity

At $P = 1$ Atmosphere,

$$f_{i,vapor} = 1 - y_{H_2O} \quad (5)$$

For small concentrations of non-electrolytes, $x_i < 1$, and Henry's constant can be used as

$$H_i = \frac{1 - y_{H_2O}}{x_{i,water}} \quad (6)$$

Where H_i = Henry's constant
 y_{H_2O} = water vapor mole fraction
 $x_{i,water}$ = mole fraction of the component in water

The above derivation is from Yaws (Yaws, 1991 and Yaws, 1992a). Many Henry's law constants are included with these articles. They are used when applicable. Other data are available from Thibodeaux (Thibodeaux 1978) including NH_3 shown graphically in Figure D-1 in Appendix D as H versus pH at varying temperatures. Henry's law constants are influenced by temperature and salts as

$$H_i = f(x_i, salt, T, pH) \quad (7)$$

The presence of salts has a pronounced affect on the above equilibria. A review of the literature provided little except some experiments the Russians performed in 1970 (Ginzburg, et. al., 1970). The salt effect is shown graphically in D-2 of Appendix D. The following method was used where ammonia was identified in tank liquid samples:

- Henry's constant determined as a function of pH and temperature.
- Henry's constant increased by factor from data of chart in Figure D-2 ($\approx 50\%$).

This method is demonstrated by example for Tank B-202. The liquid analysis indicated NH_3 at 7.88 g/l which corresponds to a mole fraction of 0.00524. Henry's constant is approximately 3 corrected for temperature and pH.

The affect of salts increases Henry's constant by about 50%. This obtains a vapor mole fraction of

$$Y_i = 0.00524 * 3 * 1.5 = 0.0236 \text{ or } 23,600 \text{ ppm.} \quad (8)$$

6.3.3 Dissolved Volatile and Semi-Volatile Liquids

For the case of dissolved liquids that are partially miscible (Yaws 1992a),

$$f_{i,\text{water}} = \gamma_{i,\infty} X_{i,\text{water}} P_{i,\text{sat}} \quad (9)$$

For systems in which the component is soluble over the complete liquid range, Henry's law constant is given by:

$$H_i = \gamma_{i,\infty} P_{i,\text{sat}} \quad (10)$$

For an ideal gas phase solution, the fugacity is the partial pressure which can be equated to the liquid fugacity as:

$$f_{i,\text{water}} = \gamma_{i,\infty} X_{i,\text{water}} P_{i,\text{sat}} = y_i P \quad (11)$$

where
 $f_{i,\text{water}}$ = the fugacity of the substance in water
 $\gamma_{i,\infty}$ = the activity coefficient at infinite dilution (see notes on equilibria),
 $x_{i,\text{water}}$ = the mole fraction of the substance in water
 $P_{i,\text{sat}}$ = the pure component vapor pressure.

For systems in which the component has small partial solubility in water and for $x_i \ll 1$,

$$f_{i,\text{water}} = H_i x_{i,\text{water}} \quad (12)$$

where H_i is Henry's constant and $x_{i,\text{water}}$ is the solubility of component i in water.

Since,

$$f_{i,\text{org}} = P_{i,\text{sat}} \quad (13)$$

Then,

$$P_{i,sat} = H_i x_i^{\circ} \quad (14)$$

and,

$$H_i = \frac{P_{i,sat}}{x_i^{\circ}} \quad (15)$$

The above derivation assumes there is a second phase to derive the equation but the second phase is not required to be present.

Henry's constants from Yaws (Yaws 1991) are used in the spreadsheet calculations. These Henry's constants are adjusted to estimate the salt and temperature effects as follows:

$$H_i(\text{salt}, T) = H_i(\text{water}, T) \frac{x_{i,\text{water}, T}^{\circ}}{x_{i,\text{salt}, T}^{\circ}} \quad (16)$$

$$H_i(\text{salt}, 25^{\circ} \text{C}) = H_i(\text{water}, 25^{\circ} \text{C}) \frac{x_{i,\text{water}, 25^{\circ} \text{C}}^{\circ}}{x_{i,\text{salt}, 25^{\circ} \text{C}}^{\circ}} \quad (17)$$

Since the solubilities are not available for salt water of varying temperature, the following relation is proposed to use for corrections to Henry's law:

$$H(\text{Salt}, T) = H(25^{\circ} \text{C}, \text{No Salt}) \left(\frac{x_{i,\text{water}, 25^{\circ} \text{C}}^{\circ}}{x_{i,\text{salt}, 25^{\circ} \text{C}}^{\circ}} \right) \left(\frac{x_{i,\text{water}, 25^{\circ} \text{C}}^{\circ}}{x_{i,\text{water}, T}^{\circ}} \right) \quad (18)$$

The above solubilities for many compounds can be found in Yaws, 1992b, 1993a, 1993b, and 1994f. This relation is used to correct Henry's law for the effects of salt and temperature where data are available for the components. It was not found by experiment and is an estimate only since multi-dimensions experiments were not conducted. This method can be demonstrated by example for dodecane in SY-101. Dodecane analysis in the liquid indicates 3.4×10^{-5} g/l corresponding to a mole fraction of 3.04×10^{-9} . Henry's constant from Yaws in 1991 in pure water is 398,600 atm/mol. frac. The solubility in pure water at 25°C from Yaws 1993a is 0.0037. Using parameters from Yaws 1992b and 1993a the solubilities are 0.00613 for 131°C and 0.000193 in Salt @ 578,000 ppm. Henry's constant is estimated from these results to be

$$H(\text{salt}, T) = 398,600 * \frac{(0.0037)^2}{(0.0063 * 0.000193)} = 4.49 \times 10^6 \quad (19)$$

This method was used for applicable tanks where volatile components were identified in the liquid phase.

6.4 CONTRIBUTORS TO VAPOR COMPOSITION FROM SOLIDS IN SOURCE TANK

6.4.1 Solid Phase Non-Volatiles (Inorganics, Organic Salts, Chelators)

For analysis performed on the solid phase non-volatiles (e.g., saltcake), there are, at present, no known partition factors available. Therefore, the same partition factors are used as in the liquid case in 6.3.1, above.

The waste stored in some of the single shell tanks consists of saltcake covered by an aqueous layer or supernate. The available analytical data corresponding to these tanks were obtained from saltcake samples. Since the object of this report was to predict vapor phase composition in waste tanks, data characterizing the supernate would be more useful for current conditions.

Attempts to predict the analyte concentrations in the aqueous phase from saltcake data proved to be futile even though the ion product for a specific salt is equal to its solubility product, K_{sp} , when a saturated solution of a single salt is in equilibrium with excess solid. The tank contents consist of multiple salts and salt complexes. The data associated with the tanks in question reveal the concentration of individual ions found in the saltcake, but do not identify the chemical composition of the precipitated salts. In other words, it is not possible to distinguish which cations and anions combined to form a precipitate. The situation would be further complicated if the probable formation of complex ions and their respective dissociation constants, K_d , were taken into account. Since K_{sp} values correspond to specific neutral salts, aqueous ionic concentrations cannot be calculated from the available data.

Due to the lack of aqueous phase data, the analytical results from the saltcake samples were utilized with partition factors in the same manner as described for liquid samples to predict the vapor composition in some of the tanks (e.g., SX-102 and SX-105). This is a conservative approach since the ions associated with slightly soluble precipitates are more likely to be found in saltcake than supernatant. Therefore, the possibility of encountering a negative error is decreased.

6.4.2 Solid Phase Crystallized/Precipitated Organics (Esters, Ketones, Paraffins, etc.)

In the case where only solid phase data are available, the vapor composition of solid organics (not salts or chelators) is estimated from solid state fugacity (Thibodeaux 1979) as

$$P_i^* = x_i^* \gamma_i^* f_i^* \quad (20)$$

Where P_i^* = the pure component vapor pressure
 f_i^* = the standard state fugacity.

For pure solids, such as crystallized/precipitated organic in contact with water, Henry's law constant is provided by:

$$H_i = \frac{P_{i,sat}}{x_i^o} \quad (21)$$

Where H_i = Henry's law constant
 $P_{i,sat}$ = vapor pressure of solid, atm
 x_i^o = solubility of solid in water, mole fraction

The above can be used for pure solids or liquids but the vapor pressure must be estimated for the sub-cooled liquid when used for a solid. This can be approximated by extrapolating to the freezing or triple point using Antoine's Equation (Prausnitz 1986). The Antoine coefficients for organic compounds and solubility are available (Yaws 1992, Yaws 1993).

For mixtures, the activity coefficient and pure state fugacity must be determined to get,

$$p_i = x_i \gamma_i f_{i,s}^o \quad (22)$$

Since there are few activity data for Tank Farm systems, the previous equation is used as an estimate when only solid data analyses were performed (no liquid data available).

This method is presented but was not used as no situations of solid phase organics have been identified.

6.4.3 Volatile Organic Component Concentration from Wet Solid Wastes

Estimation of volatile organic compound vapor density from solid wastes presents a situation in which the previous VLE models are likely to be deficient. The partition factor model estimates the vapor phase concentrations from known liquid concentration and fails in situations in which there is no significant liquid waste fraction. Therefore, this model is presented for the estimation of vapor densities of volatile organic compounds from a wet solid waste source. The following model derivation is based on work by Thibodeaux 1984 (Thibodeaux 1984).

If the volatile organic waste component of interest co-exists with a wet solid waste, comprised of both organic and inorganic matter, and the loading of the chemical is known, it is possible to develop a model to estimate the vapor density of the chemical in the air-pore spaces. Component A is a volatile chemical constituent of a waste system consisting of both a wet solid and vapor phase. Since component A is distributed throughout both the wet solid and vapor, it is common to predict the vapor density through the use of distribution coefficients. The distribution coefficient between the waste and the water, K_{Aw} is:

$$K_{AW} = \frac{\omega_A}{\phi_A} = K_{OW} \omega_O \quad (23)$$

Where K_{OW} is the distribution coefficient corrected for organic matter, ω_A is the mass fraction of component A (gA/g-waste), ϕ_A is the concentration of A in the water (gA/g-water), and ω_O is the mass fraction of organic matter in the waste (g-organics/g-waste). However, the distribution coefficients are often not readily available and an alternative method must be developed. The following model will provide a means to calculate the vapor density (concentration) from commonly available physical parameters.

The distribution of the chemical species A between the water fraction and vapor space are predicted by Henry's law:

$$p_{A1} = H_A p_{A2} \quad (24)$$

where p_{A1} is the concentration of species A in air (mgA/L-air) and p_{A2} is the concentration of species A in water (mgA/L-water). The density of water over the conditions of interest is approximately 1000 g/L, and therefore the following relation between ϕ_A and p_{A2} can be obtained (using proper conversions):

$$\phi_A = \frac{p_{A2}}{10^6} \quad (25)$$

Substituting the relationship (25) into equation (23) and combining with equation (24) yields the following expression:

$$p_{A1} = 1,000,000 \omega_A \frac{H_A}{K_{OW} \omega_O} \quad (26)$$

Combining equation (26) with Chiou's (Chiou 1979) expression for the corrected distribution coefficient:

$$K_{OW} = 10,965 \gamma_A^{-0.557} \quad (27)$$

and Dilling's (Dilling 1977) result for Henry's law:

$$H_A = 16.04 \times 10^3 p_A^{\frac{M_A}{T \alpha_A}} \quad (28)$$

Where α_A is the solubility in mg/l. The following result for the vapor density (concentration) of species A is obtained:

$$p_{A1} = \frac{16.04 \times 10^3 p_A^\circ \omega_A}{10,965 T \omega_O \gamma_A^{0.443}} \quad (29)$$

where p_A° is the pure component vapor pressure associated with species A (mm Hg), M_A is the molecular weight of species A, T is the absolute temperature (K) and γ_A is the solubility of species A in water ($\mu\text{mol/L}$). If the fraction of species A is increased, eventually A is sufficiently present such that the pure component vapor density is manifest. The vapor density under such conditions is obtained from the ideal gas law as:

$$p_{A1} = p_A^\circ \frac{M_A}{RT} = 16.04 p_A^\circ \frac{M_A}{T} \quad (30)$$

where R is the universal gas constant, 0.0821 atm-L/mol-K. Equation (29) is a function of the mass fraction of species A (ω_A), while equation (28) is independent of the mass fraction of species A. Thus at some critical value of mass fraction of species A, the vapor density becomes independent of the amount of A present and behaves as a pure substance. In other words, enough of species A is present such the vapor is saturated with species A and the vapor density will no longer increase even if additional mass of species A is added to the wet solid waste. This critical value, ω_A^{sat} , is found by equating equations (29) and (30) and solving for the mass fraction of species A, which results in the following:

$$\omega_A^{\text{sat}} = 1.1 \times 10^{-5} \omega_O M_A \gamma_A^{0.443} \quad (31)$$

Thus, if $\omega_A < \omega_A^{\text{sat}}$ equation (30) is used, and if $\omega_A > \omega_A^{\text{sat}}$ equation (28) is used.

There are some limitations on this model. The model assumes: (1) the moisture content of the waste is greater than 3%, and (2) species A is present in low concentration such that $\omega_A < 0.05$ of the overall waste. The first limitation does not present a problem in the Hanford wastes as the moisture content of sludge, slurry, and saltcake wastes are typically greater than 20%. The second limitation will need to be evaluated on individual component basis but should not present a problem as the major constituents, by weight, of the Hanford waste are inorganic salts.

Equations (29) through (31) allow calculation of the vapor density of volatile waste constituents from readily available knowledge of the mass fraction of species A, the mass fraction of organic components in the waste, the molecular weight of species A, the solubility of species A in water, the waste temperature, and the vapor pressure of pure species A. All of these parameters are available from tabulated characterization data, surveillance data, or common chemical properties handbooks.

The density equations above are converted to mole fractions by Equation (32) as these were the only tanks the method applied to:

$$y_i = \frac{24.5}{MW} \rho \times 10^{-3} \quad (32)$$

This method was applied to Tanks T-111, B-202 and BX-107. The use of this model can be demonstrated by looking at undecane in Tank B-202 as an example.

Analysis of sludge samples for Tank B-202 reported 0.0403 g/l of undecane which corresponds to a mass fractions of 2.30×10^{-5} . Use of the CVD model requires computation of the vapor pressure and solubility of undecane. The vapor pressure is computed according to Yaws (Yaws 1992a). The solubility was calculated and corrected for salts as demonstrated in Section 6.3.3. The solubility, γ , was found to be 0.0018 ppm (wt.) which was converted to μmol undecane/l water, γ_A , by the following equation:

$$\gamma_A = \frac{\gamma}{M_A} * 1000 \quad (33)$$

Next the critical value of, W_a^{sat} , of undecane was computed from equation (31) to be $1.8\text{E-}06$. This value was then compared to the mass fraction of $2.3\text{E-}05$. Since the mass fraction of undecane was greater than W_a^{sat} the vapor density was computed using equation (30) as 1.97 mg/l. The value was then converted to the reported vapor composition by equation (32).

6.4.4 Vapor Estimates When Separable Organic Phase is Present

When a tank contains a separable organic phase, the unique vapor-pressure behavior of immiscible liquids is used. Each liquid exerts its own vapor pressure independently of the other (Schweitzer 1979). The total pressure is the summation of the partial pressures of the components in the separate organic liquid phase. If the separate organic phase contains components at negligible concentrations, the distribution coefficient for the primary component comprising the organic liquid phase is given by:

$$K_i = \frac{P_{i,\text{sat}}}{P_{\text{total}}} \quad (34)$$

Note: the above is equivalent to Raoult's law

where K_i = PF = distribution coefficient (partition factor)
 $P_{i,\text{sat}}$ = vapor pressure of primary component comprising liquid phase, atm
 P_{total} = total pressure, atm

If the separate organic phase is comprised of two or more species not at negligible concentrations, then the distribution coefficient for all components comprising the organic liquid phase is given by:

$$K_i = \frac{\gamma_i P_{i, sat}}{P_{total}} \quad (35)$$

Where γ_i = activity coefficient of component i in the organic phase

The activity coefficient for each component in the organic liquid phase may be determined from the UNIFAC model (Sandler, 1989). The vapor phase concentration for both cases is provide by the following equation which is valid for the equilibrium involved:

$$y_i = K_i x_i \quad (36)$$

This method is presented but was not used since the only tank that it applied to, C-103, had vapor data available.

6.5 RETRIEVAL SCENARIOS

6.5.1 Future Estimates During Retrieval (Receiver Tank) from Liquids

The concentration of volatile compounds in the source tank is not expected to change as a result of retrieval. There may be more as a result of entrainment but this is expected to be at least an order of magnitude less than the amount predicted via the VLE or CVD models, defined in Section 6.6. The PF receiver tank model is expected to predict vapor phase particulate concentrations significantly higher during retrieval than in the current "as is" condition or the source tank during retrieval. This model predicts the vapor phase particulate loading of the receiver tank not the source tank.

For liquids, retrieval is assumed to consist of pumping to a receiver tank. For solids, retrieval is assumed to consist of sluicing in conjunction with pumping to a receiver tank. The vapor phase of the receiver tank is predicted by the following K_i model.

Because of the number of unknowns during retrieval (e.g., transfer rate, transfer pipe diameter, etc.), the general K_i using the Archimedes number given by Ballinger (Ballinger et. al., 1988) is used:

$$K_i = PF = 8.9 \times 10^{-10} Arch^{0.55} \quad (37)$$

Where

$$Arch = \frac{\rho_{air}^2 H^3 g}{\mu^2} \quad (38)$$

Where ρ_{air} = the air density
 H = the spill height
 g = gravity
 μ = the liquid viscosity

This K_i was used for all tanks to predict future vapor phase components of the receiver tank. Use of the initial K_i is conservative in that the spill height decreases as the tank fills up and the K_i decreases. Also, a metal surface is first encountered whereas a cushioning liquid is present during receiver tank filling.

Without knowing the viscosity, estimates are required. The worst case would be pure water at approximately 1.0 cP, depending on temperature. Viscosity was determined based on tank contents as discussed in Appendix C.

Since the design of the receiver Tank(s) is not known, the spill height is estimated by the configuration of the source tanks. The tanks have different spill heights as shown below:

<u>Tanks</u>	<u>Height</u>
AN, AP, AW, AY, AZ, SY	48 feet
BY, S, TX, TY	37 feet
B, BX, C, T, U	30 feet
A, AX, SX,	44 feet
B, C, T, U (D = 20 ft)	26 feet

Particle size can be predicted using the Weber and Reynolds numbers, if other data becomes available (e.g. surface tension), by

$$AMMD(\mu m) = 4 \times 10^{-15} \frac{We^{3.2}}{Re^{0.25}} \quad (39)$$

Where

$$Re = \frac{\rho DV}{\mu} \quad (40)$$

and

$$We = \frac{Dv^2\rho}{\sigma g_c} \quad (41)$$

where

- ρ = the density
- σ = the liquid surface tension
- μ = the liquid viscosity
- V = the velocity
- AMMD = the average mass mean particle diameter
- D = the particle diameter (trial and error methods are used to converge on a suitable value)

6.5.2 Solids, Future Estimates During Retrieval

6.5.2.1 Mechanical Conveyance. The diameter of particles which are considered to contribute toward the reduction of air quality range from $10\text{\AA}$ (an $\text{\AA}$ is $10^{-4}\text{ }\mu\text{m}$) fog droplets to $100\text{ }\mu\text{m}$ specks of dust. Particles less than $10\text{ }\mu\text{m}$ in diameter are inhalable, and those smaller than $2.5\text{ }\mu\text{m}$ are respirable. In addition to the mechanical sources which cause the emission of particulate material into the atmosphere, it has been demonstrated that wind speeds of 12 mph or greater are capable of transporting dust from the ground surface to the air. Depending on their shapes and densities, particles less than approximately $50\text{ }\mu\text{m}$ in diameter may remain suspended in the atmosphere for relatively long intervals of time, and particulate material no greater than a few microns in size has the potential to remain permanently suspended in the airstream.

In order to estimate the emission of particulate material into the air upon the retrieval of a dry, solid tank waste caused by the utilization of excavation equipment, the following equation (Hesketh, 1983) applies:

$$E_o = 1.73 \times 10^{-3} \frac{sUK}{M^2Y} \quad (42)$$

where

- E_o = particulate emissions, lb/ton of loaded material
- s = percent silt content
- U = mean wind speed, mph
- K = emission factor, lb/ton
- M = material moisture content, % by mass
- Y = loader bucket capacity, yd^3

For lack of a better source, silt is defined by the American Association of State Highway Officials as those particles having a diameter of less than $75\text{ }\mu$. In the case of unpaved road surfaces, the silt content is generally limited to 5-15%. The emission factor, K , is an experimentally derived correction coefficient which is dependent on loading or unloading operations and the material being transferred. The factor ranges from 0.02 lb/ton for the unloading of household garbage from a truck to 8 lb/ton for the loading of grain onto a barge.

If a tank containing saltcake waste has a moisture content of 5%, the particulate emissions resulting from its retrieval with a back hoe equipped with a 0.75 yd³ bucket can be estimated by applying equation (42). For a worst case scenario, one would assume a 15% silt content and an emission factor of 8 lb/ton. Furthermore, it should be expected that the retrieval operation would not be performed when ventilation (wind) speeds exceed 12 mph (about 1000 cfm). Solving for E_p , one obtains the following:

$$E_p = 1.7 \times 10^{-3} \frac{(15)(12)(8)}{5^2(0.75)} = 0.13 \text{ lb/ton} \quad (43)$$

The method above is presented but was not used as it requires tank ventilation flowrates (which were not obtained during this project) and retrieval rates to determine vapor phase compositions.

Research associated with the generation of airborne dust from the free fall spill of a powder was conducted by Ballinger et. al. of the Pacific Northwest Laboratory (Ballinger, et. al, 1988). Their computer generated model for the formation of particulate emissions was based on two assumptions. First, the resulting pile of material grows at a constant rate as the stream of powder falls. Second, the mass of material which ultimately becomes airborne is proportional to the drag force on the bulk powder; dust originating from the impact of the powder when it strikes the ground or floor was neglected. The percentage of powder emitted into the air by a spill is estimated by the following equation if the density and viscosity of air are 1.18 kg/m³ and 1.85E-05 Pa·s, respectively (Ballinger, 1988):

$$F = 0.1064 \frac{M^{0.125} H^{2.37}}{\rho^{1.02}} \times 100 \quad (44)$$

where F = percentage of powder emitted into the air
 M = mass of powder spilled, kg
 H = spill height, m
 ρ = bulk density of powder, kg/m³

The data utilized to derive this equation was obtained from experiments conducted with powders in which 90% of their mass consisted of particles less than 6μm in diameter. A powder composed of larger particulate material will most likely generate less airborne dust during a spill than predicted by this model. Furthermore, the equation presented by Ballinger does not account for the effects of any moisture potentially present in the material.

The method above is presented but was not used as no "bone dry" powders or solids comprise any of the tanks contents. The model is retained for use during future estimates where other retrieved methods may be considered (e.g., pneumatic transport).

6.5.2.2 Hydraulic Sluicing and Pumping. A limited sluicing method is proposed for tanks having significant quantities of solids, primarily in the form of saltcake. Retrieval operations for these tanks probably requires a "mechanical mixing" technique (e.g., cutting, sawing, etc.) such as a high pressure water jet sluicing (e.g., hydraulic mining) to break up solids prior to transfer of the resulting slurry.

Sluicing has been chosen as the solids retrieval method based on the following factors:

- Sluicing remains the only demonstrated means of waste retrieval (Krieg, 1990).
- Sluicing affords a means of reducing the mass loading of respirable particulates into the tank vapor space, and hence, reduced loading in the ventilation exhaust system.

However, there are disadvantages including additional water created by sluicing that will require the same treatment as the rest of the tank contents.

Laboratory and field investigations were conducted by the Bureau of Mines to study the effectiveness of medium pressure water jets ($\leq 30,000$ psi) in controlling the generation of airborne respirable particles during the hydraulic fragmentation of coal. This resulted in a limited sluicing scenario (Lohn and Frank, 1975). The average particulate concentration for all samples was 0.60 mg/m^3 at a ventilation rate of approximately 1,000 cfm. One of the samples yielded a concentration of 2.56 mg/m^3 but this is suspected to be erroneous. If this sample is eliminated, the average is then 0.39 mg/m^3 . A Coulter Counter was used to measure the size distribution and the total particle count for all samples analyzed. Additional test parameters are presented in Table 6-2.

Table 6-2. Sluicing Test Parameters.

Test Parameter	Maximum	Average or Nominal	Minimum
Pressure, psi	30,000	----	5,000
Transverse Speed, in./min	720	----	26
Standoff Distance, inches	----	3	----
Nozzle Flowrate, gpm	10	----	----
Ventilation Flow, cfm	----	1000	----
Particle Size, μm	----	≤ 1.07 (75%)	----
Concentration, mg/m^3	2.56 (assumed spurious)	0.39 (0.6 including spurious result)	----
Nozzle Diameter, inches	----	0.06	
Number of Samples	----	51	----

Hydraulic sluicing and pumping of tanks containing saltcake, sludges, and mixtures, are likely candidates for retrieval via sluicing by high pressure water nozzles and subsequent pumping of the slurries formed. This retrieval scenario would generate particles that will be emitted to the tank vapor space. The particle loading measured during hydraulic sluicing of coal is 0.6 mg/m^3 . However, this average was derived using a potentially spurious sample result and 0.5 mg/m^3 is recommended. Therefore, this value is used for high-solids containing tanks if it results in higher loadings than the liquid model. Otherwise, the liquid model is used.

Since pumping will also occur for this method, the Archimedes model is used to predict vapor loading for the retrieval tank being pumped to. The loading is estimated as:

$$Y_i = 0.5 X_i \quad (45)$$

where X_i is the solid/sludge mass fraction of component i and Y_i is the concentration in mg/m^3 in the vapor phase.

Table 6-3 compares vapor values using the current estimate, the sluicing model, the liquid model, and the Archimeter (spill height) model for selected analytes in B-101.

Table 6-3. Model Comparison for Selected Analytes.

Analyte	Current Estimate	Sluicing	Liquid	Archimeter
Al	2.13E-04	3.82E-08	7.66E-03	1.95
Ba	2.15E-06	3.86E-04	7.74E-05	1.97E-02
Cr	1.54E-07	1.24E-04	5.55E-06	6.35E-03
Na	4.00E-05	7.19E-03	1.44E-05	3.67E-01
Pb	1.99E-06	3.56E-04	7.15E-05	1.82E-02
^{241}Am	6.45E-07	7.31E-05	2.32E-05	5.9E-03
^{137}Cs	7.82E-05	0.133	2.81E-03	10.7
$^{239/240}\text{Pu}$	3.20E-06	3.36E-04	1.15E-04	2.93E-02
$^{89/90}\text{Sr}$	2.96E-05	0.503	1.07E-03	40.6

6.6 MASTER SPREADSHEET AND EXPLANATION

Tank vapor space data are presented in spreadsheet form. The spreadsheets are organized alphabetically by Tank Farm suffix and numerically within each farm. They include data on individual elements and compounds from reported sample data, an estimate of current vapor components, an estimate of future vapor components for the source and receiver tanks, and a listing of relevant codes and regulations. The master spreadsheet is a composite listing of all components found in any tank, along with explanatory notes. If a specific component was not reported for a given tank, that line has been suppressed to save space. Vapor component estimates that exceed the regulatory limit are highlighted

All of the data located to date on past sampling efforts are summarized in spreadsheet form, by individual tank, in the attached Appendix A. The spreadsheets contain data on all species found, regardless of regulatory status, for all 177 HLW tanks at Hanford.

The following general descriptions apply to all of the spreadsheets in Appendix A. Exceptions for individual tanks are noted on each sheet.

Analyte. This column quotes the sample analysis species as reported by the labs in various documents.

Value. Average values for each component are given, if data from more than one sample are available. Data are listed as reported, if only one set of data are available. Listed data were also obtained from TRAC when no other data were available. Units are g/l and $\mu\text{Ci/l}$ for radionuclides.

Present Vapor Composition. This column tabulates the estimated vapor concentration of each component, based on the current ventilation, pressure, and temperature conditions. Most of these values are calculated, based on the composition of liquid or salt samples. Units are ppm by volume and $\mu\text{Ci/l}$ for radionuclides.

Future Vapor Composition. Data in these columns are based on stated assumptions on retrieval scenarios and related empirical models, as described previously. Units are ppm by volume and $\mu\text{Ci/l}$ for radionuclides.

Method. Method refers to the mathematical model used to arrive at the quantities listed in the spreadsheets. Whether the entries are based on an average of several sample values, the highest, or on the only data available are noted for each tank.

Vapor Sample. Direct measurement of vapor components through sampling and analysis, or through on-line monitoring.

PF. Calculated value using partition coefficients, based on stated assumptions and salt, sludge or liquid sample data. Partition coefficients are from experimental work performed by Kimura, Ballinger, and Bendixsen.

VLE. Calculated value using vapor-liquid equilibrium and Henry's Law equations, based on stated assumptions and salt or sludge data.

Steam. Data from published steam tables, based on actual or assumed temperatures and pressures.

CVD. Chemical vapor density model using Henry's Law and other correlations for wet solids.

Data Reliability. Reliability is a grade assigned to the quality of the original data to account for sample age, QA efforts, lab protocols and species analyzed. It is a subjective factor used only to indicate the quality of the data used in compiling the spreadsheets, since there is a wide variety of characterization information available.

Level 1 - (Most reliable.) Sample data are from the tank vapor space. Chain of custody, extensive QA efforts and/or EPA methods were followed. No known tank content transfers have taken place since sampling.

Level 2 - Sample data are from the tank vapor space. No discussion of formal validation or QA efforts available.

- Level 3 -** Vapor data have been estimated empirically from salt, sludge, and/or liquid sample data, and process knowledge assumptions. Liquid data have associated QA efforts.
- Level 4 -** Vapor data have been estimated empirically from salt, sludge, and/or liquid sample data, and process knowledge assumptions. Liquid data does not have associated QA efforts.
- Level 5 -** Vapor data have been estimated empirically from salt, sludge, and/or liquid sample data, and process knowledge assumptions. Liquid data is known to have questions associated with their validity (e.g. subsequent tank transfers, waste additions, etc.).
- Level 6 -** TRAC data.

Allowable. This column quotes the regulated limits of discharge for each component, with notes on exposure time limits and physical form. If more than one regulation governs release, the most restrictive is quoted. For some compounds, different limits are specified for soluble and insoluble species. Since the compounds are insoluble in air, which is basic premise in the assumptions, the insoluble limit is voted. OSHA sets many limits by compound, but the sample data are mostly based on element. In such cases, allowable concentrations are included for the primary element. For example, sodium hydroxide is regulated and is included in the list as a limit on sodium. All limits are parts per million by volume basis and $\mu\text{Ci/l}$ for radionuclides, unless otherwise stated in the spreadsheets. The cell is left blank for unregulated components.

Regulatory Citation. For the sake of clarity, regulatory citations are abbreviated in the spreadsheets. Allowable limits are the most restrictive values when a component is controlled under more than one regulation or can occur in more than one form (e.g. soluble, salt, molecular state, etc.). However, the most logical form of the speciation is assumed (e.g., F⁻ is present as a salt such as NaF or AlF₃ not as F₂ gas). The cell is left blank for unregulated components. If the concentration of a component exceeds the allowable limits, that line is highlighted. See Appendix B for a more detailed description of these regulations.

- A. 40 CFR 50, *National Primary and Secondary Ambient Air Quality Standards*. Although these standards are not directly enforceable, they are the controlling limit behind the development and implementation of limits found in PSD permits. They are also the basis for the designation of "nonattainment" areas.
- B. 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants (NESHAPs)*. Establishes emission limits for hazardous air pollutants, pursuant to Sec. 112 of the Clean Air Act, for which emission standards have been established. Although numerous substances are listed, most are regulated by emission source. The two NESHAPs that apply to tank vapor emissions are for Beryllium (Subpart J) and Radionuclides (Subpart H). Radionuclide exposures are limited to 10 mrem/yr total for all nuclides combined, not 10 mrem/yr for each. Since modeling for downwind dilution is required to determine the limits based on 10 mrem/yr, worst case derived concentration guides (DCGs) from DOE 5400.5 (DOE 1990) are used for comparison. The DCGs are less conservative than the point source values given in 40 CFR Part 61, Appendix E, Table 2.

- C. 29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances*, defines OSHA standards for limiting employee exposure to toxic substances and hazardous chemicals. State of Washington General Occupational Health Standards, WAC 296-62 (07501-07515), also defines standards. Therefore, the most stringent of the two standards is used.
 - C1. Refers to eight hour time weighted average.
 - C2. Refers to ceiling value.
 - C3. Refers to fifteen minute exposure limit.
- D. Clean Air Act, Section 112 (b), *List of Pollutants*. List contains 189 hazardous air pollutants. Emission standards have not yet been established for these pollutants although they are known to present a threat of adverse human health effects or adverse environmental effects.

The spreadsheet that follows is the Microsoft Excel®, 5.0 version, master template used for all tank calculations. The first column (A) lists all analytes that were determined from tank farm sample analysis and TRAC data. The second column (B) is the concentration in solution determined from the analysis or TRAC data. The units for liquid analysis are grams per liter (g/l) for non-radionuclides and microcuries per liter ($\mu\text{Ci/l}$) for radionuclides (listed at the bottom half of the spreadsheet). The next column (K) is a prediction of the present vapor composition based on Kimura's data (Kimura 1987) or actual sample results. This is a factor of 36 lower than the first future column for particulates based on Kimura's data for stagnant and mixed tanks. The next two columns (L and M) predict future vapor composition during retrieval for the tank itself (source) and the receiver tank. The values in the first future column (L) are from Bendixsen 1990 for liquids or the sluicing model for tanks containing significant solids (if greater than the liquid model) and VLE/CVD models where applicable. A logical function compares the sluicing model to the liquid model and returns the greatest of the two. The values in the second future column (M) were determined by the Archimedes number correlation and VLE/CVD models where applicable.

There are several hidden columns including the following:

Column C - A spare column to insert additional sample data. Cell C11 calculates the Archimedes number (ARCH).

Column D - Averages the analytes if more than one analysis is available. It includes a logical function to not include blank cells. For radionuclides, the decay function multiplies the average or value to account for radioactive decay.

Column E - Mass fractions are calculated here for non-radionuclides and are used in the sluice model.

Column F - Contains the molecular weights, gram/gram-mole.

Column G - Contains the decay constants via equation C-3 in Appendix C and data from Chart of the Nuclides (Walker, et. al., 1977) or known constants (Long, 1978).

Column H - Not Used

Column I - Calculates liquid mole fraction by using a basis of one liter and dividing a summation of the moles including water calculated by Equation C-4 in Appendix C.

Column J - Calculates the vapor mole fraction based on VLE models or K_i under non-retrieval conditions, i.e., current mode.

Tan Air Vapor Estimates

	A	B	K	L	M	N	O	P	Q
1	Sample Type			Tank:					
2	Sample Date			Contents:					
3	Sample ID			Watchlist:					
4	Properties	Value		Status:					
5	Visc., lbm/ft-s ¹	1.0E-02		Retr. Method					
6	pH	N/A							
7	Density, g/ml	1.2							
8	Temperature, °R	600							
11	Analyte ²	Value ³	Present Vapor	Future Vapor	Future Vapor	Method	Data	Allowable ⁷	Regulatory
12			Composition ⁴	Source ⁵	Receiver ⁵		Rel ⁶		Citation
13	Acetone ⁸		0.00E+00	0.00E+00	0.00E+00	VLE		7.50E+02	C1, C3
14	Ag ⁹		0.00E+00	0.00E+00	0.00E+00	PF		2.27E-03	C1
15	Al		0.00E+00	0.00E+00	0.00E+00	PF		9.06E+00	C1
16	Al (OH) ₄		0.00E+00	0.00E+00	0.00E+00	PF			
17	As		0.00E+00	0.00E+00	0.00E+00	PF		6.52E-02	C1
18	Ba		0.00E+00	0.00E+00	0.00E+00	PF		8.92E-02	C1
19	Be		0.00E+00	0.00E+00	0.00E+00	PF		1.36E-03	B (10g/24 hr), C1
20	B		0.00E+00	0.00E+00	0.00E+00	PF		2.22E+01	C1
21	Bi		0.00E+00	0.00E+00	0.00E+00	PF			
22	Br		0.00E+00	0.00E+00	0.00E+00	PF			
23	Butanedioic acid		0.00E+00	0.00E+00	0.00E+00	PF			D ¹⁰
24	2-Butanone ⁸		0.00E+00	0.00E+00	0.00E+00	VLE		2.00E+02	C1, C3, D ¹¹
25	C ₂ H ₃ O ₃ anion		0.00E+00	0.00E+00	0.00E+00	PF			
26	C ₆ H ₅ O ₇ anion		0.00E+00	0.00E+00	0.00E+00	PF			
27	Ca		0.00E+00	0.00E+00	0.00E+00	PF		6.11E+00	C1 as CaCO ₃
28	Ce		0.00E+00	0.00E+00	0.00E+00	PF			
29	Cd		0.00E+00	0.00E+00	0.00E+00	PF		5.46E-04	C1, C2, D
30	Citric Acid		0.00E+00	0.00E+00	0.00E+00	PF			
31	Cl		0.00E+00	0.00E+00	0.00E+00	PF			
32	CN		0.00E+00	0.00E+00	0.00E+00	PF		4.70E+00	C1, D
33	CO		0.00E+00	0.00E+00	0.00E+00			3.50E+01	C1
34	Co		0.00E+00	0.00E+00	0.00E+00	PF		2.07E-02	C1, D
35	CO ₃		0.00E+00	0.00E+00	0.00E+00	PF			
36	Cr		0.00E+00	0.00E+00	0.00E+00	PF		2.35E-01	C1, D

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	A	B	K	L	M	N	O	P	Q
11	Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
12									
37	CrO ₄		0.00E+00	0.00E+00	0.00E+00	PF		2.11E-02	C2
38	Cu		0.00E+00	0.00E+00	0.00E+00	PF		3.82E-01	C1
39	Cyclohexene		0.00E+00	0.00E+00	0.00E+00	VLE		3.00E+02	
40	Decane		0.00E+00	0.00E+00	0.00E+00				
41	Dibutylphthalate		0.00E+00	0.00E+00	0.00E+00	VLE		4.40E-01	C1, D
42	Diethylphthalate		0.00E+00	0.00E+00	0.00E+00	VLE			D as DEHP
43	docos-13en-oic acid		0.00E+00	0.00E+00	0.00E+00	PF			
44	Dodecane		0.00E+00	0.00E+00	0.00E+00	VLE			
45	Dy		0.00E+00	0.00E+00	0.00E+00	PF			
46	EDTA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
47	ED3A ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
48	E2DTA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
49	2-ethyl-1-hexanol ⁸		0.00E+00	0.00E+00	0.00E+00	VLE			
50	F		0.00E+00	0.00E+00	0.00E+00	PF		3.22E+00	C1
51	Fe		0.00E+00	0.00E+00	0.00E+00	PF		2.18E+00	C1
52	Fe (CN) ⁶		0.00E+00	0.00E+00	0.00E+00	PF		5.77E-01	C1 as CN, D ¹³
53	Glycolate		0.00E+00	0.00E+00	0.00E+00	PF			
54	H ₂		0.00E+00	0.00E+00	0.00E+00				
55	HEDOA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
56	HEDTA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
57	HEIDA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
58	Heptadecane		0.00E+00	0.00E+00	0.00E+00	VLE			
59	Hexadecane		0.00E+00	0.00E+00	0.00E+00	VLE			
60	Hexanedioic acid		0.00E+00	0.00E+00	0.00E+00	PF			
61	Hexanedicanoic acid		0.00E+00	0.00E+00	0.00E+00	PF			
62	Hg		0.00E+00	0.00E+00	0.00E+00	PF		6.08E-03	B, C1, C2
63	HDBD		0.00E+00	0.00E+00	0.00E+00	PF			
64	IDA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
65	K		0.00E+00	0.00E+00	0.00E+00	PF			
66	La		0.00E+00	0.00E+00	0.00E+00	PF			
67	Li		0.00E+00	0.00E+00	0.00E+00	PF			

Tank Farm Vapor Estimates

	A	B	K	L	M	N	O	P	Q
11	Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
68	MeEDD'A ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
69	MeHEDD'A ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
70	Methane		0.00E+00	0.00E+00	0.00E+00	VLE			
71	Mg		0.00E+00	0.00E+00	0.00E+00	PF		1.02E+01	C1
72	Mn		0.00E+00	0.00E+00	0.00E+00	PF		2.22E+00	C2 , D
73	Mo		0.00E+00	0.00E+00	0.00E+00	PF		2.55E+00	C1
74	MTA		0.00E+00	0.00E+00	0.00E+00	PF			
75	Na		0.00E+00	0.00E+00	0.00E+00	PF		2.13E+00	C2 as NaOH
76	Nd		0.00E+00	0.00E+00	0.00E+00	PF			
77	NH ₃ ^{8,14}		0.00E+00	0.00E+00	0.00E+00	VLE		2.50E+01	C1
78	Ni		0.00E+00	0.00E+00	0.00E+00	PF		4.14E-02	C1, D
79	Nonanedioic acid		0.00E+00	0.00E+00	0.00E+00	PF			
80	N ₂ O		0.00E+00	0.00E+00	0.00E+00			3.00E+01	C1
81	NO ₂		0.00E+00	0.00E+00	0.00E+00	PF			
82	NO ₃		0.00E+00	0.00E+00	0.00E+00	PF			
83	Np		0.00E+00	0.00E+00	0.00E+00	PF			
84	NTA ¹²		0.00E+00	0.00E+00	0.00E+00	PF			
85	OH		0.00E+00	0.00E+00	0.00E+00	PF		2.88E+00	C2 as NaOH
86	Oxalate		0.00E+00	0.00E+00	0.00E+00	PF			
87	P		0.00E+00	0.00E+00	0.00E+00	PF			
88	Pb		0.00E+00	0.00E+00	0.00E+00	PF		5.91E-03	C1, A, D
89	Pd		0.00E+00	0.00E+00	0.00E+00	PF			
90	Pentadecane		0.00E+00	0.00E+00	0.00E+00	VLE			
91	Pentanedioic acid		0.00E+00	0.00E+00	0.00E+00	PF			
92	Phthalic acid		0.00E+00	0.00E+00	0.00E+00	PF			D as PA
93	PO ₄		0.00E+00	0.00E+00	0.00E+00	PF			
94	Pu		0.00E+00	0.00E+00	0.00E+00	PF			
95	Re		0.00E+00	0.00E+00	0.00E+00	PF			
96	Rh		0.00E+00	0.00E+00	0.00E+00	PF		2.37E-04	C1
97	Ru		0.00E+00	0.00E+00	0.00E+00	PF			
98	Sb		0.00E+00	0.00E+00	0.00E+00	PF		1.00E-01	C1, D
99	Se		0.00E+00	0.00E+00	0.00E+00	PF		6.19E-02	C1, D
100	Si		0.00E+00	0.00E+00	0.00E+00	PF		8.73E+00	C1

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Tank Farm Vapor Estimates

	A	B	K	L	M	N	O	P	Q
11	Analyte ²	Value ³	Present Vapor	Future Vapor	Future Vapor	Method	Data	Allowable ⁷	Regulatory
12			Composition ⁴	Source ⁵	Receiver ⁵		Rel ⁶		Citation
101	SiO ₃		0.00E+00	0.00E+00	0.00E+00	PF		1.93E+00	C1 (Amorphous)
102	SO ₄		0.00E+00	0.00E+00	0.00E+00	PF			
103	Sn		0.00E+00	0.00E+00	0.00E+00	PF		4.11E-01	C1
104	Sr		0.00E+00	0.00E+00	0.00E+00	PF			
105	TOC gC/l ¹⁵		0.00E+00	0.00E+00	0.00E+00	PF			
106	Ta		0.00E+00	0.00E+00	0.00E+00	PF		6.75E-01	C1
107	Te		0.00E+00	0.00E+00	0.00E+00	PF		1.91E-02	C1
108	Tetradecane		0.00E+00	0.00E+00	0.00E+00	VLE			
109	Th		0.00E+00	0.00E+00	0.00E+00	PF			
110	Ti		0.00E+00	0.00E+00	0.00E+00	PF			
111	Tl		0.00E+00	0.00E+00	0.00E+00	PF		1.20E-02	C1
112	Tridecane		0.00E+00	0.00E+00	0.00E+00	VLE			
113	TBP		0.00E+00	0.00E+00	0.00E+00			2.00E-01	C1
114	U, g/l		0.00E+00	0.00E+00	0.00E+00	PF		5.14E-03	C1
115	U 234, g/l		0.00E+00	0.00E+00	0.00E+00	PF			
116	U 235, g/l		0.00E+00	0.00E+00	0.00E+00	PF			
117	U 238, g/l		0.00E+00	0.00E+00	0.00E+00	PF			
118	Undecane		0.00E+00	0.00E+00	0.00E+00	VLE			
119	V		0.00E+00	0.00E+00	0.00E+00	PF		2.40E-02	C1 (as V ₂ O ₅)
120	Zn		0.00E+00	0.00E+00	0.00E+00	PF			
121	Zr		0.00E+00	0.00E+00	0.00E+00	PF		1.34E+00	C1, C3
122	ZrO		0.00E+00	0.00E+00	0.00E+00	PF		1.14E+00	C1 as Zr
123	Am 241 ¹⁶		0.00E+00	0.00E+00	0.00E+00	PF		2.0E-11	B ¹⁷
124	Am 242m		0.00E+00	0.00E+00	0.00E+00	PF		2.0E-11	B
125	Am 243		0.00E+00	0.00E+00	0.00E+00	PF		2.0E-11	B
126	C 14		0.00E+00	0.00E+00	0.00E+00	PF		6.0E-06	B
127	Cm 242		0.00E+00	0.00E+00	0.00E+00	PF		7.0E-10	B
128	Cm 244		0.00E+00	0.00E+00	0.00E+00	PF		4.0E-11	B
129	Cs 137		0.00E+00	0.00E+00	0.00E+00	PF		4.0E-07	B
130	CePr 144		0.00E+00	0.00E+00	0.00E+00	PF		3.0E-08	B
131	Co 60		0.00E+00	0.00E+00	0.00E+00	PF		8.0E-08	B
132	Cs 134		0.00E+00	0.00E+00	0.00E+00	PF		4.0E-07	B
133	Eu 154		0.00E+00	0.00E+00	0.00E+00	PF		5.0E-08	B
134	Eu 155		0.00E+00	0.00E+00	0.00E+00	PF		3.0E-07	B

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Tank Farm Vapor Estimates

	A	B	K	L	M	N	O	P	Q
11	Analyte ²	Value ³	Present Vapor	Future Vapor	Future Vapor	Method	Data	Allowable ⁷	Regulatory
12			Composition ⁴	Source ⁵	Receiver ⁵		Rel ⁶		Citation
135	H 3		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-04	B
136	I 129		0.00E+00	0.00E+00	0.00E+00	PF		7.0E-08	B
137	Nb 95		0.00E+00	0.00E+00	0.00E+00	PF		3.0E-06	B
138	Np 237		0.00E+00	0.00E+00	0.00E+00	PF		1.2E-12	B
139	Pm 147		0.00E+00	0.00E+00	0.00E+00	PF		1.1E-08	B
140	Pu 238		0.00E+00	0.00E+00	0.00E+00	PF		2.1E-12	B
141	Pu 239/240		0.00E+00	0.00E+00	0.00E+00	PF		2.0E-12	B
142	Pu 241		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-10	B
143	Ra 226		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-09	B
144	RuRh 106		0.00E+00	0.00E+00	0.00E+00	PF		3.0E-08	B
145	Se 79		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-06	B
146	Sn 113		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-06	B
147	Sr 89/90		0.00E+00	0.00E+00	0.00E+00	PF		9.0E-09	B
148	Sb 125		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-06	B
149	Tc 99		0.00E+00	0.00E+00	0.00E+00	PF		2.0E-06	B
150	U 234		0.00E+00	0.00E+00	0.00E+00	PF		9.0E-11	B
151	U 235		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-10	B
152	U 238		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-10	B
153	Y 90		0.00E+00	0.00E+00	0.00E+00	PF		1.0E-06	B
154	Zr 95		0.00E+00	0.00E+00	0.00E+00	PF		6.0E-07	B
155	water		1.20E+05	1.20E+05	1.20E+05	Stm Tabl	1		

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Tank Farm Vapor Estimates

Cell: A5
Note: 1. When viscosity data unavailable, estimated assuming sodium carbonate, sodium hydroxide, sodium carbonate, and solids content.

Cell: A11
Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.

Cell: B11
Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.

Cell: K11
Note: 4. Estimated current vapor composition ppm by volume and microcurie/l for radionuclides.

Cell: M11
Note: 5. Estimated future vapor composition based on stated retrieval model.

Cell: O11
Note: 6. Reliability statement.

Cell: P11
Note: 7. Allowable concentration in ppm by volume.

Cell: A13
Note: 8. Henry's constants for butanone not corrected for salt. Acetone and 2-ethyl-1-hexanol not corrected for salt or temperature. Approximated for dioctylphthalate.

Cell: A14
Note: 9. TRAC data used to estimate concentration.

Cell: Q23
Note: 10. As maleic anhydride.

Cell: Q24
Note: 11. As methylethyl ketone.

Cell: A46
Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).

Cell: Q52
Note: 13. As cyanide compounds.

Tank Vapor Estimates

Cell: A77

Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.

Cell: A105

Note: 15. Sample data reported only unspciated total organic carbon. Some species may be volatile.

Cell: A123

Note: 16. Radionuclides decayed to current year (i.e., 1994 - 1987 = 7).

Cell: P123

Note: 17. Allowable data based on DCG's in microcurie/l.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Generally, the estimates show that most of the non-radioactive analytes do not exceed limits nor will they during retrieval operations. There are some exceptions, e.g., sodium exceeds limits in most cases for retrieval tanks during retrieval assuming that it exists all as NaOH. The radionuclides exceed limits in most cases for the receiver tank during retrieval, for some of the source tanks during retrieval, and some of the tanks in the current configuration.

Tank characterization work is in progress by various groups including Los Alamos Technical Associates, Inc. (LATA). It is recommended that this document be revised as new data becomes available, especially vapor sample data. The current tank vapor space identified as "present vapor composition" will most likely change if mixers are installed in tanks. If this occurs, the data identified as "future vapor source" (liquid model) is recommended to be used for the current status. This document should also be revised after retrieval techniques are fully defined, if the retrieval techniques are not liquid pumping and sluicing/pumping of solids, as assumed. Transport models for vapors (e.g., NH_3) may be more accurate if the model is sound and the velocity distribution within the vapor spaces are known. However, previous attempts (Post 1993) underestimate concentration. Therefore, the equilibrium assumption is recommended on future characterization as tank vapor space model to obtain the upper bound.

8.0 DEFINITIONS

- Activity** Activity is the ratio of a components fugacity to its fugacity in the standard state. For ideal solutions, the activity is identical to the components mole fraction. The activity coefficient is a ratio of activity to mole fraction and is useful in predicting deviation from ideal solution behavior.
- Entrainment.** Entrainment is the physical process of a moving fluid or other perturbation generating and transporting particulate matter (aerosols). The driving force can be either forced or natural convection, or the induced air flow of a ventilation system. Entrainment, in the form of dust, could be a major factor governing ventilation system size requirements when retrieval begins, depending on the retrieval technique.
- Fugacity.** From Latin, fugacity is a tendency to escape or flee. In thermodynamics, fugacity is analogous to pressure and partial pressure and replaces pressure in non-ideal gases using the same equations. Fugacity is related to the partial molar Gibbs free energy or chemical potential. Fugacity is useful in equilibrium phase relationships, especially for mixtures.
- Henry's Law.** The ordinary statement of this law is that *the equilibrium value of the mole fraction of gas dissolved in a liquid is directly proportional to the partial pressure of that gas above the liquid surface* (Hougen, et. al., 1954). In this report, it is applied to the behavior of very dilute solutions of dissolved gases and liquids. It is most accurate when the mole fraction of the solvent (e.g. water) is near one, and at relatively low pressures. Extremely soluble gases generally react with the solvent and only the free component follows Henry's Law. Many of the Henry's Law constants and correction for salts and temperature were obtained from Dr. Carl Yaws at Lamar University.
- Ideal Solution.** An ideal solution is defined as a solution in which the fugacity of each component is equal to the product of its mole fraction and the fugacity of the pure component at the same temperature, pressure, and state of aggregation as the solution (Hougen, et. al., 1962). An ideal liquid solution is such that when one component is mixed with another, mutual solubility results, no chemical reactions occur, molecular diameters are the same, and that the intermolecular forces of attraction and repulsion are the same between unlike as between like molecules. At low pressures, gaseous mixtures exhibit nearly ideal solution behavior.
- Partition Factor.** A partition factor, also known as a partition coefficient or distribution coefficient, is the ratio of the mole fraction of a given non-volatile component in a vapor to its mole fraction in the parent solid or liquid (the waste in the present case). The partition factors are "mass transfer" distribution coefficients in that transport properties are normally used to obtain them theoretically. The particle partition coefficient values used here for current tank vapor estimates were experimentally determined by Kimura (1987) and Bendixsen (1990) at Hanford.

Vapor.

The gaseous state of an element or compound below its critical temperature determined by the physical properties of the component, temperature, pressure and in-tank chemistry. In the broader sense used in this report, it also includes any airborne non-particulate contaminant components of dust, mists, fumes, and smoke.

**Vapor-Liquid
Equilibria**

All materials have a definite vapor pressure. Vaporization occurs from a liquid when the inter-molecular forces of the liquid phase are overcome and the molecules of the substance become a vapor. These molecules then transport across the liquid-gas interface into the gas phase. Some of the molecules condense and transport back across the interface into the liquid. At equilibrium, the rate vaporizing equals the rate condensing. This is known as vapor-liquid equilibria.

9.0 REFERENCES

- Ballinger, M.Y., et. al., 1988, *Methods for Describing Airborne Fractions of Free Fall Spills of Powders and Liquids*, NUREG/CR-4997, PNL-6300, January, 1988.
- Bendixsen, R. B., *"702-A Ventilation System Flowsheets,"* WHC-SD-WM-TA-020, Westinghouse Hanford Company, Richland, Washington, April 1990.
- Chiou, C. T., Peters, L. T., Freed, V. H., 1979, *Concept of Soil Water Equilibria for Nonionic Organic Compounds*, Science, 206 (16), November, 1979: 831-832.
- Cotton, F. Albert & Geoffrey Wilkinson, *Advanced Inorganic Chemistry*, Fifth Ed., John Wiley & Sons, 1988.
- Dilling, W. L., 1977, *Interphase Transfer Processes II Evaporation Rates of Chloro Methanes, Ethanes, Ethylenes, Propanes, and Propylenes from Dilute Aqueous Solutions: Comparison with Theoretical Predictions*, Environ. Sci. Tech., 11 (4): 405-409.
- DOE 1990, Chapter III, *Derived Concentration Guides For Air And Water*, DOE 5400.5, 2/8/90.
- Ginzburg, D.M., et. al., 1972, *The System NaCl-NH₄Cl-NH₃-CO₂-H₂O*, State Scientific-Research and Design Institute of Fundamental Chemistry. Translated from Zhurnal Prikladnoi Khimii, Vol. 45, No. 8, August, 1972.
- Hanlon, B.M., *"Tank Farm Surveillance and Waste Status Summary Report for June 1993,"* WHC-EP-0182-63, October, 1993.
- Hesketh, H.E., et. al., 1983, *Fugitive Emissions and Controls*, Ann Arbor Science Publishers, 1983.
- Hougen, 1954, O.A., Watson, K.M., Ragatz, R.A., *Chemical Process Principles, Part I, Material and Energy Balances*, John Wiley & Sons, 22nd ed., April 1962.
- Hougen, 1962, O.A., Watson, K.M., Ragatz, R.A., *Chemical Process Principles, Part II, Thermodynamics*, John Wiley & Sons, 22nd ed., April 1962.
- Kimura, R.T. & D.W Lindsey, 1987, *"Characterization of Airborne Radionuclide Particulates in Ventilated Liquid Waste Tanks,"* RHO-RE-SA-216, Rockwell Hanford Operations, June 1987.
- Kreig, S.A., et. al. 1990, *Single-Shell Tank Waste Retrieval Study*, WHC-EP-0352, Westinghouse Hanford Company, Richland, WA, 1990.
- Lohn, P.D., and Frank, J.N., 1975, *Airborne Respirable Dust Generated During Cutting of Coal With Water Jets*, Bureau of Mines, Twin Cities Mining Research Center, St. Paul, Minnesota, Report of Investigations 8014, 1975.

- Long, J.T., 1978, *Engineering for Nuclear Fuel Reprocessing*, American Nuclear Society, 1978.
- Los Alamos Technical Associates, Inc., "An Engineering Review of Tank Farm Ventilation Systems", WH33200, March 1993.
- Moran, Michael J. & Howard Shapiro, *Fundamentals of Engineering Thermodynamics*, John Wiley & Sons, 1988.
- Mortimer, Charles E., *Chemistry, A Conceptual Approach*, Third Ed., D. Van Nostrand, 1975.
- Osborne, J. W., "Program Plan for the Resolution of Tank Vapor Issues," WHC-EP-0562, Westinghouse Hanford Company, Richland, Washington, September, 1992.
- Oscarson, Eric E. & Leslie A. Tusler, "Radionuclide and Chemical Inventories for the Double Shell Tanks," WHC-SD-WM-TI-543, Rev. 1, Westinghouse Hanford Company, Richland Washington, July 30, 1993.
- OSHA, 1980, *Industrial Hygiene Technical Manual*, U.S. Department of Labor, Volume VI, OSHA 3058, 1980.
- Post, R.G., 1993, *Proceedings of Waste Management*, Waste Management Symposia, Inc., February/March 1993.
- Prausnitz, 1986, J.M., Lichtenthaler, R.N., Azevedo, E.G., *Molecular Thermodynamics of Fluid-Phase Equilibria*, Prentice-Hall, 1986.
- Perry & Chilton, 1973, *Chemical Engineers' Handbook*, 5th ed., McGraw-Hill, 1973.
- Perry & Green, 1984, *Chemical Engineers' Handbook*, 6th ed., McGraw-Hill, 1984.
- Sandler, 1989, S.I., *Chemical and Engineering Thermodynamics*, 2nd Ed., Wiley Series in Chemical Engineering.
- Schweitzer, P. A., 1979, *Handbook of Separation Techniques for Chemical Engineers*, McGraw-Hill 1979.
- Thibodeaux, Louis J., 1979, *Chemodynamics: Environmental Movement of Chemicals in Air, Water, and Soil*, John Wiley & Sons, 1979.
- Walker, F.W., et. al., 1977, *Chart of the Nuclides*, 12th Edition, General Electric, 1977.
- Wastren, Inc., "Radionuclide and Chemical Inventories for the Single Shell Tanks," WHC-SD-WM-TI-565, Rev. 1, Westinghouse Hanford Company, Richland, Washington, July 30, 1993.
- Yaws, 1991, C.L., *Henry's Law Constants for 362 Organic Compounds in Water*, Chemical Engineering, November 1991.
- Yaws, 1992a, C.L., *Thermodynamic and Physical Property Data*, Gulf Publishing, 1992.

Yaws, 1992b, C.L., *Hydrocarbon Solubility in Salt Water*, Pollution Engineering, September 15, 1992

Yaws, 1993a, C.L., *Water Solubility Data for 151 Hydrocarbons*, Chemical Engineering, February 1993.

Yaws, 1993b, C.L., *The Water Solubility of Napthenes*, Chemical Engineering, October 1993.

Yaws 1994, *Solubility of Hydrocarbons in Salt Water*, Pollution Engineering, January 1994.

10.0 ANNOTATED BIBLIOGRAPHY

Event Fact Sheet No. TFS&O-EFS-87-059, Westinghouse Hanford Company, November 9, 1987.

Vent and Balance personnel were performing a DOP Test on filters in the primary ventilation system at the SY Tank Farm Exhauster. An operator smelled ammonia vapors in the air monitor enclosure. Air lancing activities in 101-SY had recently been increased to three times per week. The sheet noted that ammonia vapors had not previously been detected in that area. Industrial Hygiene and Safety sampling had the following results:

ammonia 100 ppm discharged from the exhauster stack
ammonia 50 ppm and 70 ppm discharged from air sample pumps.

Event Fact Sheet No. TFS&O-EHS-87-063, Westinghouse Hanford Company, November 16, 1987.

On September 10, 1987 calculations were performed showing tritium emissions at 702-A over the ACLs when the 401-A Condensers operated over 74°F. Operation of the condensers at the time of the fact sheet was about 90°F and the tritium value was calculated to be two times the ACL, or 4E-06 $\mu\text{Ci/ml}$.

Event Fact Sheet No. TF-EFS-90-015, Westinghouse Hanford Company, February 20, 1990.

Exhauster flex tubing was being installed in a greenhouse on Riser R-2 of Tank 105-A. The air space in the greenhouse over the riser was sampled with detections as follow:

hydrazine	0.5 ppm
ammonia	<0.5 ppm
trichloroethylene	1.0 ppm
hydrogen cyanide	<0.5 ppm
nitrogen dioxide	<0.1 ppm

Letter, C. J. Geier, WHC, to R. D. Izatt, USDOE-RL, "Maps of Registered Radioactive Air Emissions Points at Tank Farm Facilities," Correspondence No. 9251792D, March 20, 1992.

This letter has an attachment that lists all tank farm emissions points that are registered with the Washington Department of Health. The list includes the individual exhausters in the single and double shell tank farms, as well as the evaporator, railcar unloading facility, and the exhausters at double-contained receiver tanks 244-A, 244-BX, 244-S and 244-TX. Schematics and photographs are included, for some facilities.

Letter, Marchetti, S., Director Westinghouse Tank Farm Project, To Mr. R. E. Gerton, Project Manager, Department of Energy Richland Tank Farm Project Office, "SY Tank Farm Ventilation Upgrade Strategy," July 29, 1991.

This letter contains proposed modifications to the SY farm exhaust system. Inlet filters, spark proof fans, isolation of tank 102-SY with vent via portable exhauster (pending a risk assessment), a hydrogen monitor for 103-SY, and use of a parallel portable exhauster are discussed.

Letter, Wagoner, John D., Manager, Department of Energy, To Mr. T. M. Anderson, President, Westinghouse Hanford Company, "Response to the Department of Energy, Richland Field Office (RL) Tank Farm Type B Investigation into Noxious Vapors," No. 92-TOD-171, December 11, 1992.

In this letter, Mr. Wagoner indicates that the next bi-monthly status report for the noxious vapor investigation should be provided by February 1, 1993, with succeeding reports every two months thereafter.

Occurrence Report WHC-TF-1993-0012, "Personnel Observed Ammonia-Like Odors After Removing a 1" Drain Plug from an Air Lance Receiver," February 6, 1993.

This report documents levels of ammonia and organic vapors in the air in the one inch drain line in SY tank farm.

Occurrence Report WHC-TF-1993-0055-R1, "Operator Experienced Symptoms (Headache) Due to Unknown Odor While Performing Respiratory Posting of 101-A Breather Filter Exclusion Zone," October 19, 1993.

This report documents levels of ammonia in the vapor inside the breather filters of 5 ppm for Tank 106-A, and 20 ppm for Tank 101-A. Results were from Draeger tubes used on June 17, 1993.

Occurrence Report WHC-TF-1993-0081, "Personnel Smelled Unusual Odors While Performing Liquid Observation Well (LOW) Readings at Single-Shell Tank Farm 241-TX," September 17, 1993.

This report indicates that "high levels of ammonia and detectable carbon monoxide only" were found in the vicinity of the 109-TX breather filter. Concentrations and detection methods were not given.

Occurrence Report WHC-TF-1993-0105, "Discovery of Methane Gas in Waste Tank 241-SY-101 Found When Reviewing Data from Event I at Levels of 1000 ppm," December 17, 1993.

This report documents results of 1000 ppm methane from LANL.

PNL-7658, Alleman, R. T., Z. I. Antoniak, J. R. Friley, C. E. Haines, L. M. Liljegren & S. Somasundaram, **"Collection and Analysis of Existing Data for Waste Tank Mechanistic Analysis - Progress Report, December 1990,"** December 1991.

This report contains data for hydrogen in the vapor space of Tank 101-SY for the October 24, 1990 gas release event.

PNL-7687, Lokken, R. O., R. D. Scheele, D. M. Strachan & A. P. Toste, **"Hanford Tank Safety Project - Complex Concentrate Pretreatment FY 1986 Progress Report,"** September 1986.

This report contains data from analysis of organic complex concentrate waste stored in Tank 107-AN. Results are reported in grams of carbon per liter. Density is not reported.

PNL-7716, Swanson, J. L., **"Initial Studies of Pretreatment Methods for Neutralized Cladding Removal Waste (NCRW) Sludge,"** June 1991.

This document is a collection of four progress reports. It contains Pu and Am data for composite samples taken from Tanks 103-AW and 105-AW, with some cation data for 105-AW.

PNL-7953, Gillespie, B. M., R. W. Stromatt, G. A. Ross & E. A. Hoope, **"Hydrogen Safety Project Chemical Analysis Support Task -Window "C" Volatile Organic Analysis,"** January 1992.

This document contains analytical results for volatile organics in samples from Tank 101-SY. Chain of custody protocols were followed. The researchers noted that the samples arrived in inappropriate containers with too much head space.

PNL-8124, Ashby, E. C., C. Jonah, D. Meisel, L. R. Pederson & D. M. Strachan, **"Gas Generation and Retention in Tank 101-SY: A Summary of Laboratory Studies, Tank Data, and Information Needs,"** June 1992.

This report contains vapor composition data from the October 24, 1990 gas release event from Tank 101-SY.

PNL-8169, Bryan, S. A., L. R. Pederson, J. L. Ryan, R. D. Scheele & J. M. Tingey, **"Slurry Growth, Gas Retention, and Flammable Gas Generation by Hanford Radioactive Waste Tanks: Synthetic Waste Studies, FY 1991,"** August 1992.

This report contains sample data for Tanks 101-SY, 103-SY, 103-AN and 105-AN. It also contains TOC data for Tanks 101-A, 101-AX, 103-AX, 111-S, 101-SX, 102-SX, 104-SX, 103-U and 105-U.

PNL-8338, Jones, T. E., J. A. Campbell, E. W. Hoppe, L. R. Greenwood & B. M. Gillespie, "Hydrogen Safety Project Chemical Analysis Support Task - Window "E" Analyses," September 1992.

This report, about 1000 pages in length, contains analytical results, quality assurance, and chain of custody information for waste samples taken from Tank 101-SY. It appears most of the samples are sludge, however, other than the chain of custody records, there is no sample history or information about what locations in the tank were sampled. Results include some radionuclides, metals, complexants and semivolatile organics.

PNL-8339, Gerber, M. A., L. L. Burger, D. A. Nelson, J. L. Ryan & R. L. Zollars, "Assessment of Concentration Mechanisms for Organic Wastes in Underground Storage Tanks at Hanford," September, 1992.

This report contains a discussion of mechanisms for decomposition of organics in the waste tanks. Volatile organics in the Tank 103-C vapor space are identified. (The techniques used to gather these vapor data have since been called into questions.)

PNL-SA-19458, Tingey, J. M., M. L. Elliot, D. E. Larson & E. V. Morrey, "Characterization and Vitrification of Hanford Radioactive High Level Wastes," May 1991.

This article contains analytical data from a homogenized core sample taken from Tank 101-AZ. The sample date is not given.

W-030-P3, Kaiser Engineers Hanford Company, "Procurement Specification - Primary Ventilation Air Clean-Up Trains," June 7, 1993.

This specification contains lists of concentrations of radionuclides, organic contaminants, water and ammonia expected to be present upstream of the air clean up train. It does not contain or reference sample data.

WHC-EP-0562, Osborne, J. W., "Program Plan for the Resolution of Tank Vapor Issues," September, 1992.

This program plan describes a sampling and analysis effort being made to resolve questions about tank farm vapors, including characterization and determination of flammability. The plan focuses on testing several sample techniques on Tank 103-C, which has a floating organic layer. The techniques developed there are expected to be useful for investigating other tanks as well. Results are expected to support the identification of solutions to vapor problems.

WHC-MR-0142 DRAFT, Carothers, K. G., "Fire and Explosion Potential of Gases and Vapors in Hanford Site Underground Single-Shell Tanks," May 1990.

This document contains an extensive discussion of organics and slurry growth in the tank farms. Its references include listings of chemicals used in Hanford processing plants, and vapor data for C-Farm tanks.

WHC-MR-0250, Neilsen, E. H., "Waste Tank 241-A-105 Supporting Documentation - Miscellaneous Reports, Letters, Memoranda, and Data," July 1991.

This report contains a set of references that were used to support a task team investigation of Tank 105-A. It contains some operating data (temperatures, circulator pressures), but refers to WHC-EP-0409 for technical data.

WHC-MR-0402, McKinney, S. G., "Tank 241-T-111 Core 31 and Core 33 Summary Results," December 1992.

This document describes core samples taken from 111-T. The samples were sent to Battelle for analysis, and the report describes the analyses that were requested. While there was a QA plan, the samples "exceeded the 6 month holding time limit." No data are presented in this report.

WHC-SD-W030-PMP-001, Colosi, K. A., "Project Management Plan, W-030 Tank Farm Ventilation Upgrade," Rev. 1, September 29, 1993.

This document briefly describes plans to replace the 702-A ventilation system, which serves 241-AY and 241-AZ Tank farms. A discussion of regulatory notifications is included.

WHC-SD-W030-RD-001, Rev. 2A, McDaniel, L. B., "Supplemental Definition of Requirements - Tank Farm Ventilation Upgrade Project W-030," September 21, 1993.

This document provides a composition for process condensate from the 702-A ventilation system (AY and AZ Tanks). This stream has been routed to the 241-AN Tank Farm. It also lists vapor concentrations for the exhaust header. One of the ECNs to this report deletes plans for an NOx monitor in the system replacing 702-A due to a lack of regulatory or operations requirement for one.

WHC-SD-W320-FDC-001, Bailey, John W., "Project W-320, Tank 241-C-106 Sluicing, Functional Design Criteria," November 22, 1993.

This document contains core sample results and a preliminary air stream characterization for Tank 106-C. The reference given for the core sample data is SD-RE-TI-205. Tank 106-C is to be sluiced to one of the AY farm tanks. Process condensate from AY and AZ farms has been transferred to AN farm.

WHC-SD-WM-CSDD-006, Coony, F. M., "Tank Characterization Database Software Detailed Design," October 2, 1992.

This document contains a description of a software system that will be used to evaluate tank contents. It does not contain any characterization data.

WHC-SD-WM-EV-064, Adler, J. G., "PUREX Liquid Radioactive Waste Characterization Sampling Plan," March 6, 1991.

This plan outlines samples and analyses to be performed for waste sent from PUREX to the tank farms. It includes a discussion of sampling limitations versus requirements of EPA SW-846, including head space for volatile organic analyses.

WHC-SD-WM-OCD-015, Carothers, K G., "Tank Farm Waste Compatibility Program," November 1, 1991.

This document describes in general the various waste types found in single and double-shell tanks, and explains how the wastes will be controlled so that incompatible wastes will not be mixed together. The purpose of the controls is to avoid creating new unreviewed safety questions, and to prepare for future waste processing. With a few exceptions, samples are required before wastes are combined. Analyses will include inorganics, ammonia, and total organic carbon.

WHC-SD-WM-TA-020, Bendixsen, R. B., "702-A Ventilation System Flowsheet," April 4, 1990.

This document contains flowsheet information associated with the 702-A ventilation system, which serves the 241-AZ and 241-AY Tank Farms. The flowsheet includes distribution coefficients for waste versus tank vapor and waste versus process condensate. Process condensate from the aging waste tanks in AZ Farm has been stored in the 241-AN Tank Farm.

WHC-SD-WM-TI-543, Rev. 1, Van Vleet, R. J., "Radionuclide and Chemical Inventories for the Double Shell Tanks," August 10, 1993.

This document contains composition data based on sample information for the double shell tanks. Graphical presentations of tank fill histories are also given. In some cases, tanks have received new waste or been emptied after the samples were taken.

WHC-SD-WM-TI-565, Rev. 1, Van Vleet, R. J., "Radionuclide and Chemical Inventories for the Single Shell Tanks," August 10, 1993.

This document contains composition data based on sample information for the single shell tanks.

WHC-SD-WM-TP-147, Gleckler, B. P., "Evaluating Airborne Radionuclide Concentrations in the Tank Farms," Rev. 0-A, May 6, 1993.

This document describes a study to be performed to determine if a potential health hazard exists due to resuspension of radioactive surface contamination in the tank farms. (The limited data collected to date do not indicate that there is such a hazard.) The scope does not include tank vapors or chemicals. The document contains figures for A, BX, and BY Farms showing areas of surface contamination.

WHC-SD-WM-TPP-033, Sasaki, L. M., and McBeath, R. S., "Tank Farm Waste Characterization Technology Program Plan," Rev. 2, April 20, 1988

This program plan outlines technology development efforts needed to support tank waste characterization. Vapor sampling and analysis were not addressed. The plan indicated that DCRT 244-TX was sampled in September 1986, when it contained RMC waste. Another sample was planned for this tank in first quarter FY 1988, when it was to contain PRF waste. Table 8-1 of the program plan contains additional listings of tanks that were sampled, along with their waste types.

APPENDIX A

LIST OF VAPOR COMPONENTS WITH REGULATORY DRIVERS

A-1

Tank Farm 241-A Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 239/240	4.0E+01	1.11E-07	1.19E-05	2.32E-03	PF	5	2.0E-12	B
Pu 241 ⁹	1.6E+03	3.79E-06	4.06E-04	7.92E-02	PF	6	1.0E-10	B
RuRh 106 ⁹	1.1E-01	3.04E-13	2.09E-09	4.06E-07	PF	6	3.0E-08	B
Sr 89/90	6.1E+04	8.62E-07	1.38E-02	2.70E+00	PF	4	9.0E-09	B
U 238 ⁹	1.9E+00	5.41E-09	5.80E-07	1.13E-04	PF	6	1.0E-10	B
water		1.41E+05	1.41E+05	1.41E+05	Stm Table	1		

WHC-SD-W314B-DA-002, Rev. 0

Tank Farm 241-A Vapor Estimates

Sample Type	SN		Tank:	241-A-102				
Sample Date	3/14/89		Contents:	Salcake/Sludge/Water				
Sample ID	R4656		Watchlist:	N/A				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	1.6E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.57							
Temperature, °R	552							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.42E-08	9.77E-15	1.02E-12	5.60E-11	PF		2.27E-03	C1
Al	4.10E+01	1.13E-04	1.18E-02	6.48E-01	PF	5	9.06E+00	C1
Ba ⁹	1.80E-02	9.79E-09	1.03E-06	5.62E-05	PF	6	8.92E-02	C1
B	3.13E-02	2.12E-07	2.22E-05	1.21E-03	PF		2.22E+01	C1
C ₂ H ₃ O ₃ anion ⁹	1.93E+01	1.92E-05	2.01E-03	1.10E-01	PF	6		
C ₆ H ₅ O ₇ anion ⁹	1.10E+02	1.22E-04	4.51E-03	6.97E-01	PF	6		
Ca	2.97E-02	5.52E-08	5.78E-06	3.17E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cl	1.95E-01	2.59E-08	4.34E-05	2.38E-03	PF	4		
CO ₃ ⁹	3.87E+02	4.79E-04	5.02E-02	2.75E+00	PF	6		
Cr	4.26E-02	1.35E-08	6.38E-06	3.49E-04	PF	4	2.35E-01	C1, D
EDTA ¹²	1.16E+02	2.95E-05	3.09E-03	1.69E-01	PF	5		
F	1.29E+00	2.97E-07	5.29E-04	2.90E-02	PF	4	3.22E+00	C1
Fe	6.70E-03	8.90E-09	9.32E-07	5.10E-05	PF	5	2.18E+00	C1
Fe (CN) ₆ ⁹	2.58E-03	9.04E-10	9.47E-08	5.19E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.80E+02	4.58E-05	4.80E-03	2.63E-01	PF	5		
K	5.71E+00	1.09E-05	1.14E-03	6.24E-02	PF	5		
Mn ⁹	2.84E+00	3.83E-06	4.01E-04	2.20E-02	PF	6	2.22E+00	C2, D
Mo	9.59E-02	7.43E-08	7.78E-06	4.26E-04	PF	5	2.55E+00	C1
Na	2.00E+02	6.47E-04	6.77E-02	3.71E+00	PF	5	2.13E+00	C2 as NaOH
Ni	3.17E-02	3.99E-08	4.18E-06	2.29E-04	PF	5	4.14E-02	C1, D
NO ₂	1.98E+00	2.46E-07	3.35E-04	1.84E-02	PF	4		
NO ₃	1.29E+02	1.19E-05	1.62E-02	8.87E-01	PF	4		

WHC-SD-W314B-DA-002, Rev. 0

Tank Farm 241-A Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
OH	1.73E+01	7.57E-05	7.92E-03	4.34E-01	PF	5	2.88E+00	C2 as NaOH
P	1.02E-01	2.45E-07	2.56E-05	1.40E-03	PF	5		
Pb ⁹	1.35E-04	4.86E-11	5.09E-09	2.79E-07	PF	6	5.91E-03	C1, A, D
PO ₄	5.22E+00	4.91E-06	5.15E-04	2.82E-02	PF	5		
SiO ₃ ⁹	4.90E+00	4.79E-06	5.02E-04	2.75E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	9.70E+01	8.34E-06	7.87E-03	4.31E-01	PF	4		
Sr ⁹	1.68E-01	1.42E-07	1.48E-05	8.12E-04	PF	6		
TOC gC/l ¹⁷	1.25E+01	7.75E-05	8.11E-03	4.44E-01	PF	5		
U, g/l	1.24E-03	3.87E-10	4.06E-08	2.22E-06	PF	5	5.14E-03	C1
ZrO ₃ ⁹	2.06E-01	1.43E-07	1.50E-05	8.22E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	8.70E-01	2.40E-09	2.75E-07	1.38E-05	PF	5	2E-11	B ¹⁸
Am 243 ⁹	1.29E+01	3.58E-08	4.10E-06	2.05E-04	PF	6	2E-11	B
C 14 ⁹	2.61E+03	7.25E-06	8.32E-04	4.16E-02	PF	6	6.0E-06	B
Cm 242 ⁹	2.61E+01	1.45E-10	1.66E-08	8.31E-07	PF	6	7E-10	B
Cm 244 ⁹	3.31E+01	7.89E-08	9.04E-06	4.52E-04	PF	6	4E-11	B
Cs 137	6.96E+05	1.13E-04	1.95E-01	9.75E+00	PF	4	4.0E-07	B
I 129 ⁹	1.92E+00	7.40E-07	2.66E-05	3.05E-05	PF	6	7.0E-08	B
Np 237 ⁹	1.92E+00	5.32E-09	6.10E-07	3.05E-05	PF	6	1.2E-12	B
Pu 238 ⁹	6.62E+01	1.78E-07	2.04E-05	1.02E-03	PF	6	2.1E-12	B
Pu 239/240	4.53E+00	1.26E-08	1.44E-06	7.22E-05	PF	5	2.0E-12	B
Pu 241 ⁹	4.53E+03	1.04E-05	1.19E-03	5.98E-02	PF	6	1.0E-10	B
RuRh 106 ⁹	1.92E+00	5.18E-12	3.80E-08	1.90E-06	PF	6	3.0E-08	B
Se 79 ⁹	3.83E+01	1.06E-07	1.22E-05	6.11E-04	PF	6	1.0E-06	B
Sr 89/90	1.01E+00	1.65E-11	2.84E-07	1.42E-05	PF	4	9.0E-09	B
Ta 99	3.69E+02	1.02E-06	1.18E-04	5.88E-03	PF	5	2.0E-06	B
water		5.30E+04	5.30E+04	5.30E+04	Stm Table	1		

Tank Farm 241-A Vapor Estimates

Sample Type	DL		Tank:	241-A-103				
Sample Date	4/3/86		Contents:	Sludge/Water				
Sample ID	B2XDOOXX		Watchlist:	N/A				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	6.5E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.48							
Temperature, °R	578							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.01E-02	7.66E-09	1.54E-06	1.13E-04	PF	6	2.27E-03	C1
Al	3.71E+01	5.65E-05	1.14E-02	8.36E-01	PF	5	9.06E+00	C1
Ba	1.00E-02	3.00E-09	6.03E-07	4.44E-05	PF	5	8.92E-02	C1
B	3.01E-02	1.13E-07	2.26E-05	1.66E-03	PF	5	2.22E+01	C1
Bi	2.21E-01	4.35E-08	8.73E-06	6.43E-04	PF	5		
C ₂ H ₃ O ₃ anion ⁹	2.14E-01	1.18E-07	2.36E-05	1.74E-03	PF	6		
C ₆ H ₅ O ₇ anion ⁹	4.07E+01	1.12E-05	1.78E-03	1.66E-01	PF	6		
Ca	1.52E-01	1.56E-07	3.14E-05	2.31E-03	PF	5	6.11E+00	C1 as CaCO ₃
Cd	5.02E-02	1.84E-08	3.70E-06	2.73E-04	PF	5	5.46E-04	C1, C2, D
Cl	1.95E-01	1.43E-08	4.60E-05	3.39E-03	PF	4		
CO ₃ ⁹	4.36E+00	2.99E-06	6.00E-04	4.42E-02	PF	6		
Cr	3.33E-01	5.85E-08	5.29E-05	3.90E-03	PF	4	2.35E-01	C1, D
Cu	1.81E-02	1.16E-08	2.34E-06	1.72E-04	PF	5	3.82E-01	C1
EDTA ^{9,12}	1.29E+00	1.81E-07	3.64E-05	2.68E-03	PF	6		
F ⁹	6.78E-02	8.64E-09	2.95E-05	2.17E-03	PF	4	3.22E+00	C1
Fe(CN) ₆ ⁹	3.86E-06	7.48E-13	1.50E-10	1.11E-08	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	1.29E+00	1.80E-07	3.62E-05	2.67E-03	PF	6		
K	5.82E+00	6.14E-06	1.23E-03	9.08E-02	PF	5		
Mg	2.52E-03	4.32E-09	8.67E-07	6.39E-05	PF	5	1.02E+01	C1
Mn	4.02E-01	3.01E-07	6.04E-05	4.45E-03	PF	5	2.22E+00	C2, D
Na	1.88E+02	3.36E-04	6.75E-02	4.97E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.05E-01	7.32E-08	1.47E-05	1.08E-03	PF	5	4.14E-02	C1, D
NO ₃	2.03E+02	1.04E-05	2.70E-02	1.99E+00	PF	4		
P	1.37E+00	1.82E-06	3.65E-04	2.69E-02	PF	5		

WHC-SD-W314B-DA-002, Rev. 0

Tank Farm 241-A Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb ⁹	1.63E-01	3.24E-08	6.50E-06	4.79E-04	PF	6	5.91E-03	C1, A, D
PO ₄	5.22E+00	2.72E-06	5.46E-04	4.02E-02	PF	5		
Si	5.12E-01	7.52E-07	1.51E-04	1.11E-02	PF	5	8.73E+00	C1
SiO ₃ ⁹	2.71E-01	1.47E-07	2.95E-05	2.17E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	2.14E+00	1.02E-07	1.84E-04	1.36E-02	PF	4		
Sr ⁹	2.50E-04	1.17E-10	2.35E-08	1.73E-06	PF	6		
TOC gC/l ¹⁷	8.26E+00	2.83E-05	5.69E-03	4.19E-01	PF	5		
U, g/l	6.41E-03	1.11E-09	2.22E-07	1.64E-05	PF	5	5.14E-03	C1
Zn	4.75E-02	3.01E-08	6.04E-06	4.45E-04	PF	5		
Zr	9.25E-02	4.18E-08	8.40E-06	6.18E-04	PF	5	1.34E+00	C1, C3
ZrO ⁹	2.06E-01	7.93E-08	1.59E-05	1.17E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.69E+00	4.63E-09	5.64E-07	6.85E-05	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	3.83E+00	1.06E-08	1.29E-06	1.57E-04	PF	6	2.0E-11	B
C 14	9.44E-01	2.62E-09	3.19E-07	3.87E-05	PF	5	6.0E-06	B
Cm 242 ⁹	4.53E+00	2.51E-11	3.05E-09	3.71E-07	PF	6	7.0E-10	B
Cm 244 ⁹	2.61E+01	6.23E-08	7.57E-06	9.21E-04	PF	6	4.0E-11	B
Cs 137	4.06E+05	6.12E-05	1.12E-01	1.36E+01	PF	4	4.0E-07	B
Co 60	1.59E+01	1.54E-08	1.88E-06	2.28E-04	PF	5	8.0E-08	B
I 129	1.20E-01	4.63E-08	1.67E-06	4.93E-06	PF	4	7.0E-08	B
Np 237 ⁹	6.44E-02	1.79E-10	2.18E-08	2.65E-06	PF	6	1.2E-12	B
Pu 238 ⁹	1.29E+02	3.47E-07	4.22E-05	5.13E-03	PF	6	2.1E-12	B
Pu 239/240	2.52E-01	7.00E-10	8.51E-08	1.04E-05	PF	5	2.0E-12	B
Pu 241 ⁹	6.44E+03	1.48E-05	1.80E-03	2.19E-01	PF	6	1.0E-10	B
RuRh 106 ⁹	1.29E+01	3.48E-11	2.71E-07	3.30E-05	PF	6	3.0E-08	B
Se 79 ⁹	1.29E+01	3.58E-08	4.35E-06	5.29E-04	PF	6	1.0E-06	B
Sr 89/90	2.57E+03	3.91E-08	7.12E-04	8.66E-02	PF	4	9.0E-09	B
Tc 99	2.16E+02	6.00E-07	7.30E-05	8.87E-03	PF	5	2.0E-06	B
U 238 ⁹	6.44E+00	1.79E-08	2.18E-06	2.65E-04	PF	6	1.0E-10	B
water		8.99E+04	8.99E+04	8.99E+04	Stm Table	1		

MHC-SD-W314B-DA-002, Rev. 0

Tank Farm 241-A Vapor Estimates

Sample Type	Sludge		Tank:	241-A-104				
Sample Date	9/4/74		Contents:	Sludge				
Sample ID	RAT-A104-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	5.3E-03		Retr. Method	Pumping/Sluice				
pH	13.97							
Density, g/ml	1.64							
Temperature, °R	648							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	7.61E+01	2.76E-04	2.10E-02	4.48E+00	PF	5	9.06E+00	C1
Ba	1.24E+00	8.88E-07	6.75E-05	1.44E-02	PF	5	8.92E-02	C1
B	3.01E-02	2.68E-07	2.04E-05	4.35E-03	PF	5	2.22E+01	C1
Ca	1.64E+01	4.02E-05	3.06E-03	6.52E-01	PF	5	6.11E+00	C1 as CaCO ₃
CO ₃ ⁹	2.83E+02	4.63E-04	3.52E-02	7.50E+00	PF	6		
Fe	2.79E+02	4.89E-04	3.71E-02	7.92E+00	PF	5	2.18E+00	C1
Mg	2.67E+00	1.09E-05	8.29E-04	1.77E-01	PF	5	1.02E+01	C1
Mn	3.90E+01	6.95E-05	5.29E-03	1.13E+00	PF		2.22E+00	C2 , D
Na ⁹	3.77E+01	1.61E-04	1.22E-02	2.61E+00	PF	5	2.13E+00	C2 as NaOH
NO ₃ ⁹	3.77E+01	4.59E-06	4.54E-03	9.68E-01	PF	6		
OH ⁹	1.60E+01	9.25E-05	7.03E-03	1.50E+00	PF	6	2.88E+00	C2 as NaOH
Si	2.33E+01	8.16E-05	6.20E-03	1.32E+00	PF	5	8.73E+00	C1
SO ₄ ⁹	6.42E+01	7.28E-06	4.98E-03	1.06E+00	PF	6		
ZrO ⁹	6.42E+02	5.88E-04	4.47E-02	9.53E+00	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	7.65E+03	2.11E-05	2.32E-03	3.42E-01	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	2.81E+00	7.79E-09	8.55E-07	1.26E-04	PF	6	2.0E-11	B
C 14 ⁹	6.63E+03	1.84E-05	2.02E-03	2.98E-01	PF	6	6.0E+06	B
Cm 242 ⁹	6.63E+00	3.68E-11	4.04E-09	5.96E-07	PF	6	7.0E-10	B
Cs 137	1.15E+06	1.27E-04	2.10E-01	3.10E+01	PF	5	4.0E-07	B
Co 60	5.94E+04	5.76E-05	6.32E-03	9.34E-01	PF	5	8.0E-08	B
Cs 134	3.33E+04	1.23E-07	1.35E-05	1.99E-03	PF	5	4.0E-07	B
Eu 154	1.30E+05	5.89E-05	7.31E-03	1.08E+00	PF	5	5.0E-08	B
Eu 155	1.30E+05	1.96E-05	2.15E-03	3.18E-01	PF	5	3.0E-07	B
Np 237 ⁹	4.59E+02	1.28E-10	1.40E-08	2.07E+06	PF	6	1.2E-12	B

Tank Farm 241-A Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 238 ⁹	1.89E+02	5.08E-07	5.57E-05	8.24E-03	PF	6	2.1E-12	B
Pu 239/240 ⁹	6.76E+03	1.88E-05	2.06E-03	3.04E-01	PF	6	2.0E-12	B
Pu 241 ⁹	9.44E+03	2.17E-05	2.38E-03	3.52E-01	PF	6	1.0E-10	B
RuRh 106 ⁹	3.83E-01	1.03E-12	7.27E-09	1.07E-06	PF	6	3.0E-08	B
Sr 89/90	4.39E+07	4.95E-04	8.15E+00	1.20E+03	PF	5	9.0E-09	B
Sb 125	5.95E+05	9.68E-06	2.32E-06	1.57E-01	PF	5	1.0E-06	B
U 238 ⁹	1.89E+01	5.24E-08	5.75E-06	8.50E-04	PF	6	1.0E-10	B
water		1.79E+05	1.79E+05	1.79E+05	Stm Table	1		

Tank Farm 241-A Vapor Estimates

Sample Type	Sludge	Tank:	241-A-105						
Sample Date	1/12/75	Contents:	Sludge						
Sample ID	RAT-A105-1A	Watchlist:	N/A						
Properties	Value	Status:	IS/II						
Visc., lbm/ft-s ¹	3.8E-03	Retr. Method	Pumping/Sluicing						
pH	N/A								
Density, g/ml	1.54								
Temperature, °R	593								
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation	
Al	4.93E+01	7.10E-05	1.45E-02	1.83E+00	PF	5	9.06E+00	C1	
Ba	8.90E-04	2.53E-10	5.16E-08	6.51E-06	PF	5	8.92E-02	C1	
Ca	1.64E+01	1.59E-05	3.25E-03	4.11E-01	PF	5	6.11E+00	C1 as CaCO ₃	
CO ₃	5.84E+00	3.78E-06	7.73E-04	9.75E-02	PF	5			
F	7.93E-06	9.54E-13	3.31E-09	4.18E-07	PF	5	3.22E+00	C1	
Fe	8.93E+01	6.20E-05	1.27E-02	1.60E+00	PF	5	2.18E+00	C1	
Fe (CN) ⁶	3.75E-05	6.89E-12	1.41E-09	1.77E-07	PF	5	5.77E-01	C1 as CN, D ¹³	
K	1.08E-01	1.08E-07	2.21E-05	2.79E-03	PF	5	2.22E+00	C2, D	
Mn	3.85E+00	2.72E-06	5.56E-04	7.01E-02	PF	5	2.13E+00	C2 as NaOH	
Na	3.70E+02	6.25E-04	1.28E-01	1.61E+01	PF	5			
NO ₂	1.28E+01	8.32E-07	2.21E-03	2.79E-01	PF	5			
NO ₃	8.62E+01	4.16E-06	1.10E-02	1.39E+00	PF	5			
OH	5.14E+01	1.18E-04	2.40E-02	3.03E+00	PF	5	2.88E+00	C2 as NaOH	
PO ₄	2.64E-01	1.30E-07	2.65E-05	3.35E-03	PF	5			
Si	2.77E+01	3.85E-05	7.85E-03	9.91E-01	PF	5	8.73E+00	C1	
SiO ₃	4.17E-01	2.13E-07	4.36E-05	5.50E-03	PF	5	1.93E+00	C1 (Amorphous)	
SO ₄	5.28E+00	2.38E-07	4.37E-04	5.52E-02	PF	5			
Am 241 ^{9,10}	1.39E-04	1.84E-13	4.49E-11	9.89E-09	PF	6	2.0E-11	B ¹⁹	
Am 243 ⁹	5.64E-08	1.57E-16	1.83E-14	4.03E-12	PF	6	2E-11	B	
C 14 ⁹	7.14E+01	1.98E-07	2.32E-05	5.11E-03	PF	6	6.0E-06	B	
Cm 242 ⁹	1.24E-07	6.88E-19	8.04E-17	1.77E-14	PF	6	7E-10	B	
Cm 244 ⁹	5.64E-02	1.34E-10	1.57E-08	3.46E-06	PF	6	4E-11	B	
Ce 137	7.70E+05	8.76E-05	1.53E-01	3.38E+01	PF	5	4.0E-07	B	
CePr 144	9.41E+05	1.06E-10	1.24E-08	2.74E-06	PF	5	3.0E-08	B	
Eu 154	1.31E+05	6.45E-05	8.53E-03	1.88E+00	PF	5	5.0E-08	B	

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Eu 155	1.31E+05	2.28E-05	2.67E-03	5.89E-01	PF	5	3.0E-07	B
Ir 129 ⁹	1.39E-01	5.37E-08	1.93E-06	9.96E-06	PF	6	7.0E-08	B
Np 237 ⁹	1.39E-01	3.86E-10	4.51E-08	9.96E-06	PF	6	1.2E-12	B
Pu 238 ⁹	5.64E+03	1.52E+11	1.77E-09	3.91E+07	PF	6	2.1E-12	B
Pu 239/240	2.17E+03	6.04E-06	7.05E-04	1.56E+01	PF	5	2.0E-12	B
Pu 241 ⁹	2.82E-05	6.48E-14	7.58E-12	1.67E-09	PF	6	1.0E-10	B
RuRh 106	6.46E+05	5.27E-11	3.95E-07	8.71E-05	PF	5	3.0E-08	B
Se 79 ⁹	4.13E+00	1.15E-08	1.34E-06	2.96E-04	PF	6	1.0E-06	B
Sr 89/90	2.06E+07	2.39E-04	4.19E+00	9.23E+02	PF	5	9.0E-09	B
Sb 125	3.54E+05	7.45E-06	1.79E-06	1.92E-01	PF	5	1.0E-06	B
Tc 99 ⁹	1.39E+02	3.86E-07	4.51E-05	9.96E-03	PF	6	2.0E-06	B
U 238 ⁹	7.14E-08	1.98E-16	2.32E-14	5.11E-12	PF	6	1.0E-10	B
water		1.11E+05	1.11E+05	1.11E+05	Stm Table 1	1		

Tank Farm 241-A Vapor Estimates

Sample Type	DL		Tank:	241-A-106				
Sample Date	3/13/86		Contents:	Sludge				
Sample ID	A2XDOOXX		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	8.7E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.36							
Temperature, °R	501							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	2.00E-02	8.16E-09	1.67E-06	1.02E-04	PF	5	2.27E-03	C1
Al	2.60E+01	4.24E-05	8.66E-03	5.29E-01	PF	5	9.06E+00	C1
Ba	1.00E-02	3.22E-09	6.56E-07	4.01E-05	PF	5	8.92E-02	C1
B	6.01E-02	2.41E-07	4.91E-05	3.00E-03	PF	5	2.22E+01	C1
Bi	2.21E-01	4.66E-08	9.51E-06	5.81E-04	PF	5		
Ca	9.00E-02	9.91E-08	2.02E-05	1.24E-03	PF	5	6.11E+00	C1 as CaCO ₃
Cd	5.02E-02	1.97E-08	4.03E-06	2.46E-04	PF	5	5.46E-04	C1, C2, D
CO ₃ ⁹	1.27E-02	9.31E-09	1.90E-06	1.16E-04	PF	6		
Cr	1.16E+00	2.18E-07	2.01E-04	1.23E-02	PF	5	2.35E-01	C1, D
EDTA ¹²	3.80E-08	5.74E-15	1.17E-12	7.16E-11	PF	5		
F ⁹	8.03E-10	1.09E-16	3.80E-13	2.32E-11	PF	6	3.22E+00	C1
Fe	1.81E-02	1.42E-08	2.91E-06	1.78E-04	PF	5	2.18E+00	C1
Fe (CN) ₆ ⁹	3.75E-05	7.80E-12	1.59E-09	9.73E-08	PF	6	5.77E-01	C1 as CN, D ¹³
K	4.62E+00	5.22E-06	1.06E-03	6.51E-02	PF	5		
Mn	4.02E-01	3.22E-07	6.57E-05	4.02E-03	PF	5	2.22E+00	C2, D
Na	3.70E+02	7.09E-04	1.45E-01	8.84E+00	PF	5	2.13E+00	C2 as NaOH
Ni	5.01E-02	3.74E-08	7.63E-06	4.67E-04	PF	5	4.14E-02	C1, D
NO ₂ ⁹	4.86E-08	3.58E-15	9.50E-12	5.81E-10	PF	6		
NO ₃	1.95E+02	1.07E-05	2.83E-02	1.73E+00	PF	5		
OH ⁹	1.44E+02	3.72E-04	7.60E-02	4.65E+00	PF	6	2.88E+00	C2 as NaOH
P	1.67E+00	2.37E-06	4.84E-04	2.96E-02	PF	5		
Pb	1.63E-01	3.47E-08	7.08E-06	4.33E-04	PF	5	5.91E-03	C1, A, D

Tank Farm 241-A Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
PO ₄ ⁹	2.64E-01	1.47E-07	3.01E-05	1.84E-03	PF	6		
Si	1.62E-01	2.55E-07	5.20E-05	3.18E-03	PF	5	8.73E+00	C1
SO ₄ ⁹	6.13E-02	3.12E-09	5.74E-06	3.51E-04	PF	6		
TOC gC/l ¹⁷	1.30E-01	4.77E-07	9.74E-05	5.95E-03	PF	5		
Zn	2.32E-02	1.57E-08	3.21E-06	1.96E-04	PF	5		
Zr	9.25E-02	4.48E-08	9.14E-06	5.59E-04	PF	5	1.34E+00	C1, C3
ZrO ⁹	9.51E-01	3.92E-07	7.99E-05	4.88E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	4.74E+00	1.30E-08	1.72E-06	1.62E-04	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	1.43E-01	3.97E-10	5.25E-08	4.95E-06	PF	6	2E-11	B
C 14	1.09E+00	3.02E-09	4.00E-07	3.77E-05	PF	5	6.0E-06	B
Cm 242 ⁹	4.23E-01	2.34E-12	3.10E-10	2.93E-08	PF	6	7E-10	B
Cm 244 ⁹	1.39E-08	3.32E-17	4.40E-15	4.14E-13	PF	6	4E-11	B
Cs 137	3.91E+05	5.90E-05	1.17E-01	1.10E+01	PF	5	4.0E-07	B
Co 60	1.30E+01	1.26E-08	1.67E-06	1.57E-04	PF	5	8.0E-08	B
I 129	1.80E-01	6.95E-08	2.50E-06	6.24E-06	PF	5	7.0E-08	B
Np 237 ⁹	2.11E-03	5.87E-12	7.77E-10	7.32E-08	PF	6	1.2E-12	B
Pu 238 ⁹	1.09E+02	2.92E-07	3.87E-05	3.64E-03	PF	6	2.1E-12	B
Pu 239/240	2.61E-01	7.25E-10	9.59E-08	9.04E-06	PF	5	2.0E-12	B
Pu 241 ⁹	6.28E+03	1.45E-05	1.91E-03	1.80E-01	PF	6	1.0E-10	B
RuRh 106 ⁹	2.11E+00	5.71E-12	4.84E-08	4.57E-06	PF	6	3.0E-08	B
Se 79 ⁹	1.09E-08	3.01E-17	3.99E-15	3.76E-13	PF	6	1.0E-06	B
Sr 89/90	3.91E+03	5.94E-08	1.18E-03	1.11E-01	PF	5	9.0E-09	B
Sb 125	2.30E+02	8.17E-08	1.96E-08	1.02E-03	PF	5	1.0E-06	B
Tc 99	1.51E+02	4.19E-07	5.55E-05	5.23E-03	PF	5	2.0E-06	B
U 238	1.18E-03	3.29E-12	4.35E-10	4.10E-08	PF	5	1.0E-10	B
water		2.44E+03	2.44E+03	2.44E+03	Stm Table	1		

Tank Farm 241-A Vapor Estimates

- Note: 1. Viscosities estimated based on solids content and concentration of sodium hydroxide, sodium carbonate, and sodium nitrate.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume and microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data reliability deemed 6.
- Note: 7. Allowable concentration, vapor component in ppm by volume and microcurie/l for radionuclides.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).
- Note: 19. Allowable data based on DCG's in microcurie/l.

Sample Type	SN	Tank:	241-AN-101	Method	Data	Allowable ⁷	Regulatory
Sample Date	7/04/88	Contents:	Liquids/Solids				
Sample ID	T-672,3	Watchlist:	N/A				
Properties	Value	Status:	Active				
Visc., lbm/ft-s ¹	8.9E-03	Retr. Method	Pumping				
pH	N/A						
Density, g/ml	1.2563						
Temperature, °R	543						
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.69E+01	2.89E-05	1.04E-03	PF	5	9.06E+00	C1
Cl	2.22E+00	1.82E-07	6.56E-06	PF	5		
CO ₃	1.09E+00	8.35E-07	3.01E-05	PF	5		
F	1.28E+00	1.82E-07	6.55E-06	PF	5	3.22E+00	C1
K	1.24E+01	1.46E-05	5.26E-04	PF	5		
Na	1.51E+02	3.02E-04	1.09E-02	PF	5	2.13E+00	C2 as NaOH
NH ₃	1.72E-01	7.53E+02	7.53E+02	VLE	5	2.50E+01	C1
NO ₂	3.74E+01	2.87E-06	1.03E-04	PF	5		
NO ₃	1.42E+02	8.10E-06	2.91E-04	PF	5		
OH	3.95E+01	1.07E-04	3.84E-03	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.35E-07	7.85E-14	2.83E-12	PF	5		
SO ₄	1.79E+00	9.51E-08	3.42E-06	PF	5		
TOC gC/l ¹⁷	2.35E+00	9.00E-06	3.24E-04	PF	5		
Am ²⁴¹ ¹⁸	1.57E+00	4.32E-09	1.55E-07	PF	5	2.0E-11	B ¹⁹
Cs ¹³⁷	2.20E+05	3.49E-05	1.26E-03	PF	5	4.0E-07	B
Cs ¹³⁴	9.46E+02	3.60E-07	1.30E-05	PF	5	4.0E-07	B
Nd ²³⁷	9.73E-02	2.70E-10	9.73E-09	PF	5	1.2E-12	B
Pm ¹⁴⁷	7.57E+03	4.24E-06	1.53E-04	PF	5	1.1E-08	B
Pu ^{239/240}	4.43E+01	1.23E-09	4.43E-08	PF	5	2.0E-12	B
Sr ^{89/90}	1.94E+03	3.10E-08	1.12E-06	PF	5	9.0E-09	B
water		4.08E+04	4.08E+04	Stm Table	1		

Tank m 241-AN Vapor Estimates

Sample Type	SN		Tank:	241-AN-102				
Sample Date	2/28/85		Contents:	Liquids/Solids				
Sample ID	R-3639		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	5.8E-03		Retr. Method	Pumping				
pH	13.30							
Density, g/ml	1.39							
Temperature, °R	560							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al, mole/l	5.73E-01	2.60E-05	9.37E-04	5.22E-01	PF	5	9.06E+00	C1
Ba, mole/l	1.25E-04	5.68E-09	2.04E-07	1.14E-04	PF	5	8.92E-02	C1
Ca, mole/l	1.23E-02	5.58E-07	2.01E-05	1.12E-02	PF	5	6.11E+00	C1 as CaCO ₃
Cd, mole/l	5.03E-04	2.28E-08	8.22E-07	4.58E-04	PF	5	5.46E-04	C1, C2, D
Cl, mole/l	9.49E-02	2.69E-07	9.69E-06	8.64E-02	PF	4		
CO ₃ , mole/l	8.40E-01	3.81E-05	1.37E-03	7.65E-01	PF	5		
Cr, mole/l	7.96E-03	8.02E-08	2.89E-06	7.25E-03	PF	4	2.35E-01	C1, D
Cu, mole/l	5.41E-04	2.46E-08	8.84E-07	4.93E-04	PF	5	3.82E-01	C1
F, mole/l	1.18E-01	3.15E-07	1.13E-05	1.07E-01	PF	4	3.22E+00	C1
Fe, mole/l	1.80E-03	8.17E-08	2.94E-06	1.64E-03	PF	5	2.18E+00	C1
K, mole/l	5.31E-02	2.41E-06	8.68E-05	4.83E-02	PF	5		
La, mole/l	1.14E-03	5.18E-08	1.86E-06	1.04E-03	PF	5		
Mg, mole/l	3.57E-04	1.62E-08	5.83E-07	3.25E-04	PF	5	1.02E+01	C1
Mn, mole/l	1.84E-02	8.35E-07	3.01E-05	1.68E-02	PF	5	2.22E+00	C2, D
Mo	8.95E-03	4.06E-07	1.46E-05	8.15E-03	PF	5	2.55E+00	C1
Na, mole/l	1.04E+01	4.72E-04	1.70E-02	9.47E+00	PF	5	2.13E+00	C2 as NaOH
Ni, mole/l	6.43E-03	2.92E-07	1.05E-05	5.85E-03	PF	5	4.14E-02	C1, D
NO ₂ , mole/l	1.32E+00	4.61E-06	1.66E-04	1.20E+00	PF	4		
NO ₃ , mole/l	3.61E+00	1.26E-05	4.54E-04	3.29E+00	PF	4		
OH, mole/l	2.01E-01	9.13E-06	3.29E-04	1.83E-01	PF	5	2.88E+00	C2 as NaOH
Pb, mole/l	1.14E-03	5.18E-08	1.86E-06	1.04E-03	PF	4	5.91E-03	C1, A, D
PO ₄ , mole/l	4.73E-02	2.15E-06	7.73E-05	4.31E-02	PF	5		
Si, mole/l	5.61E-03	2.55E-07	9.17E-06	5.11E-03	PF	5	8.73E+00	C1
SO ₄ , mole/l	1.14E-01	5.75E-07	2.07E-05	1.04E-01	PF	5		
TOC qC/l ¹⁷	3.37E+01	1.28E-04	4.59E-03	2.56E+00	PF	5		
Zn	4.22E-04	2.95E-10	1.06E-08	5.91E-06	PF	5		

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Zr, mole/l	1.73E-03	7.85E-08	2.83E-06	1.58E-03	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	8.92E+01	2.47E-07	8.89E-06	4.95E-03	PF	5	2.0E+11	B ¹⁹
C 14	1.50E+00	4.17E-09	1.50E-07	8.35E-05	PF	5	6.0E-06	B
Cm 242	4.95E-01	6.14E-11	2.21E-09	1.23E-06	PF	5	7.0E-10	B
Cs 137	3.65E+05	6.42E-05	2.31E-03	1.93E-01	PF	4	4.0E-07	B
Co 60	1.58E+01	3.37E-08	1.21E-06	6.77E-04	PF	5	8.0E-08	B
Eu 154	1.56E+03	3.23E-06	1.16E-04	7.34E-02	PF	5	5.0E-08	B
Pu 239/240	7.03E+01	1.95E-07	7.01E-06	3.92E-03	PF	5	3.0E+12	B
Tc 99	3.08E+02	8.56E-07	3.08E-05	1.72E-02	PF	5	2.0E-06	B
water		6.43E+04	6.43E+04	6.43E+04	Stm Table	1		

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Part 1

Tank cm 241-AN Vapor Estimates

Sample Type	Slurry		Tank:	241-AN-103				
Sample Date	2/90		Contents:	Liquid				
Sample ID	DSS comp		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	2.2E-02		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.6							
Temperature, °R	525							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Aq	1.60E-02	5.72E-09	2.06E-07	2.84E-05	PF	5	2.27E-03	C1
Al	5.76E+01	8.23E-05	2.96E-03	4.08E-01	PF	5	9.06E+00	C1
As	1.60E-01	8.23E-08	2.96E-06	4.08E-04	PF	5	6.52E-02	C1
Ba	1.60E-02	4.51E-09	1.62E-07	2.23E-05	PF	5	8.92E-02	C1
Be	1.60E-02	6.86E-08	2.47E-06	3.40E-04	PF	5	1.36E-03	B (10g/24 hr), C1
Bi	4.80E-01	8.86E-08	3.19E-06	4.39E-04	PF	5		
Ca	8.46E-02	8.16E-08	2.94E-06	4.05E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.60E-02	5.51E-09	1.98E-07	2.73E-05	PF	5	5.46E-04	C1, C2, D
Cl	9.60E+00	6.61E-07	2.38E-05	5.25E-02	PF	5		
CN	3.36E-02	4.99E-08	1.79E-06	2.47E-04	PF	5	4.70E+00	C1, D
CO ₃	8.96E+00	5.76E-06	2.07E-04	2.86E-02	PF	5		
Cr	8.48E-01	1.40E-07	5.03E-06	3.12E-03	PF	5	2.35E-01	C1, D
Cu	1.20E-02	7.23E-09	2.60E-07	3.59E-05	PF	5	3.82E-01	C1
EDTA ¹²	8.48E-02	1.12E-08	4.03E-07	5.56E-05	PF	5		
F	7.36E-01	8.79E-08	3.16E-06	7.41E-03	PF	5	3.22E+00	C1
Fe	7.04E-02	4.85E-08	1.75E-06	2.41E-04	PF	5	2.18E+00	C1
Hg	1.60E-02	3.07E-09	1.11E-07	1.52E-05	PF	5	6.08E-03	B, C1, C2
K	1.52E+01	1.50E-05	5.41E-04	7.46E-02	PF	5		
Mg	2.88E-02	4.63E-08	1.67E-06	2.30E-04	PF	5	1.02E+01	C1
Mn	2.88E-02	2.02E-08	7.27E-07	1.00E-04	PF	5	2.22E+00	C2, D
Mo	8.80E-02	3.54E-08	1.27E-06	1.75E-04	PF	5	2.55E+00	C1
Na	3.36E+02	5.64E-04	2.03E-02	2.80E+00	PF	5	2.13E+00	C2 as NaOH
Ni	2.40E-02	1.57E-08	5.65E-07	7.78E-05	PF	5	4.14E-02	C1, D
NO ₂	1.38E+02	8.90E-06	3.20E-04	5.74E-01	PF	5		
NO ₃	1.60E+02	7.66E-06	2.76E-04	4.94E-01	PF	5		
OH	9.76E+01	2.21E-04	7.97E-03	1.10E+00	PF	5	2.88E+00	C2 as NaOH

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	7.20E-02	1.34E-08	4.83E-07	6.65E-05	PF	5	5.91E-03	C1, A, D
PO ₄	9.28E-01	4.53E-07	1.63E-05	2.25E-03	PF	5		
Sb	1.60E-01	5.06E-08	1.82E-06	2.51E-04	PF	5	1.00E-01	C1, D
Se	2.80E-01	1.37E-07	4.92E-06	6.78E-04	PF	5	6.19E-02	C1, D
Si	2.72E-01	3.75E-07	1.35E-05	1.86E-03	PF	5	8.73E+00	C1
SO ₄	1.60E+00	7.14E-08	2.57E-06	3.19E-03	PF	5		
TOC qC/l ¹⁷	7.36E+00	2.37E-05	8.52E-04	1.17E-01	PF	5		
Ti	1.60E-02	1.29E-08	4.63E-07	6.38E-05	PF	5		
U, g/l	1.23E-01	1.99E-08	7.18E-07	9.89E-05	PF	5	5.14E-03	C1
V	1.60E-02	1.21E-08	4.36E-07	6.00E-05	PF	5	2.40E-02	C1 (as V ₂ O ₅)
Zn	4.80E-02	2.85E-08	1.03E-06	1.41E-04	PF	5		
Zr	2.40E-02	1.02E-08	3.66E-07	5.05E-05	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	2.30E+02	6.35E-07	2.29E-05	3.15E-03	PF	5	2.0E-11	B ¹⁹
C 14	2.00E+00	5.55E-09	2.00E-07	2.75E-05	PF	5	6.0E-06	B
Cs 137	7.50E+05	1.88E-03	6.77E-02	9.32E+00	PF	5	4.0E-07	B
Co 60	3.80E+01	6.24E-08	2.25E-06	3.09E-04	PF	5	8.0E-08	B
Cs 134	1.10E+02	8.13E-08	2.93E-06	4.03E-04	PF	5	4.0E-07	B
I 129	5.30E-01	1.47E-09	5.30E-08	7.30E-06	PF	5	7.0E-08	B
Np 237	2.00E-02	5.56E-11	2.00E-09	2.76E-07	PF	5	1.2E-12	B
Pu 238	9.80E-01	2.64E-09	9.50E-08	1.31E-05	PF	5	2.1E-12	B
Pu 239/240	1.90E+00	5.28E-09	1.90E-07	2.62E-05	PF	5	2.0E-12	B
Sr 89/90	1.30E+04	3.27E-05	1.18E-03	1.62E-01	PF	5	9.0E-09	B
Tc 99	1.70E+02	4.72E-07	1.70E-05	2.34E-03	PF	5	2.0E-06	B
U 238	6.80E-02	1.89E-10	6.80E-09	9.37E-07	PF	5	1.0E-10	B
water		1.93E+04	1.93E+04	1.93E+04	Stm Tabl	1		

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Tank m 241-AN Vapor Estimates

Sample Type	SN		Tank:	241-AN-104				
Sample Date	7/02/84		Contents:	Liquid/Solids				
Sample ID	R-9991		Watchlist:	Hydrogen				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	5.1E-03		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.454							
Temperature, °R	578							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	4.88E+01	7.42E-05	2.67E-03	1.66E+00	PF	5	9.06E+00	C1
CO ₃	1.68E+01	1.15E-05	4.14E-04	2.57E-01	PF	5		
Cr	6.76E-01	1.18E-07	4.26E-06	1.19E-02	PF	5	2.35E-01	C1, D
Fe	1.12E-02	8.21E-09	2.96E-07	1.84E-04	PF	5	2.18E+00	C1
Na	1.80E+02	3.21E-04	1.16E-02	7.19E+00	PF	5	2.11E+00	C2 as NaOH
NO ₂	8.60E+01	5.90E-06	2.12E-04	1.72E+00	PF	5		
NO ₃	1.69E+02	8.60E-06	3.10E-04	2.50E+00	PF	5		
OH	6.80E+01	1.64E-04	5.91E-03	3.67E+00	PF	5	2.88E+00	C2 as NaOH
PO ₄	6.65E-01	3.45E-07	1.24E-05	7.73E-03	PF	5		
SO ₄	1.54E+00	7.31E-08	2.63E-06	1.47E-02	PF	5		
TOC gC/l ¹⁷	3.83E+00	1.31E-05	4.72E-04	2.93E-01	PF	5		
Am 241 ¹⁸	1.14E+04	3.12E-05	1.12E-03	6.98E-01	PF	5	2.0E+11	B ¹⁹
Cs 137	6.25E+05	8.96E-05	3.22E-03	3.01E+01	PF	5	4.0E+07	B
Pu 239/240	1.01E+01	2.86E-08	1.03E-06	6.40E-04	PF	5	2.0E+12	B
Sr 89/90	1.27E+03	1.84E-08	6.61E-07	6.16E-02	PF	5	9.0E+09	B
water		8.99E+04	8.99E+04	8.99E+04	Stm Tabl	1		

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Tank Farm 241-AN Vapor Estimates

Sample Type	SN		Tank:	241-AN-105				
Sample Date	11/09/84		Contents:	Liquid				
Sample ID	n/a		Watchlist:	Hydrogen				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	4.9E-03		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.43							
Temperature, °R	570							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.53E+01	3.81E-05	1.37E-03	8.87E-01	PF	5	9.06E+00	C1
Cl	6.38E-01	4.63E-08	1.67E-06	1.73E-02	PF	4		
CO ₃	2.72E+01	1.84E-05	6.63E-04	4.29E-01	PF	5		
K	3.64E+00	3.79E-06	1.37E-04	8.83E-02	PF	5		
Na	1.80E+02	3.18E-04	1.15E-02	7.41E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	1.70E-01	6.59E+02	6.59E+02	6.59E+02	VLE	5	2.50E+01	C1
NO ₂	6.26E+01	4.25E-06	1.53E-04	1.29E+00	PF	4		
NO ₃	1.35E+02	6.81E-06	2.45E-04	2.06E+00	PF	4		
OH	3.79E+01	9.06E-05	3.26E-03	2.11E+00	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.42E+00	7.31E-07	2.63E-05	1.70E-02	PF	5		
TOC gC/l ¹⁷	3.36E+00	1.14E-05	4.10E-04	2.65E-01	PF	5		
C ₈ 137	3.59E+05	5.14E-05	1.85E-03	1.80E+01	PF	4	4.0E-07	B
Gr 89/90	2.24E+03	3.24E-08	1.17E-06	1.13E-01	PF	4	9.0E-09	B
water		7.85E+04	7.85E+04	7.85E+04	Stm Tabl	1		

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Tank Farm 241-AN Vapor Estimates

Sample Type	SN		Tank:	241-AN-106				
Sample Date	2/90		Contents:	Liquid/Solids				
Sample ID	DSS Comp		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.0E-03		Retr. Method	Pumping				
pH	13.85							
Density, g/ml	1.27							
Temperature, °R	540							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Aq	3.63E-03	1.47E-09	5.31E-08	2.49E-05	PF	4	2.27E-03	C1
Al	9.28E+00	1.51E-05	5.42E-04	2.54E-01	PF	4	9.06E+00	C1
As	7.20E-05	4.21E-11	1.51E-09	7.10E-07	PF	4	6.52E-02	C1
Ba	1.11E-02	3.55E-09	1.28E-07	5.99E-05	PF	4	8.92E-02	C1
B	1.68E-02	6.69E-08	2.41E-06	1.13E-03	PF	5	2.22E+01	C1
Bi	1.45E-01	3.04E-08	1.09E-06	5.13E-04	PF	4		
Ca	9.02E-02	9.88E-08	3.56E-06	1.67E-03	PF	4	6.11E+00	C1 as CaCO ₃
Ce	4.44E-02	1.39E-08	5.00E-07	2.34E-04	PF	4		
Cd	4.96E-02	1.94E-08	6.99E-07	3.27E-04	PF	4	5.46E-04	C1, C2, D
Cl	2.46E+00	1.92E-07	6.93E-06	5.20E-02	PF	3		
CN	6.00E-06	1.01E-11	3.64E-10	1.71E-07	PF	4	4.70E+00	C1, D
CO ₃	1.96E+01	1.43E-05	5.16E-04	2.42E-01	PF	4		
Cr	5.64E-01	1.05E-07	3.80E-06	8.02E-03	PF	3	2.35E-01	C1, D
Cu	3.75E-03	2.57E-09	9.24E-08	4.33E-05	PF	4	3.82E-01	C1
EDTA ¹²	1.20E+00	1.80E-07	6.48E-06	3.04E-03	PF	5		
F	6.16E-02	8.35E-09	3.01E-07	2.40E-03	PF	3	3.22E+00	C1
Fe	#####	5.40E-09	1.72E-07	8.04E-05	PF	4	2.18E+00	C1
HEDTA ¹²	4.68E+00	7.00E-07	2.52E-05	1.18E-02	PF	5		
Hq	5.00E-05	1.09E-11	3.92E-10	1.84E-07	PF	4	6.08E-03	B, C1, C2
K	1.08E+00	1.21E-06	4.37E-05	2.05E-02	PF	4		
La	3.72E-04	1.17E-10	4.22E-09	1.98E-06	PF	5		
Li	6.96E-03	4.39E-08	1.58E-06	7.41E-04	PF	5		
Mq	2.78E-03	5.07E-09	1.83E-07	8.56E-05	PF	4	1.02E+01	C1
Mn	5.57E-02	4.44E-08	1.60E-06	7.49E-04	PF	4	2.22E+00	C2, D
Mo	6.66E-02	3.04E-08	1.09E-06	5.13E-04	PF	4	2.55E+00	C1
Na	9.03E+01	1.72E-04	6.19E-03	2.90E+00	PF	4	2.13E+00	C2 as NaOH
Nd	1.56E-02	4.75E-09	1.71E-07	8.01E-05	PF	5		

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Tank Farm 241-AN Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NH ₃ 8/14	1.23E-01	5.14E+02	5.14E+02	5.14E+02	VLE	3	2.50E+01	C1
Ni	5.28E-02	3.92E-08	1.41E-06	6.61E-04	PF	5	4.14E-02	C1, D
NO ₂	3.05E+01	2.24E-06	8.05E-05	4.91E-01	PF	3		
NO ₃	6.85E+01	3.72E-06	1.34E-04	8.17E-01	PF	3		
OH	8.06E+00	2.08E-05	7.48E-04	3.50E-01	PF	4	2.88E+00	C2 as NaOH
P	6.10E+00	8.62E-06	3.10E-04	1.45E-01	PF	4		
Pb	4.60E-01	9.74E-08	3.51E-06	1.64E-03	PF	3	5.91E-03	C1, A, D
Pd	3.36E-02	1.39E-08	5.00E-07	2.34E-04	PF	5		
PO ₄	1.84E+01	1.02E-05	3.67E-04	1.72E-01	PF	4		
Se	1.34E-04	7.43E-11	2.68E-09	1.25E-06	PF	4	6.19E-02	C1, D
Si	2.76E-02	4.32E-08	1.55E-06	7.29E-04	PF	5	8.73E+00	C1
SO ₄	2.15E+00	1.09E-07	3.92E-06	1.66E-02	PF	3		
TOC qC/l ¹⁷	3.26E+00	1.19E-05	4.28E-04	2.01E-01	PF	4		
Ta	1.56E-01	3.78E-08	1.36E-06	6.37E-04	PF	4	6.75E-01	C1
Ti	3.51E-03	3.20E-09	1.15E-07	5.40E-05	PF	4		
U, q/l	4.00E-06	7.36E-13	2.65E-11	1.24E-08	PF	4	5.14E-03	C1
Zn	9.44E-03	6.36E-09	2.29E-07	1.07E-04	PF	4		
Zr	2.78E-02	1.34E-08	4.82E-07	2.26E-04	PF	4	1.34E+00	C1, C3
Am 241 ¹⁸	6.00E-01	1.66E-09	5.97E-08	2.80E-05	PF	4	2.0E-11	B ¹⁹
C 14	3.35E-01	9.30E-10	3.35E-08	1.57E-05	PF	4	6.0E-06	B
Cm 243	4.70E-02	1.21E-10	4.37E-09	2.05E-06	PF	4	4.0E-11	B
Cs 137	2.05E+05	3.52E-05	1.27E-03	8.89E+00	PF	3	4.0E-07	B
Co 60	9.15E+00	1.71E-08	6.17E-07	2.89E-04	PF	4	8.0E-08	B
Cs 134	2.37E+01	2.44E-08	8.78E-07	4.11E-04	PF	4	4.0E-07	B
H 3	3.44E+00	1.23E-05	4.42E-04	1.36E-04	PF	3	1.0E-04	B
I 129	7.50E-02	2.90E-08	1.04E-06	3.51E-06	PF	3	7.0E-08	B
Nb 94	2.30E+01	6.39E-08	2.30E-06	1.08E-03	PF	4	3.0E-06	B
Np 237	1.60E-01	4.44E-10	1.60E-08	7.50E-06	PF	5	1.2E-12	B
Pu 238	2.00E-02	5.43E-11	1.95E-09	9.15E-07	PF	4	2.1E-12	B
Pu 239/240	3.78E-02	1.05E-10	3.78E-09	1.77E-06	PF	5	2.0E-12	B
RuRh 106	1.39E+03	7.51E-09	2.71E-07	8.13E-03	PF	3	3.0E-08	B
Se 79	2.40E-01	6.67E-10	2.40E-08	1.12E-05	PF	4	1.0E-06	B
Sr 89/90	2.23E+03	3.84E-08	1.38E-06	9.70E-02	PF	3	9.0E-09	B
Tc 99	6.92E+01	1.92E-07	6.92E-06	3.24E-03	PF	4	2.0E-06	B
U 238	4.81E-03	1.34E-11	4.81E-10	2.25E-07	PF	5	1.0E-10	B
water		3.69E+04	3.69E+04	3.69E+04	Stm Tab	1		

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Tank 241-AN Vapor Estimates

Sample Type	SN		Tank:	241-AN-107				
Sample Date	1985,86		Contents:	Liquid/Solids				
Sample ID	R-8650		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	6.6E-03		Retr. Method	Pumping				
pH	12.70							
Density ^{1A} , g/ml	1.5							
Temperature, °R	560							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.78E+00	5.80E-06	2.09E-04	1.00E-01	PF	5	9.06E+00	C1
Butanedioic acid	2.00E-02	7.02E-09	2.53E-07	1.22E-04	PF	5		D ¹⁰
Citric Acid	1.23E+01	2.65E-06	9.55E-05	4.59E-02	PF	5		
CO ₃	6.66E+01	4.60E-05	1.65E-03	7.96E-01	PF	5		
Dibutylphthalate	3.30E-01	4.91E-08	1.77E-06	8.51E-04	PF	5	4.40E-01	C1, D
Diethylphthalate ⁸	1.00E-02	1.06E-09	3.82E-08	1.84E-05	PF	5		D as DEHP
DOEA	8.60E-01	1.05E-07	3.79E-06	1.82E-03	PF	5		
EDTA ¹²	9.17E+00	1.30E-06	4.68E-05	2.25E-02	PF	5		
ED3A ¹²	4.19E+00	7.41E-07	2.67E-05	1.28E-02	PF	5		
E2DTA ¹²	5.00E-01	7.96E-08	2.87E-06	1.38E-03	PF	5		
Fe	1.84E+00	1.36E-06	4.90E-05	2.36E-02	PF	5	2.18E+00	C1
HEDOA ¹²	6.00E-01	1.13E-07	4.06E-06	1.96E-03	PF	5		
HEDTA ¹²	1.05E+01	1.48E-06	5.34E-05	2.57E-02	PF	5		
HEIDA ¹²	4.40E-01	1.03E-07	3.70E-06	1.78E-03	PF	5		
Hexanedioic acid	3.00E-01	8.51E-08	3.06E-06	1.47E-03	PF	5		
HDC	5.80E-01	1.14E-07	4.12E-06	1.98E-03	PF	5		
HDBD	3.00E-02	9.27E-09	3.34E-07	1.61E-04	PF	5		
IDA ¹²	3.03E+01	9.43E-06	3.40E-04	1.63E-01	PF	5		
MeEDD'A ¹²	1.80E-01	3.92E-08	1.41E-06	6.79E-04	PF	5		
MeHEDD'A ¹²	4.30E-01	7.61E-08	2.74E-06	1.32E-03	PF	5		
MTA	4.47E+00	1.25E-06	4.50E-05	2.17E-02	PF	5		
Na	2.10E+02	3.78E-04	1.36E-02	6.55E+00	PF	5	2.13E+00	C2 as NaOH
Nonanedioic acid	1.00E-01	2.20E-08	7.93E-07	3.81E-04	PF	5		

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Tank Farm 241-AN Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₂	3.82E+01	2.64E-06	9.52E-05	5.96E-01	PF	5		
NO ₃	1.67E+02	8.57E-06	3.09E-04	1.93E+00	PF	5		
NTA ¹²	1.40E+00	2.15E-06	7.73E-05	3.72E-02	PF	5		
OH	8.50E-01	2.07E-06	7.45E-05	3.59E-02	PF	5	2.88E+00	C2 as NaOH
Pentanedioic acid	9.00E-02	2.82E-08	1.02E-06	4.89E-04	PF	5		
Phthalic acid	2.00E-01	4.99E-08	1.80E-06	8.64E-04	PF	5		D as PA
PO ₄	2.85E+00	1.49E-06	5.38E-05	2.59E-02	PF	5		
SO ₄	5.76E+00	2.76E-07	9.93E-06	4.30E-02	PF	5		
TOC gC/l ¹⁷	3.91E+01	1.35E-04	4.86E-03	2.34E+00	PF	5		
Am 241 ¹⁸	7.57E+02	2.07E-06	7.46E-05	3.59E-02	PF	5	2.0E-11	B ¹⁹
Cm 244	5.00E+00	9.84E-09	3.54E-07	1.70E-04	PF	5	4.0E-11	B
Cs 137	3.54E+05	5.20E-05	1.87E-03	1.35E+01	PF	5	4.0E-07	B
Co 60	8.46E+02	7.19E-07	2.59E-05	1.25E-02	PF	5	8.0E-08	B
Eu 154	2.61E+03	2.99E-06	1.08E-04	5.87E-02	PF	5	5.0E-08	B
Pu 239/240	1.00E+02	2.78E-07	1.00E-05	4.81E-03	PF	5	2.0E-12	B
Pu 241	7.41E+02	1.35E-06	4.85E-05	2.33E-02	PF	5	1.0E-10	B
Sr 89/90	1.48E+05	2.19E-06	7.90E-05	5.70E+00	PF	5	9.0E-09	B
water		6.43E+04	6.43E+04	6.43E+04	Stm Tabl	1		

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Tal. /arm 241-AN Vapor Estimates

Note: 1. Estimated viscosity assuming 40 vol.% solids for all AN tanks.

Note: 1A. No density value reported for tank AN-107, estimated Sp.G.=1.5.

Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.

Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. Organic data for tank AN-107 obtained from organic complexant waste.

Note: 4. Estimated current vapor composition ppm by volume for , microcurie/l for radionuclides.

Note: 5. Estimated future vapor composition based on stated retrieval model.

Note: 6. Data denoted 5 for Tanks AN-101, 104, 105, 106, and 107 invalidated by post sample tank transfers. Tank AN-102 data reliability based on on PF availability. Tank AN-103 reliability deemed 5 due to slurry sample.

Note: 8. Henry's constants for ammonia not corrected for salt.

Note: 10. As maleic anhydride.

Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).

Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.

Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.

Note: 18. Radionuclides decayed to current year (i.e., 1994 - 1987 = 7).

Note: 19. Allowable data based on DCG's in microcurie/l.

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Tank Farm 241-AP Vapor Estimates

Sample Type	Liquid		Tank:	241-AP-101				
Sample Date	7/20/93		Contents:	Liquid				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.2E-04		Retr. Method	Pumping				
pH	13.03							
Density, g/ml	0.986							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	6.67E-04	1.26E-09	4.55E-08	2.69E-04	PF	4	9.06E+00	C1
As	1.30E-05	8.87E-12	3.19E-10	1.89E-06	PF	4	6.52E-02	C1
Ba	9.94E-05	3.71E-11	1.34E-09	7.91E-06	PF	4	8.92E-02	C1
Cd	5.68E-05	2.60E-11	9.35E-10	5.53E-06	PF	4	5.46E-04	C1, C2, D
Cl	2.20E-02	2.01E-09	7.24E-08	6.85E-03	PF	3		
CN	3.40E-04	6.70E-10	2.41E-08	1.43E-04	PF	4	4.70E+00	C1, D
Cr	3.38E-05	7.39E-12	2.66E-10	7.09E-06	PF	3	2.35E-01	C1, D
F	6.87E-02	2.57E-07	2.57E-07	2.58E-02	PF	3	3.22E+00	C1
Fe	2.81E-04	2.57E-10	9.25E-09	5.47E-05	PF	4	2.18E+00	C1
Hg	5.00E-06	1.27E-12	4.59E-11	2.71E-07	PF	4	6.08E-03	B, C1, C2
Mg	6.57E-04	4.18E-08	4.18E-08	2.47E-04	PF	4	1.02E+01	C1
Mn	1.64E-05	1.53E-11	5.50E-10	3.25E-06	PF	4	2.22E+00	C2, D
Na	1.29E+00	2.87E-06	1.03E-04	6.11E-01	PF	4	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	1.96E+00	9.56E-03	9.56E-03	9.56E-03	VLE	3	2.50E+01	C1
NO ₃	1.58E+00	1.00E-07	3.61E-06	2.78E-01	PF	3		
OH	1.82E+00	5.48E-06	1.97E-04	1.17E+00	PF	4	2.88E+00	C2 as NaOH
Pb	3.29E-04	8.14E-11	2.93E-09	1.73E-05	PF	3	5.91E-03	C1, A, D
PO ₄	1.00E-02	6.48E-09	2.33E-07	1.38E-03	PF	4		
Se	1.32E-05	8.55E-12	3.08E-10	1.82E-06	PF	4	6.19E-02	C1, D
SO ₄	8.62E-02	5.10E-09	1.84E-07	9.79E-03	PF	3		
TOC gC/l ¹⁷	1.69E-02	7.21E-08	2.60E-06	1.54E-02	PF	4		
Zr	4.94E-04	2.78E-10	1.00E-08	5.92E-05	PF	4	1.34E+00	C1, C3
Am 241 ¹⁸	1.33E+00	3.69E-09	1.33E-07	7.85E-04	PF	4	2.0E-11	B
C 14	2.90E-03	8.05E-12	2.90E-10	1.72E-06	PF	4	6.0E-06	B
Cm 243	3.18E-01	8.62E-10	3.10E-08	1.84E-04	PF	4	3.0E-14	B
Cs 137	3.26E+00	5.89E-10	2.12E-08	1.88E-03	PF	4	4.0E-07	B
CePr 144	2.10E+01	2.38E-08	8.58E-07	5.07E-03	PF	4	3.0E-08	B
Co 60	2.71E-01	6.60E-10	2.38E-08	1.41E-04	PF	4	8.0E-08	B

Tank Farm 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cs 134	2.83E-01	5.65E-10	2.03E-08	1.20E-04	PF	4	4.0E-07	B
Bu 154	9.32E-01	2.38E-09	8.56E-08	5.07E-04	PF	4	5.0E-08	B
Bu 155	6.41E-01	1.54E-09	5.54E-08	3.28E-04	PF	4	3.0E-07	B
H 3	2.10E+00	8.38E-06	3.02E-04	1.17E-03	PF	3	1.0E-04	B
I 129	3.92E-02	1.51E-08	5.45E-07	2.32E-05	PF	4	7.0E-08	B
Nb 94	2.43E-01	6.75E-10	2.43E-08	1.44E-04	PF	4	4.0E-11	B
Np 237	4.70E-02	1.31E-10	4.70E-09	2.78E-05	PF	4	1.2E-12	B
Pu 238	2.88E-01	7.94E-10	2.86E-08	1.69E-04	PF	4	2.1E-12	B
Pu 239/240	2.12E-01	5.89E-10	2.12E-08	1.25E-04	PF	4	2.0E-12	B
Ra 226	4.55E+00	1.26E-08	4.55E-07	2.69E-03	PF	4	1.0E-09	B
Ru 103	2.35E-01	1.06E-12	3.82E-11	2.26E-07	PF	3	2.0E-09	B
RuRh 106	4.72E+00	1.02E-10	3.68E-09	1.40E-03	PF	3	3.0E-08	B
Se 79	6.00E-03	1.67E-11	6.00E-10	3.55E-06	PF	4	1.0E-06	B
Sr 89/90	5.63E-01	1.02E-11	3.66E-10	3.25E-04	PF	4	9.0E-09	B
Tc 99	2.81E-02	7.81E-11	2.81E-09	1.66E-05	PF	4	2.0E-06	B

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Tank Farm 241-AP Vapor Estimates

Sample Type	Liquid		Tank:	241-AP-102				
Sample Date	1993		Contents:	Liquid				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.9E-03		Retr. Method	Pumping				
pH	13.73							
Density, g/ml	1.2							
Temperature, °R	537							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.25E-04	5.41E-11	1.95E-09	8.02E-07	PF	4	2.27E-03	C1
Al	1.16E+01	2.01E-05	7.22E-04	2.97E-01	PF	4	9.06E+00	C1
Ba	2.78E-04	9.48E-11	3.41E-09	1.40E-06	PF	4	8.92E-02	C1
Be	1.46E-04	7.58E-10	2.73E-08	1.12E-05	PF	4	1.36E-03	B (10g/24 hr), C1
Cd	1.47E-03	6.13E-10	2.21E-08	9.08E-06	PF	4	5.46E-04	C1, C2, D
Citric Acid	5.15E-01	1.25E-07	4.51E-06	1.86E-03	PF	4		
Cl	3.00E+00	2.50E-07	9.01E-06	5.93E-02	PF	3		
Cr	6.19E-01	1.23E-07	4.44E-06	8.24E-03	PF	3	2.35E-01	C1, D
EDTA ¹²	5.19E-01	8.30E-08	2.99E-06	1.23E-03	PF	4		
F	1.68E-01	5.73E-07	5.73E-07	4.01E-03	PF	3	3.22E+00	C1
Fe	3.92E-03	3.27E-09	1.18E-07	4.84E-05	PF	4	2.18E+00	C1
Glycolate	1.10E+01	6.85E-06	2.47E-04	1.01E-01	PF	4		
HEDTA ¹²	1.10E-01	1.75E-08	6.31E-07	2.60E-04	PF	4		
K	1.29E+00	1.54E-06	5.56E-05	2.29E-02	PF	4		
Na	1.02E+02	2.07E-04	7.46E-03	3.07E+00	PF	4	2.13E+00	C2 as NaOH
Ni	2.67E-02	1.55E-06	1.55E-06	6.37E-04	PF	4	4.14E-02	C1, D
NO ₃	7.72E+01	4.47E-06	1.61E-04	8.61E-01	PF	3		
OH	9.16E+00	2.52E-05	9.06E-04	3.73E-01	PF	4	2.88E+00	C2 as NaOH
Oxalate	8.00E-01	4.20E-07	1.51E-05	6.22E-03	PF	4		
P	3.05E+00	4.59E-06	1.65E-04	6.81E-02	PF	4		
Pb	1.73E-03	3.90E-10	1.41E-08	5.78E-06	PF	3	5.91E-03	C1, A, D
PO ₄	1.18E+01	6.98E-06	2.51E-04	1.03E-01	PF	4		
Sb	5.61E-03	2.15E-09	7.73E-08	3.18E-05	PF	4	1.00E-01	C1, D
Se	3.77E-01	2.23E-07	8.02E-06	3.30E-03	PF	4	6.19E-02	C1, D
SO ₄	4.50E+00	2.43E-07	8.75E-06	3.24E-02	PF	3		

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Tar. arm 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
TOC gC/l ¹⁷	3.36E+00	1.31E-05	4.71E-04	1.94E-01	PF	4		
Am 241 ¹⁸	4.39E-01	1.22E-09	4.38E-08	1.80E-05	PF	4	2.0E-11	B
Am 243	5.02E-01	1.39E-09	5.02E-08	2.07E-05	PF	4	2.0E-11	B
Cs 137	2.27E+05	4.10E-05	1.48E-03	9.10E+00	PF	3	4.0E-07	B
CePr 144	7.79E+02	8.84E-07	3.18E-05	1.31E-02	PF	4	3.0E-08	B
Co 60	1.76E+01	4.29E-08	1.54E-06	6.35E-04	PF	4	8.0E-08	B
Cs 134	2.13E+01	4.25E-08	1.53E-06	6.29E-04	PF	4	4.0E-07	B
Np 237	3.94E-01	1.09E-09	3.94E-08	1.62E-05	PF	4	1.2E-12	B
Pu 238	1.08E-01	2.98E-10	1.07E-08	4.41E-06	PF	4	2.1E-12	B
Pu 239/240	6.86E-02	1.91E-10	6.86E-09	2.82E-06	PF	4	2.0E-12	B
RuRh 106	1.19E+03	2.58E-08	9.28E-07	2.45E-02	PF	3	3.0E-08	B
Sr 89/90	1.42E+03	2.57E-08	9.24E-07	5.70E-02	PF	3	9.0E-09	B
Sb 125	3.59E+02	7.71E-07	2.78E-05	1.14E-02	PF	3	1.0E-06	B
Tc 99	7.80E+01	2.17E-07	7.80E-06	3.21E-03	PF	4	2.0E-06	B

Tank Farm 241-AP Vapor Estimates

Sample Type	SN		Tank:	241-AP-103				
Sample Date	9/91-11/91		Contents:	Liquid				
Sample ID	3AP891-1,10		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.0E-04		Retr. Method	Pumping				
pH	13.00							
Density ^{1A} , g/ml	1.00							
Temperature, °R	525							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ³	4.00E-05	1.86E-11	6.69E-10	4.06E-06	PF	4	2.27E-03	C1
Al	2.46E-01	4.56E-07	1.64E-05	9.97E-02	PF	4	9.06E+00	C1
As	4.84E-05	3.23E-11	1.16E-09	7.06E-06	PF	4	6.52E-02	C1
Ba ³	6.50E-05	2.38E-11	8.56E-10	5.19E-06	PF	4	8.92E-02	C1
Cd	1.11E-04	4.96E-11	1.79E-09	1.08E-05	PF	4	5.46E-04	C1, C2, D
Cl	4.95E-02	4.43E-09	1.59E-07	1.55E-02	PF	3		
CN	5.51E-04	1.06E-09	3.82E-08	2.32E-04	PF	4	4.70E+00	C1, D
Cr	4.39E-03	9.39E-10	3.38E-08	9.24E-04	PF	3	2.35E-01	C1, D
F	1.29E-01	4.72E-07	4.72E-07	4.87E-02	PF	3	3.22E+00	C1
Fe	8.31E-04	7.43E-10	2.68E-08	1.62E-04	PF	4	2.18E+00	C1
Hg ³	5.00E-06	1.25E-12	4.49E-11	2.72E-07	PF	4	6.08E-03	B, C1, C2
Mg ³	1.53E-03	9.51E-08	9.51E-08	5.77E-04	PF	4	1.02E+01	C1
Mn	2.90E-05	2.64E-11	9.51E-10	5.77E-06	PF	4	2.22E+00	C2, D
Na	5.31E+00	1.16E-05	4.16E-04	2.53E+00	PF	4	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	5.88E-02	2.81E+02	2.81E+02	2.81E+02	VLE	4	2.50E+01	C1
NO ₃	1.30E+00	8.08E-08	2.91E-06	2.29E-01	PF	3		
OH	1.69E+00	4.98E-06	1.79E-04	1.09E+00	PF	4	2.88E+00	C2 as NaOH
Pb ³	4.00E-04	9.68E-11	3.48E-09	2.11E-05	PF	3	5.91E-03	C1, A, D
PO ₄	1.39E-01	8.81E-08	3.17E-06	1.92E-02	PF	4		
Se ³	2.00E-05	1.27E-11	4.57E-10	2.77E-06	PF	4	6.19E-02	C1, D
SO ₄	3.50E-01	2.03E-08	7.30E-07	3.99E-02	PF	3		
TOC gC/l ¹⁷	1.12E-01	4.68E-07	1.68E-05	1.02E-01	PF	4		
Zn	2.74E-04	2.11E-10	7.60E-09	4.61E-05	PF	4		

Tank Farm 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 ^{3,18}	1.14E-02	3.14E-11	1.13E-09	6.85E-06	PF	4	2.0E-11	B
C 14	4.47E-03	1.24E-11	4.47E-10	2.71E-06	PF	4	6.0E-06	B
Cs 137	6.54E+03	1.04E-06	3.74E-05	3.40E+00	PF	3	4.0E-07	B
Cepr 144 ³	1.70E+02	2.19E-09	7.88E-08	4.78E-04	PF	4	3.0E-08	B
Co 60 ³	1.20E+01	1.51E-08	5.45E-07	3.31E-03	PF	4	8.0E-08	B
Cs 134 ³	2.24E+01	8.53E-09	3.07E-07	1.86E-03	PF	4	4.0E-07	B
Eu 154 ³	3.20E+01	5.75E-08	1.93E-06	1.17E-02	PF	4	5.0E-08	B
Eu 155 ³	8.75E+01	1.01E-07	3.65E-06	2.22E-02	PF	4	3.0E-07	B
H 3	5.24E+00	1.50E-05	5.68E-04	2.27E-03	PF	3	1.0E-04	B
Nb 94 ³	9.30E+00	2.50E-08	9.30E-07	5.64E-03	PF	4	4.0E-11	B
Pu 239/240 ³	6.97E-03	1.94E-11	6.97E-10	4.23E-06	PF	4	2.0E-12	B
Ra 226 ³	2.47E+02	6.84E-07	2.46E-05	1.49E-01	PF	4	1.0E-09	B
RuRh 106 ³	3.40E+02	2.29E-10	8.26E-09	3.21E-03	PF	3	3.0E-08	B
Se 79	1.12E-02	3.11E-11	1.12E-09	6.79E-06	PF	4	1.0E-06	B
Sn 113 ³	3.00E+01	8.33E-08	3.00E-06	1.82E-02	PF	3	1.0E-06	B
Sr 89/90	2.62E+00	4.18E-11	1.51E-09	1.37E-03	PF	3	9.0E-09	B
Tc 99	1.08E+00	3.00E-09	1.08E-07	6.55E-04	PF	4	2.0E-06	B
U 234	6.56E-03	1.82E-11	6.56E-10	3.98E-06	PF	4	9.0E-11	B
U 235	3.59E-04	9.42E-13	3.39E-11	2.06E-07	PF	4	1.0E-10	B
U 238	1.26E-03	3.50E-12	1.26E-10	7.64E-07	PF	4	1.0E-10	B

Tank Farm 241-AP Vapor Estimates

Sample Type	Liquid		Tank:	241-AP-104				
Sample Date	3/01/88		Contents:	Liquid				
Sample ID	RATAP1041A		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	0.6E-04		Retr. Method	Pumping				
pH	13.69							
Density, g/ml	1.03							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	9.71E-05	4.45E-11	1.60E-09	1.03E-05	PF	5	2.27E-03	C1
Al	9.71E-04	1.78E-09	6.41E-08	4.13E-04	PF	5	9.06E+00	C1
As	9.71E-06	6.41E-12	2.31E-10	1.49E-06	PF	5	6.52E-02	C1
Ba	4.85E-04	1.75E-10	6.31E-09	4.07E-05	PF	5	8.92E-02	C1
Bi	2.91E-03	6.89E-10	2.48E-08	1.60E-04	PF	5		
Ca	8.74E-04	1.08E-09	3.89E-08	2.51E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.94E-04	8.57E-11	3.09E-09	1.99E-05	PF	5	5.46E-04	C1, C2, D
Cl	3.75E-02	3.31E-09	1.19E-07	1.23E-02	PF	5		
CN	1.00E-04	1.90E-10	6.85E-09	4.42E-05	PF	5	4.70E+00	C1, D
CO ₃	1.98E+00	1.63E-06	5.88E-05	3.79E-01	PF	5		
Cr	1.65E-03	3.49E-10	1.25E-08	3.64E-04	PF	4	2.35E-01	C1, D
Cu	1.94E-04	1.50E-10	5.40E-09	3.48E-05	PF	5	3.82E-01	C1
F	1.66E-02	6.00E-08	6.00E-08	6.57E-03	PF	4	3.22E+00	C1
Fe	2.23E-03	1.97E-09	7.09E-08	4.57E-04	PF	5	2.18E+00	C1
K	9.71E-03	1.23E-08	4.44E-07	2.86E-03	PF	5		
Mg	1.55E-03	9.52E-08	9.52E-08	6.14E-04	PF	5	1.02E+01	C1
Mn	1.17E-04	1.05E-10	3.79E-09	2.44E-05	PF	5	2.22E+00	C2, D
Mo	4.85E-04	2.50E-10	9.00E-09	5.80E-05	PF	5	2.55E+00	C1
Na	1.13E+01	2.43E-05	8.75E-04	5.64E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.94E-04	1.19E-08	1.19E-08	7.68E-05	PF	5	4.14E-02	C1, D
NO ₃	1.93E-03	1.18E-10	4.26E-09	3.58E-04	PF	4		
P	4.76E+00	7.60E-06	2.74E-04	1.76E+00	PF	5		
Pb	3.88E-03	9.28E-10	3.34E-08	2.15E-04	PF	4	5.91E-03	C1, A, D
PO ₄	1.62E+01	1.01E-05	3.65E-04	2.36E+00	PF	5		
Si	2.33E-03	4.12E-09	1.48E-07	9.56E-04	PF	5	8.73E+00	C1
SO ₄	1.58E+00	9.04E-08	3.25E-06	1.89E-01	PF	4		
Sn	4.85E-03	2.02E-09	7.26E-08	4.68E-04	PF	5	4.11E-01	C1
TOC gC/l ¹⁷	1.90E-01	7.84E-07	2.82E-05	1.82E-01	PF	5		

Tan. Arm 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ti	9.71E-05	1.00E-10	3.60E-09	2.32E-05	PF	5		
Zr	4.85E-03	2.64E-09	9.49E-08	6.12E-04	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	7.84E-04	2.16E-12	7.76E-11	5.01E-07	PF	5	2.0E-11	B
C-14	1.14E-03	3.16E-12	1.14E-10	7.34E-07	PF	5	6.0E-06	B
Cm 244	1.33E-03	2.94E-12	1.06E-10	6.82E-07	PF	5	4.0E-11	B
Cs 137	5.81E-01	9.23E-11	3.32E-09	3.21E-04	PF	4	4.0E-07	B
Co 60	6.65E+00	8.39E-09	3.02E-07	1.95E-03	PF	5	8.0E-08	B
I 129	3.38E-02	1.31E-08	4.70E-07	2.18E-05	PF	4	7.0E-08	B
Np 237	3.84E-04	1.07E-12	3.84E-11	2.48E-07	PF	5	1.2E-12	B
Pu 239/240	3.19E-03	8.86E-12	3.19E-10	2.06E-06	PF	5	2.0E-12	B
St 89/90	3.27E-02	5.22E-13	1.88E-11	1.82E-05	PF	4	9.0E-09	B
Te 99	4.81E-02	1.34E-10	4.81E-09	3.10E-05	PF	5	2.0E-06	B
U 238	7.59E-04	2.11E-12	7.59E-11	4.89E-07	PF	5	1.0E-10	B

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Tank Farm 241-AP Vapor Estimates

Sample Type	Liquid		Tank:	241-AP-105				
Sample Date	3/10/93		Contents:	Liquid				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.355							
Temperature, °R	531							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.54E-04	6.23E-11	2.24E-09	5.40E-07	PF	4	2.27E-03	C1
Al	1.15E+01	1.86E-05	6.69E-04	1.61E-01	PF	4	9.06E+00	C1
As	9.10E-05	5.30E-11	1.91E-09	4.59E-07	PF	4	6.52E-02	C1
Ba	5.73E-04	1.83E-10	6.57E-09	1.58E-06	PF	4	8.92E-02	C1
Be	1.45E-03	7.03E-09	2.53E-07	6.10E-05	PF	4	1.36E-03	B (10g/24 hr), C1
Cd	1.82E-03	7.09E-10	2.55E-08	6.15E-06	PF	4	5.46E-04	C1, C2, D
Cl	2.61E+00	2.03E-07	7.32E-06	2.82E-02	PF	3		
CN	1.83E-02	3.07E-08	1.11E-06	2.66E-04	PF	4	4.70E+00	C1, D
Cr	1.86E-01	3.47E-08	1.25E-06	1.35E-03	PF	3	2.35E-01	C1, D
F	2.87E+00	9.16E-06	9.16E-06	3.75E-02	PF	3	3.22E+00	C1
Fe	6.44E-03	5.02E-09	1.81E-07	4.35E-05	PF	4	2.18E+00	C1
Hg	2.50E-05	5.43E-12	1.95E-10	4.71E-08	PF	4	6.08E-03	B, C1, C2
K	3.11E+01	3.48E-05	1.25E-03	3.02E-01	PF	4		
Na	1.67E+02	3.17E-04	1.14E-02	2.75E+00	PF	4	2.13E+00	C2 as NaOH
NH ₃ ^{8, 14}	4.00E-02	1.66E+02	1.66E+02	1.66E+02	VLE	4	2.50E+01	C1
Ni	1.11E-02	6.01E-07	6.01E-07	1.45E-04	PF	4	4.14E-02	C1, D
NO ₃	1.70E+02	9.20E-06	3.31E-04	1.04E+00	PF	3		
OH	5.40E+01	1.39E-04	4.99E-03	1.20E+00	PF	4	2.88E+00	C2 as NaOH
P	3.25E-01	4.58E-07	1.65E-05	3.97E-03	PF	4		
Pb	5.29E-03	1.12E-09	4.02E-08	9.67E-06	PF	3	5.91E-03	C1, A, D
PO ₄	5.26E-01	2.91E-07	1.05E-05	2.52E-03	PF	4		
Sb	6.73E-03	2.41E-09	8.67E-08	2.09E-05	PF	4	1.00E-01	C1, D
Se	1.40E-07	7.73E-14	2.78E-12	6.71E-10	PF	4	6.19E-02	C1, D
SO ₄	3.74E+00	1.89E-07	6.79E-06	1.47E-02	PF	3		
TOC gC/l ¹⁷	2.76E-01	1.00E-06	3.61E-05	8.70E-03	PF	4		
Am 241 ¹⁸	1.83E+00	5.07E-09	1.83E-07	4.40E-05	PF	4	2.0E-11	B
C 14	9.19E-01	2.55E-09	9.19E-08	2.21E-05	PF	4	6.0E-06	B

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Tank Arm 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cs 137	2.25E+05	4.06E-05	1.46E-03	5.28E+00	PF	3	4.0E-07	B
CePr 144	1.30E+03	1.47E-06	5.31E-05	1.28E-02	PF	4	3.0E-08	B
Co 60	4.33E+01	1.05E-07	3.80E-06	9.14E-04	PF	4	8.0E-08	B
Cs 134	5.14E+02	1.03E-06	3.69E-05	8.89E-03	PF	4	4.0E-07	B
H 3	3.96E+00	1.58E-05	5.69E-04	9.02E-05	PF	3	1.0E-04	B
I 129	3.42E-05	1.32E-11	4.75E-10	8.24E-10	PF	3	7.0E-08	B
Nb 94	4.35E+01	1.21E-07	4.35E-06	1.05E-03	PF	4	4.0E-11	B
Np 237	4.43E-04	1.23E-12	4.43E-11	1.07E-08	PF	4	1.2E-12	B
Pu 238	2.08E+01	5.74E-08	2.07E-06	4.98E-04	PF	4	2.1E-12	B
Pu 239/240	4.86E-02	1.35E-10	4.86E-09	1.17E-06	PF	4	2.0E-12	B
RuRh 106	2.40E+03	5.20E-08	1.87E-06	2.89E-02	PF	3	3.0E-08	B
Sr 89/90	2.93E+04	5.30E-07	1.91E-05	6.89E-01	PF	3	9.0E-09	B
Sb 125	6.99E+02	1.50E-06	5.41E-05	1.30E-02	PF	3	1.0E-06	B
Tc 99	3.95E+00	1.10E-08	3.95E-07	9.52E-05	PF	4	2.0E-06	B

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Tank Farm 241-AP Vapor Estimates

Sample Type	Liquid		Tank:	241-AP-106				
Sample Date	3/17/93		Contents:	Liquid				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	6.03E-04		Retr. Method	Pumping				
pH	9.92							
Density, g/ml	0.997							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	2.19E-03	1.02E-09	3.67E-08	2.62E-04	PF	4	2.27E-03	C1
Al	2.13E-01	3.96E-07	1.43E-05	1.02E-01	PF	4	9.06E+00	C1
As	2.50E-07	1.68E-13	6.03E-12	4.31E-08	PF	4	6.52E-02	C1
Ba	1.33E-03	4.87E-10	1.75E-08	1.25E-04	PF	4	8.92E-02	C1
Be	1.31E-03	7.34E-09	2.64E-07	1.89E-03	PF	4	1.36E-03	B (10g/24 hr), C1
C ₆ H ₅ O ₇ anion	4.40E-02	1.18E-08	4.23E-07	3.02E-03	PF	4		
Cd	2.94E-03	1.32E-09	4.75E-08	3.39E-04	PF	4	5.46E-04	C1, C2, D
Cl	5.66E-05	5.08E-12	1.83E-10	2.09E-05	PF	3		
CN	5.03E-07	9.72E-13	3.50E-11	2.50E-07	PF	4	4.70E+00	C1, D
Cr	6.33E-03	1.36E-09	4.89E-08	1.57E-03	PF	3	2.35E-01	C1, D
EDTA ¹²	2.00E-02	3.44E-09	1.24E-07	8.85E-04	PF	4		
F	1.71E-04	6.27E-10	6.27E-10	7.61E-05	PF	3	3.22E+00	C1
Fe	9.22E-03	8.27E-09	2.98E-07	2.13E-03	PF	4	2.18E+00	C1
Glycolate	6.43E-03	4.31E-09	1.55E-07	1.11E-03	PF	4		
HEDTA ¹²	2.00E-02	3.43E-09	1.23E-07	8.82E-04	PF	4		
Hg	2.50E-06	6.25E-13	2.25E-11	1.61E-07	PF	4	6.08E-03	B, C1, C2
K	8.31E-01	1.07E-06	3.85E-05	2.75E-01	PF	4		
Na	5.58E+00	1.22E-05	4.39E-04	3.14E+00	PF	4	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	1.60E-04	7.66E-01	7.66E-01	7.66E-01	VLE	4	2.50E+01	C1
Ni	5.50E-03	3.43E-07	3.43E-07	2.45E-03	PF	4	4.14E-02	C1, D
NO ₃	4.74E-03	2.96E-10	1.06E-08	9.89E-04	PF	3		
OH	1.43E-03	4.23E-09	1.52E-07	1.09E-03	PF	4	2.88E+00	C2 as NaOH
Oxolate	7.60E-02	4.29E-08	1.54E-06	1.10E-02	PF	4		
P	8.17E-02	1.32E-07	4.77E-06	3.41E-02	PF	4		
Pb	2.71E-02	6.58E-09	2.37E-07	1.69E-03	PF	4	5.91E-03	C1, A, D
PO ₄	2.10E-04	1.34E-10	4.81E-09	3.44E-05	PF	4		

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sb	9.19E-02	3.79E-08	1.36E-06	9.74E-03	PF	4	1.00E-01	Cl, D
Se	8.63E-08	5.49E-14	1.98E-12	1.41E-08	PF	4	6.19E-02	Cl, D
SO ₄	1.42E-04	8.25E-12	2.97E-10	1.91E-05	PF	3		
TOC gC/l ¹⁷	4.56E-04	1.91E-09	6.87E-08	4.91E-04	PF	4		
Am 241 ¹⁸	1.89E-04	5.24E-13	1.89E-11	1.35E-07	PF	4	2.0E-11	B
Cm 243	3.35E-04	9.08E-13	3.27E-11	2.34E-07	PF	4	3.0E-14	B
Cs 137	5.33E+00	9.62E-10	3.46E-08	3.71E-03	PF	3	4.0E-07	B
CePr 144	2.62E-02	2.97E-11	1.07E-09	7.64E-06	PF	4	3.0E-08	B
Co 60	8.84E-04	2.15E-12	7.75E-11	5.54E-07	PF	4	8.0E-08	B
Cs 134	1.47E-02	2.93E-11	1.06E-09	7.54E-06	PF	4	4.0E-07	B
H 3	4.90E-03	1.96E-08	7.04E-07	3.31E-06	PF	4	1.0E-04	B
I 129	3.90E-05	1.51E-11	5.42E-10	2.79E-08	PF	3	7.0E-08	B
Nb 94	9.74E-04	2.71E-12	9.74E-11	6.96E-07	PF	4	4.0E-11	B
Pu 238	1.68E-04	4.63E-13	1.67E-11	1.19E-07	PF	4	2.1E-12	B
Pu 239/240	1.12E-04	3.11E-13	1.12E-11	8.00E-08	PF	4	2.0E-12	B
RuRh 106	4.29E-02	9.29E-13	3.34E-11	1.53E-05	PF	4	3.0E-08	B
Sr 89/90	5.44E-04	9.83E-15	3.54E-13	3.79E-07	PF	3	9.0E-09	B
Sb 125	1.26E-02	2.71E-11	9.74E-10	6.96E-06	PF	3	1.0E-06	B
Tc 99	1.33E-03	3.69E-12	1.33E-10	9.50E-07	PF	4	2.0E-06	B

Tank Farm 241-AP Vapor Estimates

Sample Type	Liquid		Tank:	241-AP-107				
Sample Date	8/1/93		Contents:	Liquid				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.2E-04		Retr. Method	Pumping				
pH	9.17							
Density, g/ml	0.989							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.06E-03	1.99E-09	7.15E-08	4.23E-04	PF	4	9.06E+00	C1
As	1.30E-08	8.77E-15	3.16E-13	1.87E-09	PF	4	6.52E-02	C1
Ba	2.38E-05	8.79E-12	3.17E-10	1.87E-06	PF	4	8.92E-02	C1
Cd	2.20E-05	9.94E-12	3.58E-10	2.12E-06	PF	4	5.46E-04	C1, C2, D
Cl	2.20E-05	1.99E-12	7.15E-11	6.77E-06	PF	3		
CN	5.79E-07	1.13E-12	4.06E-11	2.40E-07	PF	4	4.70E+00	C1, D
F	1.42E-04	5.23E-10	5.23E-10	5.26E-05	PF	3	3.22E+00	C1
Fe	1.54E-04	1.39E-10	5.01E-09	2.97E-05	PF	4	2.18E+00	C1
Hg	3.00E-09	7.55E-16	2.72E-14	1.61E-10	PF	4	6.08E-03	B, C1, C2
Mn	3.99E-05	3.67E-11	1.32E-09	7.82E-06	PF	4	2.22E+00	C2, D
Na	2.28E+00	5.01E-06	1.81E-04	1.07E+00	PF	4	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	4.40E-05	1.41E-01	1.41E-01	1.41E-01	VLE	3	2.50E+01	C1
NO ₃	1.02E-03	6.38E-11	2.30E-09	1.77E-04	PF	3		
OH	2.52E-04	7.49E-10	2.70E-08	1.59E-04	PF	4	2.88E+00	C2 as NaOH
P	1.00E-05	1.63E-11	5.87E-10	3.47E-06	PF	4		
Pb	2.47E-04	6.03E-11	2.17E-09	1.28E-05	PF	3	5.91E-03	C1, A, D
Se	1.30E-08	8.32E-15	3.00E-13	1.77E-09	PF	4	6.19E-02	C1, D
SO ₄	4.86E-05	2.84E-12	1.02E-10	5.45E-06	PF	3		
TOC gC/l ¹⁷	5.17E-05	2.18E-10	7.84E-09	4.64E-05	PF	4		
Am 241 ¹⁸	3.50E-04	9.71E-13	3.49E-11	2.07E-07	PF	4	2.0E-11	B
C 14	2.68E-06	7.44E-15	2.68E-13	1.59E-09	PF	4	6.0E-06	B
Cm 243	3.50E-04	9.49E-13	3.42E-11	2.02E-07	PF	4	3.0E-14	B
Cs 137	8.52E-05	1.54E-14	5.54E-13	4.91E-08	PF	4	4.0E-07	B
CePr 144	8.88E-03	1.01E-11	3.63E-10	2.14E-06	PF	4	3.0E-08	B
Co 60	5.60E-05	1.36E-13	4.91E-12	2.90E-08	PF	4	8.0E-08	B
Cs 134	5.30E-05	1.06E-13	3.81E-12	2.25E-08	PF	4	4.0E-07	B
Eu 155	1.21E-04	2.91E-13	1.05E-11	6.19E-08	PF	4	3.0E-07	B
H 3	3.50E-02	1.40E-07	5.03E-06	1.96E-05	PF	3	1.0E-04	B

Tank 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
I 129	3.96E-05	1.53E-11	5.50E-10	2.34E-08	PF	3	7.0E-08	B
NB 94	4.64E-05	1.29E-13	4.64E-12	2.74E-08	PF	4	4.0E-11	B
NP 237	1.40E-05	3.89E-14	1.40E-12	8.28E-09	PF	4	1.2E-12	B
Pu 238	6.24E-04	1.72E-12	6.19E-11	3.66E-07	PF	4	2.1E-12	B
Pu 239/240	4.79E-04	1.33E-12	4.79E-11	2.83E-07	PF	4	2.0E-12	B
RA 226	9.67E-03	2.68E-11	9.67E-10	5.72E-06	PF	4	1.0E-09	B
RuRh 106	8.81E-04	1.91E-14	6.87E-13	2.60E-07	PF	1	3.0E-08	B
St 89/90	1.18E-04	2.43E-15	7.68E-14	6.81E-08	PF	1	9.0E-09	B
Tc 99	2.05E-05	5.69E-14	2.05E-12	1.21E-08	PF	4	2.0E-06	B

Tank Farm 241-AP Vapor Estimates

Sample Type	Ave. Liq.		Tank:	241-AP-108				
Sample Date	2/90, 11/84		Contents:	Liquid/Solids				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	6.6E-04		Retr. Method	Pumping				
pH	9.50							
Density ^{1A} , g/ml	1.04							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	6.90E-03	3.11E-09	1.12E-07	7.22E-04	PF	5	2.27E-03	C1
Al	6.82E-02	1.23E-07	4.42E-06	2.85E-02	PF	5	9.06E+00	C1
Ba	3.70E-04	1.31E-10	4.73E-09	3.05E-05	PF	5	8.92E-02	C1
B	6.30E-03	2.79E-08	1.00E-06	6.46E-03	PF	5	2.22E+01	C1
Ca	3.90E-03	4.74E-09	1.71E-07	1.10E-03	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.12E-04	4.86E-11	1.75E-09	1.13E-05	PF	5	5.46E-04	C1, C2, D
Cl	3.50E-01	3.04E-08	1.09E-06	1.13E-01	PF	5		
Co	2.36E-04	1.95E-10	7.00E-09	4.51E-05	PF	5	2.07E-02	C1, D
CO ₃	3.66E+00	2.97E-06	1.07E-04	6.89E-01	PF	5		
Cr	1.10E-02	2.28E-09	8.22E-08	2.39E-03	PF	5	2.35E-01	C1, D
F	1.71E-01	6.07E-07	6.07E-07	6.66E-02	PF	5	3.22E+00	C1
Fe	2.30E-04	2.00E-10	7.19E-09	4.64E-05	PF	5	2.18E+00	C1
K	4.30E-02	5.36E-08	1.93E-06	1.24E-02	PF	5		
La	5.60E-05	1.96E-11	7.05E-10	4.55E-06	PF	5		
Mg	4.90E-04	2.96E-08	2.96E-08	1.91E-04	PF	5	1.02E+01	C1
Mn	1.10E-05	9.73E-12	3.50E-10	2.26E-06	PF	5	2.22E+00	C2, D
Na	2.16E+00	4.57E-06	1.65E-04	1.06E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.00E-04	6.04E-09	6.04E-09	3.89E-05	PF		4.14E-02	C1, D
NO ₃	1.17E+01	7.05E-07	2.54E-05	2.13E+00	PF	5		
OH	5.03E+00	1.44E-05	5.18E-04	3.34E+00	PF	5	2.88E+00	C2 as NaOH
P	3.00E-03	4.71E-09	1.69E-07	1.09E-03	PF	5		
PO ₄	1.56E-01	9.60E-08	3.46E-06	2.23E-02	PF	5		
Si	1.49E-01	2.59E-07	9.32E-06	6.01E-02	PF	5	8.73E+00	C1
SO ₄	7.25E-01	4.08E-08	1.47E-06	8.52E-02	PF	5		
Sr	1.80E-04	9.95E-11	3.58E-09	2.31E-05	PF	5		

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Tank Am 241-AP Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
TOC gC/l ¹⁷	1.51E+00	6.10E-06	2.20E-04	1.42E+00	PF	5		
Zn	2.90E-04	2.17E-10	7.81E-09	5.04E-05	PF	5		
Zr	4.40E-05	2.35E-11	8.47E-10	5.46E-06	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	1.50E-03	4.14E-12	1.49E-10	9.61E-07	PF	5	2.0E-11	B
Cs 137	4.32E+03	2.16E-05	7.76E-04	7.50E+01	PF	5	4.0E-07	B
Pu 239/240	2.34E-01	6.50E-10	2.34E-08	1.51E-04	PF	5	2.0E-12	B
Sr 89/90	6.58E+03	2.23E-07	8.02E-06	7.75E+00	PF	5	9.0E-09	B

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Tank Farm 241-AP Vapor Estimates

- Note: 1. No viscosity data available, viscosity of tanks AP-101, 103, 104, 106, 107, 108 estimated as water at tank temperature. Viscosity of tanks AP-102 and 105 estimated assuming 40 vol. % solids.
- Note: 1A. Data for tank AP-108 appears incomplete as moles of water are too great with reported concentrations and density. No density reported for tank AP-103, estimated Sp.G.=1.0.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted. Tank AP-105 Se, As, Am241, and Np237 reported with unclear units. Tank AP-108 reported unidentified transuranic species at 0.236 microcurie/l.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. Data reliability for tanks AP-101, 102, 105, 106, and 107 based on the average of validated data in WHC-SD-WM-DP-051 Rev. 0, WHC-SD-WM-TRP-168 Rev. 0, WHC-SD-WM-DP-048 Rev. 0, WHC-SD-WM-TRP-170 Rev. 0, and WHC-SD-WM-DP-053 Rev. 0 respectively. Tank AP-103 invalidated due to tank transfers after sampling. Tank AP-104 reliability based on PF availability. Tank AP-108 data reliability deemed 5 due to the uncertainty of the data source. Data taken from AY-102 1990, WHC-SD-WM-TI-578 Rev. 0, sample since 80 vol.% of AP-108 was transferred from AY-102 on 11/10/91.
- Note: 7. Allowable concentration, in ppm by volume.
- Note: 8. Henry's constants for ammonia not corrected for salt.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).

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Tank . 241-AW Vapor Estimates

Sample Type	SL/SN		Tank:	241-AW-101				
Sample Date	6/90		Contents:	Liquid/Solids				
Sample ID	Mean		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.8E-03		Retr. Method	Pumping				
pH	10.89							
Density ^{1A} , g/ml	1.54							
Temperature, °R	560							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	3.33E-02	1.20E-08	4.32E-07	1.73E-04	PF	5	2.27E-03	C1
Al	2.79E+01	4.02E-05	1.45E-03	5.79E-01	PF	5	9.06E+00	C1
Ba	9.43E-03	2.68E-09	9.63E-08	3.86E-05	PF	5	8.92E-02	C1
Bi	1.21E-01	2.25E-08	8.10E-07	3.24E-04	PF	5		
Ca	3.31E-02	3.22E-08	1.16E-06	4.64E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.21E-03	4.20E-10	1.51E-08	6.05E-06	PF	5	5.46E-04	C1, C2, D
Cl	5.18E+00	3.60E-07	1.29E-05	8.29E-02	PF	5		
CN	2.68E-02	4.01E-08	1.44E-06	5.77E-04	PF	5	4.70E+00	C1, D
CO ₃	1.23E+01	7.97E-06	2.87E-04	1.15E-01	PF	5		
Cr	1.61E-01	2.67E-08	9.62E-07	1.73E-03	PF	5	2.35E-01	C1, D
Cu	2.42E-02	1.47E-08	5.29E-07	2.12E-04	PF	5	3.82E-01	C1
F	7.63E-02	9.18E-09	3.30E-07	2.25E-03	PF	5	3.22E+00	C1
Fe	4.39E-02	3.05E-08	1.10E-06	4.39E-04	PF	5	2.18E+00	C1
Hg	1.57E-04	3.04E-11	1.09E-09	4.38E-07	PF	5	6.08E-03	B, C1, C2
K	4.18E+01	4.17E-05	1.50E-03	6.00E-01	PF	5		
Mg	5.24E-02	8.49E-08	3.06E-06	1.22E-03	PF	5	1.02E+01	C1
Mn	2.61E-02	1.85E-08	6.64E-07	2.66E-04	PF	5	2.22E+00	C2, D
Mo	5.75E-02	2.33E-08	8.38E-07	3.36E-04	PF	5	2.55E+00	C1
Na	2.30E-02	3.89E-08	1.40E-06	5.60E-04	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8, 14}	2.47E+01	9.15E+02	9.16E+02	9.15E+02	VLE	5	2.50E+01	C1
NO ₂	1.02E+02	6.63E-06	2.39E-04	1.24E+00	PF	5		
NO ₃	2.14E+02	1.03E-05	3.72E-04	1.93E+00	PF	5		
OH	8.63E+01	1.97E-04	7.11E-03	2.84E+00	PF	5	2.88E+00	C2 as NaOH
Pb	3.03E-01	5.69E-08	2.05E-06	8.20E-04	PF	5	5.91E-03	C1, A, D
PO ₄	2.11E+00	1.04E-06	3.74E-05	1.50E-02	PF	5		
SO ₄	1.03E+00	4.63E-08	1.67E-06	6.01E-03	PF	5		
TOC gC/l ¹⁷	2.46E+00	7.97E-06	2.87E-04	1.15E-01	PF	5		

Tank Farm 241-AW Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Zn	3.16E-01	1.89E-07	6.80E-06	2.72E-03	PF	5		
Am 241 ¹⁸	1.20E+00	3.31E-09	1.19E-07	4.77E-05	PF	5	2.0E-11	B ¹⁹
Am 243	2.97E+02	8.25E-07	2.97E-05	1.19E-02	PF	5	2.0E-11	B
C 14	3.70E-01	1.03E-09	3.70E-08	1.48E-05	PF	5	6.0E-06	B
Cs 137	4.89E+05	8.17E-05	2.94E-03	1.77E+01	PF	4	4.0E-07	B
Co 60	6.14E+01	1.01E-07	3.63E-06	1.45E-03	PF	5	8.0E-08	B
Cs 134	1.09E+03	8.05E-07	2.90E-05	1.16E-02	PF	4	4.0E-07	B
I 129	3.03E-01	1.17E-07	4.21E-06	1.21E-05	PF	4	7.0E-08	B
Np 237	2.16E+00	6.00E-09	2.16E-07	8.64E-05	PF	5	1.2E-12	B
Pu 238	1.15E+00	3.10E-09	1.11E-07	4.46E-05	PF	5	2.1E-12	B
Sr 89/90	1.09E+03	1.83E-08	6.58E-07	3.95E-02	PF	4	9.0E-09	B
Tc 99	1.52E+02	4.22E-07	1.52E-05	6.08E-03	PF	5	2.0E-06	B
water		6.43E+04	6.43E+04	6.43E+04	Stm Tabl	1		

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Tank Farm 241-AW Vapor Estimates

Sample Type	SN		Tank:	241-AW-102				
Sample Date	4/20/88		Contents:	Liquid/Solids				
Sample ID	T-1521		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.0E-03		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.16							
Temperature, °R	549							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.72E+00	6.35E-06	2.28E-04	1.05E-01	PF	5	9.06E+00	C1
Cl	6.10E-01	5.02E-08	1.81E-06	1.33E-02	PF	5		
CO ₃	8.34E+00	6.40E-06	2.30E-04	1.06E-01	PF	5		
F	4.58E+00	6.53E-07	2.35E-05	1.84E-01	PF	5	3.22E+00	C1
K	1.34E+01	1.58E-05	5.70E-04	2.63E-01	PF	5		
Na	6.05E+01	1.21E-04	4.36E-03	2.01E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	6.81E-02	2.99E+02	2.99E+02	2.99E+02	VLE	5	2.50E+01	C1
NO ₂	1.06E+01	8.16E-07	2.94E-05	1.76E-01	PF	5		
NO ₃	5.61E+01	3.20E-06	1.15E-04	6.93E-01	PF	5		
OH	2.16E+01	5.85E-05	2.11E-03	9.72E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	5.00E-01	2.91E-07	1.05E-05	4.84E-03	PF	5		
Pu	4.28E-07	8.08E-14	2.91E-12	1.34E-09	PF	5		
SO ₄	1.94E+00	1.03E-07	3.72E-06	1.55E-02	PF	5		
TOC qC/l ¹⁷	1.23E+00	4.72E-06	1.70E-04	7.84E-02	PF	5		
Am 241 ¹⁸	4.92E+00	1.35E-08	4.87E-07	2.25E-04	PF	5	2.0E-11	B ¹⁹
Cs 137	7.92E+04	1.26E-05	4.53E-04	3.13E+00	PF	5	4.0E-07	B
Cs 134	9.86E+02	3.76E-07	1.35E-05	6.24E-03	PF	5	4.0E-07	B
Np 237	2.16E-02	6.00E-11	2.16E-09	9.97E-07	PF	5	1.2E-12	B
Pm 147	1.50E+02	8.41E-08	3.03E-06	1.40E-03	PF	5	1.1E-08	B
Pu 239/240	2.63E-02	7.30E-11	2.63E-09	1.21E-06	PF	5	2.0E-12	B
Sr 89/90	1.93E+02	3.08E-09	1.11E-07	7.68E-03	PF	5	9.0E-09	B
water		4.89E+04	4.89E+04	4.89E+04	Stm Tabl	1		

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Tank Farm 241-AW Vapor Estimates

Sample Type	SN		Tank:	241-AW-103				
Sample Date	1/23/90		Contents:	Liquid/Solids				
Sample ID	Sup 1/2		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	5.1E-04		Retr. Method	Pumping				
pH	N/A							
Density ^{1A} , g/ml	1.3							
Temperature, °R	548							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	3.90E-04	1.40E-10	5.04E-09	4.16E-05	PF	5	2.27E-03	C1
Al	1.68E-01	2.41E-07	8.68E-06	7.16E-02	PF	5	9.06E+00	C1
As	8.71E-03	4.50E-09	1.62E-07	1.34E-03	PF	5	6.52E-02	C1
Ba	7.80E-04	2.21E-10	7.94E-09	6.55E-05	PF	5	8.92E-02	C1
B	4.25E-01	1.50E-06	5.39E-05	4.45E-01	PF	5	2.22E+01	C1
Ca	3.12E-03	3.02E-09	1.09E-07	8.97E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.30E-04	4.50E-11	1.62E-09	1.34E-05	PF	5	5.46E-04	C1, C2, D
Cr	2.34E-03	3.87E-10	1.39E-08	5.18E-04	PF	4	2.35E-01	C1, D
Cu	1.43E-03	8.66E-10	3.12E-08	2.57E-04	PF	5	3.82E-01	C1
Fe	6.24E-03	4.32E-09	1.55E-07	1.28E-03	PF	5	2.18E+00	C1
K	1.00E+01	9.94E-06	3.58E-04	2.95E+00	PF	5		
Mg	7.80E-04	1.26E-09	4.53E-08	3.74E-04	PF	5	1.02E+01	C1
Mn	1.30E-04	9.16E-11	3.30E-09	2.72E-05	PF	5	2.22E+00	C2, D
Mo	1.04E-04	4.20E-11	1.51E-09	1.25E-05	PF	5	2.55E+00	C1
Na	2.12E+01	1.57E-05	1.29E-03	1.06E+01	PF	5	2.13E+00	C2 as NaOH
Ni	2.60E-04	1.71E-10	6.15E-09	5.07E-05	PF	5	4.14E-02	C1, D
P	1.76E-02	2.20E-08	7.92E-07	6.53E-03	PF	5		
Pb	1.63E-02	3.05E-09	1.10E-07	9.06E-04	PF	4	5.91E-03	C1, A, D
Zn	8.32E-03	4.96E-09	1.79E-07	1.47E-03	PF	5		
Am 241 ¹⁸	6.24E-03	1.72E-11	6.20E-10	5.11E-06	PF	5	2.0E-11	B ¹⁹
C 14	1.17E-01	3.25E-10	1.17E-08	9.64E-05	PF	5	6.0E-06	B
Cm 244	1.43E-02	3.41E-11	1.23E-09	1.01E-05	PF	5	4.0E-11	B
I 129	7.76E-03	3.00E-09	1.08E-07	6.40E-06	PF	4	7.0E-08	B
Pu 238	1.14E-04	3.07E-13	1.10E-11	9.11E-08	PF	5	2.1E-12	B
Pu 239/240	1.56E-03	4.33E-12	1.56E-10	1.29E-06	PF	5	2.0E-12	B
Tc 99	5.19E+00	1.44E-08	5.19E-07	4.28E-03	PF	5	2.0E-06	B
water		4.75E+04	4.75E+04	4.75E+04	Stm Tabl	1		

Tank Arm 241-AW Vapor Estimates

Sample Type	SN/SL		Tank:	241-AW-104				
Sample Date	11/09/84		Contents:	Liquid/Slurry				
Sample ID	R-3206		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	9.6E-03		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.41							
Temperature, °R	546							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.34E+01	3.74E-05	1.35E-03	4.37E-01	PF	5	9.06E+00	C1
Cl	5.32E+00	4.10E-07	1.47E-05	7.67E-02	PF	5		
CO ₃	3.01E+01	2.16E-05	7.79E-04	2.53E-01	PF	5		
K	4.65E+00	5.14E-06	1.85E-04	6.02E-02	PF	5		
Na	2.44E+02	4.57E-04	1.65E-02	5.35E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	6.49E+01	4.68E-06	1.68E-04	7.12E-01	PF	5		
NO ₃	1.69E+02	9.04E-06	3.25E-04	1.38E+00	PF	5		
OH	5.27E+01	1.34E-04	4.81E-03	1.56E+00	PF	5	2.88E+00	C2 as NaOH
PO ₄	3.80E+00	2.07E-06	7.47E-05	2.43E-02	PF	5		
SO ₄	7.69E+00	3.83E-07	1.38E-05	4.04E-02	PF	5		
TOC gC/l ¹⁷	4.67E+00	1.68E-05	6.04E-04	1.96E-01	PF	5		
Cs 137	8.54E+05	1.22E-04	4.41E-03	2.15E+01	PF	5	4.0E-07	B
Cs 134	6.03E+02	6.11E-08	2.20E-06	7.15E-04	PF	5	4.0E-07	B
Sr 89/90	3.62E+04	5.23E-07	1.88E-05	9.18E-01	PF	5	9.0E-09	B
water		4.48E+04	4.48E+04	4.48E+04	Stm Tabl	1		

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Tank Farm 241-AW Vapor Estimates

Sample Type	SN		Tank:	241-AW-105				
Sample Date	1990		Contents:	Liquid/Solids				
Sample ID	Comp.		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	5.4E-04		Retr. Method	Pumping				
pH	13.43							
Density, g/ml	1.01							
Temperature, °R	545							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.70E-04	8.00E-11	2.88E-09	2.23E-05	PF	5	2.27E-03	C1
Al	6.84E-01	1.29E-06	4.63E-05	3.59E-01	PF	5	9.06E+00	C1
As	1.12E-02	7.55E-09	2.72E-07	2.11E-03	PF	5	6.52E-02	C1
Ba	2.13E-03	7.89E-10	2.84E-08	2.20E-04	PF	5	8.92E-02	C1
Be	2.70E-03	1.52E-08	5.48E-07	4.25E-03	PF	5	1.36E-03	B (10g/24 hr), C1
B	5.96E-03	2.75E-08	9.89E-07	7.67E-03	PF	5	2.22E+01	C1
Br	5.00E-02	3.18E-08	1.14E-06	8.87E-03	PF	5		
Ca	1.94E-01	2.46E-07	8.86E-06	6.88E-02	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.20E-04	5.44E-11	1.96E-09	1.52E-05	PF	5	5.46E-04	C1, C2, D
Cl	8.00E-02	7.25E-09	2.61E-07	3.24E-02	PF	5		
Co	2.22E-03	1.91E-09	6.87E-08	5.33E-04	PF	5	2.07E-02	C1, D
Cr	1.33E-01	2.88E-08	1.04E-06	3.63E-02	PF	5	2.35E-01	C1, D
Cu	1.52E-02	1.20E-08	4.33E-07	3.36E-03	PF	5	3.82E-01	C1
Dy	5.10E-05	1.59E-11	5.74E-10	4.45E-06	PF	5		
F	7.00E-01	1.10E-07	3.96E-06	5.22E-01	PF	5	3.22E+00	C1
Fe	1.27E-03	1.15E-09	4.14E-08	3.21E-04	PF	5	2.18E+00	C1
K	1.49E+01	1.94E-05	6.98E-04	5.42E+00	PF	5		
La	1.34E-04	4.89E-11	1.76E-09	1.37E-05	PF	5		
Li	8.60E-05	6.29E-10	2.26E-08	1.76E-04	PF	5		
Mg	5.25E-04	1.11E-09	4.00E-08	3.10E-04	PF	5	1.02E+01	C1
Mn	7.00E-05	6.46E-11	2.33E-09	1.80E-05	PF	5	2.22E+00	C2, D
Mo	7.45E-03	3.94E-09	1.42E-07	1.10E-03	PF	5	2.55E+00	C1
Na	5.05E+01	1.11E-04	4.01E-03	3.11E+01	PF	5	2.13E+00	C2 as NaOH
Nd	2.84E-04	1.00E-10	3.60E-09	2.80E-05	PF	5		
Ni	7.09E-02	6.10E-08	2.20E-06	1.70E-02	PF	5	4.14E-02	C1, D
NO ₂	1.00E+00	8.49E-08	3.06E-06	3.08E-01	PF	5		
NO ₃	3.40E+00	2.14E-07	7.71E-06	7.77E-01	PF	5		
OH	4.58E+00	1.37E-05	4.92E-04	3.82E+00	PF	5	2.88E+00	C2 as NaOH

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Tank cm 241-AW Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
P	1.18E+00	1.93E-06	6.96E-05	5.40E-01	PF	5		
Pb	1.10E-03	2.70E-10	9.71E-09	7.53E-05	PF	5	5.91E-03	Cl, A, D
PO ₄	9.00E-02	5.78E-08	2.08E-06	1.61E-02	PF	5		
Re	3.00E-04	8.19E-11	2.95E-09	2.29E-05	PF	5		
Rh	2.75E-04	1.36E-10	4.88E-09	3.78E-05	PF	5	2.37E-04	Cl
Ru	2.75E-04	1.38E-10	4.98E-09	3.86E-05	PF	5		
Sb	5.00E-04	2.08E-10	7.49E-09	5.81E-05	PF	5	1.00E-01	Cl, D
Se	1.24E-03	7.97E-10	2.87E-08	2.23E-04	PF	5	6.19E-02	Cl, D
Si	5.34E+00	9.69E-06	3.49E-04	2.71E+00	PF	5	8.73E+00	Cl
SO ₄	1.90E-01	1.12E-08	4.01E-07	2.81E-02	PF	5		
Sr	4.00E-05	2.31E-11	8.31E-10	6.44E-06	PF	5		
Te	4.15E-04	1.65E-10	5.92E-09	4.60E-05	PF	5	1.91E-02	Cl
Th	7.88E-04	1.72E-10	6.21E-09	4.81E-05	PF	5		
Ti	9.20E-05	9.73E-11	3.50E-09	2.72E-05	PF	5		
Tl	1.22E-02	3.05E-09	1.10E-07	8.51E-04	PF	5	1.20E-02	Cl
U, g/l	5.80E-03	1.24E-09	4.45E-08	3.46E-04	PF	5	5.14E-03	Cl
V	7.00E-05	6.97E-11	2.51E-09	1.95E-05	PF	5	2.40E-02	Cl (as V ₂ O ₅)
Zn	1.73E-03	1.35E-09	4.85E-08	3.76E-04	PF	5		
Zr	7.40E-04	4.13E-10	1.49E-08	1.15E-04	PF	5	1.34E+00	Cl, C3
Am 241 ¹⁸	4.19E-03	1.16E-11	4.16E-10	3.23E-06	PF	5	2.0E-11	B ¹⁹
C 14	9.10E-01	2.53E-09	9.10E-08	7.06E-04	PF	5	6.0E-06	B
Cm 244	6.53E-04	1.56E-12	5.60E-11	4.35E-07	PF	5	4.0E-11	B
Cs 137	6.71E+04	1.12E-05	4.04E-04	4.70E+01	PF	5	4.0E-07	B
Co 60	1.02E+02	1.67E-07	6.03E-06	4.68E-02	PF	5	8.0E-08	B
Cs 134	4.93E+02	1.64E-07	1.31E-05	1.02E-01	PF	5	4.0E-07	B
H 3	5.90E+00	1.99E-05	7.16E-04	3.56E-03	PF	5	1.0E-04	B
I 129	2.41E-02	9.31E-09	3.35E-07	1.87E-05	PF	5	7.0E-08	B
Np 237	1.55E-02	4.31E-11	1.55E-09	1.20E-05	PF	5	1.2E-12	B
Pu 238	2.36E-03	6.35E-12	2.29E-10	1.77E-06	PF	5	2.1E-12	B
Pu 239/240	9.46E-03	2.63E-11	9.46E-10	7.34E-06	PF	5	2.0E-12	B
RuRh 106	9.23E+02	2.49E-09	8.98E-08	4.46E-02	PF	5	3.0E-08	B
Se 79	3.88E-02	1.08E-10	3.88E-09	3.01E-05	PF	5	1.0E-06	B
Tc 99	3.12E+01	8.67E-08	3.12E-06	2.42E-02	PF	5	2.0E-06	B
water		4.35E+04	4.35E+04	4.35E+04	Stm Tabl	1		

Tank Farm 241-AW Vapor Estimates

Sample Type	SN		Tank:	241-AW-106				
Sample Date	8/7/88		Contents:	Liquid/Solids				
Sample ID	T-1624		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	1.7E-02		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.24							
Temperature, °R	552							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	8.77E+00	1.39E-05	4.99E-04	8.34E-02	PF	5	9.06E+00	C1
Cl	1.50E+00	1.14E-07	4.12E-06	1.10E-02	PF	5		
CO ₃	1.61E+01	1.15E-05	4.12E-04	6.89E-02	PF	5		
F	2.69E+01	3.55E-06	1.28E-04	3.63E-01	PF	5	3.22E+00	C1
Na	1.32E+02	2.45E-04	8.82E-03	1.47E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}	6.76E-02	2.75E+02	2.75E+02	2.75E+02	VLE	5	2.50E+01	C1
NO ₂	2.50E+01	1.78E-06	6.42E-05	1.40E-01	PF	5		
NO ₃	1.22E+01	6.46E-07	2.32E-05	5.05E-02	PF	5		
Np	3.07E-05	5.53E-12	1.99E-10	3.33E-08	PF	5		
OH	4.39E+01	1.10E-04	3.97E-03	6.63E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.07E+00	5.78E-07	2.08E-05	3.48E-03	PF	5		
Pu	4.40E-06	7.70E-13	2.77E-11	4.63E-09	PF	5		
SO ₄	3.11E+00	1.53E-07	5.52E-06	8.32E-03	PF	5		
TOC gC/l ¹⁷	2.68E+00	9.53E-06	3.43E-04	5.73E-02	PF	5		
Am 241 ¹⁸	6.16E-01	1.69E-09	6.10E-08	1.02E-05	PF	5	2.0E-11	B ¹⁹
Cs 137	1.92E+05	3.05E-05	1.10E-03	2.75E+00	PF	5	4.0E-07	B
Cs 134	1.84E+03	7.01E-07	2.52E-05	4.22E-03	PF	5	4.0E-07	B
Np 237	2.17E-02	6.03E-11	2.17E-09	3.61E-07	PF	5	1.2E-12	B
Pm 147	1.64E+02	9.19E-08	3.31E-06	5.53E-04	PF	5	1.1E-08	B
Pu 239/240	2.70E-01	7.50E-10	2.70E-08	4.51E-06	PF	5	2.0E-12	B
Sr 89/90	2.13E+04	3.40E-07	1.22E-05	3.07E-01	PF	5	9.0E-09	B
water		5.30E+04	5.30E+04	5.30E+04	Stm Tabl	1		

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Tan. .arm 241-AW Vapor Estimates

- Note: 1. Viscosity of tanks AW-101, 102, 104, and 106 estimated assuming 40 vol.% solids. Viscosity of tanks AW-103 and 105 estimated as that of water at tank temperature.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume for , microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. Data for tanks AW-102, 104, 105, and 106 denoted 5 invalidated due to post sample tank transfers. Data reliability for tank AW-103 based PF availability. Tank AW-101 data reliability deemed 5 due to estimation from combined slurry/supernatant sample.
- Note: 7. Allowable concentration, ppm by volume.
- Note: 8. Henry's constants for butanone not corrected for salt. Acetone and 2-ethyl-1-hexanol not corrected for salt or temperature. Approximated for dioctylphthalate.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (i.e., 1994 - 1987 = 7).
- Note: 19. Allowable data based on DCG's in microcurie/l.

Sample Type	SN	Tank:		241-AX-101				
Sample Date	8/19/80	Contents:		Sludge/Saltcake/SN				
Sample ID	T-3103	Watchlist:		N/A				
Physical Property	Value	Status:		IS/II				
Visc., lbm/ft-s ¹	5.2E-03	Retr. Method		Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.51							
Temperature, °R	602							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	4.26E+01	6.25E-05	1.28E-02	1.13E+00	PF	5	9.06E+00	C1
Ba ⁹	1.32E-03	3.81E-10	7.79E-08	6.90E-06	PF	6	8.92E-02	C1
Ca ⁹	1.13E-02	1.12E-08	2.29E-06	2.03E-04	PF	6	6.11E+00	C1 as CaCO ₃
CO ₃	1.32E+01	8.71E-06	1.78E-03	1.58E-01	PF	5		
Cr ⁹	3.53E-01	5.97E-08	5.50E-05	4.87E-03	PF	6	2.35E-01	C1, D
Fe ⁹	1.59E+01	1.12E-05	2.30E-03	2.04E-01	PF	6	2.18E+00	C1
Na ⁹	2.44E-03	4.19E-09	8.58E-07	7.60E-05	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	1.02E-02	3.90E-08	1.41E-06	2.53E-04	PF	6	4.14E-02	C1, D
NO ₂	1.06E+02	7.01E-06	1.87E-02	1.65E+00	PF	5		
NO ₃	2.07E+02	1.02E-05	2.70E-02	2.39E+00	PF	5		
OH	4.83E+01	1.12E-04	2.30E-02	2.04E+00	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	4.24E-03	8.11E-10	1.66E-07	1.47E-05	PF	6	5.91E-03	C1, A, D
PO ₄	1.11E+01	5.56E-06	1.14E-03	1.01E-01	PF	5		
SO ₄ ⁹	3.39E-03	1.55E-10	2.86E-07	2.53E-05	PF	6		
TOC gC/l ¹⁷	1.14E+01	3.76E-05	7.69E-03	6.81E-01	PF	5		
ZrO ⁹	1.52E-03	5.62E-10	1.15E-07	1.02E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	9.55E+00	2.63E-08	3.14E-06	4.77E-04	PF	6	2.0E-11	B
Am 243 ⁹	2.10E-11	5.83E-20	6.95E-18	1.06E-15	PF	6	2.0E-11	B
C 14 ⁹	3.53E-02	9.81E-11	1.17E-08	1.78E-06	PF	6	6.0E-06	B
Cm 242 ⁹	2.48E-11	1.38E-22	1.64E-20	2.49E-18	PF	6	7.0E-10	B
Cm 244 ⁹	1.81E-10	4.32E-19	5.15E-17	7.83E-15	PF	6	4.0E-11	B
Ce 137	4.99E+05	6.45E-05	1.15E-01	1.75E+01	PF	5	4.0E-07	B

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
I 129 ⁹	3.53E-10	1.36E-16	4.91E-15	1.78E-14	PF	6	7.0E-08	B
Np 237 ⁹	1.81E-05	5.04E-14	6.01E-12	9.13E-10	PF	6	1.2E-12	B
Pu 238 ⁹	7.06E+00	1.90E-08	2.27E-06	3.44E-04	PF	6	2.1E-12	B
Pu 239/240	3.26E+05	9.05E-14	1.08E-11	1.64E-09	PF	5	2.0E-12	B
Pu 241 ⁹	3.53E+02	8.12E-07	9.69E-05	1.47E-02	PF	6	1.0E-10	B
RuRh 106 ⁹	2.86E+00	7.74E-12	5.91E-08	8.98E-06	PF	6	3.0E-08	B
Se 79 ⁹	7.06E-11	1.96E-19	2.34E-17	3.55E-15	PF	5	1.0E-06	B
Sr 89/90	8.82E+03	1.16E-07	2.06E-03	3.14E-01	PF	5	9.0E-09	B
Tc 99 ⁹	7.06E-09	1.96E-17	2.34E-15	3.55E-13	PF	6	2.0E-06	B
U 238 ⁹	3.53E-01	9.81E-10	1.17E-07	1.78E-05	PF	6	1.0E-10	B
water		1.23E+05	1.23E+05	1.23E+05	tm Tab	1		

Tank Farm 241-AX Vapor Estimates

Sample Type	SN	Tank:	241-AX-102	Method	Regulatory
Sample Date	11/14/88	Contents:	Sludge/Saltcake/SN		
Sample ID	RAT-AZ102-3	Watchlist:	Organic Salts		
Physical Property	Value	Status:	IS/II		
Visc., lbm/ft-s ¹	8.1E-03	Retr. Method	Pumping/Sluicing		
pH	N/A				
Density, g/ml	1.3				
Temperature, °R	538				
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Allowable ⁷
Ag	4.31E-01	1.95E-07	3.76E-05	2.44E-03	2.27E-03
Al	1.62E-01	2.93E-07	5.64E-05	3.67E-03	5 9.06E+00
Ba	1.37E-02	4.89E-09	9.40E-07	6.12E-05	5 8.92E-02
B	2.16E-02	9.60E-08	1.85E-05	1.20E-03	5 2.22E+01
Bi	8.36E-02	1.96E-08	3.76E-06	2.45E-04	5
Ca	5.61E-01	6.86E-07	1.32E-04	8.58E-03	5 6.11E+00
Cd	4.50E-02	1.97E-08	3.78E-06	2.46E-04	5 5.46E-04
Co	3.54E-02	2.93E-08	5.64E-06	3.67E-04	5 2.07E-02
CO ₃	5.88E+01	4.79E-05	9.22E-03	6.00E-01	5
Cr	2.08E-01	4.34E-08	3.76E-05	2.45E-03	4 2.35E-01
Cu	3.81E-02	2.91E-08	5.60E-06	3.64E-04	5 3.82E-01
Fe ⁹	1.49E+01	1.30E-05	2.50E-03	1.63E-01	6 2.18E+00
K	7.82E-02	9.81E-08	1.89E-05	1.23E-03	5
La	5.56E-02	1.96E-08	3.76E-06	2.45E-04	5
Li	1.39E-02	9.80E-08	1.88E-05	1.23E-03	5
Mg	1.22E-02	1.33E-07	4.78E-06	2.57E-04	5 1.02E+01
Mn	6.04E-01	5.37E-07	1.03E-04	6.72E-03	5 2.22E+00
Mo	3.84E-02	1.96E-08	3.76E-06	2.45E-04	5 2.55E+00
Na	1.68E+02	3.57E-04	6.87E-02	4.47E+00	5 2.13E+00
Nd	1.44E-01	4.89E-08	9.40E-06	6.12E-04	5
NH ₃ ^{8,14}	5.05E-01	2.35E+03	2.35E+03	2.35E+03	5 2.50E+01
Ni	5.28E-01	2.34E-06	8.42E-05	1.11E-02	5 4.14E-02
NO ₂	6.44E+01	5.27E-06	1.32E-02	8.57E-01	4
NO ₃	2.29E+02	1.39E-05	3.47E-02	2.26E+00	4
OH ⁹	2.30E+01	6.63E-05	1.27E-02	8.29E-01	6 2.88E+00
P	7.12E-01	1.12E-06	2.16E-04	1.41E-02	5

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	4.14E-01	9.78E-08	1.88E-05	1.22E-03	PF	4	5.91E-03	C1, A, D
Pd	6.38E-02	2.94E-08	5.66E-06	3.68E-04	PF	5		
PO ₄	5.32E+00	3.29E-06	6.33E-04	4.12E-02	PF	5		
Si	2.53E-02	4.42E-08	8.50E-06	5.53E-04	PF	5	8.73E+00	C1
Sn	1.19E-01	4.89E-08	9.40E-06	6.12E-04	PF	5	4.11E-01	C1
Sr	2.63E-02	1.46E-08	2.81E-06	1.83E-04	PF	5		
TOC gC/l ¹⁷	3.68E+01	1.50E-04	2.88E-02	1.88E+00	PF	5		
Ti	3.35E-03	3.41E-09	6.56E-07	4.27E-05	PF	5		
Zn	8.50E-02	6.40E-08	1.23E-05	8.00E-04	PF	5		
Zr	1.46E-01	7.85E-08	1.51E-05	9.82E-04	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	1.00E+00	2.75E-09	3.81E-07	3.44E-05	PF	5	2.0E-11	B
Cs 137	3.50E+05	5.56E-05	1.15E-01	1.04E+01	PF	4	4.0E-07	B
Co 60	7.10E+02	8.96E-07	1.24E-04	1.12E-02	PF	5	8.0E-08	B
Eu 154	6.70E+03	9.91E-06	1.55E-03	1.40E-01	PF	5	5.0E-08	B
Eu 155	4.70E+03	5.45E-06	7.55E-04	6.82E-02	PF	5	3.0E-07	B
Np 237 ⁹	2.75E-04	7.63E-13	1.06E-10	9.55E-09	PF	6	1.2E-12	B
Pu 238 ⁹	6.04E+01	1.63E-07	2.25E-05	2.03E-03	PF	6	2.1E-12	B
Pu 239/240	9.70E+01	2.69E-07	3.73E-05	3.37E-03	PF	5	2.0E-12	B
Pu 241 ⁹	4.76E+03	1.10E-05	1.52E-03	1.37E-01	PF	6	1.0E-10	B
RuRh 106 ⁹	4.76E+01	1.29E-10	1.14E-06	1.03E-04	PF	6	3.0E-08	B
Sr 89/90	1.70E+05	2.71E-06	5.63E-02	5.09E+00	PF	4	9.0E-09	B
U 238 ⁹	2.75E-01	7.63E-10	1.06E-07	9.55E-06	PF	6	1.0E-10	B
water		3.44E+04	3.44E+04	3.44E+04	tm Tab	1		

Tank Farm 241-AX Vapor Estimates

Sample Type	SN		Tank:	241-AX-103				
Sample Date	4/27/80		Contents:	Sludge/Saltcake				
Sample ID	T-93		Watchlist:	Hydrogen				
Physical Property	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.8E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.38							
Temperature, °R	577							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.99E+01	4.81E-05	9.81E-03	9.85E-01	PF	5	9.06E+00	C1
C ₂ H ₃ O ₃ anion ⁹	1.77E-01	1.02E-07	2.09E-05	2.10E-03	PF	6		
C ₆ H ₅ O ₇ anion ⁹	2.24E+00	6.08E-07	1.05E-04	1.24E-02	PF	6		
CO ₃	6.60E+01	4.78E-05	9.74E-03	9.78E-01	PF	5		
Cr ⁹	1.23E-02	2.27E-09	2.09E-06	2.10E-04	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	1.37E+00	2.03E-07	4.15E-05	4.17E-03	PF	6		
F ⁹	4.48E-02	5.80E-07	2.09E-05	1.37E-03	PF	6	3.22E+00	C1
Fe ⁹	2.59E-01	2.01E-07	4.10E-05	4.12E-03	PF	6	2.18E+00	C1
Fe (CN) ₆ ⁹	3.07E-05	6.28E-12	1.28E-09	1.29E-07	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	2.59E+00	3.85E-07	7.85E-05	7.87E-03	PF	6		
K ⁹	9.20E-02	1.02E-07	2.09E-05	2.10E-03	PF	6		
Mn ⁹	1.30E-01	1.02E-07	2.09E-05	2.10E-03	PF	6	2.22E+00	C2, D
Na ⁹	1.63E+01	3.07E-05	6.27E-03	6.29E-01	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	2.83E-02	1.18E-07	4.25E-06	8.68E-04	PF	6	4.14E-02	C1, D
NO ₂	7.68E+01	5.58E-06	1.48E-02	1.48E+00	PF	5		
NO ₃	1.60E+02	8.62E-06	2.29E-02	2.29E+00	PF	5		
OH	4.20E+01	1.07E-04	2.19E-02	2.20E+00	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	5.43E-06	1.14E-12	2.32E-10	2.33E-08	PF	6	5.91E-03	C1, A, D
PO ₄	4.05E+00	2.23E-06	4.54E-04	4.56E-02	PF	5		
SiO ₃ ⁹	3.54E-01	2.02E-07	4.12E-05	4.14E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	1.82E+00	9.12E-08	1.68E-04	1.68E-02	PF	6		

Tan Arm 241-AX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 ^{18,9}	4.72E+01	1.30E+07	1.70E+05	2.67E+03	PF	6	2.0E-11	B
Am 243 ⁹	2.36E+02	6.55E+11	8.54E+09	1.34E+06	PF	6	2.0E-11	B
C 14 ⁹	2.10E+01	5.84E+08	7.62E+06	1.20E+03	PF	6	6.0E-06	B
Cm 242 ⁹	7.01E+02	3.89E+13	5.07E+11	7.96E+09	PF	6	7.0E-10	B
Cm 244 ⁹	1.40E+01	3.34E+10	4.36E+08	6.84E+06	PF	6	4.0E-11	B
Cs 137 ⁹	5.00E+05	6.46E+05	1.26E+01	1.98E+01	PF	5	4.0E-07	B
I 129 ⁹	4.72E+02	1.82E+08	6.56E+07	2.68E+06	PF	6	7.0E-08	B
Np 237 ⁹	4.72E+02	1.31E+10	1.71E+08	2.68E+06	PF	6	1.2E-12	B
Pu 238 ⁹	4.97E+03	1.34E+11	1.75E+09	2.74E+07	PF	6	2.1E-12	B
Pu 239/240 ⁹	3.66E+05	1.02E+13	1.33E+11	2.08E+09	PF	5	2.0E-12	B
Pu 241 ⁹	2.10E+04	4.84E+13	6.31E+11	9.91E+09	PF	6	1.0E-10	B
RuRh 106 ⁹	1.56E+02	4.48E+14	3.74E+10	5.88E+08	PF	6	3.0E-08	B
Se 79 ⁹	9.56E+01	2.66E+09	3.46E+07	5.44E+05	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.60E+04	2.10E+07	4.10E+03	6.43E+01	PF	5	9.0E-09	B
Tc 99 ⁹	2.36E+01	6.55E+08	8.55E+06	1.34E+03	PF	6	2.0E-06	B
U 238 ⁹	1.21E+08	3.36E+17	4.39E+15	6.89E+13	PF	6	1.0E-10	B
water		8.84E+04	8.84E+04	8.84E+04	tm Tab	1		

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Tank Farm 241-AX Vapor Estimates

Sample Type	Sludge		Tank:	241-AX-104				
Sample Date	9/15/77		Contents:	Sludge				
Sample ID	JS-25		Watchlist:	N/A				
Physical Property	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.8E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.75							
Temperature, °R	562							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.00E+02	1.91E-04	2.59E-02	3.21E-01	PF	5	9.06E+00	C1
Ba	2.75E+00	1.04E-06	1.40E-04	1.74E-03	PF	5	8.92E-02	C1
C ₆ H ₅ O ₇ anion ⁹	1.4E+01	4.23E-05	1.52E-03	7.09E-02	PF	6		
Ca	2.53E+01	3.27E-05	4.42E-03	5.48E-02	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.69E+00	7.79E-07	1.05E-04	1.31E-03	PF	5	5.46E-04	C1, C2, D
CO ₃ ⁹	2.3E+01	1.95E-05	2.64E-03	3.27E-02	PF	6		
Cr	3.07E+00	6.77E-07	4.12E-04	5.11E-03	PF	5	2.35E-01	C1, D
F ⁹	4.5E+00	4.63E-05	1.67E-03	1.35E-02	PF	6	3.22E+00	C1
Fe	3.32E+02	3.06E-04	4.14E-02	5.13E-01	PF	5	2.18E+00	C1
Fe (CN) ₆ ⁹	3.5E-01	8.64E-08	1.17E-05	1.45E-04	PF	6	5.77E-01	C1 as CN, D ¹³
Hg	2.89E+02	7.43E-05	1.00E-02	1.25E-01	PF	5	6.08E-03	B, C1, C2
K ⁹	6.0E-01	8.00E-07	1.08E-04	1.34E-03	PF			
Mg	4.45E+00	3.60E-05	1.30E-03	1.33E-02	PF	5	1.02E+01	C1
Mn	4.29E+00	4.03E-06	5.45E-04	6.76E-03	PF	5	2.22E+00	C2, D
Na	6.80E+01	1.53E-04	2.07E-02	2.56E-01	PF	5	2.13E+00	C2 as NaOH
Ni	1.53E+01	5.03E-05	1.81E-03	4.57E-02	PF	5	4.14E-02	C1, D
NO ₂ ⁹	1.4E+01	1.21E-06	2.12E-03	2.63E-02	PF	6		
NO ₃	7.07E+01	4.53E-06	7.97E-03	9.88E-02	PF	5		
OH ⁹	4.5E+02	1.38E-03	1.86E-01	2.31E+00	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	3.1E+00	7.82E-07	1.06E-04	1.31E-03	PF	6	5.91E-03	C1, A, D
PO ₄	1.04E+01	6.80E-06	9.20E-04	1.14E-02	PF	5		
Si	8.90E+01	1.64E-04	2.22E-02	2.75E-01	PF	5	8.73E+00	C1
SiO ₃ ⁹	8.7E+00	5.90E-06	7.98E-04	9.89E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.20E+02	7.17E-06	8.73E-03	1.08E-01	PF	5		

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sr	4.94E-01	2.90E-07	3.92E-05	4.86E-04	PF	5		
U, g/l	4.25E-03	9.22E-10	1.25E-07	1.55E-06	PF	5	5.14E-03	C1
ZrO ⁹	2.4E+00	1.17E-06	1.58E-04	1.96E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ^{18,9}	4.2E+03	1.15E-05	1.19E-03	1.94E-02	PF	6	2.0E-11	B
Am 243 ⁹	1.1E+00	3.12E-09	3.20E-07	5.22E-06	PF	6	2.0E-11	B
C 14 ⁹	3.4E+03	9.35E-06	9.61E-04	1.57E-02	PF	6	6.0E-06	B
Cm 242 ⁹	1.9E+00	1.08E-11	1.11E-09	1.80E-08	PF	6	7.0E-10	B
Cm 244 ⁹	7.5E+00	1.80E-08	1.85E-06	3.02E-05	PF	6	4.0E-11	B
Cs 137	1.6E+00	1.92E-10	2.95E-07	4.81E-06	PF	5	4.0E-07	B
Eu 154	6.8E-01	1.67E-09	1.95E-07	3.17E-06	PF	5	5.0E-08	B
Eu 155	6.8E-01	1.89E-09	1.95E-07	3.17E-06	PF	5	3.0E-07	B
I 129 ⁹	1.5E+00	5.91E-07	2.13E-05	7.13E-06	PF	6	7.0E-08	B
Np 237	8.0E+00	2.22E-08	2.29E-06	3.73E-05	PF	5	1.2E-12	B
Pu 238 ⁹	7.5E+02	2.03E-06	2.09E-04	3.41E-03	PF	6	2.1E-12	B
Pu 239/240	9.2E+03	2.56E-05	2.63E-03	4.29E-02	PF	5	2.0E-12	B
Pu 241 ⁹	3.8E+04	8.68E-05	8.93E-03	1.46E-01	PF	6	1.0E-10	B
RuRh 106 ⁹	2.2E+02	6.06E-10	4.00E-06	6.52E-05	PF	6	3.0E-08	B
Se 79 ⁹	3.1E+01	8.50E-08	8.74E-06	1.43E-04	PF	6	1.0E-06	B
Sr 89/90	7.0E+01	8.48E-10	1.31E-05	2.13E-04	PF	5	9.0E-09	B
Sb 125	5.3E-01	1.47E-09	1.51E-07	2.47E-06	PF		1.0E-06	B
Tc 99 ⁹	1.1E+03	3.12E-06	3.21E-04	5.23E-03	PF	6	2.0E-06	B
U 238	3.0E-03	8.33E-12	8.57E-10	1.40E-08	PF	5	1.0E-10	B
water		6.71E+04	6.71E+04	6.71E+04	tm Tab	1		

Tank Farm 241-AX Vapor Estimates

- Note: 1. No viscosity data available; therefore, viscosity estimated assuming 40 vol. % solids.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data deemed 6. Lab data for tanks AX-101 and 103 deemed 5 due to tank activity after the sampling date. Lab data for tank AX-104 deemed 5 due to samples taken from sludge.
- Note: 8. Henry's constant for ammonia corrected for salt, temperature, and pH.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).

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Tank 241-AY Vapor Estimates

Sample Type	Ave. Liq.		Tank:	241-AY-101				
Sample Date	1985, 87, 88		Contents:	Liquid/Solids				
Sample ID	Ave.		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	7.2E-03		Retr. Method	Pumping				
pH	13.65							
Density, g/ml	1.1							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.78E+00	3.21E-06	1.16E-04	5.34E-02	PF	5	9.06E+00	C1
Al (OH) ₄	4.64E+00	2.38E-06	8.58E-05	3.96E-02	PF	5		
Ba	6.00E-03	2.14E-09	7.70E-08	3.55E-05	PF	5	8.92E-02	C1
Ca	2.17E-01	2.65E-07	9.53E-06	4.40E-03	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.01E-02	4.40E-09	1.58E-07	7.32E-05	PF	5	5.46E-04	C1, C2, D
Cl	4.62E-01	4.03E-08	1.45E-06	1.07E-02	PF	4		
CO ₃	1.70E+01	1.38E-05	4.97E-04	2.29E-01	PF	5		
Cr	3.25E-02	6.77E-09	2.44E-07	5.07E-04	PF	4	2.35E-01	C1, D
Cu	6.57E-03	5.01E-09	1.80E-07	8.33E-05	PF	5	3.82E-01	C1
EDTA ¹²	2.80E-01	4.68E-08	1.69E-06	7.78E-04	PF	5		
F	5.59E-01	8.45E-08	3.04E-06	2.39E-02	PF	4	3.22E+00	C1
Fe	1.04E-02	9.07E-09	3.26E-07	1.51E-04	PF	5	2.18E+00	C1
HEDTA ¹²	2.52E-01	4.20E-08	1.51E-06	6.98E-04	PF	5		
K	3.34E-01	4.18E-07	1.51E-05	6.95E-03	PF	5		
La	6.40E-02	2.25E-08	8.09E-07	3.74E-04	PF	5		
Mg	1.39E-02	2.83E-08	1.02E-06	4.70E-04	PF	5	1.02E+01	C1
Mn	2.58E-01	2.29E-07	8.24E-06	3.81E-03	PF	5	2.22E+00	C2, D
Na	5.67E+01	1.20E-04	4.34E-03	2.00E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8, 14}	8.50E-02	3.95E+02	3.95E+02	3.95E+02	VLE	5	2.50E+01	C1
Ni	6.52E-02	5.39E-08	1.94E-06	8.96E-04	PF	5	4.14E-02	C1, D
NO ₂	1.17E+01	9.55E-07	3.44E-05	2.06E-01	PF	4		
NO ₃	5.08E+01	3.07E-06	1.11E-04	6.64E-01	PF	4		
OH	7.61E+00	2.18E-05	7.86E-04	3.63E-01	PF	5	2.88E+00	C2 as NaOH
Pb	7.57E-02	1.79E-08	6.43E-07	2.97E-04	PF	4	5.91E-03	C1, A, D
PO ₄	9.74E-01	6.02E-07	2.17E-05	1.00E-02	PF	5		
Si	3.45E-02	6.01E-08	2.17E-06	1.00E-03	PF	5	8.73E+00	C1

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Tank Farm 241-AY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SO ₄	6.28E+00	3.54E-07	1.28E-05	5.30E-02	PF	4		
TOC gC/l ¹⁷	5.74E+00	2.33E-05	8.40E-04	3.88E-01	PF	5		
U, g/l	1.97E-02	4.04E-09	1.45E-07	6.71E-05	PF	5	5.14E-03	C1
Zn	1.13E-02	8.49E-09	3.06E-07	1.41E-04	PF	5		
Zr	4.64E-02	2.49E-08	8.96E-07	4.14E-04	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	1.96E+01	6.83E-08	2.46E-06	1.14E-03	PF	5	2.0E-11	B ¹⁹
Cs 137	1.15E+05	1.89E-05	6.82E-04	4.72E+00	PF	4	4.0E-07	B
I 129	1.50E-01	5.79E-08	2.08E-06	6.92E-06	PF	4	7.0E-08	B
Pu 239/240	4.00E-03	1.32E-08	4.75E-07	2.19E-04	PF	5	2.0E-12	B
Sr 89/90	1.44E+05	2.47E-06	8.91E-05	6.16E+00	PF	4	9.0E-09	B
Tc 99	1.96E+01	5.44E-08	1.96E-06	9.05E-04	PF	5	2.0E-06	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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Tank .rm 241-AY Vapor Estimates

Sample Type	Ave.Liq.		Tank:	241-AY-102				
Sample Date	2/90, 11/84		Contents:	Liquid/Solids				
Sample ID	Average		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	6.7E-04		Retr. Method	Pumping				
pH	9.50							
Density ^{1A} , g/ml	1.04							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	6.90E-03	3.11E-09	1.12E-07	7.04E-04	PF	5	2.27E-03	C1
Al	6.82E-02	1.23E-07	4.42E-06	2.78E-02	PF	5	9.06E+00	C1
Ba	3.70E-04	1.31E-10	4.73E-09	2.97E-05	PF	5	8.92E-02	C1
B	6.30E-03	2.79E-08	1.00E-06	6.31E-03	PF	5	2.22E+01	C1
Ca	3.90E-03	4.74E-09	1.71E-07	1.07E-03	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.12E-04	4.86E-11	1.75E-09	1.10E-05	PF	5	5.46E-04	C1, C2, D
Cl	3.50E-01	3.04E-08	1.09E-06	1.10E-01	PF	5		
Co	2.36E-04	1.95E-10	7.00E-09	4.40E-05	PF	5	2.07E-02	C1, D
CO ₃	3.66E+00	2.97E-06	1.07E-04	6.72E-01	PF	5		
Cr	1.10E-02	2.28E-09	8.22E-08	2.33E-03	PF	5	2.35E-01	C1, D
F	1.71E-01	2.57E-08	9.27E-07	9.91E-02	PF	5	3.22E+00	C1
Fe	2.30E-04	2.00E-10	7.19E-09	4.52E-05	PF	5	2.18E+00	C1
K	4.30E-02	5.36E-08	1.93E-06	1.21E-02	PF	5		
La	5.60E-05	1.96E-11	7.05E-10	4.44E-06	PF	5		
Mg	4.90E-04	9.93E-10	3.57E-08	2.25E-04	PF	5	1.02E+01	C1
Mn	1.10E-05	9.73E-12	3.50E-10	2.20E-06	PF	5	2.22E+00	C2, D
Na	2.16E+00	4.57E-06	1.65E-04	1.03E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.00E-04	8.24E-11	2.97E-09	1.87E-05	PF	5	4.14E-02	C1, D
NO ₂	9.89E-01	8.04E-08	2.89E-06	2.37E-01	PF	5		
NO ₃	1.17E+01	7.05E-07	2.54E-05	2.08E+00	PF	5		
OH	5.03E+00	1.44E-05	5.18E-04	3.26E+00	PF	5	2.88E+00	C2 as NaOH
P	3.00E-03	4.71E-09	1.69E-07	1.07E-03	PF	5		
PO ₄	1.56E-01	9.60E-08	3.46E-06	2.17E-02	PF	5		
Si	1.49E-01	2.59E-07	9.32E-06	5.86E-02	PF	5	8.73E+00	C1
SO ₄	7.25E-01	4.08E-08	1.47E-06	8.31E-02	PF	5		

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Tank Farm 241-AY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sr	1.80E-04	9.95E-11	3.58E-09	2.25E-05	PF	5		
TOC gC/l ¹⁷	1.51E+00	6.10E-06	2.20E-04	1.38E+00	PF	5		
Zn	2.90E-04	2.17E-10	7.81E-09	4.91E-05	PF	5		
Zr	4.40E-05	2.35E-11	8.47E-10	5.32E-06	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	1.50E-03	4.14E-12	1.49E-10	9.37E-07	PF	5	2.0E-11	B ¹⁹
Cd 137	4.32E+03	2.16E-05	7.76E-04	7.32E+01	PF	5	4.0E-07	B
Pu 239/240	2.34E-01	6.50E-10	2.34E-08	1.47E-04	PF	5	2.0E-12	B
Sr 89/90	6.58E+03	2.23E-07	8.02E-06	7.56E+00	PF	5	9.0E-09	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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Tank .m 241-AY Vapor Estimates

- Note: 1. Tank AY-101 viscosity estimated as that of water at tank temperature. Tank AY-102 viscosity estimated as that of water at tank temperature.
- Note: 1A. Data for tank AY-102 appears incomplete as moles of water are too great with reported concentrations and density.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. Unidentified transuranic species were reported for both tanks AY-101 and AY-102 at 31.3 and 0.236 microcuries/l respectively. Data for tank AY-101 is the average of four liquid sample from WHC-SD-WM-TI-578, Rev. 0. Data for tank AY-102 taken from WHC-SD-WM-TI-578, Rev. 0 which averages 2 liquid samples.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. Data denoted 5 invalidated due to tank transfer activities after sampling.
- Note: 7. Allowable concentration, in ppm by volume.
- Note: 8. Henry's constant for ammonia corrected for salt, temperature, and pH.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 15. Annual arithmetic mean over calendar year.
- Note: 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (i.e., 1994 - 1987 = 7).
- Note: 19. Allowable data based on DCG's in microcurie/l.

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Tank Farm 241-AZ Vapor Estimates

Sample Type	SN		Tank:	241-AZ-101				
Sample Date	5/89		Contents:	Liquid/Solids				
Sample ID	Core 2		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	8.0E-03		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.22							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	2.50E-03	1.12E-09	4.03E-08	1.67E-05	PF	5	2.27E-03	C1
Al	2.69E+00	4.82E-06	1.73E-04	7.16E-02	PF	5	9.06E+00	C1
As	7.04E-03	4.54E-09	1.63E-07	6.75E-05	PF	5	6.52E-02	C1
Ba	2.51E-03	8.86E-10	3.19E-08	1.32E-05	PF	5	8.92E-02	C1
Be	1.10E-04	5.91E-10	2.13E-08	8.78E-06	PF	5	1.36E-03	B (10g/24 hr), C1
B	6.39E-03	2.81E-08	1.01E-06	4.18E-04	PF	5	2.22E+01	C1
Ca	9.58E-03	1.16E-08	4.17E-07	1.72E-04	PF	5	6.11E+00	C1 as CaCO ₃
Ce	1.20E-03	4.14E-10	1.49E-08	6.16E-06	PF	5		
Cl	3.11E-01	2.69E-08	9.67E-07	6.39E-03	PF	4		
Co	2.09E-03	1.71E-09	6.17E-08	2.55E-05	PF	5	2.07E-02	C1, D
Cr	5.26E-01	1.09E-07	3.91E-06	7.27E-03	PF	4	2.35E-01	C1, D
CrO ₄	1.87E-01	7.79E-08	2.81E-06	1.16E-03	PF	5	2.11E-02	C2
Cu	3.10E-04	2.34E-10	8.43E-09	3.48E-06	PF	5	3.82E-01	C1
Dy	1.98E-04	5.89E-11	2.12E-09	8.76E-07	PF	5		
F	7.09E-01	1.06E-07	3.82E-06	2.68E-02	PF	4	3.22E+00	C1
Fe	2.39E-02	2.06E-08	7.43E-07	3.07E-04	PF	5	2.18E+00	C1
K	2.49E+00	3.09E-06	1.11E-04	4.59E-02	PF	5		
La	3.90E-03	1.36E-09	4.88E-08	2.02E-05	PF	5		
Li	4.23E-05	2.95E-10	1.06E-08	4.38E-06	PF	5		
Mg	2.31E-03	4.65E-09	1.68E-07	6.92E-05	PF	5	1.02E+01	C1
Mn	5.36E-04	4.71E-10	1.70E-08	7.00E-06	PF	5	2.22E+00	C2, D
Mo	5.19E-02	2.61E-08	9.41E-07	3.89E-04	PF	5	2.55E+00	C1
Na	5.67E+01	1.19E-04	4.29E-03	1.77E+00	PF	5	2.13E+00	C2 as NaOH
Nd	1.41E-03	4.73E-10	1.70E-08	7.04E-06	PF	5		
Ni	3.08E-03	2.52E-09	9.09E-08	3.75E-05	PF	5	4.14E-02	C1, D
NO ₂	1.33E+02	1.07E-05	3.87E-04	2.08E+00	PF	4		
NO ₃	1.04E+02	6.24E-06	2.25E-04	1.21E+00	PF	4		
P	3.89E-01	6.07E-07	2.18E-05	9.02E-03	PF	5		

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Tank m 241-AZ Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	4.80E-03	1.12E-09	4.04E-08	1.67E-05	PF	4	5.91E-03	C1, A, D
PO ₄	3.24E-01	1.98E-07	7.14E-06	2.95E-03	PF	5		
Re	4.54E-04	1.18E-10	4.25E-09	1.75E-06	PF	5		
Rh	2.51E-03	1.18E-09	4.24E-08	1.75E-05	PF	5	2.37E-04	C1
Ru	1.11E-03	5.31E-10	1.91E-08	7.90E-06	PF	5		
Sb	4.90E-03	1.94E-09	6.99E-08	2.89E-05	PF	5	1.00E-01	C1, D
Se	1.44E-03	8.81E-10	3.17E-08	1.31E-05	PF	5	6.19E-02	C1, D
Si	1.04E-01	1.80E-07	6.46E-06	2.67E-03	PF	5	8.73E+00	C1
SO ₄	1.88E+01	1.05E-06	3.78E-05	1.41E-01	PF	4		
Sr	2.14E-04	1.18E-10	4.23E-09	1.75E-06	PF	5		
TOC gC/l ¹⁷	1.24E-01	5.00E-07	1.80E-05	7.43E-03	PF	5		
Te	2.65E-03	1.00E-09	3.60E-08	1.49E-05	PF	5	1.91E-02	C1
Th	5.66E-04	1.18E-10	4.25E-09	1.75E-06	PF	5		
Ti	5.84E-05	5.88E-11	2.12E-09	8.74E-07	PF	5		
Tl	1.22E-02	2.89E-09	1.04E-07	4.30E-05	PF	5	1.20E-02	C1
V	8.70E-04	8.25E-10	2.97E-08	1.23E-05	PF	5	2.40E-02	C1 (as V ₂ O ₅)
Zn	7.89E-04	5.87E-10	2.11E-08	8.72E-06	PF	5		
Zr	1.05E-02	5.58E-09	2.01E-07	8.29E-05	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	1.32E+01	3.64E-08	1.31E-06	5.41E-04	PF	5	2.0E-11	B ¹⁹
C 14	1.44E+00	4.00E-09	1.44E-07	5.94E-05	PF	5	6.0E-06	B
Cm 242	4.08E-02	4.78E-14	1.72E-12	7.11E-10	PF	5	7.0E-10	B
Cm 244	1.44E-01	3.30E-10	1.19E-08	4.91E-06	PF	5	4.0E-11	B
Cs 137	2.04E+06	3.32E-04	1.20E-02	7.41E+01	PF	4	4.0E-07	B
Co 60	9.00E+02	1.30E-06	4.66E-05	1.93E-02	PF	5	8.0E-08	B
Cs 134	3.59E+04	1.90E-05	6.86E-04	2.83E-01	PF	5	4.0E-07	B
Eu 154	6.59E+03	1.06E-05	3.82E-04	1.78E-01	PF	5	5.0E-08	B
I 129	7.19E-01	2.78E-07	9.99E-06	2.97E-05	PF	4	7.0E-08	B
Np 237	7.08E-02	1.97E-10	7.08E-09	2.92E-06	PF	5	1.2E-12	B
Pu 238	7.92E-02	2.11E-10	7.61E-09	3.14E-06	PF	5	2.1E-12	B
Pu 239/240	5.16E-01	1.43E-09	5.16E-08	2.13E-05	PF	5	2.0E-12	B
Pu 241	4.32E+00	9.48E-09	3.41E-07	1.41E-04	PF	5	1.0E-10	B
Sr 89/90	5.76E+03	9.43E-08	3.39E-06	2.10E-01	PF	4	9.0E-09	B
Tc 99	3.84E+02	1.07E-06	3.84E-05	1.59E-02	PF	5	2.0E-06	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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Tank Farm 241-AZ Vapor Estimates

Sample Type	SN		Tank:	241-AZ-102				
Sample Date	8/89		Contents:	Liquid/Solids				
Sample ID	Core 1		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	6.6E-04		Retr. Method	Pumping				
pH	N/A							
Density ^{1A} , g/ml	1.18							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	7.13E-03	2.88E-09	1.04E-07	6.69E-04	PF	5	2.27E-03	C1
Al	1.05E-01	1.70E-07	6.11E-06	3.94E-02	PF	5	9.06E+00	C1
As	4.42E-03	2.57E-09	9.26E-08	5.97E-04	PF	5	6.52E-02	C1
Ba	8.10E-04	2.58E-10	9.29E-09	5.99E-05	PF	5	8.92E-02	C1
Be	1.17E-04	5.67E-10	2.04E-08	1.32E-04	PF	5	1.36E-03	B (10g/24 hr), C1
B	8.63E-03	3.42E-08	1.23E-06	7.95E-03	PF	5	2.22E+01	C1
Ca	6.24E-03	6.81E-09	2.45E-07	1.58E-03	PF	5	6.11E+00	C1 as CaCO ₃
Ce	1.22E-02	3.80E-09	1.37E-07	8.82E-04	PF	5		
Cd	1.99E-03	7.75E-10	2.79E-08	1.80E-04	PF	5	5.46E-04	C1, C2, D
Cl	7.07E-02	5.51E-09	1.98E-07	2.05E-02	PF	5		
Co	8.83E-03	6.53E-09	2.35E-07	1.52E-03	PF	5	2.07E-02	C1, D
Cr	1.04E+00	1.94E-07	6.97E-06	2.03E-01	PF	5	2.35E-01	C1, D
CrO ₄	2.77E-01	1.04E-07	3.75E-06	2.42E-02	PF	5	2.11E-02	C2
Cu	3.22E-03	2.20E-09	7.90E-08	5.10E-04	PF	5	3.82E-01	C1
Dy	9.59E-04	2.58E-10	9.27E-09	5.98E-05	PF	5		
F	8.72E-01	1.18E-07	4.24E-06	4.65E-01	PF	5	3.22E+00	C1
K	1.49E+00	1.67E-06	6.00E-05	3.87E-01	PF	5		
La	1.80E-03	5.65E-10	2.03E-08	1.31E-04	PF	5		
Li	9.01E-05	5.66E-10	2.04E-08	1.31E-04	PF	5		
Mg	9.18E-04	1.67E-09	6.01E-08	3.87E-04	PF	5	1.02E+01	C1
Mn	7.78E-04	6.17E-10	2.22E-08	1.43E-04	PF	5	2.22E+00	C2, D
Mo	3.76E-02	1.71E-08	6.15E-07	3.97E-03	PF	5	2.55E+00	C1
Na	4.96E+01	9.41E-05	3.39E-03	2.18E+01	PF	5	2.13E+00	C2 as NaOH
Nd	5.62E-03	1.70E-09	6.13E-08	3.95E-04	PF	5		
Ni	2.33E-03	1.72E-09	6.20E-08	4.00E-04	PF	5	4.14E-02	C1, D
Nonanedioic acid	3.33E+00	7.73E-07	2.78E-05	1.79E-01	PF	5		
NO ₂	6.78E+00	4.95E-07	1.78E-05	1.49E+00	PF	5		

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
P	6.91E-02	9.73E-08	3.50E-06	2.26E-02	PF	5		
Pb	6.11E-03	1.29E-09	4.64E-08	2.99E-04	PF	5	5.91E-03	C1, A, D
PO ₄	1.52E-01	8.40E-08	3.02E-06	1.95E-02	PF	5		
Re	8.79E-04	2.06E-10	7.42E-09	4.79E-05	PF	5		
Rh	1.32E-02	5.59E-09	2.01E-07	1.30E-03	PF	5	2.37E-04	C1
Ru	4.89E-03	2.11E-09	7.61E-08	4.90E-04	PF	5		
Sb	1.06E-02	3.79E-09	1.36E-07	8.80E-04	PF	5	1.00E-01	C1, D
Se	1.12E-02	6.19E-09	2.23E-07	1.44E-03	PF	5	6.19E-02	C1, D
Si	5.73E-01	8.93E-07	3.21E-05	2.07E-01	PF	5	8.73E+00	C1
SO ₄	1.41E+01	7.11E-07	2.56E-05	1.49E+00	PF	5		
Sr	2.07E-04	1.03E-10	3.70E-09	2.38E-05	PF	5		
TOC gC/l ¹⁷	1.59E+00	5.78E-06	2.08E-04	1.34E+00	PF	5		
Te	2.71E-03	9.24E-10	3.33E-08	2.14E-04	PF	5	1.91E-02	C1
Th	1.48E-03	2.78E-10	1.00E-08	6.46E-05	PF	5		
Ti	5.09E-04	4.63E-10	1.67E-08	1.07E-04	PF	5		
Tl	3.93E-02	8.41E-09	3.03E-07	1.95E-03	PF	5	1.20E-02	C1
V	2.10E-03	1.80E-09	6.47E-08	4.17E-04	PF	5	2.40E-02	C1 (as V ₂ O ₅)
Zn	3.09E-04	2.07E-10	7.47E-09	4.81E-05	PF	5		
Zr	4.41E-03	2.11E-09	7.61E-08	4.91E-04	PF	5	1.34E+00	C1, C3
Am 241 ¹⁸	1.54E+00	4.24E-09	1.53E-07	9.85E-04	PF	5	2.0E-11	B ¹⁹
C-14	1.25E+00	3.47E-09	1.25E-07	8.05E-04	PF	5	6.0E-06	B
Cs 137	8.81E+05	1.44E-04	5.17E-03	4.99E+02	PF	5	4.0E-07	B
Co 60	2.01E+02	2.89E-07	1.04E-05	6.71E-02	PF	5	8.0E-08	B
Eu 154	5.68E+02	9.14E-07	3.29E-05	2.40E-01	PF	5	5.0E-08	B
I 129	1.18E-03	4.56E-10	1.64E-08	7.61E-07	PF	5	7.0E-08	B
Np 237	1.97E+00	5.47E-09	1.97E-07	1.27E-03	PF	5	1.2E-12	B
Pu 239/240	3.27E+01	9.08E-08	3.27E-06	2.11E-02	PF	5	2.0E-12	B
Sr 89/90	7.03E+03	1.15E-07	4.14E-06	4.00E+00	PF	5	9.0E-09	B
Tc 99	1.18E+02	3.28E-07	1.18E-05	7.61E-02	PF	5	2.0E-06	B
U 238	1.16E+00	3.22E-09	1.16E-07	7.48E-04	PF	5	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

Tank Farm 241-AZ Vapor Estimates

- Note: 1. Tank AZ-101 viscosity estimated assuming 40 vol.% solids. Tank AZ-102 viscosity estimated as that of water at tank temperature.
- Note: 1A. Data for tank AZ-102 appears incomplete, density too high for given concentrations.
- Note: 1B. No temperature reported for tanks AZ-101 or 102, estimated temperature 70 F.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. Data reliability for tank AZ-101 based of PF availability. Data for tank AZ-102 denoted 5 invalidated due to post sample tank activity.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).
- Note: 19. Allowable data based on DCG's in microcurie/l.

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Tank Arm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-101				
Sample Date	1/5/76		Contents:	Sludge				
Sample ID	RAT-B101-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	5.6E-03		Retr. Method	Pumping/Sluicing				
pH	13.85							
Density, g/ml	1.59							
Temperature, °R	577							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.34E+02	2.13E-04	3.82E-02	1.95E+00	PF	5	9.06E+00	C1
Ba	6.87E+00	2.15E-06	3.86E-04	1.97E-02	PF	5	8.92E-02	C1
Ca	9.62E+00	1.03E-05	1.85E-03	9.43E-02	PF	5	6.11E+00	C1 as CaCO ₃
CO ₃ ⁹	4.21E+01	3.01E-05	5.39E-03	2.75E-01	PF	6		
Cr ⁹	8.42E-01	1.54E-07	1.24E-04	6.35E-03	PF	6	2.35E-01	C1, D
Fe	7.26E+01	5.56E-05	9.97E-03	5.08E-01	PF	5	2.18E+00	C1
Fe (CN) ₆ ⁹	2.81E-02	5.67E-09	1.02E-06	5.19E-05	PF	6	5.77E-01	C1 as CN, D ¹³
Mg	1.22E+00	2.18E-06	3.91E-04	1.99E-02	PF	5	1.02E+01	C1
Mn	7.14E+00	5.57E-06	9.98E-04	5.09E-02	PF	5	2.22E+00	C2, D
Na ⁹	2.15E+01	4.01E-05	7.19E-03	3.67E-01	PF	6	2.13E+00	C2 as NaOH
NO ₃	1.4E+02	7.29E-06	1.70E-02	8.66E-01	PF	5		
OH ⁹	1.19E+01	3.01E-05	5.39E-03	2.75E-01	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	9.59E+00	1.99E-06	3.56E-04	1.82E-02	PF	6	5.91E-03	C1, A, D
PO ₄	1.61E+02	8.74E-05	1.57E-02	7.99E-01	PF	5		
Pu	1.88E-02	3.30E-09	5.92E-07	3.02E-05	PF	5		
Si	1.40E+00	2.14E-06	3.84E-04	1.96E-02	PF	5	8.73E+00	C1
SO ₄ ⁹	4.44E+00	2.20E-07	3.56E-04	1.81E-02	PF	6		
Am 241 ^{9,18}	2.34E+02	6.45E-07	7.31E-05	5.90E-03	PF	6	2.0E-11	B ¹⁹
C 14 ⁹	1.20E+01	3.33E-08	3.77E-06	3.05E-04	PF	6	6.0E-06	B
Cs 137	6.70E+05	7.82E-05	1.33E-01	1.07E+01	PF	5	4.0E-07	B
Np 237 ⁹	1.20E-03	3.34E-12	3.78E-10	3.05E-08	PF	6	1.2E-12	B
Pu 238 ⁹	6.95E+01	1.87E-07	2.12E-05	1.71E-03	PF	6	2.1E-12	B
Pu 239/240	1.15E+03	3.20E-06	3.63E-04	2.93E-02	PF	5	2.0E-12	B
Pu 241 ⁹	2.34E+03	5.38E-06	6.09E-04	4.92E-02	PF	6	1.0E-10	B

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
RuRh: 106 ⁹	9.48E+00	2.56E+11	1.86E+07	1.50E+05	PF	6	1.0E+08	B
SE: 69/90	2.50E+06	2.96E+05	5.03E+01	4.06E+01	PF	5	9.0E+09	B
U: 238 ⁹	1.64E+01	4.56E+08	5.17E+06	4.17E+04	PF	6	1.0E+10	B
Water		8.84E+04	8.84E+04	8.84E+04	Stm Ta	1		

Tank .m 241-B Vapor Estimates

Sample Type	SN		Tank:	241-B-102				
Sample Date	10/24/75		Contents:	SludgeSaltcake/SN				
Sample ID	T-4887		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	7.1E-03		Retr. Method	Pumping/Sluicing				
pH	12.71							
Density, g/ml	1.14							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.94E-02	6.11E-08	2.20E-06	4.80E-04	PF	5	9.06E+00	C1
Ba ⁹	2.81E-03	1.15E-09	4.14E-08	9.03E-06	PF	6	8.92E-02	C1
C ₆ H ₅ O ₇ anion ⁹	3.14E+01	1.08E-05	3.89E-04	8.49E-02	PF	6		
Ca ⁹	6.61E-03	9.26E-09	3.33E-07	7.28E-05	PF	6	6.11E+00	C1 as CaCO ₃
Cl	1.15E+00	1.15E-07	4.15E-06	1.45E-02	PF	5		
CO ₃	5.05E+00	4.72E-06	1.70E-04	3.71E-02	PF	5		
Cr ⁹	1.32E-01	3.16E-08	1.14E-06	1.12E-03	PF	6	2.35E-01	C1, D
F	2.09E-01	3.63E-08	1.31E-06	4.85E-03	PF	5	3.22E+00	C1
Fe ⁹	4.29E+01	4.30E-05	1.55E-03	3.38E-01	PF	6	2.18E+00	C1
Fe (CN) ₆ ⁹	1.07E-02	2.84E-09	1.02E-07	2.23E-05	PF	6	5.77E-01	C1 as CN, D ¹³
Na	6.44E+01	1.57E-04	5.65E-03	1.23E+00	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	5.37E-01	5.10E-07	1.84E-05	4.01E-03	PF	6	4.14E-02	C1, D
NO ₂	1.66E+01	1.56E-06	5.60E-05	1.59E-01	PF	5		
NO ₃	1.14E+02	7.93E-06	2.85E-04	8.10E-01	PF	5		
OH	8.78E-01	2.90E-06	1.04E-04	2.28E-02	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	3.39E+01	9.17E-06	3.30E-04	7.21E-02	PF	6	5.91E-03	C1, A, D
PO ₄	7.81E+00	5.54E-06	2.00E-04	4.36E-02	PF	5		
Pu	3.46E-05	7.95E-12	2.86E-10	6.25E-08	PF	5		
Si	1.40E+00	2.80E-06	1.01E-04	2.20E-02	PF	5	8.73E+00	C1
SiO ₃ ⁹	1.90E-01	1.40E-07	5.05E-06	1.10E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	3.14E+01	2.03E-06	7.32E-05	1.44E-01	PF	6		
Am 241 ^{9,18}	8.48E+01	2.34E-07	3.70E-05	1.84E-03	PF	6	2.0E+11	B ¹⁹
Am 243 ⁹	2.45E-03	6.82E-12	1.08E-09	5.36E-08	PF	6	2.0E+11	B

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C 14 ⁹	1.16E+01	3.22E-08	5.09E-06	2.53E-04	PF	6	6.0E-06	B
Cm 242 ⁹	3.35E-03	1.86E-14	2.93E-12	1.46E-10	PF	5	7.0E-10	B
Cm 244 ⁹	1.65E-02	3.94E-11	6.21E-09	3.09E-07	PF	5	4.0E-11	B
Cs 137	4.00E+04	4.55E-06	1.08E-02	5.36E-01	PF	5	4.0E-07	B
Cs 134	8.68E+01	4.46E-10	7.05E-08	3.51E-06	PF	5	4.0E-07	B
I 129 ⁹	8.26E-03	3.19E-09	1.15E-07	1.80E-07	PF	6	7.0E-08	B
Np 237 ⁹	2.45E-02	6.82E-11	1.08E-08	5.36E-07	PF	6	1.2E-12	B
Pu 238 ⁹	3.35E+01	9.01E-08	1.42E-05	7.08E-04	PF	6	2.1E-12	B
Pu 239/240	2.12E+00	5.89E-09	9.30E-07	4.63E-05	PF	5	2.0E-12	B
Pu 241 ⁹	2.45E+03	5.65E-06	8.92E-04	4.44E-02	PF	6	1.0E-10	B
RuRh 106 ⁹	8.26E-01	2.23E-12	2.26E-08	1.12E-06	PF	6	3.0E-08	B
Se 79 ⁹	2.45E-01	6.82E-10	1.08E-07	5.36E-06	PF		1.0E-06	B
Sr 89/90	5.19E+03	6.00E-08	1.42E-03	7.07E-02	PF	5	9.0E-09	B
Tc 99 ⁹	7.36E+00	2.05E-08	3.23E-06	1.61E-04	PF	6	2.0E-06	B
U 238 ⁹	6.69E+00	1.86E-08	2.94E-06	1.46E-04	PF	6	1.0E-10	B
water		1.73E+04	1.73E+04	1.73E+04	Stm Ta	1		

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Tank Farm 241-B Vapor Estimates

Sample Type	SN		Tank:	241-B-103				
Sample Date	5/9/75		Contents:	Sludge				
Sample ID	T-4298		Watchlist:	Organic Salts				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	6.9E-03		Retr. Method	Pumping/Sluicing				
pH	13.12							
Density, g/ml	1.12							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.22E+00	2.36E-06	8.48E-05	1.90E-02	PF	5	9.06E+00	C1
Ba ⁹	1.03E-03	3.92E-10	1.41E-08	3.16E-06	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ anion ⁹	1.34E-01	9.34E-08	3.36E-06	7.52E-04	PF	6		
C ₆ H ₅ O ₇ anion ⁹	2.55E+01	7.76E-06	2.80E-04	6.25E-02	PF	6		
Ca ⁹	3.58E-04	4.67E-10	1.68E-08	3.76E-06	PF	6	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.88E-03	7.01E-10	2.52E-08	5.64E-06	PF	6		
CO ₃	1.08E+01	9.39E-06	3.38E-04	7.56E-02	PF	5		
Cr ⁹	9.40E-03	2.09E-09	7.54E-08	7.59E-05	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	8.06E-01	1.44E-07	5.18E-06	1.16E-03	PF	6		
F	1.33E-01	2.15E-08	7.73E-07	2.94E-03	PF	5	3.22E+00	C1
Fe ⁹	3.49E+00	3.25E-06	1.17E-04	2.62E-02	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	1.21E-01	2.97E-08	1.07E-06	2.39E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	1.25E+00	2.23E-07	8.03E-06	1.80E-03	PF	6		
K ⁹	1.03E-01	1.38E-07	4.96E-06	1.11E-03	PF	6		
Mn ⁹	4.93E-02	4.67E-08	1.68E-06	3.76E-04	PF	6	2.22E+00	C2, D
Na	5.68E+01	1.29E-04	4.64E-03	1.04E+00	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	2.91E-01	2.57E-07	9.26E-06	2.07E-03	PF	6	4.14E-02	C1, D
NO ₂	1.53E+01	1.33E-06	4.80E-05	1.40E-01	PF	5		
NO ₃	6.57E+01	4.25E-06	1.53E-04	4.45E-01	PF	5		
OH	2.24E+00	6.87E-06	2.47E-04	5.53E-02	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	9.40E+00	2.37E-06	8.53E-05	1.91E-02	PF	6	5.91E-03	C1, A, D

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
PO ₄	1.26E+01	8.32E-06	2.99E-04	6.69E-02	PF	5		
Pu	1.85E-05	3.95E-12	1.42E-10	3.18E-08	PF	5		
SiO ₃ ⁹	6.72E-01	4.61E-07	1.66E-05	3.71E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	1.70E+01	1.03E-06	3.69E-05	7.44E-02	PF	6		
Sr	2.37E-04	1.41E-10	5.06E-09	1.13E-06	PF	5		
Am 241 ^{9, 18}	3.03E+02	8.35E-07	1.34E-04	6.72E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	5.33E-01	1.48E-09	2.38E-07	1.19E-05	PF	6	2.0E-11	B
C 14 ⁹	1.33E+01	3.70E-08	5.94E-06	2.97E-04	PF	6	6.0E-06	B
Cm 242 ⁹	1.21E-01	6.71E-13	1.08E-10	5.40E-09	PF	6	7.0E-10	B
Cm 244 ⁹	8.96E+02	2.13E-10	3.43E-08	1.72E-06	PF	6	4.0E-11	B
Cs 137	4.32E+04	4.92E-06	1.18E-02	5.93E-01	PF	5	4.0E-07	B
Cs 134	1.52E+02	7.81E-10	1.26E-07	6.29E-06	PF	5	4.0E-07	B
I 129 ⁹	3.63E-02	1.40E-08	5.05E-07	8.12E-07	PF	6	7.0E-08	B
Np 237 ⁹	9.08E-02	2.52E-10	4.05E-08	2.03E-06	PF	6	1.2E-12	B
Pu 238 ⁹	2.30E+01	6.19E-08	9.95E-06	4.98E-04	PF	6	2.1E-12	B
Pu 239/240	1.14E+00	3.15E-09	5.06E-07	2.54E-05	PF	5	2.0E-12	B
Pu 241 ⁹	2.66E+03	6.12E-06	9.84E-04	4.93E-02	PF	6	1.0E-10	B
RuRh 106	5.05E+03	4.13E-13	4.25E-09	2.13E-07	PF	5	3.0E-08	B
Se 79 ⁹	4.48E-01	1.24E-09	2.00E-07	1.00E-05	PF	6	1.0E-06	B
Sr 89/90	1.16E+02	1.34E-09	3.24E-05	1.62E-03	PF	5	9.0E-09	B
Tc 99 ⁹	2.30E+01	6.39E-08	1.03E-05	5.14E-04	PF	6	2.0E-06	B
U 238 ⁹	8.96E+00	2.49E-08	4.00E-06	2.00E-04	PF	6	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Ta	1		

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Tank Farm 241-B Vapor Estimates

Sample Type	TRAC		Tank:	241-B-104				
Sample Date			Contents:	Sludge/Saltcake				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	5.3E-03		Retr. Method	Pumping/Sluicing				
pH	13.80							
Density, g/ml	1.59							
Temperature, °R	577							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	1.35E+00	8.13E-06	2.93E-04	7.96E-02	PF	6	9.06E+00	C1
Ba ⁹	2.35E-05	2.78E-11	1.00E-09	2.72E-07	PF	6	8.92E-02	C1
Bi ⁹	9.26E+02	7.18E-04	2.59E-02	7.03E+00	PF	6		
CO ₃ ⁹	8.55E+00	2.31E-05	8.31E-04	2.26E-01	PF	6		
Cr ⁹	7.12E-01	4.93E-07	1.77E-05	2.18E-02	PF	6	2.35E-01	C1, D
F ⁹	5.84E+00	2.93E-06	1.05E-04	4.88E-01	PF	6	3.22E+00	C1
Fe ⁹	1.21E+01	3.51E-05	1.26E-03	3.43E-01	PF	6	2.18E+00	C1
Mg	1.10E+01	7.43E-05	2.68E-03	7.28E-01	PF	6	1.02E+01	C1
Mn	1.10E+01	3.24E-05	1.17E-03	3.18E-01	PF	6	2.22E+00	C2, D
Na ⁹	4.91E+01	3.46E-04	1.25E-02	3.39E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	1.64E+00	4.44E-07	1.60E-05	5.66E-02	PF	6		
NO ₃ ⁹	3.56E+01	7.16E-06	2.58E-04	9.12E-01	PF	6		
OH ⁹	1.07E+01	1.02E-04	3.67E-03	9.98E-01	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	4.77E+02	9.79E-04	3.53E-02	9.59E+00	PF	6		
SiO ₃ ⁹	5.41E-01	1.15E-06	4.16E-05	1.13E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	4.77E+00	8.95E-07	3.22E-05	7.89E-02	PF	6		
ZrO ⁹	5.34E-01	8.09E-07	2.91E-05	7.93E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	2.89E+00	7.97E-09	9.02E-07	7.80E-05	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	2.89E-05	8.02E-14	9.08E-12	7.85E-10	PF	6	2.0E-11	B
C-14 ⁹	2.89E-01	8.02E-10	9.07E-08	7.85E-06	PF	6	6.0E-06	B

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Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	1.10E+06	6.10E-06	6.91E-04	5.58E-02	PF	6	7.0E-10	B
Cm 244 ⁹	2.89E+06	6.88E-15	7.79E-13	6.74E-11	PF	6	4.0E-11	B
Cs 137 ⁹	3.66E+03	6.11E-07	1.04E-03	8.98E-02	PF	6	4.0E-07	B
I 129 ⁹	2.12E-03	8.17E-10	2.94E-08	5.76E-08	PF	6	7.0E-08	B
Np 237 ⁹	4.23E-03	1.18E-11	1.33E-09	1.15E-07	PF	6	1.2E-12	B
Pu 238 ⁹	1.42E-01	3.83E-10	4.34E-08	3.75E-06	PF	6	2.1E-12	B
Pu 239/240 ⁹	7.89E+01	2.19E-07	2.48E-05	2.15E-03	PF	6	2.0E-12	B
Pu 241 ⁹	1.42E+01	3.28E-08	3.71E-06	3.21E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	2.12E-08	5.72E-20	4.15E-16	3.59E-14	PF	6	3.0E-08	B
Se 79 ⁹	3.66E-02	1.02E-10	1.15E-08	9.95E-07	PF	6	1.0E-06	B
Sr 89/90 ⁹	5.77E+03	9.69E-08	1.64E-03	1.42E-01	PF	6	9.0E-09	B
Tc 99 ⁹	1.42E+00	3.96E-09	4.48E-07	3.87E-05	PF	6	2.0E-06	B
U 238 ⁹	2.12E+01	5.88E-10	6.66E-08	5.76E-06	PF	6	1.0E-10	B
water		8.84E+04	8.84E+04	8.84E+04	Stm Ta	1		

Tank Farm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-105				
Sample Date	1/16/76		Contents:	Sludge/Saltcake				
Sample ID	RAT-B105-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.1E-03		Retr. Method	Pumping/Sluicing				
pH	12.94							
Density, g/ml	1.1							
Temperature, °R	577							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.75E+00	4.71E-06	1.70E-04	6.18E-02	PF	5	9.06E+00	C1
Ba ⁹	2.16E-04	1.15E-10	4.13E-09	1.51E-06	PF	6	8.92E-02	C1
Bi ⁹	1.12E+02	3.91E-05	1.41E-03	5.13E-01	PF	6		
Ce ⁹	6.04E-04	3.14E-10	1.13E-08	4.12E-06	PF	6		
CO ₃	1.87E+00	2.27E-06	8.16E-05	2.97E-02	PF	5		
Cr ⁹	8.63E-02	2.68E-08	9.66E-07	1.59E-03	PF	6	2.35E-01	C1, D
F ⁹	1.30E+01	2.92E-06	1.05E-04	6.51E-01	PF	6	3.22E+00	C1
Fe	5.54E+00	7.20E-06	2.59E-04	9.45E-02	PF	5	2.18E+00	C1
Mg	1.10E+01	3.34E-05	1.20E-03	4.38E-01	PF	6	1.02E+01	C1
Mn	1.10E+01	1.46E-05	5.24E-04	1.91E-01	PF	5	2.22E+00	C2, D
Na	1.83E+02	5.79E-04	2.08E-02	7.60E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	7.33E-01	8.92E-08	3.21E-06	1.52E-02	PF	5		
NO ₃	2.25E+02	2.04E-05	7.33E-04	3.47E+00	PF	5		
OH	1.47E+00	6.29E-06	2.26E-04	8.25E-02	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.01E+02	9.35E-05	3.36E-03	1.23E+00	PF	5		
SiO ₃ ⁹	5.27E-02	5.04E-08	1.82E-06	6.62E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.86E+01	1.56E-06	5.63E-05	1.85E-01	PF	5		
ZrO	6.48E-02	4.41E-08	1.59E-06	5.78E-04	PF	5	1.14E+00	C1 as Zr
Am 241 ^{9,18}	3.50E-01	9.66E-10	1.58E-07	1.27E-05	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.43E-06	1.23E-14	2.01E-12	1.62E-10	PF	6	2.0E-11	B
C 14 ⁹	8.63E+00	2.40E-08	3.92E-06	3.15E-04	PF	6	6.0E-06	B
Cm 242 ⁹	1.89E-05	1.05E-16	1.72E-14	1.38E-12	PF	6	7.0E-10	B

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 244 ⁹	1.73E-04	4.12E-13	6.73E-11	5.40E-09	PF	6	4.0E-11	B
Cs 137	7.05E+02	8.23E-08	2.02E-04	1.62E-02	PF	5	4.0E-07	B
I 129 ⁹	1.73E-02	6.67E-09	2.40E-07	6.29E-07	PF	6	7.0E-08	B
Np 237 ⁹	4.43E-02	1.23E-10	2.02E-08	1.62E-06	PF	6	1.2E-12	B
Pu 238 ⁹	1.73E-02	4.65E-11	7.60E-09	6.10E-07	PF	6	2.1E-12	B
Pu 239/240	1.51E+01	4.19E-08	6.86E-06	5.50E-04	PF	5	2.0E-12	B
Pu 241 ⁹	1.73E+00	3.97E-09	6.50E-07	5.21E-05	PF	6	1.0E-10	B
RuRh 106	4.20E-09	1.13E-20	1.19E-16	9.54E-15	PF	5	3.0E-08	B
Se 79 ⁹	3.50E-01	9.72E-10	1.59E-07	1.28E-05	PF	6	1.0E-06	B
Sr 89/90	6.49E+03	7.69E-08	1.89E-03	1.51E-01	PF	5	9.0E-09	B
Tc 99 ⁹	8.63E+00	2.40E-08	3.92E-06	3.15E-04	PF	6	2.0E-06	B
U 238 ⁹	1.73E-01	4.80E-10	7.85E-08	6.29E-06	PF	6	1.0E-10	B
water		8.84E+04	8.84E+04	8.84E+04	Stm Ta	1		

Tank Farm 241-B Vapor Estimates

Sample Type	SN		Tank:	241-B-106				
Sample Date	10/6/75		Contents:	Sludge/SN				
Sample ID	T-8577		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	7.8E-03		Retr. Method	Pumping/Sluicing				
pH	12.49							
Density, g/ml	1.23							
Temperature, °R	524							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.18E-02	2.14E-08	7.71E-07	1.53E-04	PF	5	9.06E+00	C1
Ba ⁹	4.52E-05	1.62E-11	5.82E-10	1.15E-07	PF	6	8.92E-02	C1
Bi ⁹	3.39E+01	7.94E-06	2.86E-04	5.66E-02	PF	6		
C ₆ H ₅ O ₇ anion ⁹	4.29E+00	1.29E-06	4.65E-05	9.21E-03	PF	6		
Cl	1.97E+00	1.72E-07	6.21E-06	1.97E-02	PF	5		
CO ₃	7.98E+00	6.52E-06	2.35E-04	4.65E-02	PF	5		
Cr ⁹	2.26E-02	4.72E-09	1.70E-07	1.52E-04	PF	6	2.35E-01	C1, D
F ⁹	2.94E+00	4.45E-07	1.60E-05	5.40E-02	PF	6	3.22E+00	C1
Fe ⁹	6.32E-01	5.53E-07	1.99E-05	3.94E-03	PF	6	2.18E+00	C1
Mn ⁹	4.97E-03	4.43E-09	1.59E-07	3.16E-05	PF	6	2.22E+00	C2, D
Na	9.20E+01	1.96E-04	7.06E-03	1.40E+00	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	1.99E-02	1.65E-08	5.94E-07	1.18E-04	PF	6	4.14E-02	C1, D
NO ₂	8.60E+00	7.05E-07	2.54E-05	6.53E-02	PF	5		
NO ₃	1.86E+02	1.13E-05	4.07E-04	1.05E+00	PF	5		
OH	5.27E-01	1.52E-06	5.47E-05	1.08E-02	PF	5	2.88E+00	C2 as NaOH
PO ₄	9.03E+00	5.60E-06	2.02E-04	3.99E-02	PF	5		
Pu	1.40E-05	2.81E-12	1.01E-10	2.00E-08	PF	5		
SiO ₃ ⁹	3.39E-02	2.18E-08	7.86E-07	1.56E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	2.17E+00	1.23E-07	4.42E-06	7.89E-03	PF	6		
ZrO ⁹	1.94E-02	8.90E-09	3.20E-07	6.34E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	4.52E-01	1.25E-09	1.82E-07	8.88E-06	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.52E-04	1.25E-12	1.84E-10	8.94E-09	PF	6	2.0E-11	B

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Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C ¹⁴ ⁹	1.16E+00	3.22E-09	4.71E-07	2.29E-05	PF	6	6.0E-06	B
Cr ²⁴² ⁹	6.71E-04	3.72E-15	5.45E-13	2.65E-11	PF	6	7.0E-10	B
Cr ²⁴⁴ ⁹	2.26E-03	5.38E-12	7.88E-10	3.84E-08	PF	6	4.0E-11	B
CS ¹³⁷	4.92E+04	5.59E-06	1.23E-02	5.98E-01	PF	5	4.0E-07	B
CS ¹³⁴	1.15E+02	8.53E-08	1.25E-05	6.08E-04	PF	5	4.0E-07	B
I ¹²⁹ ⁹	2.26E-03	8.72E-10	3.14E-08	4.47E-08	PF	6	7.0E-08	B
Np ²³⁷ ⁹	4.52E-03	1.25E-11	1.84E-09	8.94E-08	PF	6	1.2E-12	B
Pu ²³⁸ ⁹	9.15E-03	2.46E-11	3.61E-09	1.76E-07	PF	6	2.1E-12	B
Pu ^{239/240}	8.59E-01	2.39E-09	3.49E-07	1.70E-05	PF	5	2.0E-12	B
Pu ²⁴¹ ⁹	4.52E-01	1.04E-09	1.52E-07	7.40E-06	PF	6	1.0E-10	B
RuRh ¹⁰⁶ ⁹	1.16E-07	3.13E-19	2.94E-15	1.43E-13	PF	5	3.0E-08	B
Se ⁷⁹ ⁹	4.52E-02	1.25E-10	1.84E-08	8.94E-07	PF	6	1.0E-06	B
Sr ^{89/90}	3.62E+03	4.19E-08	9.19E-04	4.48E-02	PF	5	9.0E-09	B
Tc ⁹⁹ ⁹	1.59E+00	4.41E-09	6.45E-07	3.14E-05	PF	6	2.0E-06	B
U ²³⁸ ⁹	6.71E+01	1.86E-09	2.73E-07	1.33E-05	PF	6	1.0E-10	B
water		1.83E+04	1.83E+04	1.83E+04	Stm Ta	1		

Tank Farm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-107				
Sample Date	1/19/76		Contents:	Sludge/SN				
Sample ID	RAT-B107-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	13.97							
Density, g/ml	1.64							
Temperature, °R	522							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	7.73E+01	1.30E-04	4.66E-03	6.10E-01	PF	5	9.06E+00	C1
Ba ⁹	4.80E-04	1.59E-10	5.71E-09	7.47E-07	PF	6	8.92E-02	C1
Bi ⁹	2.40E+01	5.20E-06	1.87E-04	2.45E-02	PF	6		
CO ₃	2.32E+01	1.75E-05	6.30E-04	8.24E-02	PF	5		
Cr ⁹	8.33E-01	1.61E-07	5.79E-06	3.41E-03	PF	6	2.35E-01	C1, D
F ⁹	2.08E+01	2.91E-06	1.05E-04	2.33E-01	PF	6	3.22E+00	C1
Fe	3.40E+01	2.75E-05	9.90E-04	1.29E-01	PF	5	2.18E+00	C1
Fe (CN) ₆ ⁹	6.40E-03	1.37E-09	4.92E-08	6.43E-06	PF	6	5.77E-01	C1 as CN, D ¹³
Mg	1.64E+01	3.09E-05	1.11E-03	1.46E-01	PF	5	1.02E+01	C1
Mn	1.64E+01	1.35E-05	4.86E-04	6.35E-02	PF	5	2.22E+00	C2, D
Na	2.93E+02	5.77E-04	2.08E-02	2.71E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	4.37E+00	3.31E-07	1.19E-05	2.02E-02	PF	5		
NO ₃	1.71E+02	9.62E-06	3.46E-04	5.89E-01	PF	5		
OH ⁹	1.60E+01	4.26E-05	1.53E-03	2.01E-01	PF	6	2.88E+00	C2 as NaOH
PO ₄	1.75E+02	1.00E-04	3.61E-03	4.72E-01	PF	5		
Pu	4.48E-03	8.31E-10	2.99E-08	3.91E-06	PF	5		
SiO ₃ ⁹	1.22E+00	7.24E-07	2.61E-05	3.41E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.18E+02	6.19E-06	2.23E-04	2.62E-01	PF	5		
ZrO ⁹	3.36E+00	1.42E-06	5.12E-05	6.69E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	1.60E+00	4.42E-09	4.85E-07	2.08E-05	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.60E-05	4.45E-14	4.88E-12	2.09E-10	PF	6	2.0E-11	B
C 14 ⁹	2.08E+01	5.77E-08	6.33E-06	2.72E-04	PF	6	6.0E-06	B

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Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	4.76E-05	2.64E-16	2.90E-14	1.24E-12	PF	6	7.0E-10	B
Cm 244 ⁹	6.49E-03	1.55E-11	1.70E-09	7.28E-08	PF	6	4.0E-11	B
Cs 137	5.24E+03	6.12E-07	1.01E-03	4.32E-02	PF	5	4.0E-07	B
CePr 144	2.46E+03	6.81E-13	7.48E-11	3.21E-09	PF	5	3.0E-08	B
Eu 154	2.78E+03	1.49E-06	1.85E-04	7.95E-03	PF	5	5.0E-08	B
Eu 155	2.13E+03	4.31E-07	4.73E-05	2.03E-03	PF	5	3.0E-07	B
I 129 ⁹	3.20E+02	1.24E-08	4.45E-07	4.19E-07	PF	6	7.0E-08	B
Np 237 ⁹	9.52E-02	2.64E-10	2.90E-08	1.24E-06	PF	6	1.2E-12	B
Pu 238 ⁹	1.43E-01	3.84E-10	4.22E-08	1.81E-06	PF	6	2.1E-12	B
Pu 239/240	2.76E+02	7.65E-07	8.40E-05	3.60E-03	PF	5	2.0E-12	B
Pu 241 ⁹	8.22E+00	1.89E-08	2.08E-06	8.90E-05	PF	6	1.0E-10	B
RuRh 106	3.78E+03	6.18E-13	4.35E-09	1.87E-07	PF	6	3.0E-08	B
Se 79 ⁹	6.49E-01	1.80E-09	1.98E-07	8.49E-06	PF	6	1.0E-06	B
Sr 89/90	2.12E+04	2.51E-07	4.13E-03	1.77E-01	PF	5	9.0E-09	B
Sb 125	8.70E+03	2.37E-07	2.60E-05	1.11E-03	PF	5	1.0E-06	B
Tc 99 ⁹	1.60E+01	4.45E-08	4.88E-06	2.09E-04	PF	6	2.0E-06	B
U 238 ⁹	3.20E+00	8.90E-09	9.76E-07	4.19E-05	PF	6	1.0E-10	B
water		1.63E+04	1.63E+04	1.63E+04	Stm Ta	1		

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Sample Type	TRAC		Tank:	241-B-108				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	2.1E-02		Retr. Method	Pumping/Sluicing				
pH	13.22							
Density, g/ml	1.95							
Temperature, °R	522							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	2.28E+01	4.51E-05	1.62E-03	1.11E-01	PF	6	9.06E+00	C1
Ba ⁹	5.90E-04	2.30E-10	8.30E-09	5.68E-07	PF	6	8.92E-02	C1
Bi ⁹	4.22E+00	1.08E-06	3.88E-05	2.66E-03	PF	6		
C ₆ H ₅ O ₇ anion ⁹	1.07E+01	1.80E-02	6.49E-01	4.44E+01	PF	6		
CO ₃ ⁹	1.18E+01	1.05E-05	3.79E-04	2.59E-02	PF	6		
Cr ⁹	1.46E-01	3.34E-08	1.20E-06	3.70E-04	PF	6	2.35E-01	C1, D
F ⁹	1.07E+02	1.77E-05	6.37E-04	7.40E-01	PF	6	3.22E+00	C1
Fe ⁹	3.65E+00	3.49E-06	1.26E-04	8.59E-03	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	3.09E-02	7.80E-09	2.81E-07	1.92E-05	PF	6	5.77E-01	C1 as CN, D ¹³
K ⁹	7.59E-02	1.04E-07	3.75E-06	2.56E-04	PF	6		
Mn ⁹	1.07E-02	1.04E-08	3.74E-07	2.56E-05	PF	6	2.22E+00	C2, D
Na ⁹	6.46E+02	1.50E-03	5.41E-02	3.70E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	3.93E+01	3.52E-06	1.27E-04	1.13E-01	PF	6		
NO ₃ ⁹	7.59E+02	5.03E-05	1.81E-03	1.61E+00	PF	6		
OH ⁹	2.81E+00	8.84E-06	3.18E-04	2.18E-02	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	2.67E+02	1.81E-04	6.51E-03	4.45E-01	PF	6		
SiO ₃ ⁹	1.49E+00	1.05E-06	3.77E-05	2.58E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	5.34E+00	3.30E-07	1.19E-05	7.33E-03	PF	6		
ZrO ⁹	5.90E-01	2.95E-07	1.06E-05	7.27E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	1.44E+01	3.98E-08	3.68E-06	9.81E-05	PF	6	2.0E-11	B ¹⁹

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 243 ⁹	1.98E-02	5.48E-11	5.06E-09	1.35E-07	PF	6	2.0E-11	B
C 14 ⁹	2.81E+01	7.80E-08	7.20E-06	1.92E-04	PF	6	6.0E-06	B
Cm 242 ⁹	2.51E-02	1.39E-13	1.28E-11	3.42E-10	PF	6	7.0E-10	B
Cm 244 ⁹	2.81E-01	6.70E-10	6.18E-08	1.65E-06	PF	6	4.0E-11	B
Cs 137 ⁹	8.36E+04	1.40E-05	1.93E-02	5.16E-01	PF	6	4.0E-07	B
I 129 ⁹	1.14E-01	4.40E-08	1.58E-06	7.79E-07	PF	6	7.0E-08	B
Np 237 ⁹	2.28E-01	6.33E-10	5.84E-08	1.56E-06	PF	6	1.2E-12	B
Pu 238 ⁹	5.93E-02	1.59E-10	1.47E-08	3.93E-07	PF	6	2.1E-12	B
Pu 239/240 ⁹	1.22E+01	3.38E-08	3.12E-06	8.31E-05	PF	6	2.0E-12	B
Pu 241 ⁹	1.44E+00	3.32E-09	3.06E-07	8.18E-06	PF	6	1.0E-10	B
RuRh 106 ⁹	1.04E+00	2.81E-12	1.66E-08	4.43E-07	PF	6	3.0E-08	B
Se 79 ⁹	1.98E+00	5.49E-09	5.06E-07	1.35E-05	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.44E+05	2.42E-06	3.35E-02	8.94E-01	PF	6	9.0E-09	B
Tc 99 ⁹	8.36E+01	2.32E-07	2.14E-05	5.72E-04	PF	6	2.0E-06	B
U 238 ⁹	2.28E+01	6.33E-08	5.84E-06	1.56E-04	PF	6	1.0E-10	B
water		1.63E+04	1.63E+04	1.63E+04	Stm Ta	1		

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Tan arm 241-B Vapor Estimates

Sample Type	SN		Tank:	241-B-109				
Sample Date	10/6/75		Contents:	Sludge				
Sample ID	T-8578		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	9.4E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.28							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.80E+01	3.05E-05	1.10E-03	1.77E-01	PF	5	9.06E+00	C1
Ba ⁹	4.99E-04	1.67E-10	6.01E-09	9.67E-07	PF	6	8.92E-02	C1
Bi ⁹	3.54E-01	7.75E-08	2.79E-06	4.49E-04	PF	6		
C ₆ H ₅ O ₇ anion ⁹	2.70E+00	7.94E-07	2.86E-05	4.60E-03	PF	6		
Cl	2.22E+00	1.82E-07	6.54E-06	1.68E-02	PF	5		
CO ₃	1.90E-02	1.45E-08	5.22E-07	8.40E-05	PF	5		
Cr ⁹	1.08E-02	2.12E-09	7.62E-08	5.52E-05	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	1.83E-04	2.87E-11	1.03E-09	1.66E-07	PF	6		
F	4.64E-03	6.58E-10	2.37E-08	6.48E-05	PF	5	3.22E+00	C1
Fe ⁹	3.54E-01	2.89E-07	1.04E-05	1.68E-03	PF	6	2.18E+00	C1
Fe (CN) ₆ ⁹	8.32E-03	1.80E-09	6.47E-08	1.04E-05	PF	6	5.77E-01	C1 as CN, D ¹³
K ⁹	1.62E-01	1.91E-07	6.86E-06	1.10E-03	PF	6		
Mn ⁹	2.29E-03	1.91E-09	6.86E-08	1.10E-05	PF	6	2.22E+00	C2, D
Na	1.10E+02	2.19E-04	7.89E-03	1.27E+00	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	1.23E-06	9.53E-13	3.43E-11	5.52E-09	PF	6	4.14E-02	C1, D
NO ₂	5.25E+01	4.02E-06	1.45E-04	3.03E-01	PF	5		
NO ₃	1.54E+02	8.75E-06	3.15E-04	6.59E-01	PF	5		
OH	2.19E+01	5.90E-05	2.12E-03	3.42E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.98E+00	1.15E-06	4.13E-05	6.65E-03	PF	5		
Pu	2.91E-06	5.46E-13	1.97E-11	3.16E-09	PF	5		
SiO ₃ ⁹	4.78E-01	2.88E-07	1.04E-05	1.67E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	1.60E+00	8.49E-08	3.06E-06	4.43E-03	PF	6		

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Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
ZrO ⁹	6.66E-02	2.85E-08	1.03E-06	1.65E-04	PF	6	1.14E+00	Cl as Zr
Am 241 ^{9,18}	4.22E+00	1.16E-08	1.64E-06	6.74E-05	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.16E-03	1.16E-11	1.62E-09	6.69E-08	PF	6	2.0E-11	B
C 14 ⁹	1.45E+01	4.06E-08	5.71E-06	2.35E-04	PF	6	6.0E-06	B
Cm 242 ⁹	6.18E-03	3.43E-14	4.82E-12	1.99E-10	PF	6	7.0E-10	B
Cm 244 ⁹	6.18E-02	1.47E-10	2.07E-08	8.53E-07	PF	6	4.0E-11	B
Cs 137	1.69E+05	1.92E-05	4.05E-02	1.67E+00	PF	5	4.0E-07	B
Cs 134	9.51E+02	4.89E-09	6.88E-07	2.83E-05	PF	5	4.0E-07	B
I 129 ⁹	2.08E+02	8.03E-09	2.89E-07	3.35E-07	PF	6	7.0E-08	B
Np 237 ⁹	6.18E-02	1.72E-10	2.42E-08	9.95E-07	PF	6	1.2E-12	B
Pu 238 ⁹	2.14E+02	5.75E-11	8.09E-09	3.33E-07	PF	6	2.1E-12	B
Pu 239/240	1.79E+01	4.96E-10	6.97E-08	2.87E-06	PF	5	2.0E-12	B
Pu 241 ⁹	1.07E+01	2.46E-10	3.46E-08	1.42E-06	PF	6	1.0E-10	B
RuRh 106 ⁹	8.43E-06	2.28E-17	2.05E-13	8.46E-12	PF	5	3.0E-08	B
Se 79 ⁹	6.18E-01	1.72E-09	2.42E-07	9.95E-06	PF	6	1.0E-06	B
Sr 89/90	5.76E-02	6.66E-13	1.40E-08	5.78E-07	PF	5	9.0E-09	B
Tc 99 ⁹	1.86E+01	5.15E-08	7.25E-06	2.98E-04	PF	6	2.0E-06	B
U 238 ⁹	4.16E+00	1.16E-08	1.63E-06	6.69E-05	PF	6	1.0E-10	B
water		1.73E+04	1.73E+04	1.73E+04	Stm Ta	1		

Tank Farm 241-B Vapor Estimates

Sample Type	TRAC	Tank:	241-B-110	Method	Data	Regulatory
Sample Date		Contents:	Sludge/SN			
Sample ID		Watchlist:	N/A			
Properties	Value	Status:	IS/II			
Visc., lbm/ft-s ¹	2.1E-02	Retr. Method	Pumping/Sluicing			
pH	N/A					
Density, g/ml	1.69					
Temperature, °R	529					
Analyte ²	Value ³	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Allowable ⁷	Citation
Al	8.7E+00	1.17E-03	7.70E-02	PF	9.06E+00	Cl
Ba ⁹	4.0E-03	1.05E-07	6.93E-06	PF	8.92E-02	Cl
C ₆ H ₅ O ₇ anion ⁹	1.0E+02	5.37E-02	3.54E+00	PF		
Ca ⁹	1.7E-02	1.56E-06	1.03E-04	PF	6.11E+00	Cl as CaCO ₃
Cr ⁹	1.7E+00	2.66E-05	7.90E-03	PF	2.35E-01	Cl, D
Fe ⁹	3.4E+01	2.22E-03	1.47E-01	PF	2.18E+00	Cl
Mn ⁹	5.9E-02	1.08E-07	2.57E-04	PF	2.22E+00	C2, D
Na	1.3E+02	5.64E-04	1.34E+00	PF	2.13E+00	C2 as NaOH
Ni ⁹	4.6E-01	7.88E-07	1.87E-03	PF	4.14E-02	Cl, D
NO ₃	3.3E+02	4.16E-05	1.50E-03	PF		
OH	1.8E+01	1.08E-04	3.89E-03	PF	2.88E+00	C2 as NaOH
Pb ⁹	1.1E-03	5.22E-10	1.88E-08	PF	5.91E-03	Cl, A, D
PO ₄	1.0E+03	1.30E-03	4.68E-02	PF		
Am 241 ^{9, 18}	1.1E+03	3.12E-06	3.33E-04	PF	2.0E-11	B ¹⁹
Am 243 ⁹	2.1E+00	5.96E-09	6.35E-07	PF	2.0E-11	B
C 14 ⁹	1.1E+02	2.98E-07	3.18E-05	PF	6.0E-06	B
Cm 242 ⁹	3.2E+00	1.77E-11	1.89E-09	PF	7.0E-10	B
Cm 244 ⁹	1.1E+01	2.56E-08	2.73E-06	PF	4.0E-11	B
Cs 137 ⁹	6.4E+04	1.07E-05	1.70E-02	PF	4.0E-07	B
I 129 ⁹	5.5E-01	2.13E-07	7.67E-06	PF	7.0E-08	B
Np 237 ⁹	3.2E-02	8.87E-11	9.45E-09	PF	1.2E-12	B

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 238 ⁹	1.1E+01	2.97E-08	3.16E-06	7.05E-05	PF	6	2.1E-12	B
Pu 239/240 ⁹	2.7E+02	7.50E-07	7.99E-05	1.78E-03	PF	6	2.0E-12	B
Pu 241 ⁹	7.5E+02	1.74E-06	1.85E+04	4.12E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	1.1E+00	1.45E-12	9.90E-09	2.21E-07	PF	6	3.0E-08	B
Se 79 ⁹	8.7E+00	2.42E-08	2.58E-06	5.74E-05	PF	6	1.0E-06	B
Sr 89/90 ⁹	7.0E+04	1.17E-06	1.87E-02	4.16E-01	PF	6	9.0E-09	B
Tc 99 ⁹	3.2E+02	8.87E-07	9.45E-05	2.11E-03	PF	6	2.0E-06	B
U 238 ⁹	8.1E+00	2.26E-08	2.40E-06	5.36E-05	PF	6	1.0E-10	B
water		2.36E+04	2.36E+04	2.36E+04	Stm Ta	1		

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Tank Farm 241-B Vapor Estimates

Sample Type	TRAC		Tank:	241-B-111				
Sample Date			Contents:	Sludge (Talc-Like Substance)				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.96							
Density, g/ml	1.4							
Temperature, °R	522							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	6.0E+00	1.90E-05	6.85E-04	2.78E-01	PF	6	9.06E+00	C1
Ba ⁹	1.4E-03	9.03E-10	3.25E-08	1.32E-05	PF	6	8.92E-02	C1
Bi ⁹	9.4E+01	3.82E-05	1.38E-03	5.59E-01	PF	6		
CO ₃ ⁹	1.4E+02	2.06E-04	7.42E-03	3.01E+00	PF	6		
Cr ⁹	4.7E-01	1.71E-07	6.14E-06	1.12E-02	PF	6	2.35E-01	C1, D
F ⁹	2.1E-03	5.60E-10	2.01E-08	1.39E-04	PF	6	3.22E+00	C1
Fe ⁹	6.2E+00	9.52E-06	3.43E-04	1.39E-01	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	1.2E-02	4.94E-09	1.78E-07	7.22E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	9.3E-02	2.70E-08	9.71E-07	3.94E-04	PF	6		
K ⁹	1.3E+00	2.93E-06	1.05E-04	4.28E-02	PF	6		
Mn ⁹	6.1E-03	9.52E-09	3.43E-07	1.39E-04	PF	6	2.22E+00	C2, D
Na ⁹	4.1E+02	1.53E-03	5.51E-02	2.24E+01	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	4.1E+01	5.89E-06	2.12E-04	1.12E+00	PF	6		
NO ₃ ⁹	1.6E+02	1.65E-05	5.95E-04	3.14E+00	PF	6		
OH ⁹	1.6E+01	7.84E-05	2.82E-03	1.15E+00	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	4.2E+02	4.58E-04	1.65E-02	6.69E+00	PF	6		
SiO ₃ ⁹	8.5E-01	9.52E-07	3.43E-05	1.39E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	8.1E+01	8.03E-06	2.89E-04	1.06E+00	PF	6		
Am 241 ^{9,18}	4.5E+00	1.25E-08	1.60E-06	1.82E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	5.7E-05	1.59E-13	2.04E-11	2.32E-09	PF	6	2.0E-11	B

Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C ¹⁴ ⁹	2.4E+03	6.52E+06	8.39E-04	9.54E+02	PF	6	6.0E-06	B
Cr 242 ⁹	2.3E-04	1.25E-15	1.61E-13	1.83E-11	PF	6	7.0E-10	B
Cr 244 ⁹	1.1E+00	2.66E+09	3.42E-07	3.88E-05	PF	6	4.0E-11	B
Cr 137 ⁹	6.6E+05	1.11E-04	2.14E-01	2.43E+01	PF	6	4.0E-07	B
T 129 ⁹	5.7E+00	2.21E-06	7.96E-05	2.32E-04	PF	6	7.0E-08	B
NP 237 ⁹	1.1E+01	3.10E-08	3.99E-06	4.53E-04	PF	6	1.2E-12	B
Pu 238 ⁹	2.2E-01	6.00E-10	7.71E-08	8.77E-06	PF	6	2.1E-12	B
Pu 239/240 ⁹	3.9E+01	1.09E-07	1.40E-05	1.59E-03	PF	6	2.0E-12	B
Pu 241 ⁹	3.3E+01	7.62E-08	9.80E-06	1.11E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	1.3E-04	3.58E-16	2.95E-12	3.36E-10	PF	6	3.0E-08	B
Se 79 ⁹	9.9E+01	2.76E-07	3.55E-05	4.04E-03	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.1E-04	1.87E-15	3.61E-11	4.10E-09	PF	6	9.0E-09	B
Tc 99 ⁹	3.3E+03	9.21E-06	1.18E-03	1.35E-01	PF	6	2.0E-06	B
U 238 ⁹	4.5E+01	1.26E-09	4.61E-07	1.84E-05	PF	6	1.0E-10	B
water		1.63E+04	1.63E+04	1.63E+04	Stm Ta	1		

Tank Farm 241-B Vapor Estimates

Sample Type	TRAC		Tank:	241-B-112				
Sample Date			Contents:	Sludge/SN				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	6.2E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.8							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	8.8E+01	2.57E-04	9.24E-03	2.35E+00	PF	6	9.06E+00	C1
Ba ⁹	1.7E-02	9.65E-09	3.48E-07	8.85E-05	PF	6	8.92E-02	C1
Bi ⁹	1.3E+02	5.06E-05	1.82E-03	4.64E-01	PF	6		
C ₆ H ₅ O ₇ anion ⁹	3.0E+01	8.41E-04	3.03E-02	7.71E+00	PF	6		
Ca ⁹	3.2E-02	6.30E-08	2.27E-06	5.77E-04	PF	6	6.11E+00	C1 as CaCO ₃
Ce ⁹	5.6E-02	3.15E-08	1.13E-06	2.89E-04	PF	6		
CO ₃ ⁹	2.5E+01	3.25E-05	1.17E-03	2.98E-01	PF	6		
Cr ⁹	3.4E-01	1.13E-07	4.07E-06	4.66E-03	PF	6	2.35E-01	C1, D
F ⁹	1.0E+01	2.53E-06	9.12E-05	3.95E-01	PF	6	3.22E+00	C1
Fe ⁹	1.8E+01	2.47E-05	8.91E-04	2.27E-01	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	9.6E-01	3.56E-07	1.28E-05	3.27E-03	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	2.0E-02	5.37E-09	1.93E-07	4.92E-05	PF	6		
K ⁹	1.6E+00	3.23E-06	1.16E-04	2.96E-02	PF	6		
Mn ⁹	2.2E-01	3.09E-07	1.11E-05	2.83E-03	PF	6	2.22E+00	C2, D
Na ⁹	1.9E+02	6.57E-04	2.37E-02	6.02E+00	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	3.3E-01	4.38E-07	1.58E-05	4.01E-03	PF	6	4.14E-02	C1, D
NO ₂ ⁹	1.5E+02	1.94E-05	6.97E-04	2.31E+00	PF	6		
NO ₃ ⁹	6.9E+02	6.72E-05	2.42E-03	8.01E+00	PF	6		
OH ⁹	2.7E+01	1.26E-04	4.53E-03	1.15E+00	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	3.0E+02	3.03E-04	1.09E-02	2.78E+00	PF	6		

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Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SiO ₃ ⁹	3.0E+01	3.15E-05	1.13E-03	2.89E-01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	7.7E+01	6.99E-06	2.52E-04	5.77E-01	PF	6		
Sr	2.8E-02	2.50E-08	9.02E-07	2.30E-04	PF	6		
ZrO ⁹	5.1E-03	3.77E-09	1.36E-07	3.45E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	3.25E+02	8.96E-07	8.96E-05	8.21E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.11E-01	1.14E-09	1.14E-07	1.05E-05	PF	6	2.0E-11	B
C 14 ⁹	6.49E+02	1.80E-06	1.80E-04	1.65E-02	PF	6	6.0E-06	B
Cm 242 ⁹	5.63E-01	3.12E-12	3.12E-10	2.86E-08	PF	6	7.0E-10	B
Cm 244 ⁹	5.63E+00	1.34E-08	1.34E-06	1.23E-04	PF	6	4.0E-11	B
Cs 137 ⁹	1.60E+06	2.68E-04	4.01E-01	3.68E+01	PF	6	4.0E-07	B
I 129 ⁹	2.38E+00	9.19E-07	3.31E-05	6.06E-05	PF	6	7.0E-08	B
Np 237 ⁹	4.76E+00	1.32E-08	1.32E-06	1.21E-04	PF	6	1.2E-12	B
Pu 238 ⁹	8.01E+00	2.15E-08	2.15E-06	1.97E-04	PF	6	2.1E-12	B
Pu 239/240 ⁹	3.68E+01	1.02E-07	1.02E-05	9.36E-04	PF	6	2.0E-12	B
Pu 241 ⁹	2.38E+01	5.48E-08	5.48E-06	5.02E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	8.01E-04	2.16E-15	1.39E-11	1.27E-09	PF	6	3.0E-08	B
Se 79 ⁹	4.76E+01	1.32E-07	1.32E-05	1.21E-03	PF	6	1.0E-06	B
Sr 89/90 ⁹	8.01E+05	1.34E-05	2.01E-01	1.85E+01	PF	6	9.0E-09	B
Ta 99 ⁹	1.60E+03	4.45E-06	4.45E-04	4.08E-02	PF	6	2.0E-06	B
U 238 ⁹	4.76E+00	1.32E-08	1.32E-06	1.21E-04	PF	6	1.0E-10	B
water		1.73E+04	1.73E+04	1.73E+04	Stm Ta	1		

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Tan Arm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-201				
Sample Date	12/4/78		Contents:	Sludge/SN				
Sample ID	1898		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.5E-03		Retr. Method	Pumping/Sluicing				
pH	13.97							
Density, g/ml	1.37							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.44E+01	2.22E-05	8.01E-04	1.47E-01	PF	5	9.06E+00	C1
Bi	5.21E+01	1.04E-05	3.74E-04	6.88E-02	PF	5		
Cl	1.37E-01	1.02E-08	3.67E-07	1.08E-03	PF	5		
CO ₃	4.52E+01	3.14E-05	1.13E-03	2.08E-01	PF	5		
CrO ₄	6.85E-01	2.46E-07	8.86E-06	1.63E-03	PF	5	2.11E-02	C2
Fe	2.47E+01	1.84E-05	6.62E-04	1.22E-01	PF	5	2.18E+00	C1
Hg	6.85E-01	1.42E-07	5.12E-06	9.40E-04	PF	5	6.08E-03	B, C1, C2
K	4.11E+00	4.39E-06	1.58E-04	2.91E-02	PF	5		
La	1.78E+01	5.34E-06	1.92E-04	3.53E-02	PF	5		
Mn	4.11E-02	3.12E-08	1.12E-06	2.06E-04	PF	5	2.22E+00	C2, D
Na	3.84E+01	6.96E-05	2.51E-03	4.61E-01	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	1.37E+00	9.68E-07	3.49E-05	6.41E-03	PF	5	4.14E-02	C1, D
NO ₂	5.48E-02	3.82E-09	1.38E-07	3.29E-04	PF	5		
NO ₃	4.52E+01	2.34E-06	8.42E-05	2.01E-01	PF	5		
OH	1.58E+01	3.88E-05	1.40E-03	2.56E-01	PF	5	2.88E+00	C2 as NaOH
Pu	6.85E-02	1.17E-08	4.21E-07	7.74E-05	PF	5		
SiO ₂	4.79E+00	2.63E-06	9.46E-05	1.74E-02	PF	5	1.93E+00	C1 (Amorphous)
SO ₄	8.22E+00	3.96E-07	1.43E-05	2.36E-02	PF	5		
U, g/l	2.45E-02	4.29E-09	1.55E-07	2.84E-05	PF	5	5.14E-03	C1
Cs 137	1.5E+02	1.84E-08	3.62E-05	1.82E-03	PF	5	4.0E-07	B
CePr 144	2.2E+01	3.64E-14	4.78E-12	2.41E-10	PF	5	3.0E-08	B
Eu 154	3.8E+01	2.44E-08	3.62E-06	1.82E-04	PF	5	5.0E-08	B
Eu 155	3.8E+01	1.04E-08	1.36E-06	6.86E-05	PF	5	3.0E-07	B
Pu 239/240	4.2E+03	1.17E-05	1.54E-03	7.74E-02	PF	5	2.0E-12	B
Sr 89/90	3.7E+03	4.61E-08	9.09E-04	4.58E-02	PF	5	9.0E-09	B
U 238 ⁹	1.7E-02	4.80E-11	6.30E-09	3.17E-07	PF	5	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Ta	1		

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Tank Farm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-202		
Sample Date	12/31/91		Contents:	Sludge		
Sample ID	Comp.		Watchlist:	N/A		
Properties	Value		Status:	IS/II		
Visc., lbm/ft-s ¹	5.5E-03		Retr. Method	Pumping/sluicing		
pH	13.91					
Density, g/ml	1.75					
Temperature, °R	525					
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method Data Rel ⁶	Allowable ⁷ Regulatory Citation
Al ⁹	5.3E-01	6.14E-07	2.21E-05	3.28E-03	PF	6 9.06E+00 Cl
As	1.03E-03	4.31E-10	1.55E-08	2.30E-06	PF	5 6.52E-02 Cl
Ba ⁹	2.9E-04	6.72E-11	2.42E-09	3.59E-07	PF	6 8.92E-02 Cl
Bi ⁹	1.5E-01	2.20E-08	7.93E-07	1.18E-04	PF	6
C ₆ H ₅ O ₇ anion ⁹	5.6E+00	1.02E-06	3.66E-05	5.44E-03	PF	6
Ca ⁹	1.2E-03	9.21E-10	3.32E-08	4.92E-06	PF	6 6.11E+00 Cl as CaCO ₃
Cl	2.36E+00	1.32E-07	4.76E-06	1.13E-02	PF	5
CN	8.75E-03	1.06E-08	3.80E-07	5.64E-05	PF	5 4.70E+00 Cl, D
Cr	9.68E-01	1.30E-07	4.67E-06	3.12E-03	PF	5 2.35E-01
Decane	2.98E-02	1.14E+02	1.14E+02	1.14E+02	CVD	3
Dodecane	1.85E+00	9.20E+00	9.20E+00	9.20E+00	CVD	3
F	1.14E+01	1.11E-06	3.99E-05	1.01E-01	PF	5 3.22E+00 Cl
Fe ⁹	4.0E-01	2.25E-07	8.09E-06	1.20E-03	PF	6 2.18E+00 Cl
Hexadecanoic aci	2.10E-02	2.57E-09	9.25E-08	1.37E-05	PF	5
Hg	1.29E-03	2.01E-10	7.25E-09	1.08E-06	PF	5 6.08E-03 B, Cl, C2
K ⁹	1.6E+01	1.26E-05	4.53E-04	6.73E-02	PF	6
La	1.88E+01	4.24E-06	1.53E-04	2.27E-02	PF	5
Mn ⁹	4.3E-02	2.46E-08	8.84E-07	1.31E-04	PF	6 2.22E+00 C2, D
Na ⁹	7.2E+01	9.88E-05	3.56E-03	5.28E-01	PF	6 2.13E+00 C2 as NaOH
NH ₃ ^{9, 14}	7.88E+00	2.36E+04	2.36E+04	2.36E+04	VLE	3 2.50E+01 Cl
Ni ⁹	2.8E-07	1.48E-13	5.32E-12	7.89E-10	PF	6 4.14E-02 Cl, D
NO ₂	3.75E+00	1.97E-07	7.08E-06	1.37E-02	PF	5

Tan Arm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₃	1.25E+02	4.86E-06	1.75E-04	3.38E-01	PF	5		
OH ⁹	1.37E+01	2.53E-05	9.10E-04	1.35E-01	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	6.1E-05	9.20E-12	3.31E-10	4.91E-08	PF	6	5.91E-03	C1, A, D
Pentadecane	1.35E-01	1.67E-01	1.67E-01	1.67E-01	CVD	3		
PO ₄	4.34E+00	1.72E-06	6.21E-05	9.21E-03	PF	5		
Se	1.41E-03	5.60E-10	2.02E-08	2.99E-06	PF	5	6.19E-02	C1, D
SO ₄	3.71E+00	1.35E-07	4.85E-06	6.48E-03	PF	5		
TOC gC/l ^{9,17}	5.5E-04	1.45E-09	5.20E-08	7.72E-06	PF	6		
Tetradecane	3.33E+00	6.51E-01	6.51E-01	6.51E-01	CVD	3		
Tridecane	4.73E+00	3.08E+00	3.08E+00	3.08E+00	CVD	3		
Undecane	4.03E-02	3.23E-01	3.23E-01	3.23E-01	CVD	3	2.00E-01	C1
U, g/l	9.14E-01	1.21E-07	4.34E-06	6.44E-04	PF	5	5.14E-03	C1
Am 241 ¹⁸	1.3E+02	3.55E-07	4.65E-05	1.90E-03	PF	5	2.0E-11	B ¹⁹
Cs 137	4.6E+00	7.88E-10	1.22E-06	6.31E-05	PF	5	4.0E-07	B
Co 60	6.7E-01	1.26E-09	1.30E-07	6.73E-06	PF	5	8.0E-08	B
Eu 154	4.5E+00	8.55E-09	9.95E-07	5.17E-05	PF	5	5.0E-08	B
Eu 155	4.5E+00	8.05E-09	8.28E-07	4.30E-05	PF	5	3.0E-07	B
I 129	4.2E+00	1.64E-06	5.90E-05	6.30E-05	PF	5	7.0E-08	B
Np 237	8.7E+02	2.41E-06	2.48E-04	1.29E-02	PF	5	1.2E-12	B
Pu 238	3.7E+00	9.97E-09	1.03E-06	5.33E-05	PF	5	2.1E-12	B
Pu 239/240	2.8E+02	7.81E-07	8.03E-05	4.17E-03	PF	5	2.0E-12	B
Pu 241 ⁹	5.02E+03	1.16E-05	1.19E-03	6.18E-02	PF	6	1.0E-10	B
Se 79	4.6E-01	1.28E-09	1.31E-07	6.82E-06	PF	5	1.0E-06	B
Sr 89/90	6.8E+03	1.18E-07	1.81E-03	9.42E-02	PF	5	9.0E-09	B
Tc 99	1.1E+01	3.12E-08	3.20E-06	1.66E-04	PF	5	2.0E-06	B
U 238	2.6E-01	7.27E-10	7.47E-08	3.88E-06	PF	5	1.0E-10	B
water		1.93E+04	1.93E+04	1.93E+04	Stm Ta	1		

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Tank Farm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-203				
Sample Date	1/7/83		Contents:	Sludge/SN				
Sample ID	RAT-B203-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	7.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.69							
Density, g/ml	1.75							
Temperature, °R	525							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	6.09E+01	1.02E-04	3.68E-03	8.08E-01	PF	5	9.06E+00	C1
Ba	5.11E+01	1.69E-05	6.09E-04	1.34E-01	PF	5	8.92E-02	C1
Bi	5.78E+01	1.25E-05	4.51E-04	9.91E-02	PF	5		
Ca	1.04E+02	1.17E-04	4.23E-03	9.28E-01	PF	5	6.11E+00	C1 as CaCO ₃
Cd	6.48E+00	2.62E-06	9.44E-05	2.07E-02	PF	5	5.46E-04	C1, C2, D
Cr ⁹	1.09E-01	2.11E-08	7.58E-07	7.50E-04	PF	6	2.35E-01	C1, D
F ⁹	4.9E+00	6.91E-07	2.49E-05	9.28E-02	PF	6	3.22E+00	C1
Fe	7.19E+01	5.82E-05	2.10E-03	4.60E-01	PF	5	2.18E+00	C1
Hg	4.81E+01	1.09E-05	3.91E-04	8.57E-02	PF	5	6.08E-03	B, C1, C2
K	7.21E+01	8.38E-05	3.02E-03	6.62E-01	PF	5		
La ⁹	2.2E-01	7.10E-08	2.56E-06	5.61E-04	PF	6		
Mg	6.93E+01	1.31E-04	4.71E-03	1.03E+00	PF	5	1.02E+01	C1
Mn	1.91E+01	1.57E-05	5.67E-04	1.24E-01	PF	5	2.22E+00	C2, D
Na	4.62E+02	9.11E-04	1.28E-02	7.20E+00	PF	5	2.13E+00	C2 as NaOH
Ni	5.25E-01	4.04E-07	1.45E-05	3.19E-03	PF	5	4.14E-02	C1, D
NO ₂	1.17E+01	8.87E-07	3.19E-05	9.11E-02	PF	5		
NO ₃	2.56E+02	1.44E-05	5.18E-04	1.48E+00	PF	5		
OH ⁹	8.3E+00	2.21E-05	7.96E-04	1.75E-01	PF	6	2.88E+00	C2 as NaOH
P	1.80E+01	2.63E-05	9.48E-04	2.08E-01	PF	5		
Pb	2.28E+00	4.99E-07	1.80E-05	3.95E-03	PF	5	5.91E-03	C1, A, D
PO ₄ ⁹	2.4E+00	1.40E-06	5.03E-05	1.10E-02	PF	6		
Pu	2.05E-03	3.81E-10	1.37E-08	3.01E-06	PF	5		
SO ₄ ⁹	3.5E-01	1.82E-08	6.55E-07	1.30E-03	PF	6		
Sr	1.75E+00	9.02E-07	3.25E-05	7.12E-03	PF	5		

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Tana Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
U, g/l	6.30E-01	1.20E-07	4.32E-06	9.48E-04	PF	5	5.14E-03	C1
Zn	6.07E-01	4.23E-07	1.52E-05	3.35E-03	PF	5		
Zr	1.05E+00	5.23E-07	1.88E-05	4.13E-03	PF	5	1.34E+00	C1, C3
Am 241 ^{9,18}	5.2E-01	1.43E-09	1.47E-07	1.13E-05	PF	6	2.0E-11	B ¹⁹
Cs 137	5.2E+01	7.32E-09	1.13E-05	8.67E-04	PF	5	4.0E-07	B
Np 237 ⁹	4.6E-06	1.28E-14	1.32E-12	1.01E-10	PF	6	1.2E-12	B
Pu 238 ⁹	2.7E+02	7.16E-11	7.36E-09	5.66E-07	PF	6	2.1E-12	B
Pu 239/240	1.3E+02	3.49E-07	3.59E-05	2.76E-03	PF	5	2.0E-12	B
Pu 241 ⁹	4.2E+00	9.66E-09	9.94E-07	7.63E-05	PF	6	1.0E-10	B
Sr 89/90	2.3E+04	3.23E-07	4.99E-03	3.83E-01	PF	5	9.0E-09	B
U 238	4.4E-01	1.23E-09	1.27E-07	9.73E-06	PF	5	1.0E-10	B
water		1.93E+04	1.93E+04	1.93E+04	Stm Ta	1		

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Tank Farm 241-B Vapor Estimates

Sample Type	Sludge		Tank:	241-B-204				
Sample Date	12/4/78		Contents:	Sludge/SN				
Sample ID	1974		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	2.8E-03		Retr. Method	Pumping/Sluicing				
pH	12.83							
Density, g/ml	1.14							
Temperature, °R	527							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.00E-01	1.87E-07	6.73E-06	4.02E-03	PF	5	9.06E+00	C1
Al(OH) ₄	7.07E+01	3.76E-05	1.35E-03	8.07E-01	PF	5		
Cl	7.98E-01	7.19E-08	2.59E-06	2.47E-02	PF	5		
CO ₃	3.42E+00	2.88E-06	1.04E-04	6.18E-02	PF	5		
Cr ⁹	1.1E+00	2.39E-07	8.61E-06	2.31E-02	PF	6	2.35E-01	C1, D
CrO ₄	9.12E-01	3.97E-07	1.43E-05	8.53E-03	PF	5	2.11E-02	C2
F	2.28E+00	3.56E-07	1.28E-05	1.30E-01	PF	5	3.22E+00	C1
Fe	3.31E+01	2.98E-05	1.07E-03	6.41E-01	PF	5	2.18E+00	C1
Hg	1.14E-02	2.86E-09	1.03E-07	6.15E-05	PF	5	6.08E-03	B, C1, C2
K	4.56E+00	5.90E-06	2.12E-04	1.27E-01	PF	5		
La	2.29E+01	8.32E-06	2.99E-04	1.79E-01	PF	5		
Mn	1.14E-03	1.05E-09	3.77E-08	2.25E-05	PF	5	2.22E+00	C2, D
Na	1.60E+01	3.51E-05	1.26E-03	7.55E-01	PF	5	2.13E+00	C2 as NaOH
Ni	3.42E-01	2.93E-07	1.05E-05	6.29E-03	PF	5	4.14E-02	C1, D
NO ₂	3.42E+00	2.89E-07	1.04E-05	8.06E-02	PF	5		
NO ₃	3.19E+01	2.00E-06	7.19E-05	5.58E-01	PF	5		
OH	1.14E+00	3.38E-06	1.22E-04	7.27E-02	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.48E+01	9.46E-06	3.40E-04	2.03E-01	PF	5		
Pu	1.11E-02	2.30E-09	8.27E-08	4.93E-05	PF	5		
SiO ₂	3.47E+00	2.30E-06	8.30E-05	4.95E-02	PF	5	1.93E+00	C1 (Amorphous)
SO ₄	1.14E+00	6.65E-08	2.40E-06	1.29E-02	PF	5		
TOC gC/l ¹⁷	1.15E+00	4.84E-06	1.74E-04	1.04E-01	PF	5		
U, g/l	1.11E-02	2.35E-09	8.48E-08	5.06E-05	PF	5	5.14E-03	C1
Am 241 ^{9, 18}	5.3E+00	1.46E-08	2.30E-06	3.13E-04	PF	6	2.0E-11	B ¹⁹

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Tank Farm 241-B Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cs 137	1.4E+01	1.68E-09	3.98E-06	5.41E-04	PF	5	4.0E-07	B
Np 237 ⁹	4.7E-06	1.31E-14	2.07E-12	2.81E-10	PF	6	1.2E-12	B
Pu 238 ⁹	2.7E-01	7.30E-10	1.15E-07	1.57E-05	PF	6	2.1E-12	B
Pu 239/240	6.8E+02	1.88E-06	2.96E-04	4.03E-02	PF	5	2.0E-12	B
Pu 241 ⁹	4.3E+01	9.86E-08	1.56E-05	2.12E-03	PF	6	1.0E-10	B
Sr 89/90	4.6E+03	5.69E-08	1.35E-03	1.83E-01	PF	5	9.0E-09	B
U 238	7.8E-03	2.15E-11	3.40E-09	4.63E-07	PF	5	1.0E-10	B
water		2.14E+04	2.14E+04	2.14E+04	Stm Ta	1		

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Note: 1. No viscosity data available; therefore, viscosity estimated assuming 40 vol. % solids. Viscosity for tank B-202 reported from WHC-SD-WM-DP-034 ADDENDUM 5 REV 0-A.

Note: 1A. No density available for tanks B-108, 110, 111, and 112; therefore, adjusted to obtain minimal water.

Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.

Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. For tanks B-105, 106, 107, 108, 109, 110, 111, 112, 201, 202, 203, and 204 Al, Fe, Na, carbonate, nitrite, nitrate, phosphate, and sulfate estimated from alumina, FeOOH, sodium carbonate, nitrite, nitrate, phosphate, and sulfate.

Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.

Note: 5. Estimated future vapor composition based on stated retrieval model.

Note: 6. TRAC data deemed 6. Lab data for tanks B-102, 103, 106, and 109 deemed 5 due to post sampling activities. Lab data for tanks B-101, 107, 201, 202, 203, and 204 deemed 5 due to samples taken from sludge. Lab data for tank B-105 deemed 5 due to non-RN's taken from sludge and RN's taken from saltcake. Moles of water in tank B-101 < 0, artificially reduced nitrate by order of magnitude. In tank B-111 Bi and nitrate reduced by an order of magnitude and Na by half to obtain reasonable values. In tank B-112 Bi, nitrate, nitrite, and Na reduced by a factor of 5 to obtain reasonable values. TRAC data in serious error for this tank. Data for tanks B-201 and 202 is incomplete or in error as computed moles of water at given density exceeds amount possible.

Note: 7. Allowable concentration, in ppm by volume.

Note: 8. Henry's constants for ammonia not corrected for salt.

Note: 9. TRAC data used to estimate concentration.

Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).

Note: 13. As cyanide compounds.

Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.

Note: 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile.

Note: 18. Radionuclides decayed to current year (i.e., 1994 -1987 = 7).

Note: 19. Allowable data based on DCG's in microcurie/l.

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Tank Farm 241-BX Vapor Estimates

Sample Type	Sludge		Tank:	241-BX-101				
Sample Date	1/26/76		Contents:	Sludge/SN				
Sample ID	RAT-BX101-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	5.4E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.68							
Temperature, °R	527							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.70E+02	3.87E-04	7.28E-02	3.26E-01	PF	5	9.06E+00	C1
Ba	1.37E+00	3.87E-07	7.28E-05	3.26E-04	PF	5	8.92E-02	C1
Ca	4.01E+00	3.88E-06	7.29E-04	3.27E-03	PF	5	6.11E+00	C1 as CaCO ₃
CO ₃ ⁹	3.69E+01	2.38E-05	4.47E-03	2.00E-02	PF	6		
Cr ⁹	9.83E-05	1.62E-11	1.38E-08	6.17E-08	PF	6	2.35E-01	C1, D
Fe	2.23E+01	1.54E-05	2.90E-03	1.30E-02	PF	5	2.18E+00	C1
Fe(CN) ₆ ⁹	1.66E-02	3.03E-09	5.69E-07	2.55E-06	PF	6	5.77E-01	C1 as CN, D ¹³
Mg	1.94E+00	3.13E-06	5.88E-04	2.64E-03	PF	5	1.02E+01	C1
Mn	1.10E+01	7.74E-06	1.46E-03	6.52E-03	PF	5	2.22E+00	C2, D
Na ⁹	2.83E+01	4.75E-05	8.94E-03	4.01E-02	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	3.63E+00	2.38E-06	4.47E-04	2.00E-03	PF	6	4.14E-02	C1, D
NO ₃	2.48E+02	1.19E-05	2.91E-02	1.30E-01	PF			
OH ⁹	4.18E+02	9.51E-04	1.79E-01	8.02E-01	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	1.17E+01	2.18E-06	4.10E-04	1.84E-03	PF	6	5.91E-03	C1, A, D
PO ₄	9.50E+00	4.65E-06	8.75E-04	3.92E-03	PF	5		
Pu	1.45E-03	2.30E-10	4.32E-08	1.94E-07	PF	5		
Si	4.49E+01	6.20E-05	1.17E-02	5.23E-02	PF	5	8.73E+00	C1
SO ₄ ⁹	1.17E+00	5.22E-08	8.85E-05	3.97E-04	PF	6		
ZrO ⁹	1.97E-03	7.11E-10	1.34E-07	5.99E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	6.14E+02	1.70E-06	1.82E-04	1.43E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	6.14E-04	1.71E-12	1.83E-10	1.44E-09	PF	6	2.0E-11	B
C-14 ⁹	1.23E+02	3.41E-07	3.66E-05	2.88E-04	PF	6	6.0E-06	B

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Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	1.83E-04	1.01E-15	1.09E-13	8.54E-13	PF	6	7.0E-10	B
Cm 244 ⁹	1.83E-18	4.35E-27	4.66E-25	3.67E-24	PF	6	4.0E-11	B
Cs 137 ⁹	1.20E+06	1.40E-04	2.25E-01	1.77E+00	PF	5	4.0E-07	B
I 129 ⁹	6.14E-19	2.37E-25	8.54E-24	1.44E-24	PF	6	7.0E-08	B
Np 237 ⁹	3.65E-03	1.01E-11	1.09E-09	8.56E-09	PF	6	1.2E-12	B
Pu 238 ⁹	6.14E+01	1.65E-07	1.77E-05	1.39E-04	PF	6	2.1E-12	B
Pu 239/240	8.89E+01	2.47E-07	2.65E-05	2.08E-04	PF	5	2.0E-12	B
Pu 241 ⁹	1.83E+04	4.20E-05	4.50E-03	3.54E-02	PF	6	1.0E-10	B
RuRh 106	1.23E-03	5.32E-14	3.66E-10	2.88E-09	PF	6	3.0E-08	B
Se 79 ⁹	1.23E-01	3.41E-10	3.66E-08	2.88E-07	PF	6	1.0E-06	B
Sr 89/90	1.80E+06	2.13E-05	3.43E-01	2.70E+00	PF	5	9.0E-09	B
Tc 99 ⁹	3.65E-16	1.01E-24	1.09E-22	8.56E-22	PF	6	2.0E-06	B
U 238 ⁹	1.83E+01	5.07E-08	5.44E-06	4.28E-05	PF	6	1.0E-10	B
water		2.14E+04	2.14E+04	2.14E+04	Stm Tab	1		

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Ta Farm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-102				
Sample Date	9/30/74		Contents:	Sludge				
Sample ID	n/a		Watchlist:	FECN				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.47							
Temperature, °R	528							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	5.40E+01	1.73E-04	1.66E-02	7.26E-01	PF	5	9.06E+00	C1
Ba ⁹	1.35E-03	8.51E-10	8.19E-08	3.57E-06	PF	6	8.92E-02	C1
C ₆ H ₅ O ₇ anion ⁹	2.61E+02	1.25E-03	4.48E-02	5.23E+00	PF	6		
Ca ⁹	4.40E-02	9.51E-08	9.15E-06	4.00E-04	PF	6	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.16E-02	7.14E-09	6.87E-07	3.00E-05	PF	6		
CO ₃	1.64E+01	2.36E-05	2.27E-03	9.92E-02	PF	5		
Cr ⁹	2.75E-06	1.02E-12	4.40E-10	1.92E-08	PF	6	2.35E-01	C1, D
F	1.74E-01	4.65E-08	7.62E-05	3.33E-03	PF	4	3.22E+00	C1
Fe ⁹	1.54E+01	2.38E-05	2.29E-03	9.99E-02	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	1.27E+00	5.16E-07	4.97E-05	2.17E-03	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	4.68E-02	1.38E-08	1.33E-06	5.80E-05	PF	6		
K ⁹	1.07E+00	7.00E+00	2.29E-04	9.99E-03	PF	6		
Mn ⁹	3.03E-01	4.76E-07	4.58E-05	2.00E-03	PF	6	2.22E+00	C2, D
Na	2.62E+02	9.84E-04	9.47E-02	4.14E+00	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	2.59E+00	3.79E-06	3.65E-04	1.59E-02	PF	6	4.14E-02	C1, D
NO ₂	9.98E+01	1.44E-05	1.80E-02	7.88E-01	PF	4		
NO ₃	1.81E+02	1.94E-05	2.43E-02	1.06E+00	PF	4		
OH	4.22E+01	2.15E-04	2.06E-02	9.01E-01	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	5.78E+00	2.41E-06	2.32E-04	1.01E-02	PF	6	5.91E-03	C1, A, D
PO ₄	2.52E+00	2.76E-06	2.65E-04	1.16E-02	PF	5		
Pu	1.64E-06	5.81E-13	5.59E-11	2.44E-09	PF	5		

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Tank Farm 241-BX Vapor Estimates

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SiO ₃ ⁹	4.13E+02	4.69E+04	4.52E+02	1.97E+00	PF	6	1.93E+00	Cl (Amorphous)
SO ₄ ⁹	5.50E+01	5.50E+06	4.77E+03	2.08E+01	PF	6		
Sr ⁹	7.43E+02	7.30E+08	7.02E+06	3.07E+04	PF	6		
ZrO ⁹	2.61E+03	2.11E+09	2.03E+07	8.87E+06	PF	6	1.14E+00	Cl as Zr
Am 241 ^{9,18}	1.93E+03	5.34E+06	6.54E+04	2.24E+02	PF	6	2.0E+11	B ¹⁹
Am 243 ⁹	1.64E+00	4.54E+09	5.56E+07	1.91E+05	PF	6	2.0E+11	B
C 14 ⁹	1.64E+03	4.54E+06	5.56E+04	1.91E+02	PF	6	6.0E+06	B
Cm 242 ⁹	2.75E+00	1.53E+11	1.87E+09	6.41E+08	PF	6	7.0E+10	B
Cm 244 ⁹	8.18E+00	1.95E+08	2.39E+06	8.19E+05	PF	6	4.0E+11	B
Ca 137 ⁹	8.18E+05	1.37E+04	2.51E+01	8.62E+00	PF	6	4.0E+07	B
I 129 ⁹	2.75E+00	1.06E+06	3.83E+05	3.21E+05	PF	6	7.0E+08	B
Np 237 ⁹	2.45E+00	6.82E+09	8.35E+07	2.86E+05	PF	6	1.2E+12	B
Pu 238 ⁹	3.05E+00	8.21E+09	1.01E+06	3.45E+05	PF	6	2.1E+12	B
Pu 239/240 ⁹	1.04E+02	2.89E+07	3.54E+05	1.22E+03	PF	6	2.0E+12	B
Pu 241 ⁹	5.50E+02	1.27E+06	1.55E+04	5.32E+03	PF	6	1.0E+10	B
RuRh 106 ⁹	1.64E+03	4.42E+15	3.47E+11	1.19E+09	PF	6	3.0E+08	B
Se 79 ⁹	5.50E+01	1.53E+07	1.87E+05	6.42E+04	PF	6	1.0E+06	B
Sr 89/90 ⁹	3.27E+05	5.49E+06	1.01E+01	3.46E+00	PF	6	9.0E+09	B
Tc 99 ⁹	1.64E+03	4.55E+06	5.57E+04	1.91E+02	PF	6	2.0E+06	B
U 238 ⁹	1.12E+01	3.10E+10	3.79E+08	1.30E+06	PF	6	1.0E+10	B
water		2.25E+04	2.25E+04	2.25E+04	Stm Tab	1		

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Tan. arm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-103				
Sample Date	10/23/75		Contents:	Sludge/SN				
Sample ID	T-9138		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	6.8E-03		Retr. Method	Pumping/Sluicing				
pH	11.68							
Density, g/ml	1.1							
Temperature, °R	539							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	6.77E-02	1.32E-07	2.79E-05	1.06E-03	PF	5	9.06E+00	C1
Ba ⁹	7.61E-04	2.92E-10	6.17E-08	2.34E-06	PF	6	8.92E-02	C1
Ca ⁹	8.01E-03	1.05E-08	2.22E-06	8.44E-05	PF	6	6.11E+00	C1 as CaCO ₃
Cl	3.90E-01	3.67E-08	1.24E-04	4.70E-03	PF	5		
CO ₃	3.33E+01	2.92E-05	6.17E-03	2.34E-01	PF	5		
F	7.30E-02	1.19E-08	4.27E-05	1.62E-03	PF	5	3.22E+00	C1
Fe ⁹	2.24E-01	2.11E-07	4.45E-05	1.69E-03	PF	6	2.18E+00	C1
Fe (CN) ₆ ⁹	3.20E-01	7.95E-08	1.68E-05	6.37E-04	PF	6	5.77E-01	C1 as CN, D ¹³
Mn ⁹	6.40E-02	6.13E-08	1.29E-05	4.91E-04	PF	6	2.22E+00	C2, D
Na ⁹	5.60E+01	1.28E-04	2.71E-02	1.03E+00	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	2.36E-01	2.11E-07	4.45E-05	1.69E-03	PF	6	4.14E-02	C1, D
NO ₂	1.99E+01	1.75E-06	4.81E-03	1.82E-01	PF	5		
NO ₃	2.10E+01	1.37E-06	3.76E-03	1.43E-01	PF	5		
OH	8.06E-02	2.50E-07	5.27E-05	2.00E-03	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	8.41E-01	2.14E-07	4.51E-05	1.71E-03	PF	6	5.91E-03	C1, A, D
PO ₄	1.04E+00	6.93E-07	1.46E-04	5.55E-03	PF	5		
Pu	1.30E-04	2.81E-11	5.92E-09	2.25E-07	PF	5		
SiO ₃ ⁹	3.04E+01	2.11E-05	4.45E-03	1.69E-01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	7.61E+01	4.63E-06	8.80E-03	3.34E-01	PF	6		
Sr ⁹	1.40E-01	8.38E-08	1.77E-05	6.72E-04	PF	6		
ZrO ⁹	8.41E-03	4.14E-09	8.73E-07	3.31E-05	PF	6	1.14E+00	C1 as Zr
Am ²⁴¹ ^{9,18}	8.01E-03	2.21E-11	3.62E-09	1.77E-07	PF	6	2.0E-11	B ¹⁹

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Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 243 ⁹	3.57E-06	9.91E-15	1.62E-12	7.94E-11	PF	6	2.0E-11	B
C 14 ⁹	3.57E+02	9.91E-07	1.62E-04	7.94E-03	PF	6	6.0E-06	B
Cm 242 ⁹	8.01E-06	4.44E-17	7.27E-15	3.56E-13	PF	6	7.0E-10	B
Cs 137	2.89E+04	3.29E-06	8.07E-03	3.95E-01	PF	5	4.0E-07	B
Cs 134	2.24E+02	1.15E-09	1.88E-07	9.21E-06	PF	5	4.0E-07	B
Np 237 ⁹	4.00E-08	1.11E-16	1.82E-14	8.91E-13	PF	6	1.2E-12	B
Pu 238 ⁹	8.01E-01	2.15E-09	3.53E-07	1.73E-05	PF	6	2.1E-12	B
Pu 239/240	7.97E+00	2.21E-08	3.62E-06	1.77E-04	PF	5	2.0E-12	B
Pu 241 ⁹	8.01E-03	1.84E-11	3.01E-09	1.48E-07	PF	6	1.0E-10	B
RuRh 106	4.16E+04	3.40E-12	3.56E-08	1.74E-06	PF	5	3.0E-08	B
Sr 89/90	4.43E+03	5.13E-08	1.26E-03	6.16E-02	PF	5	9.0E-09	B
U 238 ⁹	1.62E+01	4.51E-10	7.38E-08	3.61E-06	PF	6	1.0E-10	B
water		3.56E+04	3.56E+04	3.56E+04	Stm Tab	1		

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Sample Type	DL		Tank:	241-BX-104				
Sample Date	2/26/86		Contents:	Sludge/SN				
Sample ID	72XDOOXX		Watchlist:	N/A				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.25							
Temperature, °R	538							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.10E-03	9.41E-10	9.97E-08	3.73E-06	PF	5	2.27E-03	C1
Al	3.50E+00	1.20E-05	1.27E-03	4.74E-02	PF	5	9.06E+00	C1
Ba	5.50E-04	3.70E-10	3.93E-08	1.47E-06	PF	5	8.92E-02	C1
B	2.36E-02	1.98E-07	2.10E-05	7.85E-04	PF	5	2.22E+01	C1
Bi	1.21E-02	5.34E-09	5.66E-07	2.12E-05	PF	5		
Ca	1.23E-02	2.84E-08	3.01E-06	1.12E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cd	4.95E-03	4.08E-09	4.32E-07	1.62E-05	PF	5	5.46E-04	C1, C2, D
CO ₃ ⁹	4.80E+02	7.39E-04	7.83E-02	2.93E+00	PF	6		
Cr	9.25E-01	3.64E-07	1.74E-04	6.51E-03	PF	4	2.35E-01	C1, D
Cu	5.06E-03	7.29E-09	7.73E-07	2.89E-05	PF	5	3.82E-01	C1
F ⁹	5.07E-05	1.45E-11	2.61E-08	9.76E-07	PF	6	3.22E+00	C1
Fe	3.81E-03	6.28E-09	6.65E-07	2.49E-05	PF	5	2.18E+00	C1
Fe (CN) ₆ ⁹	3.20E-03	1.39E-09	1.48E-07	5.53E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	2.22E-01	6.97E-08	7.39E-06	2.77E-04	PF	6		
K	1.52E+00	3.60E-06	3.81E-04	1.43E-02	PF	5		
Mg	4.78E-04	1.84E-09	1.95E-07	7.29E-06	PF	5	1.02E+01	C1
Mn	2.20E-02	3.69E-08	3.91E-06	1.46E-04	PF	5	2.22E+00	C2, D
Na	1.02E+02	4.09E-04	4.34E-02	1.62E+00	PF	5	2.13E+00	C2 as NaOH
Ni	4.01E-02	6.27E-08	6.65E-06	2.49E-04	PF	5	4.14E-02	C1, D
NO ₂ ⁹	1.09E+02	1.69E-05	2.33E-02	8.70E-01	PF	6		
NO ₃	9.92E+01	1.14E-05	1.56E-02	5.85E-01	PF	4		
OH ⁹	1.36E+02	7.39E-04	7.83E-02	2.93E+00	PF	6	2.88E+00	C2 as NaOH
P	2.16E+00	6.43E-06	6.81E-04	2.55E-02	PF	5		

Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	4.48E-02	2.00E-08	2.12E-06	7.92E-05	PF	4	5.91E-03	C1, A, D
PO ₄ ⁹	1.76E+00	2.06E-06	2.18E-04	8.16E-03	PF	6		
Pu	3.00E-04	1.13E-10	1.20E-08	4.50E-07	PF	5		
Si	1.24E-01	4.09E-07	4.33E-05	1.62E-03	PF	5	8.73E+00	C1
SiO ₃ ⁹	4.00E+00	4.86E-06	5.15E-04	1.93E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	2.56E+02	2.73E-05	2.61E-02	9.76E-01	PF	6		
Sr	1.26E-04	1.32E-10	1.40E-08	5.24E-07	PF	5		
TOC gC/l ¹⁷	5.62E+00	4.32E-05	4.58E-03	1.71E-01	PF	5		
U, g/l	3.58E-03	1.39E-09	1.47E-07	5.50E-06	PF	5	5.14E-03	C1
Zr	5.06E-03	5.13E-09	5.44E-07	2.03E-05	PF	5	1.34E+00	C1, C3
ZrO ⁹	1.15E-03	9.89E-10	1.05E-07	3.92E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	5.34E+01	1.47E-07	2.12E-05	5.84E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	7.93E-03	2.20E-11	3.17E-09	8.74E-08	PF	6	2.0E-11	B
C 14	8.41E-01	2.33E-09	3.36E-07	9.25E-06	PF	5	6.0E-06	B
Cm 242 ⁹	1.59E-02	8.80E-14	1.27E-11	3.49E-10	PF	6	7.0E-10	B
Cm 244 ⁹	5.34E+00	1.27E-08	1.83E-06	5.04E-05	PF	6	4.0E-11	B
Cs 137	1.43E+05	2.16E-05	4.66E-02	1.28E+00	PF	4	4.0E-07	B
Co 60	8.97E+00	8.70E-09	1.25E-06	3.45E-05	PF	5	8.0E-08	B
I 129	1.10E-01	4.25E-08	1.53E-06	1.21E-06	PF	4	7.0E-08	B
Np 237 ⁹	2.67E+01	7.41E-08	1.07E-05	2.94E-04	PF	6	1.2E-12	B
Pu 238 ⁹	5.34E+00	1.44E-08	2.07E-06	5.70E-05	PF	6	2.1E-12	B
Pu 239/240	1.84E+01	5.11E-08	7.36E-06	2.03E-04	PF	5	2.0E-12	B
Pu 241 ⁹	5.34E+02	1.23E-06	1.77E-04	4.87E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	5.55E-03	1.50E-14	1.38E-10	3.81E-09	PF	6	3.0E-08	B
Se 79 ⁹	2.38E+02	6.61E-07	9.52E-05	2.62E-03	PF	6	1.0E-06	B
Sr 89/90	2.35E+03	3.57E-08	7.71E-04	2.12E-02	PF	4	9.0E-09	B
Tc 99	1.18E+02	3.28E-07	4.72E-05	1.30E-03	PF	5	2.0E-06	B
U 238	2.52E+00	7.01E-09	1.01E-06	2.78E-05	PF	5	1.0E-10	B
water		3.44E+04	3.44E+04	3.44E+04	Stm Tab	1		

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Tank Farm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-105				
Sample Date	3/4/86		Contents:	Sludge/SN/Saltcake				
Sample ID	82XDOOXX		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.0E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.29							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.10E-03	6.09E-10	9.66E-08	3.30E-06	PF	5	2.27E-03	C1
Al	6.59E+00	1.46E-05	2.31E-03	7.89E-02	PF	5	9.06E+00	C1
Ba	8.74E-04	3.81E-10	6.05E-08	2.06E-06	PF	5	8.92E-02	C1
B	1.44E-02	7.82E-08	1.24E-05	4.23E-04	PF	5	2.22E+01	C1
Bi	1.21E-02	3.46E-09	5.49E-07	1.87E-05	PF	5		
C ₆ H ₅ O ₇ anion ⁹	9.84E+00	4.92E-06	4.94E-04	2.66E-02	PF	6		
Ca	1.30E-01	1.94E-07	3.08E-05	1.05E-03	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.45E-02	6.19E-09	9.82E-07	3.35E-05	PF	6		
Cd	1.44E-02	7.68E-09	1.22E-06	4.16E-05	PF	5	5.46E-04	C1, C2, D
Co	1.26E-03	1.28E-09	2.02E-07	6.90E-06	PF	5	2.07E-02	C1, D
CO ₃ ⁹	1.24E+02	1.24E-04	1.96E-02	6.70E-01	PF	6		
Cr	2.05E-01	5.23E-08	3.74E-05	1.27E-03	PF	4	2.35E-01	C1, D
Cu	7.04E-03	6.57E-09	1.04E-06	3.56E-05	PF	5	3.82E-01	C1
F ⁹	5.70E+00	1.05E-06	2.84E-03	9.70E-02	PF	6	3.22E+00	C1
Fe	4.75E-03	5.07E-09	8.04E-07	2.74E-05	PF	5	2.18E+00	C1
Fe(CN) ₆ ⁹	4.14E-03	1.17E-09	1.85E-07	6.32E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	9.84E-02	2.01E-08	3.18E-06	1.09E-04	PF	6		
K	2.50E+00	3.83E-06	6.07E-04	2.07E-02	PF	5		
Mg	5.27E-04	1.31E-09	2.08E-07	7.10E-06	PF	5	1.02E+01	C1
Mn	2.20E-02	2.39E-08	3.79E-06	1.29E-04	PF	5	2.22E+00	C2, D
Na	1.20E+02	3.12E-04	4.94E-02	1.69E+00	PF	5	2.13E+00	C2 as NaOH
Ni	9.96E-02	1.01E-07	1.60E-05	5.46E-04	PF	5	4.14E-02	C1, D
NO ₂ ⁹	4.77E+01	4.76E-06	9.82E-03	3.35E-01	PF	6		
NO ₃	1.28E+02	9.49E-06	1.96E-02	6.67E-01	PF	4		
OH ⁹	3.52E+01	1.24E-04	1.96E-02	6.70E-01	PF	6	2.88E+00	C2 as NaOH
P	1.79E+00	3.45E-06	5.47E-04	1.87E-02	PF	5		

Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	5.95E-02	1.72E-08	2.72E-06	9.29E-05	PF	4	5.91E-03	C1, A, D
PO ₄ ⁹	9.84E+01	7.44E-05	1.18E-02	4.03E-01	PF	6		
Pu	2.51E-04	6.15E-11	9.75E-09	3.33E-07	PF	5		
Si	1.91E-01	4.08E-07	6.46E-05	2.21E-03	PF	5	8.73E+00	C1
SiO ₃ ⁹	1.97E+01	1.55E-05	2.45E-03	8.37E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	1.50E+02	1.04E-05	1.48E-02	5.06E-01	PF	6		
Sr	1.63E-03	1.11E-09	1.76E-07	5.99E-06	PF	5		
TOC gC/l ¹⁷	9.75E+00	4.86E-05	7.70E-03	2.63E-01	PF	5		
U, g/l	4.42E-03	1.11E-09	1.76E-07	6.00E-06	PF	5	5.14E-03	C1
Zr	5.06E-03	3.32E-09	5.27E-07	1.80E-05	PF		1.34E+00	C1, C3
ZrO ₉	6.22E-02	3.47E-08	5.51E-06	1.88E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.96E+01	8.12E-08	1.13E-05	4.39E-04	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	1.54E+01	4.28E-08	5.97E-06	2.31E-04	PF	6	2.0E-11	B
C 14	5.84E-01	1.62E-09	2.26E-07	8.77E-06	PF	5	6.0E-06	B
Cm 242 ⁹	3.08E+01	1.71E-10	2.38E-08	9.24E-07	PF	6	7.0E-10	B
Cm 244 ⁹	5.18E+01	1.23E-07	1.72E-05	6.68E-04	PF	6	4.0E-11	B
Cs 137	1.79E+05	2.70E-05	5.65E-02	2.19E+00	PF	4	4.0E-07	B
Co 60	1.77E+02	1.72E-07	2.40E-05	9.29E-04	PF	5	8.0E-08	B
I 129	5.60E-02	2.16E-08	7.78E-07	8.42E-07	PF	4	7.0E-08	B
Np 237 ⁹	5.18E+00	1.44E-08	2.01E-06	7.79E-05	PF	6	1.2E-12	B
Pu 238 ⁹	4.62E+00	1.24E-08	1.74E-06	6.73E-05	PF	6	2.1E-12	B
Pu 239/240	1.54E+01	4.28E-08	5.97E-06	2.31E-04	PF	5	2.0E-12	B
Pu 241 ⁹	1.22E-02	2.80E-11	3.91E-09	1.52E-07	PF	6	1.0E-10	B
RuRh 106 ⁹	2.80E-02	7.56E-14	6.77E-10	2.62E-08	PF	6	3.0E-08	B
Se 79 ⁹	2.10E+02	5.83E-07	8.14E-05	3.16E-03	PF	6	1.0E-06	B
Sr 89/90	1.15E+04	1.75E-07	3.66E-03	1.42E-01	PF	4	9.0E-09	B
Tc 99	1.09E+02	3.03E-07	4.22E-05	1.64E-03	PF	5	2.0E-06	B
U 238	3.11E-03	8.63E-12	1.20E-09	4.67E-08	PF	5	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tab	1		

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Sample Type	SN		Tank:	241-BX-106				
Sample Date	3/16/90		Contents:	Sludge/SN				
Sample ID	R-6037		Watchlist:	FECN				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	9.4E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.33							
Temperature, °R	529							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	7.64E+00	1.68E-05	2.60E-03	9.61E-02	PF	5	9.06E+00	C1
Ba ⁹	5.34E-02	2.32E-08	3.58E-06	1.32E-04	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ anion ⁹	1.72E+00	1.36E-06	2.11E-04	7.80E-03	PF	6		
C ₆ H ₅ O ₇ anion ⁹	1.09E+01	5.83E-06	5.31E-04	3.33E-02	PF	6		
Ca	9.94E-03	1.48E-08	2.28E-06	8.44E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	4.82E-01	2.05E-07	3.17E-05	1.17E-03	PF	6		
Cl	3.42E+00	3.63E-07	8.98E-04	3.32E-02	PF	4		
CO ₃	5.60E+01	5.54E-05	8.58E-03	3.17E-01	PF	5		
Cr	1.20E+00	3.04E-07	2.12E-04	7.84E-03	PF	4	2.35E-01	C1, D
EDTA ^{9,12}	1.03E+01	2.10E-06	3.25E-04	1.20E-02	PF	5		
F	1.48E+00	2.72E-07	7.16E-04	2.65E-02	PF	4	3.22E+00	C1
Fe ⁹	6.32E+01	6.70E-05	1.04E-02	3.83E-01	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	7.47E-01	2.09E-07	3.24E-05	1.20E-03	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	1.61E+01	3.26E-06	5.05E-04	1.86E-02	PF	6		
K	4.34E+00	6.61E-06	1.02E-03	3.78E-02	PF	5		
Mn ⁹	2.18E+00	2.36E-06	3.65E-04	1.35E-02	PF	6	2.22E+00	C2, D
Na	1.62E+02	4.18E-04	6.47E-02	2.39E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}		1.79E+01	1.79E+01	1.79E+01	Sample	2	2.50E+01	C1
Ni ⁹	2.70E+00	2.72E-06	4.21E-04	1.55E-02	PF	6	4.14E-02	C1, D
NO ₂	7.78E+01	7.73E-06	1.55E-02	5.74E-01	PF	4		
NO ₃	1.62E+02	1.19E-05	2.40E-02	8.87E-01	PF	4		
OH	3.52E+01	1.23E-04	1.90E-02	7.03E-01	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
P	6.16E-01	1.18E-06	1.83E-04	6.75E-03	PF	5		
Pb ⁹	2.35E+01	6.76E-06	1.05E-03	3.86E-02	PF	6	5.91E-03	Cl, A, D
PO ₄	1.50E+01	1.13E-05	1.75E-03	6.45E-02	PF	5		
Pu	2.10E-06	5.11E-13	7.91E-11	2.92E-09	PF	5		
SiO ₃ ⁹	1.55E+02	1.21E-04	1.88E-02	6.93E-01	PF	6	1.93E+00	Cl (Amorphous)
SO ₄	1.54E+01	1.06E-06	1.47E-03	5.45E-02	PF	4		
Sr ⁹	7.47E-02	5.04E-08	7.80E-06	2.88E-04	PF	6		
TOC gC/l ¹⁷	4.40E+00	2.18E-05	3.37E-03	1.25E-01	PF	5		
U, g/l	7.36E-03	1.84E-09	2.84E-07	1.05E-05	PF	5	5.14E-03	Cl
ZrO ⁹	3.68E-02	2.04E-08	3.16E-06	1.17E-04	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	2.38E-01	6.57E-10	8.89E-08	3.75E-06	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	1.15E+01	3.19E-08	4.32E-06	1.82E-04	PF	6	2.0E-11	B
C 14 ⁹	9.78E+03	2.72E+05	3.67E-03	1.55E+01	PF	6	6.0E-06	B
Cm 242 ⁹	2.33E+01	1.29E-10	1.75E-08	7.38E-07	PF	6	7.0E-10	B
Cm 244 ⁹	5.74E+01	1.37E-07	1.85E-05	7.83E-04	PF	6	4.0E-11	B
Cs 137	1.35E+05	2.26E-05	4.58E-02	1.93E+00	PF	4	4.0E-07	B
I 129 ⁹	2.33E+01	8.99E-06	3.24E-04	3.70E-04	PF	6	7.0E-08	B
Np 237 ⁹	2.33E+01	6.47E-08	8.75E-06	3.70E-04	PF	6	1.2E-12	B
Pu 238 ⁹	3.42E+00	9.19E-09	1.24E-06	5.25E-05	PF	6	2.1E-12	B
Pu 239/240	4.77E+03	1.32E-05	1.79E-03	7.57E-02	PF	5	2.0E-12	B
Pu 241 ⁹	2.17E-02	5.00E-11	6.77E-09	2.86E-07	PF	6	1.0E-10	B
RuRh 106 ⁹	7.45E-02	2.01E-13	1.75E-09	7.38E-08	PF	6	3.0E-08	B
Sa 79 ⁹	4.04E+02	1.12E-06	1.52E-04	6.41E+03	PF	6	1.0E-06	B
Sr 89/90	5.15E+02	8.64E-09	1.75E-04	7.41E-03	PF	4	9.0E-09	B
Ta 99 ⁹	1.15E+04	3.19E-05	4.32E-03	1.82E-01	PF	6	2.0E-06	B
U 238	5.16E+03	1.43E-11	1.94E-09	8.20E-08	PF	5	1.0E-10	B
water		2.36E+04	2.36E+04	2.36E+04	Stm Tab	1		

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Tank Farm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-107				
Sample Date	3/16/90		Contents:	Sludge/SN				
Sample ID	R-6038		Watchlist:	N/A				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	9.8E-03		Retr. Method	Pumping/Sluicing				
pH	13.04							
Density, g/ml	1.22							
Temperature, °R	529							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	2.07E+00	3.82E-06	7.67E-04	2.10E-02	PF	6	9.06E+00	C1
Ba	8.97E-03	3.27E-09	6.56E-07	1.80E-05	PF	5	8.92E-02	C1
Bi ⁹	1.15E+01	2.74E-06	5.51E-04	1.51E-02	PF	6		
Ce ⁹	1.07E-02	3.82E-09	7.67E-07	2.10E-05	PF	6		
Cl	2.16E+00	1.93E-07	6.18E-04	1.69E-02	PF	4		
CO ₃	1.64E+01	1.37E-05	2.74E-03	7.51E-02	PF	5		
Cr	3.43E-01	7.31E-08	6.61E-05	1.81E-03	PF	4	2.35E-01	C1, D
Cu	4.98E-03	3.89E-09	7.80E-07	2.14E-05	PF	5	3.82E-01	C1
Dodecane	8.57E-01	1.13E+01	1.13E+01	1.13E+01	CVD	3		
F	1.42E+00	2.19E-07	7.49E-04	2.05E-02	PF	4	3.22E+00	C1
Fe	2.59E-02	2.31E-08	4.63E-06	1.27E-04	PF	5	2.18E+00	C1
K	4.81E-01	6.16E-07	1.24E-04	3.39E-03	PF	5		
Mo	5.88E-02	3.06E-08	6.14E-06	1.68E-04	PF	5	2.55E+00	C1
Na	9.70E+01	2.11E-04	4.23E-02	1.16E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	3.42E+01	2.86E-06	7.45E-03	2.04E-01	PF	4		
NO ₃	1.64E+02	1.02E-05	2.65E-02	7.26E-01	PF	4		
OH	1.85E+00	5.44E-06	1.09E-03	2.99E-02	PF	5	2.88E+00	C2 as NaOH
P	5.27E+00	8.49E-06	1.70E-03	4.67E-02	PF	5		
Pb	3.40E-02	8.20E-09	1.65E-06	4.51E-05	PF	4	5.91E-03	C1, A, D
Pentadecane	6.05E-02	2.20E-01	2.20E-01	2.20E-01	CVD	3		
PO ₄	1.54E+01	9.74E-06	1.95E-03	5.35E-02	PF	5		
Pu	6.92E-05	1.42E-11	2.84E-09	7.79E-08	PF	5		
Si	2.61E-01	4.66E-07	9.34E-05	2.56E-03	PF	5	8.73E+00	C1

Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SiO ₃ ⁹	1.15E+00	7.55E-07	1.51E-04	4.15E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.74E+01	1.00E-06	1.82E-03	4.98E-02	PF	4		
TOC gC/l ¹⁷	2.70E+00	1.12E-05	2.25E-03	6.18E-02	PF	5		
Tetradecane	1.76E+00	8.39E-01	8.39E-01	8.39E-01	CVD	3	1.23E-02	C1
Tridecane	2.41E+00	3.86E+00	3.86E+00	3.86E+00	CVD	3		
Tri-Butylphosphate	2.53E-02	6.76E-02	6.76E-02	6.76E-02	CVD	3	2.00E-01	C1
U, g/l	8.58E-01	1.80E-07	3.61E-05	9.90E-04	PF	5	5.14E-03	C1
Undecane	1.55E-02	3.89E+01	3.89E+01	3.89E+01	CVD	3		
ZrO ⁹	1.61E+00	7.51E-07	1.51E-04	4.13E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.49E-01	6.87E-10	1.01E-07	3.78E-06	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	6.67E-05	1.85E-13	2.73E-11	1.02E-09	PF	6	2.0E-11	B
C 14 ⁹	1.56E-01	4.32E-10	6.38E-08	2.38E-06	PF	6	6.0E-06	B
Cm 242 ⁹	2.22E-05	1.23E-16	1.82E-14	6.78E-13	PF	6	7.0E-10	B
Cm 244 ⁹	1.50E-05	3.57E-14	5.26E-12	1.96E-10	PF	6	4.0E-11	B
Cs 137	2.49E+04	4.16E-06	9.21E-03	3.43E-01	PF	4	4.0E-07	B
I 129 ⁹	6.06E-03	2.34E-09	8.43E-08	9.26E-08	PF	6	7.0E-08	B
Np 237 ⁹	1.50E-02	4.16E-11	6.13E-09	2.28E-07	PF	6	1.2E-12	B
Pu 238 ⁹	7.48E-02	2.01E-10	2.97E-08	1.11E-06	PF	6	2.1E-12	B
Pu 239/240	4.24E+01	1.18E-07	1.74E-05	6.47E-04	PF	5	2.0E-12	B
Pu 241 ⁹	7.48E+00	1.72E-08	2.54E-06	9.46E-05	PF	6	1.0E-10	B
RuRh 106 ⁹	2.60E+03	7.02E-09	6.64E-05	2.48E-03	PF	6	3.0E-08	B
Se 79 ⁹	7.48E-02	2.08E-10	3.07E-08	1.14E-06	PF	6	1.0E-06	B
Sr 89/90	5.71E+01	9.58E-10	2.12E-05	7.90E-04	PF	4	9.0E-09	B
Tc 99 ⁹	3.84E+00	1.07E-08	1.57E-06	5.87E-05	PF	6	2.0E-06	B
U 238	6.05E-01	1.68E-09	2.48E-07	9.25E-06	PF	5	1.0E-10	B
water		2.36E+04	2.36E+04	2.36E+04	Stm Tab	1		

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Tan. arm 241-BX Vapor Estimates

Sample Type	TRAC		Tank:	241-BX-108				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	9.7E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.23							
Temperature, °R	533							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	8.43E+01	1.34E-04	3.10E-02	5.85E-02	PF	6	9.06E+00	C1
Ba ⁹	7.62E-04	2.39E-10	5.53E-08	1.04E-07	PF	6	8.92E-02	C1
Bi ⁹	1.52E+01	3.13E-06	7.25E-04	1.37E-03	PF	6		
Ce ⁹	4.27E-04	1.31E-10	3.03E-08	5.71E-08	PF	6		
CO ₃ ⁹	2.44E+00	1.74E-06	4.04E-04	7.62E-04	PF	6		
Cr ⁹	5.28E-01	9.68E-08	1.01E-04	1.90E-04	PF	6	2.35E-01	C1, D
F ⁹	3.86E+00	5.13E-07	2.02E-03	3.81E-03	PF	6	3.22E+00	C1
Fe ⁹	1.12E+01	8.57E-06	1.98E-03	3.74E-03	PF	6	2.18E+00	C1
Fe (CN) ₆ ⁹	6.81E-05	1.38E-11	3.19E-09	6.02E-09	PF	6	5.77E-01	C1 as CN, D ¹³
Na ⁹	9.35E+00	1.74E-05	4.04E-03	7.62E-03	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	3.76E+00	2.70E-07	8.12E-04	1.53E-03	PF	6		
NO ₃ ⁹	1.22E+01	6.49E-07	1.95E-03	3.68E-03	PF	6		
OH ⁹	1.73E+02	4.36E-04	1.01E-01	1.90E-01	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	7.21E+00	3.92E-06	9.08E-04	1.71E-03	PF	6		
SiO ₃ ⁹	1.52E-01	8.61E-08	1.99E-05	3.76E-05	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	3.96E-01	1.97E-08	4.10E-05	7.73E-05	PF	6		
ZrO ⁹	2.13E+00	8.56E-07	1.98E-04	3.74E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	3.02E+00	8.34E-09	1.22E-06	3.64E-06	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	9.06E-05	2.52E-13	3.68E-11	1.10E-10	PF	6	2.0E-11	B
C 14 ⁹	8.24E-01	2.29E-09	3.35E-07	9.98E-07	PF	6	6.0E-06	B

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Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	3.02E-05	1.68E-16	2.45E-14	7.31E-14	PF	6	7.0E-10	B
Cm 244 ⁹	5.22E-04	1.24E-12	1.82E-10	5.43E-10	PF	6	4.0E-11	B
Cs 137 ⁹	5.22E+03	8.72E-07	1.91E+03	5.71E-03	PF	6	4.0E-07	B
I 129 ⁹	2.03E-03	7.85E-10	2.82E-08	2.46E-09	PF	6	7.0E-08	B
Np 237 ⁹	5.22E-03	1.45E-11	2.12E-09	6.33E-09	PF	6	1.2E-12	B
Pu 238 ⁹	1.02E-01	2.73E-10	4.00E-08	1.19E-07	PF	6	2.1E-12	B
Pu 239/240 ⁹	5.77E+01	1.60E-07	2.34E-05	6.99E-05	PF	6	2.0E-12	B
Pu 241 ⁹	1.02E+01	2.34E-08	3.42E-06	1.02E-05	PF	6	1.0E-10	B
RuRh 106	7.14E-08	1.93E-19	1.81E-15	5.40E-15	PF	6	3.0E-08	B
Se 79 ⁹	3.02E-02	8.39E-11	1.23E-08	3.66E-08	PF	6	1.0E-06	B
Sr 89/90 ⁹	5.22E+04	8.76E-07	1.92E-02	5.73E-02	PF	6	9.0E-09	B
Tc 99 ⁹	1.02E+00	2.82E-09	4.13E-07	1.23E-06	PF	6	2.0E-06	B
U 238 ⁹	1.02E+00	2.82E-09	4.13E-07	1.23E-06	PF	6	1.0E-10	B
water		2.82E+04	2.82E+04	2.82E+04	Stm Tab	1		

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Tan. Farm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-109				
Sample Date	3/16/90		Contents:	Sludge				
Sample ID	R-6039		Watchlist:	N/A				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	9.7E-03		Retr. Method	Pumping/Sluicing				
pH	13.04							
Density, g/ml	1.34							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	1.51E+01	2.74E-05	5.09E-03	1.51E-01	PF	6	9.06E+00	C1
Ba ⁹	5.20E-04	1.86E-10	3.46E-08	1.03E-06	PF	6	8.92E-02	C1
B	3.21E-02	1.43E-07	2.66E-05	7.92E-04	PF	5	2.22E+01	C1
Bi ⁹	2.33E-01	5.47E-08	1.02E-05	3.02E-04	PF	6		
Ca	1.05E-02	1.29E-08	2.39E-06	7.13E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	3.83E-06	1.34E-12	2.50E-10	7.43E-09	PF	6		
Cl	2.71E+00	2.38E-07	7.06E-04	2.10E-02	PF	4		
CO ₃	2.12E+01	1.73E-05	3.22E-03	9.59E-02	PF	5		
Cr	1.03E-01	2.16E-08	1.81E-05	5.38E-04	PF	4	2.35E-01	C1, D
F	1.49E+00	2.26E-07	7.15E-04	2.13E-02	PF	4	3.22E+00	C1
Fe ⁹	1.51E-01	1.32E-07	2.45E-05	7.30E-04	PF	6	2.18E+00	C1
Fe (CN) ₆ ⁹	5.48E-03	1.27E-09	2.36E-07	7.01E-06	PF	6	5.77E-01	C1 as CN, D ¹³
Hg	2.47E-04	6.03E-11	1.12E-08	3.34E-07	PF	5	6.08E-03	B, C1, C2
Mg	6.98E-03	1.43E-08	2.65E-06	7.89E-05	PF	5	1.02E+01	C1
Na	1.40E+02	2.99E-04	5.55E-02	1.65E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	2.41E+01	1.98E-06	4.78E-03	1.42E-01	PF	4		
NO ₃	3.07E+02	1.87E-05	4.52E-02	1.34E+00	PF	4		
OH	1.85E+00	5.34E-06	9.93E-04	2.95E-02	PF	5	2.88E+00	C2 as NaOH
P	6.47E+00	1.02E-05	1.90E-03	5.67E-02	PF	5		
PO ₄	1.99E+01	1.24E-05	2.30E-03	6.84E-02	PF	5		
Pu	1.59E-05	3.20E-12	5.94E-10	1.77E-08	PF	5		
SiO ₃ ⁹	4.11E-01	2.65E-07	4.93E-05	1.47E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.36E+01	1.34E-06	2.24E-03	6.67E-02	PF	4		

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Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
TOC gC/l ¹⁷	3.00E+00	1.23E-05	2.28E-03	6.79E-02	PF	5		
U, g/l	2.55E-01	5.26E-08	9.77E-06	2.91E-04	PF	5	5.14E-03	C1
ZrO ⁹	4.38E-02	2.01E-08	3.73E-06	1.11E-04	PF	6	1.14E+00	C1 as Zr
Am-241 ¹⁸	3.39E+00	9.36E-09	1.26E-06	5.17E-05	PF	5	2.0E-11	B ¹⁹
Am-243 ⁹	2.74E-03	7.60E-12	1.02E-09	4.20E-08	PF	6	2.0E-11	B
C-14 ⁹	9.62E+00	2.67E-08	3.59E-06	1.48E-04	PF	6	6.0E-06	B
Cm-242 ⁹	5.55E-02	3.08E-13	4.14E-11	1.70E-09	PF	6	7.0E-10	B
Cm-244 ⁹	1.37E-03	3.26E-12	4.38E-10	1.80E-08	PF	6	4.0E-11	B
Cs-137	1.61E+04	2.69E-06	5.42E-03	2.23E-01	PF	4	4.0E-07	B
I-129 ⁹	9.62E-03	3.71E-09	1.34E-07	1.48E-07	PF	6	7.0E-08	B
Np-237 ⁹	2.77E-02	7.71E-11	1.04E-08	4.26E-07	PF	6	1.2E-12	B
Pu-238 ⁹	7.03E-01	1.89E-09	2.54E-07	1.05E-05	PF	6	2.1E-12	B
Pu-239/240	9.72E-01	2.70E-09	3.63E-07	1.49E-05	PF	5	2.0E-12	B
Pu-241 ⁹	2.74E+01	6.30E-08	8.46E-06	3.48E-04	PF	6	1.0E-10	B
RuRh-106 ⁹	2.85E-06	7.70E-18	6.63E-14	2.73E-12	PF	6	3.0E-08	B
Se-79 ⁹	1.37E-01	3.80E-10	5.11E-08	2.10E-06	PF	6	1.0E-06	B
Sr-89/90	3.24E+02	5.44E-09	1.09E-04	4.51E-03	PF	4	9.0E-09	B
Tc-99 ⁹	5.55E+00	1.54E-08	2.07E-06	8.52E-05	PF	6	2.0E-06	B
U-238	1.80E-01	5.00E-10	6.72E-08	2.77E-06	PF	5	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tab	1		

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Tan. Arm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-110				
Sample Date	3/16/90		Contents:	Sludge/SN/Saltcake				
Sample ID	R-6040		Watchlist:	FECN				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	9.9E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.37							
Temperature, °R	527							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	5.29E-01	1.02E-06	1.75E-04	5.55E-03	PF	5	9.06E+00	C1
Ba ⁹	8.50E-04	3.24E-10	5.53E-08	1.76E-06	PF	6	8.92E-02	C1
Bi ⁹	1.33E+01	3.32E-06	5.67E-04	1.80E-02	PF	6		
C ₆ H ₅ O ₇ anion ⁹	7.57E+01	3.03E-05	3.57E-03	1.65E-01	PF	6		
Ca	8.98E-03	1.17E-08	2.00E-06	6.36E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.30E-02	4.85E-09	8.29E-07	2.63E-05	PF	6		
Cl	4.89E+00	4.56E-07	1.25E-03	3.96E-02	PF	4		
CO ₃	1.72E+01	1.50E-05	2.56E-03	8.12E-02	PF	5		
Cr	9.72E-01	2.17E-07	1.67E-04	5.30E-03	PF	4	2.35E-01	C1, D
F	1.41E+00	2.28E-07	6.62E-04	2.10E-02	PF	4	3.22E+00	C1
Fe ⁹	1.04E+01	9.65E-06	1.65E-03	5.24E-02	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	1.73E-01	4.25E-08	7.26E-06	2.31E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	3.72E-03	6.62E-10	1.13E-07	3.60E-06	PF	6		
K	2.92E+00	3.91E-06	6.68E-04	2.12E-02	PF	5		
Mn ⁹	5.84E-02	5.54E-08	9.48E-06	3.01E-04	PF	6	2.22E+00	C2, D
Mo	6.70E-02	3.64E-08	6.23E-06	1.98E-04	PF	5	2.55E+00	C1
Na	1.64E+02	3.72E-04	6.36E-02	2.02E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}		8.03E+01	8.03E+01	8.03E+01	Sample	2	2.50E+01	C1
Ni ⁹	3.85E-05	3.41E-11	5.82E-09	1.85E-07	PF	6	4.14E-02	C1, D
NO ₂	3.65E+01	3.19E-06	7.08E-03	2.25E-01	PF	4		
NO ₃	3.13E+02	2.03E-05	4.50E-02	1.43E+00	PF	4		
OH	2.35E+01	7.22E-05	1.23E-02	3.92E-01	PF	5	2.88E+00	C2 as NaOH

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Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
P	4.06E-01	6.84E-07	1.17E-04	3.71E-03	PF	5		
Pb ⁹	1.33E-06	3.35E-13	5.72E-11	1.82E-09	PF	6	5.91E-03	Cl, A, D
PO ₄	1.42E+01	9.38E-06	1.60E-03	5.09E-02	PF	5		
Pu	1.30E-06	2.78E-13	4.75E-11	1.51E-09	PF	5		
Si	4.38E-02	8.17E-08	1.40E-05	4.43E-04	PF	5	8.73E+00	Cl
SiO ₃ ⁹	8.10E+00	5.56E-06	9.51E-04	3.02E-02	PF	6	1.93E+00	Cl (Amorphous)
SO ₄	1.46E+01	8.81E-07	1.36E-03	4.31E-02	PF	4		
Sr ⁹	8.10E-03	4.80E-09	8.21E-07	2.61E-05	PF	6		
TOC gC/l ¹⁷	5.60E+00	2.44E-05	4.16E-03	1.32E-01	PF	5		
U, g/l	4.29E-03	9.41E-10	1.61E-07	5.11E-06	PF	5	5.14E-03	Cl
ZrO ₂ ⁹	2.79E+00	1.36E-06	2.33E-04	7.38E-03	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	2.60E-01	7.18E-10	9.43E-08	3.90E-06	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	1.18E-01	3.29E-10	4.32E-08	1.79E-06	PF	6	2.0E-11	B
C 14 ⁹	1.33E+02	3.69E-07	4.84E-05	2.00E-03	PF	6	6.0E-06	B
Cm 242 ⁹	1.33E-01	7.36E-13	9.68E-11	4.00E-09	PF	6	7.0E-10	B
Cm 244 ⁹	1.33E+00	3.16E-09	4.16E-07	1.72E-05	PF	6	4.0E-11	B
Cs 137	1.35E+05	2.26E-05	4.45E-02	1.84E+00	PF	4	4.0E-07	B
I 129 ⁹	6.82E-01	2.63E-07	9.48E-06	1.03E-05	PF	6	7.0E-08	B
Np 237 ⁹	1.18E+00	3.29E-09	4.32E-07	1.79E-05	PF	6	1.2E-12	B
Pu 238 ⁹	1.47E-01	3.96E-10	5.20E-08	2.15E-06	PF	6	2.1E-12	B
Pu 239/240	7.99E-02	2.22E-10	2.92E-08	1.20E-06	PF	5	2.0E-12	B
Pu 241 ⁹	9.33E+00	2.15E-08	2.82E-06	1.17E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	2.66E-04	7.17E-16	6.04E-12	2.50E-10	PF	6	3.0E-08	B
Sa 79 ⁹	1.18E+01	3.29E-08	4.32E-06	1.79E-04	PF	6	1.0E-06	B
Sr 89/90	1.50E+01	2.52E-10	4.96E-06	2.05E-04	PF	4	9.0E-09	B
Tc 99 ⁹	3.95E-02	1.10E-06	1.44E-04	5.95E-03	PF	6	2.0E-06	B
U-238	3.03E-03	8.41E-12	1.10E-09	4.56E-08	PF	5	1.0E-10	B
water		2.14E+04	2.14E+04	2.14E+04	Stm Tab	1		

Tan Farm 241-BX Vapor Estimates

Sample Type	SN		Tank:	241-BX-111				
Sample Date	3/16/90		Contents:	Sludge/SN/Saltcake				
Sample ID	R-6041		Watchlist:	FECN				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.44							
Temperature, °R	529							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.91E+01	6.55E-05	1.23E-02	2.71E-01	PF	5	9.06E+00	C1
Ba ⁹	7.70E-04	2.54E-10	4.77E-08	1.05E-06	PF	6	8.92E-02	C1
Bi ⁹	1.15E+00	2.49E-07	4.67E-05	1.03E-03	PF	6		
C ₆ H ₅ O ₇ anion ⁹	6.55E+01	2.36E-05	2.94E-03	9.75E-02	PF	6		
Ca	1.14E-02	1.29E-08	2.42E-06	5.34E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.13E-02	3.64E-09	6.83E-07	1.51E-05	PF	6		
Cl	4.96E+00	4.01E-07	1.20E-03	2.65E-02	PF	4		
CO ₃	3.59E+01	2.71E-05	5.08E-03	1.12E-01	PF	5		
F	1.46E+00	2.05E-07	6.52E-04	1.44E-02	PF	4	3.22E+00	C1
Fe ⁹	3.22E+00	2.60E-06	4.88E-04	1.08E-02	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	1.49E-01	3.19E-08	5.98E-06	1.32E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	3.22E-03	4.97E-10	9.32E-08	2.06E-06	PF	6		
Hg	2.61E-05	5.88E-12	1.10E-09	2.43E-08	PF	5	6.08E-03	B, C1, C2
K	6.41E+00	7.44E-06	1.40E-03	3.08E-02	PF	5		
Mn ⁹	5.63E-02	4.63E-08	8.69E-06	1.92E-04	PF	6	2.22E+00	C2, D
Na	2.14E+02	4.21E-04	7.90E-02	1.74E+00	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}		7.00E+01	7.00E+01	7.00E+01	Sample	2	2.50E+01	C1
Ni ⁹	3.22E-05	2.47E-11	4.63E-09	1.02E-07	PF	6	4.14E-02	C1, D
NO ₂	6.35E+01	4.81E-06	1.17E-02	2.59E-01	PF	4		
NO ₃	1.62E+02	9.09E-06	2.22E-02	4.89E-01	PF	4		
OH	5.83E+01	1.55E-04	2.91E-02	6.42E-01	PF	5	2.88E+00	C2 as NaOH
P	4.00E-01	5.84E-07	1.10E-04	2.42E-03	PF	5		

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Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb ⁹	1.15E-06	2.51E-13	4.71E-11	1.04E-09	PF	6	5.91E-03	C1, A, D
PO ₄	1.48E+01	8.48E-06	1.59E-03	3.51E-02	PF	5		
Pu	1.40E-06	2.60E-13	4.87E-11	1.07E-09	PF	5		
SiO ₃ ⁹	7.01E+00	4.17E-06	7.83E-04	1.73E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.52E+01	7.96E-07	1.34E-03	2.97E-02	PF	4		
Sr ⁹	7.01E-03	3.60E-09	6.76E-07	1.49E-05	PF	6		
TOC gC/l ¹⁷	5.70E+00	2.15E-05	4.03E-03	8.90E-02	PF	5		
U, g/l	1.82E+00	3.46E-07	6.49E-05	1.43E-03	PF	5	5.14E-03	C1
Zn	1.03E-02	7.17E-09	1.35E-06	2.97E-05	PF	5		
ZrO ⁹	2.41E-01	1.02E-07	1.91E-05	4.22E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.38E-01	3.81E-10	4.76E-08	1.58E-06	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	1.02E-01	2.84E-10	3.56E-08	1.18E-06	PF	6	2.0E-11	B
C 14 ⁹	1.15E+02	3.19E-07	3.99E-05	1.32E-03	PF	6	6.0E-06	B
Cm 242 ⁹	1.15E-01	6.37E-13	7.96E-11	2.64E-09	PF	6	7.0E-10	B
Cm 244 ⁹	1.15E+00	2.74E-09	3.42E-07	1.13E-05	PF	6	4.0E-11	B
Cs 137	2.59E+05	4.33E-05	8.11E-02	2.69E+00	PF	4	4.0E-07	B
I 129 ⁹	5.90E-01	2.28E-07	8.20E-06	6.78E-06	PF	6	7.0E-08	B
Np 237 ⁹	1.15E+00	3.19E-09	3.99E-07	1.32E-05	PF	6	1.2E-12	B
Pu 238 ⁹	4.66E-02	1.25E-10	1.57E-08	5.19E-07	PF	6	2.1E-12	B
Pu 239/240	8.58E-02	2.38E-10	2.98E-08	9.86E-07	PF	5	2.0E-12	B
Pu 241 ⁹	8.07E-01	1.86E-09	2.32E-07	7.68E-06	PF	6	1.0E-10	B
RuRh 106 ⁹	7.40E+06	2.00E-05	1.60E-01	5.30E+00	PF	6	3.0E-08	B
Se 79 ⁹	1.02E+01	2.85E-08	3.56E-06	1.18E-04	PF	6	1.0E-06	B
Sr 89/90	1.99E+01	3.34E-10	6.26E-06	2.07E-04	PF	4	9.0E-09	B
Tc 99 ⁹	3.42E+02	9.49E-07	1.19E-04	3.93E-03	PF	6	2.0E-06	B
U 238	1.28E+00	3.57E-09	4.46E-07	1.48E-05	PF	5	1.0E-10	B
water		2.36E+04	2.36E+04	2.36E+04	Stm Tab	1		

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Sample Type	SN		Tank:	241-BX-112				
Sample Date	3/16/90		Contents:	Sludge/SN				
Sample ID	R-6042		Watchlist:	N/A				
Properties	Value		Status:	IS/PI				
Visc., lbm/ft-s ¹	7.2E-03		Retr. Method	Pumping/Sluicing				
pH	12.86							
Density, g/ml	1.2							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.60E-01	9.41E-07	9.81E-05	7.24E-03	PF	5	9.06E+00	C1
Ba ⁹	1.25E-04	8.91E-11	9.29E-09	6.86E-07	PF	6	8.92E-02	C1
Bi	3.07E-01	1.43E-07	1.50E-05	1.10E-03	PF	5		
Ce ⁹	1.35E-02	9.38E-09	9.79E-07	7.23E-05	PF	6		
Cl	1.84E+00	3.21E-07	5.36E-04	3.95E-02	PF	4		
CO ₃	2.09E+01	3.40E-05	3.55E-03	2.62E-01	PF	5		
Cr	3.17E-01	1.32E-07	6.21E-05	4.58E-03	PF	4	2.35E-01	C1, D
F	1.11E+00	3.36E-07	5.95E-04	4.39E-02	PF	4	3.22E+00	C1
Fe ⁹	5.44E+00	9.50E-06	9.90E-04	7.31E-02	PF	6	2.18E+00	C1
K	7.86E-01	1.97E-06	2.05E-04	1.52E-02	PF	5		
Mo	4.13E-01	4.20E-07	4.38E-05	3.24E-03	PF	5	2.55E+00	C1
Na	7.95E+01	3.38E-04	3.52E-02	2.60E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	2.99E+01	4.88E-06	6.62E-03	4.89E-01	PF	4		
NO ₃	1.24E+02	1.50E-05	2.04E-02	1.50E+00	PF	4		
OH	1.24E+00	7.13E-06	7.43E-04	5.49E-02	PF	5	2.88E+00	C2 as NaOH
P	3.81E+00	1.20E-05	1.25E-03	9.24E-02	PF	5		
PO ₄	1.74E+01	2.15E-05	2.24E-03	1.66E-01	PF	5		
Pu	1.88E-04	7.53E-11	7.85E-09	5.79E-07	PF	5		
SiO ₃ ⁹	1.22E+00	1.56E-06	1.63E-04	1.20E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	7.86E+00	8.88E-07	8.34E-04	6.16E-02	PF	4		
Sr	5.13E-03	5.69E-09	5.94E-07	4.38E-05	PF	5		
TOC gC/l ¹⁷	3.73E+00	3.04E-05	3.17E-03	2.34E-01	PF	5		
U, g/l	1.83E+02	7.51E-05	7.83E-03	5.78E-01	PF	5	5.14E+03	C1

Tank Farm 241-BX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
ZrO ⁹	3.36E-01	3.07E-07	3.20E-05	2.36E-03	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	1.20E+00	3.31E-09	4.97E-07	2.55E-05	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	3.20E+04	8.89E-13	1.33E-10	6.85E-09	PF	6	2.0E-11	B
C 14 ⁹	4.76E+00	1.32E-08	1.98E-06	1.02E-04	PF	6	6.0E-06	B
Cm 242 ⁹	8.22E-03	4.56E-14	6.84E-12	3.51E-10	PF	6	7.0E-10	B
Cm 244 ⁹	1.13E-03	2.68E-12	4.02E-10	2.06E-08	PF	6	4.0E-11	B
Cs 137	5.10E+04	8.53E-06	1.92E-02	9.84E-01	PF	4	4.0E-07	B
I 129 ⁹	4.76E-03	1.84E-09	6.62E-08	1.02E-07	PF	6	7.0E-08	B
Np 237 ⁹	1.60E-02	4.45E-11	6.67E-09	3.42E-07	PF	6	1.2E-12	B
Pu 238 ⁹	1.60E-01	4.31E-10	6.46E-08	3.32E-06	PF	6	2.1E-12	B
Pu 239/240	1.15E+01	3.19E+08	4.79E-06	2.46E-04	PF	5	2.0E-12	B
Pu 241 ⁹	1.60E+01	3.68E-08	5.52E-06	2.84E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	2.42E-07	6.55E-19	6.29E-15	3.23E-13	PF	6	3.0E-08	B
Se 79 ⁹	9.52E-02	2.64E-10	3.97E-08	2.04E-06	PF	6	1.0E-06	B
Sr 89/90	8.53E+02	1.43E-08	3.22E-04	1.65E-02	PF	4	9.0E-09	B
Tc 99 ⁹	3.20E+00	8.90E-09	1.33E-06	6.85E-05	PF	6	2.0E-06	B
U 238	1.29E+02	3.58E-07	5.37E-05	2.76E-03	PF	5	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tab	1		

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Note: 1. All tanks in the BX farm, except BX-107, viscosity estimated assuming 40 vol.% solids. Tank BX-107 used 37.8 vol.% solids from characterization data in WHC-SD-WM-DP-028, Rev. O-A.

Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.

Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. However HCN, hydrazine and nitrogen oxides reported as less than values in the vapor at 2 ppm, 0.2 ppm, 0.5 ppm respectively for tank BX-106, 110, and 111.

Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.

Note: 5. Estimated future vapor composition based on stated retrieval model.

Note: 6. TRAC data deemed 6. Tanks BX-101, and 102 analytical data deemed 5 due to sludge sample. Data for tank BX-103 denoted 5 invalidated due to post sample tank transfers. To obtain minimal positive moles of water and a reasonable density citrate values were reduced by a factor of 100 in tanks BX-105 and 106, and hydroxide reduced by a factor of 10 in tank BX-105. The density of tank BX-104 was adjusted from 1.21 to 1.25 to obtain positive moles of water.

Note: 7. Allowable concentration, in ppm by volume.

Note: 9. TRAC data used to estimate concentration.

Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).

Note: 13. As cyanide compounds.

Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate. Maximum ammonia measured in vapor space from 3 samples for tanks BX-106, 110, and 111 as reported in WHC internal memos. The solubility used in the CVD model for tributyl phosphate in tank BX-107 not corrected for salts.

Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile. Recent vapor analysis for tanks BX-106 and 110 indicate TOC in vapor at 3.5 ppm and 5.3-7 ppm respectively.

Note: 18. Radionuclides decayed to current year (rounded to nearest year).

Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-BY Vapor Estimates

Sample Type	SN		Tank:	241-BY-101				
Sample Date	8/16/72		Contents:	Saltcake/ Sludge				
Sample ID			Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping/Sluicing				
pH	13.83							
Density, g/ml	1.42							
Temperature, R	534							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.69E-09	2.77E-15	2.94E-13	1.55E-11	PF	6	2.27E-03	C1
Al	8.19E+01	2.46E-04	2.61E-02	1.37E+00	PF	6	9.06E+00	C1
Ba	1.02E-03	6.07E-10	6.43E-08	3.38E-06	PF	6	8.92E-02	C1
Bi	3.00E-16	1.17E-22	1.24E-20	6.51E-19	PF	6		
C ₆ H ₅ O ₇ anion	3.89E+01	2.36E-04	8.50E-03	1.32E+00	PF	6		
Ca	1.37E-07	2.77E-13	2.94E-11	1.55E-09	PF	6	6.11E+00	C1 as CaCO ₃
Ce	8.87E-03	5.15E-09	5.46E-07	2.87E-05	PF	6		
Cl	7.51E-09	1.09E-15	1.85E-12	9.71E-11	PF	6		
CO ₃	4.10E+01	5.54E-05	5.88E-03	3.09E-01	PF	6		
F	1.30E+00	3.26E-07	5.88E-04	3.09E-02	PF	6	3.22E+00	C1
Fe	2.32E+00	3.37E-06	3.57E-04	1.88E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	8.87E-02	3.40E-08	3.60E-06	1.89E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.82E-03	1.06E-09	1.12E-07	5.91E-06	PF	6		
K	2.66E-01	5.54E-07	5.88E-05	3.09E-03	PF	6		
Mn	3.75E-02	5.54E-08	5.88E-06	3.09E-04	PF	6	2.22E+00	C2, D
Na	2.66E+02	9.40E-04	9.96E-02	5.24E+00	PF	6	2.13E+00	C2 as NaOH
Ni	1.02E-04	1.41E-10	1.49E-08	7.86E-07	PF	6	4.14E-02	C1, D
NO ₂	1.23E+02	1.67E-05	2.30E-02	1.21E+00	PF	6		
NO ₃	7.51E+02	7.56E-05	1.04E-01	5.48E+00	PF	6		
OH	1.16E+01	5.54E-05	5.88E-03	3.09E-01	PF	6	2.88E+00	C2 as NaOH
Pb	2.12E-06	8.30E-13	8.80E-11	4.63E-09	PF	6	5.91E-03	C1, A, D
PO ₄	3.41E+01	3.51E-05	3.72E-03	1.96E-01	PF	6		
SiO ₃	5.19E+00	5.54E-06	5.88E-04	3.09E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.98E+01	1.86E-06	1.77E-03	9.33E-02	PF	6		
Sr	5.39E-03	4.98E-09	5.27E-07	2.77E-05	PF	6		

Tank .rm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
ZrO	1.09E-03	8.29E-10	8.79E-08	4.62E-06	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	5.53E+01	1.53E-07	1.94E-05	8.51E-04	PF	6	2.0E-11	B ¹⁹
Am 243	6.83E-02	1.90E-10	2.40E-08	1.06E-06	PF	6	2.0E-11	B
C 14	1.37E+02	3.79E-07	4.80E-05	2.11E-03	PF	6	6.0E-06	B
Cm 242	6.83E-02	3.79E-13	4.80E-11	2.11E-09	PF	6	7.0E-10	B
Cm 244	1.37E+00	3.25E-09	4.12E-07	1.81E-05	PF	6	4.0E-11	B
Cs 137	3.11E+05	3.27E-05	6.22E-02	2.73E+00	PF	5	4.0E-07	B
Cs 134	2.30E+03	4.38E-09	5.55E-07	2.44E-05	PF	5	4.0E-07	B
I 129	4.06E-01	1.57E-07	5.64E-06	6.28E-06	PF	6	7.0E-08	B
Np 237	6.83E-01	1.90E-09	2.40E-07	1.06E-05	PF	6	1.2E-12	B
Pu 238	8.12E-02	2.18E-10	2.77E-08	1.22E-06	PF	6	2.1E-12	B
Pu 239/240	3.50E-02	9.73E-11	1.23E-08	5.43E-07	PF	6	2.0E-12	B
Pu 241	1.37E-02	3.14E-11	3.98E-09	1.75E-07	PF	6	1.0E-10	B
RuRh 106	1.37E-04	3.69E-16	3.00E-12	1.32E-10	PF	6	3.0E-08	B
Se 79	6.83E+00	1.90E-08	2.40E-06	1.06E-04	PF	6	1.0E-06	B
Sr 89/90	2.40E+05	4.02E-06	7.65E-02	3.36E+00	PF	6	9.0E-09	B
Tc 99	2.77E+02	7.69E-07	9.74E-05	4.28E-03	PF	6	2.0E-06	B
U 238	3.50E-02	9.74E-11	1.23E-08	5.43E-07	PF	6	1.0E-10	B
water		2.94E+04	2.94E+04	2.94E+04	Stm Ta	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	SN		Tank:	241-BY-102				
Sample Date	6/3/91d		Contents:	Saltcake				
Sample ID	R-8081		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.5E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.42							
Temperature, R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	5.99E-02	2.20E-08	4.78E-06	1.06E-04	PF	5	2.27E-03	C1
Al	1.87E+01	2.74E-05	5.96E-03	1.32E-01	PF	5	9.06E+00	C1
As	1.76E-06	9.30E-13	2.02E-10	4.47E-09	PF	5	6.52E-02	C1
Ba	2.61E-02	7.55E-09	1.64E-06	3.63E-05	PF	5	8.92E-02	C1
Bi	3.17E-01	6.01E-08	1.31E-05	2.89E-04	PF	5		
C ₆ H ₅ O ₇ anion	1.47E+01	3.45E-06	6.70E-04	1.66E-02	PF	6		
Ca	1.41E-02	1.40E-08	3.03E-06	6.72E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce	8.45E-01	2.39E-07	5.20E-05	1.15E-03	PF	5		
Cl	2.17E-09	1.53E-16	5.33E-13	1.18E-11	PF	6		
CN	2.07E-02	3.15E-08	6.85E-06	1.52E-04	PF	5	4.70E+00	C1, D
CO ₃	3.10E-04	2.05E-10	4.45E-08	9.85E-07	PF	5		
Cr	5.21E-01	8.81E-08	8.63E-05	1.91E-03	PF	4	2.35E-01	C1, D
Cu	5.21E-02	3.23E-08	7.01E-06	1.55E-04	PF	5	3.82E-01	C1
F	1.58E-03	1.94E-10	7.16E-07	1.59E-05	PF	4	3.22E+00	C1
Fe	3.59E-02	2.54E-08	5.52E-06	1.22E-04	PF	5	2.18E+00	C1
Fe (CN) ₆	4.18E-02	7.82E-09	1.70E-06	3.76E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.08E-03	1.47E-10	3.19E-08	7.05E-07	PF	6		
K	4.15E+00	4.22E-06	9.16E-04	2.03E-02	PF	5		
La	9.15E-02	2.61E-08	5.67E-06	1.25E-04	PF	5		
Mg	1.90E-01	3.14E-07	6.82E-05	1.51E-03	PF	5	1.02E+01	C1
Mn	1.32E-02	9.49E-09	2.06E-06	4.56E-05	PF	6	2.22E+00	C2, D
Mo	6.41E-02	2.65E-08	5.75E-06	1.27E-04	PF	5	2.55E+00	C1
Na	5.64E+00	9.71E-06	2.11E-03	4.67E-02	PF	5	2.13E+00	C2 as NaOH
Ni	5.07E-02	3.40E-08	7.40E-06	1.64E-04	PF	5	4.14E-02	C1, D
NO ₂	5.35E+01	3.54E-06	1.00E-02	2.22E-01	PF	4		
NO ₃	1.27E+02	6.24E-06	1.76E-02	3.90E-01	PF	4		

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
OH	4.59E+01	1.07E-04	2.32E-02	5.15E-01	PF	5	2.88E+00	C2 as NaOH
Pb	5.14E-01	9.84E-08	2.14E-05	4.73E-04	PF	5	5.91E-03	C1, A, D
PO ₄	1.41E-01	7.07E-08	1.54E-05	3.40E-04	PF	5		
Se	1.20E-04	6.02E-11	1.31E-08	2.90E-07	PF	5	6.19E-02	C1, D
Si	3.38E-01	4.78E-07	1.04E-04	2.30E-03	PF	5	8.73E+00	C1
SO ₄	1.55E+01	7.10E-07	1.39E-03	3.08E-02	PF	4		
Sr	1.06E-02	4.77E-09	1.04E-06	2.30E-05	PF	5		
TOC gC/l ¹⁷	2.20E+00	7.26E-06	1.58E-03	3.49E-02	PF	5		
Ta	1.34E-01	2.93E-08	6.37E-06	1.41E-04	PF	5	6.75E-01	C1
Ti	3.59E-02	2.96E-08	6.44E-06	1.43E-04	PF	5		
Zr	1.13E-01	4.92E-08	1.07E-05	2.37E-04	PF	5	1.34E+00	C1, C3
ZrO	2.71E-04	1.00E-10	2.18E-08	4.83E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.55E+01	4.28E-08	5.42E-06	2.06E-04	PF	6	2.0E-11	B ¹⁹
Am 243	2.30E-02	6.39E-11	8.11E-09	3.08E-07	PF	6	2.0E-11	B
C 14	3.98E+01	1.10E-07	1.40E-05	5.31E-04	PF	6	6.0E-06	B
Cm 242	3.14E-02	1.74E-13	2.21E-11	8.38E-10	PF	6	7.0E-10	B
Cm 244	3.14E-01	7.48E-10	9.49E-08	3.60E-06	PF	6	4.0E-11	B
Cs 137	2.20E+05	3.77E-05	7.17E-02	2.72E+00	PF	4	4.0E-07	B
I 129	1.55E+01	5.98E-08	2.15E-06	2.07E-06	PF	6	7.0E-08	B
Np 237	3.14E-01	8.72E-10	1.11E-07	4.20E-06	PF	6	1.2E-12	B
Pu 238	1.61E-01	4.34E-10	5.50E-08	2.09E-06	PF	6	2.1E-12	B
Pu 239/240	4.61E-03	1.28E-11	1.62E-09	6.15E-08	PF	6	2.0E-12	B
Pu 241	1.57E-03	3.61E-12	4.58E-10	1.74E-08	PF	6	1.0E-10	B
RuRh 106	6.28E-05	1.70E-16	1.38E-12	5.23E-11	PF	6	3.0E-08	B
Se 79	2.30E+00	6.40E-09	8.11E-07	3.08E-05	PF	6	1.0E-06	B
Sr 89/90	4.20E+02	7.22E-09	1.37E-04	5.21E-03	PF	6	9.0E-09	B
Tc 99	4.60E+02	1.28E-06	1.62E-04	6.15E-03	PF	5	2.0E-06	B
U 238	3.14E-01	8.72E-10	1.11E-07	4.20E-06	PF	6	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	DL		Tank:	241-BY-103				
Sample Date	6/3/91d		Contents:	Saltcake/ Sludge				
Sample ID	R-8088		Watchlist:	FeCN				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.0E-01		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	2.24							
Temperature, R	542							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.45E-10	4.97E-17	7.35E-15	2.81E-14	PF	6	2.27E-03	C1
Al	2.65E+01	3.62E-05	5.36E-03	2.05E-02	PF	5	9.06E+00	C1
As	1.80E-06	8.85E-13	1.31E-10	5.01E-10	PF	5	6.52E-02	C1
Ba	6.90E-04	1.86E-10	2.75E-08	1.05E-07	PF	5	8.92E-02	C1
Bi	1.03E-02	1.82E-09	2.69E-07	1.03E-06	PF	5		
C ₆ H ₅ O ₇ anion	2.51E+00	1.04E-04	3.75E-03	5.89E-02	PF	6		
Ca	2.07E-03	1.91E-09	2.82E-07	1.08E-06	PF	5	6.11E+00	C1 as CaCO ₃
Ce	4.62E-04	1.22E-10	1.80E-08	6.89E-08	PF	6		
Cd	1.38E-03	4.54E-10	6.72E-08	2.57E-07	PF	5	5.46E-04	C1, C2, D
Cl	2.31E-10	1.52E-17	3.60E-14	1.38E-13	PF	6		
CO ₃	1.22E+03	7.52E-04	1.11E-01	4.26E-01	PF	5		
Cr	3.74E-01	5.89E-08	3.93E-05	1.50E-04	PF	4	2.35E-01	C1, D
F	5.02E+01	5.73E-06	1.44E-02	5.51E-02	PF	6	3.22E+00	C1
Fe	5.66E-02	3.73E-08	5.52E-06	2.11E-05	PF	5	2.18E+00	C1
Fe(CN) ₆	1.85E-01	3.22E-08	4.76E-06	1.82E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.65E-04	2.08E-11	3.07E-09	1.18E-08	PF	6		
K	4.07E+00	3.85E-06	5.70E-04	2.18E-03	PF	5		
Mg	2.07E-03	3.18E-09	4.71E-07	1.80E-06	PF	5	1.02E+01	C1
Mn	6.90E-04	4.63E-10	6.85E-08	2.62E-07	PF	5	2.22E+00	C2, D
Mo	3.66E-02	1.41E-08	2.08E-06	7.96E-06	PF	5	2.55E+00	C1
Na	1.37E+02	2.20E-04	3.25E-02	1.24E-01	PF	5	2.13E+00	C2 as NaOH
Ni	1.19E-01	7.43E-08	1.10E-05	4.20E-05	PF	6	4.14E-02	C1, D
NO ₂	4.34E+00	2.68E-07	5.15E-04	1.97E-03	PF	4		
NO ₃	1.31E+01	5.99E-07	1.15E-03	4.41E-03	PF	4		
OH	7.51E+02	1.63E-03	2.41E-01	9.22E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.04E-01	1.85E-08	2.74E-06	1.05E-05	PF	5	5.91E-03	C1, A, D

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Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
PO ₄	1.45E+00	6.77E-07	1.00E-04	3.83E-04	PF	5		
Se	7.60E-06	3.55E-12	5.25E-10	2.01E-09	PF	5	6.19E-02	C1, D
Si	3.79E-02	4.99E-08	7.39E-06	2.82E-05	PF	5	8.73E+00	C1
SiO ₃	3.04E-01	1.47E-07	2.18E-05	8.34E-05	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.97E+00	2.12E-07	2.83E-04	1.08E-03	PF	4		
Sn	3.31E-02	1.03E-08	1.52E-06	5.81E-06	PF	5	4.11E-01	C1
Sr	6.90E-04	2.89E-10	4.28E-08	1.64E-07	PF	5		
TOC gC/l ¹⁷	2.73E+00	8.39E-06	1.24E-03	4.75E-03	PF	5		
ZrO	2.84E-03	9.79E-10	1.45E-07	5.54E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.34E+02	3.69E-07	2.97E-05	2.09E-04	PF	6	2.0E-11	B ¹⁹
Am 243	8.57E-03	2.38E-11	1.91E-09	1.35E-08	PF	6	2.0E-11	B
C 14	8.57E+00	2.38E-08	1.91E-06	1.35E-05	PF	6	6.0E-06	B
Cm 242	1.20E-02	6.63E-14	5.33E-12	3.75E-11	PF	6	7.0E-10	B
Cm 244	5.35E-02	1.28E-10	1.03E-08	7.22E-08	PF	6	4.0E-11	B
Cs 137	5.43E+02	9.31E-08	1.12E-04	7.90E-04	PF	4	4.0E-07	B
I 129	1.96E-02	7.58E-09	2.73E-07	3.09E-08	PF	6	7.0E-08	B
Np 237	4.10E-02	1.14E-10	9.16E-09	6.45E-08	PF	6	1.2E-12	B
Pu 238	1.32E+01	3.55E-08	2.86E-06	2.01E-05	PF	6	2.1E-12	B
Pu 239/240	7.14E+02	1.98E-06	1.59E-04	1.12E-03	PF	6	2.0E-12	B
Pu 241	1.96E+03	4.52E-06	3.63E-04	2.56E-03	PF	6	1.0E-10	B
RuRh 106	1.32E-02	3.57E-14	1.84E-10	1.29E-09	PF	6	3.0E-08	B
Se 79	3.93E-01	1.09E-09	8.76E-08	6.17E-07	PF	6	1.0E-06	B
Sr 89/90	2.33E+02	4.01E-09	4.83E-05	3.40E-04	PF	4	9.0E-09	B
To 99	1.17E+02	3.25E-07	2.61E-05	1.84E-04	PF	5	2.0E-06	B
U 238	3.39E+00	9.42E-09	7.57E-07	5.33E-06	PF	6	1.0E-10	B
water		3.95E+04	3.95E+04	3.95E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	Saltcake		Tank:	241-BY-104				
Sample Date	11/12/92d		Contents:	Saltcake/ Sludge				
Sample ID	R-1773		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.0E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.75							
Temperature, R	589							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.51E-09	1.23E-15	2.27E-13	8.25E-12	PF	6	2.27E-03	C1
Al	1.41E+02	1.98E-04	3.65E-02	1.32E+00	PF	5	9.06E+00	C1
Ba	7.35E-02	2.03E-08	3.75E-06	1.36E-04	PF	5	8.92E-02	C1
Bi	6.51E+00	1.18E-06	2.17E-04	7.88E-03	PF	6		
C ₆ H ₅ O ₇ anion	4.94E+01	1.53E-05	1.83E-03	1.02E-01	PF	6		
Ca	2.56E+00	2.42E-06	4.47E-04	1.62E-02	PF	5	6.11E+00	C1 as CaCO ₃
Ce	9.11E-03	2.46E-09	4.54E-07	1.65E-05	PF	6		
Cd	1.72E-01	5.81E-08	1.07E-05	3.89E-04	PF	5	5.46E-04	C1, C2, D
Cl	3.40E+00	2.30E-07	6.79E-04	2.46E-02	PF	5		
CN	1.21E-01	1.76E-07	3.25E-05	1.18E-03	PF	5	4.70E+00	C1,D
Co	1.17E-01	7.50E-08	1.39E-05	5.02E-04	PF	5	2.07E-02	C1, D
CO ₃	1.17E+02	7.38E-05	1.36E-02	4.94E-01	PF	6		
Cr	2.94E+01	4.75E-06	3.95E-03	1.43E-01	PF	5	2.35E-01	C1, D
Cu	7.88E-02	4.66E-08	8.60E-06	3.12E-04	PF	5	3.82E-01	C1
F	1.18E+01	1.38E-06	4.34E-03	1.57E-01	PF	5	3.22E+00	C1
Fe	1.24E+01	8.38E-06	1.55E-03	5.61E-02	PF	5	2.18E+00	C1
Fe (CN) ₆	9.11E+00	1.63E-06	3.00E-04	1.09E-02	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.64E-03	4.70E-10	8.69E-08	3.15E-06	PF	6		
K	5.25E+00	5.09E-06	9.40E-04	3.41E-02	PF	5		
Mg	2.63E-01	4.15E-07	7.66E-05	2.78E-03	PF	5	1.02E+01	C1
Mn	6.42E-01	4.42E-07	8.15E-05	2.96E-03	PF	5	2.22E+00	C2, D
Mo	4.57E-02	1.80E-08	3.33E-06	1.21E-04	PF	5	2.55E+00	C1
Na	2.80E+02	4.61E-04	8.50E-02	3.08E+00	PF	5	2.13E+00	C2 as NaOH
Ni	7.00E+00	4.49E-06	8.29E-04	3.00E-02	PF	5	4.14E-02	C1, D
NO ₂	2.08E+01	1.32E-06	3.16E-03	1.15E-01	PF	5		
NO ₃	8.58E+01	4.03E-06	9.67E-03	3.50E-01	PF	5		

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
P	7.18E+00	8.76E-06	1.62E-03	5.87E-02	PF	5		
PO ₄	1.01E+01	4.84E-06	8.93E-04	3.24E-02	PF	5		
Se	3.50E+00	1.68E-06	3.09E-04	1.12E-02	PF	5	6.19E-02	C1, D
Si	1.59E+00	2.15E-06	3.97E-04	1.44E-02	PF	5	8.73E+00	C1
SO ₄	4.64E+01	2.03E-06	3.38E-03	1.22E-01	PF	5		
Sr	2.89E+00	1.24E-06	2.29E-04	8.32E-03	PF	5		
TOC gC/l ¹⁷	1.59E+01	5.01E-05	9.26E-03	3.36E-01	PF	5		
U, g/l	6.51E+00	1.03E-06	1.91E-04	6.93E-03	PF	5	5.14E-03	C1
Zn	1.75E-01	1.02E-07	1.88E-05	6.82E-04	PF	5		
Zr	1.23E-01	5.11E-08	9.44E-06	3.42E-04	PF	5	1.34E+00	C1, C3
ZrO	1.37E+00	4.83E-07	8.92E-05	3.23E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.80E+02	4.99E-07	5.13E-05	3.34E-03	PF	5	2.0E-11	B ¹⁹
Am 243	9.85E-02	2.73E-10	2.81E-08	1.83E-06	PF	6	2.0E-11	B
C 14	1.32E+02	3.66E-07	3.77E-05	2.45E-03	PF	6	6.0E-06	B
Cm 242	1.76E-01	9.75E-13	1.00E-10	6.53E-09	PF	6	7.0E-10	B
Cm 244	1.30E+00	3.10E-09	3.19E-07	2.08E-05	PF	6	4.0E-11	B
Cs 137	2.03E+05	3.57E-05	5.51E-02	3.58E+00	PF	5	4.0E-07	B
I 129	4.57E-01	1.77E-07	6.35E-06	8.50E-06	PF	6	7.0E-08	B
Np 237	6.51E-01	1.81E-09	1.86E-07	1.21E-05	PF	6	1.2E-12	B
Pu 238	2.64E+01	7.10E-08	7.30E-06	4.75E-04	PF	6	2.1E-12	B
Pu 239/240	1.22E+02	3.40E-07	3.50E-05	2.28E-03	PF	5	2.0E-12	B
Pu 241	6.51E+01	1.50E-07	1.54E-05	1.00E-03	PF	6	1.0E-10	B
RuRh 106	1.93E-04	5.22E-16	3.44E-12	2.24E-10	PF	6	3.0E-08	B
Se 79	6.51E+00	1.81E-08	1.86E-06	1.21E-04	PF	6	1.0E-06	B
Sr 89/90	2.50E+05	4.41E-06	6.80E-02	4.43E+00	PF	5	9.0E-09	B
Tc 99	2.64E+02	7.33E-07	7.54E-05	4.90E-03	PF	6	2.0E-06	B
U 238	4.59E+00	1.28E-08	1.31E-06	8.54E-05	PF	5	1.0E-10	B
water		1.05E+05	1.05E+05	1.05E+05	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	DL		Tank:	241-BY-105				
Sample Date	6/3/91d		Contents:	Saltcake/ Sludge				
Sample ID	R-8092		Watchlist:	FeCN				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	3.3E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.95							
Temperature, R	574							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	5.00E-02	2.93E-08	2.91E-06	5.44E-05	PF	5	2.27E-03	C1
Al	5.07E+00	1.19E-05	1.18E-03	2.20E-02	PF	5	9.06E+00	C1
As	9.00E-08	7.60E-14	7.52E-12	1.41E-10	PF	5	6.52E-02	C1
Ba	2.00E-02	9.24E-09	9.15E-07	1.71E-05	PF	5	8.92E-02	C1
Bi	3.07E-01	9.30E-08	9.21E-06	1.72E-04	PF	5		
C ₆ H ₅ O ₇ anion	2.99E+01	1.33E-03	4.77E-02	2.46E+00	PF	6		
Ca	2.10E+00	3.32E-06	3.29E-04	6.16E-03	PF	6	6.11E+00	C1 as CaCO ₃
Ce	7.14E-01	3.23E-07	3.20E-05	5.98E-04	PF	5		
Cl	3.73E-09	4.22E-16	6.68E-13	1.25E-11	PF	6		
CO ₃	1.22E+03	1.29E-03	1.28E-01	2.39E+00	PF	5		
Cr	2.36E-01	6.38E-08	2.85E-05	5.32E-04	PF	4	2.35E-01	C1, D
Cu	4.50E-02	4.45E-08	4.41E-06	8.25E-05	PF	5	3.82E-01	C1
F	9.98E-01	1.95E-07	3.29E-04	6.16E-03	PF	6	3.22E+00	C1
Fe	3.83E+00	4.33E-06	4.29E-04	8.03E-03	PF	6	2.18E+00	C1
Fe (CN) ₆	4.99E+00	1.49E-06	1.48E-04	2.76E-03	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.47E-03	3.18E-10	3.15E-08	5.89E-07	PF	6		
K	1.71E+00	2.78E-06	2.75E-04	5.14E-03	PF	5		
Mg	7.14E-02	1.88E-07	1.87E-05	3.49E-04	PF	5	1.02E+01	C1
Mn	2.57E-02	2.96E-08	2.93E-06	5.49E-05	PF	6	2.22E+00	C2, D
Mo	3.57E-02	2.35E-08	2.33E-06	4.36E-05	PF	5	2.55E+00	C1
Na	1.14E+02	3.14E-04	3.11E-02	5.81E-01	PF	5	2.13E+00	C2 as NaOH
Ni	3.10E+00	3.32E-06	3.29E-04	6.16E-03	PF	6	4.14E-02	C1, D
NO ₂	1.57E+01	1.66E-06	2.14E-03	4.00E-02	PF	4		
NO ₃	2.64E+02	2.07E-05	2.67E-02	5.00E-01	PF	4		
OH	2.07E+02	7.72E-04	7.65E-02	1.43E+00	PF	5	2.88E+00	C2 as NaOH
Pb	7.88E-07	2.41E-13	2.39E-11	4.46E-10	PF	6	5.91E-03	C1, A, D

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
PO ₄	5.25E+00	4.21E-06	4.17E-04	7.80E-03	PF	6		
Se	7.00E-05	5.61E-11	5.56E-09	1.04E-07	PF	5	6.19E-02	C1, D
Si	2.57E-01	5.81E-07	5.75E-05	1.08E-03	PF	5	8.73E+00	C1
SiO ₃	3.99E+00	3.32E-06	3.29E-04	6.16E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.00E+01	1.46E-06	1.31E-03	2.44E-02	PF	4		
Sr	9.29E-03	6.68E-09	6.62E-07	1.24E-05	PF	5		
TOC gC/l ¹⁷	2.97E+00	1.57E-05	1.55E-03	2.90E-02	PF	5		
Ta	1.29E+00	4.51E-07	4.47E-05	8.36E-04	PF	5	6.75E-01	C1
Ti	3.14E-02	4.14E-08	4.10E-06	7.67E-05	PF	5		
Zr	9.29E-02	6.46E-08	6.40E-06	1.20E-04	PF	5	1.34E+00	C1, C3
ZrO	5.78E-01	3.42E-07	3.38E-05	6.33E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	7.95E+01	2.19E-07	2.02E-05	4.06E-04	PF	6	2.0E-11	B ¹⁹
Am 243	1.70E+02	4.73E-07	4.37E-05	8.76E-04	PF	5	2.0E-11	B
C 14	5.68E+01	1.58E-07	1.45E-05	2.92E-04	PF	6	6.0E-06	B
Cm 242	9.51E-02	5.27E-13	4.87E-11	9.77E-10	PF	6	7.0E-10	B
Cm 244	5.25E-01	1.25E-09	1.16E-07	2.32E-06	PF	6	4.0E-11	B
Cs 137	7.50E+04	1.29E-05	1.78E-02	3.57E-01	PF	4	4.0E-07	B
I 129	2.70E-01	1.04E-07	3.75E-06	1.39E-06	PF	6	7.0E-08	B
Np 237	5.25E-01	1.46E-09	1.35E-07	2.70E-06	PF	6	1.2E-12	B
Pu 238	5.25E+00	1.41E-08	1.30E-06	2.62E-05	PF	6	2.1E-12	B
Pu 239/240	5.68E+01	1.58E-07	1.46E-05	2.92E-04	PF	6	2.0E-12	B
Pu 241	4.26E+01	9.79E-08	9.04E-06	1.81E-04	PF	6	1.0E-10	B
RuRh 106	1.32E-04	3.57E-16	2.11E-12	4.23E-11	PF	6	3.0E-08	B
Se 79	5.25E+00	1.46E-08	1.35E-06	2.70E-05	PF	6	1.0E-06	B
Sr 89/90	1.40E+01	2.41E-10	3.33E-06	6.69E-05	PF	4	9.0E-09	B
To 99	3.00E+01	8.33E-08	7.69E-06	1.54E-04	PF	5	2.0E-06	B
U 238	1.05E+01	2.92E-08	2.69E-06	5.41E-05	PF	6	1.0E-10	B
water		8.42E+04	8.42E+04	8.42E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	DL		Tank:	241-BY-106				
Sample Date	6/3/91d		Contents:	Saltcake/ Sludge				
Sample ID	R-8083		Watchlist:	FeCN				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	4.9E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.46							
Temperature, R	587							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	5.48E-02	2.03E-08	4.25E-06	3.03E-04	PF	5	2.27E-03	C1
Al	2.94E+01	4.36E-05	9.12E-03	6.50E-01	PF	5	9.06E+00	C1
As	2.00E-03	1.07E-09	2.23E-07	1.59E-05	PF	5	6.52E-02	C1
Ba	2.10E-02	6.14E-09	1.28E-06	9.15E-05	PF	5	8.92E-02	C1
Bi	3.15E-01	6.03E-08	1.26E-05	8.99E-04	PF	5		
C ₆ H ₅ O ₇ anion	2.35E-13	6.31E-20	1.04E-17	9.41E-16	PF	6		
Ca	1.37E-02	1.37E-08	2.87E-06	2.04E-04	PF	5	6.11E+00	C1 as CaCO ₃
Ce	8.22E-01	2.35E-07	4.92E-05	3.50E-03	PF	5		
Cl	4.53E-09	3.23E-16	1.08E-12	7.71E-11	PF	6		
CO ₃	1.74E+01	1.16E-05	2.43E-03	1.73E-01	PF	5		
Cr	4.04E-01	6.90E-08	6.51E-05	4.64E-03	PF	4	2.35E-01	C1, D
Cu	5.00E-02	3.13E-08	6.54E-06	4.66E-04	PF	5	3.82E-01	C1
F	8.23E-01	1.02E-07	3.63E-04	2.58E-02	PF	6	3.22E+00	C1
Fe	5.34E-02	3.82E-08	7.98E-06	5.69E-04	PF	5	2.18E+00	C1
Fe (CN) ₆	1.73E+00	3.26E-07	6.82E-05	4.86E-03	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	2.30E-03	3.15E-10	6.58E-08	4.69E-06	PF	6		
K	5.75E+00	5.90E-06	1.23E-03	8.80E-02	PF	5		
Mg	1.58E-01	2.63E-07	5.51E-05	3.93E-03	PF	5	1.02E+01	C1
Mn	2.26E-02	1.65E-08	3.44E-06	2.45E-04	PF	6	2.22E+00	C2, D
Mo	8.22E-02	3.43E-08	7.17E-06	5.11E-04	PF	5	2.55E+00	C1
Na	1.44E+02	2.51E-04	5.24E-02	3.74E+00	PF	5	2.13E+00	C2 as NaOH
Ni	5.00E-02	3.39E-08	7.10E-06	5.06E-04	PF	5	4.14E-02	C1, D
NO ₂	6.64E+01	4.44E-06	1.21E-02	8.61E-01	PF	4		
NO ₃	1.18E+02	5.86E-06	1.59E-02	1.14E+00	PF	4		
OH	4.93E+01	1.16E-04	2.43E-02	1.73E+00	PF	5	2.88E+00	C2 as NaOH
Pb	6.17E-07	1.19E-13	2.50E-11	1.78E-09	PF	6	5.91E-03	C1, A, D

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
PO ₄	2.35E+00	1.19E-06	2.49E-04	1.77E-02	PF	6		
Se	3.50E-04	1.77E-10	3.71E-08	2.64E-06	PF	5	6.19E-02	C1, D
Si	2.88E-01	4.12E-07	8.61E-05	6.14E-03	PF	5	8.73E+00	C1
SiO ₃	3.13E+00	1.65E-06	3.44E-04	2.45E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	3.29E+01	1.52E-06	2.87E-03	2.04E-01	PF	4		
Sn	9.59E-02	3.23E-08	6.75E-06	4.81E-04	PF	5	4.11E-01	C1
Sr	9.59E-04	4.36E-10	9.12E-08	6.50E-06	PF	5		
TOC gC/l ¹⁷	3.28E+00	1.09E-05	2.29E-03	1.63E-01	PF	5		
Ta	1.37E-01	3.03E-08	6.34E-06	4.52E-04	PF	5	6.75E-01	C1
Ti	3.36E-02	2.80E-08	5.86E-06	4.18E-04	PF	5		
Zr	9.59E-02	4.22E-08	8.82E-06	6.29E-04	PF	5	1.34E+00	C1, C3
ZrO	1.11E-03	4.16E-10	8.69E-08	6.19E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	4.89E+01	1.35E-07	1.66E-05	2.01E-03	PF	6	2.0E-11	B ¹⁹
Am 243	4.89E-02	1.36E-10	1.67E-08	2.03E-06	PF	6	2.0E-11	B
C 14	8.23E+01	2.28E-07	2.82E-05	3.41E-03	PF	6	6.0E-06	B
Cm 242	4.56E-02	2.53E-13	3.12E-11	3.77E-09	PF	6	7.0E-10	B
Cm 244	8.23E-01	1.96E-09	2.42E-07	2.92E-05	PF	6	4.0E-11	B
Cs 137	3.10E+05	5.32E-05	9.83E-02	1.19E+01	PF	4	4.0E-07	B
I 129	2.45E-01	9.45E-08	3.40E-06	1.01E-05	PF	6	7.0E-08	B
Np 237	4.11E-01	1.14E-09	1.41E-07	1.70E-05	PF	6	1.2E-12	B
Pu 238	4.11E+00	1.11E-08	1.37E-06	1.65E-04	PF	6	2.1E-12	B
Pu 239/240	1.45E+01	4.01E-08	4.95E-06	5.98E-04	PF	6	2.0E-12	B
Pu 241	1.67E+01	3.84E-08	4.73E-06	5.72E-04	PF	6	1.0E-10	B
RuRh 106	9.45E-05	2.55E-16	2.02E-12	2.44E-10	PF	6	3.0E-08	B
Se 79	4.11E+00	1.14E-08	1.41E-06	1.70E-04	PF	6	1.0E-06	B
Sr 89/90	1.10E+02	1.89E-09	3.50E-05	4.23E-03	PF	4	9.0E-09	B
Ta 99	8.70E+01	2.42E-07	2.98E-05	3.60E-03	PF	5	2.0E-06	B
U 238	8.23E-02	2.29E-10	2.82E-08	3.41E-06	PF	6	1.0E-10	B
water		1.02E+05	1.02E+05	1.02E+05	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	TRAC	Tank:	241-BY-107						
Sample Date	N/A	Contents:	Saltcake/ Sludge						
Sample ID	TRAC	Watchlist:	FeCN						
Properties	Value	Status:	IS / II						
Visc., lbm/ft-s ¹	6.8E-03	Retr. Method	Pumping/Sluicing						
pH	N/A								
Density, g/ml	1.2								
Temperature, R	542								
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Allowable ⁷	Regulatory Citation		
Ag ⁹	2.18E-09	1.32E-15	2.06E-13	1.48E-11	PF	6	2.27E-03	C1	
Al	4.57E+01	1.10E-04	1.72E-02	1.24E+00	PF	6	9.06E+00	C1	
Ba	5.16E-04	2.45E-10	3.84E-08	2.76E-06	PF	6	8.92E-02	C1	
Bi	2.09E+00	6.49E-07	1.02E-04	7.32E-03	PF	6			
C ₆ H ₅ O ₇ anion	1.89E+01	1.08E-05	1.02E-03	1.22E-01	PF	6			
Ca	2.78E-01	4.52E-07	7.08E-05	5.10E-03	PF	6	6.11E+00	C1 as CaCO ₃	
Ce	4.17E-03	1.94E-09	3.03E-07	2.18E-05	PF	6			
Cl	3.48E-09	4.04E-16	1.01E-12	7.28E-11	PF	6			
CO ₃	3.57E+01	3.88E-05	6.07E-03	4.37E-01	PF	6			
Cr	9.93E-02	2.76E-08	1.95E-05	1.40E-03	PF	6	2.35E-01	C1, D	
F	9.43E-01	1.90E-07	5.06E-04	3.64E-02	PF	6	3.22E+00	C1	
Fe	2.78E+00	3.23E-06	5.06E-04	3.64E-02	PF	6	2.18E+00	C1	
Fe (CN) ⁶	4.07E+00	1.25E-06	1.96E-04	1.41E-02	PF	6	5.77E-01	C1 as CN, D ¹³	
HEDTA ¹²	1.89E-03	4.19E-10	6.56E-08	4.72E-06	PF	6			
K	1.59E-01	2.65E-07	4.15E-05	2.99E-03	PF	6			
Mn	2.18E-02	2.58E-08	4.05E-06	2.91E-04	PF	6	2.22E+00	C2, D	
Na	9.63E+01	2.78E-04	4.35E-02	3.13E+00	PF	6	2.13E+00	C2 as NaOH	
Ni	3.48E+00	3.83E-06	6.00E-04	4.32E-02	PF	6	4.14E-02	C1, D	
NO ₂	9.14E+01	9.93E-06	2.02E-02	1.46E+00	PF	6			
NO ₃	3.67E+02	2.96E-05	6.04E-02	4.34E+00	PF	6			
OH	3.38E+01	1.29E-04	2.02E-02	1.46E+00	PF	6	2.88E+00	C2 as NaOH	
Pb	6.16E-07	1.93E-13	3.03E-11	2.18E-09	PF	6	5.91E-03	C1, A, D	
PO ₄	2.78E+00	2.29E-06	3.59E-04	2.58E-02	PF	6			
SiO ₃	2.98E+00	2.55E-06	3.99E-04	2.87E-02	PF	6	1.93E+00	C1 (Amorphous)	
SO ₄	9.53E+00	7.17E-07	1.01E-03	7.28E-02	PF	6			

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sr	1.79E+00	1.32E-06	2.07E-04	1.49E-02	PF	6		
ZrO	4.27E-01	2.60E-07	4.07E-05	2.93E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.90E+01	1.63E-07	2.44E-05	1.84E-03	PF	6	2.0E-11	B ¹⁹
Am 243	5.90E-02	1.64E-10	2.46E-08	1.85E-06	PF	6	2.0E-11	B
C 14	5.90E+01	1.64E-07	2.46E-05	1.85E-03	PF	6	6.0E-06	B
Cm 242	5.90E-02	3.27E-13	4.91E-11	3.69E-09	PF	6	7.0E-10	B
Cm 244	5.90E-01	1.41E-09	2.11E-07	1.59E-05	PF	6	4.0E-11	B
Cs 137	1.99E+05	3.32E-05	7.47E-02	5.61E+00	PF	6	4.0E-07	B
I 129	1.99E-01	7.67E-08	2.76E-06	6.22E-06	PF	6	7.0E-08	B
Np 237	5.10E-01	1.42E-09	2.12E-07	1.60E-05	PF	6	1.2E-12	B
Pu 238	6.98E+00	1.88E-08	2.82E-06	2.12E-04	PF	6	2.1E-12	B
Pu 239/240	3.49E+01	9.69E-08	1.45E-05	1.09E-03	PF	6	2.0E-12	B
Pu 241	2.95E+01	6.79E-08	1.02E-05	7.65E-04	PF	6	1.0E-10	B
RuRh 106	8.86E-05	2.39E-16	2.30E-12	1.73E-10	PF	6	3.0E-08	B
Se 79	4.03E+00	1.12E-08	1.68E-06	1.26E-04	PF	6	1.0E-06	B
Sr 89/90	1.50E+05	2.52E-06	5.67E-02	4.26E+00	PF	6	9.0E-09	B
Tc 99	1.99E+02	5.52E-07	8.27E-05	6.22E-03	PF	6	2.0E-06	B
U 238	5.10E+00	1.42E-08	2.12E-06	1.60E-04	PF	6	1.0E-10	B
water		3.95E+04	3.95E+04	3.95E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	TRAC		Tank:	241-BY-108				
Sample Date	N/A		Contents:	Sludge/ Saltcake				
Sample ID	TRAC		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	5.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.67							
Density, g/ml	1.2							
Temperature, R	557							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.71E-09	3.30E-15	3.50E-13	4.92E-11	PF	6	2.27E-03	C1
Al	6.60E+01	2.35E-04	2.49E-02	3.51E+00	PF	6	9.06E+00	C1
Ba	6.49E-04	4.55E-10	4.82E-08	6.79E-06	PF	6	8.92E-02	C1
Bi	2.43E-01	1.12E-07	1.19E-05	1.67E-03	PF	6		
C ₆ H ₅ O ₇ anion	4.40E+01	2.20E-04	7.93E-03	3.28E+00	PF	6		
Ca	4.63E-01	1.11E-06	1.18E-04	1.66E-02	PF	6	6.11E+00	C1 as CaCO ₃
Ce	8.11E-03	5.57E-09	5.90E-07	8.30E-05	PF	6		
Cl	8.23E-09	1.41E-15	2.39E-12	3.37E-10	PF	6		
CO ₃	4.98E+01	7.98E-05	8.46E-03	1.19E+00	PF	6		
Cr	1.16E-02	4.75E-09	2.27E-06	3.19E-04	PF	6	2.35E-01	C1, D
F	1.97E+00	5.86E-07	1.06E-03	1.49E-01	PF	6	3.22E+00	C1
Fe	2.78E+00	4.77E-06	5.06E-04	7.12E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	4.75E+00	2.15E-06	2.28E-04	3.21E-02	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.24E-03	1.06E-09	1.13E-07	1.59E-05	PF	6		
K	3.13E-01	7.71E-07	8.17E-05	1.15E-02	PF	6		
Mn	4.40E-02	7.69E-08	8.15E-06	1.15E-03	PF	6	2.22E+00	C2, D
Na	2.09E+02	6.71E-04	9.24E-02	1.30E+01	PF	6	2.13E+00	C2 as NaOH
Ni	4.05E+00	6.60E-06	7.00E-04	9.85E-02	PF	6	4.14E-02	C1, D
NO ₂	1.07E+02	1.71E-05	2.36E-02	3.32E+00	PF	6		
NO ₃	6.26E+02	7.46E-05	1.03E-01	1.45E+01	PF	6		
OH	7.88E+00	4.45E-05	4.72E-03	6.64E-01	PF	6	2.88E+00	C2 as NaOH
Pb	1.16E-06	5.38E-13	5.70E-11	8.02E-09	PF	6	5.91E-03	C1, A, D
PO ₄	4.40E+00	5.36E-06	5.68E-04	7.99E-02	PF	6		
SiO ₃	5.33E+00	6.74E-06	7.14E-04	1.00E-01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.11E+01	1.24E-06	1.18E-03	1.66E-01	PF	6		

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Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sr	1.07E-01	1.16E-07	1.23E-05	1.74E-03	PF	6		
ZrO	5.56E-03	4.99E-09	5.29E-07	7.45E-05	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	1.03E+02	2.85E-07	4.28E-05	4.25E-03	PF	6	2.0E-11	B ¹⁹
Am 243	1.03E-01	2.87E-10	4.30E-08	4.28E-06	PF	6	2.0E-11	B
C 14	6.89E+01	1.91E-07	2.87E-05	2.85E-03	PF	6	6.0E-06	B
Cm 242	1.16E-01	6.43E-13	9.64E-11	9.58E-09	PF	6	7.0E-10	B
Cm 244	1.03E+00	2.46E-09	3.69E-07	3.67E-05	PF	6	4.0E-11	B
Cs 137	2.32E+05	3.87E-05	8.71E-02	8.66E+00	PF	6	4.0E-07	B
I 129	3.44E-01	1.33E-07	4.79E-06	1.43E-05	PF	6	7.0E-08	B
Np 237	8.14E-01	2.26E-09	3.39E-07	3.37E-05	PF	6	1.2E-12	B
Pu 238	1.16E+01	3.12E-08	4.68E-06	4.65E-04	PF	6	2.1E-12	B
Pu 239/240	7.20E+01	2.00E-07	3.00E-05	2.98E-03	PF	6	2.0E-12	B
Pu 241	4.70E+01	1.08E-07	1.62E-05	1.61E-03	PF	6	1.0E-10	B
RuRh 106	1.22E-04	3.30E-16	3.17E-12	3.15E-10	PF	6	3.0E-08	B
Se 79	5.95E+00	1.65E-08	2.48E-06	2.46E-04	PF	6	1.0E-06	B
Sr 89/90	5.95E+04	9.98E-07	2.24E-02	2.23E+00	PF	6	9.0E-09	B
Tc 99	2.32E+02	6.44E-07	9.65E-05	9.60E-03	PF	6	2.0E-06	B
U 238	1.03E+00	2.87E-09	4.31E-07	4.28E-05	PF	6	1.0E-10	B
water		6.00E+04	6.00E+04	6.00E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type ⁸	SN		Tank:	241-BY-109				
Sample Date	6/3/91d		Contents:	Saltcake/ Sludge				
Sample ID	R-8094		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.3E-01		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.4							
Temperature, R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	5.00E-02	1.83E-08	4.05E-06	7.93E-06	PF	5	2.27E-03	C1
Al	2.06E+01	3.02E-05	6.66E-03	1.31E-02	PF	5	9.06E+00	C1
As	7.20E-07	3.80E-13	8.38E-11	1.64E-10	PF	5	6.52E-02	C1
Ba	2.00E-02	5.78E-09	1.27E-06	2.50E-06	PF	5	8.92E-02	C1
Bi	2.65E-01	5.02E-08	1.11E-05	2.17E-05	PF	5		
C ₆ H ₅ O ₇ anion	1.24E+01	1.04E-05	5.73E-04	4.49E-03	PF	6		
Ca	1.79E-02	1.77E-08	3.91E-06	7.66E-06	PF	5	6.11E+00	C1 as CaCO ₃
Ce	7.14E-01	2.02E-07	4.45E-05	8.72E-05	PF	5		
Cl	2.09E-09	1.48E-16	5.21E-13	1.02E-12	PF	6		
CO ₃	4.64E-04	3.06E-10	6.75E-08	1.32E-07	PF	5		
Cr	5.46E-01	9.23E-08	9.17E-05	1.80E-04	PF	4	2.35E-01	C1, D
Cu	4.14E-02	2.56E-08	5.65E-06	1.11E-05	PF	5	3.82E-01	C1
F	3.13E+00	3.84E-07	1.44E-03	2.82E-03	PF	6	3.22E+00	C1
Fe	7.17E-01	5.07E-07	1.12E-04	2.19E-04	PF	6	2.18E+00	C1
Fe(CN) ₆	3.65E-02	6.82E-09	1.50E-06	2.95E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.11E-03	1.50E-10	3.30E-08	6.47E-08	PF	6		
K	3.88E+00	3.94E-06	8.69E-04	1.70E-03	PF	5		
Li	2.86E-02	1.63E-07	3.60E-05	7.05E-05	PF	5		
Mg	1.50E-02	2.47E-08	5.46E-06	1.07E-05	PF	5	1.02E+01	C1
Mn	1.43E-02	1.03E-08	2.28E-06	4.46E-06	PF	6	2.22E+00	C2, D
Mo	5.71E-02	2.35E-08	5.19E-06	1.02E-05	PF	5	2.55E+00	C1
Na	1.29E+02	2.22E-04	4.90E-02	9.59E-02	PF	5	2.13E+00	C2 as NaOH
Ni	4.57E-02	3.07E-08	6.76E-06	1.33E-05	PF	5	4.14E-02	C1, D
NO ₂	4.07E+01	2.69E-06	7.73E-03	1.51E-02	PF	4		
NO ₃	1.01E+02	4.96E-06	1.42E-02	2.79E-02	PF	4		
OH	7.23E+02	1.68E-03	3.71E-01	7.27E-01	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	1.24E-04	2.37E-11	5.23E-09	1.02E-08	PF	6	5.91E-03	C1, A, D
PO ₄	1.50E+00	7.52E-07	1.66E-04	3.25E-04	PF	6		
Se	1.47E-07	7.37E-14	1.62E-11	3.18E-11	PF	5	6.19E-02	C1, D
Si	2.56E-01	3.62E-07	7.98E-05	1.56E-04	PF	5	8.73E+00	C1
SiO ₃	1.96E+00	1.02E-06	2.25E-04	4.40E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	3.93E+01	1.80E-06	3.57E-03	7.00E-03	PF	4		
Sr	9.29E-03	4.18E-09	9.22E-07	1.81E-06	PF	5		
TOC gC/l ¹⁷	4.77E+00	1.57E-05	3.47E-03	6.80E-03	PF	5		
Ti	3.07E-02	2.53E-08	5.58E-06	1.09E-05	PF	5		
Zr	9.29E-02	4.04E-08	8.91E-06	1.75E-05	PF	5	1.34E+00	C1, C3
ZrO	3.52E-04	1.30E-10	2.87E-08	5.63E-08	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.94E+01	5.35E-08	6.88E-06	2.31E-05	PF	6	2.0E-11	B ¹⁹
Am 243	2.64E-02	7.34E-11	9.44E-09	3.17E-08	PF	6	2.0E-11	B
C 14	3.35E+01	9.30E-08	1.20E-05	4.02E-05	PF	5	6.0E-06	B
Cm 242	3.35E-02	1.86E-13	2.39E-11	8.03E-11	PF	6	7.0E-10	B
Cm 244	3.35E-01	7.98E-10	1.03E-07	3.45E-07	PF	6	4.0E-11	B
Cs 137	1.74E+05	2.98E-05	5.75E-02	1.93E-01	PF	6	4.0E-07	B
I 129	1.30E-01	5.04E-08	1.81E-06	1.57E-07	PF	6	7.0E-08	B
Np 237	2.64E-01	7.34E-10	9.44E-08	3.17E-07	PF	6	1.2E-12	B
Pu 238	6.87E-02	1.85E-10	2.38E-08	7.99E-08	PF	6	2.1E-12	B
Pu 239/240	1.16E-03	3.23E-12	4.15E-10	1.40E-09	PF	6	2.0E-12	B
Pu 241	2.82E-04	6.49E-13	8.34E-11	2.80E-10	PF	6	1.0E-10	B
RuRh 106	4.58E-05	1.24E-16	1.02E-12	3.43E-12	PF	6	3.0E-08	B
Se 79	2.64E+00	7.34E-09	9.44E-07	3.17E-06	PF	6	1.0E-06	B
Sr 89/90	1.90E+02	3.27E-09	6.30E-05	2.12E-04	PF	4	9.0E-09	B
Tc 99	9.00E+01	2.50E-07	3.21E-05	1.08E-04	PF	5	2.0E-06	B
U 238	1.94E-01	5.39E-10	6.92E-08	2.33E-07	PF	6	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	TRAC		Tank:	241-BY-110				
Sample Date	N/A		Contents:	Saltcake/ Sludge				
Sample ID	TRAC		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	4.4E-03		Retr. Method	Pumping/Sluicing				
pH	13.29							
Density, g/ml	1.2							
Temperature, R	580							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.52E-09	2.37E-15	3.33E-13	3.98E-11	PF	6	2.27E-03	C1
Al	7.17E+01	1.93E-04	2.71E-02	3.24E+00	PF	6	9.06E+00	C1
Ba	7.17E-04	3.79E-10	5.33E-08	6.39E-06	PF	6	8.92E-02	C1
Bi	1.37E+00	4.75E-07	6.68E-05	8.00E-03	PF	6		
C ₆ H ₅ O ₇ anion	3.72E+01	2.96E-05	2.00E-03	4.98E-01	PF	6		
Ca	2.61E-01	4.73E-07	6.64E-05	7.96E-03	PF	6	6.11E+00	C1 as CaCO ₃
Ce	8.48E-03	4.39E-09	6.17E-07	7.39E-05	PF	6		
Cl	4.63E-09	5.99E-16	1.35E-12	1.62E-10	PF	6		
CO ₃	3.98E+01	4.81E-05	6.75E-03	8.10E-01	PF	6		
Cr	6.52E-02	2.02E-08	1.28E-05	1.53E-03	PF	6	2.35E-01	C1, D
F	1.24E+00	2.78E-07	6.64E-04	7.96E-02	PF	6	3.22E+00	C1
Fe	2.93E+00	3.80E-06	5.34E-04	6.40E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	4.43E+00	1.52E-06	2.13E-04	2.55E-02	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.65E-03	9.03E-10	1.27E-07	1.52E-05	PF	6		
K	2.54E-01	4.73E-07	6.64E-05	7.96E-03	PF	6		
Mn	3.59E-02	4.73E-08	6.64E-06	7.96E-04	PF	6	2.22E+00	C2, D
Na	1.50E+02	4.73E-04	6.64E-02	7.96E+00	PF	6	2.13E+00	C2 as NaOH
Ni	3.46E+00	4.25E-06	5.97E-04	7.15E-02	PF	6	4.14E-02	C1, D
NO ₂	1.17E+02	1.42E-05	2.60E-02	3.12E+00	PF	6		
NO ₃	4.04E+02	3.63E-05	6.64E-02	7.96E+00	PF	6		
OH	3.33E+00	1.42E-05	1.99E-03	2.39E-01	PF	6	2.88E+00	C2 as NaOH
Pb	7.83E-07	2.74E-13	3.85E-11	4.62E-09	PF	6	5.91E-03	C1, A, D
PO ₄	3.72E+00	3.41E-06	4.79E-04	5.74E-02	PF	6		
SiO ₃	4.96E+00	4.73E-06	6.64E-04	7.96E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.89E+01	1.58E-06	2.01E-03	2.41E-01	PF	6		

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Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sr	1.70E+00	1.40E-06	1.96E-04	2.35E-02	PF	6		
ZrO	2.80E-01	1.90E-07	2.67E-05	3.20E-03	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	7.76E+01	2.14E-07	3.21E-05	3.61E-03	PF	6	2.0E-11	B ¹⁹
Am 243	7.76E+02	2.15E-10	3.23E-08	3.63E-06	PF	6	2.0E-11	B
C 14	6.52E+01	1.81E-07	2.72E-05	3.05E-03	PF	6	6.0E-06	B
Cm 242	7.76E-02	4.30E-13	6.45E-11	7.25E-09	PF	6	7.0E-10	B
Cm 244	6.52E-01	1.55E-09	2.33E-07	2.62E-05	PF	6	4.0E-11	B
Cs 137	3.35E+05	5.60E-05	1.26E-01	1.41E+01	PF	6	4.0E-07	B
I 129	3.88E-01	1.50E-07	5.39E-06	1.81E-05	PF	6	7.0E-08	B
Np 237	6.52E-01	1.81E-09	2.72E-07	3.05E-05	PF	6	1.2E-12	B
Pu 238	6.52E+00	1.76E-08	2.63E-06	2.96E-04	PF	6	2.1E-12	B
Pu 239/240	4.05E+01	1.13E-07	1.69E-05	1.90E-03	PF	6	2.0E-12	B
Pu 241	3.88E+01	8.92E-08	1.34E-05	1.50E-03	PF	6	1.0E-10	B
RuRh 106	1.50E-04	4.05E-16	3.89E-12	4.37E-10	PF	6	3.0E-08	B
Se 79	6.52E+00	1.81E-08	2.72E-06	3.05E-04	PF	6	1.0E-06	B
Sr 89/90	1.76E+05	2.96E-06	6.65E-02	7.47E+00	PF	6	9.0E-09	B
Tc 99	2.64E+02	7.34E-07	1.10E-04	1.24E-02	PF	6	2.0E-06	B
U 238	3.88E-02	1.08E-10	1.62E-08	1.81E-06	PF	6	1.0E-10	B
water		9.27E+04	9.27E+04	9.27E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	TRAC		Tank:	241-BY-111				
Sample Date	N/A		Contents:	Saltcake/ Sludge				
Sample ID	TRAC		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	6.3E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.2							
Temperature, R	547							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.11E-09	2.83E-15	2.93E-13	3.46E-11	PF	6	2.27E-03	C1
Al	6.91E+01	2.51E-04	2.61E-02	3.07E+00	PF	6	9.06E+00	C1
Ba	6.33E-04	4.54E-10	4.71E-08	5.55E-06	PF	6	8.92E-02	C1
Bi	4.95E-16	2.33E-22	2.41E-20	2.84E-18	PF	6		
C ₆ H ₅ O ₇ anion	4.37E+01	1.53E-04	5.50E-03	1.87E+00	PF	6		
Ca	8.06E-08	1.98E-13	2.05E-11	2.42E-09	PF	6	6.11E+00	C1 as CaCO ₃
Ce	8.06E-03	5.65E-09	5.86E-07	6.91E-05	PF	6		
Cl	6.33E-09	1.11E-15	1.84E-12	2.17E-10	PF	6		
CO ₃	3.57E+01	5.84E-05	6.06E-03	7.14E-01	PF	6		
F	1.09E+00	3.32E-07	5.86E-04	6.91E-02	PF	6	3.22E+00	C1
Fe	1.96E+00	3.43E-06	3.56E-04	4.20E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	1.55E-01	7.20E-08	7.47E-06	8.80E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.22E-03	1.08E-09	1.12E-07	1.32E-05	PF	6		
K	2.24E-01	5.65E-07	5.86E-05	6.91E-03	PF			
Mn	3.16E-02	5.65E-08	5.86E-06	6.91E-04	PF	6	2.22E+00	C2, D
Na	1.32E+02	5.65E-04	5.86E-02	6.91E+00	PF	6	2.13E+00	C2 as NaOH
NH ₃ ^{8, 14}		1.02E+01	1.02E+01	1.02E+01	Sample	2	2.50E+01	C1
Ni	1.04E-01	1.73E-07	1.79E-05	2.11E-03	PF	6	4.14E-02	C1, D
NO ₂	1.04E+02	1.70E-05	2.29E-02	2.70E+00	PF	6		
NO ₃	6.91E+02	8.42E-05	1.13E-01	1.34E+01	PF	6		
OH	1.96E+01	1.13E-04	1.17E-02	1.38E+00	PF	6	2.88E+00	C2 as NaOH
Pb	8.63E-07	4.10E-13	4.25E-11	5.01E-09	PF	6	5.91E-03	C1, A, D
PO ₄	3.28E+00	4.08E-06	4.23E-04	4.99E-02	PF	6		
SiO ₃	4.37E+00	5.65E-06	5.86E-04	6.91E-02	PF	6	1.93E+00	C1 (Amorphous)

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Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SO ₄	1.67E+01	1.90E-06	1.77E-03	2.09E-01	PF	6		
Sr	1.04E-01	1.16E-07	1.20E-05	1.41E-03	PF	6		
ZrO	9.21E-04	8.46E-10	8.77E-08	1.03E-05	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	4.67E+01	1.29E-07	1.93E-05	1.57E-03	PF	6	2.0E-11	B ¹⁹
Am 243	5.75E+02	1.60E-10	2.40E-08	1.95E-06	PF	6	2.0E-11	B
C 14	1.17E+02	3.24E-07	4.86E-05	3.96E-03	PF	6	6.0E-06	B
Cm 242	1.15E+01	6.38E-13	9.58E-11	7.80E-09	PF	6	7.0E-10	B
Cm 244	1.15E+00	2.74E-09	4.11E-07	3.35E-05	PF	6	4.0E-11	B
Cs 137	2.96E+05	4.94E-05	1.11E-01	9.05E+00	PF	6	4.0E-07	B
I 129	4.04E+01	1.56E-07	5.62E-06	1.37E-05	PF	6	7.0E-08	B
Np 237	5.75E+01	1.60E-09	2.40E-07	1.95E-05	PF	6	1.2E-12	B
Pu 238	6.84E+02	1.84E-10	2.76E-08	2.25E-06	PF	6	2.1E-12	B
Pu 239/240	1.45E+01	4.02E-10	6.03E-08	4.91E-06	PF	6	2.0E-12	B
Pu 241	1.71E+01	3.94E-10	5.90E-08	4.81E-06	PF	6	1.0E-10	B
RuRh 106	1.15E-04	3.11E-16	2.99E-12	2.44E-10	PF	6	3.0E-08	B
Se 79	5.75E+00	1.60E-08	2.40E-06	1.95E-04	PF	6	1.0E-06	B
Sr 89/90	2.02E+05	3.39E-06	7.63E-02	6.22E+00	PF	6	9.0E-09	B
Tc 99	2.33E+02	6.48E-07	9.72E-05	7.92E-03	PF	6	2.0E-06	B
U 238	5.75E+01	1.60E-09	2.40E-07	1.95E-05	PF	6	1.0E-10	B
water		4.62E+04	4.62E+04	4.62E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

Sample Type	DL	Tank:		241-BY-112			
Sample Date	4/4/72d	Contents:		Saltcake/ Sludge			
Sample ID	RAT-BY112-1	Watchlist:		FeCN			
Properties	Value	Status:		IS / II			
Visc., lbm/ft-s ¹	2.1E-02	Retr. Method		Pumping/Sluicing			
pH	N/A						
Density, g/ml	1.42						
Temperature, R	542						
Analyte ²	Value ³	Present Vapor Composition ⁴		Future Vapor Source ⁵		Future Vapor Receiver ⁵	
		Method		Data Allowable ⁷		Regulatory Citation	
		Rel ⁶					
Ag ⁹	9.98E-10	3.81E-16	7.97E-14	1.21E-12	PF	2.27E-03	Cl
Al	5.82E+01	8.87E-05	1.86E-02	2.82E-01	PF	9.06E+00	Cl
Ba	4.08E-04	1.23E-10	2.57E-08	3.90E-07	PF	8.92E-02	Cl
Bi	1.72E-08	3.40E-15	7.10E-13	1.08E-11	PF		
C6H5O7 anion ⁸	9.98E+00	3.34E-06	4.55E-04	1.06E-02	PF		
Ca	2.72E-07	2.80E-13	5.86E-11	8.91E-10	PF	6.11E+00	Cl as CaCO ₃
Ce	2.54E-03	7.47E-10	1.56E-07	2.38E-06	PF		
Cl	1.63E-09	1.20E-16	4.02E-13	6.11E-12	PF		
CO ₃	9.94E+00	6.82E-06	1.43E-03	2.17E-02	PF		
Cr	1.14E-01	2.01E-08	1.89E-05	2.88E-04	PF	2.35E-01	Cl, D
F	6.90E-01	8.79E-08	3.13E-04	4.75E-03	PF	3.22E+00	Cl
Fe	2.29E-01	1.68E-07	3.52E-05	5.35E-04	PF	2.18E+00	Cl
Fe (CN) ₆ ¹²	2.63E-01	5.11E-08	1.07E-05	1.63E-04	PF	5.77E-01	Cl as CN, D ¹³
HEDTA ¹²	7.53E-04	1.06E-10	2.21E-08	3.37E-07	PF		
K	7.08E-02	7.47E-08	1.56E-05	2.38E-04	PF		
Mn	1.52E-02	1.14E-08	2.39E-06	3.63E-05	PF	2.22E+00	C2, D
Na	2.71E+02	4.85E-04	1.01E-01	1.54E+00	PF	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}		1.00E+01	1.00E+01	1.00E+01	Sample	2.50E+01	Cl
Ni	8.39E-02	5.85E-08	1.22E-05	1.86E-04	PF	4.14E-02	Cl, D
NO ₂	5.96E+01	4.10E-06	1.12E-02	1.70E-01	PF		
NO ₃	1.01E+02	5.16E-06	1.40E-02	2.13E-01	PF		
OH	1.08E+02	2.61E-04	5.47E-02	8.32E-01	PF	2.88E+00	C2 as NaOH
Pb	1.91E-07	3.79E-14	7.93E-12	1.21E-10	PF	5.91E-03	Cl, A, D
PO ₄	4.27E+00	2.22E-06	4.65E-04	7.07E-03	PF		
Si	5.34E-01	7.84E-07	1.64E-04	2.50E-03	PF	8.73E+00	Cl

Tank Farm 241-BY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SiO ₃	1.36E+00	7.37E-07	1.54E-04	2.35E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.36E+00	2.07E-07	3.91E-04	5.94E-03	PF	6		
Sr	4.81E-01	2.25E-07	4.71E-05	7.16E-04	PF	6		
ZrO	4.90E-04	1.89E-10	3.94E-08	6.00E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	9.08E+00	2.51E-08	3.18E-06	7.97E-05	PF	6	2.0E-11	B ¹⁹
Am 243	1.82E+02	5.04E-11	6.39E-09	1.60E-07	PF	6	2.0E-11	B
C 14	2.70E+01	7.49E-08	9.50E-06	2.38E-04	PF	6	6.0E-06	B
Cm 242	2.70E-02	1.50E-13	1.90E-11	4.76E-10	PF	6	7.0E-10	B
Cm 244	2.70E-01	6.43E-10	8.15E-08	2.05E-06	PF	6	4.0E-11	B
Cs 137	6.86E+05	7.23E-05	1.37E-01	3.45E+00	PF	5	4.0E-07	B
T 129	9.08E+02	3.50E-08	1.26E-06	8.02E-07	PF	6	7.0E-08	B
Np 237	1.82E+01	5.04E-10	6.39E-08	1.60E-06	PF	6	1.2E-12	B
Pu 238	9.32E+02	2.51E-10	3.18E-08	7.98E-07	PF	6	2.1E-12	B
Pu 239/240	1.47E+03	4.09E-12	5.18E-10	1.30E-08	PF	6	2.0E-12	B
Pu 241	7.36E+04	1.69E-12	2.15E-10	5.38E-09	PF	6	1.0E-10	B
RuRh 106	3.68E-05	9.94E-17	8.08E-13	2.03E-11	PF	6	3.0E-08	B
Se 79	1.82E+00	5.04E-09	6.39E-07	1.60E-05	PF	6	1.0E-06	B
Sr 89/90	3.84E+02	4.12E-09	7.83E-05	1.97E-03	PF	5	9.0E-09	B
Tc 99	7.36E+01	2.04E-07	2.59E-05	6.50E-04	PF	6	2.0E-06	B
U 238	4.66E+02	1.29E-10	1.64E-08	4.12E-07	PF	6	1.0E-10	B
water		3.95E+04	3.95E+04	3.95E+04	Stm Tabl	1		

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Tank Farm 241-BY Vapor Estimates

- Note:** 1. No viscosity data available; therefore, viscosity estimated assuming 40 vol. % solids.
- Note:** 1A. Density for tank BY-103 was raised from 1.45 to 2.24 and NO₃ was reduced by 10 to obtain positive moles of water. Density for tank BY-105 was raised from 1.4 to 1.95 to obtain positive moles of water.
- Note:** 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note:** 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. Reported values for tanks BY-111 and BY-112 of HCN & CN < 2.0 ppm, N₂H₂ < 0.2 ppm, and NO_x < 0.5 ppm reported from vapor samples taken by WHC on 3/26/93.
- Note:** 4. Estimated current vapor composition ppm by volume for volatiles, microcurie/l for radionuclides.
- Note:** 5. Estimated future vapor composition based on stated retrieval model.
- Note:** 6. TRAC data denoted by 6. Lab data for tanks BY-102, 103, 105, 106, and 109 denoted by 4, 5 based on PF availability. Lab data for tanks BY-101 and BY-112 denoted by 5 due to tank activity after the sampling date. Lab data for tank BY-104 denoted by 5 due to samples taken from saltcake. Recent vapor sample data denoted by 2.
- Note:** 7. Allowable concentration, in ppm by volume.
- Note:** 9. TRAC data used to estimate concentration.
- Note:** 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note:** 13. As cyanide compounds.
- Note:** 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate. Reported values of 10.2 ppm for tank BY-111 and 10.03 ppm for tank BY-112 reported from vapor samples taken by WHC on 6/26/93.
- Note:** 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile. Reported values of 6.3 ppm for tank BY-111 and 5.9 ppm for tank BY-112 reported from vapor samples taken by WHC on 3/26/93.
- Note:** 18. Radionuclides decayed to current year (rounded to nearest year).
- Note:** 19. Allowable data based on DCG's in microcurie/l.

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Tank Farm 241-C Vapor Estimates

Sample Type	TRAC		Tank:	241-C-101				
Sample Date	N/A		Contents:	Sludge				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.4E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.4							
Temperature, °R	557							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.28E-09	1.47E-15	1.85E-13	1.03E-11	PF	6	2.27E-03	C1
Al	8.10E+01	2.09E-04	2.62E-02	1.47E+00	PF	6	9.06E+00	C1
Ba	1.14E-02	5.79E-09	7.27E-07	4.07E-05	PF	6	8.92E-02	C1
Bi	5.10E-15	1.70E-21	2.13E-19	1.19E-17	PF	6		
Ce	2.52E-06	1.25E-12	1.57E-10	8.81E-09	PF	6		
Cl	3.30E-11	4.10E-18	8.24E-15	4.61E-13	PF	6		
CO ₃	5.40E+00	6.26E-06	7.86E-04	4.40E-02	PF	6		
F	2.85E-04	6.14E-11	1.31E-07	7.34E-06	PF	6	3.22E+00	C1
Fe	1.35E-05	1.68E-11	2.11E-09	1.18E-07	PF	6	2.18E+00	C1
Fe (CN) ₆	1.62E-03	5.32E-10	6.68E-08	3.74E-06	PF	6	5.77E-01	C1 as CN, D ¹³
Na	2.97E+02	8.99E-04	1.13E-01	6.32E+00	PF	6	2.13E+00	C2 as NaOH
Ni	9.00E-06	1.06E-11	1.33E-09	7.46E-08	PF	6	4.14E-02	C1, D
NO ₂	1.23E+00	1.43E-07	2.34E-04	1.31E-02	PF	6		
NO ₃	8.10E+02	6.99E-05	1.14E-01	6.39E+00	PF	6		
OH	1.53E+02	6.26E-04	7.86E-02	4.40E+00	PF	6	2.88E+00	C2 as NaOH
Pb	5.70E-13	1.92E-19	2.41E-17	1.35E-15	PF	6	5.91E-03	C1, A, D
PO ₄	5.70E-02	5.02E-08	6.30E-06	3.53E-04	PF	6		
SiO ₃	4.50E-02	4.12E-08	5.17E-06	2.90E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.91E+00	2.34E-07	2.65E-04	1.48E-02	PF	6		
ZrO	3.30E-03	2.15E-09	2.69E-07	1.51E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.54E+02	4.25E-07	5.47E-05	2.99E-03	PF	6	2.0E-11	B ¹⁹
Am 243	3.00E-02	8.33E-11	1.07E-08	5.86E-07	PF	6	2.0E-11	B
C 14	6.00E+01	1.67E-07	2.14E-05	1.17E-03	PF	6	6.0E-06	B
Cm 242	6.00E-02	3.33E-13	4.28E-11	2.34E-09	PF	6	7.0E-10	B
Cm 244	6.00E-02	1.43E-10	1.84E-08	1.01E-06	PF	6	4.0E-11	B

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cs 137	6.00E+05	1.00E-04	1.93E-01	1.06E+01	PF	6	4.0E-07	B
I 129	2.11E+01	8.14E-08	2.93E-06	4.12E-06	PF	6	7.0E-08	B
Np 237	6.00E+01	1.67E-09	2.14E-07	1.17E-05	PF	6	1.2E-12	B
Pu 238	6.00E+00	1.62E-08	2.08E-06	1.14E-04	PF	6	2.1E-12	B
Pu 239/240	3.89E+02	1.08E-06	1.39E-04	7.60E-03	PF	6	2.0E-12	B
Pu 241	8.92E+02	2.05E-06	2.64E-04	1.44E-02	PF	6	1.0E-10	B
RuRh 106	6.00E-03	1.62E-14	1.34E-10	7.31E-09	PF	6	3.0E-08	B
Se 79	3.00E+00	8.34E-09	1.07E-06	5.86E-05	PF	6	1.0E-06	B
Sr 89/90	2.11E+05	3.54E-06	6.82E-02	3.73E+00	PF	6	9.0E-09	B
Tc 99	1.54E+02	4.28E-07	5.50E-05	3.01E-03	PF	6	2.0E-06	B
U 238	6.00E+00	1.67E-08	2.14E-06	1.17E-04	PF	6	1.0E-10	B
water		6.00E+04	6.00E+04	6.00E+04	Stm Ta	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	SN		Tank:	241-C-102				
Sample Date	6/3/91		Contents:	Sludge/ SN				
Sample ID	R-8089		Watchlist:	Organic Salts				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	8.4E-03		Retr. Method	Pumping/Sluicing				
pH	13.94							
Density, g/ml	1.15							
Temperature, °R	536							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.22E+00	6.74E-06	1.27E-03	4.34E-02	PF	5	9.06E+00	C1
As	2.30E-03	1.73E-09	3.26E-07	1.12E-05	PF	5	6.52E-02	C1
Ba	6.80E-05	2.81E-11	5.28E-09	1.81E-07	PF	6	8.92E-02	C1
Ca	1.74E-03	2.46E-09	4.62E-07	1.58E-05	PF	5	6.11E+00	C1 as CaCO ₃
CN	9.13E-02	1.98E-07	3.73E-05	1.28E-03	PF	5	4.70E+00	C1, D
CO ₃	2.10E+01	1.98E-05	3.72E-03	1.27E-01	PF	5		
Cr	5.57E-02	1.34E-08	1.14E-05	3.90E-04	PF	4	2.35E-01	C1, D
F	3.53E+01	6.16E-06	1.97E-02	6.75E-01	PF	6	3.22E+00	C1
Fe	3.39E-02	3.42E-08	6.44E-06	2.20E-04	PF	5	2.18E+00	C1
K	8.70E-01	1.26E-06	2.37E-04	8.12E-03	PF	5		
Mg	5.22E-03	1.23E-08	2.31E-06	7.91E-05	PF	5	1.02E+01	C1
Mn	3.48E-04	3.57E-10	6.73E-08	2.30E-06	PF	5	2.22E+00	C2, D
Mo	4.35E-03	2.56E-09	4.82E-07	1.65E-05	PF	5	2.55E+00	C1
Na	6.17E+01	1.52E-04	2.85E-02	9.76E-01	PF	5	2.13E+00	C2 as NaOH
Ni	1.42E-08	1.36E-14	2.56E-12	8.77E-11	PF	6	4.14E-02	C1, D
NO ₂	1.83E+01	1.73E-06	4.23E-03	1.45E-01	PF	4		
NO ₃	3.57E+01	2.50E-06	6.12E-03	2.10E-01	PF	4		
OH	1.48E+01	4.92E-05	9.25E-03	3.17E-01	PF	5	2.88E+00	C2 as NaOH
Pb	2.54E-13	6.92E-20	1.30E-17	4.46E-16	PF	6	5.91E-03	C1, A, D
Pu	6.62E-07	1.53E-13	2.88E-11	9.87E-10	PF	4		
Se	4.00E-05	2.86E-11	5.38E-09	1.84E-07	PF	5	6.19E-02	C1, D
Si	2.61E-02	5.27E-08	9.91E-06	3.39E-04	PF	5	8.73E+00	C1
SiO ₃	4.70E-10	3.49E-16	6.58E-14	2.25E-12	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	7.49E-01	4.89E-08	8.29E-05	2.84E-03	PF	5		
Sn	7.22E-02	3.43E-08	6.45E-06	2.21E-04	PF	5	4.11E-01	C1
TOC gC/l ¹⁷	3.20E+00	1.51E-05	2.83E-03	9.70E-02	PF	5		

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
ZrO	1.98E+02	1.05E-04	1.97E-02	6.73E-01	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	6.19E+02	1.71E-06	2.67E-04	1.10E-02	PF	6	2.0E-11	B ¹⁹
Am 243	4.35E+01	1.21E-09	1.89E-07	7.77E-06	PF	6	2.0E-11	B
C 14	6.19E-04	1.72E-12	2.69E-10	1.11E-08	PF	6	6.0E-06	B
Cm 242	6.19E+01	3.43E-12	5.37E-10	2.21E-08	PF	6	7.0E-10	B
Cm 244	6.19E-10	1.47E-18	2.31E-16	9.50E-15	PF	6	4.0E-11	B
Cs 137	1.60E+04	2.74E-06	6.44E-03	2.65E-01	PF	4	4.0E-07	B
Co 60	1.51E+02	2.83E-07	4.42E-05	1.82E-03	PF	5	8.0E-08	B
I 129	3.18E-11	1.23E-17	4.42E-16	5.68E-16	PF	6	7.0E-08	B
Np 237	4.35E+03	1.21E-11	1.89E-09	7.78E-08	PF	6	1.2E-12	B
Pu 238	3.18E+01	8.55E-08	1.34E-05	5.51E-04	PF	6	2.1E-12	B
Pu 239/240	5.80E+00	1.61E-08	2.52E-06	1.04E-04	PF	5	2.0E-12	B
Pu 241	4.35E+03	1.00E-05	1.57E-03	6.44E-02	PF	6	1.0E-10	B
RuRh 106	6.19E+01	1.67E-12	1.68E-08	6.90E-07	PF	6	3.0E-08	B
Se 79	5.02E-10	1.39E-18	2.18E-16	8.97E-15	PF	6	1.0E-06	B
Sr 89/90	1.90E+01	3.27E-10	7.67E-06	3.16E-04	PF	4	9.0E-09	B
Tc 99	1.60E+01	4.44E-08	6.96E-06	2.86E-04	PF	5	2.0E-06	B
U 238	1.24E+01	3.44E-08	5.38E-06	2.21E-04	PF	6	1.0E-10	B
water		3.19E+04	3.19E+04	3.19E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Na	3.36E+01	7.65E-05	1.67E-02	8.31E-01	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}		3.68E+02	3.68E+02	3.68E+02	Sample	2	2.50E+01	C1
Ni	7.48E-02	6.64E-08	1.45E-05	7.21E-04	PF	5	4.14E-02	C1, D
N ₂ O		8.80E+02	8.80E+02	8.80E+02	Sample	2	3.00E+01	C1
NO ₂	2.80E+01	2.45E-06	6.95E-03	3.46E-01	PF	4		
NO ₃	4.02E+00	2.61E-07	7.41E-04	3.69E-02	PF	4		
OH	4.61E+02	1.42E-03	3.10E-01	1.54E+01	PF	6	2.88E+00	C2 as NaOH
Pb	5.55E+00	1.41E-06	3.07E-04	1.53E-02	PF	6	5.91E-03	C1, A, D
PO ₄	1.96E+00	1.30E-06	2.83E-04	1.41E-02	PF	5		
Pu	2.67E-04	5.73E-11	1.25E-08	6.22E-07	PF	5		
Se	3.00E-05	1.99E-11	4.34E-09	2.16E-07	PF	5	6.19E-02	C1, D
Si	2.06E-02	3.86E-08	8.41E-06	4.18E-04	PF	5	8.73E+00	C1
SiO ₃	2.03E-09	1.40E-15	3.05E-13	1.52E-11	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.43E+01	1.47E-06	2.89E-03	1.44E-01	PF	4		
Sn	4.67E-03	2.06E-09	4.48E-07	2.23E-05	PF	5	4.11E-01	C1
Sr	8.26E-16	4.92E-22	1.07E-19	5.34E-18	PF	6		
TOC gC/l ¹⁷	7.46E+00	3.26E-05	7.10E-03	3.53E-01	PF	5		
Tetradecane		1.51E+01	1.51E+01	1.51E+01	Sample	2		
Tridecane		6.83E+01	6.83E+01	6.83E+01	Sample	2	2.00E+01	C1
Zr	2.80E-01	1.61E-07	3.52E-05	1.75E-03	PF	5	1.34E+00	C1, C3
ZrO	4.33E+01	2.12E-05	4.63E-03	2.30E-01	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.00E-01	8.29E-10	1.40E-07	9.00E-06	PF	5	2.0E-11	B ¹⁹
Am 243	9.52E-02	2.64E-10	4.45E-08	2.87E-06	PF	6	2.0E-11	B
C 14	6.96E+02	1.93E-06	3.25E-04	2.10E-02	PF	6	6.0E-06	B
Cm 242	1.35E-01	7.51E-13	1.26E-10	8.15E-09	PF	6	7.0E-10	B
Cm 244	1.21E-10	2.88E-19	4.84E-17	3.12E-15	PF	6	4.0E-11	B
Cs 137	6.40E+04	1.10E-05	2.77E-02	1.79E+00	PF	4	4.0E-07	B
Co 60	7.40E+01	1.39E-07	2.33E-05	1.50E-03	PF	5	8.0E-08	B
I 129	5.49E-11	2.12E-17	7.63E-16	1.66E-15	PF	6	7.0E-08	B
Np 237	1.21E-03	3.36E-12	5.65E-10	3.64E-08	PF	6	1.2E-12	B
Pu 238	1.21E+01	3.25E-08	5.47E-06	3.53E-04	PF	6	2.1E-12	B
Pu 239/240	2.40E+01	6.67E-08	1.12E-05	7.23E-04	PF	5	2.0E-12	B
Pu 241	1.35E+03	3.12E-06	5.24E-04	3.38E-02	PF	6	1.0E-10	B
RuRh 106	1.45E-01	3.66E-13	2.95E-09	2.55E-07	PF	6	3.0E-08	B

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Se 79	8.05E-10	2.24E-18	3.76E-16	2.43E-14	PF	6	1.0E-06	B
Sr 89/90	2.50E+02	4.30E-09	1.08E-04	7.00E-03	PF	4	9.0E-09	B
Ta 99	3.70E+01	1.03E-07	1.73E-05	1.12E-03	PF	5	2.0E-05	B
U 238	9.52E+00	2.64E-08	4.45E-06	2.87E-04	PF	6	1.0E-10	B
water		9.83E+04	9.83E+04	9.83E+04	Stm Tabl	1		

Tank Farm 241-C Vapor Estimates

Sample Type	DL		Tank:	241-C-104				
Sample Date	4/15/86		Contents:	Sludge				
Sample ID	D1XCOOXX		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	4.1E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.18							
Temperature, °R	550							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	5.66E-01	2.67E-07	5.43E-05	2.94E-04	PF	5	2.27E-03	C1
Al	3.64E+01	6.87E-05	1.40E-02	7.56E-02	PF	5	9.06E+00	C1
Ba	4.72E+00	1.75E-06	3.57E-04	1.93E-03	PF	5	8.92E-02	C1
B	2.07E-02	9.59E-08	1.95E-05	1.06E-04	PF	5	2.22E+01	C1
Bi	4.40E+00	1.07E-06	2.18E-04	1.18E-03	PF	5		
C ₂ H ₃ O ₃ anion	3.40E-10	2.31E-16	4.70E-14	2.55E-13	PF	6		
C ₆ H ₅ O ₇ anion	1.70E-10	1.03E-16	9.33E-15	1.13E-13	PF	6		
Ca	1.37E+01	1.74E-05	3.55E-03	1.92E-02	PF	5	6.11E+00	C1 as CaCO ₃
Cd	1.55E+00	7.05E-07	1.43E-04	7.77E-04	PF	5	5.46E-04	C1, C2, D
Cl	1.88E-23	1.71E-30	5.57E-27	3.01E-26	PF	6		
Co	1.96E-02	6.09E-07	3.44E-06	6.09E-07	PF	5	3.50E+01	C1
CO ₃	5.37E-06	4.56E-12	9.28E-10	5.02E-09	PF	6		
Cr	1.36E+00	2.96E-07	2.71E-04	1.47E-03	PF	4	2.35E-01	C1, D
Cu	1.36E-01	1.08E-07	2.20E-05	1.19E-04	PF	5	3.82E-01	C1
EDTA ¹²	1.34E-09	2.34E-16	4.77E-14	2.58E-13	PF	6		
F	1.52E-16	2.40E-23	8.30E-20	4.50E-19	PF	6	3.22E+00	C1
Fe	3.16E+01	2.87E-05	5.85E-03	3.17E-02	PF	5	2.18E+00	C1
Fe (CN) ₆	1.07E-15	2.58E-22	5.25E-20	2.84E-19	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	2.51E-09	4.36E-16	8.86E-14	4.80E-13	PF	6		
K	1.63E+00	2.13E-06	4.33E-04	2.35E-03	PF	5		
Mg	6.61E+00	1.40E-05	2.85E-03	1.55E-02	PF	5	1.02E+01	C1
Mn	3.97E+00	3.68E-06	7.48E-04	4.05E-03	PF	5	2.22E+00	C2, D
Na	1.16E+02	2.57E-04	5.23E-02	2.83E-01	PF	5	2.13E+00	C2 as NaOH
NH ₃ ^{8,14}		4.00E+01	4.00E+01	4.00E+01	Sample	2	2.50E+01	C1
Ni	2.31E+00	1.99E-06	4.06E-04	2.20E-03	PF	5	4.14E-02	C1, D

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₂	4.12E-10	3.51E-17	9.28E-14	5.02E-13	PF	6		
NO ₃	2.83E+01	1.79E-06	4.73E-03	2.56E-02	PF	4		
OH	3.04E+02	9.12E-04	1.86E-01	1.00E+00	PF	6	2.88E+00	C2 as NaOH
P	3.79E+00	6.23E-06	1.27E-03	6.86E-03	PF	5		
Pb	9.90E-01	2.44E-07	4.95E-05	2.68E-04	PF	5	5.91E-03	C1, A, D
PO ₄	3.40E-12	2.19E-18	4.46E-16	2.42E-15	PF	6		
Pu	1.05E-02	2.19E-09	4.46E-07	2.41E-06	PF	5		
Si	6.82E+01	1.24E-04	2.52E-02	1.37E-01	PF	5	8.73E+00	C1
SiO ₃	1.34E-11	9.00E-18	1.83E-15	9.92E-15	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	6.89E-04	4.06E-11	7.44E-08	4.03E-07	PF	6		
Sr	9.83E-02	5.69E-08	1.16E-05	6.27E-05	PF	5		
TOC gC/l ¹⁷	5.34E+00	2.27E-05	4.61E-03	2.50E-02	PF	5		
U, g/l	3.00E+01	6.42E-06	1.31E-03	7.07E-03	PF	5	5.14E-03	C1
Zn	1.42E-01	1.11E-07	2.26E-05	1.23E-04	PF	5		
Zr	7.48E+01	4.19E-05	8.52E-03	4.61E-02	PF	5	1.34E+00	C1, C3
ZrO	4.83E-03	2.30E-09	4.68E-07	2.54E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	8.23E-01	2.26E-09	3.44E-07	2.49E-06	PF	5	2.0E-11	B ¹⁹
Am 243	6.29E-01	1.75E-09	2.66E-07	1.92E-06	PF	6	2.0E-11	B
C 14	1.33E+00	3.69E-09	5.63E-07	4.07E-06	PF	5	6.0E-06	B
Cm 242	7.99E-01	4.43E-12	6.76E-10	4.88E-09	PF	6	7.0E-10	B
Cm 244	8.95E-12	2.13E-20	3.26E-18	2.35E-17	PF	6	4.0E-11	B
Ce 137	1.18E+05	1.70E-05	4.07E-03	2.94E-01	PF	4	4.0E-07	B
Co 60	3.98E+02	3.86E-07	5.89E-05	4.25E-04	PF	5	8.0E-08	B
I 129	8.95E-12	3.46E-18	1.24E-16	2.74E-17	PF	6	7.0E-08	B
Np 237	4.60E-03	1.28E-11	1.95E-09	1.41E-08	PF	6	1.2E-12	B
Pu 238	4.60E+01	1.24E-07	1.89E-05	1.36E-04	PF	6	2.1E-12	B
Pu 239/240	7.73E+00	2.15E-08	3.27E-06	2.36E-05	PF	5	2.0E-12	B
Pu 241	2.66E+03	6.12E-06	9.34E-04	6.75E-03	PF	6	1.0E-10	B
RuRh 106	1.79E+00	4.84E-12	4.73E-08	3.42E-07	PF	6	3.0E-08	B
Se 79	3.63E-10	1.01E-18	1.54E-16	1.11E-15	PF	6	1.0E-06	B
Sr 89/90	1.30E+04	1.98E-07	4.52E-03	3.26E-02	PF	4	9.0E-09	B
Te 99	2.78E+01	7.72E-08	1.18E-05	8.51E-05	PF	5	2.0E-06	B
U 238	1.78E-02	4.95E-11	7.56E-09	5.46E-08	PF	5	1.0E-10	B
water		5.03E+04	5.03E+04	5.03E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	DL		Tank:	241-C-105				
Sample Date	4/11/86		Contents:	Sludge				
Sample ID	RAT-C105-4A		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.0E-01		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.98							
Temperature, °R	557							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.98E-01	9.34E-08	1.71E-05	3.68E-05	PF	5	2.27E-03	C1
Al	4.31E+02	5.40E-04	9.86E-02	2.13E-01	PF	5	9.06E+00	C1
As	5.60E-01	2.53E-07	4.61E-05	9.94E-05	PF	5	6.52E-02	C1
Ba	2.63E-01	6.49E-08	1.19E-05	2.56E-05	PF	5	8.92E-02	C1
B	5.25E-01	1.61E-06	2.95E-04	6.36E-04	PF	5	2.22E+01	C1
Bi	3.52E-15	5.70E-22	1.04E-19	2.24E-19	PF	6		
C ₂ H ₃ O ₃ anion	7.92E-02	3.57E-08	6.52E-06	1.41E-05	PF	6		
C ₆ H ₅ O ₇ anion	1.94E+02	7.71E-03	2.78E-01	3.04E+00	PF	6		
Ca	2.80E+00	2.37E-06	4.32E-04	9.32E-04	PF	5	6.11E+00	C1 as CaCO ₃
Ce	4.73E-01	1.14E-07	2.09E-05	4.50E-05	PF	5		
Cd	1.40E-01	4.23E-08	7.72E-06	1.66E-05	PF	5	5.46E-04	C1, C2, D
Cl	1.94E-13	1.17E-20	3.42E-17	7.37E-17	PF	6		
CO ₃	8.45E+00	4.76E-06	8.70E-04	1.88E-03	PF	6		
Cr	2.45E+00	3.54E-07	2.91E-04	6.27E-04	PF	4	2.35E-01	C1, D
Cu	2.80E-01	1.48E-07	2.70E-05	5.83E-05	PF	5	3.82E-01	C1
EDTA ¹²	4.58E-01	5.30E-08	9.68E-06	2.09E-05	PF	6		
F	1.00E-03	1.05E-10	3.26E-07	7.03E-07	PF	6	3.22E+00	C1
Fe	2.68E+01	1.62E-05	2.95E-03	6.37E-03	PF	5	2.18E+00	C1
Fe (CN) ₆	1.66E-02	2.64E-09	4.82E-07	1.04E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	9.86E-01	1.14E-07	2.08E-05	4.48E-05	PF	6		
K	3.52E-01	3.05E-07	5.58E-05	1.20E-04	PF	6		
Mg	5.78E-01	8.14E-07	1.49E-04	3.21E-04	PF	5	1.02E+01	C1
Mn	1.25E+01	7.69E-06	1.40E-03	3.03E-03	PF	5	2.22E+00	C2, D
Na	1.13E+02	1.66E-04	3.03E-02	6.54E-02	PF	5	2.13E+00	C2 as NaOH
Nd	3.68E-01	8.64E-08	1.58E-05	3.40E-05	PF	5		

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NH ₃ ^{8,14}		3.20E+00	3.20E+00	3.20E+00	Sample	2	2.50E+01	C1
Ni	1.03E+01	5.90E-06	1.08E-03	2.32E-03	PF	5	4.14E-02	C1, D
NO ₂	1.62E-01	9.16E-09	2.17E-05	4.69E-05	PF	6		
NO ₃	1.74E+02	7.31E-06	1.74E-02	3.74E-02	PF	6		
OH	9.33E+02	1.86E-03	3.39E-01	7.31E-01	PF	6	2.88E+00	C2 as NaOH
Pb	1.98E+00	3.23E-07	5.91E-05	1.27E-04	PF	5	5.91E-03	C1, A, D
PO ₄	6.69E-01	2.86E-07	5.23E-05	1.13E-04	PF	6		
Sb	4.38E+00	1.21E-06	2.22E-04	4.78E-04	PF	5	1.00E-01	C1, D
Se	1.75E+00	7.49E-07	1.37E-04	2.95E-04	PF	5	6.19E-02	C1, D
Si	1.89E+01	2.28E-05	4.17E-03	8.99E-03	PF	5	8.73E+00	C1
SiO ₃	5.28E-03	2.35E-09	4.29E-07	9.26E-07	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	5.28E-01	2.07E-08	3.40E-05	7.33E-05	PF	6		
Sr	2.80E-01	1.08E-07	1.96E-05	4.24E-05	PF	5		
Ti	4.03E-01	2.84E-07	5.18E-05	1.12E-04	PF	5		
Tl	2.80E+00	4.64E-07	8.47E-05	1.83E-04	PF	5	1.20E-02	C1
U, g/l	1.84E+01	2.61E-06	4.77E-04	1.03E-03	PF	5	5.14E-03	C1
V	1.05E-01	6.96E-08	1.27E-05	2.74E-05	PF	5	2.40E-02	C1 (as V ₂ O ₅)
Zr	1.24E+00	4.61E-07	8.41E-05	1.81E-04	PF	5	1.34E+00	C1, C3
ZrO	7.57E-02	2.39E-08	4.37E-06	9.42E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.70E+00	1.56E-08	1.42E-06	6.15E-06	PF	5	2.0E-11	B ¹⁹
Am 243	1.81E+01	5.02E-08	4.57E-06	1.98E-05	PF	6	2.0E-11	B
C 14	2.82E+00	7.83E-09	7.11E-07	3.08E-06	PF	5	6.0E-06	B
Cm 242	1.86E+01	1.03E-10	9.36E-09	4.05E-08	PF	6	7.0E-10	B
Cm 244	1.24E+02	2.95E-07	2.68E-05	1.16E-04	PF	6	4.0E-11	B
Cs 137	4.42E+05	6.67E-05	9.09E-02	3.94E-01	PF	4	4.0E-07	B
Co 60	1.66E+01	1.61E-08	1.46E-06	6.34E-06	PF	5	8.0E-08	B
I 129	2.70E-01	1.04E-07	3.75E-06	2.95E-07	PF	4	7.0E-08	B
Np 237	1.33E-01	3.70E-10	3.37E-08	1.46E-07	PF	6	1.2E-12	B
Pu 238	9.99E+01	2.69E-07	2.45E-05	1.06E-04	PF	6	2.1E-12	B
Pu 239/240	2.52E+03	7.01E-06	6.37E-04	2.76E-03	PF	6	2.0E-12	B
Pu 241	6.19E+03	1.42E-05	1.29E-03	5.60E-03	PF	6	1.0E-10	B
RuRh 106	4.76E+00	1.29E-11	7.49E-08	3.24E-07	PF	6	3.0E-08	B
Se 79	5.24E+01	1.45E-07	1.32E-05	5.73E-05	PF	6	1.0E-06	B
Sr 89/90	5.12E+03	7.78E-08	1.06E-03	4.59E-03	PF	4	9.0E-09	B

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Tc 99	2.58E+02	7.17E-07	6.51E-05	2.82E-04	PF	5	2.0E-06	B
U 238	2.57E+00	7.15E-09	6.50E-07	2.81E-06	PF	5	1.0E-10	B
water		6.00E+04	6.00E+04	6.00E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	DL	Tank:	241-C-106			
Sample Date	5/19/86	Contents:	Sludge/ SN			
Sample ID	RAT-C106-4A	Watchlist:	High Heat Load			
Properties	Value	Status:	PI			
Visc., lbm/ft-s ¹	4.5E-03	Retr. Method	Pumping/Sluicing			
pH	N/A					
Density, g/ml	1.3					
Temperature, °R	624					
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Method	Data Rel ⁶	Allowable ⁷
						Regulatory Citation
Ag ⁹	3.68E+00	1.96E-06	3.21E-04	PF	5	2.27E+03
Al	2.01E+02	4.27E-04	7.00E-02	PF	5	9.06E+00
As	6.83E-01	5.23E-07	8.56E-05	PF	5	6.52E-02
Ba	6.13E-01	2.57E-07	4.21E-05	PF	5	8.92E-02
B	6.13E-01	3.20E-06	5.24E-04	PF	5	2.22E+01
Bi	1.73E-15	4.75E-22	7.78E-20	PF	6	
Ca	3.33E+00	4.78E-06	7.83E-04	PF	5	6.11E+00
Ce	8.58E-01	3.52E-07	5.76E-05	PF	5	
CO ₃	2.77E+00	2.65E-06	4.34E-04	PF	6	
Cr	3.06E+00	7.50E-07	5.53E-04	PF	4	2.35E-01
Cu	5.25E-01	4.71E-07	7.71E-05	PF	5	3.82E-01
Fe	1.44E+02	1.48E-04	2.42E-02	PF	5	2.18E+00
Mg	7.35E-01	1.76E-06	2.88E-04	PF	5	1.02E+01
Mn	7.88E+00	8.22E-06	1.35E-03	PF	5	2.22E+00
Na	2.73E+02	6.81E-04	1.12E-01	PF	5	2.13E+00
Nd	9.80E-01	3.91E-07	6.40E-05	PF	5	
NH ₃ ^{8,14}		1.10E+01	1.10E+01	Sample	2	2.50E+01
NO ₃	2.19E+02	1.56E-05	3.32E-02	PF	6	
OH	5.88E+01	1.99E-04	3.25E-02	PF	6	2.88E+00
P	1.28E+01	2.37E-05	3.88E-03	PF	5	
Pb	4.38E+00	1.21E-06	1.99E-04	PF	5	5.91E-03
Sb	5.08E+00	2.39E-06	3.92E-04	PF	5	1.00E-01
Se	2.45E+00	1.78E-06	2.92E-04	PF	5	6.19E-02
Si	4.55E+01	9.33E-05	1.53E-02	PF	5	8.73E+00
SO ₄	1.11E-02	7.35E-10	1.08E-06	PF	6	
Sr	1.93E-01	1.26E-07	2.06E-05	PF	5	

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ti	5.78E-01	6.91E-07	1.13E-04	7.42E-03	PF	5		
Tl	2.10E+00	5.91E-07	9.68E-05	6.34E-03	PF	5	1.20E-02	C1
Zr	1.05E+00	6.62E-07	1.09E-04	7.11E-03	PF	5	1.34E+00	C1, C3
ZrO	8.29E-01	4.45E-07	7.29E-05	4.77E-03	PF	5	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.39E+01	3.81E-08	5.28E-06	4.09E-04	PF	5	2.0E-11	B ¹⁹
Am 243	1.15E-01	3.20E-10	4.43E-08	3.44E-06	PF	6	2.0E-11	B
C 14	3.51E-01	9.74E-10	1.35E-07	1.05E-05	PF	5	6.0E-06	B
Cm 242	3.43E-01	1.90E-12	2.63E-10	2.04E-08	PF	6	7.0E-10	B
Cs 137	2.78E+04	4.19E-06	8.71E-03	6.75E-01	PF	4	4.0E-07	B
Co 60	1.27E+01	1.23E-08	1.71E-06	1.32E-04	PF	5	8.0E-08	B
I 129	1.40E-02	5.41E-09	1.95E-07	4.17E-07	PF	4	7.0E-08	B
Np 237	2.31E-03	6.41E-12	8.87E-10	6.88E-08	PF	6	1.2E-12	B
Pu 238	8.11E+00	2.18E-08	3.02E-06	2.34E-04	PF	6	2.1E-12	B
Pu 239/240	9.78E+02	2.72E-06	3.76E-04	2.91E-02	PF	5	2.0E-12	B
Pu 241	8.11E+02	1.86E-06	2.58E-04	2.00E-02	PF	6	1.0E-10	B
RuRh 106	4.68E-02	1.26E-13	1.12E-09	8.69E-08	PF	6	3.0E-08	B
Sr 89/90	1.65E+03	2.51E-08	5.20E-04	4.03E-02	PF	4	9.0E-09	B
Tc 99	1.41E+02	3.92E-07	5.42E-05	4.20E-03	PF	5	2.0E-06	B
U 238	6.76E+04	1.88E-12	2.60E-10	2.01E-08	PF	5	1.0E-10	B
water		1.51E+05	1.51E+05	1.51E+05	Stm Tabl	1		

Tank Farm 241-C Vapor Estimates

Sample Type	DL		Tank:	241-C-107				
Sample Date	6/3/91		Contents:	Sludge				
Sample ID	R-8046		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	4.2E-03		Retr. Method	Pumping/Sluicing				
pH	13.23							
Density, g/ml	1.14							
Temperature, °R	592							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	9.65E-02	4.38E-08	9.59E-06	5.42E-04	PF	5	2.27E-03	C1
Al	2.81E-02	5.10E-08	1.12E-05	6.31E-04	PF	5	9.06E+00	C1
As	5.00E-04	3.27E-10	7.15E-08	4.04E-06	PF	5	6.52E-02	C1
Ba	6.43E-05	2.30E-11	5.03E-09	2.84E-07	PF	6	8.92E-02	C1
Bi	1.18E+01	2.76E-06	6.03E-04	3.41E-02	PF	6		
C ₂ H ₃ O ₃ anion	5.88E-02	3.84E-08	8.40E-06	4.75E-04	PF	6		
C ₆ H ₅ O ₇ anion	1.49E-02	4.24E-09	8.45E-07	5.24E-05	PF	6		
Ca	1.75E-03	2.14E-09	4.69E-07	2.65E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce	6.58E-05	2.31E-11	5.04E-09	2.85E-07	PF	6		
Cl	5.56E-11	4.87E-18	1.70E-14	9.63E-13	PF	6		
CN	6.20E-02	1.17E-07	2.56E-05	1.44E-03	PF	5	4.70E+00	C1, D
CO ₃	1.92E+01	1.57E-05	3.43E-03	1.94E-01	PF	5		
Cr	3.22E-01	6.74E-08	6.64E-05	3.75E-03	PF	4	2.35E-01	C1, D
EDTA ¹²	2.27E-01	3.82E-08	8.35E-06	4.72E-04	PF	6		
F	8.62E-03	1.31E-09	4.87E-06	2.75E-04	PF	6	3.22E+00	C1
Fe	1.75E-03	1.53E-09	3.35E-07	1.89E-05	PF	5	2.18E+00	C1
Fe (CN) ₆	5.25E-08	1.21E-14	2.66E-12	1.50E-10	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	6.51E-01	1.09E-07	2.38E-05	1.35E-03	PF	6		
K	2.42E-01	3.04E-07	6.65E-05	3.76E-03	PF	5		
Mg	1.75E-03	3.57E-09	7.82E-07	4.42E-05	PF	5	1.02E+01	C1
Mn	4.39E-04	3.91E-10	8.56E-08	4.84E-06	PF	5	2.22E+00	C2, D
Mo	2.02E-02	1.03E-08	2.26E-06	1.27E-04	PF	5	2.55E+00	C1
Na	5.44E+01	1.16E-04	2.54E-02	1.43E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.80E-11	1.50E-17	3.28E-15	1.85E-13	PF	6	4.14E-02	C1, D
NO ₂	5.35E+01	4.38E-06	1.25E-02	7.05E-01	PF	4		

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₃	3.68E+01	2.24E-06	6.37E-03	3.60E-01	PF	4		
OH	2.89E+00	8.33E-06	1.82E-03	1.03E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.72E-12	4.08E-19	8.93E-17	5.05E-15	PF	6	5.91E-03	C1, A, D
PO ₄	8.42E+00	5.22E-06	1.14E-03	6.46E-02	PF	5		
Pu	7.60E-04	1.53E-10	3.34E-08	1.89E-06	PF	6		
Si	3.16E-02	5.53E-08	1.21E-05	6.84E-04	PF	5	8.73E+00	C1
SiO ₃	5.96E-02	3.84E-08	8.40E-06	4.75E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	9.65E+00	5.47E-07	1.08E-03	6.09E-02	PF	4		
Sn	4.39E-03	1.81E-09	3.96E-07	2.24E-05	PF	5	4.11E-01	C1
Sr	2.74E-08	1.53E-14	3.34E-12	1.89E-10	PF	6		
TOC gC/l ¹⁷	1.03E+00	4.21E-06	9.20E-04	5.20E-02	PF	5		
Zr	8.95E-02	4.82E-08	1.05E-05	5.96E-04	PF	5	1.34E+00	C1, C3
ZrO	1.65E+00	7.54E-07	1.65E-04	9.32E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	7.60E-01	2.10E-09	3.32E-07	2.60E-05	PF	5	2.0E-11	B ¹⁹
Am 243	2.12E-02	5.88E-11	9.29E-09	7.27E-07	PF	6	2.0E-11	B
C 14	2.33E+00	6.47E-09	1.02E-06	8.00E-05	PF	6	6.0E-06	B
Cm 242	4.66E-02	2.58E-13	4.08E-11	3.20E-09	PF	6	7.0E-10	B
Cm 244	5.51E-03	1.31E-11	2.07E-09	1.62E-07	PF	6	4.0E-11	B
Cs 137	4.12E+04	7.07E-06	1.67E-02	1.31E+00	PF	4	4.0E-07	B
I 129	2.33E-03	9.00E-10	3.24E-08	8.00E-08	PF	6	7.0E-08	B
Np 237	6.14E-03	1.71E-11	2.69E-09	2.11E-07	PF	6	1.2E-12	B
Pu 238	3.18E+00	8.55E-09	1.35E-06	1.06E-04	PF	6	2.1E-12	B
Pu 239/240	4.62E+02	1.28E-06	2.03E-04	1.59E-02	PF	5	2.0E-12	B
Pu 241	4.66E+02	1.07E-06	1.69E-04	1.33E-02	PF	6	1.0E-10	B
RuRh 106	3.18E-03	8.58E-15	8.69E-11	6.80E-09	PF	6	3.0E-08	B
Se 79	4.66E-02	1.29E-10	2.04E-08	1.60E-06	PF	6	1.0E-06	B
Sr 89/90	1.70E+03	2.92E-08	6.92E-04	5.42E-02	PF	4	9.0E-09	B
Tc 99	8.10E+01	2.25E-07	3.55E-05	2.78E-03	PF	5	2.0E-06	B
U 238	3.18E+00	8.83E-09	1.39E-06	1.09E-04	PF	6	1.0E-10	B
water		1.09E+05	1.09E+05	1.09E+05	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	DL		Tank:	241-C-108				
Sample Date	6/19/75		Contents:	Sludge				
Sample ID	T-5489		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	6.7E-03		Retr. Method	Pumping/Sluicing				
pH	13.68							
Density, g/ml	1.13							
Temperature, °R	537							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	8.80E-14	4.32E-20	8.83E-18	3.52E-16	PF	6	2.27E-03	C1
Al	1.88E+00	3.68E-06	7.53E-04	3.01E-02	PF	5	9.06E+00	C1
Ba	4.40E-04	1.70E-10	3.48E-08	1.39E-06	PF	6	8.92E-02	C1
Bi	8.40E+00	2.13E-06	4.35E-04	1.74E-02	PF	6		
Ca	4.80E+00	6.35E-06	1.30E-03	5.19E-02	PF	6	6.11E+00	C1 as CaCO ₃
Ce	5.60E-06	2.12E-12	4.33E-10	1.73E-08	PF	6		
Cl	5.60E-12	5.29E-19	1.73E-15	6.91E-14	PF	6		
CN		2.20E-01	0.00E+00	2.20E-01	Sample	2	4.70E+00	C1, D
CO ₃	9.60E+00	8.47E-06	1.73E-03	6.91E-02	PF	6		
Cr	2.08E-01	4.70E-08	4.33E-05	1.73E-03	PF	6	2.35E-01	C1, D
F	7.60E-04	1.25E-10	4.33E-07	1.73E-05	PF	6	3.22E+00	C1
Fe	4.40E+00	4.16E-06	8.50E-04	3.40E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	4.80E+00	1.20E-06	2.45E-04	9.78E-03	PF	6	5.77E-01	C1 as CN, D ¹³
Na	3.68E+02	8.47E-04	1.73E-01	6.91E+00	PF	6	2.13E+00	C2 as NaOH
Ni	4.80E+00	4.31E-06	8.81E-04	3.52E-02	PF	6	4.14E-02	C1, D
NO ₂	2.25E+01	1.99E-06	5.29E-03	2.11E-01	PF	5		
NO ₃	6.82E+01	4.48E-06	1.19E-02	4.75E-01	PF	5		
OH	8.13E+00	2.53E-05	5.17E-03	2.07E-01	PF	5	2.88E+00	C2 as NaOH
Pb	3.32E-13	8.49E-20	1.74E-17	6.93E-16	PF	6	5.91E-03	C1, A, D
PO ₄	3.80E+00	2.55E-06	5.21E-04	2.08E-02	PF	6		
SiO ₃	6.00E-04	4.18E-10	8.55E-08	3.41E-06	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.28E-02	7.84E-10	1.44E-06	5.76E-05	PF	6		
ZrO	1.28E+00	6.33E-07	1.29E-04	5.17E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.62E+02	4.48E-07	7.13E-05	1.65E-03	PF	6	2.0E-11	B ¹⁹
Am 243	3.24E+02	9.01E-11	1.44E-08	7.35E-07	PF	6	2.0E-11	B

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C 14	1.19E+00	3.30E-09	5.26E-07	2.70E-05	PF	6	6.0E-06	B
Cm 242	8.00E-02	4.44E-13	7.07E-11	3.62E-09	PF	6	7.0E-10	B
Cm 244	4.00E-07	9.54E-16	1.52E-13	7.79E-12	PF	6	4.0E-11	B
Cs 137	4.14E+04	4.70E-06	1.12E-02	5.75E-01	PF	5	4.0E-07	B
Cs 134	2.23E+02	1.15E-09	1.83E-07	9.37E-06	PF	5	4.0E-07	B
I 129	8.00E-06	3.09E-12	1.11E-10	1.81E-10	PF	6	7.0E-08	B
Np 237	1.19E-03	3.30E-12	5.26E-10	2.70E-08	PF	6	1.2E-12	B
Pu 238	8.00E+00	2.15E-08	3.43E-06	1.76E-04	PF	6	2.1E-12	B
Pu 239/240	4.76E+02	1.12E-06	2.11E-04	1.08E-02	PF	6	2.0E-12	B
Pu 241	8.00E+02	1.84E-06	2.93E-04	1.50E-02	PF	6	1.0E-10	B
RuRh 106	4.00E-03	1.08E-14	1.10E-10	5.66E-09	PF	6	3.0E-08	B
Se 79	1.62E-04	4.51E-13	7.18E-11	3.68E-09	PF	6	1.0E-06	B
Sr 89/90	6.78E+02	7.85E-09	1.87E-04	9.60E-03	PF	5	9.0E-09	B
Sb 125	1.66E+02	3.50E-09	5.58E-07	2.86E-05	PF	5	1.0E-06	B
Tc 99	4.00E-03	1.11E-11	1.77E-09	9.07E-08	PF	6	2.0E-06	B
U 238	4.00E+00	1.11E-08	1.77E-06	9.07E-05	PF	6	1.0E-10	B
water		3.31E+04	3.31E+04	3.31E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	DL		Tank:	241-C-109				
Sample Date	6/19/75		Contents:	Sludge/ SN				
Sample ID	T-5490		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.4E-03		Retr. Method	Pumping/Sluicing				
pH	13.89							
Density, g/ml	1.21							
Temperature, °R	542							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	8.80E-11	4.00E-17	8.24E-15	2.90E-13	PF	6	2.27E-03	C1
Al	1.69E+00	3.07E-06	6.32E-04	2.23E-02	PF	5	9.06E+00	C1
Ba	6.08E-04	2.17E-10	4.49E-08	1.58E-06	PF	6	8.92E-02	C1
Bi	8.40E-01	1.97E-07	4.06E-05	1.43E-03	PF	6		
Ca	1.60E+01	1.96E-05	4.04E-03	1.42E-01	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.12E-03	3.92E-10	8.09E-08	2.85E-06	PF	6		
Cl	8.40E-10	7.35E-17	2.43E-13	8.55E-12	PF	6		
CO ₃	2.88E+01	2.35E-05	4.85E-03	1.71E-01	PF	6		
Cr	4.00E-02	8.37E-09	7.78E-06	2.74E-04	PF	6	2.35E-01	C1, D
F	2.28E-01	3.46E-08	1.21E-04	4.27E-03	PF	6	3.22E+00	C1
Fe	6.80E-01	5.95E-07	1.23E-04	4.32E-03	PF	6	2.18E+00	C1
Fe(CN) ₆	1.60E+01	3.70E-06	7.63E-04	2.69E-02	PF	6	5.77E-01	C1 as CN, D ¹³
K	4.80E-04	6.03E-10	1.24E-07	4.38E-06	PF	6		
Na	3.76E+01	8.01E-05	1.65E-02	5.82E-01	PF	6	2.13E+00	C2 as NaOH
N ₂	1.40E+01	1.16E-05	2.40E-03	8.45E-02	PF	6	1.14E-02	C1, D
NO ₂	1.41E+02	1.15E-05	3.10E-02	1.09E+00	PF	5		
NO ₃	4.90E+01	2.98E-06	7.98E-03	2.81E-01	PF	5		
OH	1.31E+01	3.77E-05	7.79E-03	2.74E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.08E-13	2.56E-20	5.27E-18	1.86E-16	PF	6	5.91E-03	C1, A, D
PO ₄	1.84E+00	1.14E-06	2.35E-04	8.29E-03	PF	6		
SiO ₃	6.00E-01	3.87E-07	7.98E-05	2.81E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.92E+00	1.09E-07	2.02E-04	7.12E-03	PF	6		
Sr	3.52E-03	1.96E-09	4.04E-07	1.42E-05	PF	6		
ZrO	1.72E-01	7.88E-08	1.62E-05	5.72E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	4.00E-01	1.10E-09	1.64E-07	8.03E-06	PF	6	2.0E-11	B ¹⁹

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 243	2.38E-05	6.61E-14	9.83E-12	4.80E-10	PF	6	2.0E-11	B
C 14	7.57E+00	2.10E-08	3.13E-06	1.53E-04	PF	6	6.0E-06	B
Cm 242	8.44E-06	4.68E-17	6.96E-15	3.40E-13	PF	6	7.0E-10	B
Cm 244	2.38E-03	5.67E-12	8.44E-10	4.12E-08	PF	6	4.0E-11	B
Cs 137	1.49E+05	1.69E-05	3.78E-02	1.84E+00	PF	5	4.0E-07	B
Cs 134	2.34E+02	1.21E-09	1.79E-07	8.76E-06	PF	5	4.0E-07	B
I 129	8.00E-03	3.09E-09	1.11E-07	1.62E-07	PF	6	7.0E-08	B
Np 237	2.38E-02	6.61E-11	9.83E-09	4.80E-07	PF	6	1.2E-12	B
Pu 238	4.00E-01	1.08E-09	1.60E-07	7.83E-06	PF	6	2.1E-12	B
Pu 239/240	4.76E+00	1.32E-08	1.97E-06	9.61E-05	PF	6	2.0E-12	B
Pu 241	4.00E-01	9.21E-10	1.37E-07	6.69E-06	PF	6	1.0E-10	B
RuRh 106	1.62E-07	4.38E-19	4.18E-15	2.04E-13	PF	6	3.0E-08	B
Se 79	1.62E-01	4.51E-10	6.70E-08	3.27E-06	PF	6	1.0E-06	B
Sr 89/90	6.68E+02	7.72E-09	1.72E-04	8.41E-03	PF	5	9.0E-09	B
Tc 99	4.00E+00	1.11E-08	1.65E-06	8.08E-05	PF	6	2.0E-06	B
U 238	8.44E-01	2.34E-09	3.49E-07	1.70E-05	PF	6	1.0E-10	B
water		3.95E+04	3.95E+04	3.95E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	SN		Tank:	241-C-110				
Sample Date	6/3/91		Contents:	Sludge/ SN				
Sample ID	R-8087		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.2							
Temperature, °R	545							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	5.00E-03	2.18E-09	4.72E-07	1.03E-05	PF	5	2.27E-03	C1
Al	3.00E-02	5.22E-08	1.13E-05	2.47E-04	PF	5	9.06E+00	C1
As	5.00E-04	3.13E-10	6.79E-08	1.48E-06	PF	5	6.52E-02	C1
Ba	2.89E-05	9.91E-12	2.15E-09	4.69E-08	PF	6	8.92E-02	C1
B	1.75E-02	7.47E-08	1.62E-05	3.54E-04	PF	5	2.22E+01	C1
Bi	1.75E-02	3.93E-09	8.53E-07	1.86E-05	PF	5		
Ca	1.67E-03	1.96E-09	4.25E-07	9.28E-06	PF	5	6.11E+00	C1 as CaCO ₃
Ce	2.92E-02	9.80E-09	2.12E-06	4.64E-05	PF	5		
CO ₃	1.51E+01	1.18E-05	2.56E-03	5.59E-02	PF	5		
Cr	3.07E-01	6.16E-08	6.01E-05	1.31E-03	PF	4	2.35E-01	C1, D
F	9.99E-10	1.45E-16	5.35E-13	1.17E-11	PF	6	3.22E+00	C1
Fe	2.50E-03	2.10E-09	4.55E-07	9.92E-06	PF	5	2.18E+00	C1
Fe (CN) ₆	1.71E-12	3.79E-19	8.21E-17	1.79E-15	PF	6	5.77E-01	C1 as CN, D ¹³
Hg	1.05E-03	2.45E-10	5.32E-08	1.16E-06	PF	5	6.08E-03	B, C1, C2
K	9.50E-01	1.14E-06	2.48E-04	5.41E-03	PF	5		
Mg	1.67E-03	3.27E-09	7.09E-07	1.55E-05	PF	5	1.02E+01	C1
Mn	3.33E-04	2.84E-10	6.17E-08	1.35E-06	PF	5	2.22E+00	C2, D
Mo	2.08E-02	1.02E-08	2.21E-06	4.82E-05	PF	5	2.55E+00	C1
Na	6.99E+01	1.43E-04	3.10E-02	6.75E-01	PF	5	2.13E+00	C2 as NaOH
Ni	1.58E-15	1.26E-21	2.72E-19	5.94E-18	PF	6	4.14E-02	C1, D
NO ₂	1.89E+01	1.48E-06	4.19E-03	9.13E-02	PF	4		
NO ₃	1.13E+02	6.58E-06	1.86E-02	4.05E-01	PF	4		
OH	8.32E+01	2.30E-04	4.99E-02	1.09E+00	PF	5	2.88E+00	C2 as NaOH
Pb	1.58E-14	3.58E-21	7.76E-19	1.69E-17	PF	6	5.91E-03	C1, A, D
PO ₄	7.35E+00	4.37E-06	9.48E-04	2.07E-02	PF	5		
Pu	1.79E-05	3.44E-12	7.46E-10	1.63E-08	PF	5		

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Se	2.00E-04	1.19E-10	2.58E-08	5.63E-07	PF	5	6.19E-02	C1, D
Si	2.50E-02	4.19E-08	9.10E-06	1.98E-04	PF	5	8.73E+00	C1
SiO ₃	9.99E-11	6.17E-17	1.34E-14	2.92E-13	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.75E+01	9.51E-07	1.86E-03	4.05E-02	PF	4		
Sr	8.33E-04	4.45E-10	9.64E-08	2.10E-06	PF	5		
TOC gC/l ¹⁷	6.32E-01	2.47E-06	5.37E-04	1.17E-02	PF	5		
Zr	5.00E-03	2.58E-09	5.60E-07	1.22E-05	PF	5	1.34E+00	C1, C3
ZrO	2.76E+00	1.21E-06	2.63E-04	5.73E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.63E+01	7.25E-08	1.09E-05	3.43E-04	PF	6	2.0E-11	B ¹⁹
Am 243	2.63E-04	7.30E-13	1.09E-10	3.45E-09	PF	6	2.0E-11	B
C 14	1.07E-10	2.96E-19	4.44E-17	1.40E-15	PF	6	6.0E-06	B
Cm 242	3.91E-04	2.17E-15	3.25E-13	1.03E-11	PF	6	7.0E-10	B
Cm 244	9.23E-13	2.20E-21	3.30E-19	1.04E-17	PF	6	4.0E-11	B
Cs 137	2.43E+04	4.17E-06	9.37E-03	2.96E-01	PF	4	4.0E-07	B
I 129	6.75E-13	2.61E-19	9.38E-18	8.87E-18	PF	6	7.0E-08	B
Np 237	1.31E-04	3.65E-13	5.48E-11	1.73E-09	PF	6	1.2E-12	B
Pu 238	1.31E+01	3.54E-08	5.31E-06	1.67E-04	PF	6	2.1E-12	B
Pu 239/240	4.40E+01	1.22E-07	1.83E-05	5.78E-04	PF	5	2.0E-12	B
Pu 241	2.63E+02	6.05E-07	9.07E-05	2.86E-03	PF	6	1.0E-10	B
RuRh 106	6.75E-09	1.82E-20	1.75E-16	5.53E-15	PF	6	3.0E-08	B
Se 79	1.31E-11	3.65E-20	5.48E-18	1.73E-16	PF	6	1.0E-06	B
Sr 89/90	8.38E+00	1.44E-10	3.24E-06	1.02E-04	PF	4	9.0E-09	B
Tc 99	7.01E-01	1.95E-07	2.92E-05	9.21E-04	PF	5	2.0E-06	B
U 238	1.31E-01	3.65E-10	5.48E-08	1.73E-06	PF	6	1.0E-10	B
water		4.35E+04	4.35E+04	4.35E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	SN		Tank:	241-C-111				
Sample Date	2/19/75		Contents:	Sludge				
Sample ID	T-2167		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.4E-03		Retr. Method	Pumping/Sluicing				
pH	13.91							
Density, g/ml	1.2							
Temperature, °R	538							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.02E-10	4.47E-17	9.63E-15	3.29E-13	PF	6	2.27E-03	C1
Al	3.97E+00	6.96E-06	1.50E-03	5.12E-02	PF	5	9.06E+00	C1
Ba	6.95E-04	2.40E-10	5.17E-08	1.77E-06	PF	6	8.92E-02	C1
Bi	6.95E+00	1.57E-06	3.39E-04	1.16E-02	PF	6		
Ca	5.56E+00	6.58E-06	1.42E-03	4.84E-02	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.75E-08	5.93E-15	1.28E-12	4.36E-11	PF	6		
Cl	5.10E-10	4.31E-17	1.48E-13	5.07E-12	PF	6		
CO ₃	1.34E+01	1.06E-05	2.28E-03	7.80E-02	PF	6		
Cr	2.41E-01	4.87E-08	4.72E-05	1.61E-03	PF	6	2.35E-01	C1, D
F	7.88E-02	1.15E-08	4.22E-05	1.44E-03	PF	6	3.22E+00	C1
Fe	5.10E+00	4.31E-06	9.27E-04	3.17E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	6.02E+00	1.34E-06	2.89E-04	9.89E-03	PF	6	5.77E-01	C1 as CN, D ¹³
Na	3.29E+01	6.77E-05	1.46E-02	4.98E-01	PF	6	2.13E+00	C2 as NaOH
Ni	8.34E+00	6.69E-06	1.44E-03	4.92E-02	PF	6	4.14E-02	C1, D
NO ₂	2.71E+01	2.14E-06	6.00E-03	2.05E-01	PF	5		
NO ₃	9.55E+01	5.60E-06	1.57E-02	5.36E-01	PF	5		
OH	1.38E+01	3.84E-05	8.27E-03	2.83E-01	PF	5	2.88E+00	C2 as NaOH
Pb	3.06E-13	6.99E-20	1.51E-17	5.14E-16	PF	6	5.91E-03	C1, A, D
PO ₄	3.94E+00	2.36E-06	5.08E-04	1.74E-02	PF	6		
SiO ₃	3.52E-01	2.19E-07	4.72E-05	1.61E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	8.80E-01	4.82E-08	9.34E-05	3.19E-03	PF	6		
ZrO	9.73E-01	4.30E-07	9.27E-05	3.17E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	9.27E+01	2.56E-07	3.84E-05	1.88E-03	PF	6	2.0E-11	B ¹⁹
Am 243	1.88E+02	5.22E-11	7.82E-09	3.84E-07	PF	6	2.0E-11	B
C 14	3.51E+00	9.74E-09	1.46E-06	7.16E-05	PF	6	6.0E-06	B

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Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242	3.26E-02	1.81E-13	2.71E-11	1.33E-09	PF	6	7.0E-10	B
Cm 244	2.38E-03	5.67E-12	8.51E-10	4.17E-08	PF	6	4.0E-11	B
Cs 137	1.88E+04	3.14E-06	7.06E-03	3.46E-01	PF	6	4.0E-07	B
I 129	9.27E-03	3.58E-09	1.29E-07	1.89E-07	PF	6	7.0E-08	B
Np 237	2.38E-02	6.61E-11	9.91E-09	4.86E-07	PF	6	1.2E-12	B
Pu 238	1.38E+01	3.71E-08	5.56E-06	2.73E-04	PF	6	2.1E-12	B
Pu 239/240	3.76E+02	1.04E-06	1.57E-04	7.68E-03	PF	6	2.0E-12	B
Pu 241	4.63E+02	1.07E-06	1.60E-04	7.84E-03	PF	6	1.0E-10	B
RuRh 106	1.38E-04	3.72E-16	3.58E-12	1.76E-10	PF	6	3.0E-08	B
Se 79	1.38E-01	3.83E-10	5.74E-08	2.82E-06	PF	6	1.0E-06	B
Sr 89/90	4.13E+05	5.93E-06	1.56E-01	7.65E+00	PF	6	9.0E-09	B
To 99	4.63E+00	1.29E-08	1.93E-06	9.47E-05	PF	6	2.0E-06	B
U 238	4.63E+00	1.29E-08	1.93E-06	9.47E-05	PF	6	1.0E-10	B
water		3.44E+04	3.44E+04	3.44E+04	Stm Tabl	1		

Tank Farm 241-C Vapor Estimates

Sample Type	DL		Tank:	241-C-112				
Sample Date	6/26/75		Contents:	Sludge				
Sample ID	T-5624		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	6.6E-03		Retr. Method	Pumping/Sluicing				
pH	13.69							
Density, g/ml	1.22							
Temperature, °R	543							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.79E-11	1.27E-17	2.59E-15	1.05E-13	PF	6	2.27E-03	C1
Al	4.26E-01	7.71E-07	1.58E-04	6.40E-03	PF	5	9.06E+00	C1
Ba	1.96E-04	6.98E-11	1.43E-08	5.79E-07	PF	6	8.92E-02	C1
Bi	4.32E-01	1.01E-07	2.07E-05	8.37E-04	PF	6		
Ca	1.02E+01	1.24E-05	2.54E-03	1.03E-01	PF	6	6.11E+00	C1 as CaCO ₃
Ce	2.13E-03	7.45E-10	1.53E-07	6.18E-06	PF	6		
Cl	9.11E-01	7.95E-08	2.61E-04	1.06E-02	PF	5		
CO ₃	3.17E+01	2.58E-05	5.29E-03	2.14E-01	PF	5		
Cr	1.32E-02	2.76E-09	2.54E-06	1.03E-04	PF	6	2.35E-01	C1, D
F	4.67E-02	7.06E-09	2.46E-05	9.96E-04	PF	5	3.22E+00	C1
Fe	2.79E-01	2.44E-07	5.00E-05	2.02E-03	PF	6	2.18E+00	C1
Fe (CN) ₆	1.70E+01	3.92E-06	8.04E-04	3.25E-02	PF	6	5.77E-01	C1 as CN, D ¹³
K	1.98E-03	2.48E-09	5.09E-07	2.06E-05	PF	6		
Na	6.16E+01	1.31E-04	2.68E-02	1.09E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.50E+01	1.24E-05	2.54E-03	1.03E-01	PF	6	4.14E-02	C1, D
NO ₂	6.44E+01	5.26E-06	1.40E-02	5.67E-01	PF	5		
NO ₃	1.12E+02	6.79E-06	1.81E-02	7.32E-01	PF	5		
OH	8.37E+00	2.41E-05	4.93E-03	2.00E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.85E-13	4.38E-20	8.97E-18	3.63E-16	PF	6	5.91E-03	C1, A, D
PO ₄	2.47E+00	1.53E-06	3.13E-04	1.27E-02	PF	5		
Pu	3.12E-06	6.25E-13	1.28E-10	5.18E-09	PF	5		
SiO ₃	3.81E-01	2.45E-07	5.02E-05	2.03E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	7.37E-01	4.16E-08	7.69E-05	3.11E-03	PF	6		
Sr	2.23E-02	1.24E-08	2.54E-06	1.03E-04	PF	6		
ZrO	8.13E-02	3.71E-08	7.61E-06	3.08E-04	PF	6	1.14E+00	C1 as Zr

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 ¹⁸	5.08E+01	1.40E-07	2.07E-05	1.16E-03	PF	6	2.0E-11	B ¹⁹
Am 243	1.03E+02	2.86E-11	4.22E-09	2.37E-07	PF	6	2.0E-11	B
C 14	6.11E+00	1.70E-08	2.50E-06	1.41E-04	PF	6	6.0E-06	B
Cm 242	5.08E-02	2.82E-13	4.16E-11	2.34E-09	PF	6	7.0E-10	B
Cm 244	1.51E-03	3.60E-12	5.31E-10	2.99E-08	PF	6	4.0E-11	B
Cs 137	1.25E+05	1.42E-05	3.15E-02	1.77E+00	PF	5	4.0E-07	B
Cs 134	2.20E+02	1.13E-09	1.67E-07	9.38E-06	PF	5	4.0E-07	B
I 129	2.54E-03	9.81E-10	3.53E-08	5.85E-08	PF	6	7.0E-08	B
Np 237	1.10E-02	3.05E-11	4.50E-09	2.53E-07	PF	6	1.2E-12	B
Pu 238	2.54E+00	6.84E-09	1.01E-06	5.67E-05	PF	6	2.1E-12	B
Pu 239/240	1.91E-01	5.31E-10	7.84E-08	4.41E-06	PF	5	2.0E-12	B
Pu 241	2.54E+02	5.84E-07	8.62E-05	4.85E-03	PF	6	1.0E-10	B
RuRh 106	1.30E-03	3.52E-15	3.33E-11	1.87E-09	PF	6	3.0E-08	B
Se 79	7.55E-02	2.10E-10	3.09E-08	1.74E-06	PF	6	1.0E-06	B
Sr 89/90	1.29E+03	1.50E-08	3.31E-04	1.86E-02	PF	5	9.0E-09	B
Tc 99	2.27E+00	6.29E-09	9.28E-07	5.22E-05	PF	6	2.0E-06	B
U 238	2.75E+00	7.63E-09	1.13E-06	6.33E-05	PF	6	1.0E-10	B
water		4.08E+04	4.08E+04	4.08E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	SN		Tank:	241-C-201				
Sample Date	12/4/78		Contents:	Sludge				
Sample ID	T-3421		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.5E-03		Retr. Method	Pumping/Sluicing				
pH	13.53							
Density, g/ml	1.16							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.00E-12	5.15E-19	9.80E-17	2.98E-15	PF	6	2.27E-03	C1
Al	1.86E+00	3.81E-06	7.26E-04	2.21E-02	PF	5	9.06E+00	C1
Ba	3.04E-05	1.23E-11	2.34E-09	7.10E-08	PF	6	8.92E-02	C1
Bi	8.12E-01	2.15E-07	4.09E-05	1.24E-03	PF	5		
Cl	2.32E+00	2.29E-07	6.99E-04	2.12E-02	PF	5		
CO ₃	2.32E+01	2.14E-05	4.08E-03	1.24E-01	PF	5		
CrO ₄	3.48E-01	1.66E-07	3.16E-05	9.61E-04	PF	5	2.11E-02	C2
F	5.80E-01	9.94E-08	3.22E-04	9.78E-03	PF	5	3.22E+00	C1
Fe	7.20E+01	7.12E-05	1.35E-02	4.12E-01	PF	5	2.18E+00	C1
Hg	8.12E-02	2.24E-08	4.26E-06	1.29E-04	PF	5	6.08E-03	B, C1, C2
K	4.64E-01	6.59E-07	1.25E-04	3.81E-03	PF	5		
La	8.12E-01	3.23E-07	6.16E-05	1.87E-03	PF	5		
Mn	1.16E-02	1.17E-08	2.22E-06	6.76E-05	PF	5	2.22E+00	C2, D
Na	3.13E+01	7.54E-05	1.43E-02	4.36E-01	PF	5	2.13E+00	C2 as NaOH
Na	9.28E+00	8.71E-06	1.66E-03	5.04E-02	PF	5	4.14E-02	C1, D
NO ₂	1.16E+00	1.07E-07	2.66E-04	8.08E-03	PF	5		
NO ₃	4.41E+01	3.03E-06	7.50E-03	2.28E-01	PF	5		
OH	5.80E+00	1.89E-05	3.60E-03	1.09E-01	PF	5	2.88E+00	C2 as NaOH
Pb	2.51E-14	6.71E-21	1.28E-18	3.88E-17	PF	6	5.91E-03	C1, A, D
PO ₄	1.72E+02	1.21E-04	2.29E-02	6.98E-01	PF	5		
Pu	4.07E-02	9.24E-09	1.76E-06	5.34E-05	PF	5		
SO ₄	1.39E+01	8.90E-07	1.53E-03	4.64E-02	PF	5		
TOC gC/l ¹⁷	2.40E+00	1.11E-05	2.11E-03	6.41E-02	PF	5		
U, g/l	7.70E-02	1.79E-08	3.41E-06	1.04E-04	PF	5	5.14E-03	C1
ZrO	4.23E-04	2.19E-10	4.16E-08	1.27E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.32E+00	3.65E-09	5.66E-07	2.11E-05	PF	6	2.0E-11	B ¹⁹

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 243	5.35E-05	1.49E-13	2.31E-11	8.60E-10	PF	6	2.0E-11	B
C 14	6.78E-03	1.88E-11	2.92E-09	1.09E-07	PF	6	6.0E-06	B
Cm 242	1.32E-05	7.33E-17	1.14E-14	4.24E-13	PF	6	7.0E-10	B
Cm 244	5.35E-08	1.28E-16	1.98E-14	7.38E-13	PF	6	4.0E-11	B
Cs 137	8.89E+03	1.09E-06	2.54E-03	9.47E-02	PF	5	4.0E-07	B
I 129	1.18E-04	4.55E-11	1.64E-09	1.89E-09	PF	6	7.0E-08	B
Np 237	2.75E-04	7.63E-13	1.18E-10	4.42E-09	PF	6	1.2E-12	B
Pu 238	3.93E-03	1.06E-11	1.64E-09	6.11E-08	PF	6	2.1E-12	B
Pu 239/240	2.89E+03	8.03E-06	1.25E-03	4.65E-02	PF	5	2.0E-12	B
Pu 241	3.93E-01	9.03E-10	1.40E-07	5.23E-06	PF	6	1.0E-10	B
RuRh 106	7.85E-10	2.12E-21	2.11E-17	7.87E-16	PF	6	3.0E-08	B
Se 79	2.64E-03	7.34E-12	1.14E-09	4.25E-08	PF	6	1.0E-06	B
Sr 89/90	4.73E+04	5.89E-07	1.37E-02	5.11E-01	PF	5	9.0E-09	B
Tc 99	7.85E-02	2.18E-10	3.38E-08	1.26E-06	PF	6	2.0E-06	B
U 238	5.41E-02	1.50E-10	2.33E-08	8.69E-07	PF	5	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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Tank Farm 241-C Vapor Estimates

Sample Type	TRAC		Tank:	241-C-202					
Sample Date	N/A		Contents:	Sludge					
Sample ID	TRAC		Watchlist:	N/A					
Properties	Value		Status:	IS / II					
Visc., lbm/ft-s ¹	3.0E-02		Retr. Method	Pumping/Sluicing					
pH	12.37								
Density, g/ml	1.3								
Temperature, °R	529								
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation	
Ba	7.92E-04	2.75E-10	5.44E-08	3.52E-07	PF	6	8.92E-02	C1	
Bi	5.55E-16	1.26E-22	2.50E-20	1.62E-19	PF	6			
CO ₃	1.27E+02	1.00E-04	1.99E-02	1.29E-01	PF	6	2.13E+00	C2 as NaOH	
Na	6.08E+01	1.25E-04	2.48E-02	1.61E-01	PF	6			
NO ₃	3.17E-09	1.87E-16	4.81E-13	3.11E-12	PF	6	2.88E+00	C2 as NaOH	
OH	3.96E-01	1.11E-06	2.19E-04	1.42E-03	PF	6	5.91E-03	C1, A, D	
Pb	5.55E-12	1.27E-18	2.52E-16	1.63E-15	PF	6			
PO ₄	1.74E-13	1.05E-19	2.08E-17	1.34E-16	PF	6			
SO ₄	2.03E-03	1.12E-10	1.99E-07	1.29E-06	PF	6			
ZrO	2.91E-04	1.29E-10	2.55E-08	1.65E-07	PF	6	1.14E+00	C1 as Zr	
Am 241 ¹⁸	7.85E+00	2.17E-08	3.00E-06	2.78E-05	PF	6	2.0E-11	B ¹⁹	
Am 243	2.64E-04	7.33E-13	1.02E-10	9.40E-10	PF	6	2.0E-11	B	
C 14	7.85E-01	2.18E-09	3.02E-07	2.79E-06	PF	6	6.0E-06	B	
Cm 242	1.07E-04	5.94E-16	8.22E-14	7.61E-13	PF	6	7.0E-10	B	
Cs 137	1.07E-10	1.79E-20	3.72E-17	3.44E-16	PF	6	4.0E-07	B	
Np 237	1.07E-04	2.97E-13	4.12E-11	3.81E-10	PF	6	1.2E-12	B	
Pu 238	2.64E-02	7.11E-11	9.84E-09	9.11E-08	PF	6	2.1E-12	B	
Pu 239/240	1.71E+01	4.76E-08	6.59E-06	6.10E-05	PF	6	2.0E-12	B	
Pu 241	1.86E+00	4.27E-09	5.91E-07	5.47E-06	PF	6	1.0E-10	B	
RuRh 106	2.36E-07	6.36E-19	5.65E-15	5.23E-14	PF	6	3.0E-08	B	
Se 79	1.36E-15	3.77E-24	5.22E-22	4.83E-21	PF	6	1.0E-06	B	
Sr 89/90	1.36E-11	2.28E-22	4.72E-18	4.37E-17	PF	6	9.0E-09	B	
Tc 99	5.28E-14	1.47E-22	2.03E-20	1.88E-19	PF	6	2.0E-06	B	
U 238	5.28E+01	1.47E-07	2.03E-05	1.88E-04	PF	6	1.0E-10	B	
water		2.36E+04	2.36E+04	2.36E+04	Stm Tabl	1			

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Tank Farm 241-C Vapor Estimates

Sample Type	TRAC		Tank:	241-C-203				
Sample Date	N/A		Contents:	Sludge				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	6.6E-04		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	0.99							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ba	1.58E-04	5.87E-11	1.43E-08	4.95E-06	PF	6	8.92E-02	C1
Bi	1.11E-16	2.69E-23	6.55E-21	2.27E-18	PF	6		
CO ₃	2.54E+00	2.15E-06	5.22E-04	1.81E-01	PF	6		
Na	1.22E+00	2.68E-06	6.52E-04	2.26E-01	PF	6	2.13E+00	C2 as NaOH
NO ₃	1.32E-07	8.31E-15	2.63E-11	9.12E-09	PF	6		
Pb	1.11E-13	2.72E-20	6.62E-18	2.29E-15	PF	6	5.91E-03	C1, A, D
PO ₄	3.49E-07	2.24E-13	5.45E-11	1.89E-08	PF	6		
SO ₄	4.07E-04	2.39E-11	5.23E-08	1.81E-05	PF	6		
ZrO	5.07E-04	2.41E-10	5.85E-08	2.03E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.57E-01	4.33E-10	7.88E-08	3.66E-05	PF	6	2.0E-11	B ¹⁹
Am 243	5.28E-06	1.47E-14	2.67E-12	1.24E-09	PF	6	2.0E-11	B
C 14	1.57E-02	4.36E-11	7.93E-09	3.68E-06	PF	6	6.0E-06	B
Cm 242	2.14E-06	1.19E-17	2.16E-15	1.00E-12	PF	6	7.0E-10	B
Cm 244	5.28E-14	1.26E-22	2.29E-20	1.06E-17	PF	6	4.0E-11	B
Cs 137	3.14E-04	5.25E-14	1.43E-10	6.64E-08	PF	6	4.0E-07	B
I 129	1.57E-10	6.06E-17	2.18E-15	3.68E-14	PF	6	7.0E-08	B
Np 237	2.14E-06	5.95E-15	1.08E-12	5.02E-10	PF	6	1.2E-12	B
Pu 238	1.06E-03	2.84E-12	5.17E-10	2.40E-07	PF	6	2.1E-12	B
Pu 239/240	3.43E-01	9.52E-10	1.73E-07	8.03E-05	PF	6	2.0E-12	B
Pu 241	3.71E-02	8.54E-11	1.55E-08	7.20E-06	PF	6	1.0E-10	B
RuRh 106	4.28E-09	1.16E-20	1.35E-16	6.26E-14	PF	6	3.0E-08	B
Se 79	2.71E-09	7.53E-18	1.37E-15	6.36E-13	PF	6	1.0E-06	B
Sr 89/90	3.14E+04	5.27E-07	1.44E-02	6.66E+00	PF	6	9.0E-09	B
Tc 99	1.06E-07	2.93E-16	5.34E-14	2.48E-11	PF	6	2.0E-06	B
U 238	1.06E+00	2.93E-09	5.34E-07	2.48E-04	PF	6	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

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[illegible]

Tank Farm 241-C Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
RuRh 106	1.76E-11	4.76E-23	5.49E-19	2.52E-16	PF	6	3.0E-08	B
Se 79	7.14E-05	1.98E-13	3.57E-11	1.64E-08	PF	6	1.0E-06	B
Sr 89/90	3.95E+00	4.56E-11	1.23E-06	5.67E-04	PF	5	9.0E-09	B
Tc 99	2.62E-03	7.27E-12	1.31E-09	6.02E-07	PF	6	2.0E-06	B
U 238	7.85E-03	2.18E-11	3.93E-09	1.81E-06	PF	6	1.0E-10	B
water		2.25E+04	2.25E+04	2.25E+04	Stm Tabl	1		

Tank Farm 241-C Vapor Estimates

- Note: 1. No viscosity data available. Viscosity for tanks C-203 and C-204 used estimate of water corrected to tank temperature. All other tanks were estimated assuming 40 vol. % solids.
- Note: 1A. No densities were reported for tanks C-101 and C-203; therefore, density was adjusted to minimize moles of water. Density for tank C-105 was raised from 1.75 to 1.98 and NO₃ reduced by 10 to obtain positive moles of water.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. Reported values for tank C-103 of n-C₁₁H₂₄ < 4.9 ppm and n-C₁₅H₃₂ < 3.6 ppm reported from vapor samples taken by WHC on 12/93. Reported values for tank C-111 of N₂H₄ < 0.2 ppm, NO_x < 0.5 ppm, NH₃ < 2.0 ppm, and CN < 0.04 ppm reported from vapor samples taken by WHC on 8/11/93.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data denoted by 6. Lab data for tanks C-102, 103, 104, 105, 106, 107, and 110 denoted by 4,5 based on PF availability. Lab data for tanks C-108, 109, 111, 112, 201, and 204 denoted by 5 due to tank activity after the sampling date. Recent vapor sample data denoted by 2. Reported value for tank C-104 of 0.003 ppm, tank C-105 of 0.05 ppm, and tank C-106 of 0.047 ppm for NO_x reported from vapor samples taken by PNL/WHC on 3/3/94. Reported value for tank C-108 of 0.22 ppm CN reported from vapor samples taken by PNL/WHC on 8/25/93.
- Note: 7. Allowable concentration, in ppm by volume.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate. Reported value for tank C-103 of 368 ppm reported from vapor samples taken by WHC on 1/94 (WHC-SD-WM-SARR-001 REV 0). Reported value from tank C-104 of 49 ppm, C-105 of 3.2 ppm, and C-106 of 11.0 ppm reported from vapor samples taken by PNL/WHC on 3/3/93.
- Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).

Tank Farm 241-C Vapor Estimates

Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-S Vapor Estimates

Sample Type	SL		Tank:	241-S-101				
Sample Date	11/19/75		Contents:	Sludge/Saltcake/SN				
Sample ID	T-9715		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	6.1E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.61							
Temperature, °R	583							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	1.36E-09	1.13E-15	9.58E-14	1.34E-11	PF	6	2.27E-03	C1
Al	4.91E+01	1.64E-04	1.38E-02	1.93E+00	PF	5	9.06E+00	C1
Ba	5.07E-04	3.33E-10	2.81E-08	3.94E-06	PF	6	8.92E-02	C1
Bi	2.66E-16	1.14E-22	9.66E-21	1.35E-18	PF	6		
C ₂ H ₃ O ₃ anion	9.28E-03	1.11E-08	9.39E-07	1.32E-04	PF	6		
C ₆ H ₅ O ₇ anion	1.05E+01	4.40E-04	1.58E-02	5.21E+00	PF	6		
Ca	1.98E-08	4.45E-14	3.76E-12	5.27E-10	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.73E-03	1.11E-09	9.39E-08	1.32E-05	PF	6		
Cl	8.66E-10	1.39E-16	1.88E-13	2.63E-11	PF	6		
CO ₃	1.91E-01	2.86E-07	2.42E-05	3.39E-03	PF	5		
Cr	2.60E+01	9.98E-06	3.79E-03	5.32E-01	PF	6	2.35E-01	C1, D
EDTA ¹²	5.44E-02	1.68E-08	1.42E-06	1.98E-04	PF	6		
F	1.18E-01	3.27E-08	4.70E-05	6.58E-03	PF	6	3.22E+00	C1
Fe	2.10E+00	3.38E-06	2.85E-04	4.00E-02	PF	6	2.18E+00	C1
Fe(CN) ₆	1.30E-03	5.51E-10	4.65E-08	6.52E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.05E-01	3.23E-08	2.73E-06	3.82E-04	PF	6		
K	7.42E-01	1.71E-06	1.45E-04	2.03E-02	PF	6		
Mn	2.04E-02	3.34E-08	2.82E-06	3.95E-04	PF	6	2.22E+00	C2, D
Na	1.73E+02	6.77E-04	5.72E-02	8.01E+00	PF	6	2.13E+00	C2 as NaOH
Ni	2.54E-02	3.87E-08	3.26E-06	4.57E-04	PF	6	4.14E-02	C1, D
NO ₂	1.02E+02	1.53E-05	1.68E-02	2.36E+00	PF	5		
NO ₃	2.90E+02	3.24E-05	3.55E-02	4.98E+00	PF	5		
OH	6.12E+01	3.24E-04	2.73E-02	3.83E+00	PF	5	2.88E+00	C2 as NaOH

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Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Pb	2.60E-04	1.13E-10	9.53E-09	1.34E-06	PF	6	5.91E-03	C1, A, D
PO ₄	1.18E+00	1.34E-06	1.13E-04	1.58E-02	PF	6		
SiO ₃	4.70E-01	5.56E-07	4.70E-05	6.58E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.97E+00	3.09E-07	2.35E-04	3.29E-02	PF	6		
Sr	8.80E+02	8.99E-04	7.59E-02	1.06E+01	PF	6		
ZrO	4.02E-03	3.38E-09	2.85E-07	4.00E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.51E+02	6.92E-07	7.74E-05	8.19E-03	PF	6	2.0E-11	B ¹⁹
Am 243	1.35E+01	3.76E-10	4.20E-08	4.45E-06	PF	6	2.0E-11	B
C 14	3.18E+01	8.82E-08	9.86E-06	1.04E-03	PF	6	6.0E-06	B
Cm 242	2.84E+01	1.58E-12	1.76E-10	1.86E-08	PF	6	7.0E-10	B
Cm 244	6.19E+01	1.47E-09	1.65E-07	1.74E-05	PF	6	4.0E-11	B
Cs 137	8.21E+03	9.33E-07	1.56E-03	1.66E-01	PF	5	4.0E-07	B
Cs 134	1.24E+03	6.37E-09	7.13E-07	7.54E-05	PF	5	4.0E-07	B
I 129	1.84E+01	7.10E-08	5.71E-08	6.04E-06	PF	6	7.0E-08	B
Np 237	6.19E+02	1.72E-10	1.92E-08	2.03E-06	PF	6	1.2E-12	B
Pu 238	6.19E+00	1.66E-08	1.86E-06	1.97E-04	PF	6	2.1E-12	B
Pu 239/240	1.49E+02	4.13E-07	4.62E-05	4.89E-03	PF	6	2.0E-12	B
Pu 241	1.27E+03	1.44E-06	1.61E-04	1.70E-02	PF	5	1.0E-10	B
RuRh 106	6.85E-05	1.85E-16	1.33E-12	1.40E-10	PF	6	3.0E-08	B
Se 79	3.68E+00	1.02E-08	1.14E-06	1.21E-04	PF	6	1.0E-06	B
Sr 89/90	3.34E+05	5.61E-06	9.40E-02	9.95E+00	PF	6	9.0E-09	B
Tc 99	1.24E+02	3.44E-07	3.84E-05	4.07E-03	PF	6	2.0E-06	B
U 238	1.24E+00	3.44E-09	3.84E-07	4.07E-05	PF	6	1.0E-10	B
water		9.69E+04	9.69E+04	9.69E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SN		Tank:	241-S-102				
Sample Date	3/28/80		Contents:	Saltcake/ Sludge				
Sample ID	T-8101		Watchlist:	Hydrogen, Org Salts				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	5.2E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.4							
Temperature, °R	567							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Al	4.77E+01	7.65E-05	1.54E-02	1.10E+00	PF	5	9.06E+00	C1
Ba	3.61E-04	1.14E-10	2.30E-08	1.64E-06	PF	6	8.92E-02	C1
Bi	2.02E-16	4.19E-23	8.44E-21	6.02E-19	PF	6		
C ₂ H ₃ O ₃ anion	2.17E-11	1.25E-17	2.52E-15	1.80E-13	PF	6		
C ₆ H ₅ O ₇ anion	7.22E-09	2.50E-15	3.33E-13	3.60E-11	PF	6		
Ce	1.35E-11	4.17E-18	8.40E-16	5.99E-14	PF	6		
CO ₃	8.21E+00	5.92E-06	1.19E-03	8.52E-02	PF	5		
Cr	2.02E+00	3.73E-07	3.39E-04	2.42E-02	PF	6	2.35E-01	C1, D
EDTA ¹²	8.66E-11	1.28E-17	2.59E-15	1.85E-13	PF	6		
F	3.66E-10	4.90E-17	1.68E-13	1.20E-11	PF	6	3.22E+00	C1
Fe	2.69E-01	2.08E-07	4.20E-05	2.99E-03	PF	6	2.18E+00	C1
Fe (CN) ₆	1.30E-03	2.65E-10	5.35E-08	3.81E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.35E-10	1.99E-17	4.01E-15	2.86E-13	PF	6		
K	7.70E-10	8.54E-16	1.72E-13	1.23E-11	PF	6		
Mn	1.59E-11	1.25E-17	2.52E-15	1.80E-13	PF	6	2.22E+00	C2, D
Na	2.52E+02	4.73E-04	9.55E-02	6.81E+00	PF	5	2.13E+00	C2 as NaOH
Ni	8.66E-02	6.35E-08	1.28E-05	9.14E-04	PF	6	4.14E-02	C1, D
NO ₂	1.21E+02	8.78E-06	2.30E-02	1.64E+00	PF	5		
NO ₃	1.36E+02	7.29E-06	1.91E-02	1.36E+00	PF	5		
OH	6.89E+01	1.75E-04	3.54E-02	2.52E+00	PF	5	2.88E+00	C2 as NaOH
Pb	2.98E-01	6.24E-08	1.26E-05	8.97E-04	PF	6	5.91E-03	C1, A, D
PO ₄	3.99E-01	2.19E-07	4.41E-05	3.14E-03	PF	5		
Pu	8.23E-06	1.46E-12	2.95E-10	2.10E-08	PF	5		

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
SiO ₃	1.44E-09	8.22E-16	1.66E-13	1.18E-11	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.04E-01	2.02E-08	3.67E-05	2.62E-03	PF	5		
Sr	4.23E-13	2.08E-19	4.20E-17	2.99E-15	PF	6		
U, g/l	3.23E-04	5.87E-11	1.19E-08	8.45E-07	PF	5	5.14E-03	C1
ZrO	5.29E-04	2.14E-10	4.32E-08	3.08E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	4.81E+00	1.33E-08	1.71E-06	1.91E-04	PF	6	2.0E-11	B ¹⁹
Am 243	9.62E-04	2.67E-12	3.44E-10	3.84E-08	PF	6	2.0E-11	B
C 14	3.90E-08	1.08E-16	1.39E-14	1.56E-12	PF	6	6.0E-06	B
Cm 242	3.38E-03	1.88E-14	2.41E-12	2.70E-10	PF	6	7.0E-10	B
Cm 244	4.81E-10	1.15E-18	1.47E-16	1.65E-14	PF	6	4.0E-11	B
Cs 137	1.95E-04	3.26E-14	6.29E-11	7.03E-09	PF	6	4.0E-07	B
I 129	2.47E-10	9.54E-17	8.82E-17	9.87E-15	PF	6	7.0E-08	B
Np 237	4.81E-05	1.34E-13	1.72E-11	1.92E-09	PF	6	1.2E-12	B
Pu 238	9.62E-01	2.59E-09	3.33E-07	3.72E-05	PF	6	2.1E-12	B
Pu 239/240	5.05E-03	1.40E-11	1.80E-09	2.02E-07	PF	5	2.0E-12	B
Pu 241	9.62E+00	2.21E-08	2.85E-06	3.18E-04	PF	6	1.0E-10	B
RuRh 106	2.47E-04	6.67E-16	5.50E-12	6.15E-10	PF	6	3.0E-08	B
Se 79	3.38E-09	9.39E-18	1.21E-15	1.35E-13	PF	6	1.0E-06	B
Sr 89/90	2.47E+04	4.15E-07	7.99E-03	8.94E-01	PF	6	9.0E-09	B
Tc 99	1.43E-07	3.97E-16	5.11E-14	5.71E-12	PF	6	2.0E-06	B
U 238	2.28E-04	6.33E-13	8.14E-11	9.10E-09	PF	5	1.0E-10	B
water		7.42E+04	7.42E+04	7.42E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SN		Tank:	241-S-103				
Sample Date	12/6/74		Contents:	Saltcake/SN/Sludge				
Sample ID	T-8009		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	6.8E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.24							
Temperature, °R	551							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Al	1.27E+01	2.08E-05	4.64E-03	2.30E-01	PF	5	9.06E+00	C1
Ba	1.17E-03	3.78E-10	8.43E-08	4.18E-06	PF	6	8.92E-02	C1
Bi	4.47E-16	9.45E-23	2.11E-20	1.05E-18	PF	6		
C ₂ H ₃ O ₃ anion	2.45E-09	1.44E-15	3.22E-13	1.60E-11	PF	6		
C ₆ H ₅ O ₇ anion	4.05E-08	1.08E-14	2.11E-12	1.19E-10	PF	6		
Ca	1.70E-07	1.88E-13	4.20E-11	2.08E-09	PF	6	6.11E+00	C1 as CaCO ₃
Ce	2.98E-11	9.41E-18	2.10E-15	1.04E-13	PF	6		
CO ₃	4.04E+00	2.97E-06	6.64E-04	3.29E-02	PF	5		
Cr	5.01E-01	9.44E-08	9.49E-05	4.71E-03	PF	6	2.35E-01	C1, D
EDTA ¹²	1.92E-08	2.90E-15	6.47E-13	3.21E-11	PF	6		
F	8.11E-02	1.11E-08	4.21E-05	2.09E-03	PF	5	3.22E+00	C1
Fe	2.98E-02	2.35E-08	5.25E-06	2.60E-04	PF	6	2.18E+00	C1
Fe (CN) ₆	1.00E-15	2.09E-22	4.66E-20	2.31E-18	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.81E-08	2.73E-15	6.09E-13	3.02E-11	PF	6		
K	1.28E-09	1.45E-15	3.23E-13	1.60E-11	PF	6		
Mn	4.69E-10	3.76E-16	8.40E-14	4.17E-12	PF	6	2.22E+00	C2, D
Na	8.83E+01	1.70E-04	3.78E-02	1.88E+00	PF	5	2.11E+00	C2 as NaOH
Ni	6.28E-03	4.70E-09	1.05E-06	5.21E-05	PF	6	4.14E-02	C1, D
NO ₂	2.66E+01	1.96E-06	5.70E-03	2.83E-01	PF	5		
NO ₃	8.87E+01	4.86E-06	1.41E-02	7.00E-01	PF	5		
OH	2.01E+01	5.22E-05	1.17E-02	5.78E-01	PF	5	2.88E+00	C2 as NaOH
Pb	4.37E-06	9.32E-13	2.08E-10	1.03E-08	PF	6	5.91E-03	C1, A, D
PO ₄	3.27E+00	1.83E-06	4.08E-04	2.02E-02	PF	5		

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Pu	1.48E-03	2.68E-10	5.98E-08	2.97E-06	PF	5		
SiO ₃	1.60E-09	9.29E-16	2.07E-13	1.03E-11	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.16E+00	5.92E-08	1.19E-04	5.91E-03	PF	5		
Sr	6.50E-13	3.26E-19	7.28E-17	3.61E-15	PF	6		
ZrO	6.82E-04	2.81E-10	6.28E-08	3.12E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁹	1.07E+00	2.94E-09	4.27E-07	3.25E-05	PF	6	2.0E-11	B ¹⁹
Am 243	3.17E-04	8.79E-13	1.28E-10	9.73E-09	PF	6	2.0E-11	B
C 14	2.16E-06	5.99E-15	8.70E-13	6.64E-11	PF	6	6.0E-06	B
Cm 242	8.64E-04	4.79E-15	6.95E-13	5.30E-11	PF	6	7.0E-10	B
Cm 244	2.13E-09	5.08E-18	7.37E-16	5.62E-14	PF	6	4.0E-11	B
Cs 137	1.78E+05	1.97E-05	4.30E-02	3.28E+00	PF	5	4.0E-07	B
Cs 134	7.62E+02	2.82E-09	4.09E-07	3.12E-05	PF	5	4.0E-07	B
I 129	7.48E-10	2.89E-16	3.02E-16	2.30E-14	PF	6	7.0E-08	B
Np 237	7.48E-06	2.08E-14	3.02E-12	2.30E-10	PF	6	1.2E-12	B
Pu 238	2.13E-01	5.73E-10	8.32E-08	6.35E-06	PF	6	2.1E-12	B
Pu 239/240	9.08E+01	2.52E-07	3.66E-05	2.79E-03	PF	5	2.0E-12	B
Pu 241	3.17E+00	7.28E-09	1.06E-06	8.06E-05	PF	6	1.0E-10	B
RuRh 106	3.16E+04	1.29E-12	1.20E-08	9.15E-07	PF	5	3.0E-08	B
Se 79	1.07E-08	2.96E-17	4.29E-15	3.27E-13	PF	6	1.0E-06	B
Sr 89/90	2.40E+02	2.71E-09	5.89E-05	4.50E-03	PF	5	9.0E-09	B
Tc 99	4.32E-07	1.20E-15	1.74E-13	1.33E-11	PF	6	2.0E-06	B
U 238	3.17E-02	8.80E-11	1.28E-08	9.74E-07	PF	6	1.0E-10	B
water		5.16E+04	5.16E+04	5.16E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SL		Tank:	241-S-104				
Sample Date	4/13/90		Contents:	Sludge				
Sample ID	Composite		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	6.4E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.75							
Temperature, °R	576							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	8.75E-03	2.98E-09	5.66E-07	3.37E-05	PF	5	2.27E-03	C1
Al	2.08E+02	2.83E-04	5.38E-02	3.21E+00	PF	5	9.06E+00	C1
As	3.38E-02	1.66E-08	3.15E-06	1.88E-04	PF	5	6.52E-02	C1
Ba	6.34E-02	1.70E-08	3.23E-06	1.93E-04	PF	5	8.92E-02	C1
B	6.16E+01	2.06E-04	3.91E-02	2.33E+00	PF	5	2.22E+01	C1
Bi	8.31E-02	1.46E-08	2.78E-06	1.65E-04	PF	5		
Ca	6.56E+00	6.02E-06	1.15E-03	6.82E-02	PF	5	6.11E+00	C1 as CaCO ₃
Ce	1.11E-01	2.91E-08	5.54E-06	3.30E-04	PF	5		
Cd	6.56E-03	2.15E-09	4.09E-07	2.44E-05	PF	5	5.46E-04	C1, C2, D
Cl	5.93E+00	3.89E-07	1.18E-03	7.05E-02	PF	5		
CN	7.07E-03	9.99E-09	1.90E-06	1.13E-04	PF	5	4.70E+00	C1, D
Co	1.64E-02	1.02E-08	1.94E-06	1.16E-04	PF	5	2.07E-02	C1, D
CO ₃	1.29E+01	7.90E-06	1.50E-03	8.95E-02	PF	5		
Cr	4.45E+00	6.98E-07	5.98E-04	3.56E-02	PF	5	2.35E-01	C1, D
Cu	1.28E-01	7.35E-08	1.40E-05	8.32E-04	PF	5	3.82E-01	C1
F	3.83E-01	4.35E-08	1.41E-04	8.39E-03	PF	5	3.22E+00	C1
Fe	3.12E+00	2.05E-06	3.89E-04	2.32E-02	PF	5	2.18E+00	C1
K	6.28E-01	5.92E-07	1.12E-04	6.70E-03	PF	5		
La	1.84E-02	4.86E-09	9.25E-07	5.51E-05	PF	5		
Mg	7.82E-01	1.20E-06	2.28E-04	1.36E-02	PF	5	1.02E+01	C1
Mn	3.05E+00	2.04E-06	3.87E-04	2.31E-02	PF	5	2.22E+00	C2, D
Na	2.29E+02	3.66E-04	6.96E-02	4.14E+00	PF	5	2.13E+00	C2 as NaOH
Ni	9.85E+00	6.13E-06	1.17E-03	6.95E-02	PF	5	4.14E-02	C1, D
NO ₂	4.29E+01	2.63E-06	6.51E-03	3.88E-01	PF	5		
NO ₃	3.57E+02	1.63E-05	4.02E-02	2.40E+00	PF	5		
OH	1.53E+02	3.30E-04	6.28E-02	3.74E+00	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
P	1.93E-01	2.29E-07	4.35E-05	2.59E-03	PF	5		
Pb	7.77E-02	1.38E-08	2.62E-06	1.56E-04	PF	5	5.91E-03	C1, A, D
PO ₄	3.83E+00	1.78E-06	3.39E-04	2.02E-02	PF	5		
Sb	3.20E-01	9.64E-08	1.83E-05	1.09E-03	PF	5	1.00E-01	C1, D
Se	1.31E-01	6.09E-08	1.16E-05	6.90E-04	PF	5	6.19E-02	C1, D
Si	2.85E+00	3.74E-06	7.11E-04	4.24E-02	PF	5	8.73E+00	C1
SiO ₃	1.35E-01	6.51E-08	1.24E-05	7.38E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.20E+00	1.78E-07	3.06E-04	1.82E-02	PF	5		
Sn	2.01E-02	6.21E-09	1.18E-06	7.03E-05	PF	5	4.11E-01	C1
Sr	8.54E-01	3.57E-07	6.78E-05	4.04E-03	PF	5		
TOC gC/l ¹⁷	3.99E+00	1.22E-05	2.32E-03	1.38E-01	PF	5		
Ti	2.24E-02	1.71E-08	3.26E-06	1.94E-04	PF	5		
Zn	1.43E+00	8.08E-07	1.54E-04	9.16E-03	PF	5		
Zr	6.25E-02	2.52E-08	4.80E-06	2.86E-04	PF	5	1.34E+00	C1, C3
ZrO	5.75E-03	1.97E-09	3.75E-07	2.24E-05	PF	5	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.15E+02	5.94E-07	6.11E-05	6.73E-03	PF	5	2.0E-11	B ¹⁹
Am 243	1.80E-02	4.99E-11	5.13E-09	5.65E-07	PF	6	2.0E-11	B
C 14	2.06E+00	5.73E-09	5.90E-07	6.49E-05	PF	5	6.0E-06	B
Cm 242	4.61E-02	2.56E-13	2.63E-11	2.90E-09	PF	6	7.0E-10	B
Cm 244	8.98E-04	2.14E-12	2.20E-10	2.43E-08	PF	6	4.0E-11	B
Cs 137	1.12E+05	1.87E-05	2.88E-02	3.18E+00	PF	5	4.0E-07	B
Co 60	2.50E+01	4.11E-08	4.23E-06	4.65E-04	PF	5	8.0E-08	B
Eu 154	2.76E+02	4.83E-07	5.62E-05	6.19E-03	PF	5	5.0E-08	B
Eu 155	2.76E+02	4.28E-07	4.40E-05	4.84E-03	PF	5	3.0E-07	B
I 129	6.00E+01	2.32E-05	1.71E-05	1.89E-03	PF	5	7.0E-08	B
Np 237	3.64E-02	1.01E-10	1.04E-08	1.15E-06	PF	6	1.2E-12	B
Pu 238	8.01E+00	2.16E-08	2.22E-06	2.44E-04	PF	6	2.1E-12	B
Pu 239/240	6.73E+02	1.87E-06	1.92E-04	2.12E-02	PF	5	2.0E-12	B
Pu 241	1.80E+02	4.13E-07	4.25E-05	4.68E-03	PF	6	1.0E-10	B
RuRh 106	2.67E-05	7.22E-17	4.76E-13	5.24E-11	PF	6	3.0E-08	B
Se 79	2.67E-01	7.42E-10	7.63E-08	8.40E-06	PF	6	1.0E-06	B
Sr 89/90	5.73E+05	9.61E-06	1.48E-01	1.63E+01	PF	5	9.0E-09	B
Tc 99	4.95E+01	1.37E-07	1.41E-05	1.56E-03	PF	5	2.0E-06	B
U 238	1.19E-02	3.30E-11	3.40E-09	3.74E-07	PF	5	1.0E-10	B
water		8.70E+04	8.70E+04	8.70E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SL		Tank:	241-S-105				
Sample Date	8/23/74		Contents:	Saltcake/ Sludge				
Sample ID	RAT-S105-6		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	8.9E-03		Retr. Method	Pumping/Sluicing				
pH	13.20							
Density, g/ml	1.31							
Temperature, °R	546							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.13E-10	2.58E-16	2.71E-14	2.14E-12	PF	6	2.27E-03	C1
Al	4.15E-01	1.37E-06	1.43E-04	1.13E-02	PF	5	9.06E+00	C1
Ba	2.61E-04	1.69E-10	1.78E-08	1.41E-06	PF	6	8.92E-02	C1
Bi	1.33E-16	5.67E-23	5.95E-21	4.71E-19	PF	6		
CO ₃	1.78E+01	2.64E-05	2.77E-03	2.20E-01	PF	5		
Cr	2.43E+00	9.24E-07	4.37E-04	3.46E-02	PF	6	2.35E-01	C1, D
Fe	1.62E-01	2.58E-07	2.70E-05	2.14E-03	PF	6	2.18E+00	C1
Na	3.60E+02	1.39E-03	1.46E-01	1.16E+01	PF	5	2.13E+00	C2 as NaOH
NO ₂	2.52E+00	3.75E-07	5.11E-04	4.05E-02	PF	5		
NO ₃	9.19E+02	1.01E-04	1.38E-01	1.10E+01	PF	5		
OH	2.68E+00	1.40E-05	1.47E-03	1.17E-01	PF	5	2.88E+00	C2 as NaOH
Pb	4.23E-14	1.82E-20	1.91E-18	1.51E-16	PF	6	5.91E-03	C1, A, D
SiO ₃	1.33E-01	1.56E-07	1.64E-05	1.30E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.68E+00	1.73E-07	1.63E-04	1.29E-02	PF	6		
ZrO	3.71E-04	3.08E-10	3.23E-08	2.56E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.17E+00	1.43E-08	1.96E-06	1.18E-04	PF	6	2.0E-11	B ¹⁹
Am 243	1.10E+01	3.06E-10	4.20E-08	2.54E-06	PF	6	2.0E-11	B
Ci 14	5.79E+00	1.61E-08	2.21E-06	1.34E-04	PF	6	6.0E-06	B
Cm 242	2.97E-03	1.65E-14	2.27E-12	1.37E-10	PF	6	7.0E-10	B
Cm 244	1.16E+03	2.76E-12	3.79E-10	2.29E-08	PF	6	4.0E-11	B
Cs 137	1.12E+04	1.24E-06	2.56E-03	1.55E-01	PF	5	4.0E-07	B
I 129	2.97E-02	1.15E-08	1.14E-08	6.66E-07	PF	6	7.0E-08	B
Np 237	5.79E-02	1.61E-10	2.21E-08	1.34E-06	PF	6	1.2E-12	B
Pu 238	1.72E+01	4.63E-10	6.37E-08	3.85E-06	PF	6	2.1E-12	B

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Pu 239/240	7.51E+00	2.09E-08	2.87E-06	1.73E-04	PF	6	2.0E-12	B
Pu 241	1.16E+01	2.66E-08	3.66E-06	2.21E-04	PF	6	1.0E-10	B
RuRh 106	1.72E-06	4.65E-18	4.10E-14	2.48E-12	PF	6	3.0E-08	B
Se 79	4.70E-01	1.30E-09	1.79E-07	1.08E-05	PF	6	1.0E-06	B
Sr 89/90	2.97E+04	4.99E-07	1.03E-02	6.21E-01	PF	6	9.0E-09	B
To 99	1.72E+01	4.78E-08	6.57E-06	3.97E-04	PF	6	2.0E-06	B
U 238	5.79E-02	1.61E-10	2.21E-08	1.34E-06	PF	6	1.0E-10	B
water		4.48E+04	4.48E+04	4.48E+04	Stm Tabl	1		

Tank Farm 241-S Vapor Estimates

Sample Type	SN		Tank:	241-S-106				
Sample Date	6/4/75		Contents:	Saltcake/ Sludge				
Sample ID	RAT-S106-3		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.45							
Temperature, °R	551							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	4.72E-10	1.81E-16	3.69E-14	1.21E-12	PF	6	2.27E-03	C1
Al	5.00E+01	7.66E-05	1.56E-02	5.12E-01	PF	5	9.06E+00	C1
Ba	4.18E-04	1.26E-10	2.57E-08	8.44E-07	PF	6	8.92E-02	C1
Bi	1.31E-16	2.60E-23	5.30E-21	1.74E-19	PF	6		
C ₂ H ₃ O ₃ anion	3.65E-04	2.01E-10	4.10E-08	1.34E-06	PF	6		
C ₆ H ₅ O ₇ anion	9.24E-01	3.00E-07	4.12E-05	2.01E-03	PF	6		
Ca	7.78E-09	8.04E-15	1.64E-12	5.38E-11	PF	6	6.11E+00	C1 as CaCO ₃
Ce	3.41E-07	1.01E-13	2.05E-11	6.72E-10	PF	6		
Cl	1.70E-13	1.26E-20	4.10E-17	1.34E-15	PF	6		
CO ₃	1.62E+01	1.12E-05	2.28E-03	7.46E-02	PF	5		
Cr	2.29E-01	4.04E-08	3.71E-05	1.21E-03	PF	6	2.35E-01	C1, D
EDTA ¹²	2.82E-03	3.99E-10	8.15E-08	2.67E-06	PF	6		
F	7.30E-04	9.34E-11	3.24E-07	1.06E-05	PF	6	3.22E+00	C1
Fe	6.81E-02	5.03E-08	1.03E-05	3.36E-04	PF	6	2.18E+00	C1
Fe (CN) ₆	1.95E-07	3.79E-14	7.74E-12	2.54E-10	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	5.35E-03	7.55E-10	1.54E-07	5.05E-06	PF	6		
K	3.79E-04	4.02E-10	8.20E-08	2.69E-06	PF	6		
Mn	1.07E-03	8.04E-10	1.64E-07	5.38E-06	PF	6	2.22E+00	C2, D
Na	2.56E+02	4.59E-04	9.17E-02	3.07E+00	PF	5	2.13E+00	C2 as NaOH
Ni	2.58E-05	1.81E-11	3.68E-09	1.21E-07	PF	6	4.14E-02	C1, D
NO ₂	8.20E+01	5.67E-06	1.50E-02	4.93E-01	PF	5		
NO ₃	1.50E+02	7.71E-06	2.04E-02	6.70E-01	PF	5		
OH	7.57E+01	1.84E-04	3.75E-02	1.23E+00	PF	5	2.88E+00	C2 as NaOH
Pb	3.02E-06	6.02E-13	1.23E-10	4.03E-09	PF	6	5.91E-03	C1, A, D
PO ₄	2.29E+00	1.20E-06	2.44E-04	8.00E-03	PF	5		

Tank Farm 241-S Vapor Estimates

Sample Type	DL		Tank:	241-S-107				
Sample Date	10/16/78		Contents:	Sludge/Saltcake/SN				
Sample ID	RAT-S107-2		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	4.6E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.3							
Temperature, °R	573							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Al	3.27E+01	6.21E-05	1.14E-02	1.01E+00	PF	5	9.06E+00	C1
Ba	2.15E-04	8.06E-11	1.48E-08	1.31E-06	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ anion	5.38E-12	3.68E-18	6.75E-16	5.99E-14	PF	6		
C ₆ H ₅ O ₇ anion	2.73E-08	1.11E-14	1.36E-12	1.81E-10	PF	6		
Ce	3.01E-12	1.10E-18	2.02E-16	1.80E-14	PF	6		
CO ₃	1.66E+01	1.42E-05	2.60E-03	2.31E-01	PF	5		
Cr	2.58E+01	5.66E-06	4.67E-03	4.14E-01	PF	6	2.35E-01	C1, D
EDTA ¹²	4.16E-11	7.31E-18	1.34E-15	1.19E-13	PF	6		
F	6.82E+00	1.08E-06	3.37E-03	2.99E-01	PF	6	3.22E+00	C1
Fe	1.58E+00	1.45E-06	2.65E-04	2.35E-02	PF	6	2.18E+00	C1
Fe(CN) ₆	1.94E-04	4.69E-11	8.60E-09	7.62E-07	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.00E-10	1.76E-17	3.23E-15	2.86E-13	PF	6		
K	1.65E-09	2.17E-15	3.98E-13	3.53E-11	PF	6		
Mn	7.90E-11	7.36E-17	1.35E-14	1.20E-12	PF	6	2.22E+00	C2, D
Na	1.65E+02	3.68E-04	6.75E-02	5.99E+00	PF	6	2.13E+00	C2 as NaOH
Ni	1.29E-02	1.12E-08	2.06E-06	1.83E-04	PF	6	4.14E-02	C1, D
NO ₂	9.40E+01	8.06E-06	1.92E-02	1.70E+00	PF	5		
NO ₃	2.03E+02	1.29E-05	3.08E-02	2.73E+00	PF	5		
OH	3.50E+01	1.06E-04	1.94E-02	1.72E+00	PF	5	2.88E+00	C2 as NaOH
Pb	5.96E-06	1.48E-12	2.71E-10	2.40E-08	PF	6	5.91E-03	C1, A, D
PO ₄	1.06E+01	6.88E-06	1.26E-03	1.12E-01	PF	5		
SiO ₃	1.08E-09	7.27E-16	1.33E-13	1.18E-11	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	5.53E-04	3.28E-11	5.41E-08	4.80E-06	PF	6		
Sr	6.32E-13	3.68E-19	6.75E-17	5.99E-15	PF	6		
TOC gC/l ¹⁷	9.00E+00	3.85E-05	7.05E-03	6.25E-01	PF	5		

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Pu	1.17E-06	1.98E-13	4.04E-11	1.32E-09	PF	5		
SiO ₃	3.70E-01	2.01E-07	4.10E-05	1.34E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.33E+00	1.12E-07	2.05E-04	6.72E-03	PF	6		
Sr	2.14E-09	1.01E-15	2.05E-13	6.72E-12	PF	6		
ZrO	4.77E-05	1.84E-11	3.76E-09	1.23E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	7.36E-01	2.03E-09	2.52E-07	1.36E-05	PF	6	2.0E-11	B ¹⁹
Am 243	2.50E-04	6.94E-13	8.61E-11	4.63E-09	PF	6	2.0E-11	B
C 14	1.45E+01	4.02E-08	4.98E-06	2.68E-04	PF	6	6.0E-06	B
Cm 242	5.78E-04	3.21E-15	3.98E-13	2.14E-11	PF	6	7.0E-10	B
Cm 244	4.86E-03	1.16E-11	1.44E-09	7.75E-08	PF	6	4.0E-11	B
Cs 137	5.30E+05	6.02E-05	1.12E-01	6.03E+00	PF	5	4.0E-07	B
Cs 134	2.02E+03	1.04E-08	1.29E-06	6.94E-05	PF	5	4.0E-07	B
I 129	4.34E+02	1.68E-08	1.50E-08	8.05E-07	PF	6	7.0E-08	B
Np 237	9.73E-02	2.70E-10	3.35E-08	1.81E-06	PF	6	1.2E-12	B
Pu 238	4.34E-02	1.17E-10	1.45E-08	7.80E-07	PF	6	2.1E-12	B
Pu 239/240	7.19E-02	2.00E-10	2.48E-08	1.33E-06	PF	5	2.0E-12	B
Pu 241	9.73E-01	2.24E-09	2.78E-07	1.50E-05	PF	6	1.0E-10	B
RuRh 106	1.12E-06	3.02E-18	2.40E-14	1.29E-12	PF	6	3.0E-08	B
Se 79	9.73E-01	2.70E-09	3.35E-07	1.81E-05	PF	6	1.0E-06	B
Sr 89/90	1.22E+03	1.41E-08	2.62E-04	1.41E-02	PF	5	9.0E-09	B
Tc 99	2.89E+01	8.03E-08	9.97E-06	5.37E-04	PF	6	2.0E-06	B
U 238	4.86E-03	1.35E-11	1.68E-09	9.03E-08	PF	6	1.0E-10	B
water		5.16E+04	5.16E+04	5.16E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
ZrO	3.09E+01	1.48E-05	2.71E-03	2.41E-01	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.91E+02	8.03E-07	1.11E-04	1.31E-02	PF	6	2.0E-11	B ¹⁹
Am 243	5.04E-02	1.40E-10	1.94E-08	2.28E-06	PF	6	2.0E-11	B
C 14	7.18E-08	1.99E-16	2.76E-14	3.24E-12	PF	6	6.0E-06	B
Cm 242	1.44E-01	7.96E-13	1.10E-10	1.29E-08	PF	6	7.0E-10	B
Cm 244	1.44E-09	3.42E-18	4.74E-16	5.56E-14	PF	6	4.0E-11	B
Cs 137	4.12E+05	5.06E-05	1.05E-01	1.23E+01	PF	5	4.0E-07	B
I 129	5.04E-10	1.95E-16	1.94E-16	2.28E-14	PF	6	7.0E-08	B
Np 237	2.13E+03	5.93E-12	8.21E-10	9.64E-08	PF	6	1.2E-12	B
Pu 238	3.69E+01	9.92E-08	1.37E-05	1.61E-03	PF	6	2.1E-12	B
Pu 239/240	4.41E+03	1.22E-05	1.69E-03	1.99E-01	PF	5	2.0E-12	B
Pu 241	1.44E+03	3.30E-06	4.57E-04	5.37E-02	PF	6	1.0E-10	B
RuRh 106	2.91E-02	7.86E-14	6.98E-10	8.19E-08	PF	6	3.0E-08	B
Se 79	7.18E-09	1.99E-17	2.76E-15	3.24E-13	PF	6	1.0E-06	B
Sr 89/90	4.84E+04	6.03E-07	1.25E-02	1.47E+00	PF	5	9.0E-09	B
Tc 99	2.91E-07	8.08E-16	1.12E-13	1.31E-11	PF	6	2.0E-06	B
U 238	7.18E+00	1.99E-08	2.76E-06	3.24E-04	PF	6	1.0E-10	B
water		8.28E+04	8.28E+04	8.28E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SN	Tank:		241-S-108		
Sample Date	6/30/74	Contents:	Saltcake/ Sludge			
Sample ID	RAT-S108-4	Watchlist:	N/A			
Properties	Value	Status:	PI			
Visc., lbm/ft-s	6.6E-03	Retr. Method.	Pumping/Sluicing			
pH	N/A					
Density, g/ml	1.51					
Temperature, °R	562					
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Allowable ⁷ Rel.
Ag ⁹	9.62E-10	3.53E-16	7.22E-14	3.98E-12	PF	6 2.27E-03
Al	4.42E+01	6.49E-05	1.32E-02	7.31E-01	PF	5 9.06E+00
Ba	2.45E-04	7.09E-11	1.45E-08	7.98E-07	PF	6 8.92E-02
C ₂ H ₃ O ₃ anion	2.32E-02	1.23E-08	2.50E-06	1.38E-04	PF	6
C ₆ H ₅ O ₇ anion	5.68E+00	1.56E-06	2.44E-04	1.76E-02	PF	6
Ca	3.50E-08	3.47E-14	7.08E-12	3.91E-10	PF	6 6.11E+00
Ce	1.84E-03	5.20E-10	1.06E-07	5.86E-06	PF	6
Cl	3.10E-10	2.20E-17	7.18E-14	3.96E-12	PF	6
CO ₃	2.62E+00	1.73E-06	3.54E-04	1.95E-02	PF	6
Cr	1.57E+00	2.66E-07	2.45E-04	1.35E-02	PF	6 2.35E-01
EDTA ¹²	1.27E-01	1.72E-08	3.52E-06	1.94E-04	PF	6
F	2.49E-01	3.06E-08	1.06E-04	5.86E-03	PF	6 3.22E+00
Fe	2.09E+01	1.48E-05	3.02E-03	1.67E-01	PF	5 2.18E+00
Fe (CN) ₆	1.75E-04	3.27E-11	6.68E-09	3.69E-07	PF	6 5.77E-01
HEDTA ¹²	2.45E-01	3.31E-08	6.77E-06	3.73E-04	PF	6
K	1.71E-01	1.73E-07	3.54E-05	1.95E-03	PF	6
Mn	1.18E-02	8.51E-09	1.74E-06	9.59E-05	PF	6 2.22E+00
Na	1.84E+02	3.18E-04	6.49E-02	3.58E+00	PF	5 2.13E+00
Na ¹³	7.87E-03	5.29E-09	1.08E-06	5.96E-05	PF	6 4.14E-02
NO ₂	8.94E+01	5.92E-06	1.57E-02	8.68E-01	PF	5
NO ₃	1.61E+02	7.93E-06	2.11E-02	1.16E+00	PF	6
OH	3.27E+01	7.62E-05	1.56E-02	8.59E-01	PF	5 2.88E+00
Pb	3.63E-06	6.95E-13	1.42E-10	7.83E-09	PF	6 5.91E-03
PO ₄	4.15E-01	2.08E-07	4.26E-05	2.35E-03	PF	6
SiO ₃	3.32E-01	1.73E-07	3.54E-05	1.95E-03	PF	6 1.93E+00
						Regulatory Citation
						Cl
						Cl
						Cl
						Cl as CaCO ₃
						Cl, D
						Cl
						Cl
						Cl as CN, D ¹³
						Cl, D
						C ₂ , D
						C ₂ as NaOH
						Cl, D
						C ₂ as NaOH
						Cl, A, D
						Cl (Amorphous)

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
SO ₄	3.37E+00	1.54E-07	2.84E-04	1.57E-02	PF	6		
Sr	1.14E-04	5.12E-11	1.05E-08	5.77E-07	PF	6		
ZrO	9.18E-01	3.40E-07	6.95E-05	3.83E-03	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	4.85E+01	1.34E-07	1.59E-05	1.51E-03	PF	6	2.0E-11	B ¹⁹
Am 243	4.49E+02	1.25E-10	1.49E-08	1.41E-06	PF	6	2.0E-11	B
C 14	2.60E+01	7.22E-08	8.61E-06	8.13E-04	PF	6	6.0E-06	B
Cm 242	9.10E+02	5.05E-13	6.02E-11	5.69E-09	PF	6	7.0E-10	B
Cm 244	2.60E+01	6.20E-10	7.39E-08	6.98E-06	PF	6	4.0E-11	B
Cs 137	4.58E+05	5.08E-05	9.07E-02	8.57E+00	PF	5	4.0E-07	B
I 129	8.75E-02	3.38E-08	2.90E-08	2.74E-06	PF	6	7.0E-08	B
Np 237	8.75E-02	2.43E-10	2.90E-08	2.74E-06	PF	6	1.2E-12	B
Pu 238	1.30E+00	3.50E-09	4.17E-07	3.94E-05	PF	6	2.1E-12	B
Pu 239/240	1.09E+02	3.03E-07	3.61E-05	3.42E-03	PF	5	2.0E-12	B
Pu 241	2.60E+01	5.98E-08	7.13E-06	6.74E-04	PF	6	1.0E-10	B
RuRh 106	3.95E+03	1.61E-13	1.23E-09	1.16E-07	PF	5	3.0E-08	B
Se 79	2.25E+00	6.24E-09	7.44E-07	7.03E-05	PF	6	1.0E-06	B
Sr 89/90	3.15E-04	3.55E-15	6.35E-11	6.01E-09	PF	5	9.0E-09	B
Sb 125	4.60E-01	7.48E-12	8.92E-10	8.43E-08	PF	5	1.0E-06	B
Tc 99	8.75E+01	2.43E-07	2.90E-05	2.74E-03	PF	6	2.0E-06	B
U 238	8.75E-02	2.43E-10	2.90E-08	2.74E-06	PF	6	1.0E-10	B
water		6.71E+04	6.71E+04	6.71E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SC		Tank:	241-S-109				
Sample Date	12/8/76		Contents:	Saltcake/ Sludge				
Sample ID	RAT-S109-1		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	5.8E-03		Retr. Method	Pumping/Sluicing				
pH	13.35							
Density, g/ml	1.27							
Temperature, °R	557							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation.
Ag ⁹	4.00E-09	3.01E-15	3.57E-13	3.95E-11	PF	6	2.27E-03	C1
Al	7.55E+00	2.27E-05	2.69E-03	2.98E-01	PF	5	9.06E+00	C1
Ba	1.21E-03	7.16E-10	8.50E-08	9.40E-06	PF	6	8.92E-02	C1
Bi	1.95E-16	7.58E-23	9.00E-21	9.96E-19	PF	6		
C ₂ H ₃ O ₃ anion	1.40E-01	1.51E-07	1.79E-05	1.98E-03	PF	6		
C ₆ H ₅ O ₇ anion	8.84E+00	7.53E-05	2.71E-03	9.88E-01	PF	6		
Ca	1.02E+00	2.07E-06	2.45E-04	2.72E-02	PF	5	6.11E+00	C1 as CaCO ₃
Ce	2.60E-03	1.51E-09	1.79E-07	1.98E-05	PF	6		
Cl	1.16E-09	1.68E-16	3.20E-13	3.54E-11	PF	6		
CO ₃	5.33E+01	7.21E-05	8.55E-03	9.47E-01	PF	5		
Cr	1.27E+00	4.40E-07	2.35E-04	2.60E-02	PF	5	2.35E-01	C1, D
EDTA ¹²	8.37E-01	2.33E-07	2.76E-05	3.05E-03	PF	6		
F	1.77E+00	4.44E-07	8.95E-04	9.91E-02	PF	6	3.22E+00	C1
Fe	3.81E+00	5.52E-06	6.55E-04	7.25E-02	PF	5	2.18E+00	C1
Fe(CN) ₆	1.53E-03	5.88E-10	6.97E-08	7.71E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.30E+00	3.61E-07	4.28E-05	4.74E-03	PF	6		
K	1.81E-01	3.77E-07	4.48E-05	4.96E-03	PF	6		
Mg	2.54E-01	8.59E-07	1.02E-04	1.13E-02	PF	5	1.02E+01	C1
Mn	3.81E-02	5.62E-08	6.67E-06	7.38E-04	PF	5	2.22E+00	C2, D
Na	4.44E+02	1.57E-03	1.86E-01	2.06E+01	PF	5	2.13E+00	C2 as NaOH
Ni	4.09E-03	5.63E-09	6.68E-07	7.39E-05	PF	6	4.14E-02	C1, D
NO ₂	1.78E+01	2.42E-06	3.72E-03	4.12E-01	PF	5		
NO ₃	6.79E+02	6.84E-05	1.05E-01	1.17E+01	PF	5		
OH	3.81E+00	1.82E-05	2.16E-03	2.39E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.26E-05	4.92E-12	5.84E-10	6.46E-08	PF	6	5.91E-03	C1, A, D

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
PO ₄	1.27E-01	1.30E-07	1.55E-05	1.71E-03	PF	5		
Pu	8.31E-04	2.76E-10	3.28E-08	3.63E-06	PF	5		
Si	1.27E+00	3.68E-06	4.37E-04	4.83E-02	PF	5	8.73E+00	C1
SiO ₃	1.07E+00	1.14E-06	1.35E-04	1.50E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.14E+01	1.07E-06	1.14E-03	1.27E-01	PF	5		
Sr	3.26E-05	3.00E-11	3.56E-09	3.94E-07	PF	6		
ZrO	9.77E-02	7.41E-08	8.79E-06	9.73E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	9.30E+01	2.57E-07	3.64E-05	3.37E-03	PF	6	2.0E-11	B ¹⁹
Am 243	4.65E-02	1.29E-10	1.83E-08	1.70E-06	PF	6	2.0E-11	B
C 14	1.38E+02	3.84E-07	5.44E-05	5.04E-03	PF	6	6.0E-06	B
Cm 242	1.38E+01	7.67E-13	1.09E-10	1.01E-08	PF	6	7.0E-10	B
Cm 244	3.27E+01	7.79E-10	1.10E-07	1.02E-05	PF	6	4.0E-11	B
Cs 137	9.11E+04	1.06E-05	2.26E-02	2.09E+00	PF	5	4.0E-07	B
I 129	4.15E+01	1.60E-07	1.63E-07	1.51E-05	PF	6	7.0E-08	B
Np 237	4.65E+01	1.29E-09	1.83E-07	1.70E-05	PF	6	1.2E-12	B
Pu 238	2.01E+01	5.41E-10	7.67E-08	7.11E-06	PF	6	2.1E-12	B
Pu 239/240	5.11E+01	1.42E-07	2.01E-05	1.86E-03	PF	5	2.0E-12	B
Pu 241	2.76E+00	6.36E-09	9.01E-07	8.35E-05	PF	6	1.0E-10	B
RuRh 106	1.89E-04	5.09E-16	4.63E-12	4.29E-10	PF	6	3.0E-08	B
Se 79	9.30E+00	2.58E-08	3.66E-06	3.39E-04	PF	6	1.0E-06	B
Sr 89/90	1.85E+04	2.20E-07	4.67E-03	4.33E-01	PF	5	9.0E-09	B
Tc 99	2.76E+02	7.68E-07	1.09E-04	1.01E-02	PF	6	2.0E-06	B
U 238	1.38E+02	3.84E-11	5.44E-09	5.04E-07	PF	6	1.0E-10	B
water		6.00E+04	6.00E+04	6.00E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SC		Tank:	241-S-110				
Sample Date	4/23/75		Contents:	Saltcake/ Sludge				
Sample ID	RAT-S109-3		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	8.3E-03		Retr. Method	Pumping/Sluicing				
pH	13.06							
Density, g/ml	1.9							
Temperature, °R	584							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	2.06E-09	5.22E-16	1.23E-13	4.33E-12	PF	6	2.27E-03	C1
Al	1.15E+00	1.17E-06	2.75E-04	9.68E-03	PF	5	9.06E+00	C1
Ba	8.40E-04	1.68E-10	3.94E-08	1.39E-06	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ anion	8.78E-03	3.20E-09	7.53E-07	2.66E-05	PF	6		
C ₆ H ₅ O ₇ anion	7.25E+00	1.08E-06	2.47E-04	8.95E-03	PF	6		
Ca	4.58E-07	3.13E-13	7.37E-11	2.60E-09	PF	6	6.11E+00	C1 as CaCO ₃
Ce	2.14E-04	4.18E-11	9.82E-09	3.46E-07	PF	6		
Cl	1.34E-10	6.52E-18	2.46E-14	8.66E-13	PF	6		
CO ₃	4.09E+00	1.87E-06	4.39E-04	1.55E-02	PF	5		
Cr	1.37E+01	1.60E-06	1.70E-03	6.00E-02	PF	6	2.35E-01	C1, D
EDTA ¹²	4.58E-02	4.29E-09	1.01E-06	3.56E-05	PF	6		
F	4.20E-02	3.55E-09	1.42E-05	5.01E-04	PF	6	3.22E+00	C1
Fe	1.30E+00	6.34E-07	1.49E-04	5.26E-03	PF	6	2.18E+00	C1
Fe(CN) ₆	1.95E-02	2.51E-09	5.91E-07	2.08E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	9.54E-02	8.91E-09	2.10E-06	7.39E-05	PF	6		
K	1.49E-02	1.04E-08	2.46E-06	8.66E-05	PF	6		
Mn	8.40E-03	4.18E-09	9.82E-07	3.46E-05	PF	6	2.22E+00	C2, D
Na	2.84E+01	3.37E-05	7.94E-03	2.80E-01	PF	5	2.13E+00	C2 as NaOH
Ni	4.58E-02	2.12E-08	5.00E-06	1.76E-04	PF	6	4.14E-02	C1, D
NO ₂	2.94E+00	1.34E-07	4.11E-04	1.45E-02	PF	5		
NO ₃	4.99E+01	1.69E-06	5.18E-03	1.83E-01	PF	5		
OH	1.96E+00	3.15E-06	7.40E-04	2.61E-02	PF	5	2.88E+00	C2 as NaOH
Pb	1.56E-03	2.07E-10	4.86E-08	1.72E-06	PF	6	5.91E-03	C1, A, D
PO ₄	2.25E+00	7.80E-07	1.84E-04	6.47E-03	PF	5		
SiO ₃	2.90E-01	1.04E-07	2.46E-05	8.66E-04	PF	6	1.93E+00	C1 (Amorphous)

Tank Farm 241-S Vapor Estimates

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
SO ₄	7.25E+00	2.29E-07	4.86E-04	1.71E-02	PF	6		
Sr	3.36E-04	1.04E-10	2.46E-08	8.66E-07	PF	6		
ZrO	1.22E-03	3.12E-10	7.34E-08	2.59E-06	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	2.48E+01	6.83E-08	6.47E-06	5.67E-04	PF	6	2.0E-11	B ¹⁹
Am 243	4.95E+03	1.37E-11	1.30E-09	1.14E-07	PF	6	2.0E-11	B
C 14	7.63E+01	2.12E-07	2.01E-05	1.76E-03	PF	6	6.0E-06	B
Cm 242	1.75E+02	9.73E-14	9.22E-12	8.07E-10	PF	6	7.0E-10	B
Cm 244	7.63E+02	1.82E-10	1.72E-08	1.51E-06	PF	6	4.0E-11	B
Cs 137	1.09E+02	1.24E-08	1.76E-05	1.54E-03	PF	5	4.0E-07	B
I 129	2.27E+01	8.76E-08	5.97E-08	5.23E-06	PF	6	7.0E-08	B
Np 237	1.71E+01	3.15E-10	2.99E-08	2.61E-06	PF	6	1.2E-12	B
Pu 238	7.63E-01	2.05E-09	1.95E-07	1.70E-05	PF	6	2.1E-12	B
Pu 239/240	1.06E+00	2.95E-09	2.79E-07	2.45E-05	PF	5	2.0E-12	B
Pu 241	3.82E+01	8.78E-08	8.32E-06	7.28E-04	PF	6	1.0E-10	B
RuRh 106	3.82E-05	1.03E-16	6.26E-13	5.48E-11	PF	6	3.0E-08	B
Se 79	3.82E+00	1.06E-08	1.00E-06	8.79E-05	PF	6	1.0E-06	B
Sr 89/90	8.11E+01	9.38E-10	1.33E-06	1.17E-03	PF	5	9.0E-09	B
Tc 99	1.55E+02	4.30E-07	4.07E-05	3.57E-03	PF	6	2.0E-06	B
U 238	3.40E-01	9.46E-10	8.96E-08	7.84E-06	PF	6	1.0E-10	B
water		9.83E+04	9.83E+04	9.83E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

Sample Type	SL		Tank:	241-S-111				
Sample Date	9/18/80		Contents:	Saltcake/Sludge/SN				
Sample ID	RAT-S111-5		Watchlist:	Hydrogen/Organic Salts				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	2.0E-02		Retr. Method	Pumping/Sluicing				
pH	13.83							
Density, g/ml	1.75							
Temperature, °R	553							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	1.91E-09	7.80E-16	1.23E-13	2.59E-12	PF	6	2.27E-03	C1
Al	1.04E+01	1.70E-05	2.69E-03	5.65E-02	PF	5	9.06E+00	C1
Ba	9.75E-04	3.14E-10	4.97E-08	1.04E-06	PF	6	8.92E-02	C1
Bi	1.02E-16	2.15E-23	3.41E-21	7.15E-20	PF	6		
C ₂ H ₃ O ₃ anion	1.02E-02	6.00E-09	9.49E-07	1.99E-05	PF	6		
C ₆ H ₅ O ₇ anion	8.42E+00	2.58E-06	3.11E-04	8.57E-03	PF	6		
Ca	1.26E-01	1.39E-07	2.20E-05	4.62E-04	PF	5	6.11E+00	C1 as CaCO ₃
Ce	2.48E-04	7.83E-11	1.24E-08	2.60E-07	PF	6		
Cd	4.03E-01	1.59E-07	2.51E-05	5.28E-04	PF	5	5.46E-04	C1, C2, D
Cl	1.67E+00	1.32E-07	3.33E-04	7.00E-03	PF	5		
CO ₃	8.75E+00	6.44E-06	1.02E-03	2.14E-02	PF	5		
Cr	7.53E+00	1.42E-06	1.01E-03	2.12E-02	PF	5	2.35E-01	C1, D
EDTA ¹²	5.32E-02	8.05E-09	1.27E-06	2.67E-05	PF	6		
F	3.57E-01	4.88E-08	1.31E-04	2.76E-03	PF	5	3.22E+00	C1
Fe	2.26E-01	1.78E-07	2.82E-05	5.92E-04	PF	5	2.18E+00	C1
Fe (CN) ₆	7.09E-03	1.48E-09	2.34E-07	4.91E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.11E-01	1.67E-08	2.64E-06	5.55E-05	PF	6		
Hg	7.86E-02	1.73E-08	2.73E-06	5.73E-05	PF	5	6.08E-03	B, C1, C2
K	1.73E-02	1.96E-08	3.10E-06	6.50E-05	PF	6		
Mn	9.75E-03	7.83E-09	1.24E-06	2.60E-05	PF	6	2.22E+00	C2, D
Na	2.00E+00	3.84E-06	6.07E-04	1.28E-02	PF	5	2.13E+00	C2 as NaOH
Ni	2.61E-02	1.96E-08	3.10E-06	6.50E-05	PF	6	4.14E-02	C1, D
NO ₂	2.38E+01	1.76E-06	3.61E-03	7.59E-02	PF	5		
NO ₃	7.70E+02	4.22E-05	8.68E-02	1.82E+00	PF	5		
OH	1.14E+01	2.96E-05	4.68E-03	9.83E-02	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁷	Allowable ⁷	Regulatory Citation
Pb	1.86E-04	3.97E-11	6.28E-09	1.32E-07	PF	6	5.91E-03	Cl, A, D
PO ₄	1.09E+01	6.10E-06	9.64E-04	2.02E-02	PF	5		
Pu	1.26E-04	2.28E-11	3.61E-09	7.57E-08	PF	5		
Si	4.50E-01	7.10E-07	1.12E-04	2.36E-03	PF	5	8.73E+00	Cl
SiO ₃	3.37E-01	1.96E-07	3.10E-05	6.50E-04	PF	6	1.93E+00	Cl (Amorphous)
SO ₄	3.03E+01	1.55E-06	2.20E-03	4.63E-02	PF	5		
Sr	3.50E-04	1.76E-10	2.78E-08	5.83E-07	PF	6		
U, g/l	7.04E-02	1.31E-08	2.07E-06	4.34E-05	PF	5	5.14E-03	Cl
ZrO	1.91E-03	7.87E-10	1.24E-07	2.61E-06	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	6.71E+00	1.85E-08	1.90E-06	6.15E-05	PF	6	2.0E-11	B ¹⁹
Am 243	3.35E-03	9.31E-12	9.58E-10	3.09E-08	PF	6	2.0E-11	B
C 14	8.86E+01	2.46E-07	2.53E-05	8.17E-04	PF	6	6.0E-06	B
Cm 242	6.23E-03	3.45E-14	3.55E-12	1.15E-10	PF	6	7.0E-10	B
Cm 244	8.86E-02	2.11E-10	2.17E-08	7.01E-07	PF	6	4.0E-11	B
Cs 137	1.24E+05	1.60E-05	2.46E-02	7.95E-01	PF	5	4.0E-07	B
Co 60	9.89E+01	4.36E-08	4.48E-06	1.45E-04	PF	5	8.0E-08	B
Eu 154	8.68E+02	6.52E-07	7.59E-05	2.45E-03	PF	5	5.0E-08	B
Eu 155	8.68E+02	3.14E-07	3.23E-05	1.04E-03	PF	5	3.0E-07	B
I 129	2.28E-01	8.79E-08	6.50E-08	2.10E-06	PF	6	7.0E-08	B
Np 237	1.32E-01	3.66E-10	3.76E-08	1.21E-06	PF	6	1.2E-12	B
Pu 238	1.32E-01	3.55E-10	3.65E-08	1.18E-06	PF	6	2.1E-12	B
Pu 239/240	7.73E+00	2.15E-08	2.21E-06	7.12E-05	PF	5	2.0E-12	B
Pu 241	4.43E+00	1.02E-08	1.05E-06	3.38E-05	PF	6	1.0E-10	B
RuRh 106	1.69E+03	4.43E-12	2.92E-08	9.42E-07	PF	5	3.0E-08	B
Se 79	4.43E+00	1.23E-08	1.27E-06	4.09E-05	PF	6	1.0E-06	B
Sr 89/90	3.05E+04	4.00E-07	6.17E-03	1.99E-01	PF	5	9.0E-09	B
Tc 99	1.32E+02	3.66E-07	3.76E-05	1.21E-03	PF	6	2.0E-06	B
U 238	4.97E-02	1.38E-10	1.42E-08	4.59E-07	PF	5	1.0E-10	B
water		5.44E+04	5.44E+04	5.44E+04	Stm Tabl	1		

Tank Farm 241-S Vapor Estimates

Sample Type	SC		Tank:	241-S-112				
Sample Date	11/15/74		Contents:	Saltcake/ Sludge				
Sample ID	RAT-S112-1		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s	6.4E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.3							
Temperature, °R	552							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.33E-08	1.01E-14	1.16E-12	1.20E-10	PF	6	2.27E-03	C1
Al	1.14E+01	3.46E-05	3.97E-03	4.11E-01	PF	5	9.06E+00	C1
Ba	2.78E-03	1.66E-09	1.91E-07	1.98E-05	PF	6	8.92E-02	C1
Bi	3.48E-16	1.37E-22	1.57E-20	1.62E-18	PF	6		
C ₂ H ₃ O ₃ anion	6.22E-02	6.79E-08	7.80E-06	8.08E-04	PF	6		
C ₆ H ₅ O ₇ anion	5.39E+01	1.79E-04	6.44E-03	2.13E+00	PF	6		
Ca	1.16E-06	2.38E-12	2.73E-10	2.83E-08	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.16E-02	6.79E-09	7.80E-07	8.08E-05	PF	6		
Cl	8.71E-09	1.27E-15	2.34E-12	2.42E-10	PF	6		
CO ₃	1.08E+02	1.47E-04	1.69E-02	1.75E+00	PF	5		
Cr	1.78E-01	6.24E-08	3.22E-05	3.34E-03	PF	6	2.35E-01	C1, D
EDTA ¹²	4.98E-01	1.40E-07	1.60E-05	1.66E-03	PF	6		
F	5.39E+00	1.37E-06	2.67E-03	2.76E-01	PF	6	3.22E+00	C1
Fe	2.32E+00	3.40E-06	3.90E-04	4.04E-02	PF	6	2.18E+00	C1
Fe(CN) ₆	1.12E-02	4.33E-09	4.97E-07	5.14E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	7.88E-01	2.20E-07	2.53E-05	2.62E-03	PF	6		
K	1.62E+00	3.40E-06	3.90E-04	4.04E-02	PF	6		
Mn	9.12E-02	1.36E-07	1.56E-05	1.62E-03	PF	6	2.22E+00	C2, D
Na	3.36E+02	1.20E-03	1.37E-01	1.42E+01	PF	5	2.13E+00	C2 as NaOH
Ni	3.40E-02	4.72E-08	5.42E-06	5.61E-04	PF	6	4.14E-02	C1, D
NO ₂	2.69E+01	3.69E-06	5.51E-03	5.70E-01	PF	5		
NO ₃	5.58E+02	5.67E-05	8.46E-02	8.77E+00	PF	5		
OH	2.44E+01	1.18E-04	1.35E-02	1.40E+00	PF	5	2.88E+00	C2 as NaOH
Pb	8.71E-04	3.45E-10	3.96E-08	4.10E-06	PF	6	5.91E-03	C1, A, D
PO ₄	6.02E+00	6.25E-06	7.17E-04	7.43E-02	PF	5		

Tank Farm 241-S Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
SiO ₃	6.22E+00	6.70E-06	7.70E-04	7.97E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	7.88E+01	7.46E-06	7.72E-03	7.99E-01	PF	6		
Sr	7.46E-04	6.95E-10	7.98E-08	8.26E-06	PF	6		
ZrO	2.65E-03	2.03E-09	2.33E-07	2.42E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	4.15E+02	1.14E-06	1.58E-04	1.36E-02	PF	6	2.0E-11	B ¹⁹
Am 243	3.70E+01	1.03E-09	1.42E-07	1.22E-05	PF	6	2.0E-11	B
C 14	4.15E+02	1.15E-06	1.59E-04	1.37E-02	PF	6	6.0E-06	B
Cm 242	4.15E+01	2.30E-12	3.18E-10	2.73E-08	PF	6	7.0E-10	B
Cm 244	2.13E+00	5.08E-09	7.03E-07	6.03E-05	PF	6	4.0E-11	B
Cs 137	1.31E+04	1.46E-06	3.02E-03	2.59E-01	PF	5	4.0E-07	B
I 129	1.68E+00	6.49E-07	6.47E-07	5.55E-05	PF	6	7.0E-08	B
Np 237	1.68E+00	4.67E-09	6.47E-07	5.55E-05	PF	6	1.2E-12	B
Pu 238	1.23E+01	3.32E-10	4.59E-08	3.95E-06	PF	6	2.1E-12	B
Pu 239/240	7.97E+01	2.21E-09	3.06E-07	2.63E-05	PF	5	2.0E-12	B
Pu 241	4.15E+01	9.54E-10	1.32E-07	1.13E-05	PF	6	1.0E-10	B
RuRh 106	1.68E-04	4.54E-16	4.03E-12	3.46E-10	PF	6	3.0E-08	B
Se 79	2.91E+01	8.09E-08	1.12E-05	9.62E-04	PF	6	1.0E-06	B
Sr 89/90	8.70E+02	9.62E-09	2.04E-04	1.75E-02	PF	5	9.0E-09	B
Tc 99	8.29E+02	2.30E-06	3.19E-04	2.74E-02	PF	6	2.0E-06	B
U 238	8.29E+03	2.30E-11	3.19E-09	2.74E-07	PF	6	1.0E-10	B
water		5.30E+04	5.30E+04	5.30E+04	Stm Tabl	1		

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Tank Farm 241-S Vapor Estimates

- Note: 1. No viscosity data available; therefore, viscosity was estimated assuming 40 vol. % solids.
- Note: 1A. Density for tank S-101 was raised from 1.51 to 1.61 and tank S-105 from 1.26 to 1.31 to obtain positive moles of water.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data denoted by 6. Lab data for tanks S-101, 104, 105, and 111 denoted by 5 due to samples taken from sludge. Lab data for tanks S-102, 103, 106, 107, 108, 109, 110, and 112 denoted by 5 due to tank activity after the sampling date. Data for tank S-110 appears incomplete as moles of water too high for given concentrations and density.
- Note: 7. Allowable concentration, in ppm by volume.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).
- Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-SX Vapor Estimates

Sample Type	DL		Tank:	241-SX-101				
Sample Date	4/26/89		Contents:	Liquid/Solids				
Sample ID	R-4884		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	5.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.20							
Density ^{1A} , g/ml	1.3							
Temperature, °R	599							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.24E+00	7.76E-06	4.32E-04	1.45E-01	PF	5	9.06E+00	C1
Ba ⁹	5.79E-04	7.14E-10	3.97E-08	1.33E-05	PF	6	8.92E-02	C1
B	4.32E-03	6.64E-08	3.69E-06	1.24E-03	PF	5	2.22E+01	C1
Ca	4.01E-03	1.69E-08	9.43E-07	3.16E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cd	2.25E-03	3.39E-09	1.89E-07	6.33E-05	PF	5	5.46E-04	C1, C2, D
Cl	5.49E+00	1.66E-06	1.48E-03	4.94E-01	PF	5		
Cr	3.33E-01	2.40E-07	6.02E-05	2.02E-02	PF	5	2.35E-01	C1, D
F	1.27E+00	6.64E-07	6.29E-04	2.11E-01	PF	5	3.22E+00	C1
Fe ⁹	2.37E+00	7.15E-06	3.98E-04	1.33E-01	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	1.42E-02	1.13E-08	6.30E-07	2.11E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	7.37E-02	4.25E-08	2.37E-06	7.92E-04	PF	5		
K	1.17E-01	5.07E-07	2.82E-05	9.45E-03	PF	5		
Na	2.78E+01	2.04E-04	1.14E-02	3.81E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.76E-02	5.04E-08	2.81E-06	9.40E-04	PF	5	4.14E-02	C1, D
NO ₂	5.06E+00	1.43E-06	1.03E-03	3.47E-01	PF	5		
NO ₃	8.99E+01	1.88E-05	1.36E-02	4.57E+00	PF	5		
OH	2.72E+00	2.70E-05	1.50E-03	5.04E-01	PF	5	2.88E+00	C2 as NaOH
P	1.61E-01	8.78E-07	4.88E-05	1.64E-02	PF	5		
Pb ⁹	6.32E-01	5.16E-07	2.87E-05	9.62E-03	PF	6	5.91E-03	C1, A, D
Pd	3.19E-02	5.09E-08	2.83E-06	9.48E-04	PF	5		
PO ₄	5.32E+00	1.14E-05	6.33E-04	2.12E-01	PF	5		
Pu ⁹	1.42E-01	9.83E-08	5.47E-06	1.83E-03	PF	6		
SO ₄ ⁹	7.01E+00	1.37E-06	6.87E-04	2.30E-01	PF	6		

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Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Sn	5.93E-02	8.42E-08	4.69E-06	1.57E-03	PF	5	4.11E-01	C1
TOC gC/l ¹⁷	3.20E-01	4.51E-06	2.51E-04	8.40E-02	PF	5		
ZrO ⁹	4.53E-03	7.15E-09	3.98E-07	1.33E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	8.00E+04	2.20E-04	3.05E-02	4.11E+00	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	3.13E-02	8.69E-11	1.20E-08	1.62E-06	PF	6	2.0E-11	B
C 14 ⁹	3.13E-09	8.69E-18	1.20E-15	1.62E-13	PF	6	6.0E-06	B
Cm 242 ⁹	1.05E-01	5.82E-13	8.06E-11	1.09E-08	PF	6	7.0E-10	B
Cm 244 ⁹	2.13E-11	5.08E-20	7.03E-18	9.47E-16	PF	6	4.0E-11	B
Cs 137	2.84E+10	4.63E+00	9.61E+03	1.29E+06	PF	5	4.0E-07	B
I 129 ⁹	1.05E-11	4.05E-18	1.46E-16	5.44E-16	PF	6	7.0E-08	B
Np 237 ⁹	1.05E-03	2.92E-12	4.04E-10	5.44E-08	PF	6	1.2E-12	B
Pu 238 ⁹	2.13E+01	5.73E-08	7.94E-06	1.07E-03	PF	6	2.1E-12	B
Pu 239/240	3.00E+04	8.33E-05	1.15E-02	1.55E+00	PF	5	2.0E-12	B
Pu 241 ⁹	1.05E+02	2.42E-07	3.34E-05	4.50E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	5.26E-05	1.42E-16	1.26E-12	1.70E-10	PF	6	3.0E-08	B
Se 79 ⁹	1.56E-10	4.33E-19	6.00E-17	8.08E-15	PF	6	1.0E-06	B
Sr 89/90	2.20E+06	3.60E-05	7.48E-01	1.01E+02	PF	5	9.0E-09	B
Tc 99	1.45E+07	4.03E-02	5.58E+00	7.51E+02	PF	5	2.0E-06	B
U 238 ⁹	5.26E-01	1.46E-09	2.02E-07	2.72E-05	PF	6	1.0E-10	B
water		1.19E+05	1.19E+05	1.19E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	Saltcake		Tank:	241-SX-102				
Sample Date	9/3/80		Contents:	Saltcake/Liquid				
Sample ID	T-2959		Watchlist:	Hydrogen				
Properties	Value		Status:	PI/IS				
Visc., lbm/ft-s ¹	4.9E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.56							
Temperature, °R	615							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.24E-02	1.21E-08	2.35E-06	2.28E-04	PF	6	2.27E-03	C1
Al	3.24E+01	4.84E-05	9.40E-03	9.10E-01	PF	5	9.06E+00	C1
Ba ⁹	3.24E-04	9.54E-11	1.85E-08	1.79E-06	PF	6	8.92E-02	C1
B ⁹	4.32E-03	1.58E-08	3.08E-06	2.98E-04	PF	6	2.22E+01	C1
C ₂ H ₃ O ₃ ⁹ anion	1.12E-05	6.02E-12	1.17E-09	1.13E-07	PF	6		
C ₆ H ₅ O ₇ ⁹ anion	3.24E-02	1.01E-08	1.34E-06	1.89E-04	PF	6		
Ca ⁹	3.53E-04	3.56E-10	6.92E-08	6.69E-06	PF	6	6.11E+00	C1 as CaCO ₃
Cl	6.84E+00	4.93E-07	1.53E-03	1.48E-01	PF	5		
CO ₃	4.79E+01	3.22E-05	6.26E-03	6.06E-01	PF	5		
Cr ⁹	1.53E+00	2.63E-07	2.31E-04	2.23E-02	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	6.76E-05	9.34E-12	1.81E-09	1.76E-07	PF	6		
F ⁹	3.24E-04	4.04E-11	1.34E-07	1.29E-05	PF	6	3.22E+00	C1
Fe ⁹	1.32E-01	9.51E-08	1.85E-05	1.79E-03	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	7.94E-04	1.51E-10	2.94E-08	2.84E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	1.64E-04	2.26E-11	4.39E-09	4.25E-07	PF	6		
K ⁹	2.29E-03	2.37E-09	4.60E-07	4.45E-05	PF	6		
Mn ⁹	6.47E-05	4.74E-11	9.22E-09	8.92E-07	PF	6	2.22E+00	C2, D
Na	2.17E+02	4.16E-04	8.08E-02	7.82E+00	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	1.56E-02	1.07E-08	2.07E-06	2.01E-04	PF	6	4.14E-02	C1, D
NO ₂	1.03E+02	6.95E-06	1.75E-02	1.70E+00	PF	5		

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₃	2.02E+02	1.01E-05	2.55E-02	2.47E+00	PF	5		
OH	3.76E+01	8.92E-05	1.73E-02	1.68E+00	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	6.18E-03	1.20E-09	2.34E-07	2.26E-05	PF	6	5.91E-03	C1, A, D
PO ₄	7.69E+00	3.93E-06	7.63E-04	7.38E-02	PF	5		
SiO ₃ ³	1.35E-03	7.16E-10	1.39E-07	1.35E-05	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.02E+01	9.42E-07	1.65E-03	1.60E-01	PF	5		
TOC gC/l ¹⁷	1.27E+01	4.27E-05	8.29E-03	8.03E-01	PF	5		
ZrO ⁹	3.24E-03	1.22E-09	2.37E-07	2.30E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	3.50E+00	9.66E-09	1.11E-06	1.82E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	2.07E-03	5.75E-12	6.63E-10	1.08E-07	PF	6	2.0E-11	B
C 14 ⁹	8.74E-02	2.43E-10	2.80E-08	4.56E-06	PF	6	6.0E-06	B
Cm 242 ⁹	6.44E-03	3.57E-14	4.12E-12	6.72E-10	PF	6	7.0E-10	B
Cm 244 ⁹	2.07E-03	4.93E-12	5.69E-10	9.28E-08	PF	6	4.0E-11	B
Ce 137	4.54E+05	5.87E-05	1.02E-01	1.65E+01	PF	5	4.0E-07	B
I 129 ⁹	5.88E-04	2.27E-10	8.17E-09	3.07E-08	PF	6	7.0E-08	B
Np 237 ⁹	2.62E-04	7.28E-13	8.40E-11	1.37E-08	PF	6	1.2E-12	B
Pu 238 ⁹	1.19E+00	3.20E-09	3.70E-07	6.02E-05	PF	6	2.1E-12	B
Pu 239/240 ⁹	7.07E+00	1.96E-08	2.27E-06	3.69E-04	PF	6	2.0E-12	B
Pu 241 ⁹	5.88E+00	1.35E-08	1.56E-06	2.54E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	5.88E-05	1.59E-16	1.17E-12	1.91E-10	PF	6	3.0E-08	B
Se 79 ⁹	8.74E-03	2.43E-11	2.80E-09	4.57E-07	PF	6	1.0E-06	B
Sr 89/90 ⁹	5.88E+05	9.87E-06	1.71E-01	2.78E+01	PF	6	9.0E-09	B
Tc 99 ⁹	2.94E-01	8.17E-10	9.42E-08	1.54E-05	PF	6	2.0E-06	B
U 238 ⁹	5.88E-02	1.63E-10	1.88E-08	3.07E-06	PF	6	1.0E-10	B
water		1.40E+05	1.40E+05	1.40E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	Sludge		Tank:	241-SX-103				
Sample Date	10/10/77		Contents:	Sludge				
Sample ID	1104		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	4.0E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.3							
Temperature, °R	639							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.16E+01	4.53E-05	7.52E-03	1.01E+00	PF	5	9.06E+00	C1
Ba	4.12E-01	1.70E-07	2.83E-05	3.80E-03	PF	5	8.92E-02	C1
Bi	3.13E-01	8.47E-08	1.41E-05	1.89E-03	PF	5		
C ₂ H ₃ O ₃ ⁹ anion	1.79E-01	1.35E-07	2.24E-05	3.01E-03	PF	6		
C ₆ H ₅ O ₇ ⁹ anion	5.00E+01	8.89E-05	3.20E-03	1.98E+00	PF	6		
Ca	4.41E+01	6.24E-05	1.04E-02	1.39E+00	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	7.37E-03	2.98E-09	4.95E-07	6.65E-05	PF	6		
Cd	7.87E-02	3.97E-08	6.61E-06	8.87E-04	PF	5	5.46E-04	C1, C2, D
CO ₃ ⁹	3.16E+01	2.98E-05	4.95E-03	6.65E-01	PF	6		
Cr	4.00E+00	9.66E-07	7.23E-04	9.71E-02	PF	5	2.35E-01	C1, D
EDTA ^{9,12}	7.63E-01	1.48E-07	2.46E-05	3.30E-03	PF	6		
F	7.41E-01	1.30E-07	3.67E-04	4.92E-02	PF	5	3.22E+00	C1
Fe	1.12E+00	1.13E-06	1.88E-04	2.52E-02	PF	5	2.18E+00	C1
Fe(CN) ₆ ⁹	3.42E-03	9.13E-10	1.52E-07	2.04E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	2.18E+00	4.21E-07	7.00E-05	9.39E-03	PF	6		
Hg	1.58E+00	4.45E-07	7.39E-05	9.92E-03	PF	5	6.08E-03	B, C1, C2
K ⁹	3.16E+00	4.58E-06	7.62E-04	1.02E-01	PF	6		
Mg	5.10E-02	1.20E-07	2.00E-05	2.68E-03	PF	5	1.02E+01	C1
Mn	4.45E-01	4.58E-07	7.61E-05	1.02E-02	PF	5	2.22E+00	C2, D
Na	5.52E+02	1.36E-03	2.26E-01	3.03E+01	PF	5	2.13E+00	C2 as NaOH
Ni	9.98E-02	9.57E-08	1.59E-05	2.14E-03	PF	5	4.14E-02	C1, D
NO ₂ ⁹	3.68E+01	3.48E-06	7.52E-03	1.01E+00	PF	6		

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₃ ⁹	1.95E+02	1.37E-05	2.96E-02	3.97E+00	PF	6		
OH ⁹	2.24E+01	7.45E-05	1.24E-02	1.66E+00	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	2.18E-01	5.96E-08	9.90E-06	1.33E-03	PF	6	5.91E-03	C1, A, D
PO ₄	1.04E+00	7.45E-07	1.24E-04	1.66E-02	PF	5		
Pu	2.20E-04	5.10E-11	8.48E-09	1.14E-06	PF	5		
Si	6.18E-01	1.25E-06	2.08E-04	2.79E-02	PF	5	8.73E+00	C1
SiO ₃ ⁹	2.00E+00	1.49E-06	2.47E-04	3.32E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	8.55E+01	5.59E-06	8.38E-03	1.12E+00	PF	5		
Sr ⁹	4.74E-03	3.05E-09	5.07E-07	6.80E-05	PF	6		
TOC qC/l ¹⁷	9.20E+01	4.34E-04	7.21E-02	9.68E+00	PF	5		
Tl	1.10E+00	3.05E-07	5.07E-05	6.81E-03	PF	5	1.20E-02	C1
U, q/l	4.70E-04	1.12E-10	1.86E-08	2.49E-06	PF	5	5.14E-03	C1
ZrO ⁹	1.68E-03	8.88E-10	1.48E-07	1.98E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.65E+01	1.53E-07	2.11E-05	3.41E-03	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	5.26E-01	1.46E-09	2.02E-07	3.26E-05	PF	6	2.0E-11	B
C 14 ⁹	1.64E+02	4.55E-07	6.30E-05	1.02E-02	PF	6	6.0E-06	B
Cm 242 ⁹	1.07E+00	5.94E-12	8.22E-10	1.32E-07	PF	6	7.0E-10	B
Cm 244 ⁹	2.63E+00	6.27E-09	8.68E-07	1.40E-04	PF	6	4.0E-11	B
CB 137	3.51E+05	4.20E-05	8.72E-02	1.41E+01	PF	5	4.0E-07	B
CB 134	6.41E+02	6.39E-09	8.85E-07	1.43E-04	PF	5	4.0E-07	B
I 129 ⁹	7.82E-01	3.02E-07	1.09E-05	4.85E-05	PF	6	7.0E-08	B
Np 237 ⁹	5.26E-01	1.46E-09	2.02E-07	3.26E-05	PF	6	1.2E-12	B
Pu 238 ⁹	3.13E-01	8.42E-10	1.17E-07	1.88E-05	PF	6	2.1E-12	B
Pu 239/240	1.35E+01	3.75E-08	5.19E-06	8.36E-04	PF	5	2.0E-12	B
Pu 241	7.82E-01	9.74E-10	1.35E-07	2.17E-05	PF		1.0E-10	B
RuRh 106 ⁹	1.64E-04	4.43E-16	3.93E-12	6.34E-10	PF	6	3.0E-08	B
Se 79 ⁹	1.56E+01	4.33E-08	6.00E-06	9.67E-04	PF	6	1.0E-06	B
Sr 89/90	1.60E+05	1.82E-06	3.79E-02	6.10E+00	PF	5	9.0E-09	B

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Tc 99 ⁹	5.26E+02	1.46E-06	2.02E-04	3.26E-02	PF	6	2.0E-06	B
U 238	3.32E-04	9.22E-13	1.28E-10	2.06E-08	PF	5	1.0E-10	B
water		1.69E+05	1.69E+05	1.69E+05	Stm Ta	1		

Tank Farm 241-SX Vapor Estimates

Sample Type	Liquid		Tank:	241-SX-104				
Sample Date	5/14/88		Contents:	Liquid/Solids				
Sample ID	RAT-SX104-3		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	5.7E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.5							
Temperature, °R	633							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	4.32E+01	7.87E-05	1.30E-02	1.20E+00	PF	5	9.06E+00	C1
Ba ⁹	4.62E-04	1.66E-10	2.75E-08	2.53E-06	PF	6	8.92E-02	C1
B	6.49E-02	2.90E-07	4.81E-05	4.43E-03	PF	5	2.22E+01	C1
C ₂ H ₃ O ₃ ⁹ anion	8.85E-03	5.80E-09	9.62E-07	8.86E-05	PF	6		
C ₆ H ₅ O ₇ ⁹ anion	7.31E+00	4.00E-06	3.15E-04	6.10E-02	PF	6		
Ca	8.02E-02	9.86E-08	1.63E-05	1.51E-03	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.62E-03	5.69E-10	9.43E-08	8.69E-06	PF	6		
Cl	8.86E+00	7.78E-07	2.06E-03	1.90E-01	PF	4		
CO ₃	1.32E+01	1.08E-05	1.79E-03	1.65E-01	PF	5		
Cr	1.56E-01	3.27E-08	2.45E-05	2.25E-03	PF	4	2.35E-01	C1, D
EDTA ^{9,12}	5.77E-02	9.71E-09	1.61E-06	1.48E-04	PF	6		
F	1.90E+00	2.89E-07	8.15E-04	7.51E-02	PF	4	3.22E+00	C1
Fe	5.58E-02	4.90E-08	8.12E-06	7.48E-04	PF	5	2.18E+00	C1
Fe(CN) ₆ ⁹	1.04E-03	2.41E-10	4.00E-08	3.68E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	1.08E-01	1.81E-08	3.00E-06	2.77E-04	PF	6		
K	3.13E+00	3.95E-06	6.54E-04	6.02E-02	PF	5		
Mg	7.29E-03	1.49E-08	2.48E-06	2.28E-04	PF	5	1.02E+01	C1
Mn ⁹	2.12E-02	1.90E-08	3.14E-06	2.89E-04	PF	6	2.22E+00	C2, D
Na	3.56E+02	7.61E-04	1.26E-01	1.16E+01	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	4.62E-03	3.85E-09	6.38E-07	5.88E-05	PF	6	4.14E-02	C1, D
NO ₂	1.15E+02	9.45E-06	2.04E-02	1.88E+00	PF	4		
NO ₃	4.09E+02	2.49E-05	5.38E-02	4.95E+00	PF	4		

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Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
OH	3.40E+01	9.83E-05	1.63E-02	1.50E+00	PF	5	2.88E+00	C2 as NaOH
P	4.65E+00	7.37E-06	1.22E-03	1.13E-01	PF	5		
Pb ⁹	2.82E-02	6.70E-09	1.11E-06	1.02E-04	PF	6	5.91E-03	C1, A, D
PO ₄	9.50E+00	5.91E-06	9.80E-04	9.03E-02	PF	5		
Pu	1.14E-05	2.30E-12	3.81E-10	3.51E-08	PF	5		
SiO ₃ ⁹	5.77E-01	3.73E-07	6.19E-05	5.70E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.88E+00	1.64E-07	2.45E-04	2.25E-02	PF	4		
Sr ⁹	6.92E-04	3.87E-10	6.41E-08	5.90E-06	PF	6		
TOC qC/l ¹⁷	5.00E+00	2.05E-05	3.40E-03	3.13E-01	PF	5		
ZrO ⁹	1.27E-03	5.84E-10	9.67E-08	8.91E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	1.98E+02	5.46E-07	6.56E-05	8.34E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.77E-01	4.91E-10	5.90E-08	7.50E-06	PF	6	2.0E-11	B
C 14 ⁹	2.70E+01	7.50E-08	9.00E-06	1.14E-03	PF	6	6.0E-06	B
Cm 242 ⁹	3.43E-01	1.90E-12	2.28E-10	2.91E-08	PF	6	7.0E-10	B
Cm 244 ⁹	7.69E-01	1.83E-09	2.20E-07	2.80E-05	PF	6	4.0E-11	B
Cs 137 ⁹	4.51E+05	7.54E-05	1.36E-01	1.73E+01	PF	5	4.0E-07	B
I 129 ⁹	1.98E-01	7.64E-08	2.75E-06	8.40E-06	PF	6	7.0E-08	B
Np 237 ⁹	7.69E-01	2.14E-09	2.56E-07	3.26E-05	PF	6	1.2E-12	B
Pu 238 ⁹	1.14E+01	3.07E-08	3.68E-06	4.68E-04	PF	6	2.1E-12	B
Pu 239/240 ⁹	7.00E-01	1.94E-09	2.33E-07	2.97E-05	PF	6	2.0E-12	B
Pu 241 ⁹	7.69E-01	1.77E-07	2.12E-05	2.70E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	7.69E-05	2.08E-16	1.60E-12	2.03E-10	PF	6	3.0E-08	B
Se 79 ⁹	3.43E+00	9.53E-09	1.14E-06	1.45E-04	PF	6	1.0E-06	B
Sr 89/90 ⁹	3.00E+02	5.03E-09	9.06E-05	1.15E-02	PF	4	9.0E-09	B
Tc 99 ⁹	1.14E+02	3.17E-07	3.80E-05	4.84E-03	PF	6	2.0E-06	B
U 238 ⁹	3.85E-01	1.07E-09	1.28E-07	1.63E-05	PF	6	1.0E-10	B
water		1.62E+05	1.62E+05	1.62E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	Saltcake		Tank:	241-SX-105				
Sample Date	2/1/77		Contents:	Saltcake/Liquid				
Sample ID	RAT-SX105-2		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	4.0E-03		Retr. Method	Pumping/Sluicing				
pH	13.49							
Density ^{1A} , g/ml	1.15							
Temperature, °R	645							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.18E+01	1.17E-04	1.25E-02	2.63E+00	PF	5	9.06E+00	C1
Ba ⁹	5.00E-04	3.64E-10	3.88E-08	8.14E-06	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ ⁹ anion	8.85E-03	1.18E-08	1.25E-06	2.63E-04	PF	6		
C ₆ H ₅ O ₇ ⁹ anion	2.92E+01	1.59E-04	5.71E-03	3.55E+00	PF	6		
Ce ⁹	3.23E-03	2.30E-09	2.45E-07	5.15E-05	PF	6		
Cl	2.12E+00	3.77E-07	6.44E-04	1.35E-01	PF	5		
CO ₃	3.18E+01	5.28E-05	5.63E-03	1.18E+00	PF	5		
Cr	2.12E+00	9.02E-07	4.33E-04	9.09E-02	PF	5	2.35E-01	C1, D
EDTA ^{9,12}	5.77E-02	1.97E-08	2.10E-06	4.41E-04	PF	6		
F	2.12E-02	6.53E-09	1.19E-05	2.49E-03	PF	5	3.22E+00	C1
Fe	3.18E-01	5.66E-07	6.04E-05	1.27E-02	PF	5	2.18E+00	C1
Fe(CN) ₆ ⁹	5.00E-03	2.35E-09	2.51E-07	5.26E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	1.08E-01	3.67E-08	3.92E-06	8.22E-04	PF	6		
K ⁹	1.35E+00	3.45E-06	3.68E-04	7.72E-02	PF	6		
Mg	1.06E-02	4.40E-08	4.70E-06	9.85E-04	PF	5	1.02E+01	C1
Mn	1.06E-01	1.92E-07	2.05E-05	4.30E-03	PF	5	2.22E+00	C2, D
Na	2.54E+02	1.10E-03	1.17E-01	2.46E+01	PF	5	2.13E+00	C2 as NaOH
Ni ⁹	2.27E-02	3.83E-08	4.09E-06	8.58E-04	PF	6	4.14E-02	C1, D
NO ₂	4.24E+00	7.06E-07	9.80E-04	2.06E-01	PF	5		
NO ₃	7.00E+02	8.65E-05	1.20E-01	2.52E+01	PF	5		
OH	5.30E+00	3.11E-05	3.31E-03	6.95E-01	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb ⁹	1.58E-01	7.60E-08	8.11E-06	1.70E-03	PF	6	5.91E-03	C1, A, D
PO ₄	1.06E+01	1.34E-05	1.43E-03	2.99E-01	PF	5		
Si	2.12E-01	7.54E-07	8.05E-05	1.69E-02	PF	5	8.73E+00	C1
SiO ₃ ⁹	1.15E+00	1.51E-06	1.61E-04	3.38E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.65E+01	3.05E-06	2.93E-03	6.16E-01	PF	5		
Sr ⁹	1.00E-03	1.13E-09	1.21E-07	2.53E-05	PF	6		
U, g/l	9.40E-03	3.93E-09	4.20E-07	8.81E-05	PF	5	5.14E-03	C1
ZrO ⁹	1.27E-03	1.18E-09	1.26E-07	2.65E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.85E+02	1.04E-06	1.63E-04	2.33E-02	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	3.12E-01	8.66E-10	1.36E-07	1.94E-05	PF	6	2.0E-11	B
C 14 ⁹	3.85E+01	1.07E-07	1.67E-05	2.39E-03	PF	6	6.0E-06	B
Cm 242 ⁹	3.95E-01	2.19E-12	3.43E-10	4.91E-08	PF	6	7.0E-10	B
Cm 244 ⁹	1.56E+00	3.72E-09	5.82E-07	8.33E-05	PF	6	4.0E-11	B
Cs 137	2.41E+05	2.88E-05	6.77E-02	9.68E+00	PF	5	4.0E-07	B
Eu 154	6.35E+02	3.71E-07	6.56E-05	9.39E-03	PF	5	5.0E-08	B
I 129 ⁹	3.85E-01	1.49E-07	5.35E-06	2.39E-05	PF	6	7.0E-08	B
Np 237 ⁹	1.56E-01	4.33E-10	6.78E-08	9.70E-06	PF	6	1.2E-12	B
Pu 238 ⁹	1.56E+00	4.20E-09	6.57E-07	9.40E-05	PF	6	2.1E-12	B
Pu 239/240	2.55E+04	7.08E-13	1.11E-10	1.59E-08	PF	5	2.0E-12	B
Pu 241 ⁹	7.69E+00	1.77E-08	2.77E-06	3.96E-04	PF	6	1.0E-10	B
RuRh 106	3.70E+03	1.21E-12	1.21E-08	1.74E-06	PF		3.0E-08	B
Se 79 ⁹	7.69E+00	2.14E-08	3.34E-06	4.78E-04	PF		1.0E-06	B
Sr 89/90	3.41E+04	4.15E-07	9.73E-03	1.39E+00	PF	5	9.0E-09	B
Sb 125	2.54E+02	8.93E-09	1.40E-06	2.00E-04	PF	5	1.0E-06	B
Tc 99 ⁹	2.70E+02	7.50E-07	1.17E-04	1.68E-02	PF	6	2.0E-06	B
U 238	6.62E+03	1.84E-11	2.88E-09	4.12E-07	PF	5	1.0E-10	B
water		1.75E+05	1.75E+05	1.75E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	SN		Tank:	241-SX-106				
Sample Date	11/17/79		Contents:	Liq/Saltcake/Sludge				
Sample ID	T-4379		Watchlist:	Hydrogen/Organic				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	4.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.26							
Density, g/ml	1.11							
Temperature, °R	570							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	5.10E+00	1.12E-05	2.08E-03	2.75E-01	PF	5	9.06E+00	C1
Ba ⁹	1.37E-04	5.94E-11	1.10E-08	1.46E-06	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ ⁹ anion	3.95E-01	3.13E-07	5.80E-05	7.68E-03	PF	6		
C ₆ H ₅ O ₇ ⁹ anion	2.00E+01	7.28E-06	1.17E-03	1.79E-01	PF	6		
Ce ⁹	7.37E-03	3.12E-09	5.80E-07	7.68E-05	PF	6		
CO ₃	1.50E+01	1.48E-05	2.75E-03	3.64E-01	PF	5		
Cr ⁹	5.26E-04	1.33E-10	1.11E-07	1.47E-05	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	3.05E+00	6.20E-07	1.15E-04	1.52E-02	PF	6		
F ⁹	5.00E-01	9.18E-08	2.90E-04	3.84E-02	PF	6	3.22E+00	C1
Fe ⁹	1.26E+00	1.34E-06	2.48E-04	3.28E-02	PF	6	2.18E+00	C1
Fe(CN) ₆ ⁹	4.12E-02	1.15E-08	2.14E-06	2.83E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	5.79E+00	1.17E-06	2.18E-04	2.88E-02	PF	6		
K ⁹	2.05E-01	3.12E-07	5.79E-05	7.66E-03	PF	6		
Mn ⁹	1.16E-01	1.25E-07	2.32E-05	3.07E-03	PF	6	2.22E+00	C2, D
Na	5.19E+01	1.34E-04	2.49E-02	3.29E+00	PF		2.13E+00	C2 as NaOH
Ni ⁹	6.32E-02	6.36E-08	1.18E-05	1.56E-03	PF	6	4.14E-02	C1, D
NO ₂	1.86E+01	1.85E-06	4.45E-03	5.90E-01	PF	5		
NO ₃	4.44E+01	3.27E-06	7.89E-03	1.04E+00	PF	5		
OH	3.11E+00	1.09E-05	2.01E-03	2.67E-01	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	7.89E-02	2.26E-08	4.20E-06	5.56E-04	PF	6	5.91E-03	C1, A, D

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Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
PO ₄	8.36E+00	6.28E-06	1.17E-03	1.54E-01	PF	5		
SiO ₃ ⁹	2.42E-01	1.89E-07	3.51E-05	4.64E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	2.05E+02	1.41E-05	2.35E-02	3.11E+00	PF	6		
Sr ⁹	2.79E-04	1.88E-10	3.49E-08	4.62E-06	PF	6		
ZrO ⁹	2.84E-04	1.58E-10	2.92E-08	3.87E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	2.13E+02	5.88E-07	9.53E-05	1.44E-02	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.05E-01	2.92E-10	4.73E-08	7.16E-06	PF	6	2.0E-11	B
C 14 ⁹	1.10E+01	3.05E-08	4.95E-06	7.50E-04	PF	6	6.0E-06	B
Cm 242 ⁹	2.70E-01	1.50E-12	2.43E-10	3.68E-08	PF	6	7.0E-10	B
Cm 244 ⁹	4.27E-01	1.02E-09	1.65E-07	2.50E-05	PF	6	4.0E-11	B
Cs 137 ⁹	1.05E+05	1.76E-05	4.27E-02	6.46E+00	PF	6	4.0E-07	B
I 129 ⁹	2.13E-01	8.22E-08	2.96E-06	1.45E-05	PF	6	7.0E-08	B
Np 237 ⁹	2.70E-01	7.50E-10	1.22E-07	1.84E-05	PF	6	1.2E-12	B
Pu 238 ⁹	2.56E-02	6.89E-11	1.12E-08	1.69E-06	PF	6	2.1E-12	B
Pu 239/240 ⁹	9.49E-04	2.61E-12	4.23E-10	6.41E-08	PF	6	2.0E-12	B
Pu 241 ⁹	5.83E-04	1.34E-12	2.17E-10	3.29E-08	PF	6	1.0E-10	B
RuRh 106 ⁹	4.27E-05	1.15E-16	1.20E-12	1.82E-10	PF	6	3.0E-08	B
Se 79	3.70E+00	1.03E-08	1.67E-06	2.52E-04	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.05E+05	1.76E-06	4.28E-02	6.49E+00	PF	6	9.0E-09	B
Tc 99 ⁹	1.56E+02	4.33E-07	7.03E-05	1.06E-02	PF	6	2.0E-06	B
U 238 ⁹	1.05E-01	2.92E-10	4.73E-08	7.16E-06	PF	6	1.0E-10	B
water		7.85E+04	7.85E+04	7.85E+04	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	SN		Tank:	241-SX-107				
Sample Date	9/5/79		Contents:	Sludge				
Sample ID	RAT-SX10		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.98							
Density, g/ml	1.24							
Temperature, °R	629							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.68E+01	3.00E-05	6.13E-03	6.64E-01	PF	5	9.06E+00	C1
Ba ⁹	2.50E-03	8.81E-10	1.80E-07	1.95E-05	PF	6	8.92E-02	C1
Ca	1.05E-01	1.27E-07	2.59E-05	2.80E-03	PF	6	6.11E+00	C1 as CaCO ₃
CO ₃	1.39E+01	1.12E-05	2.28E-03	2.47E-01	PF	5		
Cr ⁹	6.84E+01	1.41E-05	1.30E-02	1.40E+00	PF	6	2.35E-01	C1, D
Fe ⁹	5.92E+00	5.10E-06	1.04E-03	1.13E-01	PF	6	2.18E+00	C1
Na	1.16E+02	2.43E-04	4.97E-02	5.38E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	4.39E+01	3.54E-06	9.41E-03	1.02E+00	PF	5		
NO ₃	1.12E+02	6.70E-06	1.78E-02	1.93E+00	PF	5		
OH	1.62E+01	4.60E-05	9.39E-03	1.02E+00	PF	5	2.88E+00	C2 as NaOH
PO ₄	7.98E+00	4.87E-06	9.96E-04	1.08E-01	PF	5		
SO ₄ ⁹	6.32E-03	3.53E-10	6.49E-07	7.02E-05	PF	6		
TOC gC/l ¹⁷	4.80E+00	1.93E-05	3.94E-03	4.27E-01	PF	5		
ZrO ⁹	2.76E-02	1.24E-08	2.54E-06	2.75E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ^{18,9}	6.76E+02	1.87E-06	2.71E-04	4.12E-02	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	2.63E-01	7.30E-10	1.06E-07	1.61E-05	PF	6	2.0E-11	B
C 14 ⁹	2.63E-06	7.30E-15	1.06E-12	1.61E-10	PF	6	6.0E-06	B
Cm 242 ⁹	6.76E-01	3.75E-12	5.44E-10	8.29E-08	PF	6	7.0E-10	B
Cm 244 ⁹	1.32E-09	3.15E-18	4.57E-16	6.95E-14	PF	6	4.0E-11	B
Ce 137	1.30E+05	1.64E-05	3.56E-02	5.43E+00	PF	5	4.0E-07	B
CePr 144	6.03E+04	2.45E-10	3.56E-08	5.42E-06	PF	5	3.0E-08	B

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Co 60	4.76E+03	1.84E-06	2.67E-04	4.06E-02	PF	5	8.0E-08	B
Eu 154	4.86E+04	3.36E-05	5.51E-03	8.40E-01	PF	5	5.0E-08	B
I 129 ⁹	3.91E-09	1.51E-15	5.43E-14	2.40E-13	PF	6	7.0E-08	B
Np 237 ⁹	5.33E-03	1.48E-11	2.15E-09	3.27E-07	PF	6	1.2E-12	B
Pu 238 ⁹	2.63E+01	7.08E-08	1.03E-05	1.56E-03	PF	6	2.1E-12	B
Pu 239/240	2.22E-02	6.16E-11	8.95E-09	1.36E-06	PF	5	2.0E-12	B
Pu 241	6.76E+02	9.26E-07	1.34E-04	2.05E-02	PF		1.0E-10	B
RuRh 106 ⁹	7.82E-02	2.11E-13	1.97E-09	2.99E-07	PF	6	3.0E-08	B
Se 79 ⁹	1.07E-07	2.97E-16	4.31E-14	6.57E-12	PF	6	1.0E-06	B
Sr 89/90	2.92E+06	1.73E-05	8.12E-01	1.24E+02	PF	5	9.0E-09	B
Sb 125	7.84E+04	4.61E-06	6.69E-04	1.02E+01	PF	5	1.0E-06	B
Tc 99 ⁹	3.91E-06	1.09E-14	1.58E-12	2.40E-10	PF	6	2.0E-06	B
U 234	1.99E+00	5.53E-09	8.02E-07	1.22E+04	PF		9.0E-11	B
U 238	1.99E+00	5.53E-09	8.02E-07	1.22E+04	PF	5	1.0E-10	B
water		1.57E+05	1.57E+05	1.57E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	TRAC		Tank:	241-SX-108				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	8.5E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1							
Temperature, °R	659							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.80E+01	1.06E-05	2.04E-03	1.00E-01	PF	6	2.27E-03	C1
Ba ⁹	1.00E-03	4.62E-10	8.92E-08	4.37E-06	PF	6	8.92E-02	C1
Ca ⁹	2.67E-01	4.23E-07	8.16E-05	4.00E-03	PF	6	6.11E+00	C1 as CaCO ₃
Cr ⁹	3.47E+01	9.38E-06	8.16E-03	4.00E-01	PF	6	2.35E-01	C1, D
Fe ⁹	3.73E+00	4.22E-06	8.14E-04	3.99E-02	PF	6	2.18E+00	C1
Na ⁹	4.60E+02	1.27E-04	2.45E-01	1.20E+01	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	1.20E-10	1.27E-17	3.19E-14	1.56E-12	PF	6		
NO ₃ ⁹	9.33E+01	7.33E-06	1.84E-02	9.02E-01	PF	6		
SO ₄ ⁹	2.53E-03	1.85E-10	3.22E-07	1.58E-05	PF	6		
ZrO ⁹	7.33E-03	4.34E-09	8.37E-07	4.11E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	3.42E+02	9.44E-07	1.70E-04	8.94E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.33E-01	3.69E-10	6.65E-08	3.50E-06	PF	6	2.0E-11	B
C 14 ⁹	2.70E-06	7.50E-15	1.35E-12	7.10E-11	PF	6	6.0E-06	B
Cm 242 ⁹	3.42E-01	1.90E-12	3.41E-10	1.80E-08	PF	6	7.0E-10	B
Cm 244 ⁹	2.70E-09	6.44E-18	1.16E-15	6.09E-14	PF	6	4.0E-11	B
Cs 137 ⁹	6.67E-03	1.12E-12	3.01E-09	1.58E-07	PF	6	4.0E-07	B
I 129 ⁹	3.42E-09	1.32E-15	4.75E-14	8.99E-14	PF	6	7.0E-08	B
Np 237 ⁹	2.70E-03	7.50E-12	1.35E-09	7.10E-08	PF	6	1.2E-12	B
Pu 238 ⁹	1.33E+01	3.58E-08	6.44E-06	3.39E-04	PF	6	2.1E-12	B

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 239/240 ⁹	2.34E+02	6.50E-07	1.17E-04	6.15E-03	PF	6	2.0E-12	B
Pu 241 ⁹	4.00E+02	9.20E-07	1.66E-04	8.71E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	3.42E+02	9.24E-14	1.07E-09	5.61E-08	PF	6	3.0E-08	B
Se 79 ⁹	1.33E-07	3.69E-16	6.65E-14	3.50E-12	PF	6	1.0E-06	B
Sr 89/90 ⁹	6.67E+05	1.12E-05	3.02E-01	1.59E+01	PF	6	9.0E-09	B
Tc 99 ⁹	3.96E-06	1.10E-14	1.98E-12	1.04E-10	PF	6	2.0E-06	B
U 238 ⁹	1.33E+00	3.69E-09	6.65E-07	3.50E-05	PF	6	1.0E-10	B
water		1.90E+05	1.90E+05	1.90E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	TRAC		Tank:	241-SX-109				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	9.2E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.95							
Temperature, °R	615							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	3.60E+01	7.27E-05	8.36E-03	6.83E-01	PF	6	9.06E+00	C1
Ba ⁹	1.00E-03	3.98E-10	4.58E-08	3.74E-06	PF	6	8.92E-02	C1
Cr ⁹	3.47E+01	8.08E-06	4.18E-03	3.42E-01	PF	6	2.35E-01	C1, D
Fe ⁹	3.00E+00	2.92E-06	3.36E-04	2.75E-02	PF	6	2.18E+00	C1
Na ⁹	4.60E+02	1.09E-03	1.25E-01	1.02E+01	PF	6	2.14E+00	C2 as NaOH
NO ₃ ⁹	1.27E+03	8.59E-05	1.28E-01	1.05E+01	PF	6		
OH ⁹	1.13E+02	3.63E-04	4.17E-02	3.41E+00	PF	6	2.88E+00	C2 as NaOH
SO ₄ ⁹	2.53E-03	1.60E-10	1.65E-07	1.35E-05	PF	6		
ZrO ⁹	3.60E-03	1.83E-09	2.11E-07	1.72E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	1.33E+02	3.67E-07	3.39E-05	3.45E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	5.41E-02	1.50E-10	1.39E-08	1.41E-06	PF	6	2.0E-11	B
C 14 ⁹	1.33E-06	3.69E-15	3.41E-13	3.47E-11	PF	6	6.0E-06	B
Cm 242 ⁹	1.98E-01	1.10E-12	1.01E-10	1.03E-08	PF	6	7.0E-10	B
Cm 244 ⁹	6.67E-10	1.59E-18	1.47E-16	1.49E-14	PF	6	4.0E-11	B
Cs 137 ⁹	6.67E-03	1.12E-12	1.54E-09	1.57E-07	PF	6	4.0E-07	B
I 129 ⁹	3.42E-09	1.32E-15	4.75E-14	8.93E-14	PF	6	7.0E-08	B
Np 237 ⁹	1.33E-03	3.69E-12	3.41E-10	3.47E-08	PF	6	1.2E-12	B
Pu 238 ⁹	1.33E+01	3.58E-08	3.30E-06	3.36E-04	PF	6	2.1E-12	B
Pu 239/240 ⁹	1.50E+02	4.44E-07	4.10E-05	4.18E-03	PF	6	2.0E-12	B

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 241 ⁹	1.98E+02	4.55E-07	4.20E-05	4.28E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	1.33E-02	5.76E-13	3.41E-09	3.47E-07	PF	6	3.0E-08	B
Se 79 ⁹	5.95E-08	1.65E-16	1.53E-14	1.55E-12	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.98E-05	3.67E-06	5.08E-02	5.17E+00	PF	6	9.0E-09	B
Tc 99 ⁹	1.98E-06	5.50E-15	5.08E-13	5.17E-11	PF	6	2.0E-06	B
U 238 ⁹	6.67E-01	1.85E-09	1.71E-07	1.74E-05	PF	6	1.0E-10	B
water		1.40E+05	1.40E+05	1.40E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	TRAC		Tank:	241-SX-110				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	8.9E-03		Retr. Method	Pumping/Sluicing				
pH	13.89							
Density ^{1A} , g/ml	1.7							
Temperature, °R	630							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	1.04E-03	2.56E-09	2.77E-07	2.42E-05	PF	6	9.06E+00	C1
Ba ⁹	1.42E-03	6.89E-10	7.45E-08	6.52E-06	PF	6	8.92E-02	C1
Ca ⁹	1.54E-01	2.56E-07	2.77E-05	2.42E-03	PF	6	6.11E+00	C1 as CaCO ₃
Cr ⁹	1.38E+01	3.92E-06	1.91E-03	1.67E-01	PF	6	2.35E-01	C1, D
Fe ⁹	1.50E+00	1.78E-06	1.93E-04	1.68E-02	PF	6	2.18E+00	C1
Na ⁹	4.23E+02	1.22E-03	1.32E-01	1.16E+01	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	1.53E-03	1.72E-09	1.86E-07	1.63E-05	PF	6	4.14E-02	C1, D
NO ₃ ⁹	1.19E+03	9.81E-05	1.38E-01	1.21E+01	PF	6		
OH ⁹	1.31E+01	5.12E-05	5.54E-03	4.84E-01	PF	6	2.88E+00	C2 as NaOH
SO ₄ ⁹	3.69E-03	2.84E-10	2.76E-07	2.42E-05	PF	6		
ZrO ⁹	4.23E-03	2.63E-09	2.84E-07	2.49E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	2.70E+02	7.45E-07	7.89E-05	7.05E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	7.69E-02	2.14E-10	2.26E-08	2.02E-06	PF	6	2.0E-11	B
C 14 ⁹	4.57E-07	1.27E-15	1.34E-13	1.20E-11	PF	6	6.0E-06	B
Cm 242 ⁹	2.29E-01	1.27E-12	1.34E-10	1.20E-08	PF	6	7.0E-10	B
Cm 244 ⁹	2.70E-10	6.44E-19	6.81E-17	6.09E-15	PF	6	4.0E-11	B
Cs 137 ⁹	1.14E-04	1.91E-14	3.03E-11	2.70E-09	PF	6	4.0E-07	B
I 129 ⁹	7.69E-11	2.97E-17	1.07E-15	2.02E-15	PF	6	7.0E-08	B
Np 237 ⁹	1.56E-03	4.33E-12	4.59E-10	4.10E-08	PF	6	1.2E-12	B

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Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 238 ⁹	2.29E+00	6.16E-09	6.53E-07	5.83E-05	PF	6	2.1E-12	B
Pu 239/240 ⁹	1.46E+02	4.06E-07	4.29E-05	3.83E-03	PF	6	2.0E-12	B
Pu 241 ⁹	3.12E+02	7.18E-07	7.60E-05	6.79E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	1.56E-01	4.21E-13	2.86E-09	2.55E-07	PF	6	3.0E-08	B
Se 79 ⁹	1.98E-09	5.50E-18	5.82E-16	5.20E-14	PF	6	1.0E-06	B
Sr 89/90 ⁹	2.70E+05	4.53E-06	7.19E-02	6.42E+00	PF	6	9.0E-09	B
Tc 99 ⁹	7.69E-08	2.14E-16	2.26E-14	2.02E-12	PF	6	2.0E-06	B
U 238 ⁹	7.69E-01	2.14E-09	2.26E-07	2.02E-05	PF	6	1.0E-10	B
water		1.58E+05	1.58E+05	1.58E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	DL		Tank:	241-SX-111				
Sample Date	8/1/75		Contents:	Sludge				
Sample ID	RAT-SX111-1		Watchlist:	N/A				
Properties	Value		Status:	II/IS				
Visc., lbm/ft-s ¹	4.2E-03		Retr. Method	Pumping/Sluicing				
pH	13.85							
Density, g/ml	1.21							
Temperature, °R	651							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	5.40E+00	9.69E-06	2.02E-03	2.03E-01	PF	5	9.06E+00	C1
Ba ⁹	1.73E-03	6.12E-10	1.28E-07	1.28E-05	PF	6	8.92E-02	C1
CO ₃	8.40E+00	6.78E-06	1.41E-03	1.42E-01	PF	5		
Cr ⁹	3.47E+01	7.18E-06	6.74E-03	6.79E-01	PF	6	2.35E-01	C1, D
Fe	3.54E-03	3.06E-09	6.39E-07	6.43E-05	PF	5	2.18E+00	C1
Na ⁹	9.56E+01	2.01E-04	4.20E-02	4.23E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂	1.38E+01	1.12E-06	3.03E-03	3.05E-01	PF	5		
NO ₃	1.67E+02	1.00E-05	2.72E-02	2.74E+00	PF	5		
OH	1.19E+01	3.39E-05	7.07E-03	7.12E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	5.25E-01	3.22E-07	6.71E-05	6.76E-03	PF	5		
Pu	1.17E-06	2.32E-13	4.84E-11	4.88E-09	PF	5		
Si	4.24E-03	7.34E-09	1.53E-06	1.54E-04	PF	5	8.73E+00	C1
SO ₄ ⁹	4.47E-03	2.50E-10	4.70E-07	4.74E-05	PF	6		
ZrO ⁹	7.33E-03	3.32E-09	6.92E-07	6.97E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	1.01E+01	2.79E-08	4.15E-06	5.85E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	5.05E-03	1.40E-11	2.09E-09	2.94E-07	PF	6	2.0E-11	B
C 14 ⁹	1.33E+02	3.69E-07	5.49E-05	7.75E-03	PF	6	6.0E-06	B
Cm 242 ⁹	9.37E-03	5.20E-14	7.73E-12	1.09E-09	PF	6	7.0E-10	B
Cm 244 ⁹	1.33E-01	3.17E-10	4.72E-08	6.66E-06	PF	6	4.0E-11	B
Cs 137 ²⁰	2.15E+05	2.44E-05	5.45E-02	7.70E+00	PF	5	4.0E-07	B
I 129 ⁹	3.42E-01	1.32E-07	4.75E-06	2.00E-05	PF	6	7.0E-08	B

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Np 237 ⁹	1.98E-01	5.50E-10	8.18E-08	1.16E-05	PF	6	1.2E-12	B
Pu 238 ⁹	1.98E-01	5.33E-10	7.93E-08	1.12E-05	PF	6	2.1E-12	B
Pu 239/240 ²⁰	8.03E+01	2.23E-07	3.32E-05	4.68E-03	PF	5	2.0E-12	B
Pu 241 ⁹	6.67E+00	1.53E-08	2.28E-06	3.22E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	6.13E-05	1.66E-16	1.58E-12	2.23E-10	PF	6	3.0E-08	B
Se 79 ⁹	6.67E+00	1.85E-08	2.76E-06	3.89E-04	PF	6	1.0E-06	B
Sr 89/90 ²⁰	3.38E+06	3.91E+05	8.72E-01	1.23E+02	PF	5	9.0E-09	B
Tc 99 ⁹	1.98E+02	5.50E-07	8.18E-05	1.16E-02	PF	6	2.0E-06	B
U 238 ⁹	6.67E-02	1.85E-10	2.76E-08	3.89E-06	PF	6	1.0E-10	B
water		1.82E+05	1.82E+05	1.82E+05	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	TRAC		Tank:	241-SX-112				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.45							
Temperature, °R	620							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	2.13E+02	3.57E-04	6.65E-02	2.34E+00	PF	6	9.06E+00	C1
Ba ⁹	2.89E-03	9.54E-10	1.78E-07	6.26E-06	PF	6	8.92E-02	C1
Cr ⁹	1.24E+02	2.39E-05	2.01E-02	7.08E-01	PF	6	2.35E-01	C1, D
Fe ⁹	1.03E+01	8.31E-06	1.55E-03	5.46E-02	PF	6	2.18E+00	C1
Na ⁹	5.00E+02	9.83E-04	1.83E-01	6.45E+00	PF	6	2.13E+00	C2 as NaOH
NO ₃ ⁹	1.34E+02	7.51E-06	1.82E-02	6.41E-01	PF	6		
OH ⁹	4.47E+02	1.19E-03	2.22E-01	7.80E+00	PF	6	2.88E+00	C2 as NaOH
SO ₄ ⁹	1.34E-01	7.00E-09	1.18E-05	4.14E-04	PF	6		
ZrO ⁹	2.89E-02	1.22E-08	2.28E-06	8.02E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	7.82E+02	2.16E-06	2.68E-04	1.42E-02	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	2.63E-01	7.30E-10	9.07E-08	4.79E-06	PF	6	2.0E-11	B
C 14 ⁹	1.07E+00	2.97E-09	3.69E-07	1.95E-05	PF	6	6.0E-06	B
Cm 242 ⁹	7.82E-01	4.34E-12	5.38E-10	2.85E-08	PF	6	7.0E-10	B
Cm 244 ⁹	7.82E-04	1.86E-12	2.31E-10	1.22E-08	PF	6	4.0E-11	B
Ce 137 ⁹	7.82E+03	1.31E-06	2.43E-03	1.29E-01	PF	6	4.0E-07	B
I 129 ⁹	2.63E-03	1.02E-09	3.66E-08	4.80E-08	PF	6	7.0E-08	B
Np 237 ⁹	6.33E-03	1.76E-11	2.18E-09	1.15E-07	PF	6	1.2E-12	B
Pu 238 ⁹	5.26E+01	1.42E-07	1.76E-05	9.29E-04	PF	6	2.1E-12	B
Pu 239/240 ⁹	6.33E+02	1.76E-06	2.18E-04	1.15E-02	PF	6	2.0E-12	B

Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 241 ⁹	1.07E+03	2.46E-06	3.06E-04	1.62E-02	PF	6	1.0E-10	B
RuRh 106 ⁹	7.82E-02	2.11E-13	1.68E-09	8.89E-08	PF	6	3.0E-08	B
Se 79 ⁹	5.29E-02	1.47E-10	1.82E-08	9.65E-07	PF	6	1.0E-06	B
Tc 99 ⁹	1.89E+00	5.14E-09	6.38E-07	3.37E-05	PF	6	2.0E-06	B
U 238 ⁹	2.63E+00	7.31E-09	9.07E-07	4.80E-05	PF	6	1.0E-10	B
water		1.46E+05	1.46E+05	1.46E+05	Stm Ta	1		

Tank Farm 241-SX Vapor Estimates

Sample Type	TRAC		Tank:	241-SX-113				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	9.6E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.3							
Temperature, °R	541							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	4.91E+01	1.41E-04	1.71E-02	1.46E+00	PF	6	9.06E+00	C1
Ba ⁹	1.27E-03	7.21E-10	8.72E-08	7.44E-06	PF	6	8.92E-02	C1
Cr ⁹	9.09E+00	3.02E-06	1.64E-03	1.40E-01	PF	6	2.35E-01	C1, D
Fe ⁹	5.09E-01	7.07E-07	8.55E-05	7.29E-03	PF	6	2.18E+00	C1
Na ⁹	4.18E+02	1.41E-03	1.71E-01	1.46E+01	PF	6	2.13E+00	C2 as NaOH
NO ₃ ⁹	7.25E+02	7.00E-05	1.10E-01	9.38E+00	PF	6		
OH ⁹	4.00E+01	1.83E-04	2.21E-02	1.89E+00	PF	6	2.88E+00	C2 as NaOH
SiO ₃ ⁹	3.45E+01	3.53E-05	4.27E-03	3.64E-01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	5.27E+00	4.74E-07	5.16E-04	4.40E-02	PF	6		
ZrO ⁹	2.55E-03	1.85E-09	2.24E-07	1.91E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	3.69E+01	1.02E-07	1.41E-05	1.05E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	6.39E-03	1.77E-11	2.46E-09	1.83E-07	PF	6	2.0E-11	B
C 14 ⁹	6.39E+01	1.77E-07	2.46E-05	1.83E-03	PF	6	6.0E-06	B
Cm 242 ⁹	1.82E-02	1.01E-13	1.40E-11	1.04E-09	PF	6	7.0E-10	B
Cm 244 ⁹	9.09E-03	2.17E-11	3.00E-09	2.23E-07	PF	6	4.0E-11	B
Ce 137 ⁹	3.69E+05	6.17E-05	1.28E-01	9.54E+00	PF	6	4.0E-07	B
I 129 ⁹	1.82E-01	7.03E-08	2.53E-06	5.21E-06	PF	6	7.0E-08	B
Np 237 ⁹	4.67E-01	1.30E-09	1.80E-07	1.34E-05	PF	6	1.2E-12	B
Pu 238 ⁹	7.37E-01	1.98E-09	2.75E-07	2.05E-05	PF	6	2.1E-12	B

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Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 239/240 ⁹	6.39E+01	1.77E-07	2.46E-05	1.83E-03	PF	6	2.0E-12	B
Pu 241 ⁹	7.37E+01	1.70E-07	2.35E-05	1.75E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	4.67E-04	1.26E-15	1.12E-11	8.34E-10	PF	6	3.0E-08	B
Se 79 ⁹	2.70E+00	7.50E-09	1.04E-06	7.73E-05	PF	6	1.0E-06	B
Sr 89/90 ⁹	2.70E+05	4.53E-06	9.40E-02	7.00E+00	PF	6	9.0E-09	B
Tc 99 ⁹	9.09E+01	2.52E-07	3.50E-05	2.60E-03	PF	6	2.0E-06	B
U 238 ⁹	3.69E-01	1.02E-09	1.42E-07	1.06E-05	PF	6	1.0E-10	B
water		3.82E+04	3.82E+04	3.82E+04	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Sample Type	TRAC	Tank:	241-SX-114				
Sample Date		Contents:	Sludge				
Sample ID		Watchlist:	N/A				
Properties	Value	Status:	IS/II				
Visc., lbm/ft-s ¹	7.0E-03	Retr. Method	Pumping/Sluicing				
pH	N/A						
Density ^{1A} , g/ml	1.6						
Temperature, °R	645						
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	1.04E+01	2.68E-05	2.94E-03	3.19E-01	PF 6	9.06E+00	C1
Ba ⁹	1.30E-03	6.60E-10	7.25E-08	7.87E-06	PF 6	8.92E-02	C1
Cr ⁹	2.26E+01	6.71E-06	3.32E-03	3.60E-01	PF 6	2.35E-01	C1, D
Fe ⁹	2.43E+00	3.02E-06	3.32E-04	3.60E-02	PF 6	2.18E+00	C1
Na ⁹	4.00E+02	1.21E-03	1.33E-01	1.44E+01	PF 6	2.13E+00	C2 as NaOH
NO ₃ ⁹	1.09E+03	9.40E-05	1.34E-01	1.46E+01	PF 6		
OH ⁹	6.09E+01	2.49E-04	2.74E-02	2.97E+00	PF 6	2.88E+00	C2 as NaOH
SO ₄ ⁹	3.53E-03	2.84E-10	2.81E-07	3.05E-05	PF 6		
ZrO ⁹	9.13E-01	5.93E-07	6.52E-05	7.08E-03	PF 6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	3.53E+02	9.74E-07	1.10E-04	1.16E-02	PF 6	2.0E-11	B ¹⁹
Am 243 ⁹	1.29E-01	3.58E-10	4.03E-08	4.27E-06	PF 6	2.0E-11	B
Cm 242 ⁹	3.06E-01	1.70E-12	1.91E-10	2.02E-08	PF 6	7.0E-10	B
Nb 237 ⁹	2.23E-03	6.19E-12	6.97E-10	7.39E-08	PF 6	1.2E-12	B
Pu 238 ⁹	4.35E+00	1.17E-08	1.32E-06	1.40E-04	PF 6	2.1E-12	B
Pu 239/240 ⁹	1.53E+02	4.25E-07	4.78E-05	5.07E-03	PF 6	2.0E-12	B
Pu 241 ⁹	3.08E+02	8.93E-07	1.00E-04	1.06E-02	PF 6	1.0E-10	B
RuRh 106 ⁹	8.70E-02	2.35E-13	1.69E-09	1.80E-07	PF 6	3.0E-08	B
Sr 89/90 ⁹	4.35E+05	7.30E-06	1.23E-01	1.30E+01	PF 6	9.0E-09	B
U 238 ⁹	1.29E+00	3.58E-09	4.03E-07	4.27E-05	PF 6	1.0E-10	B
water		1.75E+05	1.75E+05	1.75E+05	Stm Ta 1		

Tank Farm 241-SX Vapor Estimates

Sample Type	Sludge		Tank:	241-SX-115				
Sample Date	3/110/75		Contents:	Sludge				
Sample ID	RAT-SX115-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	5.9E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.5							
Temperature, °R	577							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	8.50E+01	2.59E-04	2.57E-02	4.24E+00	PF	5	9.06E+00	C1
Ba ⁹	3.42E-03	2.06E-09	2.03E-07	3.36E-05	PF	6	8.92E-02	C1
Ca	1.36E+01	2.80E-05	2.77E-03	4.57E-01	PF	5	6.11E+00	C1 as CaCO ₃
Cr ⁹	2.76E+01	9.70E-06	4.33E-03	7.14E-01	PF	6	2.35E-01	C1, D
Fe	9.16E+01	1.35E-04	1.33E-02	2.20E+00	PF	5	2.18E+00	C1
Mg	4.86E+00	1.67E-05	1.65E-03	2.72E-01	PF	5	1.02E+01	C1
Mn	2.20E+01	3.29E-05	3.26E-03	5.38E-01	PF	5	2.22E+00	C2, D
Na	4.41E+01	1.58E-04	1.56E-02	2.58E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	3.68E+00	5.07E-07	6.52E-04	1.08E-01	PF	5		
NO ₃ ⁹	1.02E+03	1.04E-04	1.34E-01	2.21E+01	PF	6		
OH ⁹	1.12E+02	5.42E-04	5.37E-02	8.86E+00	PF	6	2.88E+00	C2 as NaOH
PO ₄	1.80E+01	1.88E-05	1.86E-03	3.07E-01	PF	5		
Pu	1.96E-01	6.61E-08	6.55E-06	1.08E-03	PF	5		
Si	1.69E+01	4.97E-05	4.92E-03	8.12E-01	PF	5	8.73E+00	C1
SO ₄ ⁹	1.13E+01	1.08E-06	9.59E-04	1.58E-01	PF	6		
TOC qC/l ¹⁷	1.23E+00	8.44E-06	8.35E-04	1.38E-01	PF	5		
ZrO ⁹	9.87E-03	7.60E-09	7.52E-07	1.24E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	2.63E+02	7.26E-07	8.71E-05	1.19E-02	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	7.82E-02	2.17E-10	2.61E-08	3.55E-06	PF	6	2.0E-11	B
C 14 ⁹	1.32E+02	3.66E-07	4.40E-05	5.99E-03	PF	6	6.0E-06	B
Cm 242 ⁹	2.63E-01	1.46E-12	1.75E-10	2.38E-08	PF	6	7.0E-10	B
Cm 244 ⁹	1.07E-01	2.55E-10	3.06E-08	4.17E-06	PF	6	4.0E-11	B

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Tank Farm 241-SX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cs 137	7.05E+04	8.02E-06	1.44E-02	1.96E+00	PF	5	4.0E-07	B
Co 60	3.19E+05	7.28E-05	8.74E-03	1.19E+00	PF	5	8.0E-08	B
Cs 134	4.11E+04	2.11E-07	2.54E-05	3.46E-03	PF	5	4.0E-07	B
Eu 154	9.24E+04	4.55E-05	6.18E-03	8.42E-01	PF	5	5.0E-08	B
I 129 ⁹	5.33E-01	2.06E-07	7.41E-06	2.42E-05	PF	6	7.0E-08	B
Np 237 ⁹	2.63E-01	7.31E-10	8.77E-08	1.19E-05	PF	6	1.2E-12	B
Pu 238 ⁹	3.91E+00	1.05E-08	1.26E-06	1.72E-04	PF	6	2.1E-12	B
Pu 239/240	1.20E+04	3.33E-05	4.00E-03	5.44E-01	PF	5	2.0E-12	B
Pu 241 ⁹	2.63E+02	6.05E-07	7.26E-05	9.89E-03	PF	6	1.0E-10	B
RuRh 106 ⁹ A	5.33E-03	1.44E-14	1.11E-10	1.51E-08	PF	6	3.0E-08	B
Se 79 ⁹	9.25E+00	2.57E-08	3.08E-06	4.20E-04	PF	6	1.0E-06	B
Sr 89/90	4.78E+07	5.53E-04	9.95E+00	1.35E+03	PF	5	9.0E-09	B
Sb 125	4.22E+05	8.88E-06	1.07E-03	1.45E-01	PF	5	1.0E-06	B
Tc 99 ⁹	2.63E+02	7.31E-07	8.77E-05	1.19E-02	PF	6	2.0E-06	B
U 238 ⁹	9.37E-01	2.60E-09	3.12E-07	4.25E-05	PF	6	1.0E-10	B
water		8.84E+04	8.84E+04	8.84E+04	Stm Ta	1		

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Tank Farm 241-SX Vapor Estimates

Note: 1. Viscosity of all tanks in the SX farm estimated assuming 40 vol.% solids.

Note: 1A. Tanks SX-101, 103, 105, reported density too low, density artificially raised to obtain minimal positive moles of water. No density reported for tanks SX-108, 109, 110, 112, 113, 114, and 115. Tank 108 estimated Sp.G.=1.0, tanks 109, 110, and 114 estimated to obtain minimal moles of water, nitrate concentration reduced in tanks 112, 113, and 115 by an order of magnitude, 50%, and 75% respectively to obtain reasonable density with minimal moles of water.

Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.

Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.

Note: 4. Estimated current vapor composition ppm by volume for volatiles, ppm by mass for non-volatiles, and microcurie/l for radionuclides.

Note: 5. Estimated future vapor composition based on stated retrieval model.

Note: 6. TRAC data reliability deemed 6. Data estimated from sluge sample denoted 5.

Note: 7. Allowable concentration, vapor component in ppm by volume for vapors, ppm by weight (@STP) for non-volatiles.

Note: 9. TRAC data used to estimate concentration.

Note: 10. As maleic anhydride.

Note: 11. As methylethyl ketone.

Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).

Note: 13. As cyanide compounds.

Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.

Note: 15. Annual arithmetic mean over calendar year.

Note: 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile.

Note: 18. Radionuclides decayed to current year (rounded to nearest year).

Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-SY Vapor Estimates

Sample Type	Average		Tank:	241-SY-101				
Sample Date	1986-93		Contents:	Liquid/Solids				
Sample ID			Watchlist:	Hydrogen				
Properties	Ave Value		Status:	Active				
Visc., lbm/ft-s ¹	5.1E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.53							
Temperature, °R	591							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Acetone ⁸	5.05E-05	3.15E-02	3.15E-02	3.15E-02	VLE	5	7.50E+02	C1, C3
Al	4.43E+01	2.50E-03	2.50E-03	1.50E+00	PF	5	9.06E+00	C1
B	6.96E-02	9.65E-06	9.65E-06	5.79E-03	PF	5	2.22E+01	C1
2-Butanone ⁸	7.70E-05	3.87E-02	3.87E-02	3.87E-02	VLE	5	2.00E+02	C1, C3, D ¹¹
Ca	4.27E-01	1.63E-05	1.63E-05	9.77E-03	PF	5	6.11E+00	C1 as CaCO3
Cl	1.14E+01	3.10E-05	3.10E-05	2.98E-01	PF	5		
CN	9.05E-02	5.31E-06	5.31E-06	3.19E-03	PF	5	4.70E+00	C1, D
CO3	3.48E+01	8.84E-04	8.84E-04	5.31E-01	PF	5		
Cr	6.83E-02	4.44E-07	4.44E-07	1.20E-03	PF	5	2.35E-01	C1, D
Dodecane	3.40E-05	1.21E+03	1.21E+03	1.21E+03	VLE	5		
EDTA ¹²	6.83E+00	3.57E-05	3.57E-05	2.14E-02	PF	5		
2-ethyl-1-hexanol ⁸	1.62E-04	1.22E-02	1.22E-02	1.22E-02	VLE	5		
F	2.53E+00	1.20E-05	1.20E-05	1.22E-01	PF	5	3.22E+00	C1
Fe	4.38E-02	1.19E-06	1.19E-06	7.16E-04	PF	5	2.18E+00	C1
HEDTA ¹²	1.83E+01	9.54E-05	9.54E-05	5.72E-02	PF	5		
K	4.51E+00	1.76E-04	1.76E-04	1.06E-01	PF	5		
Methane	0.00E+00	1.00E+03	1.00E+03	1.00E+03	Vap Samp	2		
Mo	1.46E-01	2.32E-06	2.32E-06	1.39E-03	PF	5	2.55E+00	C1
Na	2.66E+02	1.76E-02	1.76E-02	1.06E+01	PF	5	2.13E+00	C2 as NaOH
NH3 ^{8,14}	3.31E-01	8.90E+02	1.33E+03	1.33E+03	VLE	5	2.50E+01	C1
Ni	8.62E-02	2.23E-06	2.23E-06	1.34E-03	PF	5	4.14E-02	C1, D
NO2	1.46E+02	3.71E-04	3.71E-04	2.90E+00	PF	5		
NO3	1.85E+02	3.50E-04	3.50E-04	2.73E+00	PF	5		
OH	3.74E+01	3.36E-03	3.36E-03	2.02E+00	PF	5	2.88E+00	C2 as NaOH
PO4	8.87E+00	1.71E-04	1.71E-04	1.03E-01	PF	5		

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Tank Farm 241-SY Vapor Estimates

SO ₄	4.94E+00	8.71E-06	8.71E-06	4.71E-02	PF	5	
TOC gC/l ¹⁷	1.73E+01	2.20E-03	2.20E-03	1.32E+00	PF	5	
Tridecane	2.90E-05	3.08E+02	3.08E+02	3.08E+02	VLE	5	
Undecane	2.40E-05	2.38E+02	2.38E+02	2.38E+02	VLE	5	
Zn	1.02E-01	2.39E-06	2.39E-06	1.44E-03	PF	5	
Am 241 ¹⁸	1.77E+00	1.77E-07	1.77E-07	1.06E-04	PF	5	2.0E-11
Cs 137	3.86E+05	2.58E-03	2.58E-03	2.32E+01	PF	5	4.0E-07
Pu 239/240	1.39E-01	1.39E-08	1.39E-08	8.34E-06	PF	5	2.0E-12
Sr 89/90	4.86E+03	3.24E-06	3.24E-06	2.92E-01	PF	5	9.0E-09
water		1.08E+05	1.08E+05	1.08E+05	Stm Tabl	1	

Tank Farm 241-SY: Vapor Estimates

Sample Type	Ave. SN		Tank:	241-SY-102				
Sample Date	10/1/88		Contents:	Liquid/Solids				
Sample ID	102SY-1,2		Watchlist:	N/A				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	6.6E-04		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.3							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁴	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Al	1.54E+00	2.21E-06	7.95E-05	5.12E-01	PF	5	9.06E+00	C1
Ba	5.36E-05	1.51E-11	5.45E-10	3.51E-06	PF	5	8.92E-02	C1
B	1.41E-02	4.96E-08	1.79E-06	1.15E-02	PF	5	2.22E+01	C1
Ca	3.65E-03	3.53E-09	1.27E-07	8.20E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cr	2.82E-02	4.66E-09	1.68E-07	4.87E-03	PF	5	2.35E-01	C1, D
Dy	2.11E-04	5.03E-11	1.81E-09	1.17E-05	PF	5		
Fe	2.90E-03	2.00E-09	7.22E-08	4.65E-04	PF	5	2.18E+00	C1
K	3.05E+00	3.03E-06	1.09E-04	7.02E-01	PF	5		
La	3.61E-04	1.01E-10	3.62E-09	2.33E-05	PF	5		
Li	9.02E-06	5.03E-11	1.81E-09	1.17E-05	PF	5		
Mg	1.58E-04	2.55E-10	9.17E-09	5.91E-05	PF	5	1.02E+01	C1
Mn	3.57E-05	2.51E-11	9.04E-10	5.83E-06	PF	5	2.22E+00	C2, D
Mo	1.25E-03	5.04E-10	1.81E-08	1.17E-04	PF	5	2.55E+00	C1
Na	2.62E+01	4.41E-05	1.59E-03	1.02E+01	PF	5	2.13E+00	C2 as NaOH
Nd	1.69E-03	4.54E-10	1.64E-08	1.05E-04	PF	5		
Ni	3.82E-04	2.51E-10	9.02E-09	5.82E-05	PF	5	4.14E-02	C1, D
P	1.21E-01	1.51E-07	5.44E-06	3.51E-02	PF	5		
Rh	4.01E-02	1.51E-08	5.42E-07	3.50E-03	PF	5	2.37E-04	C1
Ru	2.63E-02	1.01E-08	3.63E-07	2.34E-03	PF	5		
Si	1.68E-01	2.32E-07	8.36E-06	5.39E-02	PF	5	8.73E+00	C1
Sr	6.84E-05	3.01E-11	1.08E-09	6.98E-06	PF	5		
Te	3.32E-03	1.00E-09	3.61E-08	2.33E-04	PF	5	1.91E-02	C1
Ti	1.25E-04	1.01E-10	3.63E-09	2.34E-05	PF	5		
Tl	2.34E-02	4.44E-09	1.60E-07	1.03E-03	PF	5	1.20E-02	C1
Zn	2.55E-03	1.52E-09	5.47E-08	3.52E-04	PF	5		
Zr	1.19E-04	5.06E-11	1.82E-09	1.17E-05	PF	5	1.34E+00	C1, C3
Am 241 ¹⁰	9.67E-02	2.66E-10	9.59E-09	6.18E-05	PF	5	2.0E-11	B ¹⁹
Pu 239/240	1.02E-01	2.83E-10	1.02E-08	6.57E-05	PF	5	2.0E-12	B

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Tank Farm 241-SY Vapor Estimates

Start	89/90	4.77E+01	7.81E+12	2.81E+10	2.72E+04	PF	5	9.0E+09	B
To	99	2.91E+00	8.09E+09	2.91E+07	1.88E+03	PF	5	2.0E+06	B
water			2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

Tank Farm 241-SY Vapor Estimates

Sample Type	Ave.		Tank:	241-SY-103				
Sample Date	6/85		Contents:	Liquid/Solids				
Sample ID	R-5255, 6, 7		Watchlist:	Hydrogen				
Properties	Value		Status:	Active				
Visc., lbm/ft-s ¹	5.0E-03		Retr. Method	Pumping				
pH	N/A							
Density, g/ml	1.52							
Temperature, °R	603							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁴	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Al	5.77E+01	8.83E-05	3.18E-03	1.92E+00	PF	5	9.06E+00	C1
B	1.02E-01	3.83E-07	1.38E-05	8.31E-03	PF	5	2.22E+01	C1
Ca	3.09E-01	3.19E-07	1.15E-05	6.93E-03	PF	5	6.11E+00	C1 as CaCO ₃
Cl	1.24E+01	9.15E-07	3.29E-05	3.18E-01	PF	5		
CO ₃	3.92E+01	2.70E-05	9.72E-04	5.86E-01	PF	5		
Cr	2.11E+00	3.72E-07	1.34E-05	3.64E-02	PF	5	2.35E-01	C1, D
Cu	1.27E-02	8.20E-09	2.95E-07	1.78E-04	PF	5	3.82E-01	C1
EDTA ¹²	6.43E+00	9.10E-07	3.28E-05	1.97E-02	PF	5		
HEDTA ¹²	5.47E-01	7.71E-08	2.78E-06	1.67E-03	PF	5		
Hg	5.90E-03	1.21E-09	4.37E-08	2.63E-05	PF	5	6.08E-03	B, C1, C2
K	4.82E+00	5.11E-06	1.84E-04	1.11E-01	PF	5		
Mg	4.50E-03	7.75E-09	2.79E-07	1.68E-04	PF	5	1.02E+01	C1
Mo	1.63E-01	7.02E-08	2.53E-06	1.52E-03	PF	5	2.55E+00	C1
Na	2.74E+02	4.92E-04	1.77E-02	1.07E+01	PF	5	2.11E+00	C2 as NaOH
Ni	7.34E-02	5.14E-08	1.85E-06	1.12E-03	PF	5	4.14E-02	C1, D
NO ₂	1.29E+02	8.91E-06	3.21E-04	2.51E+00	PF	5		
NO ₃	1.64E+02	8.40E-06	3.03E-04	2.37E+00	PF	5		
OH	2.65E+01	6.44E-05	2.32E-03	1.40E+00	PF	5	2.88E+00	C2 as NaOH
P	4.54E+00	6.05E-06	2.18E-04	1.31E-01	PF	5		
PO ₄	8.85E+00	4.63E-06	1.67E-04	1.00E-01	PF	5		
Si	5.56E+02	8.20E-08	2.95E-06	1.78E-03	PF	5	8.73E+00	C1
SO ₄	8.33E+00	3.98E-07	1.43E-05	7.78E-02	PF	5		
TOC qC/l ¹⁷	4.41E+01	1.52E-04	5.47E-03	3.29E+00	PF	5		
Am 241 ¹⁸	6.73E+00	1.84E-08	6.63E-07	4.00E-04	PF	5	2.0E-11	B ¹⁹
Cb 137	6.10E+05	8.97E-05	3.23E-03	2.92E+01	PF	5	4.0E+07	B

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Tank Farm 241-SY Vapor Estimates

PU 239/240	4.77E+00	1.32E+08	4.76E+07	2.87E+04	PF	5	2.0E+12	H
Sr 89/90	4.66E+03	5.91E+08	2.49E+06	2.25E+01	PF	5	9.0E+09	H
water		1.24E+05	1.24E+05	1.24E+05	Stm Tabl	1		

Tank Farm 241-SY Vapor Estimates

- Note:** 1. Viscosity of tanks SY-101 and 103 estimated assuming 40 vol.% solids. Viscosity of Tank SY-102 estimated as that of water at tank temperature.
- Note:** 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note:** 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note:** 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides. Prior to the mixer pump installation SY-101, Hydrogen, Nitrogen, Nitrogen Oxide, and Ammonium periodically. The mixer pump appears to have leveled off this behavior.
- Note:** 5. Estimated future vapor composition based on stated retrieval model.
- Note:** 6. Data reliability of tank SY-101 deemed 5, with the exception of methane, due to average of slurry and supernatant samples. Methane reliability deemed 2 as the data is from a vapor sample. Data in tanks SY-102 and 103 denoted 5 invalidated due to post sample tank transfers. Data reported for tank SY-102 is also in question due to the density being too high for given concentrations.
- Note:** 7. Allowable concentration, vapor component in ppm by volume for vapors, ppm by weight (@STP) for non-volatiles.
- Note:** 8. Henry's constants for butanone not corrected for salt. Acetone and 2-ethyl-1-hexanol not corrected for salt or temperature.
- Note:** 11. As methylethyl ketone.
- Note:** 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note:** 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note:** 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile.
- Note:** 18. Radionuclides decayed to current year (rounded to nearest year).
- Note:** 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-101				
Sample Date	8/1/89		Contents:	Sludge/ SN				
Sample ID	RAT-T101-1		Watchlist:	FeCN				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	7.2E-03		Retr. Method	Pumping/Sluicing				
pH	13.00							
Density, g/ml	1.2							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.93E-09	9.37E-16	3.37E-14	7.23E-12	PF	6	2.27E-03	C1
Al	3.16E-01	6.14E-07	2.21E-05	4.74E-03	PF	5	9.06E+00	C1
Ba	2.58E-04	9.89E-11	3.56E-09	7.63E-07	PF	6	8.92E-02	C1
B	1.22E-02	5.82E-08	2.10E-06	4.49E-04	PF	5	2.22E+01	C1
C ₆ H ₅ O ₇ anion	1.51E+01	4.92E-06	1.77E-04	3.80E-02	PF	6		
Ca	6.81E-03	8.94E-09	3.22E-07	6.89E-05	PF	5	6.11E+00	C1 as CaCO ₃
Ce	8.34E-03	3.13E-09	1.13E-07	2.41E-05	PF	6		
Cl	1.08E+00	1.01E-07	3.64E-06	1.25E-02	PF	4		
CO ₃	3.97E+01	3.47E-05	1.25E-03	2.68E-01	PF	5		
Cr	1.53E+00	3.43E-07	1.23E-05	1.19E-02	PF	4	2.35E-01	C1, D
F	1.09E+00	1.77E-07	6.38E-06	2.32E-02	PF	4	3.22E+00	C1
Fe	6.75E-01	6.33E-07	2.28E-05	4.88E-03	PF	6	2.18E+00	C1
Fe (CN) ₆	2.38E-02	5.90E-09	2.12E-07	4.55E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.77E-03	6.76E-10	2.43E-08	5.21E-06	PF	6		
K	5.23E-01	7.04E-07	2.53E-05	5.43E-03	PF	5		
Mn	2.18E-02	2.09E-08	7.51E-07	1.61E-04	PF	6	2.22E+00	C2, D
Na	5.91E+01	1.35E-04	4.86E-03	1.04E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.87E-01	1.66E-07	5.98E-06	1.28E-03	PF	6	4.14E-02	C1, D
NO ₂	9.14E+00	8.02E-07	2.89E-05	8.04E-02	PF	6		
NO ₃	2.38E+02	1.55E-05	5.59E-04	1.56E+00	PF	6		
OH	1.69E+00	5.21E-06	1.88E-04	4.02E-02	PF	6	2.88E+00	C2 as NaOH
P	1.07E+00	1.81E-06	6.52E-05	1.40E-02	PF	5		
Pb	3.77E-06	9.57E-13	3.44E-11	7.38E-09	PF	6	5.91E-03	C1, A, D
PO ₄	4.48E+00	2.98E-06	1.07E-04	2.30E-02	PF	5		
Pu	9.35E-05	2.01E-11	7.24E-10	1.55E-07	PF	5		

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SiO ₃	1.51E+00	1.04E-06	3.75E-05	8.04E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.32E+01	8.01E-07	2.88E-05	5.57E-02	PF	4		
Sr	1.75E-06	1.04E-12	3.75E-11	8.04E-09	PF	6		
ZrO	1.17E-04	5.75E-11	2.07E-09	4.43E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.13E-01	3.11E-10	1.12E-08	2.40E-06	PF	5	2.0E-11	B ¹⁹
Am 243	1.77E-01	4.92E-10	1.77E-08	3.79E-06	PF	6	2.0E-11	B
C 14	1.40E+02	3.87E-07	1.39E-05	2.99E-03	PF	6	6.0E-06	B
Cm 242	1.99E-01	1.10E-12	3.97E-11	8.49E-09	PF	6	7.0E-10	B
Cm 244	8.05E-01	1.92E-09	6.91E-08	1.48E-05	PF	6	4.0E-11	B
Cs 137	9.36E+04	1.53E-05	5.49E-04	1.76E+00	PF	4	4.0E-07	B
I 129	1.99E-01	7.67E-08	2.76E-06	4.25E-06	PF	6	7.0E-08	B
Np 237	1.61E-01	4.47E-10	1.61E-08	3.45E-06	PF	6	1.2E-12	B
Pu 238	5.90E-02	1.59E-10	5.72E-09	1.23E-06	PF	6	2.1E-12	B
Pu 239/240	2.54E-01	7.05E-10	2.54E-08	5.44E-06	PF	5	2.0E-12	B
Pu 241	4.19E-04	9.63E-13	3.47E-11	7.43E-09	PF	6	1.0E-10	B
RuRh 106	5.90E-05	1.59E-16	5.74E-15	7.88E-11	PF	6	3.0E-08	B
Sa 79	3.97E+00	1.10E-08	3.97E-07	8.51E-05	PF	6	1.0E-06	B
Sr 89/90	5.04E+01	8.25E-10	2.97E-08	9.54E-04	PF	4	9.0E-09	B
Ta 99	1.07E+02	2.97E-07	1.07E-05	2.29E-03	PF	5	2.0E-06	B
U 238	1.02E-01	2.83E-10	1.02E-08	2.18E-06	PF	6	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Ta	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-102				
Sample Date	3/13/74		Contents:	Sludge/ SN				
Sample ID	T-2287		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	8.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.68							
Density, g/ml	1.24							
Temperature, °R	527							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.82E-10	7.76E-17	2.79E-15	5.28E-13	PF	6	2.27E-03	C1
Al	5.77E+00	9.85E-06	3.55E-04	6.70E-02	PF	5	9.06E+00	C1
Ba	9.08E-06	3.06E-12	1.10E-10	2.08E-08	PF	6	8.92E-02	C1
C ₆ H ₅ O ₇ anion	1.07E+00	3.02E-07	1.09E-05	2.06E-03	PF	6		
Ca	6.60E-09	7.61E-15	2.74E-13	5.18E-11	PF	6	6.11E+00	C1 as CaCO ₃
Ce	5.78E-04	1.90E-10	6.85E-09	1.29E-06	PF	6		
Cl	2.89E-10	2.38E-17	8.56E-16	2.59E-12	PF	6		
CO ₃	1.06E+01	8.15E-06	2.93E-04	5.54E-02	PF	5		
F	8.70E-01	1.24E-07	4.47E-06	1.44E-02	PF	5	3.22E+00	C1
Fe	4.62E-02	3.81E-08	1.37E-06	2.59E-04	PF	6	2.18E+00	C1
Fe (CN) ₆	1.07E-02	2.33E-09	8.40E-08	1.59E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	2.31E-04	3.64E-11	1.31E-09	2.47E-07	PF	6		
K	1.65E-01	1.95E-07	7.03E-06	1.33E-03	PF	6		
Mn	1.82E-03	1.52E-09	5.48E-08	1.04E-05	PF	6	2.22E+00	C2 , D
Na	9.47E+01	1.90E-04	6.83E-03	1.29E+00	PF	5	2.13E+00	C2 as NaOH
Ni	2.39E-02	1.87E-08	6.73E-07	1.27E-04	PF	6	4.14E-02	C1, D
NO ₂	3.32E+01	2.56E-06	9.21E-05	2.26E-01	PF	5		
NO ₃	1.35E+02	7.72E-06	2.78E-04	6.83E-01	PF	5		
OH	8.06E+00	2.19E-05	7.87E-04	1.49E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.24E-07	2.76E-14	9.93E-13	1.88E-10	PF	6	5.91E-03	C1, A, D
PO ₄	1.12E+00	6.54E-07	2.35E-05	4.45E-03	PF	5		
Pu	3.99E-06	7.54E-13	2.71E-11	5.13E-09	PF	5		
SiO ₃	1.24E-01	7.51E-08	2.70E-06	5.11E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	9.80E+00	5.23E-07	1.88E-05	3.20E-02	PF	5		
Sr	2.15E-07	1.12E-13	4.05E-12	7.65E-10	PF	6		

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Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
ZrO	2.48E-06	1.07E-12	3.84E-11	7.26E-09	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	1.65E+01	4.56E-08	1.64E-06	3.10E-04	PF	6	2.0E-11	B ¹⁹
Am 243	8.25E+03	2.29E-11	8.25E-10	1.56E-07	PF	6	2.0E-13	B
C 14	8.25E+00	2.29E-08	8.25E-07	1.56E-04	PF	6	6.0E-06	B
Cm 242	1.65E-02	9.16E-14	3.30E-12	6.23E-10	PF	6	7.0E-10	B
Cm 244	6.69E-02	1.60E-10	5.74E-09	1.09E-06	PF	6	4.0E-11	B
Cs 137	2.02E+05	2.24E-05	8.05E-04	2.28E+00	PF	5	4.0E-07	B
Cs 134	1.49E+04	5.51E-08	1.98E-06	3.75E-04	PF	5	4.0E-07	B
I 129	1.65E-02	6.37E-09	2.29E-07	3.12E-07	PF	6	7.0E-08	B
Np 237	8.25E-03	2.29E-11	8.25E-10	1.56E-07	PF	6	1.2E-12	B
Pu 238	4.24E-03	1.14E-11	4.11E-10	7.76E-08	PF	6	2.1E-12	B
Pu 239/240	2.45E-01	6.80E-10	2.45E-08	4.62E-06	PF	5	2.0E-12	B
Pu 241	1.90E-05	4.36E-14	1.57E-12	2.97E-10	PF	6	1.0E-10	B
RuRh 106	4.24E-06	1.14E-17	4.12E-16	4.99E-12	PF	6	3.0E-08	B
Se 79	3.35E-01	9.29E-10	3.35E-08	6.32E-06	PF	6	1.0E-06	B
Sr 89/90	3.35E+02	5.61E-09	2.02E-07	5.73E-03	PF	6	9.0E-09	B
Tc 99	8.25E+00	2.29E-08	8.25E-07	1.56E-04	PF	6	2.0E-06	B
U 238	4.24E-02	1.18E-10	4.24E-09	8.01E-07	PF	6	1.0E-10	B
water		2.14E+04	2.14E+04	2.14E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-103				
Sample Date	3/13/74		Contents:	Sludge/ SN				
Sample ID	T-2288		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	8.2E-03		Retr. Method	Pumping/Sluicing				
pH	13.66							
Density, g/ml	1.25							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	9.49E-10	3.97E-16	1.43E-14	2.70E-12	PF	6	2.27E-03	C1
Al	4.45E+00	7.45E-06	2.68E-04	5.06E-02	PF	5	9.06E+00	C1
Ba	2.74E-04	9.03E-11	3.25E-09	6.14E-07	PF	6	8.92E-02	C1
C ₆ H ₅ O ₇ anion	7.43E+00	2.02E-06	7.29E-05	1.38E-02	PF	6		
Ca	3.91E-08	4.42E-14	1.59E-12	3.00E-10	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.37E-05	4.42E-12	1.59E-10	3.00E-08	PF	6		
Cl	1.08E-10	8.68E-18	3.13E-16	9.44E-13	PF	6		
CO ₃	1.48E+01	1.11E-05	4.01E-04	7.57E-02	PF	5		
F	8.66E-01	1.21E-07	4.36E-06	1.40E-02	PF	5	3.22E+00	C1
Fe	3.33E-01	2.68E-07	9.66E-06	1.82E-03	PF	6	2.18E+00	C1
Fe (CN) ₆	1.27E-04	2.71E-11	9.76E-10	1.84E-07	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.86E-03	2.87E-10	1.03E-08	1.95E-06	PF	6		
K	3.03E-02	3.51E-08	1.26E-06	2.39E-04	PF	6		
Mn	1.08E-02	8.84E-09	3.18E-07	6.01E-05	PF	6	2.22E+00	C2, D
Na	9.03E+01	1.77E-04	6.39E-03	1.21E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.76E-01	1.35E-07	4.85E-06	9.16E-04	PF	6	4.14E-02	C1, D
NO ₂	5.02E+01	3.79E-06	1.36E-04	3.35E-01	PF	5		
NO ₃	8.12E+01	4.55E-06	1.64E-04	4.02E-01	PF	5		
OH	7.81E+00	2.08E-05	7.47E-04	1.41E-01	PF	5	2.88E+00	C2 as NaOH
Pb	8.12E-07	1.77E-13	6.38E-12	1.20E-09	PF	6	5.91E-03	C1, A, D
PO ₄	1.49E+00	8.52E-07	3.07E-05	5.79E-03	PF	5		
Pu	1.07E-05	1.98E-12	7.13E-11	1.35E-08	PF	5		
SiO ₃	6.65E-01	3.95E-07	1.42E-05	2.69E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.82E+01	9.51E-07	3.42E-05	5.82E-02	PF	5		
Sr	8.61E-07	4.42E-13	1.59E-11	3.00E-09	PF	6		

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
ZrO	2.05E-03	8.67E-10	3.12E-08	5.90E-06	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	8.73E+01	2.41E-07	8.67E-06	1.64E-03	PF	6	2.0E-11	B ¹⁹
Am 243	7.93E+02	2.20E-10	7.93E-09	1.50E-06	PF	6	2.0E-11	B
C 14	6.87E+01	1.91E-07	6.87E-06	1.30E-03	PF	6	6.0E-06	B
Cm 242	9.78E-02	5.43E-13	1.95E-11	3.69E-09	PF	6	7.0E-10	B
Cm 244	3.97E+01	9.45E-10	3.40E-08	6.42E-06	PF	6	4.0E-11	B
Cs 137	2.23E+05	2.47E-05	8.89E-04	2.52E+00	PF	5	4.0E-07	B
Cs 134	1.94E+03	7.16E-09	2.58E-07	4.87E-05	PF	5	4.0E-07	B
T 129	9.78E-02	3.78E-08	1.36E-06	1.85E-06	PF	6	7.0E-08	B
Np 237	5.82E-02	1.62E-10	5.82E-09	1.10E-06	PF	6	1.2E-12	B
Pu 238	7.93E-01	2.13E-09	7.69E-08	1.45E-05	PF	6	2.1E-12	B
Pu 239/240	6.57E-01	1.82E-09	6.56E-08	1.24E-05	PF	5	2.0E-12	B
Pu 241	7.93E-01	1.82E-09	6.57E-08	1.24E-05	PF	6	1.0E-10	B
RuRh 106	2.91E-05	7.86E-17	2.83E-15	3.42E-11	PF	6	3.0E-08	B
Se 79	1.96E+00	5.43E-09	1.96E-07	3.69E-05	PF	6	1.0E-06	B
Sr 89/90	1.96E+05	3.28E-06	1.18E-04	3.34E+00	PF	6	9.0E-09	B
Tc 99	6.87E+01	1.91E-07	6.87E-06	1.30E-03	PF	6	2.0E-06	B
U 238	1.96E+01	5.43E-10	1.96E-08	3.69E-06	PF	6	1.0E-10	B
water		1.73E+04	1.73E+04	1.73E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	SL		Tank:	241-T-104				
Sample Date	9/18/80		Contents:	Sludge/ SN				
Sample ID	RAT-T104-2		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	9.3E-03		Retr. Method	Pumping/Sluicing				
pH	13.77							
Density, g/ml	1.31							
Temperature, °R	524							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	3.50E+01	1.82E-05	6.56E-04	1.07E-01	PF	5	2.27E-03	C1
Al	3.80E+01	7.91E-05	2.85E-03	4.63E-01	PF	5	9.06E+00	C1
Ba	2.67E-05	1.10E-11	3.94E-10	6.41E-08	PF	6	8.92E-02	C1
Bi	3.57E+01	9.60E-06	3.46E-04	5.62E-02	PF	5		
Ce	3.32E-02	1.33E-08	4.80E-07	7.81E-05	PF	6		
Cd	7.21E-02	3.62E-08	1.30E-06	2.12E-04	PF	5	5.46E-04	C1, C2, D
Cl	1.30E+00	1.30E-07	4.70E-06	1.22E-02	PF	5		
CO ₃	1.57E+00	1.47E-06	5.29E-05	8.60E-03	PF	5		
Cr	1.63E+00	3.91E-07	1.41E-05	1.03E-02	PF	5	2.35E-01	C1, D
F	2.09E+01	3.63E-06	1.31E-04	3.62E-01	PF	5	3.22E+00	C1
Fe	2.40E+00	2.41E-06	8.67E-05	1.41E-02	PF	5	2.18E+00	C1
Mn	1.65E-01	1.69E-07	6.07E-06	9.86E-04	PF	5	2.22E+00	C2, D
Na	5.65E+01	1.38E-04	4.97E-03	8.08E-01	PF	5	2.13E+00	C2 as NaOH
Ni	3.92E+01	3.73E-05	1.34E-03	2.18E-01	PF	5	4.14E-02	C1, D
NO ₂	8.31E+00	7.81E-07	2.81E-05	5.94E-02	PF	6		
NO ₃	8.97E+01	6.25E-06	2.25E-04	4.76E-01	PF	5		
OH	1.01E+01	3.34E-05	1.20E-03	1.95E-01	PF	6	2.88E+00	C2 as NaOH
Pb	6.67E-03	1.81E-09	6.52E-08	1.06E-05	PF	5	5.91E-03	C1, A, D
PO ₄	1.02E+02	7.26E-05	2.61E-03	4.25E-01	PF	5		
Pu	5.27E-03	1.21E-09	4.37E-08	7.10E-06	PF	5		
Si	9.80E+00	1.97E-05	7.08E-04	1.15E-01	PF	5	8.73E+00	C1
SiO ₃	2.73E+00	2.02E-06	7.27E-05	1.18E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.61E+02	1.70E-05	6.10E-04	8.94E-01	PF	5		
TOC gC/l ¹⁷	1.34E+02	6.27E-04	2.26E-02	3.67E+00	PF	5		
U, g/l	9.67E-02	2.28E-08	8.22E-07	1.34E-04	PF	5	5.14E-03	C1
ZrO	3.21E+00	1.68E-06	6.06E-05	9.85E-03	PF	6	1.14E+00	C1 as Zr

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 ¹⁸	3.54E-04	9.62E-13	3.46E-11	5.63E-09	PF	5	2.0E-11	B ¹⁹
Am 243	1.19E-03	3.30E-12	1.19E-10	1.93E-08	PF	6	2.0E-11	B
C 14	1.19E-01	3.30E-10	1.19E-08	1.93E-06	PF	6	6.0E-06	B
Cm 242	2.41E-04	1.33E-15	4.81E-14	7.81E-12	PF	6	7.0E-10	B
Cm 244	5.94E-04	1.41E-12	5.09E-11	8.28E-09	PF	6	4.0E-11	B
Cs 137	1.69E+03	2.18E-07	7.86E-06	1.92E-02	PF	5	4.0E-07	B
I 129	3.05E-03	1.18E-09	4.24E-08	4.95E-08	PF	6	7.0E-08	B
Np 237	6.10E-03	1.69E-11	6.10E-10	9.91E-08	PF	6	1.2E-12	B
Pu 238	1.19E+00	3.19E-09	1.15E-07	1.87E-05	PF	6	2.1E-12	B
Pu 239/240	3.24E+02	9.01E-07	3.24E-05	5.27E-03	PF	5	2.0E-12	B
Pu 241	5.94E+01	1.37E-07	4.92E-06	7.99E-04	PF	6	1.0E-10	B
RuRh 106	1.76E-06	4.77E-18	1.72E-16	1.79E-12	PF	6	3.0E-08	B
Se 79	5.29E-02	1.47E-10	5.29E-09	8.60E-07	PF	6	1.0E-06	B
Sr 89/90	6.54E+03	8.56E-08	3.08E-06	7.51E-02	PF	5	9.0E-09	B
Tc 99	1.76E+00	4.90E-09	1.76E-07	2.87E-05	PF	6	2.0E-06	B
U 238	6.84E-02	1.90E-10	6.84E-09	1.11E-06	PF	5	1.0E-10	B
water		1.83E+04	1.83E+04	1.83E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-105				
Sample Date	3/15/65		Contents:	Sludge				
Sample ID	RAT-T105-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.3E-02		Retr. Method	Pumping/Sluicing				
pH	13.89							
Density, g/ml	1.64							
Temperature, °R	535							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.88E+00	6.46E-06	2.33E-04	2.48E-02	PF	5	9.06E+00	C1
Ba	9.97E-05	3.27E-11	1.18E-09	1.26E-07	PF	6	8.92E-02	C1
Bi	1.13E+00	2.44E-07	8.77E-06	9.35E-04	PF	6		
Cl	1.39E+00	1.12E-07	4.02E-06	6.85E-03	PF	5		
CO ₃	2.62E+01	1.96E-05	7.07E-04	7.54E-02	PF	5		
Cr	9.70E-01	1.86E-07	6.71E-06	3.22E-03	PF	6	2.35E-01	C1, D
F	7.60E-02	1.06E-08	3.81E-07	6.90E-04	PF	5	3.22E+00	C1
Fe	1.51E+01	1.21E-05	4.37E-04	4.65E-02	PF	6	2.18E+00	C1
Na	7.59E+01	1.49E-04	5.35E-03	5.70E-01	PF	5	2.13E+00	C2 as NaOH
NO ₂	3.77E-16	2.84E-23	1.02E-21	1.42E-18	PF	6		
NO ₃	9.75E+01	5.44E-06	1.96E-04	2.71E-01	PF	5		
OH	1.33E+01	3.51E-05	1.26E-03	1.35E-01	PF	5	2.88E+00	C2 as NaOH
Pb	4.04E-13	8.79E-20	3.16E-18	3.37E-16	PF	6	5.91E-03	C1, A, D
PO ₄	5.12E+02	2.92E-04	1.05E-02	1.12E+00	PF	6		
SO ₄	2.59E-04	1.35E-11	4.85E-10	4.65E-07	PF	6		
ZrO	1.46E+00	6.12E-07	2.20E-05	2.35E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.39E+01	1.49E-07	5.36E-06	5.71E-04	PF	6	2.0E-11	B ¹⁹
Am 243	5.39E-03	1.50E-11	5.39E-10	5.74E-08	PF	6	2.0E-11	B
Cm 242	1.89E-02	1.05E-11	3.78E-12	4.03E-10	PF	6	7.0E-10	B
Cs 137	7.10E+03	6.24E-07	2.25E-05	3.59E-02	PF	5	4.0E-07	B
Np 237	5.39E-04	1.50E-12	5.39E-11	5.74E-09	PF	6	1.2E-12	B
Pu 238	5.39E+01	1.45E-07	5.22E-06	5.57E-04	PF	6	2.1E-12	B
Pu 239/240	6.19E+02	1.72E-06	6.19E-05	6.60E-03	PF	6	2.0E-12	B
Pu 241	5.39E+02	1.24E-06	4.46E-05	4.76E-03	PF	6	1.0E-10	B
RuRh 106	1.09E-05	2.95E-17	1.06E-15	7.26E-12	PF	6	3.0E-08	B
Sr 89/90	1.38E+04	2.32E-07	8.36E-06	1.34E-01	PF	6	9.0E-09	B
Tc 99	8.01E-16	2.23E-24	8.01E-23	8.54E-21	PF	6	2.0E-06	B

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
U-238	5.39E+00	1.50E-08	5.39E-07	5.74E-05	PF	6	1.0E-10	B
water		3.06E+04	3.06E+04	3.06E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	SL		Tank:	241-T-106				
Sample Date	2/27/75		Contents:	Sludge/ SN				
Sample ID	RAT-T106-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	9.6E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.29							
Temperature, °R	525							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.77E-11	1.38E-17	4.98E-16	7.84E-14	PF	6	2.27E-03	C1
Al	1.65E+02	3.30E-04	1.19E-02	1.87E+00	PF	5	9.06E+00	C1
Ba	1.89E-03	7.43E-10	2.67E-08	4.21E-06	PF	6	8.92E-02	C1
Bi	7.92E-01	2.04E-07	7.36E-06	1.16E-03	PF	6		
Ca	6.41E+00	8.64E-06	3.11E-04	4.90E-02	PF	5	6.11E+00	C1 as CaCO ₃
Ce	3.52E-03	1.36E-09	4.88E-08	7.69E-06	PF	6		
Cr	4.53E-01	1.04E-07	3.75E-06	2.66E-03	PF	6	2.35E-01	C1, D
F	2.14E+02	3.57E-05	1.28E-03	3.44E+00	PF	6	3.22E+00	C1
Fe	3.13E+01	3.01E-05	1.09E-03	1.71E-01	PF	5	2.18E+00	C1
Mg	2.19E+00	4.92E-06	1.77E-04	2.79E-02	PF	5	1.02E+01	C1
Mn	1.54E+01	1.51E-05	5.44E-04	8.56E-02	PF	5	2.22E+00	C2, D
Na	1.34E+02	3.14E-04	1.13E-02	1.78E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	2.76E+00	2.49E-07	8.96E-06	1.83E-02	PF	5		
NO ₃	1.51E+02	1.01E-05	3.64E-04	7.44E-01	PF	5		
OH	2.14E+01	6.78E-05	2.44E-03	3.84E-01	PF	6	2.88E+00	C2 as NaOH
Pb	2.77E-13	7.21E-20	2.60E-18	4.08E-16	PF	6	5.91E-03	C1, A, D
PO ₄	8.93E+01	6.10E-05	2.19E-03	3.45E-01	PF	5		
Pu	7.11E-03	1.57E-09	5.66E-08	8.90E-06	PF	5		
Si	5.08E+01	9.79E-05	3.52E-03	5.54E-01	PF	5	8.73E+00	C1
SiO ₃	7.67E-01	5.45E-07	1.96E-05	3.08E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.91E-01	3.06E-08	1.10E-06	1.56E-03	PF	6		
ZrO	8.05E-01	4.06E-07	1.46E-05	2.30E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.74E+01	1.03E-07	3.72E-06	5.85E-04	PF	6	2.0E-11	B ¹⁹
Am 243	2.52E+03	6.98E-12	2.51E-10	3.96E+08	PF	6	2.0E-11	B
C-14	1.26E+00	3.49E-09	1.26E-07	1.98E-05	PF	6	6.0E-06	B
Cm 242	8.84E-03	4.90E-14	1.76E-12	2.78E-10	PF	6	7.0E-10	B

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 244	7.48E-04	1.78E-12	6.42E-11	1.01E-08	PF	6	4.0E-14	B
Cs 137	5.27E+05	5.99E-05	2.16E-03	5.09E+00	PF	5	4.0E-07	B
CePr 144	4.74E+05	5.36E-11	1.93E-09	3.04E-07	PF	5	3.0E-08	B
I 129	3.74E-03	1.44E-09	5.20E-08	5.88E-08	PF	6	7.0E-08	B
Np 237	7.82E-03	2.17E-11	7.82E-10	1.23E-07	PF	6	1.2E-12	B
Pu 238	3.74E+01	1.01E-07	3.62E-05	5.70E-04	PF	6	2.1E-12	B
Pu 239/240	4.35E+02	1.21E-06	4.35E-05	6.84E-03	PF	5	2.0E-12	B
Pu 241	2.52E+02	5.79E-07	2.08E-05	3.28E-03	PF	6	1.0E-10	B
RuRh 106	4.08E-07	1.10E-18	3.97E-17	4.00E-13	PF	6	3.0E-08	B
Se 79	6.46E-02	1.79E-10	6.46E-09	1.02E-06	PF	6	1.0E-06	B
St 89/90	6.33E+05	7.32E-06	2.64E-04	6.22E+00	PF	5	9.0E-09	B
Sb 125	5.48E+04	1.15E-06	4.15E-05	6.53E-03	PF	5	1.0E-06	B
Tc 99	2.52E+00	6.99E-09	2.52E-07	3.96E-05	PF	6	2.0E-06	B
U 238	1.26E+01	3.49E-08	1.26E-06	1.98E-04	PF	6	1.0E-10	B
Water		1.93E+04	1.93E+04	1.93E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	SN	Tank:	241-T-107			
Sample Date	8/1/89	Contents:	Sludge/ SN			
Sample ID	RAT-T107-1	Watchlist:	FeCN			
Properties	Value	Status:	PI			
Visc., lbm/ft-s ¹	7.1E-03	Retr. Method	Pumping/Sluicing			
pH	12.40					
Density, g/ml	1.2					
Temperature, °R	531					
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Method	Data Rel ⁶	Allowable ⁷
Al	2.75E-02	5.01E-08	1.80E-06	3.88E-04	PF	5
Ba	1.61E-04	5.79E-11	2.09E-09	4.49E-07	PF	6
B	1.37E-02	6.12E-08	2.20E-06	4.75E-04	PF	5
Bi	2.20E+01	5.18E-06	1.86E-04	4.01E-02	PF	6
Cl	1.25E+00	1.10E-07	3.95E-06	1.36E-02	PF	4
CO3	2.24E+01	1.84E-05	6.61E-04	1.42E-01	PF	5
Cr	2.12E-01	4.45E-08	1.60E-06	1.55E-03	PF	4
F	9.33E-01	1.42E-07	5.11E-06	1.87E-02	PF	4
Fe	4.60E-02	4.04E-08	1.45E-06	3.13E-04	PF	5
K	2.67E-01	3.37E-07	1.21E-05	2.61E-03	PF	5
Na	5.40E+01	1.15E-04	4.16E-03	8.95E-01	PF	5
NO2	2.68E+01	2.20E-06	7.93E-05	2.22E-01	PF	4
NO3	1.36E+02	8.29E-06	2.99E-04	8.36E-01	PF	4
OH	4.23E-01	1.22E-06	4.40E-05	9.49E-03	PF	5
P	1.39E+00	2.20E-06	7.94E-05	1.71E-02	PF	5
Pb	3.08E-14	7.32E-21	2.63E-19	5.68E-17	PF	6
PO4	5.85E+00	3.64E-06	1.31E-04	2.82E-02	PF	5
Pu	9.79E-06	1.97E-12	7.10E-11	1.53E-08	PF	6
SO4	1.63E+01	9.27E-07	3.34E-05	6.47E-02	PF	4
TOC gC/l ¹⁷						
	8.64E-01	3.54E-06	1.27E-04	2.74E-02	PF	5
ZrO	3.08E+00	1.42E-06	5.10E-05	1.10E-02	PF	6
Am 241 ¹⁸	1.99E-02	5.48E-11	1.97E-09	4.25E-07	PF	5
Am 243	7.54E-05	2.09E-13	7.53E-12	1.62E-09	PF	5
C 14	4.36E-03	1.21E-11	4.36E-10	9.39E-08	PF	6
Cm 242	2.93E-05	1.63E-16	5.86E-15	1.26E-12	PF	6
Ch 137	2.23E-04	3.63E-06	1.51E-04	4.22E-01	PF	4

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Np 237	2.93E-05	8.15E-14	2.93E-12	6.32E-10	PF	6	1.2E-12	B
Pb 238	1.31E-01	3.52E-10	1.27E-08	2.73E-06	PF	6	2.1E-12	B
Pb 239/240	1.20E+01	3.33E-08	1.20E-06	2.58E-04	PF	5	2.0E-12	B
Pb 241	7.54E+00	1.73E-08	6.24E-07	1.34E-04	PF	6	1.0E-10	B
RuRh 106	1.47E-08	3.96E-20	1.43E-18	1.97E-14	PF	6	3.0E-08	B
Sr 89/90	3.31E+02	5.42E-09	1.95E-07	6.30E-03	PF	4	9.0E-09	B
Tc 99	2.93E-16	8.15E-25	2.93E-23	6.32E-21	PF	6	2.0E-06	B
U 238	4.36E-01	1.21E-09	4.36E-08	9.40E-06	PF	6	1.0E-10	B
water		2.59E+04	2.59E+04	2.59E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-108				
Sample Date	5/13/74		Contents:	Sludge				
Sample ID	T-3391		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	9.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.97							
Density, g/ml	1.18							
Temperature, °R	523							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.58E-11	1.15E-17	4.15E-16	6.92E-14	PF	6	2.27E-03	C1
Al	6.58E-01	1.18E-06	4.23E-05	7.05E-03	PF	5	9.06E+00	C1
Ba	6.60E-04	2.33E-10	8.37E-09	1.39E-06	PF	6	8.92E-02	C1
Bi	9.00E+00	2.08E-06	7.48E-05	1.25E-02	PF	6		
Ce	4.20E-04	1.45E-10	5.21E-09	8.69E-07	PF	6		
Cl	8.40E-10	7.24E-17	2.61E-15	6.95E-12	PF	6		
CO ₃	4.73E+01	3.80E-05	1.37E-03	2.28E-01	PF	5		
Cr	3.12E-01	6.43E-08	2.31E-06	1.74E-03	PF	6	2.35E-01	C1, D
F	7.66E-01	1.14E-07	4.12E-06	1.17E-02	PF	5	3.22E+00	C1
Fe	6.60E+00	5.69E-06	2.05E-04	3.41E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	2.40E-02	5.46E-09	1.97E-07	3.28E-05	PF	6	5.77E-01	C1 as CN, D ¹³
K	7.20E-02	8.91E-08	3.21E-06	5.34E-04	PF	6		
Na	7.20E+01	1.51E-04	5.44E-03	9.06E-01	PF	5	2.13E+00	C2 as NaOH
Ni	2.10E-06	1.72E-12	6.18E-11	1.03E-08	PF	6	4.14E-02	C1, D
NO ₂	4.88E+01	3.94E-06	1.42E-04	3.07E-01	PF	5		
NO ₃	4.98E+01	2.98E-06	1.07E-04	2.32E-01	PF	5		
OH	1.57E+01	4.46E-05	1.60E-03	2.67E-01	PF	5	2.88E+00	C2 as NaOH
Pb	9.00E-14	2.10E-20	7.55E-19	1.26E-16	PF	6	5.91E-03	C1, A, D
PO ₄	3.87E+00	2.36E-06	8.51E-05	1.42E-02	PF	5		
Pu	1.06E-04	2.10E-11	7.54E-10	1.26E-07	PF	5		
SiO ₃	3.18E-02	2.02E-08	7.27E-07	1.21E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.43E+01	7.98E-07	2.87E-05	4.31E-02	PF	5		
ZrO	1.26E+00	5.68E-07	2.05E-05	3.41E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.20E+00	3.31E-09	1.19E-07	1.99E-05	PF	6	2.0E-11	B ¹⁹
Am 243	3.08E+05	8.56E-14	3.08E-12	5.13E-10	PF	6	2.0E-11	B

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Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C-14	6.00E-01	1.67E-09	6.00E-08	1.00E-05	PF	6	6.0E-06	B
Cm 242	1.22E-05	6.75E-17	2.43E-15	4.05E-13	PF	6	7.0E-10	B
Cm 244	6.00E-04	1.43E-12	5.15E-11	8.58E-09	PF	6	4.0E-11	B
Ce-137	1.58E+05	1.75E-05	6.31E-04	1.58E+00	PF	5	4.0E-07	B
Ce-134	1.98E+03	7.31E-09	2.63E-07	4.38E-05	PF	5	4.0E-07	B
Eu-154	7.68E+02	3.48E-07	1.42E-05	2.36E-03	PF	5	5.0E-08	B
Eu-155	7.68E+02	1.16E-07	4.17E-06	6.95E-04	PF	5	3.0E-07	B
I 129	3.08E-03	1.19E-09	4.28E-08	5.14E-08	PF	6	7.0E-08	B
Np 237	1.20E-02	3.33E-11	1.20E-09	2.00E-07	PF	6	1.2E-12	B
Pu 238	4.87E-02	1.31E-10	4.72E-09	7.86E-07	PF	6	2.1E-12	B
Pu 239/240	6.51E+00	1.81E-08	6.51E-07	1.08E-04	PF	5	2.0E-12	B
Pu 241	3.08E+00	7.09E-09	2.55E-07	4.25E-05	PF	6	1.0E-10	B
RuRh 106	2.97E+05	1.21E-11	4.37E-10	4.66E-06	PF	5	3.0E-08	B
Se 79	5.35E-02	1.49E-10	5.35E-09	8.92E-07	PF	6	1.0E-06	B
Sr 89/90	1.78E+04	2.99E-07	1.08E-05	2.69E-01	PF	6	9.0E-09	B
Tc 99	1.78E+00	4.96E-09	1.78E-07	2.97E-05	PF	6	2.0E-06	B
U 238	6.49E-01	1.40E-09	6.49E-08	1.08E-05	PF	6	1.0E-10	B
water		1.73E+04	1.73E+04	1.73E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-109				
Sample Date	3/13/74		Contents:	Sludge				
Sample ID	T-2289		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.58							
Density, g/ml	1.2							
Temperature, °R	537							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.00E-10	4.35E-17	1.57E-15	3.32E-13	PF	6	2.27E-03	C1
Al	8.47E-01	1.47E-06	5.29E-05	1.12E-02	PF	5	9.06E+00	C1
Ba	3.55E-04	1.22E-10	4.37E-09	9.28E-07	PF	6	8.92E-02	C1
Bi	7.74E-01	1.74E-07	6.25E-06	1.33E-03	PF	6		
Ce	1.28E-02	4.27E-09	1.54E-07	3.26E-05	PF	6		
Cl	1.59E-08	1.33E-15	4.80E-14	1.63E-10	PF	6		
CO ₃	3.25E+01	2.54E-05	9.14E-04	1.94E-01	PF	5		
Cr	2.37E-02	4.74E-09	1.71E-07	1.63E-04	PF	6	2.35E-01	C1, D
F	9.29E-01	1.35E-07	4.85E-06	1.75E-02	PF	5	3.22E+00	C1
Fe	5.01E-01	4.19E-07	1.51E-05	3.20E-03	PF	6	2.18E+00	C1
Fe (CN) ₆	1.82E-03	4.03E-10	1.45E-08	3.07E-06	PF	6	5.77E-01	C1 as CN, D ¹³
K	5.46E-03	6.57E-09	2.36E-07	5.01E-05	PF	6		
Na	8.60E+01	1.75E-04	6.31E-03	1.34E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.59E-07	1.27E-13	4.56E-12	9.67E-10	PF	6	4.14E-02	C1, D
NO ₂	4.69E+01	3.67E-06	1.32E-04	3.65E-01	PF	5		
NO ₃	6.06E+01	3.52E-06	1.27E-04	3.50E-01	PF	5		
OH	6.53E+00	1.80E-05	6.48E-04	1.37E-01	PF	5	2.88E+00	C2 as NaOH
Pb	4.05E-13	9.18E-20	3.30E-18	7.01E-16	PF	6	5.91E-03	C1, A, D
PO ₄	5.93E+00	3.52E-06	1.27E-04	2.69E-02	PF	5		
Pu	4.70E-05	9.03E-12	3.25E-10	6.89E-08	PF	5		
SiO ₃	1.37E+00	8.42E-07	3.03E-05	6.43E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.58E+01	8.56E-07	3.08E-05	5.89E-02	PF	5		
ZrO	1.46E-01	6.38E-08	2.30E-06	4.87E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	9.23E-02	2.55E-10	9.17E-09	1.95E-06	PF	6	2.0E-11	H ¹⁹
Am 243	2.83E-06	7.86E-15	2.83E-13	6.00E-11	PF	6	2.0E-11	H

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C-14	4.55E-01	1.26E-09	4.55E-08	9.65E-06	PF	6	6.0E-06	B
Cm 242	9.60E-07	5.33E-18	1.92E-16	4.07E-14	PF	6	7.0E-10	B
Cm 244	9.11E-05	2.17E-13	7.82E-12	1.66E-09	PF	6	4.0E-11	B
Cs 137	1.59E+05	1.76E-05	6.34E-04	2.02E+00	PF	5	4.0E-07	B
Co 60	2.81E+02	5.62E-08	2.02E-06	4.29E-04	PF	5	8.0E-08	B
Cs 134	2.21E+03	8.16E-09	2.94E-07	6.23E-05	PF	5	4.0E-07	B
I 129	1.35E-02	5.23E-09	1.88E-07	2.87E-07	PF	6	7.0E-08	B
Np 237	3.20E-02	8.89E-11	3.20E-09	6.79E-07	PF	6	1.2E-12	B
Pu 238	9.11E-03	2.45E-11	8.82E-10	1.87E-07	PF	6	2.1E-12	B
Pu 239/240	2.88E+00	8.01E-09	2.88E-07	6.11E-05	PF	5	2.0E-12	B
Pu 241	2.71E-01	6.23E-10	2.24E-08	4.76E-06	PF	6	1.0E-10	B
RuRh 106	2.92E+05	1.19E-11	4.29E-10	5.83E-06	PF	5	3.0E-08	B
Se 79	2.34E-01	6.50E-10	2.34E-08	4.96E-06	PF	6	1.0E-06	B
Sr 89/90	3.20E+02	5.37E-09	1.93E-07	6.15E-03	PF	6	9.0E-09	B
Tc 99	9.11E+00	2.53E-08	9.11E-07	1.93E-04	PF	6	2.0E-06	B
U 238	1.85E-01	5.13E-10	1.85E-08	2.92E-06	PF	6	1.0E-10	B
water		3.31E+04	3.31E+04	3.31E+04	Stm Ta	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-110				
Sample Date	1/20/75		Contents:	Sludge/ SN				
Sample ID	T-5313		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	8.1E-03		Retr. Method	Pumping/Sluicing				
pH	13.84							
Density, g/ml	1.08							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.93E-02	3.59E-08	1.29E-06	2.44E-04	PF	5	9.06E+00	C1
Ba	5.23E-08	1.92E-14	6.90E-13	1.30E-10	PF	6	8.92E-02	C1
Bi	1.46E+00	3.52E-07	1.27E-05	2.39E-03	PF	6		
CO ₃	1.32E+00	1.11E-06	3.98E-05	7.52E-03	PF	5		
Cr	6.97E-01	1.49E-07	5.38E-06	4.58E-03	PF	6	2.35E-01	C1, D
F	6.02E+00	9.36E-07	3.37E-05	1.08E-01	PF	5	3.22E+00	C1
Fe	1.53E+01	1.38E-05	4.95E-04	9.36E-02	PF	6	2.18E+00	C1
Na	4.30E+01	9.39E-05	3.38E-03	6.39E-01	PF	5	2.13E+00	C2 as NaOH
NO ₂	2.95E-01	2.48E-08	8.92E-07	2.19E-03	PF	5		
NO ₃	5.63E+01	3.51E-06	1.26E-04	3.11E-01	PF	5		
OH	1.18E+01	3.50E-05	1.26E-03	2.38E-01	PF	6	2.88E+00	C2 as NaOH
Pb	1.46E-14	3.55E-21	1.28E-19	2.42E-17	PF	6	5.91E-03	C1, A, D
PO ₄	2.65E+01	1.69E-05	6.07E-04	1.15E-01	PF	5		
Pu	3.28E-06	6.75E-13	2.43E-11	4.60E-09	PF	5		
SiO ₃	1.05E-09	6.91E-16	2.49E-14	4.70E-12	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.95E+00	1.13E-07	4.08E-06	6.95E-03	PF	5		
ZrO	3.76E-05	1.77E-11	6.36E-10	1.20E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.65E+00	1.56E-08	5.61E-07	1.06E-04	PF	6	2.0E-11	B ¹⁹
Am 243	1.39E-05	3.87E-14	1.39E-12	2.64E-10	PF	6	2.0E-11	B
C 14	1.39E-12	3.87E-21	1.39E-19	2.63E-17	PF	6	6.0E-06	B
Cm 242	4.90E-06	2.72E-17	9.78E-16	1.85E-13	PF	6	7.0E-10	B
Cm 244	4.14E-16	9.88E-25	3.56E-23	6.72E-21	PF	6	4.0E-11	B
Cs 137	3.24E+01	3.69E-09	1.33E-07	3.76E-04	PF	5	4.0E-07	B
I 129	5.65E-14	2.18E-20	7.85E-19	1.07E-18	PF	6	7.0E-08	B
Np 237	4.90E-05	1.36E-13	4.90E-12	9.26E-10	PF	6	1.2E-12	B
Pu 238	2.83E-01	7.60E-10	2.74E-08	5.18E-06	PF	6	2.1E-12	B

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Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 239/240	7.78E-01	2.16E-09	7.78E-08	1.47E-05	PF	5	2.0E-12	B
Pu 241	2.83E+01	6.50E-08	2.34E-06	4.42E-04	PF	6	1.0E-10	B
RuRh 106	1.39E-08	3.77E-20	1.36E-18	1.64E-14	PF	6	3.0E-08	B
Se 79	2.07E-12	5.76E-21	2.07E-19	3.92E-17	PF	6	1.0E-06	B
Sr 89/90	2.83E+03	4.74E-08	1.71E-06	4.84E-02	PF	6	9.0E-09	B
Tc 99	6.97E-11	1.94E-19	6.97E-18	1.32E-15	PF	6	2.0E-06	B
U 238	1.39E-01	3.87E-10	1.19E-08	2.64E-06	PF	6	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank	241-T-111				
Sample Date	3/15/65		Contents	Sludge/SN				
Sample ID			Watchlist	N/A				
Properties	Value		Status	PI				
Visc., lbm/ft-s ¹	2.7E-03		Retr. Method	Pumping/Sluicing				
pH	11.15							
Density, g/ml	1.235							
Temperature, °R	524							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.58E-01	6.68E-08	2.40E-06	1.51E-03	PF	6	2.27E-03	C1
Al	7.08E-01	1.20E-06	4.31E-05	2.71E-02	PF	5	9.06E+00	C1
As	1.85E-02	1.13E-08	4.06E-07	2.55E-04	PF	5	6.52E-02	C1
Ba	7.98E-02	2.66E-08	9.57E-07	6.03E-04	PF	5	8.92E-02	C1
Be	6.18E-04	3.13E-09	1.13E-07	7.10E-05	PF	5	1.36E-03	B (10g/24 hr), C1
B	4.84E-03	2.01E-08	7.22E-07	4.55E-04	PF	5	2.22E+01	C1
Bi	2.91E+01	6.35E-06	2.28E-04	1.44E-01	PF	6		
Ca	2.94E+00	3.35E-06	1.21E-04	7.59E-02	PF	5	6.11E+00	C1 as CaCO ₃
Ce	6.23E-02	2.03E-08	7.31E-07	4.60E-04	PF	5		
Cd	1.00E-02	4.09E-09	1.47E-07	9.28E-05	PF	5	5.46E-04	C1, C2, D
Cl	5.56E-01	4.53E-08	1.63E-06	1.64E-02	PF	4		
Co	1.38E-02	1.07E-08	3.85E-07	2.42E-04	PF	5	2.07E-02	C1, D
Cr	2.22E+00	4.33E-07	1.56E-05	4.42E-02	PF	6	2.35E-01	C1, D
Cu	3.62E-02	2.58E-08	9.28E-07	5.85E-04	PF	5	3.82E-01	C1
Decane	1.12E-02	1.10E+02	1.10E+02	1.10E+02	CVD	3	3.00E+02	
Dodecane	1.73E-01	8.73E+00	8.73E+00	8.73E+00	CVD	3		
F	2.85E+00	4.02E-07	1.45E-05	1.55E-01	PF	6	3.22E+00	C1
Fe	2.22E+01	1.81E-05	6.52E-04	4.11E-01	PF	6	2.18E+00	C1
Heptadecane	1.73E-02	1.00E-02	1.00E-02	1.00E-02	CVD	3		
Hexadecane	1.98E-02	6.30E-02	6.30E-02	6.30E-02	CVD	3		
Hexanedecanoic acid	2.72E-02	4.75E-09	1.71E-07	1.08E-04	PF	5		
K	6.91E-02	8.08E-08	2.91E-06	1.83E-03	PF	5		
La	5.07E+00	1.66E-06	5.99E-05	3.77E-02	PF	6		
Mg	4.39E-01	8.34E-07	3.00E-05	1.89E-02	PF	5	1.02E+01	C1

Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Mn	7.76E+00	6.43E-06	2.32E-04	1.46E-01	PF	6	2.22E+00	C2, D
Na	4.57E+01	9.05E-05	3.26E-03	2.50E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.01E+01	7.78E-06	2.80E-04	1.76E-01	PF		4.14E-02	C1, D
NO ₂	9.21E-01	7.02E-08	2.53E-06	2.07E-02	PF	4		
NO ₃	5.10E+01	2.88E-06	1.04E-04	8.50E-01	PF	4		
OH	2.42E-02	6.50E-08	2.34E-06	1.47E-03	PF	6	2.88E+00	C2 as NaOH
P	1.29E+01	1.89E-05	6.82E-04	4.29E-01	PF	5		
Pb	4.51E-01	9.93E-08	3.58E-06	2.25E-03	PF	6	5.91E-03	C1, A, D
Pentadecane	2.59E-02	1.55E-01	1.55E-01	1.55E-01	CVD	3		
PO ₄	1.92E+01	1.11E-05	4.00E-04	2.52E-01	PF	6		
Sb	1.16E-01	4.32E-08	1.56E-06	9.80E-04	PF	5	1.00E-01	C1, D
Se	4.69E-02	2.71E-08	9.75E-07	6.14E-04	PF	5	6.19E-02	C1, D
Si	7.00E+00	1.14E-05	4.10E-04	2.59E-01	PF	5	8.73E+00	C1
SO ₄	4.38E+00	2.31E-07	8.32E-06	4.72E-02	PF	4		
Sn	9.87E-03	3.78E-09	1.36E-07	8.58E-05	PF	5	4.11E-01	C1
Sr	3.68E-01	1.91E-07	6.86E-06	4.32E-03	PF	5		
TOC gC/l ¹⁷	3.85E+00	1.46E-05	5.27E-04	3.32E-01	PF	5		
Tetradecane	3.55E-01	6.10E-01	6.10E-01	6.10E-01	CVD	3		
Ti	5.93E-02	5.63E-08	2.03E-06	1.28E-03	PF	5		
Tridecane	4.88E-01	2.91E+00	2.91E+00	2.91E+00	CVD	3		
Undecane	1.79E-02	3.08E+01	3.08E+01	3.08E+01	CVD	3		
V	1.81E-02	1.62E-08	5.82E-07	3.67E-04	PF	5	2.40E-02	C1 (as V ₂ O ₅)
Zn	1.31E-01	9.21E-08	3.31E-06	2.09E-03	PF	5		
Zr	4.94E-03	2.47E-09	8.91E-08	5.61E-05	PF	5	1.34E+00	C1, C3
ZrO	3.06E-08	1.31E-14	4.70E-13	2.96E-10	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.24E+01	1.45E-07	5.23E-06	3.29E-03	PF	6	2.0E-11	B ¹⁹
Am 243	5.77E-05	1.60E-13	5.76E-12	3.63E-09	PF	6	2.0E-11	B
Cm 242	1.15E-03	6.40E-15	2.30E-13	1.45E-10	PF	6	7.0E-10	B
Cs 137	2.05E+02	3.61E-08	1.30E-06	1.23E-02	PF	5	4.0E-07	B
Eu 154	1.33E+00	2.77E-09	1.13E-07	7.10E-05	PF	5	5.0E-08	B
Eu 155	3.79E+00	7.87E-09	2.83E-07	1.78E-04	PF	5	3.0E-07	B
Np 237	5.77E-05	1.60E-13	5.77E-12	3.63E-09	PF	6	1.2E-12	B

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Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 238	4.05E-01	1.09E-09	3.93E-08	2.47E-05	PF	6	2.1E-12	B
Pu 239/240	1.71E+02	4.76E-07	1.71E-05	1.08E-02	PF	6	2.0E-12	B
Pu 241	5.77E+01	1.33E-07	4.78E-06	3.01E-03	PF	6	1.0E-10	B
RuRh 106	1.21E+03	9.59E-17	3.45E-15	1.39E-10	PF	5	3.0E-08	B
Sr 89/90	6.69E+03	1.12E-07	4.04E-06	3.82E-01	PF	6	9.0E-09	B
Tc 99	8.34E+00	2.32E-08	8.34E-07	5.26E-04	PF	5	2.0E-06	B
U 238	1.15E+00	3.19E-09	1.15E-07	7.24E-05	PF	6	1.0E-10	B
water	0.00E+00	1.83E+04	1.83E+04	1.83E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	SN		Tank:	241-T-112				
Sample Date	10/27/87		Contents:	Sludge/ SN				
Sample ID	RAT-T112-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.2E-02		Retr. Method	Pumping/Sluicing				
pH	13.69							
Density, g/ml	1.5							
Temperature, °R	541							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	3.72E-02	2.38E-07	8.58E-06	9.95E-04	PF	5	9.06E+00	C1
Ba	8.67E-07	1.10E-12	3.94E-11	4.57E-09	PF	6	8.92E-02	C1
Bi	8.28E+02	6.86E-04	2.47E-02	2.86E+00	PF	6		
Ca	2.54E-02	1.10E-07	3.96E-06	4.59E-04	PF	5	6.11E+00	C1 as CaCO ₃
Cl	5.49E-01	1.70E-07	6.11E-06	1.13E-02	PF	4		
CO ₃	5.03E+00	1.45E-05	5.22E-04	6.06E-02	PF	5		
Cr	5.62E-01	4.15E-07	1.49E-05	7.81E-03	PF	4	2.35E-01	C1, D
F	6.73E-01	3.60E-07	1.30E-05	2.56E-02	PF	4	3.22E+00	C1
Fe	1.10E+02	3.41E-04	1.23E-02	1.42E+00	PF	6	2.18E+00	C1
K	5.79E-01	2.57E-06	9.25E-05	1.07E-02	PF	5		
La	4.34E-01	5.40E-07	1.94E-05	2.25E-03	PF	6		
Mg	4.35E-04	3.14E-09	1.13E-07	1.31E-05	PF	5	1.02E+01	C1
Mn	4.34E-01	1.36E-06	4.91E-05	5.70E-03	PF	6	2.22E+00	C2, D
Na	6.28E+01	4.73E-04	1.70E-02	1.97E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	4.44E+01	1.28E-05	4.62E-04	6.97E-01	PF	4		
NO ₃	2.41E+01	5.17E-06	1.86E-04	2.81E-01	PF	4		
OH	8.35E+00	8.50E-05	3.06E-03	3.55E-01	PF	5	2.88E+00	C2 as NaOH
P	1.00E+00	5.58E-06	2.01E-04	2.33E-02	PF	5		
Pb	6.70E-13	5.60E-19	2.02E-17	2.34E-15	PF	6	5.91E-03	C1, A, D
PO ₄	3.75E+02	8.20E-04	2.95E-02	3.43E+00	PF	6		
Pu	3.15E-06	2.24E-12	8.05E-11	9.34E-09	PF	6		
SO ₄	8.77E+00	1.75E-06	6.32E-05	6.60E-02	PF	4		
TOC gC/l ¹⁷	2.52E+00	3.63E-05	1.31E-03	1.52E-01	PF	5		
ZrO	2.13E-04	3.44E-10	1.24E-08	1.44E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.18E+00	5.99E-09	2.16E-07	2.50E-05	PF	5	2.0E-11	H ¹⁹
Am 243	2.02E+03	5.62E-12	2.02E-10	2.35E-08	PF	6	2.0E-11	H

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Tank Farm 241-T Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242	1.17E-03	6.50E-15	2.34E-13	2.71E-11	PF	6	7.0E-10	B
Np 237	1.17E-03	3.26E-12	1.17E-10	1.36E-08	PF	6	1.2E-12	B
Pu 238	3.94E+01	1.06E-07	3.82E-06	4.43E-04	PF	6	2.1E-12	B
Pu 239/240	1.85E+00	5.14E-09	1.85E-07	2.14E-05	PF	5	2.0E-12	B
Pu 241	7.88E+02	1.81E-06	6.53E-05	7.57E-03	PF	6	1.0E-10	B
RuRh 106	2.77E-06	7.48E-18	2.69E-16	2.00E-12	PF	6	3.0E-08	B
Sr 89/90	1.60E+04	2.68E-07	9.65E-06	1.68E-01	PF	6	9.0E-09	B
U 238	7.88E+00	2.19E-08	7.88E-07	9.14E-05	PF	6	1.0E-10	B
water		3.82E+04	3.82E+04	3.82E+04	Stm Tabl	1		

Tank Farm 241-T Vapor Estimates

Sample Type	TRAC		Tank:	241-T-201				
Sample Date	N/A		Contents:	Sludge/ SN				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.7E-04		Retr. Method	Pumping/Sluicing				
pH	9.96							
Density, g/ml	0.99							
Temperature, °R	519							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Na	2.09E-03	4.60E-09	1.12E-06	3.36E-04	PF	6	2.13E+00	C2 as NaOH
OH	1.55E-03	4.60E-09	1.12E-06	3.36E-04	PF	6	2.88E+00	C2 as NaOH
water		1.36E+04	1.36E+04	1.36E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	TRAC		Tank:	241-T-202				
Sample Date	N/A		Contents:	Sludge				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.6E-03		Retr. Method	Pumping/Sluicing				
pH	13.72							
Density, g/ml	1.1							
Temperature, °R	525							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Bi	7.92E-01	1.85E-07	4.21E-05	1.07E-03	PF	6		C1, D
Cr	1.26E-01	2.62E-08	2.69E-05	6.82E-04	PF	6	2.35E-01	C1
F	4.78E+00	7.23E-07	2.80E-03	7.10E-02	PF	6	3.22E+00	
K	9.81E+00	1.23E-05	2.80E-03	7.10E-02	PF	6		
La	1.76E-01	6.19E-08	1.41E-05	3.57E-04	PF	6	2.22E+00	C2, D
Mn	2.14E-01	1.90E-07	4.32E-05	1.10E-03	PF	6	2.13E+00	C2 as NaOH
Na	5.79E+01	1.23E-04	2.80E-02	7.10E-01	PF	6		
NO ₃	7.80E+01	4.73E-06	1.40E-02	3.55E-01	PF	6	2.88E+00	C2 as NaOH
OH	8.93E+00	2.57E-05	5.84E-03	1.48E-01	PF	6	5.91E-03	C1, A, D
Pb	7.80E-20	1.84E-26	4.19E-24	1.06E-22	PF	6		
PO ₄	3.52E+00	2.18E-06	4.95E-04	1.26E-02	PF	6		
SO ₄	3.65E-01	2.06E-08	4.22E-05	1.07E-03	PF	6		
Am 241 ¹⁸	6.46E-01	1.78E-09	2.92E-07	1.03E-05	PF	6	2.0E-11	B19
Np 237	5.10E-06	1.42E-14	2.32E-12	8.17E-11	PF	6	1.2E-12	B
Pu 238	2.52E-02	6.77E-11	1.11E-08	3.91E-07	PF	6	2.1E-12	B
Pu 239/240	4.42E+00	1.23E-08	2.01E-06	7.08E-05	PF	6	2.0E-12	B
Pu 241	3.74E+00	8.60E-09	1.41E-06	4.96E-05	PF	6	1.0E-10	B
water		1.93E+04	1.93E+04	1.93E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	TRAC		Tank:	241-T-203				
Sample Date	N/A		Contents:	Sludge				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	8.0E-03		Retr. Method	Pumping/Sluicing				
pH	13.93							
Density, g/ml	1.1							
Temperature, °R	525							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Bi	4.75E+00	1.13E-06	2.53E-04	6.20E-03	PF	6		
Cr	7.55E-01	1.60E-07	1.61E-04	3.95E-03	PF	6	2.35E-01	C1, D
F	7.17E+00	1.10E-06	4.19E-03	1.03E-01	PF	6	3.22E+00	C1
K	1.21E+01	1.54E-05	3.44E-03	8.43E-02	PF	6		
La	1.06E+00	3.77E-07	8.45E-05	2.07E-03	PF	6		
Mn	1.28E+00	1.16E-06	2.59E-04	6.35E-03	PF	6	2.22E+00	C2, D
Na	5.21E+01	1.12E-04	2.52E-02	6.17E-01	PF	6	2.13E+00	C2 as NaOH
NO ₃	9.06E+01	5.57E-06	1.62E-02	3.98E-01	PF	6		
OH	1.43E+01	4.18E-05	9.37E-03	2.30E-01	PF	6	2.88E+00	C2 as NaOH
Pb	4.68E-19	1.12E-25	2.51E-23	6.16E-22	PF	6	5.91E-03	C1, A, D
PO ₄	4.30E+00	2.70E-06	6.05E-04	1.48E-02	PF	6		
SO ₄	5.06E-01	2.90E-08	5.85E-05	1.43E-03	PF	6		
Am 241 ¹⁸	3.88E+00	1.07E-08	1.75E-06	5.87E-05	PF	6	2.0E-11	B ¹⁹
Np 237	3.06E-05	8.50E-14	1.39E-11	4.67E-10	PF	6	1.2E-12	B
Pu 238	1.51E-01	4.06E-10	6.65E-08	2.23E-06	PF	6	2.1E-12	B
Pu 239/240	2.65E+01	7.36E-08	1.21E-05	4.04E-04	PF	6	2.0E-12	B
Pu 241	2.24E+01	5.16E-08	8.45E-06	2.83E-04	PF	6	1.0E-10	B
water		1.93E+04	1.93E+04	1.93E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

Sample Type	DL		Tank:	241-T-204				
Sample Date	12/4/78		Contents:	Sludge				
Sample ID	1914		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	6.9E-03		Retr. Method	Pumping/Sluicing				
pH	13.10							
Density, g/ml	1.07							
Temperature, °R	521							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.14E-01	4.15E-07	9.06E-05	2.70E-03	PF	5	9.06E+00	C1
Bi	6.42E-02	1.61E-08	3.51E-06	1.05E-04	PF	5		
Cl	6.42E-01	6.01E-08	2.10E-04	6.25E-03	PF	4		
CO ₃	8.56E+00	7.47E-06	1.63E-03	4.86E-02	PF	5		
Cr	1.07E+00	2.39E-07	2.35E-04	7.01E-03	PF	4	2.35E-01	C1, D
Fe	3.96E+01	3.70E-05	8.08E-03	2.41E-01	PF	5	2.18E+00	C1
Hg	4.28E-02	1.12E-08	2.43E-06	7.25E-05	PF	5	6.08E-03	B, C1, C2
K	2.89E+01	3.88E-05	8.47E-03	2.52E-01	PF	5		
Mn	4.28E-03	4.08E-09	8.89E-07	2.65E-05	PF	5	2.22E+00	C2, D
Na	3.21E+01	7.31E-05	1.59E-02	4.75E-01	PF	5	2.13E+00	C2 as NaOH
NO ₂	6.42E-01	5.62E-08	1.59E-04	4.75E-03	PF	4		
NO ₃	5.67E+01	3.68E-06	1.04E-02	3.12E-01	PF	4		
OH	2.14E+00	6.59E-06	1.44E-03	4.29E-02	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.39E+01	9.22E-06	2.01E-03	5.99E-02	PF	5		
Pu	1.32E-03	2.83E-10	6.18E-08	1.84E-06	PF	5		
Si	2.90E+01	5.43E-05	1.18E-02	3.53E-01	PF	5	8.73E+00	C1
SO ₄	1.07E+00	6.48E-08	1.27E-04	3.80E-03	PF	4		
TOC qC/l ¹⁷	7.21E+00	3.15E-05	6.86E-03	2.05E-01	PF	5		
U, g/l	1.29E-03	2.84E-10	6.19E-08	1.85E-06	PF	5	5.14E-03	C1
Am 241 ¹⁸	2.18E-02	5.91E-11	9.95E-09	3.85E-07	PF	5	2.0E-11	B ¹⁹
Cs 137	1.08E+03	1.33E-07	3.35E-04	1.29E-02	PF	4	4.0E-07	B
CePr 144	4.38E+01	7.27E-14	1.22E-11	4.73E-10	PF	5	3.0E-08	B
Pu 239/240	8.11E+01	2.25E-07	3.79E-05	1.46E-03	PF	5	2.0E-12	B
Sr 89/90	2.30E+03	2.87E-08	7.23E-04	2.79E-02	PF	4	9.0E-09	B
U 238	7.22E-04	2.00E-12	3.37E-10	1.30E-08	PF	5	1.0E-10	B
water		1.54E+04	1.54E+04	1.54E+04	Stm Tabl	1		

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Tank Farm 241-T Vapor Estimates

- Note: 1. No viscosity data available; therefore, viscosity estimated assuming 40 vol. % solids. For tanks T-111 and T-201 the viscosity estimate of water corrected for tank temperature was used.
- Note: 1A. Density for tank T-112 was raised from 1.3 to 1.5 and Bi, PO4 reduced by 10 to obtain positive moles of water. No density was reported for tanks T-201, 202, and 203; therefore, density was adjusted to minimize moles of water.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume and microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data denoted by 6. Lab data for tanks T-102, 103, 105, 108, 109, 110, and 111 denoted by 5 due to tank activity after the sampling date. Lab data for tanks T-104 and 106 denoted by 5 due to samples taken from sludge. Lab data for tanks T-101, 107, 112, and 204 denoted by 4, 5 based on PF availability. Bi in tanks T-105, 106, 110, and 111 reduced by E+03 to obtain positive moles of water.
- Note: 7. Allowable concentration, in ppm by volume.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (rounded to nearest year).
- Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-101				
Sample Date	8/25/72		Contents:	Sludge/ SN				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	7.6E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	2							
Temperature, °R	588							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Al	8.20E-01	1.05E-06	1.86E-04	9.58E-03	PF	6	9.06E+00	C1
Ba	2.28E-03	5.77E-10	1.02E-07	5.24E-06	PF	6	8.92E-02	C1
Bi	3.95E-16	6.55E-23	1.15E-20	5.96E-19	PF	6		
C ₂ H ₃ O ₃ anion	1.37E-11	6.32E-18	1.11E-15	5.75E-14	PF	6		
C ₆ H ₅ O ₇ anion	1.73E-08	2.04E-13	7.35E-12	1.86E-09	PF	6		
Ca	3.64E-05	3.16E-11	5.57E-09	2.87E-07	PF	6	6.11E+00	C1 as CaCO ₃
Ce	4.25E-12	1.05E-18	1.86E-16	9.58E-15	PF	6		
CO ₃	1.09E-05	6.32E-12	1.11E-09	5.75E-08	PF	6		
Cr	4.86E-11	7.19E-18	5.71E-15	2.95E-13	PF	6	2.35E-01	C1, D
EDTA ¹²	5.46E-11	6.49E-18	1.14E-15	5.90E-14	PF	6		
F	2.31E-10	2.48E-17	7.42E-14	3.83E-12	PF	6	3.22E+00	C1
Fe	1.70E-04	1.05E-10	1.86E-08	9.58E-07	PF	6	2.18E+00	C1
Fe(CN) ₆	8.20E-03	1.34E-09	2.36E-07	1.22E-05	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	8.50E-11	1.01E-17	1.77E-15	9.15E-14	PF	6		
K	9.41E-10	8.37E-16	1.48E-13	7.61E-12	PF	6		
Mn	1.67E-11	1.05E-17	1.86E-15	9.58E-14	PF	6	2.22E+00	C2, D
Na	1.40E+03	2.11E-03	3.71E-01	1.92E+01	PF	6	2.13E+00	C2 as NaOH
Ni	1.43E-01	8.39E-08	1.48E-05	7.63E-04	PF	6	4.14E-02	C1, D
NO ₂	1.40E-08	8.10E-16	1.86E-12	9.58E-11	PF	6		
NO ₃	3.64E+02	1.57E-05	3.59E-02	1.85E+00	PF	6		

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
OH	2.06E+02	4.21E-04	7.42E-02	3.83E+00	PF	6	2.88E+00	C2 as NaOH
Pb	6.38E+00	1.07E-06	1.88E-04	9.71E-03	PF	6	5.91E-03	C1, A, D
PO ₄	1.15E-09	5.07E-16	8.93E-14	4.61E-12	PF	6		
SiO ₃	9.11E-10	4.16E-16	7.33E-14	3.78E-12	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.91E+00	1.17E-07	1.86E-04	9.58E-03	PF	6		
Sr	5.46E-13	2.15E-19	3.80E-17	1.96E-15	PF	6		
ZrO	2.61E-04	8.46E-11	1.49E-08	7.70E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.04E-03	8.38E-12	7.54E-10	7.62E-08	PF	6	2.0E-11	B ¹⁹
Am 243	1.23E-06	3.42E-15	3.08E-13	3.11E-11	PF	6	2.0E-11	B
C 14	6.07E+01	1.69E-07	1.52E-05	1.53E-03	PF	6	6.0E-06	B
Cm 242	2.71E-06	1.50E-17	1.35E-15	1.37E-13	PF	6	7.0E-10	B
Cm 244	6.07E-10	1.45E-18	1.30E-16	1.32E-14	PF	6	4.0E-11	B
Cs 137	2.50E+05	2.63E-05	3.55E-02	3.59E+00	PF	5	4.0E-07	B
Cs 134	5.28E+03	1.01E-08	9.06E-07	9.15E-05	PF	5	4.0E-07	B
I 129	2.71E-10	1.05E-16	3.76E-15	6.84E-15	PF	6	7.0E-08	B
Np 237	2.46E-08	6.84E-17	6.15E-15	6.22E-13	PF	6	1.2E-12	B
Pu 238	9.03E-04	2.43E-12	2.19E-10	2.21E-08	PF	6	2.1E-12	B
Pu 239/240	1.64E-03	4.56E-12	4.10E-10	4.14E-08	PF	6	2.0E-12	B
Pu 241	3.04E-04	6.98E-13	6.29E-11	6.35E-09	PF	6	1.0E-10	B
RuRh 106	9.03E-06	2.44E-17	1.41E-13	1.42E-11	PF	6	3.0E-08	B
Se 79	9.03E-09	2.51E-17	2.26E-15	2.28E-13	PF	6	1.0E-06	B
Sr 89/90	2.46E+04	4.13E-07	5.57E-03	5.63E-01	PF	6	9.0E-09	B
Tc 99	3.04E-07	8.43E-16	7.59E-14	7.67E-12	PF	6	2.0E-06	B
U 238	2.46E-07	6.84E-16	6.15E-14	6.22E-12	PF	6	1.0E-10	B
water		1.04E+05	1.04E+05	1.04E+05	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SL		Tank:	241-TX-102				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX102-1A		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	7.8E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.45							
Temperature, °R	557							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Aq	2.57E-10	1.09E-16	2.01E-14	1.02E-12	PF	6	2.27E-03	C1
Al	6.75E+01	1.14E-04	2.11E-02	1.07E+00	PF	5	9.06E+00	C1
Ba	1.75E-03	5.84E-10	1.08E-07	5.50E-06	PF	6	8.92E-02	C1
Bi	4.91E-16	1.07E-22	1.98E-20	1.01E-18	PF	6		
C ₆ H ₅ O ₇ anion	3.97E-01	1.56E-07	1.77E-05	1.47E-03	PF	6		
Ca	3.74E-10	4.27E-16	7.88E-14	4.02E-12	PF	6	6.11E+00	C1 as CaCO ₃
Ce	6.54E-05	2.13E-11	3.94E-09	2.01E-07	PF	6		
Cl	2.57E-11	2.10E-18	6.19E-15	3.16E-13	PF	6		
CO ₃	9.84E+00	7.48E-06	1.38E-03	7.05E-02	PF	5		
F	8.88E-03	1.25E-09	3.94E-06	2.01E-04	PF	6	3.22E+00	C1
Fe	1.31E-02	1.07E-08	1.97E-06	1.00E-04	PF	6	2.18E+00	C1
Fe(CN) ₆	2.80E-05	6.04E-12	1.12E-09	5.69E-08	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	6.54E-04	1.02E-10	1.88E-08	9.60E-07	PF	6		
K	4.67E-03	5.47E-09	1.01E-06	5.15E-05	PF	6		
Mn	3.74E-04	3.10E-10	5.73E-08	2.92E-06	PF	6	2.22E+00	C2, D
Na	2.23E+02	4.43E-04	8.17E-02	4.17E+00	PF	5	2.13E+00	C2 as NaOH
Ni	8.18E-13	6.33E-19	1.17E-16	5.96E-15	PF	6	4.14E-02	C1, D
NO ₂	1.25E+02	9.54E-06	2.29E-02	1.17E+00	PF	5		
NO ₃	2.78E+02	1.57E-05	3.78E-02	1.93E+00	PF	5		
OH	5.71E+01	1.53E-04	2.83E-02	1.44E+00	PF	5	2.88E+00	C2 as NaOH

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Pb	3.74E-14	8.25E-21	1.52E-18	7.77E-17	PF	6	5.91E-03	C1, A, D
PO ₄	1.07E+01	6.18E-06	1.14E-03	5.82E-02	PF	5		
SiO ₃	1.78E-02	1.07E-08	1.97E-06	1.00E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	9.12E-01	4.81E-08	8.01E-05	4.08E-03	PF	6		
Sr	2.06E-11	1.07E-17	1.97E-15	1.00E-13	PF	6		
TOC gC/l ¹⁷	5.64E+00	2.15E-05	3.96E-03	2.02E-01	PF	5		
ZrO	2.57E-06	1.10E-12	2.03E-10	1.03E-08	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.14E-03	3.14E-12	3.90E-10	2.96E-08	PF	6	2.0E-11	B ¹⁹
Am 243	8.84E-08	2.46E-16	3.05E-14	2.31E-12	PF	6	2.0E-11	B
C 14	6.95E+00	1.93E-08	2.40E-06	1.82E-04	PF	6	6.0E-06	B
Cm 242	2.34E-07	1.30E-18	1.61E-16	1.22E-14	PF	6	7.0E-10	B
Cm 244	1.20E-02	2.86E-11	3.55E-09	2.69E-07	PF	6	4.0E-11	B
Ce 137	4.28E+05	5.68E-05	1.06E-01	8.02E+00	PF	5	4.0E-07	B
I 129	4.67E-02	1.81E-08	6.50E-07	1.22E-06	PF	6	7.0E-08	B
Np 237	4.67E-02	1.30E-10	1.61E-08	1.22E-06	PF	6	1.2E-12	B
Pu 238	2.34E-04	6.29E-13	7.81E-11	5.93E-09	PF	6	2.1E-12	B
Pu 239/240	2.40E-04	6.67E-13	8.28E-11	6.28E-09	PF	6	2.0E-12	B
Pu 241	1.20E-06	2.76E-15	3.43E-13	2.60E-11	PF	6	1.0E-10	B
RuRh 106	2.34E-07	6.31E-19	5.02E-15	3.81E-13	PF	6	3.0E-08	B
Se 79	6.95E+01	1.93E-09	2.40E-07	1.82E-05	PF	6	1.0E-06	B
Sr 89/90	6.95E+02	1.17E-08	2.17E-04	1.65E-02	PF	6	9.0E-09	B
Tc 99	2.34E+01	6.49E-08	8.06E-06	6.12E-04	PF	6	2.0E-06	B
U 238	2.34E-08	6.49E-17	8.06E-15	6.12E-13	PF	6	1.0E-10	B
water		6.00E+04	6.00E+04	6.00E+04	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-103				
Sample Date	9/21/79		Contents:	Sludge				
Sample ID	T-1467		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	9.1E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.26							
Temperature, °R	529							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ag	3.70E-11	1.53E-17	3.33E-15	1.28E-13	PF	6	2.27E-03	C1
Al	1.73E+01	2.85E-05	6.22E-03	2.39E-01	PF	5	9.06E+00	C1
Ba	2.52E-04	8.20E-11	1.79E-08	6.87E-07	PF	6	8.92E-02	C1
Bi	1.06E-16	2.26E-23	4.92E-21	1.89E-19	PF	6		
C ₆ H ₅ O ₇ anion	2.86E-01	7.45E-08	1.47E-05	6.25E-04	PF	6		
Ca	1.35E-11	1.50E-17	3.26E-15	1.26E-13	PF	6	6.11E+00	C1 as CaCO ₃
Ce	4.71E-04	1.50E-10	3.26E-08	1.26E-06	PF	6		
Cl	1.85E-09	1.47E-16	5.13E-13	1.97E-11	PF	6		
CO ₃	1.38E+01	1.02E-05	2.23E-03	8.58E-02	PF	5		
F	3.20E-02	4.40E-09	1.63E-05	6.28E-04	PF	6	3.22E+00	C1
Fe	1.85E-02	1.47E-08	3.21E-06	1.23E-04	PF	6	2.18E+00	C1
Fe(CN) ₆	1.35E-09	2.83E-16	6.16E-14	2.37E-12	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	2.36E-05	3.58E-12	7.80E-10	3.00E-08	PF	6		
K	6.56E-04	7.49E-10	1.63E-07	6.28E-06	PF	6		
Mn	2.69E-04	2.18E-10	4.75E-08	1.83E-06	PF	6	2.22E+00	C2, D
Na	7.74E+00	1.50E-05	3.26E-03	1.26E-01	PF	6	2.13E+00	C2 as NaOH
Ni	4.04E-03	3.05E-09	6.64E-07	2.55E-05	PF	6	4.14E-02	C1, D
NO ₂	4.88E+01	3.63E-06	1.03E-02	3.96E-01	PF	5		
NO ₃	1.24E+02	6.84E-06	1.94E-02	7.46E-01	PF	5		
OH	2.36E+01	6.18E-05	1.35E-02	5.18E-01	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Pb	1.04E-08	2.24E-15	4.89E-13	1.88E-11	PF	6	5.91E-03	C1, A, D
PO ₄	3.51E+00	1.98E-06	4.31E-04	1.66E-02	PF	5		
Pu	2.01E-04	3.67E-11	7.99E-09	3.07E-07	PF	5		
SiO ₃	6.39E-02	3.74E-08	8.16E-06	3.14E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.02E+00	1.04E-07	2.04E-04	7.85E-03	PF	5		
Sr	1.03E-07	5.19E-14	1.13E-11	4.35E-10	PF	6		
TOC gC/l ¹⁷	3.38E+00	1.25E-05	2.73E-03	1.05E-01	PF	5		
ZrO	1.85E-04	7.70E-11	1.68E-08	6.45E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.68E-01	4.64E-10	6.63E-08	3.89E-06	PF	6	2.0E-11	B ¹⁹
Am 243	1.68E-04	4.67E-13	6.67E-11	3.92E-09	PF	6	2.0E-11	B
C 14	1.36E+00	3.79E-09	5.41E-07	3.17E-05	PF	6	6.0E-06	B
Cm 242	3.36E-04	1.87E-15	2.67E-13	1.56E-11	PF	6	7.0E-10	B
Cm 244	1.68E-03	4.01E-12	5.73E-10	3.36E-08	PF	6	4.0E-11	B
Cs 137	1.85E+05	2.33E-05	4.99E-02	2.93E+00	PF	5	4.0E-07	B
I 129	3.36E-03	1.30E-09	4.68E-08	7.83E-08	PF	6	7.0E-08	B
Np 237	6.82E-03	1.89E-11	2.71E-09	1.59E-07	PF	6	1.2E-12	B
Pu 238	8.64E-04	2.33E-12	3.32E-10	1.95E-08	PF	6	2.1E-12	B
Pu 239/240	1.24E+01	3.43E-08	4.90E-06	2.87E-04	PF	5	2.0E-12	B
Pu 241	5.00E-06	1.15E-14	1.64E-12	9.64E-11	PF	6	1.0E-10	B
RuRh 106	1.68E-07	4.54E-19	4.16E-15	2.44E-13	PF	6	3.0E-08	B
Se 79	6.82E-02	1.89E-10	2.71E-08	1.59E-06	PF	6	1.0E-06	B
Sr 89/90	1.74E+03	2.22E-08	4.76E-04	2.79E-02	PF	5	9.0E-09	B
Tc 99	3.36E+00	9.35E-09	1.34E-06	7.83E-05	PF	6	2.0E-06	B
U 238	3.36E-07	9.35E-16	1.34E-13	7.83E-12	PF	6	1.0E-10	B
water		2.36E+04	2.36E+04	2.36E+04	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-104				
Sample Date	4/19/76		Contents:	Saltcake/ SN				
Sample ID	T-4391		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	1.0E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.4							
Temperature, °R	519							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ag	1.30E-16	5.52E-23	1.05E-20	4.09E-19	PF	6	2.27E-03	C1
Al	1.73E+01	2.93E-05	5.60E-03	2.18E-01	PF	5	9.06E+00	C1
Ba	1.22E-03	4.08E-10	7.77E-08	3.02E-06	PF	6	8.92E-02	C1
Bi	6.10E-16	1.34E-22	2.55E-20	9.91E-19	PF	6		
C ₆ H ₅ O ₇ anion	7.72E-08	2.74E-14	3.57E-12	2.03E-10	PF	6		
Ca	1.46E-16	1.67E-22	3.19E-20	1.24E-18	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.14E-10	3.72E-17	7.10E-15	2.76E-13	PF	6		
Cl	3.72E+00	3.04E-07	9.28E-04	3.61E-02	PF	5		
CO ₃	2.78E+01	2.12E-05	4.05E-03	1.57E-01	PF	5		
Cu	5.19E-02	3.71E-08	7.08E-06	2.75E-04	PF	5	3.82E-01	C1
F	3.86E-08	5.47E-15	1.77E-11	6.90E-10	PF	6	3.22E+00	C1
Fe	6.91E-09	5.65E-15	1.08E-12	4.19E-11	PF	6	2.18E+00	C1
Fe (CN) ₆	5.28E-12	1.14E-18	2.18E-16	8.46E-15	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	2.28E-10	3.56E-17	6.78E-15	2.64E-13	PF	6		
Hg	8.36E-02	1.90E-08	3.63E-06	1.41E-04	PF	5	6.08E-03	B, C1, C2
K	1.26E-09	1.48E-15	2.82E-13	1.10E-11	PF	6		
Mn	1.10E-10	9.14E-17	1.74E-14	6.78E-13	PF	6	2.22E+00	C2, D
Na	2.17E+02	4.32E-04	8.24E-02	1.20E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	4.49E+01	3.44E-06	8.52E-03	3.32E-01	PF	5		
NO ₃	2.75E+02	1.56E-05	3.87E-02	1.51E+00	PF	5		

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
OH	5.14E+01	1.38E-04	2.64E-02	1.03E+00	PF	5	2.88E+00	C2 as NaOH
Pb	1.07E-01	2.37E-08	4.51E-06	1.76E-04	PF	5	5.91E-03	C1, A, D
PO ₄	7.72E-08	4.48E-14	8.53E-12	3.32E-10	PF	6		
Pu	3.20E-04	6.01E-11	1.15E-08	4.45E-07	PF	5		
SiO ₃	9.35E-09	5.63E-15	1.07E-12	4.18E-11	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.77E+01	9.37E-07	1.61E-03	6.26E-02	PF	5		
ZrO	8.53E-05	3.65E-11	6.96E-09	2.71E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.62E-05	1.00E-13	1.29E-11	7.42E-10	PF	6	2.0E-11	B ¹⁹
Am 243	4.06E-15	1.13E-23	1.45E-21	8.37E-20	PF	6	2.0E-11	B
C 14	2.09E-06	5.79E-15	7.45E-13	4.30E-11	PF	6	6.0E-06	B
Cm 242	2.42E-14	1.34E-25	1.72E-23	9.94E-22	PF	6	7.0E-10	B
Cm 244	4.06E-09	9.69E-18	1.25E-15	7.18E-14	PF	6	4.0E-11	B
Ce 137	5.16E+05	6.02E-05	1.16E+01	6.70E+00	PF	5	4.0E-07	B
Ce 134	2.40E+03	1.72E-08	2.21E-06	1.28E-04	PF	5	4.0E-07	B
Eu 154	3.05E+05	1.64E-04	2.38E-02	1.37E+00	PF	5	5.0E-08	B
Eu 155	3.05E+05	6.17E-05	7.93E-03	4.58E-01	PF	5	3.0E-07	B
I 129	1.21E-08	4.66E-15	1.68E-13	2.49E-13	PF	6	7.0E-08	B
Np 237	2.09E-08	5.80E-17	7.45E-15	4.30E-13	PF	6	1.2E-12	B
Pu 238	2.11E+02	5.08E-07	6.53E-05	3.77E-03	PF	5	2.1E-12	B
Pu 239/240	1.96E+01	5.45E-08	7.00E-06	4.04E-04	PF	5	2.0E-12	B
Pu 241	4.06E-04	9.35E-13	1.20E-10	6.93E-09	PF	6	1.0E-10	B
RuRh 106	1.65E-13	4.45E-25	3.67E-21	2.12E-19	PF	6	3.0E-08	B
Se 79	1.65E-07	4.58E-16	5.88E-14	3.39E-12	PF	6	1.0E-06	B
Sr 89/90	7.73E+04	9.17E-07	1.77E-02	1.02E+00	PF	5	9.0E-09	B
Tc 99	8.13E-06	2.26E-14	2.90E-12	1.67E-10	PF	6	2.0E-06	B
U 238	4.06E+04	1.13E-12	1.45E-10	8.37E-09	PF	6	1.0E-10	B
water		1.36E+04	1.36E+04	1.36E+04	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-105				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX105-1		Watchlist:	Organic Salts				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	5.8E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.36							
Temperature, °R	558							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag	4.77E-10	1.99E-16	3.97E-14	2.57E-12	PF	6	2.27E-03	C1
Al	1.35E+01	2.25E-05	4.49E-03	2.90E-01	PF	5	9.06E+00	C1
Ba	4.77E-04	1.57E-10	3.13E-08	2.02E-06	PF	6	8.92E-02	C1
Bi	1.86E-16	4.01E-23	8.02E-21	5.18E-19	PF	6		
C ₆ H ₅ O ₇ anion	4.77E+01	1.37E-05	2.27E-03	1.77E-01	PF	6		
Ca	6.94E-08	7.80E-14	1.56E-11	1.01E-09	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.21E-04	3.90E-11	7.80E-09	5.03E-07	PF	6		
Cl	9.11E-11	7.31E-18	2.34E-14	1.51E-12	PF	6		
CO ₃	6.54E+01	4.90E-05	9.80E-03	6.33E-01	PF	5		
F	2.47E-02	3.44E-09	1.17E-05	7.55E-04	PF	6	3.22E+00	C1
Fe	2.43E+00	1.95E-06	3.90E-04	2.52E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	2.34E-09	4.97E-16	9.93E-14	6.41E-12	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.21E-03	1.86E-10	3.73E-08	2.41E-06	PF	6		
K	1.69E-02	1.95E-08	3.90E-06	2.52E-04	PF	6		
Mn	4.77E-02	3.90E-08	7.80E-06	5.03E-04	PF	6	2.22E+00	C2 , D
Na	7.81E+01	1.53E-04	3.05E-02	1.97E+00	PF	6	2.13E+00	C2 as NaOH
Ni	1.56E-01	1.19E-07	2.38E-05	1.54E-03	PF	6	4.14E-02	C1, D
NO ₂	3.99E+00	3.00E-07	7.80E-04	5.03E-02	PF	6		
NO ₃	1.86E+02	1.04E-05	2.70E-02	1.75E+00	PF	6		
OH	2.16E+01	5.71E-05	1.14E-02	7.37E-01	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Pb	1.78E-06	3.86E-13	7.72E-11	4.99E-09	PF	6	5.91E-03	Cl, A, D
PO ₄	8.55E+00	4.87E-06	9.73E-04	6.28E-02	PF	5		
SiO ₃	3.30E-01	1.95E-07	3.90E-05	2.52E-03	PF	6	1.93E+00	Cl (Amorphous)
SO ₄	1.65E+00	8.57E-08	1.54E-04	9.96E-03	PF	6		
Sr	3.82E-11	1.95E-17	3.90E-15	2.52E-13	PF	6		
TOC gC/l ¹⁷	1.18E+01	4.42E-05	8.84E-03	5.71E-01	PF	5		
ZrO	6.94E-06	2.92E-12	5.83E-10	3.76E-08	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	1.29E-03	3.58E-12	4.74E-10	4.62E-08	PF	6	2.0E-11	B ¹⁹
Am 243	8.67E-08	2.41E-16	3.19E-14	3.11E-12	PF	6	2.0E-11	B
C 14	1.29E+01	3.58E-08	4.74E-06	4.62E-04	PF	6	6.0E-06	B
Cm 242	1.76E-07	9.75E-19	1.29E-16	1.26E-14	PF	6	7.0E-10	B
Cm 244	2.23E-02	5.31E-11	7.03E-09	6.85E-07	PF	6	4.0E-11	B
Cs 137	8.67E+03	1.45E-06	2.88E-03	2.81E-01	PF	6	4.0E-07	B
I 129	4.34E-02	1.67E-08	6.03E-07	1.55E-06	PF	6	7.0E-08	B
Np 237	8.67E-02	2.41E-10	3.19E-08	3.11E-06	PF	6	1.2E-12	B
Pu 238	3.52E-04	9.46E-13	1.25E-10	1.22E-08	PF	6	2.1E-12	B
Pu 239/240	3.63E-04	1.01E-12	1.34E-10	1.30E-08	PF	6	2.0E-12	B
Pu 241	1.41E-03	3.24E-12	4.28E-10	4.18E-08	PF	6	1.0E-10	B
RuRh 106	3.05E-05	8.23E-17	6.98E-13	6.81E-11	PF	6	3.0E-08	B
Se 79	1.29E+00	3.58E-09	4.74E-07	4.62E-05	PF	6	1.0E-06	B
Sr 89/90	1.29E+03	2.16E-08	4.29E-04	4.19E-02	PF	6	9.0E-09	B
Tc 99	4.34E+01	1.20E-07	1.59E-05	1.55E-03	PF	6	2.0E-06	B
U 238	4.34E-13	1.20E-21	1.59E-19	1.55E-17	PF	6	1.0E-10	B
water		6.14E+04	6.14E+04	6.14E+04	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-106				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX106-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	1.9E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.5							
Temperature, °R	549							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ag	6.41E-11	2.05E-17	4.84E-15	7.31E-14	PF	6	2.27E-03	C1
Al	2.35E+01	3.00E-05	7.09E-03	1.07E-01	PF	5	9.06E+00	C1
Ba	3.50E-05	8.79E-12	2.08E-09	3.14E-08	PF	6	8.92E-02	C1
CO ₃	1.26E+01	7.23E-06	1.71E-03	2.58E-02	PF	5		
Na	6.41E+00	9.60E-06	2.27E-03	3.43E-02	PF	6	2.13E+00	C2 as NaOH
NO ₂	1.87E-10	1.07E-17	3.31E-14	4.98E-13	PF	6		
NO ₃	3.27E+01	1.39E-06	4.29E-03	6.47E-02	PF	6		
OH	4.52E+01	9.15E-05	2.17E-02	3.27E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.22E-14	2.04E-21	4.82E-19	7.27E-18	PF	6	5.91E-03	C1, A, D
PO ₄	1.52E+01	6.62E-06	1.57E-03	2.36E-02	PF	5		
SiO ₃	4.43E-12	2.01E-18	4.75E-16	7.17E-15	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.22E-01	8.82E-09	1.88E-05	2.84E-04	PF	6		
TOC gC/l ¹⁷	6.40E+00	1.84E-05	4.35E-03	6.55E-02	PF	5		
ZrO	4.43E-13	1.43E-19	3.38E-17	5.09E-16	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.47E-05	9.57E-14	1.15E-11	3.42E-10	PF	6	2.0E-11	B ¹⁹
Am 243	1.73E-08	4.81E-17	5.78E-15	1.72E-13	PF	6	2.0E-11	B
C 14	2.99E+00	8.31E-09	9.98E-07	2.97E-05	PF	6	6.0E-06	B
Cm 242	5.83E-08	3.23E-19	3.88E-17	1.15E-15	PF	6	7.0E-10	B
Cm 244	1.17E-03	2.78E-12	3.34E-10	9.92E-09	PF	6	4.0E-11	B
Cs 137	1.73E+04	1.15E-06	2.07E-03	6.15E-02	PF	6	4.0E-07	B

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
I 129	5.83E-03	2.25E-09	8.10E-08	5.78E-08	PF	6	7.0E-08	B
Np 237	2.36E-02	6.57E-11	7.88E-09	2.34E-07	PF	6	1.2E-12	B
Pu 238	5.83E-06	1.57E-14	1.88E-12	5.60E-11	PF	6	2.1E-12	B
Pu 239/240	4.10E-06	1.14E-14	1.37E-12	4.06E-11	PF	6	2.0E-12	B
Pu 241	2.99E-08	6.89E-17	8.26E-15	2.46E-13	PF	6	1.0E-10	B
RuRh 106	1.17E-08	3.15E-20	2.42E-16	7.21E-15	PF	6	3.0E-08	B
Se 79	1.73E-01	4.81E-10	5.78E-08	1.72E-06	PF	6	1.0E-06	B
Sr 89/90	2.99E-06	5.02E-17	9.04E-13	2.69E-11	PF	6	9.0E-09	B
Tc 99	5.20E+00	1.44E-08	1.73E-06	5.16E-05	PF	6	2.0E-06	B
U 238	1.73E-07	4.82E-16	5.78E-14	1.72E-12	PF	6	1.0E-10	B
water		4.89E+04	4.89E+04	4.89E+04	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-107				
Sample Date	8/18/75		Contents:	Saltcake/ SN				
Sample ID	T-7178		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	8.6E-03		Retr. Method	Pumping/Sluicing				
pH	13.37							
Density, g/ml	1.3							
Temperature, °R	530							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Ba	2.71E-11	8.66E-18	1.86E-15	7.70E-14	PF	6	8.92E-02	C1
CO ₃	1.91E+01	1.39E-05	2.99E-03	1.24E-01	PF	5		
Na	1.69E-02	3.21E-08	6.90E-06	2.85E-04	PF	6	2.13E+00	C2 as NaOH
NO ₂	2.55E+01	1.86E-06	5.21E-03	2.15E-01	PF	5		
NO ₃	1.76E+02	9.55E-06	2.67E-02	1.10E+00	PF	5		
OH	3.95E+00	1.02E-05	2.19E-03	9.03E-02	PF	5	2.88E+00	C2 as NaOH
PO ₄	3.89E+00	2.15E-06	4.63E-04	1.91E-02	PF	5		
Pu	2.28E-03	4.09E-10	8.79E-08	3.63E-06	PF	5		
SO ₄	4.26E-06	2.15E-13	4.17E-10	1.72E-08	PF	6		
ZrO	1.76E-10	7.20E-17	1.55E-14	6.40E-13	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	4.96E-06	1.17E-14	1.89E-12	1.22E-10	PF	6	2.0E-11	B ¹⁹
Am 243	2.18E-09	6.06E-18	8.39E-16	5.38E-14	PF	6	2.0E-11	B
C 14	7.34E-08	2.04E-16	2.82E-14	1.81E-12	PF	6	6.0E-06	B
Cm 242	6.54E-11	3.63E-22	5.03E-20	3.23E-18	PF	6	7.0E-10	B
Cm 244	1.47E-09	3.50E-18	4.84E-16	3.11E-14	PF	6	4.0E-11	B
Cs 137	7.34E-03	1.23E-12	2.55E-09	1.63E-07	PF	6	4.0E-07	B
I 129	3.77E-09	1.45E-15	5.24E-14	9.30E-14	PF	6	7.0E-08	B
Np 237	1.47E-08	4.08E-17	5.64E-15	3.62E-13	PF	6	1.2E-12	B
Pu 238	1.47E-06	3.95E-15	5.47E-13	3.51E-11	PF	6	2.1E-12	B
Pu 239/240	1.40E+02	3.89E-07	5.38E-05	3.45E-03	PF	5	2.0E-12	B

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Pu 241	1.47E-05	3.38E-14	4.67E-12	3.00E-10	PF	6	1.0E-10	B
RuRh 106	3.77E-12	1.02E-23	9.03E-20	5.80E-18	PF	6	3.0E-08	B
Se 79	5.95E-08	1.65E-16	2.29E-14	1.47E-12	PF	6	1.0E-06	B
Sr 89/90	1.39E+05	1.61E-06	3.35E-02	2.15E+00	PF	5	9.0E-09	B
Tc 99	3.77E-06	1.05E-14	1.45E-12	9.30E-11	PF	6	2.0E-06	B
U 238	1.47E-06	4.08E-15	5.64E-13	3.62E-11	PF	6	1.0E-10	B
water		2.48E+04	2.48E+04	2.48E+04	Stm Tabl	1		

Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-108				
Sample Date	2/5/81		Contents:	Saltcake				
Sample ID	RAT-TX108-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	2.1E-02		Retr. Method	Pumping/Sluicing				
pH	13.45							
Density, g/ml	1.8							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag	1.06E-09	6.62E-16	6.70E-14	2.19E-12	PF	6	2.27E-03	C1
Al	2.70E-01	6.71E-07	6.79E-05	2.22E-03	PF	5	9.06E+00	C1
Ba	8.08E-04	3.96E-10	4.01E-08	1.31E-06	PF	6	8.92E-02	C1
Bi	1.28E-16	4.12E-23	4.16E-21	1.36E-19	PF	6		
Ca	6.31E-02	1.06E-07	1.07E-05	3.50E-04	PF	6	6.11E+00	C1 as CaCO ₃
Ce	2.56E-01	1.23E-07	1.24E-05	4.06E-04	PF	6		
Cl	6.31E-09	7.56E-16	1.22E-12	4.00E-11	PF	6		
CO ₃	9.00E+00	1.01E-05	1.02E-03	3.33E-02	PF	5		
F	4.14E+00	8.60E-07	1.48E-03	4.83E-02	PF	6	3.22E+00	C1
Na	4.14E+02	1.21E-03	1.22E-01	3.99E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂	5.52E+01	6.19E-06	8.15E-03	2.66E-01	PF	6		
NO ₃	1.22E+03	1.02E-04	1.34E-01	4.37E+00	PF	6		
OH	4.76E+00	1.88E-05	1.90E-03	6.21E-02	PF	5	2.88E+00	C2 as NaOH
Pb	4.34E-13	1.41E-19	1.42E-17	4.65E-16	PF	6	5.91E-03	C1, A, D
PO ₄	3.80E+00	3.23E-06	3.27E-04	1.07E-02	PF	5		
SiO ₃	1.50E+01	1.32E-05	1.34E-03	4.37E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	5.72E+01	4.44E-06	4.04E-03	1.32E-01	PF	6		
TOC gC/l ¹⁷	8.17E+00	4.57E-05	4.62E-03	1.51E-01	PF	5		
ZrO	1.28E-04	8.04E-11	8.13E-09	2.66E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.97E+00	5.44E-09	5.44E-07	1.80E-05	PF	6	2.0E-11	B ¹⁹

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation ⁻
Am 243	1.17E-03	3.25E-12	3.25E-10	1.08E-08	PF	6	2.0E-11	B
C 14	1.97E+01	5.47E-08	5.47E-06	1.81E-04	PF	6	6.0E-06	B
Cm 242	4.00E-05	2.22E-16	2.22E-14	7.32E-13	PF	6	7.0E-10	B
Cm 244	1.01E-01	2.41E-10	2.41E-08	7.97E-07	PF	6	4.0E-11	B
Cs 137	1.97E+05	3.30E-05	4.94E-02	1.63E+00	PF	6	4.0E-07	B
I 129	1.17E-01	4.53E-08	1.63E-06	1.08E-06	PF	6	7.0E-08	B
Np 237	1.60E-01	4.44E-10	4.44E-08	1.47E-06	PF	6	1.2E-12	B
Pu 238	1.97E-01	5.31E-10	5.31E-08	1.75E-06	PF	6	2.1E-12	B
Pu 239/240	1.39E+00	3.85E-09	3.85E-07	1.27E-05	PF	6	2.0E-12	B
Pu 241	1.97E+00	4.53E-09	4.53E-07	1.50E-05	PF	6	1.0E-10	B
RuRh 106	5.86E-07	1.58E-18	1.01E-14	3.35E-13	PF	6	3.0E-08	B
Se 79	1.97E+00	5.48E-09	5.48E-07	1.81E-05	PF	6	1.0E-06	B
Sr 89/90	1.01E+04	1.70E-07	2.55E-03	8.41E-02	PF	6	9.0E-09	B
Tc 99	7.99E+01	2.22E-07	2.22E-05	7.33E-04	PF	6	2.0E-06	B
U 238	3.94E-01	1.10E-09	1.10E-07	3.62E-06	PF	6	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-109				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX109-2		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	7.8E-03		Retr. Method	Pumping/Sluicing				
pH	13.97							
Density, g/ml	1.7							
Temperature, °R	586							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag	7.57E-09	5.61E-15	5.04E-13	4.98E-11	PF	6	2.27E-03	C1
Al	1.40E+01	4.15E-05	3.73E-03	3.68E-01	PF	5	9.06E+00	C1
Ba	1.05E-03	6.14E-10	5.52E-08	5.46E-06	PF	6	8.92E-02	C1
Bi	2.89E+01	1.11E-05	9.94E-04	9.82E-02	PF	6		
C ₆ H ₅ O ₇ anion	1.31E+02	7.94E-04	2.86E-02	7.05E+00	PF	6		
Ca	8.25E-09	1.65E-14	1.48E-12	1.47E-10	PF	6	6.11E+00	C1 as CaCO ₃
Ce	7.57E-02	4.32E-08	3.89E-06	3.84E-04	PF	6		
Cl	2.41E-08	3.44E-15	4.95E-12	4.89E-10	PF	6		
CO ₃	3.36E+01	4.48E-05	4.03E-03	3.98E-01	PF	5		
Cr	1.10E+00	3.76E-07	1.52E-04	1.50E-02	PF	6	2.35E-01	C1, D
F	6.53E+00	1.62E-06	2.47E-03	2.44E-01	PF	6	3.22E+00	C1
Fe	2.68E+01	3.83E-05	3.44E-03	3.40E-01	PF	6	2.18E+00	C1
Fe (CN) ₆	8.94E-05	3.37E-11	3.03E-09	3.00E-07	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	1.31E-02	3.57E-09	3.21E-07	3.17E-05	PF	6		
K	2.68E-01	5.50E-07	4.95E-05	4.89E-03	PF	6		
Mn	1.10E-01	1.60E-07	1.44E-05	1.42E-03	PF	6	2.22E+00	C2, D
Na	1.72E+02	5.98E-04	5.38E-02	5.31E+00	PF	6	2.13E+00	C2 as NaOH
Ni	2.68E-01	3.64E-07	3.27E-05	3.23E-03	PF	6	4.14E-02	C1, D
NO ₂	2.20E+02	2.94E-05	3.44E-02	3.40E+00	PF	6		
NO ₃	8.94E+02	8.87E-05	1.04E-01	1.02E+01	PF	6		

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
OH	1.60E+01	7.53E-05	6.77E-03	6.69E-01	PF	5	2.88E+00	C2 as NaOH
Pb	5.02E-06	1.94E-12	1.74E-10	1.72E-08	PF	6	5.91E-03	C1, A, D
PO ₄	7.60E+00	7.70E-06	6.92E-04	6.84E-02	PF	5		
SiO ₃	2.06E+01	2.17E-05	1.95E-03	1.93E-01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	6.60E+01	6.11E-06	4.95E-03	4.89E-01	PF	6		
Sr	4.81E-05	4.38E-11	3.93E-09	3.89E-07	PF	6		
TOC gC/l ¹⁷	9.54E+00	6.36E-05	5.72E-03	5.65E-01	PF	5		
ZrO	5.92E+00	4.42E-06	3.98E-04	3.93E-02	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	8.92E+01	2.46E-07	2.61E-05	2.19E-03	PF	6	2.0E-11	B ¹⁹
Am 243	7.06E-02	1.96E-10	2.08E-08	1.74E-06	PF	6	2.0E-11	B
C 14	2.04E+02	5.68E-07	6.01E-05	5.04E-03	PF	6	6.0E-06	B
Cm 242	1.38E-01	7.63E-13	8.08E-11	6.78E-09	PF	6	7.0E-10	B
Cm 244	6.88E-01	1.64E-09	1.74E-07	1.46E-05	PF	6	4.0E-11	B
Cs 137	6.13E+05	1.03E-04	1.63E-01	1.37E+01	PF	6	4.0E-07	B
I 129	6.88E-01	2.66E-07	9.56E-06	1.70E-05	PF	6	7.0E-08	B
Np 237	1.38E+00	3.82E-09	4.05E-07	3.39E-05	PF	6	1.2E-12	B
Pu 238	3.53E+00	9.51E-09	1.01E-06	8.44E-05	PF	6	2.1E-12	B
Pu 239/240	1.58E+02	4.39E-07	4.65E-05	3.90E-03	PF	6	2.0E-12	B
Pu 241	6.88E+01	1.58E-07	1.68E-05	1.41E-03	PF	6	1.0E-10	B
RuRh 106	1.39E-04	3.77E-16	2.56E-12	2.14E-10	PF	6	3.0E-08	B
Se 79	2.04E+01	5.68E-08	6.01E-06	5.05E-04	PF	6	1.0E-06	B
Sr 89/90	8.18E+04	1.37E-06	2.18E-02	1.83E+00	PF	6	9.0E-09	B
Tc 99	6.13E+02	1.70E-06	1.80E-04	1.51E-02	PF	6	2.0E-06	B
U 238	6.88E-01	1.91E-09	2.02E-07	1.70E-05	PF	6	1.0E-10	B
water		1.01E+05	1.01E+05	1.01E+05	Stm Tabl	1		

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-110				
Sample Date	2/10/81		Contents:	Saltcake				
Sample ID	RAT-TX110-2		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	8.8E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.39							
Temperature, R	551							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	2.46E-09	1.15E-15	2.00E-13	9.60E-12	PF	6	2.27E-03	C1
Al	3.70E+01	6.93E-05	1.21E-02	5.77E-01	PF	5	9.06E+00	C1
Ba	3.43E-04	1.27E-10	2.20E-08	1.05E-06	PF	6	8.92E-02	C1
Bi	1.14E+02	2.75E-05	4.78E-03	2.29E-01	PF	6		
C ₆ H ₅ O ₇ anion	4.35E+01	1.67E-05	2.02E-03	1.39E-01	PF	6		
Ca	2.06E-09	2.60E-15	4.53E-13	2.17E-11	PF	6	6.11E+00	C1 as CaCO ₃
Ce	4.80E-02	1.74E-08	3.02E-06	1.44E-04	PF	6		
Cl	1.60E-08	1.45E-15	4.02E-12	1.93E-10	PF	6		
CO ₃	1.62E+01	1.37E-05	2.37E-03	1.14E-01	PF	5		
Cr	9.15E-02	1.98E-08	1.55E-05	7.41E-04	PF	6	2.35E-01	C1, D
F	4.46E+00	6.98E-07	2.06E-03	9.89E-02	PF	6	3.22E+00	C1
Fe	3.49E+00	3.15E-06	5.48E-04	2.62E-02	PF	6	2.18E+00	C1
Fe(CN) ₆	8.00E-06	1.91E-12	3.32E-10	1.59E-08	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.20E-03	5.53E-10	9.61E-08	4.60E-06	PF	6		
K	1.31E-01	1.71E-07	2.97E-05	1.42E-03	PF	6		
Mn	3.14E-02	2.89E-08	5.03E-06	2.41E-04	PF	6	2.22E+00	C2, D
Na	1.31E+02	2.89E-04	5.03E-02	2.41E+00	PF	6	2.13E+00	C2 as NaOH
Ni	8.58E-02	7.35E-08	1.28E-05	6.12E-04	PF	6	4.14E-02	C1, D
NO ₂	9.39E+01	7.94E-06	1.80E-02	8.60E-01	PF	4		
NO ₃	1.43E+02	8.97E-06	2.03E-02	9.72E-01	PF	4		

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
OH	4.95E+01	1.47E-04	2.56E-02	1.23E+00	PF	5	2.88E+00	C2 as NaOH
Pb	1.20E-06	2.93E-13	5.10E-11	2.44E-09	PF	6	5.91E-03	C1, A, D
PO ₄	8.55E+00	5.48E-06	9.52E-04	4.56E-02	PF	5		
SiO ₃	8.58E+00	5.71E-06	9.92E-04	4.75E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.40E+01	2.58E-06	4.03E-03	1.93E-01	PF	6		
Sr	1.49E-05	8.55E-12	1.49E-09	7.12E-08	PF	6		
TOC gC/l ¹⁷	4.11E+00	1.73E-05	3.01E-03	1.44E-01	PF	5		
ZrO	4.29E-01	2.03E-07	3.52E-05	1.69E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.47E+01	6.82E-08	8.84E-06	5.68E-04	PF	6	2.0E-11	B ¹⁹
Am 243	2.94E-02	8.15E-11	1.06E-08	6.79E-07	PF	6	2.0E-11	B
C 14	5.72E+01	1.59E-07	2.06E-05	1.32E-03	PF	6	6.0E-06	B
Cm 242	4.02E-02	2.23E-13	2.89E-11	1.86E-09	PF	6	7.0E-10	B
Cm 244	2.32E-01	5.52E-10	7.15E-08	4.60E-06	PF	6	4.0E-11	B
Ce 137	2.32E+05	3.87E-05	7.52E-02	4.84E+00	PF	6	4.0E-07	B
I 129	2.94E-01	1.13E-07	4.08E-06	6.79E-06	PF	6	7.0E-08	B
Np 237	4.64E-01	1.29E-09	1.67E-07	1.07E-05	PF	6	1.2E-12	B
Pu 238	1.19E-01	3.20E-10	4.15E-08	2.67E-06	PF	6	2.1E-12	B
Pu 239/240	6.80E+00	1.89E-08	2.45E-06	1.57E-04	PF	6	2.0E-12	B
Pu 241	5.10E+00	1.17E-08	1.52E-06	9.77E-05	PF	6	1.0E-10	B
RuRh 106	3.40E-05	9.18E-17	7.62E-13	4.90E-11	PF	6	3.0E-08	B
Se 79	5.10E+00	1.42E-08	1.83E-06	1.18E-04	PF	6	1.0E-06	B
Sr 89/90	5.72E+04	9.59E-07	1.86E-02	1.20E+00	PF	6	9.0E-09	B
Tc 99	1.70E+02	4.72E-07	6.11E-05	3.93E-03	PF	6	2.0E-06	B
U 238	2.32E-01	6.44E-10	8.34E-08	5.36E-06	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN	Tank:	241-TX-111				
Sample Date	2/3/81	Contents:	Saltcake				
Sample ID	RAT-TX111-1	Watchlist:	N/A				
Properties	Value	Status:	IS / II				
Visc., lbm/ft-s ¹	7.7E-03	Retr. Method	Pumping/Sluicing				
pH	N/A						
Density, g/ml	1.42						
Temperature, R	552						
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷
Ag	4.64E-10	1.77E-16	3.70E-14	1.70E-12	PF	6	2.27E-03
Al	2.54E+01	3.87E-05	8.10E-03	3.71E-01	PF	5	9.06E+00
Ba	1.86E-04	5.58E-11	1.17E-08	5.35E-07	PF	6	8.92E-02
Bi	3.00E-01	5.90E-08	1.24E-05	5.66E-04	PF	6	
C ₆ H ₅ O ₇ anion	5.43E+00	1.46E-06	2.47E-04	1.40E-02	PF	6	
Ca	2.57E-10	2.64E-16	5.53E-14	2.54E-12	PF	6	6.11E+00
Ce	2.00E-02	5.88E-09	1.23E-06	5.64E-05	PF	6	
Cl	1.78E-08	1.31E-15	4.39E-12	2.01E-10	PF	6	
CO ₃	3.78E+01	2.59E-05	5.42E-03	2.49E-01	PF	5	
Cr	1.14E-02	2.01E-09	1.89E-06	8.67E-05	PF	6	2.35E-01
F	1.36E+00	1.73E-07	6.15E-04	2.82E-02	PF	6	3.22E+00
Fe	4.78E-01	3.52E-07	7.35E-05	3.37E-03	PF	6	2.18E+00
Fe(CN) ₆	1.93E-06	3.74E-13	7.83E-11	3.59E-09	PF	6	5.77E-01
HEDTA ¹²	4.00E-04	5.62E-11	1.17E-08	5.39E-07	PF	6	
K	1.64E-02	1.73E-08	3.62E-06	1.66E-04	PF	6	
Mn	3.93E-03	2.94E-09	6.15E-07	2.82E-05	PF	6	2.22E+00
Na	1.28E+02	2.30E-04	4.91E-02	2.21E+00	PF	6	2.13E+00
Ni	1.21E-02	8.47E-09	1.77E-06	8.12E-05	PF	6	4.14E-02
NO ₂	1.28E+01	8.84E-07	2.40E-03	1.10E-01	PF	6	
NO ₃	1.36E+02	6.92E-06	1.88E-02	8.64E-01	PF	6	

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
OH	3.55E+01	8.59E-05	1.80E-02	8.25E-01	PF	5	2.88E+00	C2 as NaOH
Pb	1.50E-07	2.98E-14	6.23E-12	2.86E-10	PF	6	5.91E-03	C1, A, D
PO ₄	2.85E+00	1.48E-06	3.11E-04	1.42E-02	PF	5		
SiO ₃	2.14E+00	1.16E-06	2.43E-04	1.11E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	4.14E+01	1.97E-06	3.71E-03	1.70E-01	PF	6		
Sr	1.86E-06	8.68E-13	1.82E-10	8.33E-09	PF	6		
TOC gC/l ¹⁷	6.48E+00	2.22E-05	4.65E-03	2.13E-01	PF	5		
ZrO	5.35E-02	2.06E-08	4.31E-06	1.98E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.67E+00	1.01E-08	1.28E-06	9.71E-05	PF	6	2.0E-11	B ¹⁹
Am 243	3.67E-03	1.02E-11	1.29E-09	9.77E-08	PF	6	2.0E-11	B
C 14	7.14E+00	1.98E-08	2.51E-06	1.90E-04	PF	6	6.0E-06	B
Cm 242	5.02E-03	2.78E-14	3.53E-12	2.67E-10	PF	6	7.0E-10	B
Cm 244	3.67E-02	8.74E-11	1.11E-08	8.38E-07	PF	6	4.0E-11	B
Cs 137	6.37E+04	1.06E-05	2.02E-02	1.53E+00	PF	6	4.0E-07	B
I 129	5.02E-02	1.94E-08	6.97E-07	1.34E-06	PF	6	7.0E-08	B
Np 237	7.14E-02	1.98E-10	2.51E-08	1.90E-06	PF	6	1.2E-12	B
Pu 238	1.49E-02	4.00E-11	5.07E-09	3.84E-07	PF	6	2.1E-12	B
Pu 239/240	8.49E-01	2.36E-09	2.99E-07	2.26E-05	PF	6	2.0E-12	B
Pu 241	6.37E-01	1.46E-09	1.86E-07	1.41E-05	PF	6	1.0E-10	B
RuRh 106	4.24E-06	1.15E-17	9.32E-14	7.05E-12	PF	6	3.0E-08	B
Se 79	7.14E-01	1.98E-09	2.51E-07	1.90E-05	PF	6	1.0E-06	B
Sr 89/90	3.67E+04	6.15E-07	1.17E-02	8.85E-01	PF	6	9.0E-09	B
Tc 99	3.67E+04	1.02E-07	1.29E-05	9.77E-04	PF	6	2.0E-06	B
U 238	1.43E-01	3.97E-10	5.03E-08	3.81E-06	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-112				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX112-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.5E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.45							
Temperature, R	533							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.30E-10	4.77E-17	1.02E-14	2.26E-13	PF	6	2.27E-03	C1
Al	4.32E+01	6.32E-05	1.35E-02	2.99E-01	PF	5	9.06E+00	C1
Ba	1.06E-04	3.05E-11	6.51E-09	1.44E-07	PF	6	8.92E-02	C1
Bi	8.55E-03	1.61E-09	3.45E-07	7.65E-06	PF	6		
C ₆ H ₅ O ₇ anion	1.55E-01	3.96E-08	6.90E-06	1.87E-04	PF	6		
Ca	8.14E-12	8.03E-18	1.72E-15	3.80E-14	PF	6	6.11E+00	C1 as CaCO ₃
Ce	4.48E-02	1.26E-08	2.70E-06	5.98E-05	PF	6		
Cl	1.30E-08	9.18E-16	3.14E-12	6.96E-11	PF	6		
CO ₃	7.80E+00	5.13E-06	1.10E-03	2.43E-02	PF	5		
Cr	4.07E-04	6.86E-11	6.60E-08	1.46E-06	PF	6	2.35E-01	C1, D
F	6.92E-01	8.45E-08	3.07E-04	6.81E-03	PF	6	3.22E+00	C1
Fe	1.59E-02	1.12E-08	2.39E-06	5.30E-05	PF	6	2.18E+00	C1
HEDTA ¹²	1.14E-05	1.54E-12	3.28E-10	7.27E-09	PF	6		
K	4.88E-04	4.94E-10	1.06E-07	2.34E-06	PF	6		
Mn	1.55E-04	1.11E-10	2.37E-08	5.26E-07	PF	6	2.22E+00	C2, D
Na	9.77E+01	1.68E-04	3.58E-02	7.94E-01	PF	6	2.13E+00	C2 as NaOH
Ni	5.29E-04	3.54E-10	7.56E-08	1.68E-06	PF	6	4.14E-02	C1, D
NO ₂	1.14E+01	7.52E-07	2.09E-03	4.63E-02	PF	6		
NO ₃	1.51E+02	7.37E-06	2.05E-02	4.54E-01	PF	6		
OH	5.82E+01	1.35E-04	2.89E-02	6.40E-01	PF	5	2.88E+00	C2 as NaOH

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pb	6.92E-09	1.32E-15	2.82E-13	6.25E-12	PF	6	5.91E-03	C1, A, D
PO ₄	3.80E+00	1.90E-06	4.06E-04	8.99E-03	PF	5		
SiO ₃	3.09E+00	1.61E-06	3.43E-04	7.61E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	3.50E+01	1.60E-06	3.07E-03	6.82E-02	PF	6		
Sr	7.33E-08	3.29E-14	7.02E-12	1.56E-10	PF	6		
TOC gC/l ¹⁷	3.90E+00	1.28E-05	2.74E-03	6.08E-02	PF	5		
ZrO	2.20E-03	8.11E-10	1.73E-07	3.84E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.21E-01	3.34E-10	4.15E-08	1.58E-06	PF	6	2.0E-11	B ¹⁹
Am 243	1.21E-04	3.36E-13	4.17E-11	1.59E-09	PF	6	2.0E-11	B
C 14	8.14E-01	2.26E-09	2.81E-07	1.07E-05	PF	6	6.0E-06	B
Cm 242	1.65E-02	9.15E-14	1.14E-11	4.33E-10	PF	6	7.0E-10	B
Cm 244	1.21E-03	2.88E-12	3.58E-10	1.37E-08	PF	6	4.0E-11	B
Cs 137	2.86E+04	4.78E-06	8.90E-03	3.39E-01	PF	6	4.0E-07	B
I 129	1.65E-02	6.37E-09	2.29E-07	2.17E-07	PF	6	7.0E-08	B
Np 237	3.30E-02	9.17E-11	1.14E-08	4.34E-07	PF	6	1.2E-12	B
Pu 238	3.30E-04	8.88E-13	1.10E-10	4.21E-09	PF	6	2.1E-12	B
Pu 239/240	2.75E-02	7.64E-11	9.48E-09	3.62E-07	PF	6	2.0E-12	B
Pu 241	8.14E-03	1.87E-11	2.32E-09	8.87E-08	PF	6	1.0E-10	B
RuRh 106	1.65E-07	4.46E-19	3.55E-15	1.35E-13	PF	6	3.0E-08	B
Se 79	2.86E-01	7.94E-10	9.86E-08	3.76E-06	PF	6	1.0E-06	B
Sr 89/90	3.30E+03	5.54E-08	1.03E-03	3.93E-02	PF	6	9.0E-09	B
Tc 99	8.14E+00	2.26E-08	2.81E-06	1.07E-04	PF	6	2.0E-06	B
U 238	1.65E-02	4.58E-11	5.69E-09	2.17E-07	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-113				
Sample Date	1/18/74		Contents:	Saltcake				
Sample ID	T-848		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	9.4E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.3							
Temperature, R	534							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	4.22E-11	2.02E-17	3.68E-15	1.62E-13	PF	6	2.27E-03	C1
Al	6.09E+00	1.17E-05	2.12E-03	9.35E-02	PF	6	9.06E+00	C1
Ba	5.66E-05	2.14E-11	3.88E-09	1.71E-07	PF	6	8.92E-02	C1
Bi	9.14E+00	2.26E-06	4.11E-04	1.81E-02	PF	6		
Ce	3.05E-02	1.13E-08	2.05E-06	9.01E-05	PF	6		
Cl	4.79E-09	4.42E-16	1.29E-12	5.66E-11	PF	6		
CO ₃	2.87E+01	2.48E-05	4.50E-03	1.98E-01	PF	6		
Cr	2.26E-01	5.00E-08	4.09E-05	1.80E-03	PF	6	2.35E-01	C1, D
F	1.00E+01	1.60E-06	4.95E-03	2.18E-01	PF	6	3.22E+00	C1
Fe	4.79E+00	4.42E-06	8.04E-04	3.54E-02	PF	6	2.18E+00	C1
Na	2.23E+02	5.02E-04	9.12E-02	4.02E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	7.83E+00	6.77E-07	1.60E-03	7.05E-02	PF	6		
NO ₃	1.35E+02	8.66E-06	2.05E-02	9.01E-01	PF	6		
OH	3.40E+01	1.03E-04	1.88E-02	8.28E-01	PF	5	2.88E+00	C2 as NaOH
Pb	3.79E-12	9.46E-19	1.72E-16	7.58E-15	PF	6	5.91E-03	C1, A, D
PO ₄	7.06E+00	4.62E-06	8.40E-04	3.70E-02	PF	5		
SiO ₃	1.65E+01	1.13E-05	2.05E-03	9.01E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.65E+01	9.89E-07	1.62E-03	7.13E-02	PF	6		
ZrO	1.39E+00	6.73E-07	1.22E-04	5.39E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.59E+00	7.14E-09	9.89E-07	5.72E-05	PF	6	2.0E-11	B ¹⁹

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 243	1.76E-04	4.90E-13	6.78E-11	3.92E-09	PF	6	2.0E-11	B
C 14	4.47E+00	1.24E-08	1.72E-06	9.93E-05	PF	6	6.0E-06	B
Cm 242	8.70E-03	4.83E-14	6.68E-12	3.86E-10	PF	6	7.0E-10	B
Cm 244	1.76E-05	4.20E-14	5.82E-12	3.37E-10	PF	6	4.0E-11	B
Cs 137	1.77E+05	1.96E-05	4.07E-02	2.35E+00	PF	5	4.0E-07	B
Cs 134	3.57E+02	1.32E-09	1.83E-07	1.06E-05	PF	5	4.0E-07	B
I 129	4.35E-03	1.68E-09	6.05E-08	9.68E-08	PF	6	7.0E-08	B
Np 237	1.29E-02	3.59E-11	4.98E-09	2.88E-07	PF	6	1.2E-12	B
Pu 238	1.29E-01	3.48E-10	4.82E-08	2.79E-06	PF	6	2.1E-12	B
Pu 239/240	2.59E+01	7.19E-08	9.95E-06	5.75E-04	PF	6	2.0E-12	B
Pu 241	1.29E+01	2.98E-08	4.12E-06	2.38E-04	PF	6	1.0E-10	B
RuRh 106	1.29E-07	3.49E-19	3.10E-15	1.79E-13	PF	6	3.0E-08	B
Se 79	8.70E-02	2.42E-10	3.35E-08	1.94E-06	PF	6	1.0E-06	B
Sr 89/90	3.53E+03	5.92E-08	1.23E-03	7.11E-02	PF	6	9.0E-09	B
Tc 99	3.53E+00	9.80E-09	1.36E-06	7.85E-05	PF	6	2.0E-06	B
U 238	4.35E+01	1.21E-07	1.67E-05	9.68E-04	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-114				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX114-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.7E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.43							
Temperature, R	550							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.58E-10	5.57E-17	1.25E-14	2.21E-13	PF	6	2.27E-03	C1
Al	4.18E+01	5.89E-05	1.32E-02	2.33E-01	PF	5	9.06E+00	C1
Ba	1.48E-04	4.11E-11	9.24E-09	1.63E-07	PF	6	8.92E-02	C1
Bi	1.04E+00	1.89E-07	4.24E-05	7.48E-04	PF	6		
Ce	6.91E-03	1.88E-09	4.22E-07	7.44E-06	PF	6		
Cl	1.38E-08	9.38E-16	3.38E-12	5.95E-11	PF	6		
CO ₃	7.20E+00	4.56E-06	1.03E-03	1.81E-02	PF	5		
Cr	2.57E-02	4.17E-09	4.22E-06	7.44E-05	PF	6	2.35E-01	C1, D
F	9.38E-02	1.10E-08	4.22E-05	7.44E-04	PF	6	3.22E+00	C1
Fe	5.43E-01	3.69E-07	8.29E-05	1.46E-03	PF	6	2.18E+00	C1
Na	1.04E+02	1.71E-04	3.85E-02	6.80E-01	PF	6	2.13E+00	C2 as NaOH
NO ₂	2.27E+00	1.44E-07	4.22E-04	7.44E-03	PF	6		
NO ₃	5.92E+01	2.79E-06	8.17E-03	1.44E-01	PF	6		
OH	6.68E+01	1.49E-04	3.36E-02	5.92E-01	PF	5	2.88E+00	C2 as NaOH
Pb	4.39E-13	8.07E-20	1.81E-17	3.20E-16	PF	6	5.91E-03	C1, A, D
PO ₄	2.85E+00	1.37E-06	3.08E-04	5.44E-03	PF	5		
SiO ₃	7.41E-01	3.70E-07	8.33E-05	1.47E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	3.31E+01	1.45E-06	2.95E-03	5.20E-02	PF	6		
TOC gC/l ¹⁷	2.84E+00	9.00E-06	2.02E-03	3.57E-02	PF	5		
ZrO	1.58E-01	5.61E-08	1.26E-05	2.23E-04	PF	6	1.14E+00	C1 as Zr

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 ¹⁸	2.94E-01	8.10E-10	1.02E-07	3.21E-06	PF	6	2.0E-11	B ¹⁹
Am 243	1.47E-05	4.08E-14	5.13E-12	1.62E-10	PF	6	2.0E-11	B
C 14	1.60E+00	4.45E-09	5.60E-07	1.76E-05	PF	6	6.0E-06	B
Cm 242	9.87E-04	5.48E-15	6.89E-13	2.17E-11	PF	6	7.0E-10	B
Cm 244	9.87E-05	2.35E-13	2.96E-11	9.33E-10	PF	6	4.0E-11	B
Cs 137	3.47E+04	5.80E-06	1.09E-02	3.45E-01	PF	6	4.0E-07	B
I 129	1.47E-02	5.67E-09	2.04E-07	1.62E-07	PF	6	7.0E-08	B
Np 237	4.00E-02	1.11E-10	1.40E-08	4.41E-07	PF	6	1.2E-12	B
Pu 238	4.94E-02	1.33E-10	1.67E-08	5.27E-07	PF	6	2.1E-12	B
Pu 239/240	2.94E+00	8.15E-09	1.03E-06	3.23E-05	PF	6	2.0E-12	B
Pu 241	1.47E+00	3.38E-09	4.25E-07	1.34E-05	PF	6	1.0E-10	B
RuRh 106	1.47E-08	3.96E-20	3.20E-16	1.01E-14	PF	6	3.0E-08	B
Se 79	2.94E-01	8.15E-10	1.03E-07	3.23E-06	PF	6	1.0E-06	B
Sr 89/90	4.00E+02	6.72E-09	1.27E-04	3.99E-03	PF	6	9.0E-09	B
Tc 99	9.87E+00	2.74E-08	3.45E-06	1.09E-04	PF	6	2.0E-06	B
U 238	1.47E+00	4.08E-09	5.13E-07	1.62E-05	PF	6	1.0E-10	B

Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-115				
Sample Date	2/3/81		Contents:	Saltcake				
Sample ID	RAT-TX115-1		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	7.6E-03		Retr. Method	Pumping/Sluicing				
pH	13.30							
Density, g/ml	1.27							
Temperature, R	541							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Aq	4.54E-11	1.85E-17	4.05E-15	1.85E-13	PF	6	2.27E-03	C1
Al	8.63E-01	1.41E-06	3.08E-04	1.41E-02	PF	5	9.06E+00	C1
Ba	2.64E-05	8.50E-12	1.86E-09	8.48E-08	PF	6	8.92E-02	C1
Bi	8.67E-02	1.83E-08	3.99E-06	1.82E-04	PF	6		
Ce	1.16E-02	3.64E-09	7.95E-07	3.63E-05	PF	6		
Cl	4.54E-09	3.57E-16	1.25E-12	5.71E-11	PF	6		
CO ₃	1.44E+01	1.06E-05	2.31E-03	1.06E-01	PF	5		
Cr	4.13E-03	7.77E-10	7.64E-07	3.49E-05	PF	6	2.35E-01	C1, D
F	3.14E+00	4.28E-07	1.59E-03	7.26E-02	PF	6	3.22E+00	C1
Fe	4.54E-02	3.57E-08	7.80E-06	3.57E-04	PF	6	2.18E+00	C1
Na	5.78E+01	1.11E-04	2.42E-02	1.11E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂	3.80E+00	2.80E-07	7.95E-04	3.63E-02	PF	6		
NO ₃	1.03E+02	5.64E-06	1.60E-02	7.32E-01	PF	6		
OH	3.40E+00	8.82E-06	1.93E-03	8.80E-02	PF	5	2.88E+00	C2 as NaOH
Pb	7.84E-13	1.67E-19	3.65E-17	1.67E-15	PF	6	5.91E-03	C1, A, D
PO ₄	4.75E+00	2.65E-06	5.79E-04	2.65E-02	PF	5		
SiO ₃	6.19E+00	3.59E-06	7.84E-04	3.58E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	7.84E+00	4.00E-07	7.86E-04	3.59E-02	PF	6		
TOC gC/l ¹⁷	3.20E-01	1.18E-06	2.57E-04	1.17E-02	PF	5		
ZrO	1.77E-02	7.31E-09	1.60E-06	7.30E-05	PF	6	1.14E+00	C1 as Zr

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 ¹⁸	2.90E-02	8.00E-11	1.13E-08	7.99E-07	PF	6	2.0E-11	B ¹⁹
Am 243	1.78E-06	4.96E-15	7.02E-13	4.95E-11	PF	6	2.0E-11	B
C 14	2.90E+00	8.05E-09	1.14E-06	8.04E-05	PF	6	6.0E-06	B
Cm 242	8.25E-05	4.58E-16	6.49E-14	4.57E-12	PF	6	7.0E-10	B
Cm 244	1.23E-03	2.92E-12	4.14E-10	2.92E-08	PF	6	4.0E-11	B
Cs 137	1.67E+04	2.80E-06	5.94E-03	4.19E-01	PF	6	4.0E-07	B
I 129	8.25E-03	3.19E-09	1.15E-07	2.29E-07	PF	6	7.0E-08	B
Np 237	1.23E-02	3.41E-11	4.83E-09	3.40E-07	PF	6	1.2E-12	B
Pu 238	2.45E-02	6.60E-11	9.36E-09	6.59E-07	PF	6	2.1E-12	B
Pu 239/240	2.45E-01	6.82E-10	9.66E-08	6.80E-06	PF	6	2.0E-12	B
Pu 241	1.23E-01	2.82E-10	4.00E-08	2.82E-06	PF	6	1.0E-10	B
RuRh 106	8.25E-07	2.23E-18	2.03E-14	1.43E-12	PF	6	3.0E-08	B
Se 79	1.23E-01	3.41E-10	4.83E-08	3.40E-06	PF	6	1.0E-06	B
Sr 89/90	1.23E+04	2.06E-07	4.37E-03	3.08E-01	PF	6	9.0E-09	B
Tc 99	4.13E+00	1.15E-08	1.62E-06	1.14E-04	PF	6	2.0E-06	B
U 238	8.25E+00	2.29E-08	3.25E-06	2.29E-04	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	TRAC		Tank:	241-TX-116				
Sample Date	N/A		Contents:	Saltcake				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	5.2E-04		Retr. Method	Pumping/Sluicing				
pH	11.33							
Density, g/ml	0.99							
Temperature, R	549							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	3.18E-11	2.86E-17	3.64E-15	5.43E-12	PF	6	2.27E-03	C1
Al	1.13E+00	4.06E-06	5.17E-04	7.71E-01	PF	6	9.06E+00	C1
Ba	5.02E-05	3.56E-11	4.53E-09	6.75E-06	PF	6	8.92E-02	C1
Bi	1.76E-16	8.16E-23	1.04E-20	1.55E-17	PF	6		
Ce	5.86E-03	4.06E-09	5.17E-07	7.71E-04	PF	6		
Cl	2.97E-09	5.15E-16	1.05E-12	1.56E-09	PF	6		
CO ₃	1.55E+01	2.50E-05	3.19E-03	4.75E+00	PF	6		
Cr	1.09E-16	4.51E-23	2.58E-20	3.86E-17	PF	6	2.35E-01	C1, D
F	1.59E+01	4.77E-06	1.03E-02	1.54E+01	PF	6	3.22E+00	C1
Na	3.47E+02	1.46E-03	1.87E-01	2.78E+02	PF	6	2.13E+00	C2 as NaOH
NO ₂	1.55E+00	2.51E-07	4.16E-04	6.20E-01	PF	6		
NO ₃	2.85E+02	3.42E-05	5.67E-02	8.46E+01	PF	6		
OH	3.64E-02	2.08E-07	2.65E-05	3.95E-02	PF	6	2.88E+00	C2 as NaOH
Pb	1.55E-13	7.26E-20	9.24E-18	1.38E-14	PF	6	5.91E-03	C1, A, D
PO ₄	1.63E+02	2.00E-04	2.55E-02	3.81E+01	PF	6		
SiO ₂	6.28E+01	8.01E-05	1.02E-02	1.52E+01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	7.95E+00	8.92E-07	1.02E-03	1.53E+00	PF	6		
ZrO	2.26E-04	2.05E-10	2.61E-08	3.89E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.96E-03	1.09E-11	1.99E-09	2.08E-06	PF	6	2.0E-11	B ¹⁹
Am 243	3.05E-07	8.48E-18	1.54E-13	1.61E-10	PF	6	2.0E-11	B

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C 14	4.19E-01	1.16E-09	2.11E-07	2.21E-04	PF	6	6.0E-06	B
Cm 242	4.30E-07	2.38E-18	4.34E-16	4.53E-13	PF	6	7.0E-10	B
Cm 244	1.70E-05	4.04E-14	7.35E-12	7.68E-09	PF	6	4.0E-11	B
Cs 137	8.37E+03	1.40E-06	3.82E-03	3.99E+00	PF	6	4.0E-07	B
I 129	3.39E-03	1.31E-09	4.72E-08	1.79E-06	PF	6	7.0E-08	B
Np 237	8.37E-03	2.33E-11	4.23E-09	4.42E-06	PF	6	1.2E-12	B
Pu 238	1.92E-03	5.18E-12	9.41E-10	9.83E-07	PF	6	2.1E-12	B
Pu 239/240	3.17E-07	8.80E-16	1.60E-13	1.67E-10	PF	6	2.0E-12	B
Pu 241	4.64E-10	1.07E-18	1.94E-16	2.03E-13	PF	6	1.0E-10	B
RuRh 106	2.49E-10	6.72E-22	7.84E-18	8.19E-15	PF	6	3.0E-08	B
Se 79	8.37E-02	2.33E-10	4.23E-08	4.42E-05	PF	6	1.0E-06	B
Sr 89/90	1.70E+04	2.85E-07	7.76E-03	8.11E+00	PF	6	9.0E-09	B
To 99	2.49E+00	6.91E-09	1.26E-06	1.31E-03	PF	6	2.0E-06	B
U 238	1.24E+00	3.46E-09	6.29E-07	6.57E-04	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	TRAC		Tank:	241-TX-117				
Sample Date	N/A		Contents:	Saltcake				
Sample ID	TRAC		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	4.8E-04		Retr. Method	Pumping/Sluicing				
pH	11.39							
Density, g/ml	0.99							
Temperature, R	555							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.35E-11	1.11E-17	1.55E-15	2.24E-12	PF	6	2.27E-03	C1
Al	5.91E-01	1.93E-06	2.70E-04	3.91E-01	PF	6	9.06E+00	C1
Ba	5.06E-05	3.26E-11	4.56E-09	6.61E-06	PF	6	8.92E-02	C1
Bi	3.54E-11	1.50E-17	2.09E-15	3.03E-12	PF	6		
Ce	2.95E-03	1.86E-09	2.61E-07	3.77E-04	PF	6		
Cl	1.18E-09	1.86E-16	4.17E-13	6.03E-10	PF	6		
CO ₃	2.78E+01	4.10E-05	5.73E-03	8.30E+00	PF	6		
Cr	1.10E-12	4.14E-19	2.61E-16	3.77E-13	PF	6	2.35E-01	C1, D
F	2.41E+01	6.57E-06	1.56E-02	2.26E+01	PF	6	3.22E+00	C1
Fe	2.36E-23	3.73E-29	5.21E-27	7.54E-24	PF	6	2.18E+00	C1
Na	3.12E+02	1.20E-03	1.68E-01	2.43E+02	PF	6	2.13E+00	C2 as NaOH
NO ₂	5.91E-01	8.72E-08	1.59E-04	2.30E-01	PF	6		
NO ₃	1.94E+02	2.13E-05	3.87E-02	5.60E+01	PF	6		
OH	4.22E-02	2.19E-07	3.06E-05	4.44E-02	PF	6	2.88E+00	C2 as NaOH
Pb	6.33E-13	2.70E-19	3.78E-17	5.46E-14	PF	6	5.91E-03	C1, A, D
PO ₄	2.03E+02	2.26E-04	3.17E-02	4.58E+01	PF	6		
SiO ₃	1.94E+01	2.26E-05	3.15E-03	4.56E+00	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	3.25E+00	3.32E-07	4.18E-04	6.05E-01	PF	6		
ZrO	4.09E-04	3.38E-10	4.72E-08	6.84E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	8.55E-03	2.36E-11	4.29E-09	4.78E-06	PF	6	2.0E-11	B ¹⁹

Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 243	1.71E-06	4.75E-15	8.64E-13	9.61E-10	PF	6	2.0E-11	B
C 14	4.22E+00	1.17E-08	2.13E-06	2.37E-03	PF	6	6.0E-06	B
Cm 242	8.44E-06	4.68E-17	8.51E-15	9.47E-12	PF	6	7.0E-10	B
Cm 244	8.44E-06	2.01E-14	1.66E-12	4.07E-09	PF	6	4.0E-11	B
Cs 137	2.51E+03	4.19E-07	1.14E-03	1.27E+00	PF	6	4.0E-07	B
I 129	1.25E-03	4.84E-10	1.74E-08	7.05E-07	PF	6	7.0E-08	B
Np 237	3.42E-03	9.50E-12	1.73E-09	1.92E-06	PF	6	1.2E-12	B
Pu 238	8.44E-03	2.27E-11	4.13E-09	4.60E-06	PF	6	2.1E-12	B
Pu 239/240	4.22E-06	1.17E-14	2.13E-12	2.37E-09	PF	6	2.0E-12	B
Pu 241	8.44E-09	1.94E-17	3.53E-15	3.93E-12	PF	6	1.0E-10	B
RuRh 106	1.25E-09	3.39E-21	3.95E-17	4.40E-14	PF	6	3.0E-08	B
Se 79	2.51E-02	6.97E-11	1.27E-08	1.41E-05	PF	6	1.0E-06	B
Sr 89/90	2.96E+04	4.97E-07	1.36E-02	1.51E+01	PF	6	9.0E-09	B
Tc 99	8.44E-01	2.34E-09	4.26E-07	4.74E-04	PF	6	2.0E-06	B
U 238	8.44E+00	2.34E-08	4.26E-06	4.74E-03	PF	6	1.0E-10	B

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Tank Farm 241-TX Vapor Estimates

Sample Type	SN		Tank:	241-TX-118				
Sample Date	10/16/81		Contents:	Saltcake				
Sample ID	RAT-TX118-4		Watchlist:	FeCN, Organic Salts				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	9.7E-03		Retr. Method	Pumping/Sluicing				
pH	12.83							
Density, g/ml	1.4							
Temperature, R	534							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag	1.22E-08	8.35E-15	9.86E-13	6.51E-11	PF	6	2.27E-03	C1
Al	7.72E+00	2.12E-05	2.50E-03	1.65E-01	PF	5	9.06E+00	C1
Ba	2.28E-03	1.23E-09	1.46E-07	9.61E-06	PF	6	8.92E-02	C1
Bi	6.39E-08	2.26E-14	2.67E-12	1.76E-10	PF	6		
C ₂ H ₃ O ₃ anion	4.03E+00	3.98E-06	4.70E-04	3.10E-02	PF	6		
C ₆ H ₅ O ₇ anion	9.90E+01	6.72E-05	4.57E-03	5.23E-01	PF	6		
Ca	1.29E-06	2.39E-12	2.82E-10	1.86E-08	PF	6	6.11E+00	C1 as CaCO ₃
Ce	5.33E-02	2.82E-08	3.32E-06	2.19E-04	PF	6		
Cd	4.06E-03	2.68E-09	3.17E-07	2.09E-05	PF	5	5.46E-04	C1, C2, D
Cl	2.66E-08	3.52E-15	6.65E-12	4.39E-10	PF	6		
CO ₃	1.45E+01	1.79E-05	2.11E-03	1.39E-01	PF	5		
Cr	3.96E-03	1.25E-09	6.65E-07	4.39E-05	PF	6	2.35E-01	C1, D
EDTA ¹²	2.21E+01	5.59E-06	6.60E-04	4.36E-02	PF	6		
F	1.54E-01	3.53E-08	7.08E-05	4.67E-03	PF	4	3.22E+00	C1
Fe	2.65E-02	3.50E-08	4.13E-06	2.73E-04	PF	5	2.18E+00	C1
Fe(CN) ₆	3.04E-01	1.06E-07	1.25E-05	8.28E-04	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	4.26E+01	1.08E-05	1.27E-03	8.38E-02	PF	6		
K	2.97E-01	5.63E-07	6.65E-05	4.39E-03	PF	6		
Mn	1.61E-01	2.17E-07	2.56E-05	1.69E-03	PF	5	2.22E+00	C2, D
Na	9.82E+01	3.16E-04	3.73E-02	2.46E+00	PF	5	2.11E+00	C2 as NaOH
Ni	1.09E-02	1.37E-08	1.61E-06	1.06E-04	PF	5	4.14E-02	C1, D
NO ₂	1.75E+02	2.17E-05	3.32E-02	2.19E+00	PF	6		

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Tank Farm 241-TX Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₃	5.63E+01	5.17E-06	7.93E-03	5.24E-01	PF	6		
OH	1.14E+00	4.97E-06	5.86E-04	3.87E-02	PF	6	2.88E+00	C2 as NaOH
Pb	8.50E-02	3.04E-08	3.59E-06	2.37E-04	PF	5	5.91E-03	C1, A, D
PO ₄	1.45E+02	1.35E-04	1.60E-02	1.06E+00	PF	6		
Pu	2.88E-05	8.74E-12	1.03E-09	6.80E-08	PF	5		
Si	5.00E-03	1.32E-08	1.56E-06	1.03E-04	PF	5	8.73E+00	C1
SiO ₃	3.50E+01	3.41E-05	4.02E-03	2.66E-01	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.89E+02	2.48E-05	2.63E-02	1.74E+00	PF	6		
Sr	5.17E-02	4.35E-08	5.13E-06	3.39E-04	PF	5		
TOC gC/l ¹⁷	1.28E+00	7.89E-06	9.31E-04	6.15E-02	PF	5		
Zr	3.90E-03	3.17E-09	3.74E-07	2.47E-05	PF	5	1.34E+00	C1, C3
ZrO	3.27E-03	2.26E-09	2.67E-07	1.76E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	1.48E+01	4.01E-08	5.16E-06	3.13E-04	PF	5	2.0E-11	B ¹⁹
Am 243	5.35E-01	1.49E-09	1.91E-07	1.16E-05	PF	6	2.0E-11	B
C 14	7.61E+02	2.11E-06	2.72E-04	1.65E-02	PF	6	6.0E-06	B
Cm 242	1.52E+00	8.44E-12	1.09E-09	6.58E-08	PF	6	7.0E-10	B
Cm 244	7.61E-01	1.81E-09	2.33E-07	1.41E-05	PF	6	4.0E-11	B
Cs 137	1.36E+05	1.80E-05	3.48E-02	2.11E+00	PF	4	4.0E-07	B
I 129	7.61E-01	2.94E-07	1.06E-05	1.65E-05	PF	6	7.0E-08	B
Np 237	1.52E+00	4.23E-09	5.44E-07	3.29E-05	PF	6	1.2E-12	B
Pu 238	1.52E+01	4.10E-08	5.27E-06	3.19E-04	PF	6	2.1E-12	B
Pu 239/240	1.77E+00	4.91E-09	6.31E-07	3.82E-05	PF	5	2.0E-12	B
Pu 241	3.09E+03	7.10E-06	9.13E-04	5.53E-02	PF	6	1.0E-10	B
RuRh 106	2.47E-03	6.67E-15	5.50E-11	3.33E-09	PF	6	3.0E-08	B
Se 79	1.52E+01	4.23E-08	5.44E-06	3.29E-04	PF	6	1.0E-06	B
Sr 89/90	1.14E+02	1.53E-09	2.95E-05	1.79E-03	PF	4	9.0E-09	B
Tc 99	6.79E+02	1.89E-06	2.42E-04	1.47E-02	PF	6	2.0E-06	B
U 238	6.17E+00	1.71E-08	2.20E-06	1.34E-04	PF	6	1.0E-10	B

Tank Farm 241-TX Vapor Estimates

- Note: 1. No viscosity data available; therefore, viscosity estimated assuming 40 vol. % solids. For tanks TX-116, 117 used estimate of water corrected for tank temperature.
- Note: 1A. Density raised in tank TX-101 from 1.17 to 2.0 and Al reduced by E+02, in TX-108 from 1.38 to 1.8, in TX-109 from 1.42 to 1.7, and in TX-118 from 1.3 to 1.4 and NO3 reduced by E+02 to obtain positive moles of water.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data denoted by 6. Lab data for tanks TX-101, 103, 104, 107, and 113 denoted by 5 due to tank activity after the sampling date. Lab data for tank TX-102 denoted by 5 due to samples taken from sludge. Lab data for tanks TX-105, 106, 108, 109, 110, 111, 112, 114, 115, and 118 denoted by 4, 5 based on partition factor availability. NO3 in tank TX-101 reduced by 10 to obtain positive ppm values. Data in tanks TX-103, 106, 107, 112, 114, and 115 appears incomplete as moles of water too high for given concentrations and density.
- Note: 7. Allowable concentration, vapor component in ppm by volume for vapors, ppm by weight (@STP) for non-volatiles.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspiciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (i.e., 1994 - 1987 = 7).
- Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-TY Vapor Estimates

Sample Type	SL			Tank:	241-TY-101				
Sample Date	9/11/85			Contents:	Sludge				
Sample ID	51XC0000			Watchlist:	FeCN				
Properties	Value			Status:	IS / II				
Visc., lbm/ft-s ¹	1.2E-02			Retr. Method	Pumping/Sluicing				
pH	9.31								
Density, g/ml	1.64								
Temperature, °R	525								
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation	
Aq ⁹	6.31E-03	2.44E-09	4.36E-07	1.46E-05	PF	5	2.27E-03	C1	
Al	4.77E+01	7.36E-05	1.32E-02	4.41E-01	PF	5	9.06E+00	C1	
Ba	3.15E+00	9.57E-07	1.71E-04	5.74E-03	PF	5	8.92E-02	C1	
Bi	4.46E+01	8.89E-06	1.59E-03	5.32E-02	PF	5			
Ce	6.27E-03	1.86E-09	3.34E-07	1.12E-05	PF	6			
Cd	1.74E-02	6.47E-09	1.16E-06	3.88E-05	PF	5	5.46E-04	C1, C2, D	
Cl	1.21E+00	9.00E-08	2.58E-04	8.63E-03	PF	5			
CO ₃	2.69E+01	1.86E-05	3.34E-03	1.12E-01	PF	6			
Cr	1.38E+01	2.45E-06	1.98E-03	6.62E-02	PF	5	2.35E-01	C1, D	
F	5.53E+00	7.13E-07	2.17E-03	7.26E-02	PF	5	3.22E+00	C1	
Fe	6.59E+01	4.90E-05	8.77E-03	2.94E-01	PF	5	2.18E+00	C1	
Mn	9.15E-01	6.93E-07	1.24E-04	4.15E-03	PF	5	2.22E+00	C2, D	
Na	1.98E+02	3.50E-04	6.42E-02	2.15E+00	PF	5	2.13E+00	C2 as NaOH	
Ni	8.36E+00	5.90E-06	1.06E-03	3.54E-02	PF	5	4.14E-02	C1, D	
NO ₂	1.03E+00	7.17E-08	1.67E-04	5.58E-03	PF	6			
NO ₃	2.38E+02	1.23E-05	2.86E-02	9.58E-01	PF	5			
OH	3.48E-04	8.52E-10	1.53E-07	5.11E-06	PF	5	2.88E+00	C2 as NaOH	
P	4.15E+01	5.57E-05	9.98E-03	3.34E-01	PF	5			
Pb	3.67E-01	7.38E-08	1.32E-05	4.42E-04	PF	5	5.91E-03	C1, A, D	
PO ₄	2.91E+01	1.53E-05	2.75E-03	9.19E-02	PF	6			
Pu	5.08E-03	8.67E-10	1.55E-07	5.20E-06	PF	5			
Si	6.35E+01	9.44E-05	1.69E-02	5.66E-01	PF	5	8.73E+00	C1	
SiO ₃	5.15E-01	2.82E-07	5.05E-05	1.69E-03	PF	6	1.93E+00	C1 (Amorphous)	
SO ₄	9.00E+00	4.33E-07	6.99E-04	2.34E-02	PF	5			
TOC gC/l ¹⁷	1.09E+00	3.78E-06	6.77E-04	2.27E-02	PF	5			
Zr	6.31E-01	2.89E-07	5.17E-05	1.73E-03	PF	5	1.34E+00	C1, C3	

Tank Farm 241-TY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
ZrO	7.16E+00	2.79E-06	4.99E-04	1.67E-02	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	2.13E+01	5.84E-08	6.41E-06	3.50E-04	PF	5	2.0E-11	B ¹⁹
Am 243	1.33E-02	3.70E-11	4.06E-09	2.21E-07	PF	6	2.0E-11	B
C 14	1.43E+00	3.97E-09	4.35E-07	2.38E-05	PF	5	6.0E-06	B
Cm 242	6.65E-04	3.69E-15	4.05E-13	2.21E-11	PF	6	7.0E-10	B
Cm 244	2.24E-04	5.34E-13	5.86E-11	3.20E-09	PF	6	4.0E-11	B
Cs 137	4.65E+04	6.83E-06	1.12E-02	6.14E-01	PF	5	4.0E-07	B
Co 60	1.64E+01	1.39E-08	1.53E-06	8.33E-05	PF	5	8.0E-08	B
I 129	7.70E-02	2.97E-08	1.07E-06	1.28E-06	PF	5	7.0E-08	B
Np 237	1.63E-02	4.54E-11	4.98E-09	2.72E-07	PF	6	1.2E-12	B
Pu 238	3.12E+02	8.06E-07	8.85E-05	4.83E-03	PF	5	2.1E-12	B
Pu 239/240	3.11E+02	8.63E-07	9.47E-05	5.17E-03	PF	5	2.0E-12	B
Pu 241	6.65E+02	1.53E-06	1.68E-04	9.17E-03	PF	6	1.0E-10	B
RuRh 106	2.00E-05	5.39E-17	3.79E-13	2.07E-11	PF	6	3.0E-08	B
Se 79	1.33E-01	3.70E-10	4.06E-08	2.21E-06	PF	6	1.0E-06	B
Sr 89/90	2.03E+04	3.01E-07	4.96E-03	2.71E-01	PF	5	9.0E-09	B
Tc 99	1.21E+01	3.36E-08	3.68E-06	2.01E-04	PF	5	2.0E-06	B
U 238	2.69E+00	7.48E-09	8.22E-07	4.48E-05	PF	5	1.0E-10	B
water		1.93E+04	1.93E+04	1.93E+04	Stm Tabl	1		

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Tank Farm 241-TY Vapor Estimates

Sample Type	DL		Tank:	241-TY-102				
Sample Date	9/9/85		Contents:	Saltcake				
Sample ID	41XDO000		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	6.7E-03		Retr. Method	Pumping/Sluicing				
pH	12.92							
Density, g/ml	1.3							
Temperature, °R	550							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	1.32E-08	8.73E-15	1.15E-12	9.91E-11	PF	6	2.27E-03	C1
Al	1.16E+00	3.05E-06	4.02E-04	3.47E-02	PF	6	9.06E+00	C1
Ba	1.24E-03	6.45E-10	8.50E-08	7.32E-06	PF	6	8.92E-02	C1
Bi	1.73E+00	5.92E-07	7.80E-05	6.72E-03	PF	6		
C ₆ H ₅ O ₇ anion	1.57E+01	2.06E-05	7.80E-04	2.34E-01	PF	6		
Ca	1.32E-08	2.36E-14	3.10E-12	2.67E-10	PF	6	6.11E+00	C1 as CaCO ₃
Ce	1.16E-02	5.89E-09	7.76E-07	6.68E-05	PF	6		
Cl	4.54E-08	5.78E-15	1.22E-11	1.05E-09	PF	6		
CO ₃	2.31E+02	2.75E-04	3.62E-02	3.12E+00	PF	6		
Cr	6.60E-02	2.01E-08	1.19E-05	1.03E-03	PF	6	2.35E-01	C1, D
F	5.51E-01	1.22E-07	2.73E-04	2.35E-02	PF	4	3.22E+00	C1
Fe	1.86E+00	2.37E-06	3.12E-04	2.69E-02	PF	6	2.18E+00	C1
Fe(CN) ₆	1.11E-03	3.75E-10	4.94E-08	4.26E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	2.31E-02	5.63E-09	7.42E-07	6.39E-05	PF	6		
K	1.61E-01	2.94E-07	3.88E-05	3.34E-03	PF	6		
Mn	1.57E-02	2.03E-08	2.68E-06	2.31E-04	PF	6	2.22E+00	C2, D
Na	1.80E-02	1.18E-03	1.55E-01	1.34E+01	PF	6	2.13E+00	C2 as NaOH
Ni	4.95E-09	5.99E-15	7.89E-13	6.80E-11	PF	6	4.14E-02	C1, D
NO ₂	1.52E+00	1.81E-07	3.11E-04	2.68E-02	PF	4		
NO ₃	3.63E+02	3.21E-05	5.51E-02	4.74E+00	PF	4		
OH	1.40E+00	5.89E-06	7.76E-04	6.68E-02	PF	6	2.88E+00	C2 as NaOH
Pb	3.59E-12	1.24E-18	1.63E-16	1.40E-14	PF	6	5.91E-03	C1, A, D
PO ₄	7.84E+01	7.08E-05	9.33E-03	8.04E-01	PF	6		
SiO ₃	1.57E+00	1.47E-06	1.94E-04	1.67E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.06E+01	1.70E-06	2.02E-03	1.74E-01	PF	4		

Tank Farm 241-TY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Sr	1.07E-09	8.70E-16	1.15E-13	9.87E-12	PF	6		
ZrO	3.55E-01	2.37E-07	3.12E-05	2.69E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	5.84E+01	1.60E-07	2.21E+05	1.81E-03	PF	5	2.0E-11	B ¹⁹
Am 243	1.23E+04	3.41E-13	4.72E+11	3.87E-09	PF	6	2.0E-11	B
C 14	2.57E+02	7.12E-07	9.86E-05	8.08E-03	PF	6	6.0E-06	B
Cm 242	1.67E-05	9.28E-17	1.28E-14	1.05E-12	PF	6	7.0E-10	B
Cm 244	4.13E-01	9.84E-10	1.36E-07	1.12E-05	PF	6	4.0E-11	B
Cs 137	1.62E+04	2.38E-06	4.94E-03	4.05E-01	PF	4	4.0E-07	B
Co 60	1.75E+00	1.49E-09	2.06E-07	1.69E-05	PF	5	8.0E-08	B
I 129	1.67E+00	6.46E-07	2.33E-05	5.27E-05	PF	6	7.0E-08	B
Np 237	2.45E+00	6.82E-09	9.44E-07	7.74E-05	PF	6	1.2E-12	B
Pu 238	2.12E+00	5.70E-09	7.90E-07	6.47E-05	PF	6	2.1E-12	B
Pu 239/240	1.45E+01	4.03E-08	5.58E-06	4.57E-04	PF	6	2.0E-12	B
Pu 241	1.67E+01	3.85E-08	5.33E-06	4.37E-04	PF	6	1.0E-10	B
RuRh 106	1.23E-05	3.31E-17	2.94E-13	2.41E-11	PF	6	3.0E-08	B
Se 79	2.90E+01	8.06E-08	1.12E-05	9.14E-04	PF	6	1.0E-06	B
Sr 89/90	4.13E+04	6.92E-07	1.44E-02	1.18E+00	PF	6	9.0E-09	B
Tc 99	8.25E+02	2.29E-06	3.17E-04	2.60E-02	PF	6	2.0E-06	B
U 238	2.90E+02	8.06E-11	1.12E-08	9.14E-07	PF	6	1.0E-10	B
water		5.03E+04	5.03E+04	5.03E+04	Stm Tabl	1		

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Tank Farm 241-TY Vapor Estimates

Sample Type	DL		Tank:	241-TY-103				
Sample Date	8/21/85		Contents:	Sludge				
Sample ID	33XC0000		Watchlist:	FeCN				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	1.4E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.24							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	1.58E-08	7.70E-15	1.45E-12	4.10E-11	PF	6	2.27E-03	C1
Al	4.40E+01	8.56E-05	1.61E-02	4.56E-01	PF	6	9.06E+00	C1
Ba	7.99E-04	3.06E-10	5.75E-08	1.63E-06	PF	6	8.92E-02	C1
Bi	3.42E+01	8.60E-06	1.62E-03	4.59E-02	PF	6		
C ₆ H ₅ O ₇ anion	1.79E+01	7.63E-06	9.36E-04	4.07E-02	PF	6		
Ca	5.87E-08	7.70E-14	1.45E-11	4.11E-10	PF	6	6.11E+00	C1 as CaCO ₃
Ce	2.28E-03	8.56E-10	1.61E-07	4.56E-06	PF	6		
Cl	2.16E+00	2.03E-07	6.08E-04	1.73E-02	PF	4		
CO ₃	4.08E+00	3.57E-06	6.70E-04	1.90E-02	PF	5		
Cr	8.48E-01	1.90E-07	1.61E-04	4.56E-03	PF	6	2.35E-01	C1, D
F	5.13E-01	8.34E-08	2.66E-04	7.56E-03	PF	4	3.22E+00	C1
Fe	1.96E+01	1.83E-05	3.44E-03	9.78E-02	PF	6	2.18E+00	C1
Fe (CN) ₆	1.30E-03	3.23E-10	6.07E-08	1.72E-06	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ¹²	3.10E-02	5.55E-09	1.04E-06	2.96E-05	PF	6		
K	1.96E-01	2.63E-07	4.95E-05	1.40E-03	PF	6		
Mn	1.79E-02	1.71E-08	3.21E-06	9.13E-05	PF	6	2.22E+00	C2, D
Na	1.16E+02	2.64E-04	4.96E-02	1.41E+00	PF	6	2.13E+00	C2 as NaOH
Ni	3.75E-11	3.34E-17	6.27E-15	1.78E-13	PF	6	4.14E-02	C1, D
NO ₂	1.37E+01	1.20E-06	2.94E-03	8.34E-02	PF	4		
NO ₃	2.19E+02	1.43E-05	3.48E-02	9.89E-01	PF	4		
OH	1.11E+02	3.42E-04	6.43E-02	1.83E+00	PF	6	2.88E+00	C2 as NaOH
Pb	1.96E-12	4.96E-19	9.32E-17	2.65E-15	PF	6	5.91E-03	C1, A, D
PO ₄	1.55E+01	1.03E-05	1.93E-03	5.49E-02	PF	6		
SiO ₃	1.11E+00	7.66E-07	1.44E-04	4.08E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	1.10E+01	6.68E-07	1.13E-03	3.21E-02	PF	4		

Tank Farm 241-TY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Sr	4.40E-08	2.63E-14	4.93E-12	1.40E-10	PF	6		
TOC gC/l ¹⁷	1.94E+00	8.49E-06	1.59E-03	4.53E-02	PF	5		
U, g/l	3.90E-02	8.60E-09	1.62E-06	4.59E-05	PF	5	5.14E-03	Cl
ZrO	5.22E+00	2.56E-06	4.81E-04	1.36E-02	PF	6	1.14E+00	Cl as Zr
Am 241 ¹⁸	4.15E+00	1.14E-08	1.65E-06	6.06E-05	PF	5	2.0E-11	B ¹⁹
Am 243	6.61E-03	1.84E-11	2.66E-09	9.78E-08	PF	6	2.0E-11	B
C 14	3.26E+02	9.05E-07	1.31E-04	4.83E-03	PF	6	6.0E-06	B
Cm 242	1.15E-03	6.36E-15	9.23E-13	3.39E-11	PF	6	7.0E-10	B
Cm 244	4.85E-01	1.16E-09	1.68E-07	6.16E-06	PF	6	4.0E-11	B
Cs 137	2.96E+03	4.35E-07	9.47E-04	3.48E-02	PF	4	4.0E-07	B
Co 60	1.76E+00	1.50E-09	2.17E-07	7.98E-06	PF	5	8.0E-08	B
I 129	1.63E+00	6.30E-07	2.27E-05	2.41E-05	PF	6	7.0E-08	B
Np 237	3.26E+00	9.06E-09	1.31E-06	4.83E-05	PF	6	1.2E-12	B
Pu 238	1.63E+02	4.39E-07	6.37E-05	2.34E-03	PF	6	2.1E-12	B
Pu 239/240	5.73E+02	1.59E-06	2.31E-04	8.48E-03	PF	6	2.0E-12	B
Pu 241	2.07E-02	3.76E-11	5.46E-09	2.01E-07	PF	5	1.0E-10	B
RuRh 106	2.60E-05	7.02E-17	6.54E-13	2.40E-11	PF	6	3.0E-08	B
Se 79	3.26E+01	9.06E-08	1.31E-05	4.83E-04	PF	6	1.0E-06	B
Sr 89/90	1.89E+05	2.81E-06	6.11E-02	2.24E+00	PF	5	9.0E-09	B
Tc 99	1.62E+01	4.50E-08	6.53E-06	2.40E-04	PF	5	2.0E-06	B
U 238	2.76E-02	7.66E-13	1.11E-08	4.08E-07	PF	5	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-TY Vapor Estimates

Sample Type	SN		Tank:	241-TY-104				
Sample Date	8/12/85		Contents:	Sludge/ SN				
Sample ID	2320000		Watchlist:	FeCN/Organic Salts				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	7.3E-03		Retr. Method	Pumping/Sluicing				
pH	12.11							
Density, g/ml	1.21							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	7.20E-03	3.12E-09	6.74E-07	3.35E-05	PF	5	2.27E-03	C1
Al	6.28E-01	1.09E-06	2.35E-04	1.17E-02	PF	5	9.06E+00	C1
Ba	2.00E-04	6.82E-11	1.47E-08	7.33E-07	PF	5	8.92E-02	C1
Bi	2.60E-03	5.81E-10	1.26E-07	6.24E-06	PF	5		
Ca	6.89E-11	8.05E-17	1.74E-14	8.65E-13	PF	6	6.11E+00	C1 as CaCO ₃
Ce	6.32E-03	2.11E-09	4.56E-07	2.26E-05	PF	6		
Cd	5.00E-04	2.09E-10	4.51E-08	2.24E-06	PF	5	5.46E-04	C1, C2, D
Cl	6.32E-10	5.27E-17	1.82E-13	9.06E-12	PF	6		
CO ₃	4.00E+01	3.11E-05	6.74E-03	3.35E-01	PF	5		
Cr	1.89E+00	3.77E-07	3.67E-04	1.82E-02	PF	4	2.35E-01	C1, D
F	5.89E-01	8.52E-08	3.13E-04	1.56E-02	PF	4	3.22E+00	C1
Fe	2.64E-01	2.20E-07	4.76E-05	2.37E-03	PF	5	2.18E+00	C1
Fe (CN) ₆	2.30E-03	5.06E-10	1.09E-07	5.44E-06	PF	6	5.77E-01	C1 as CN, D ¹³
K	6.89E-03	8.25E-09	1.79E-06	8.87E-05	PF	6		
Mn	4.00E-03	3.40E-09	7.35E-07	3.65E-05	PF	5	2.22E+00	C2, D
Na	7.48E+01	1.52E-04	3.29E-02	1.63E+00	PF	5	2.13E+00	C2 as NaOH
Ni	2.67E-02	2.11E-08	4.57E-06	2.27E-04	PF	5	4.14E-02	C1, D
NO ₂	6.90E+00	5.39E-07	1.52E-03	7.53E-02	PF	4		
NO ₃	1.14E+02	6.61E-06	1.86E-02	9.23E-01	PF	4		
OH	2.21E-01	6.07E-07	1.31E-04	6.52E-03	PF	5	2.88E+00	C2 as NaOH
P	4.10E+00	6.18E-06	1.34E-03	6.64E-02	PF	5		
Pb	1.60E-03	3.61E-10	7.81E-08	3.88E-06	PF	5	5.91E-03	C1, A, D
PO ₄	2.70E+00	1.60E-06	3.45E-04	1.71E-02	PF	6		
Pu	3.12E-05	5.97E-12	1.29E-09	6.42E-08	PF	5		
Si	8.60E-03	1.43E-08	3.10E-06	1.54E-04	PF	5	8.73E+00	C1
SiO ₃	4.36E-01	2.68E-07	5.80E-05	2.88E-03	PF	6	1.93E+00	C1 (Amorphous)

Tank Farm 241-TY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
SO ₄	6.24E+00	3.37E-07	6.57E-04	3.26E-02	PF	4		
Sr	1.03E-08	5.49E-15	1.19E-12	5.89E-11	PF	6		
TOC gC/l ¹⁷	2.05E+00	7.98E-06	1.73E-03	8.57E-02	PF	5		
U, g/l	3.70E-02	7.26E-09	1.57E-06	7.80E-05	PF	5	5.14E-03	C1
Zr	9.20E-04	4.72E-10	1.02E-07	5.07E-06	PF	5	1.34E+00	C1, C3
ZrO	4.94E-01	2.16E-07	4.66E-05	2.32E-03	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	3.05E-01	8.35E-10	1.24E-07	8.97E-06	PF	5	2.0E-11	B ¹⁹
Am 243	1.71E-03	4.74E-12	7.05E-10	5.09E-08	PF	6	2.0E-11	B
C 14	1.17E+00	3.25E-09	4.83E-07	3.49E-05	PF	5	6.0E-06	B
Cm 244	1.15E-03	2.74E-12	4.07E-10	2.94E-08	PF	6	4.0E-11	B
Cs 137	1.91E+04	2.81E-06	6.26E-03	4.52E-01	PF	4	4.0E-07	B
Co 60	2.38E+00	2.02E-09	3.01E-07	2.17E-05	PF	5	8.0E-08	B
I 129	4.03E+03	1.56E-09	5.61E-08	1.20E-07	PF	6	7.0E-08	B
Np 237	1.16E-02	3.23E-11	4.81E-09	3.47E-07	PF	6	1.2E-12	B
Pu 238	3.41E+00	9.19E-09	1.37E-06	9.87E-05	PF	6	2.1E-12	B
Pu 239/240	1.91E+00	5.30E-09	7.89E-07	5.70E-05	PF	5	2.0E-12	B
Pu 241	5.74E+01	1.32E-07	1.96E-05	1.42E-03	PF	6	1.0E-10	B
RuRh 106	1.38E-06	3.73E-18	3.56E-14	2.57E-12	PF	6	3.0E-08	B
Se 79	5.74E-02	1.59E-10	2.37E-08	1.71E-06	PF	6	1.0E-06	B
Sr 89/90	1.11E+02	1.65E-09	3.67E-05	2.65E-03	PF	4	9.0E-09	B
Tc 99	5.99E+01	1.66E-07	2.48E-05	1.79E-03	PF	5	2.0E-06	B
U 238	2.61E-02	7.25E-11	1.08E-08	7.79E-07	PF	5	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-TY Vapor Estimates

Sample Type	SL		Tank:	241-TY-105				
Sample Date	9/13/85		Contents:	Sludge				
Sample ID	61XC0000		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s ¹	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	9.68							
Density, g/ml	1.53							
Temperature, °R	531							
Analyte ²	Value ¹	Present Vapor Composition ⁴	Future Vapor Source ³	Future Vapor Receiver ³	Method	Data Rel. ⁵	Allowable ⁷	Regulatory Citation
Ag ⁹	2.43E-03	9.83E-10	1.80E-07	6.41E-06	PF	5	2.27E-03	C1
Al	2.92E+00	4.72E-06	8.64E-04	3.08E-02	PF	5	9.06E+00	C1
Ba	7.63E-02	2.43E-08	4.45E-06	1.58E-04	PF	5	8.92E-02	C1
Bi	5.97E-01	1.25E-07	2.28E-05	8.13E-04	PF	5		
Ce	1.60E-05	4.99E-12	9.14E-10	3.25E-08	PF	6		
Cd	8.37E-03	3.26E-09	5.97E-07	2.13E-05	PF	5	5.46E-04	C1, C2, D
Cl	9.57E-01	7.46E-08	2.18E-04	7.78E-03	PF	5		
CO ₃	7.55E+01	5.49E-05	1.00E-02	3.58E-01	PF	6		
F	5.13E-01	6.93E-08	2.16E-04	7.68E-03	PF	5	3.22E+00	C1
Fe	3.20E+01	2.49E-05	4.57E-03	1.63E-01	PF	5	2.18E+00	C1
Mn	2.49E-01	1.98E-07	3.62E-05	1.29E-03	PF	5	2.22E+00	C2, D
Na	1.76E+02	3.34E-04	6.11E-02	2.18E+00	PF	5	2.13E+00	C2 as NaOH
Ni	1.30E-01	9.62E-08	1.76E-05	6.27E-04	PF	5	4.14E-02	C1, D
NO ₂	6.49E+00	4.74E-07	1.13E-03	4.01E-02	PF	5		
NO ₃	2.72E+02	1.47E-05	3.51E-02	1.25E+00	PF	5		
OH	8.15E-04	2.09E-09	3.83E-07	1.36E-05	PF	5	2.88E+00	C2 as NaOH
P	5.94E+01	8.36E-05	1.53E-02	5.45E-01	PF	5		
Pb	5.94E-01	1.25E-07	2.29E-05	8.16E-04	PF	5	5.91E-03	C1, A, D
PO ₄	2.17E+01	1.20E-05	2.20E-03	7.82E-02	PF	6		
Si	5.63E-01	8.78E-07	1.61E-04	5.72E-03	PF	5	8.73E+00	C1
SiO ₃	1.72E-03	9.85E-10	1.80E-07	6.42E-06	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	8.36E+00	4.22E-07	6.96E-04	2.48E-02	PF	5		
TOC gC/l ¹⁷	1.23E+00	4.47E-06	8.19E-04	2.92E-02	PF	5		

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Tank Farm 241-TY Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
U, g/l	6.26E+00	1.51E-06	2.77E-04	9.87E-03	PF	5	5.14E-03	C1, C3
Zr	1.12E-02	5.37E-09	9.83E-07	3.50E-05	PF	5	1.34E+00	C1, C3
ZrO	4.92E-03	2.01E-09	3.67E-07	1.31E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁰	4.86E+01	1.33E-07	1.57E-05	8.68E-04	PF	5	2.0E-11	B19-1
Am 243	2.29E-03	6.35E-12	7.47E-10	4.14E-08	PF	6	2.0E-11	B
C 14	1.20E+00	3.33E-09	3.92E-07	2.17E-05	PF	5	6.0E-06	B
Cm 242	5.87E-02	3.26E-13	3.83E-11	2.12E-09	PF	6	7.0E-10	B
Cm 244	2.29E-04	5.45E-13	6.41E-11	3.55E-09	PF	6	4.0E-11	B
Cs 137	1.45E+04	2.14E-06	3.77E-03	2.09E-01	PF	5	4.0E-07	B
Co 60	2.25E+01	1.91E-08	2.25E-06	1.25E-04	PF	5	8.0E-08	B
I 129	5.27E-02	2.03E-08	7.33E-07	9.54E-07	PF	5	7.0E-08	B
Np 237	3.40E-02	9.44E-11	1.11E-08	6.15E-07	PF	6	1.2E-12	B
Pu 238	5.87E-01	1.58E-09	1.86E-07	1.03E-05	PF	6	2.1E-12	B
Pu 239/240	3.70E+01	1.03E-07	1.21E-05	6.70E-04	PF	5	2.0E-12	B
Pu 241	2.29E+01	5.26E-08	6.19E-06	3.43E-04	PF	6	1.0E-10	B
RuRh 106	2.29E-06	6.18E-18	4.66E-14	2.58E-12	PF	6	3.0E-08	B
Se 79	3.40E-01	9.44E-10	1.11E-07	6.15E-06	PF	6	1.0E-06	B
Sr 89/90	3.51E+05	5.21E-06	9.19E-02	5.09E+00	PF	5	9.0E-09	B
Tc 99	5.03E+01	1.40E-07	1.64E-05	9.10E-04	PF	5	2.0E-06	B
U 238	5.84E+00	1.62E-08	1.91E-06	1.06E-04	PF	5	1.0E-10	B
water		2.59E+04	2.59E+04	2.59E+04	Stm Table	1		

Tank Farm 241-TY Vapor Estimates

Sample Type	SL		Tank:	241-TY-106				
Sample Date	9/26/85		Contents:	Sludge				
Sample ID	161C0000		Watchlist:	N/A				
Properties	Value		Status:	IS / II				
Visc., lbm/ft-s	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	8.48							
Density, g/ml	1.43							
Temperature, °R	526							
Analyte ²	Value ³	q Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Ag ⁹	9.08E-03	7.30E-09	7.19E-07	5.22E-05	PF	5	2.27E-03	C1
Al	1.52E+01	4.88E-05	4.81E-03	3.49E-01	PF	5	9.06E+00	C1
Ba	3.03E-01	1.92E-07	1.89E-05	1.37E-03	PF	5	8.92E-02	C1
Bi	3.52E-01	1.46E-07	1.44E-05	1.04E-03	PF	5		
Ce	1.09E-12	6.74E-19	6.64E-17	4.82E-15	PF	6		
Cd	2.46E-02	1.91E-08	1.88E-06	1.36E-04	PF	5	5.46E-04	C1, C2, D
Cl	1.10E-15	1.71E-22	2.69E-19	1.95E-17	PF	6		
CO ₃	9.32E+00	1.35E-05	1.33E-03	9.64E-02	PF	6		
Cr	1.12E-01	4.15E-08	1.84E-05	1.34E-03	PF	5	2.35E-01	C1, D
F	1.48E-10	3.96E-17	6.64E-14	4.82E-12	PF	6	3.22E+00	C1
Fe	7.39E+01	1.14E-04	1.13E-02	8.18E-01	PF	5	2.18E+00	C1
Mn	8.71E-01	1.37E-06	1.35E-04	9.82E-03	PF	5	2.22E+00	C2, D
Na	1.10E+02	4.15E-04	4.09E-02	2.97E+00	PF	5	2.13E+00	C2 as NaOH
Ni	8.81E-02	1.30E-07	1.28E-05	9.26E-04	PF	5	4.14E-02	C1, D
NO ₂	3.57E-10	5.18E-17	6.64E-14	4.82E-12	PF	6		
NO ₃	1.83E+02	1.97E-05	2.52E-02	1.83E+00	PF	5		
OH	5.09E-05	2.60E-10	2.56E-08	1.86E-06	PF	5	2.88E+00	C2 as NaOH
P	1.96E+01	5.49E-05	5.41E-03	3.92E-01	PF	5		
Pb	5.36E-01	2.25E-07	2.21E-05	1.61E-03	PF	5	5.91E-03	C1, A, D
PO ₄	1.48E-06	1.62E-12	1.60E-10	1.16E-08	PF	6		
Pu	4.95E-04	1.76E-10	1.73E-08	1.26E-06	PF	5		
Si	1.60E+02	4.96E-04	4.89E-02	3.54E+00	PF	5	8.73E+00	C1
SiO ₂	7.15E+02	8.16E-04	8.04E-02	5.83E+00	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.95E-03	2.96E-10	2.63E-07	1.91E-05	PF	6		
TOC gC/l ¹⁷	2.99E+00	2.16E-05	2.13E-03	1.55E-01	PF	5		
U, g/l	8.58E+00	3.13E-06	3.08E-04	2.24E-02	PF	5	5.14E-03	C1

Tank Farm 241-TY Vapor Estimates

Analyte ²	Value ³	q Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel.	Allowable ⁷	Regulatory Citation
Zr	6.18E-01	5.89E-07	5.81E-05	4.21E-03	PF	5	1.34E+00	C1, C3
ZrO	4.97E-03	4.03E-09	3.97E-07	2.88E-05	PF	6	1.14E+00	C1 as Zr
Am 241 ¹⁸	7.92E+01	2.17E-07	2.73E-05	1.55E-03	PF	5	2.0E-11	B ¹⁹
Am 243	3.11E+03	8.63E-12	1.09E-09	6.17E-08	PF	6	2.0E-11	B
C 14	1.14E+00	3.16E-09	3.97E-07	2.26E-05	PF	5	6.0E-06	B
Cm 242	7.98E-02	4.43E-13	5.57E-11	3.16E-09	PF	6	7.0E-10	B
Cm 244	1.55E-11	3.70E-20	4.66E-18	2.65E-16	PF	6	4.0E-11	B
Cs 137	3.19E+04	4.69E-06	8.85E-03	5.03E-01	PF	5	4.0E-07	B
Co 60	2.42E+01	2.05E-08	2.59E-06	1.47E-04	PF	5	8.0E-08	B
I 129	1.72E+02	6.63E-05	2.39E-03	3.41E-03	PF	5	7.0E-08	B
Np 237	4.62E+04	1.28E-12	1.62E-10	9.17E-09	PF	6	1.2E-12	B
Pu 238	9.24E+01	2.49E-09	3.13E-07	1.78E-05	PF	6	2.1E-12	B
Pu 239/240	3.03E+01	8.41E-08	1.06E-05	6.01E-04	PF	5	2.0E-12	B
Pu 241	3.11E+01	7.15E-08	9.00E-06	5.11E-04	PF	6	1.0E-10	B
RuRh 106	3.11E-06	8.39E-18	6.77E-14	3.85E-12	PF	6	3.0E-08	B
Se 79	1.55E-08	4.32E-17	5.43E-15	3.09E-13	PF	6	1.0E-06	B
Sr 89/90	2.35E+05	3.48E-06	6.56E-02	3.73E+00	PF	5	9.0E-05	B
Tc 99	1.67E+01	4.65E-08	5.85E-06	3.32E-04	PF	5	2.0E-06	B
U 238	6.46E+00	1.79E-08	2.26E-06	1.28E-04	PF	5	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-TY Vapor Estimates

- Note: 1. No viscosity data available; therefore, viscosity estimated assuming 40 vol. % solids.
- Note: 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note: 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit.
- Note: 4. Estimated current vapor composition ppm by volume for volatiles, ppm by mass for non-volatiles, and microcurie/l for radionuclides.
- Note: 5. Estimated future vapor composition based on stated retrieval model.
- Note: 6. TRAC data denoted by 6. Lab data for tanks TY-101, 105 and 106 denoted by 5 due to samples taken from sludge. Lab data for tanks TY-102, 103, and 104 denoted by 4, 5 based on PF availability.
- Note: 7. Allowable concentration, vapor component in ppm by volume for vapors, ppm by weight (@STP) for non-volatiles.
- Note: 9. TRAC data used to estimate concentration.
- Note: 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note: 13. As cyanide compounds.
- Note: 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note: 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note: 18. Radionuclides decayed to current year (i.e., 1994 - 1987 = 7).
- Note: 19. Allowable data based on DCG's in microcurie/l.

Tank Farm 241-U Vapor Estimates

Sample Type	TRAC		Tank:	241-U-101				
Sample Date			Contents:	Sludge/SN				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	5.7E-02		Retr. Method	Pumping/Sluicing				
pH	11.94							
Density, g/ml	1.4							
Temperature, °R	531							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	1.2E+02	2.60E-04	3.76E-02	2.05E-01	PF	6	9.06E+00	C1
Ba ⁹	2.7E-03	1.21E-09	1.75E-07	9.56E-07	PF	6	8.92E-02	C1
CO ₃ ⁹	2.4E+02	2.45E-04	3.54E-02	1.93E-01	PF	6		
Na ⁹	7.4E+02	1.94E-03	2.81E-01	1.53E+00	PF	6	2.13E+00	C2 as NaOH
NO ₃ ⁹	4.5E-01	3.40E-08	6.40E-05	3.50E-04	PF	6		
OH ⁹	1.5E-01	5.26E-07	7.60E-05	4.15E-04	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	9.1E+01	6.95E-05	1.00E-02	5.49E-02	PF	6		
SO ₄ ⁹	9.1E+01	6.35E-06	8.27E-03	4.51E-02	PF	6		
ZrO ⁹	2.6E-03	1.49E-09	2.16E-07	1.18E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	9.4E+01	2.60E-07	3.34E-05	2.05E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	6.3E-02	1.74E-10	2.24E-08	1.38E-07	PF	6	2.0E-11	B
C 14 ⁹	1.1E+02	2.93E-07	3.77E-05	2.32E-04	PF	6	6.0E-06	B
Cm 242 ⁹	3.1E-04	1.74E-15	2.24E-13	1.38E-12	PF	6	7.0E-10	B
Cm 244 ⁹	8.6E-02	2.04E-10	2.63E-08	1.61E-07	PF	6	4.0E-11	B
Cs 137 ⁹	6.3E+05	1.05E-04	2.02E-01	1.24E+00	PF	6	4.0E-07	B
I 129 ⁹	3.1E-01	1.21E-07	4.37E-06	6.89E-07	PF	6	7.0E-08	B
Np 237 ⁹	8.6E-01	2.38E-09	3.06E-07	1.88E-06	PF	6	1.2E-12	B
Pu 238 ⁹	2.1E+00	5.69E-09	7.31E-07	4.49E-06	PF	6	2.1E-12	B
Pu 239/240 ⁹	2.5E+01	7.06E-08	9.08E-06	5.57E-05	PF	6	2.0E-12	B
Pu 241 ⁹	3.1E+01	7.23E-08	9.29E-06	5.71E-05	PF	6	1.0E-10	B

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
RuRh 106 ⁹	9.4E-05	2.55E-16	2.10E-12	1.29E-11	PF	6	3.0E-08	B
Se 79 ⁹	5.4E+00	1.51E-08	1.94E-06	1.19E-05	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.1E+05	1.77E-06	3.42E-02	2.10E-01	PF	6	9.0E-09	B
Tc 99 ⁹	2.1E+02	5.87E-07	7.55E-05	4.64E-04	PF	6	2.0E-06	B
U 238 ⁹	2.1E+01	5.87E-08	7.55E-06	4.64E-05	PF	6	1.0E-10	B
water		2.59E+04	2.59E+04	2.59E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	SN		Tank:	241-U-102				
Sample Date	3/1/76		Contents:	Sludge/SN/Saltcake				
Sample ID	RAT-U102-1		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	7.8E-03		Retr. Method	Pumping/Sluicing				
pH	11.17							
Density, g/ml	1.27							
	545							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	5.40E-01	9.20E-07	1.93E-04	6.29E-03	PF	5	9.06E+00	C1
Ba ⁹	3.5E-04	1.16E-10	2.43E-08	7.95E-07	PF	6	8.92E-02	C1
C ₂ H ₃ O ₃ anion ⁹	2.7E-03	1.65E-09	3.45E-07	1.13E-05	PF	6		
C ₆ H ₅ O ₇ anion ⁹	5.4E-01	1.44E-07	2.73E-05	9.83E-04	PF	6		
Ca ⁹	5.7E-08	6.50E-14	1.36E-11	4.44E-10	PF	6	6.11E+00	C1 as CaCO ₃
Ce ⁹	2.0E-02	6.50E-09	1.36E-06	4.44E-05	PF	6		
CO ₃	1.02E+01	7.82E-06	1.64E-03	5.35E-02	PF	5		
Cr	5.62E-03	1.10E-09	1.04E-06	3.40E-05	PF	5	2.35E-01	C1, D
EDTA ^{9,12}	1.6E-02	2.56E-09	5.36E-07	1.75E-05	PF	6		
F ⁹	2.7E-01	3.82E-08	1.36E-04	4.44E-03	PF	6	3.22E+00	C1
Fe	5.11E-02	4.20E-08	8.78E-06	2.87E-04	PF	5	2.18E+00	C1
Fe(CN) ₆ ⁹	1.9E-07	4.14E-14	8.66E-12	2.83E-10	PF	6	5.77E-01	C1 as CN, D ¹³
HEDTA ^{9,12}	4.0E-02	6.21E-09	1.30E-06	4.25E-05	PF	6		
K ⁹	2.8E-04	3.25E-10	6.80E-08	2.22E-06	PF	6		
Na ⁹	3.2E+01	6.50E-05	1.36E-02	4.44E-01	PF	6	2.13E+00	C2 as NaOH
Ni	3.02E-01	2.36E-07	4.93E-05	1.61E-03	PF	5	4.14E-02	C1, D
NO ₂	1.38E+01	1.06E-06	2.89E-03	9.43E-02	PF	5		
NO ₃	2.16E+02	1.23E-05	3.35E-02	1.10E+00	PF	5		
OH ⁹	2.5E-02	6.88E-08	1.44E-05	4.70E-04	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	1.5E-07	3.30E-14	6.90E-12	2.25E-10	PF	6	5.91E-03	C1, A, D
PO ₄	1.98E-01	1.15E-07	2.41E-05	7.87E-04	PF			

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu	2.10E-04	3.96E-11	8.28E-09	2.71E-07	PF	5		
Si	7.81E-02	1.28E-07	2.68E-05	8.77E-04	PF	5	8.73E+00	C1
SiO ₃ ⁹	1.6E+00	9.84E-07	2.06E-04	6.72E-03	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	6.1E+00	3.23E-07	6.09E-04	1.99E-02	PF	6		
Sr ⁹	3.1E-06	1.63E-12	3.40E-10	1.11E-08	PF	6		
ZrO ⁹	1.2E-04	5.16E-11	1.08E-08	3.53E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,10}	3.6E+00	1.00E-08	1.42E-06	6.84E-05	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.4E-03	3.92E-12	5.56E-10	2.68E-08	PF	6	2.0E-11	B
C 14 ⁹	2.1E+01	5.83E-08	8.26E-06	3.99E-04	PF	6	6.0E-06	B
Cm 242 ⁹	5.0E-03	2.75E-14	3.90E-12	1.88E-10	PF	6	7.0E-10	B
Cm 244 ⁹	1.4E-02	3.37E-11	4.77E-09	2.30E-07	PF	6	4.0E-11	B
Gs 137	1.37E+05	1.60E-05	3.40E-02	1.64E+00	PF	5	4.0E-07	B
CePr 144	1.04E+04	2.88E-12	4.08E-10	1.97E-08	PF	5	3.0E-08	B
Co 60	2.10E+03	5.47E-07	7.75E-05	3.74E-03	PF	5	8.0E-08	B
Eu 154	2.89E+03	1.55E-06	2.48E-04	1.20E-02	PF	5	5.0E-08	B
Eu 155	2.89E+03	5.84E-07	8.27E-05	3.99E-03	PF	5	3.0E-07	B
I 129 ⁹	5.0E-02	1.92E-08	6.90E-07	9.43E-07	PF	6	7.0E-08	B
Np 237 ⁹	1.4E-01	3.92E-10	5.56E-08	2.68E-06	PF	6	1.2E-12	B
Pu 238 ⁹	1.8E-03	4.93E-12	6.99E-10	3.37E-08	PF	6	2.1E-12	B
Pu 239/240	1.29E+01	3.57E-08	5.06E-06	2.44E-04	PF	5	2.0E-12	B
Pu 241 ⁹	1.5E-05	3.43E-14	4.86E-12	2.34E-10	PF	6	1.0E-10	B
RuRh 106	3.18E+03	5.20E-13	4.72E-09	2.28E-07	PF	5	3.0E-08	B
Se 79 ⁹	7.1E-01	1.96E-09	2.78E-07	1.34E-05	PF	6	1.0E-06	B
Sr 89/90	2.58E+04	3.06E-07	6.50E-03	3.14E-01	PF	5	9.0E-09	B
Tc 99 ⁹	3.6E+01	1.01E-07	1.43E-05	6.89E-04	PF	6	2.0E-06	B
U 238 ⁹	3.6E-09	1.01E-17	1.43E-15	6.89E-14	PF		1.0E-10	B
water		4.35E+04	4.35E+04	4.35E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	Sludge		Tank:	241-U-103				
Sample Date	12/4/78		Contents:	Sludge/SN/Saltcake				
Sample ID	3064		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	9.6E-03		Retr. Method	Pumping/Sluicing				
pH	13.61							
Density, g/ml	1.4							
Temperature, °R	550							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.88E+01	4.46E-05	6.08E-03	2.38E-01	PF	5	9.06E+00	C1
Ba ⁹	4.2E-04	1.98E-10	2.70E-08	1.06E-06	PF	6	8.92E-02	C1
Cl	2.80E+00	3.20E-07	6.99E-04	2.74E-02	PF	5		
CO ₃	3.36E+01	3.58E-05	4.89E-03	1.92E-01	PF	5		
Cr	4.20E+00	1.15E-06	7.05E-04	2.76E-02	PF	5	2.35E-01	C1, D
F	3.50E-02	6.93E-09	1.61E-05	6.30E-04	PF	5	3.22E+00	C1
Fe	4.20E+00	4.80E-06	6.55E-04	2.57E-02	PF	5	2.18E+00	C1
Hg	1.40E-01	4.46E-08	6.08E-06	2.38E-04	PF	5	6.08E-03	B, C1, C2
K	1.40E+00	2.30E-06	3.13E-04	1.23E-02	PF	5		
La	1.06E+01	4.88E-06	6.66E-04	2.61E-02	PF	5		
Mn	7.00E-03	8.15E-09	1.11E-06	4.35E-05	PF	5	2.22E+00	C2, D
Na	3.08E+02	8.57E-04	1.17E-01	4.58E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	4.20E+01	4.49E-06	7.97E-03	3.12E-01	PF	5		
NO ₃	6.41E+02	5.09E-05	9.03E-02	3.54E+00	PF	5		
OH	7.00E+00	2.64E-05	3.60E-03	1.41E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	3.14E+01	2.54E-05	3.47E-03	1.36E-01	PF	5		
Pu	9.76E-05	2.56E-11	3.49E-09	1.37E-07	PF	5		
Si	8.68E+00	1.98E-05	2.71E-03	1.06E-01	PF	5	8.73E+00	C1
SiO ₃ ⁹	4.3E-04	3.61E-10	4.93E-08	1.93E-06	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.80E+00	2.07E-07	2.55E-04	9.98E-03	PF	5		
TOC gC/l ¹⁷	9.61E+00	5.13E-05	6.99E-03	2.74E-01	PF	5		
U, g/l	1.38E-02	3.71E-09	5.06E-07	1.98E-05	PF	5	5.14E-03	C1
Am 241 ¹⁸	8.9E+01	2.42E-07	3.11E-05	1.29E-03	PF	5	2.0E-11	B ¹⁹
Am 243 ⁹	4.0E-08	1.10E-16	1.42E-14	5.89E-13	PF	6	2.0E-11	B

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
C 14 ⁹	2.3E-03	6.35E-12	8.17E-10	3.40E-08	PF	6	6.0E-06	B
Cm 242 ⁹	1.1E-07	6.26E-19	8.05E-17	3.35E-15	PF	6	7.0E-10	B
Cm 244 ⁹	1.1E-06	2.69E-15	3.46E-13	1.44E-11	PF	6	4.0E-11	B
Cs 137	2.2E+05	2.70E-05	5.20E-02	2.16E+00	PF	5	4.0E-07	B
I 129 ⁹	5.6E-06	2.18E-12	7.85E-11	8.38E-11	PF	6	7.0E-08	B
Np 237 ⁹	1.7E-05	4.66E-14	5.99E-12	2.49E-10	PF	6	1.2E-12	B
Pu 238 ⁹	5.6E-03	1.52E-11	1.95E-09	8.12E-08	PF	6	2.1E-12	B
Pu 239/240	6.0E+00	1.67E-08	2.14E-06	8.91E-05	PF	5	2.0E-12	B
Pu 241 ⁹	1.7E-07	3.86E-16	4.96E-14	2.06E-12	PF	6	1.0E-10	B
RuRh 106 ⁹	4.6E-09	1.24E-20	1.02E-16	4.24E-15	PF	6	3.0E-08	B
Se 79 ⁹	1.1E-04	3.14E-13	4.03E-11	1.68E-09	PF	6	1.0E-06	B
Sr 89/90	6.8E+03	8.42E-08	1.62E-03	6.75E-02	PF	5	9.0E-09	B
Tc 99 ⁹	3.8E-03	1.06E-11	1.36E-09	5.66E-08	PF	6	2.0E-06	B
U 238	9.7E-03	2.70E-11	3.47E-09	1.44E-07	PF	5	1.0E-10	B
water		5.03E+04	5.03E+04	5.03E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	Sludge		Tank:	241-U-104				
Sample Date	3/14/61		Contents:	Sludge				
Sample ID	M-179		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	4.5E-03		Retr. Method	Pumping/Sluicing				
pH	10.03							
Density, g/ml	1.05							
Temperature, °R	524							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
CO ₃ ⁹	5.2E-07	4.92E-13	1.01E-10	6.42E-09	PF	6		
Na ⁹	1.0E+02	2.52E-04	5.15E-02	3.28E+00	PF	6	2.13E+00	C2 as NaOH
OH ⁹	1.8E-03	6.15E-09	1.26E-06	8.02E-05	PF	6	2.88E+00	C2 as NaOH
Pu	3.17E-05	7.38E-12	1.51E-09	9.62E-08	PF	5		
SiO ₃ ⁹	1.7E+02	1.26E-04	2.59E-02	1.65E+00	PF	6	1.93E+00	C1 (Amorphous)
U, g/l	6.71E+00	1.60E-06	3.28E-04	2.09E-02	PF	5	5.14E-03	C1
Am 241 ^{9,18}	2.4E-07	6.62E-16	1.14E-13	8.63E-12	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.1E-10	3.09E-19	5.29E-17	4.02E-15	PF	6	2.0E-11	B
C 14 ⁹	4.3E-09	1.20E-17	2.06E-15	1.57E-13	PF	6	6.0E-06	B
Cm 242 ⁹	6.4E-12	3.57E-23	6.12E-21	4.65E-19	PF	6	7.0E-10	B
Cm 244 ⁹	4.3E-11	1.03E-19	1.77E-17	1.35E-15	PF	6	4.0E-11	B
Ce 137	7.6E+02	5.00E-08	1.54E-04	1.17E-02	PF	5	4.0E-07	B
Co 60	2.6E-03	9.56E-14	1.64E-11	1.25E-09	PF	5	8.0E-08	B
I 129 ⁹	4.3E-10	1.67E-16	6.02E-15	1.57E-14	PF	6	7.0E-08	B
Np 237 ⁹	8.8E-10	2.44E-18	4.18E-16	3.18E-14	PF	6	1.2E-12	B
Pu 238 ⁹	4.3E-08	1.17E-16	2.00E-14	1.52E-12	PF	6	2.1E-12	B
Pu 239/240	1.9E+00	5.40E-09	9.26E-07	7.04E-05	PF	5	2.0E-12	B
Pu 241 ⁹	2.2E-07	4.98E-16	8.54E-14	6.49E-12	PF	6	1.0E-10	B
Se 79 ⁹	6.4E-09	1.79E-17	3.07E-15	2.33E-13	PF	6	1.0E-06	B
Sr 89/90	4.9E+02	3.98E-09	1.02E-04	7.77E-03	PF	5	9.0E-09	B
Tc 99 ⁹	2.2E-07	6.02E-16	1.03E-13	7.84E-12	PF	6	2.0E-06	B
U 238	4.7E+00	1.31E-08	2.25E-06	1.71E-04	PF	5	1.0E-10	B
water		1.83E+04	1.83E+04	1.83E+04	Stm Tabl	1		

Tank Farm 241-U Vapor Estimates

Sample Type	Saltcake		Tank:	241-U-105				
Sample Date	12/4/78		Contents:	Sludge/SN/Saltcake				
Sample ID	RAT-U105-3		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.0E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.62							
Temperature, °R	549							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.94E+01	3.11E-05	5.42E-03	1.52E-01	PF	5	9.06E+00	C1
Ba ⁹	7.0E-05	2.20E-11	3.83E-09	1.08E-07	PF	6	8.92E-02	C1
Bi	1.62E-01	3.35E-08	5.85E-06	1.64E-04	PF	5		
CO ₃	8.75E+01	6.31E-05	1.10E-02	3.09E-01	PF	5		
La	9.72E-01	3.03E-07	5.28E-05	1.48E-03	PF	5		
Na	5.99E+02	1.13E-03	1.97E-01	5.52E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	6.80E+01	4.92E-06	1.12E-02	3.13E-01	PF	5		
NO ₃	2.98E+02	1.60E-05	3.63E-02	1.02E+00	PF	5		
OH	1.94E+01	4.94E-05	8.61E-03	2.42E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	4.86E+00	2.66E-06	4.64E-04	1.30E-02	PF	5		
Pu	2.70E-03	4.79E-10	8.35E-08	2.34E-06	PF	5		
Si	3.45E+01	5.33E-05	9.30E-03	2.61E-01	PF	5	8.73E+00	C1
SiO ₃ ⁹	9.5E-04	5.40E-10	9.41E-08	2.64E-06	PF	6	1.93E+00	C1 (Amorphous)
SO ₄	2.43E+01	1.22E-06	1.91E-03	5.36E-02	PF	5		
TOC gC/l ¹⁷	4.54E+01	1.64E-04	2.86E-02	8.02E-01	PF	5		
U, g/l	2.73E-01	4.96E-08	8.66E-06	2.43E-04	PF	5	5.14E-03	C1
ZrO ⁹	1.3E-05	5.37E-12	9.36E-10	2.63E-08	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9/18}	1.3E-01	3.49E-10	3.88E-08	1.71E-06	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	3.0E-05	1.04E-13	1.16E-11	5.11E-10	PF	6	2.0E-11	B
C 14 ⁹	4.4E-03	1.23E-11	1.37E-09	6.04E-08	PF	6	6.0E-06	B
Cm 242 ⁹	3.2E-06	1.80E-17	2.00E-15	8.81E-14	PF	6	7.0E-10	B
Cm 244 ⁹	5.6E-06	1.34E-14	1.49E-12	6.58E-11	PF	6	4.0E-11	B
Ce 137	4.1E+05	5.01E-05	8.35E-02	3.68E+00	PF	5	4.0E-07	B

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
I 129 ⁹	1.3E-05	4.88E-12	1.76E-10	1.72E-10	PF	6	7.0E-08	B
Np 237 ⁹	2.6E-05	7.12E-14	7.91E-12	3.49E-10	PF	6	1.2E-12	B
Pu 238 ⁹	5.6E-03	1.52E-11	1.69E-09	7.43E-08	PF	6	2.1E-12	B
Pu 239/240	1.4E+02	3.86E-07	4.29E-05	1.89E-03	PF	5	2.0E-12	B
Pu 241 ⁹	4.4E-02	1.02E-10	1.14E-08	5.00E-07	PF	6	1.0E-10	B
RuRh 106 ⁹	6.3E-11	1.71E-22	1.22E-18	5.36E-17	PF	6	3.0E-08	B
Se 79 ⁹	2.6E-04	7.12E-13	7.91E-11	3.48E-09	PF	6	1.0E-06	B
Sr 89/90	3.7E+05	4.61E-06	7.69E-02	3.39E+00	PF	5	9.0E-09	B
Tc 99 ⁹	6.3E-03	1.76E-11	1.95E-09	8.60E-08	PF	6	2.0E-06	B
U 238	1.9E-01	5.33E-10	5.92E-08	2.61E-06	PF	5	1.0E-10	B
water		4.89E+04	4.89E+04	4.89E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	SN		Tank:	241-U-106				
Sample Date	2/26/74		Contents:	Sludge/SN/Saltcake				
Sample ID	T-1970		Watchlist:	Organic Salts				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	7.1E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.31							
Temperature, °R	553							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	1.46E+01	2.48E-05	5.05E-03	1.84E-01	PF	5	9.06E+00	C1
Ba ⁹	2.2E-04	7.45E-11	1.51E-08	5.51E-07	PF	6	8.92E-02	C1
CO ₃	4.16E+00	3.19E-06	6.47E-04	2.36E-02	PF	5		
F	2.75E-02	3.91E-09	1.35E-05	4.92E-04	PF	5	3.22E+00	C1
Na	1.32E+02	2.64E-04	5.36E-02	1.95E+00	PF	5	2.13E+00	C2 as NaOH
NO ₂	5.71E+00	4.39E-07	1.16E-03	4.22E-02	PF	5		
NO ₃	2.54E+02	1.45E-05	3.82E-02	1.39E+00	PF	5		
OH	2.00E+01	5.40E-05	1.10E-02	4.00E-01	PF	5	2.88E+00	C2 as NaOH
PO ₄	1.18E+00	6.86E-07	1.39E-04	5.08E-03	PF	5		
Pu	9.39E-07	1.77E-13	3.59E-11	1.31E-09	PF	5		
SO ₄	2.02E+00	1.07E-07	1.96E-04	7.16E-03	PF	5		
ZrO ⁹	1.3E-04	5.52E-11	1.12E-08	4.09E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	9.5E-07	2.62E-15	3.59E-13	1.94E-11	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.7E-10	1.32E-18	1.81E-16	9.74E-15	PF	6	2.0E-11	B
C 14 ⁹	7.0E-08	1.93E-16	2.65E-14	1.43E-12	PF	6	6.0E-06	B
Cm 242 ⁹	9.5E-10	5.26E-21	7.22E-19	3.89E-17	PF	6	7.0E-10	B
Cm 244 ⁹	2.3E-11	5.57E-20	7.66E-18	4.13E-16	PF	6	4.0E-11	B
Cs 137	1.29E+05	1.43E-05	2.94E-02	1.59E+00	PF	5	4.0E-07	B
I 129 ⁹	1.0E-10	4.03E-17	1.45E-15	2.14E-15	PF	6	7.0E-08	B
Np 237 ⁹	3.5E-10	9.65E-19	1.33E-16	7.15E-15	PF	6	1.2E-12	B
Pu 238 ⁹	2.3E-05	6.29E-14	8.65E-12	4.66E-10	PF	6	2.1E-12	B
Pu 239/240	5.76E-02	1.60E-10	2.20E-08	1.18E-06	PF	5	2.0E-12	B
Pu 241 ⁹	6.0E-07	1.38E-15	1.90E-13	1.02E-11	PF	6	1.0E-10	B

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
RuRh 106 ⁹	1.0E-11	2.82E-23	2.48E-19	1.34E-17	PF	6	3.0E-08	B
Se 79 ⁹	1.2E-09	3.25E-18	4.46E-16	2.40E-14	PF	6	1.0E-06	B
Sr 89/90 ⁹	2.3E-03	3.92E-14	8.08E-10	4.35E-08	PF	6	9.0E-09	B
Tc 99 ⁹	6.0E-08	1.67E-16	2.29E-14	1.23E-12	PF	6	2.0E-06	B
U 238 ⁹	2.3E-07	6.49E-16	8.92E-14	4.81E-12	PF	6	1.0E-10	B
water		5.44E+04	5.44E+04	5.44E+04	Stm Tabl	1		

Tank Farm 241-U Vapor Estimates

Sample Type	Sludge		Tank:	241-U-107				
Sample Date	12/9/74		Contents:	Sludge/SN/Saltcake				
Sample ID	RAT-U107-1		Watchlist:	Organic Salts				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	6.2E-03		Retr. Method	Pumping/Sluicing				
pH	11.58							
Density, g/ml	1.14							
Temperature, °R	541							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	8.09E+00	1.83E-05	3.21E-03	1.64E-01	PF	5	9.06E+00	C1
Ba	2.75E+00	1.23E-06	2.15E-04	1.10E-02	PF	5	8.92E-02	C1
C ₂ H ₃ O ₃ anion ⁹	2.5E-01	2.02E-07	3.54E-05	1.80E-03	PF	6		
C ₆ H ₅ O ₇ anion ⁹	7.2E+00	2.71E-06	4.06E-04	2.42E-02	PF	6		
Ce ⁹	3.6E-03	1.59E-09	2.79E-07	1.42E-05	PF	6		
CO ₃ ⁹	2.0E+00	1.99E-06	3.49E-04	1.78E-02	PF	6		
Cr ⁹	2.7E-04	7.14E-11	5.64E-08	2.87E-06	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	1.3E+00	2.73E-07	4.78E-05	2.43E-03	PF	6		
F ⁹	2.5E-01	4.68E-08	1.40E-04	7.11E-03	PF	6	3.22E+00	C1
Fe	5.03E+00	5.50E-06	9.63E-04	4.91E-02	PF	5	2.18E+00	C1
HEDTA ^{9,12}	1.8E+00	3.81E-07	6.67E-05	3.40E-03	PF	6		
K ⁹	1.3E-01	2.04E-07	3.58E-05	1.82E-03	PF	6		
Mg	7.29E-01	1.86E-06	3.26E-04	1.66E-02	PF	5	1.02E+01	C1
Mn	5.49E-01	6.11E-07	1.07E-04	5.45E-03	PF	5	2.22E+00	C2, D
Na ⁹	7.2E+00	1.90E-05	3.34E-03	1.70E-01	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	7.8E-03	8.10E-09	1.42E-06	7.23E-05	PF	6	4.14E-02	C1, D
NO ₂	4.60E-01	4.71E-08	1.07E-04	5.46E-03	PF	5		
NO ₃	1.71E+02	1.30E-05	2.96E-02	1.51E+00	PF	5		
OH ⁹	6.5E-02	2.34E-07	4.10E-05	2.09E-03	PF	6	2.88E+00	C2 as NaOH
Pb ⁹	1.4E-07	4.04E-14	7.08E-12	3.61E-10	PF	6	5.91E-03	C1, A, D
PO ₄	2.32E+02	1.80E-04	3.15E-02	1.60E+00	PF	5		
Pu	8.04E-03	2.02E-09	3.53E-07	1.80E-05	PF	5		

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SiO ₃ ⁹	9.8E-02	7.86E-08	1.38E-05	7.02E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	6.2E-01	4.42E-08	6.98E-05	3.55E-03	PF	6		
Sr ⁹	1.2E-04	8.15E-11	1.43E-08	7.27E-07	PF	6		
ZrO ⁹	1.4E-04	7.82E-11	1.37E-08	6.98E-07	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	1.3E+02	3.59E-07	5.67E-05	3.21E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	5.8E-02	1.61E-10	2.54E-08	1.44E-06	PF	6	2.0E-11	B
C 14 ⁹	5.3E+00	1.46E-08	2.31E-06	1.31E-04	PF	6	6.0E-06	B
Cm 242 ⁹	1.3E-01	7.22E-13	1.14E-10	6.44E-09	PF	6	7.0E-10	B
Cm 244 ⁹	1.9E-01	4.61E-10	7.28E-08	4.12E-06	PF	6	4.0E-11	B
Cs 137	2.47E+04	2.74E-06	6.48E-03	3.66E-01	PF	5	4.0E-07	B
Co 60	4.91E+02	9.83E-12	1.55E-09	8.77E-08	PF	5	8.0E-08	B
Cs 134	5.13E-02	1.90E-13	2.99E-11	1.69E-09	PF	5	4.0E-07	B
I 129 ⁹	6.5E-02	2.51E-08	9.05E-07	1.61E-06	PF	6	7.0E-08	B
Np 237 ⁹	1.3E-01	3.62E-10	5.71E-08	3.23E-06	PF	6	1.2E-12	B
Pu 238 ⁹	1.9E-02	5.21E-11	8.22E-09	4.65E-07	PF	6	2.1E-12	B
Pu 239/240	4.92E+02	1.37E-06	2.16E-04	1.22E-02	PF	5	2.0E-12	B
Pu 241 ⁹	2.1E-04	4.85E-13	7.67E-11	4.33E-09	PF	6	1.0E-10	B
RuRh 106 ⁹	1.9E-05	5.23E-17	5.29E-13	2.99E-11	PF	6	3.0E-08	B
Se 79 ⁹	1.9E+00	5.37E-09	8.48E-07	4.80E-05	PF	6	1.0E-06	B
Sr 89/90	7.06E+04	7.97E-07	1.89E-02	1.07E+00	PF	5	9.0E-09	B
Tc 99 ⁹	5.8E+01	1.61E-07	2.55E-05	1.44E-03	PF	6	2.0E-06	B
U 238 ⁹	3.3E-07	9.28E-16	1.47E-13	8.28E-12	PF	6	1.0E-10	B
water		3.82E+04	3.82E+04	3.82E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	Saltcake		Tank:	241-U-108				
Sample Date	8/14/75		Contents:	Sludge/SN/Saltcake				
Sample ID	RAT-U108-1		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	6.7E-03		Retr. Method	Pumping/Sluicing				
pH	11.35							
Density, g/ml	0.9							
Temperature, °R	550							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	7.36E+01	1.77E-04	3.70E-02	1.41E+00	PF	5	9.06E+00	C1
Ba ⁹	1.2E-04	5.88E-11	1.23E-08	4.68E-07	PF	6	8.92E-02	C1
Ca	8.98E-02	1.46E-07	3.05E-05	1.16E-03	PF	5	6.11E+00	C1 as CaCO ₃
Ce ⁹	7.9E-08	3.66E-14	7.67E-12	2.92E-10	PF	6		
CO ₃	3.56E+00	3.85E-06	8.06E-04	3.07E-02	PF	5		
F ⁹	2.1E+00	4.31E-07	1.53E-03	5.83E-02	PF	6	3.22E+00	C1
Fe	7.93E+00	9.18E-06	1.92E-03	7.31E-02	PF	5	2.18E+00	C1
Mg	8.98E-02	2.43E-07	5.08E-05	1.93E-03	PF	5	1.02E+01	C1
Mn	8.98E-02	1.06E-07	2.22E-05	8.43E-04	PF	5	2.22E+00	C2, D
Na	7.81E+00	2.20E-05	4.61E-03	1.75E-01	PF	5	2.13E+00	C2 as NaOH
NO ₂	1.20E+00	1.30E-07	3.54E-04	1.35E-02	PF	5		
NO ₃	1.18E+01	9.51E-07	2.59E-03	9.85E-02	PF	5		
OH	3.82E-02	1.46E-07	3.05E-05	1.16E-03	PF	5	2.88E+00	C2 as NaOH
PO ₄	7.47E+01	6.14E-05	1.28E-02	4.89E-01	PF	5		
SiO ₂	3.50E+01	2.99E-05	6.26E-03	2.38E-01	PF	5	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	4.3E-04	3.26E-11	6.15E-08	2.34E-06	PF	6		
ZrO ⁹	3.6E-04	2.19E-10	4.59E-08	1.74E-06	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	5.0E+00	1.39E-08	2.78E-06	1.11E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.7E-03	4.66E-12	9.32E-10	3.71E-08	PF	6	2.0E-11	B
C 14 ⁹	5.6E-03	1.57E-11	3.13E-09	1.25E-07	PF	6	6.0E-06	B
Cm 242 ⁹	4.6E-03	2.54E-14	5.08E-12	2.02E-10	PF	6	7.0E-10	B
Cm 244 ⁹	3.4E-06	8.00E-15	1.60E-12	6.37E-11	PF	6	4.0E-11	B
Cs 137	1.3E+05	1.47E-05	4.42E-02	1.76E+00	PF	5	4.0E-07	B

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Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cs-134	7.9E+03	4.07E-08	8.15E-06	3.24E-04	PF	5	4.0E-07	B
I 129 ⁹	1.7E-05	6.48E-12	2.33E-10	3.71E-10	PF	6	7.0E-08	B
Np 237 ⁹	7.3E-05	2.03E-13	4.07E-11	1.62E-09	PF	6	1.2E-12	B
Pu 238 ⁹	2.3E-01	6.16E-10	1.23E-07	4.90E-06	PF	6	2.1E-12	B
Pu 239/240	3.9E+01	1.09E-07	2.18E-05	8.66E-04	PF	5	2.0E-12	B
Pu 241 ⁹	2.3E+01	5.26E-08	1.05E-05	4.19E-04	PF	6	1.0E-10	B
RuRh 106 ⁹	5.6E-04	1.53E-15	1.96E-11	7.78E-10	PF	6	3.0E-08	B
Se 79 ⁹	2.9E-04	8.05E-13	1.61E-10	6.41E-09	PF	6	1.0E-06	B
Sr 89/90	7.6E+03	8.75E-08	2.63E-03	1.05E-01	PF	5	9.0E-09	B
Tc 99 ⁹	1.1E-02	3.14E-11	6.27E-09	2.50E-07	PF	6	2.0E-06	B
U 238 ⁹	5.0E-01	1.40E-09	2.80E-07	1.11E-05	PF	6	1.0E-10	B
water		5.03E+04	5.03E+04	5.03E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	SN		Tank:	241-U-109				
Sample Date	11/12/75		Contents:	Sludge/Saltcake/SN				
Sample ID	RAT-U109-1		Watchlist:	Hydrogen				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	6.7E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.24							
Temperature, °R	548							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	4.91E-11	2.18E-17	4.48E-15	1.75E-13	PF	6	2.27E-03	C1
Al	9.22E+00	1.64E-05	3.37E-03	1.32E-01	PF	5	9.06E+00	C1
Ba ⁹	9.70E-05	3.40E-11	6.98E-09	2.73E-07	PF	6	8.92E-02	C1
Ce ⁹	3.20E-05	1.10E-11	2.25E-09	8.79E-08	PF	6		
CO ₃	1.46E+01	1.17E-05	2.40E-03	9.38E-02	PF	5		
F ⁹	1.08E-01	1.61E-08	5.63E-05	2.20E-03	PF	6	3.22E+00	C1
Fe	4.60E-02	3.95E-08	8.10E-06	3.16E-04	PF	5	2.18E+00	C1
Mg	1.00E-02	2.00E-08	4.11E-06	1.61E-04	PF	5	1.02E+01	C1
Mn	4.70E-02	4.10E-08	8.42E-06	3.29E-04	PF	5	2.22E+00	C2, D
Na	1.32E+02	2.76E-04	5.67E-02	2.21E+00	PF	5	2.11E+00	C2 as NaOH
NO ₂	2.89E+01	2.32E-06	6.19E-03	2.42E-01	PF	5		
NO ₃	1.91E+02	1.14E-05	3.04E-02	1.19E+00	PF	5		
OH	2.23E+01	6.29E-05	1.29E-02	5.05E-01	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	8.56E-15	1.99E-21	4.08E-19	1.59E-17	PF	6	5.91E-03	C1, A, D
PO ₄	4.52E+00	2.75E-06	5.64E-04	2.20E-02	PF	5		
Pu	6.15E-02	1.21E-08	2.48E-06	9.71E-05	PF	5		
Si	3.12E+00	5.35E-06	1.10E-03	4.29E-02	PF	5	8.73E+00	C1
SiO ₃ ⁹	8.56E-02	5.41E-08	1.11E-05	4.34E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	1.65E-01	9.19E-09	1.70E-05	6.64E-04	PF	6		
ZrO ⁹	6.28E-06	2.82E-12	5.78E-10	2.26E-08	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	1.70E-01	4.68E-10	6.80E-08	3.76E-06	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.14E-04	3.17E-13	4.60E-11	2.54E-09	PF	6	2.0E-11	B
C-14 ⁹	1.70E+00	4.71E-09	6.84E-07	3.78E-05	PF	6	6.0E-06	B

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	2.31E-05	1.28E-16	1.86E-14	1.03E-12	PF	6	7.0E-10	B
Cm 244 ⁹	1.14E-03	2.72E-12	3.95E-10	2.18E-08	PF	6	4.0E-11	B
Cs 137	7.54E+01	8.57E-09	1.87E-05	1.03E-03	PF	5	4.0E-07	B
I 129 ⁹	5.09E+03	1.97E-09	7.07E-08	1.13E-07	PF	6	7.0E-08	B
Np 237 ⁹	5.71E-03	1.59E-11	2.30E-09	1.27E-07	PF	6	1.2E-12	B
Pu 238 ⁹	2.31E-02	6.23E-11	9.04E-09	4.99E-07	PF	6	2.1E-12	B
Pu 239/240	3.78E+03	1.05E-05	1.52E-03	8.43E-02	PF	5	2.0E-12	B
Pu 241 ⁹	4.01E-02	9.22E-11	1.34E-08	7.40E-07	PF	6	1.0E-10	B
RuRh 106 ⁹	5.71E-08	1.54E-19	1.43E-15	7.93E-14	PF	6	3.0E-08	B
Se 79 ⁹	1.14E-01	3.17E-10	4.60E-08	2.54E-06	PF	6	1.0E-06	B
Sr 89/90	3.15E+03	3.64E-08	7.93E-04	4.38E-02	PF	5	9.0E-09	B
Tc 99 ⁹	3.39E+00	9.42E-09	1.37E-06	7.56E-05	PF	6	2.0E-06	B
U 238 ⁹	1.14E-02	3.17E-11	4.60E-09	2.54E-07	PF	6	1.0E-10	B
water		4.75E+04	4.75E+04	4.75E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	TRAC		Tank:	241-U-110				
Sample Date			Contents:	Sludge				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.23							
Temperature, °R	535							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	7.67E-12	5.82E-18	7.07E-16	2.89E-14	PF	6	2.27E-03	C1
Al ⁹	7.81E+01	2.37E-04	2.88E-02	1.17E+00	PF	6	9.06E+00	C1
Ba ⁹	2.70E-04	1.61E-10	1.96E-08	8.00E-07	PF	6	8.92E-02	C1
Bi ⁹	1.85E+01	7.23E-06	8.78E-04	3.59E-02	PF	6		
Ce ⁹	3.98E-06	2.33E-12	2.82E-10	1.15E-08	PF	6		
CO ₃ ⁹	8.52E+00	1.16E-05	1.41E-03	5.77E-02	PF	6		
Cr ⁹	2.98E+01	1.04E-05	5.70E-03	2.33E-01	PF	6	2.35E-01	C1, D
F ⁹	5.40E-04	1.37E-10	2.82E-07	1.15E-05	PF	6	3.22E+00	C1
Fe ⁹	1.56E+01	2.28E-05	2.77E-03	1.13E-01	PF	6	2.18E+00	C1
Na ⁹	1.99E+02	7.08E-04	8.59E-02	3.51E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	1.31E+00	1.79E-07	2.82E-04	1.15E-02	PF	6		
NO ₃ ⁹	5.40E+02	5.48E-05	8.65E-02	3.53E+00	PF	6		
OH ⁹	1.99E+02	9.58E-04	1.16E-01	4.75E+00	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	8.10E+00	8.39E-06	1.02E-03	4.16E-02	PF	6		
SiO ₃ ⁹	5.40E-02	5.81E-08	7.06E-06	2.88E-04	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	3.41E-03	3.23E-10	3.53E-07	1.44E-05	PF	6		
ZrO ⁹	2.98E+00	2.28E-06	2.77E-04	1.13E-02	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,1B}	1.42E+02	3.92E-07	5.74E-05	1.94E-03	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	2.84E-02	7.89E-11	1.15E-08	3.91E-07	PF	6	2.0E-11	B
C 14 ⁹	3.57E-01	9.91E-10	1.45E-07	4.92E-06	PF	6	6.0E-06	E

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	8.45E-02	4.68E-13	6.86E-11	2.32E-09	PF	6	7.0E-10	B
Cm 244 ⁹	1.27E-04	3.02E-13	4.42E-11	1.50E-09	PF	6	4.0E-11	B
Cs 137 ⁹	1.42E+03	2.37E-07	5.21E-04	1.77E-02	PF	6	4.0E-07	B
I 129 ⁹	7.29E-04	2.82E-10	1.01E-08	1.00E-08	PF	6	7.0E-08	B
Np 237 ⁹	2.69E-03	7.46E-12	1.09E-09	3.70E-08	PF	6	1.2E-12	B
Pu 238 ⁹	5.76E+01	1.55E-07	2.27E-05	7.69E-04	PF	6	2.1E-12	B
Pu 239/240 ⁹	5.76E+01	1.60E-07	2.34E-05	7.93E-04	PF	6	2.0E-12	B
Pu 241 ⁹	4.22E+02	9.71E-07	1.42E-04	4.82E-03	PF	6	1.0E-10	B
RuRh 106 ⁹	8.45E-05	2.28E-16	2.14E-12	7.25E-11	PF	6	3.0E-08	B
Se 79 ⁹	1.27E-02	3.52E-11	5.15E-09	1.75E-07	PF	6	1.0E-06	B
Sr 89/90 ⁹	4.22E+05	7.09E-06	1.55E-01	5.27E+00	PF	6	9.0E-09	B
Tc 99 ⁹	4.22E-01	1.17E-09	1.72E-07	5.82E-06	PF	6	2.0E-06	B
U 238 ⁹	4.22E+01	1.17E-07	1.72E-05	5.82E-04	PF	6	1.0E-10	B
water		3.06E+04	3.06E+04	3.06E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	Sludge		Tank:	241-U-111				
Sample Date ^{1A}	9/23/80		Contents:	Sludge/Saltcake				
Sample ID	RAT-U111-2		Watchlist:	N/A				
Properties	Value		Status:	PI				
Visc., lbm/ft-s ¹	1.8E-02		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density, g/ml	1.75							
Temperature, °R	539							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	1.77E-10	7.16E-17	1.14E-14	1.92E-13	PF	6	2.27E-03	C1
Al	1.69E+02	2.74E-04	4.37E-02	7.35E-01	PF	5	9.06E+00	C1
Ba ⁹	3.13E-04	1.00E-10	1.60E-08	2.68E-07	PF	6	8.92E-02	C1
Bi ⁹	1.04E+00	2.19E-07	3.49E-05	5.87E-04	PF	6		
C ₂ H ₃ O ₃ anion ⁹	6.02E-02	3.51E-08	5.61E-06	9.43E-05	PF	6		
C ₆ H ₅ O ₇ anion ⁹	3.05E+00	1.52E-06	1.13E-04	4.08E-03	PF	6		
Ca ⁹	1.93E-09	2.11E-15	3.37E-13	5.66E-12	PF	6	6.11E+00	C1 as CaCO ₃
Ce ⁹	1.12E-03	3.51E-10	5.61E-08	9.43E-07	PF	6		
Cl ⁹	5.70E-10	4.45E-17	1.14E-13	1.91E-12	PF	6		
CO ₃	6.81E+01	4.97E-05	7.93E-03	1.33E-01	PF	5		
Cr ⁹	1.69E+00	3.15E-07	2.27E-04	3.81E-03	PF	6	2.35E-01	C1, D
EDTA ^{9,12}	4.66E-01	6.98E-08	1.11E-05	1.87E-04	PF	6		
F ⁹	7.63E-02	1.03E-08	2.80E-05	4.71E-04	PF	6	3.22E+00	C1
Fe ⁹	1.04E+00	8.15E-07	1.30E-04	2.19E-03	PF	6	2.18E+00	C1
HEDTA ^{9,12}	8.83E-01	1.32E-07	2.11E-05	3.54E-04	PF	6		
K ⁹	3.13E-02	3.51E-08	5.61E-06	9.43E-05	PF	6		
Mn ⁹	1.77E-02	1.41E-08	2.24E-06	3.77E-05	PF	6	2.22E+00	C2, D
Na ⁹	1.85E+02	3.51E-04	5.61E-02	9.43E-01	PF	6	2.13E+00	C2 as NaOH
Ni ⁹	2.33E-03	1.73E-09	2.76E-07	4.63E-06	PF	6	4.14E-02	C1, D
NO ₂	1.96E+02	1.43E-05	2.98E-02	5.00E-01	PF	5		

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
NO ₃	4.36E+02	2.37E-05	4.91E-02	8.26E-01	PF	5		
OH	9.85E+01	2.53E-04	4.05E-02	6.80E-01	PF	5	2.88E+00	C2 as NaOH
Pb ⁹	3.29E-08	6.96E-15	1.11E-12	1.87E-11	PF	6	5.91E-03	C1, A, D
PO ₄	4.73E+01	2.62E-05	4.18E-03	7.03E-02	PF	5		
SiO ₃ ⁹	3.05E-02	1.76E-08	2.80E-06	4.71E-05	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	3.13E-01	1.58E-08	2.28E-05	3.83E-04	PF	6		
Sr ⁹	4.26E-05	2.12E-11	3.38E-09	5.68E-08	PF	6		
TOC gC/l ¹⁷	9.10E+00	3.32E-05	5.30E-03	8.90E-02	PF	5		
ZrO ⁹	1.69E-01	6.89E-08	1.10E-05	1.85E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	3.47E+01	9.58E-08	9.86E-06	2.57E-04	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	1.69E-02	4.70E-11	4.84E-09	1.26E-07	PF	6	2.0E-11	B
C 14 ⁹	1.61E+00	4.46E-09	4.59E-07	1.20E-05	PF	6	6.0E-06	B
Cm 242 ⁹	4.34E-02	2.41E-13	2.48E-11	6.46E-10	PF	6	7.0E-10	B
Cm 244 ⁹	5.64E-02	1.34E-10	1.38E-08	3.61E-07	PF	6	4.0E-11	B
Cs 137	2.37E+04	3.06E-06	4.73E-03	1.23E-01	PF	5	4.0E-07	B
Cs 134	3.81E+03	1.03E-07	1.06E-05	2.76E-04	PF	5	4.0E-07	B
I 129 ⁹	3.26E-02	1.26E-08	4.53E-07	2.43E-07	PF	6	7.0E-08	B
Np 237 ⁹	4.12E-02	1.15E-10	1.18E-08	3.07E-07	PF	6	1.2E-12	B
Pu 238 ⁹	8.25E-02	2.22E-10	2.28E-08	5.96E-07	PF	6	2.1E-12	B
Pu 239/240	1.63E+01	4.53E-08	4.65E-06	1.21E-04	PF	5	2.0E-12	B
Pu 241 ⁹	2.39E+00	5.49E-09	5.65E-07	1.47E-05	PF	6	1.0E-10	B
RuRh 106 ⁹	7.16E-06	1.93E-17	1.28E-13	3.33E-12	PF	6	3.0E-08	B
Se 79 ⁹	5.64E-01	1.57E-09	1.61E-07	4.21E-06	PF	6	1.0E-06	B
Sr 89/90	2.63E+03	3.45E-08	5.32E-04	1.39E-02	PF	5	9.0E-09	B
Tc 99 ⁹	1.61E+01	4.46E-08	4.59E-06	1.20E-04	PF	6	2.0E-06	B
U 238 ⁹	2.39E-01	6.63E-10	6.82E-08	1.78E-06	PF	6	1.0E-10	B
water		3.56E+04	3.56E+04	3.56E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	TRAC		Tank:	241-U-112				
Sample Date			Contents:	Sludge/SN				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	2.6E-02		Retr. Method	Pumping/Sluicing				
pH	13.58							
Density ^{1A} , g/ml	2							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	2.91E-09	1.55E-15	1.65E-13	2.93E-12	PF	6	2.27E-03	C1
Al ⁹	1.51E+02	3.22E-04	3.42E-02	6.07E-01	PF	6	9.06E+00	C1
Ba ⁹	2.21E-03	9.29E-10	9.86E-08	1.75E-06	PF	6	8.92E-02	C1
Bi ⁹	8.09E-01	2.23E-07	2.37E-05	4.20E-04	PF	6		
Ce ⁹	7.55E-02	3.10E-08	3.30E-06	5.85E-05	PF	6		
CO ₃ ⁹	3.24E+01	3.10E-05	3.30E-03	5.85E-02	PF	6		
Cr ⁹	1.40E+00	3.44E-07	1.65E-04	2.92E-03	PF	6	2.35E-01	C1, D
F ⁹	1.13E+01	2.02E-06	3.64E-03	6.46E-02	PF	6	3.22E+00	C1
Fe ⁹	5.93E-01	6.10E-07	6.47E-05	1.15E-03	PF	6	2.18E+00	C1
Na ⁹	3.37E+02	8.43E-04	8.96E-02	1.59E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	4.96E+01	4.77E-06	6.59E-03	1.17E-01	PF	6		
NO ₃ ⁹	1.17E+03	8.37E-05	1.16E-01	2.05E+00	PF	6		
OH ⁹	6.47E+00	2.19E-05	2.33E-03	4.13E-02	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	1.02E+02	7.46E-05	7.93E-03	1.41E-01	PF	6		
SiO ₃ ⁹	8.09E+00	6.12E-06	6.50E-04	1.15E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	4.15E+01	2.76E-06	2.64E-03	4.69E-02	PF	6		
ZrO ⁹	1.13E-01	6.09E-08	6.47E-06	1.15E-04	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9,18}	2.77E+00	7.64E-09	6.88E-07	1.44E-05	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	5.39E-04	1.50E-12	1.35E-10	2.82E-09	PF	6	2.0E-11	B
C-14 ⁹	1.08E+02	2.99E-07	2.69E-05	5.64E-04	PF	6	6.0E-06	B

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Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Cm 242 ⁹	2.19E-03	1.21E-14	1.09E-12	2.29E-11	PF	6	7.0E-10	B
Cm 244 ⁹	2.19E-02	5.21E-11	4.69E-09	9.82E-08	PF	6	4.0E-11	B
Cs 137 ⁹	5.39E+05	9.01E-05	1.22E+01	2.55E+00	PF	6	4.0E-07	B
I 129 ⁹	2.77E-01	1.07E-07	3.85E-06	1.45E-06	PF	6	7.0E-08	B
Np 237 ⁹	5.39E+01	1.50E-09	1.35E-07	2.82E-06	PF	6	1.2E-12	B
Pu 238 ⁹	3.79E-01	1.02E-09	9.18E-08	1.92E-06	PF	6	2.1E-12	B
Pu 239/240 ⁹	1.89E+00	5.26E-09	4.74E-07	9.92E-06	PF	6	2.0E-12	B
Pu 241 ⁹	1.60E+00	3.69E-09	3.32E-07	6.95E-06	PF	6	1.0E-10	B
RuRh 106 ⁹	1.60E-06	4.33E-18	2.50E-14	5.23E-13	PF	6	3.0E-08	B
Se 75 ⁹	4.81E+00	1.34E-08	1.20E-06	2.52E-05	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.60E+04	2.69E-07	3.63E-03	7.60E-02	PF	6	9.0E-09	B
Tc 99 ⁹	1.60E+02	4.45E-07	4.01E-05	8.39E-04	PF	6	2.0E-06	B
U 238 ⁹	3.79E-01	1.05E-09	9.47E-08	1.98E-06	PF	6	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	TRAC		Tank:	241-U-201				
Sample Date			Contents:	Sludge/SN				
Sample ID			Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.4E-02		Retr. Method	Pumping/Sluicing				
pH	11.06							
Density ^{1A} , g/ml	1.6							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel. ⁶	Allowable ⁷	Regulatory Citation
Al ⁹	4.28E+02	1.03E-03	1.21E-01	2.92E+00	PF	6	9.06E+00	C1
Ba ⁹	2.59E-03	1.22E-09	1.44E-07	3.48E-06	PF	6	8.92E-02	C1
Ce ⁹	5.18E-02	2.39E-08	2.83E-06	6.81E-05	PF	6		
CO ₃ ⁹	2.22E+01	2.39E-05	2.83E-03	6.81E-02	PF	6		
F ⁹	5.81E+00	1.16E-06	2.34E-03	5.64E-02	PF	6	3.22E+00	C1
Na ⁹	1.27E+02	3.57E-04	4.21E-02	1.02E+00	PF	6	2.13E+00	C2 as NaOH
NO ₂ ⁹	2.43E+02	2.63E-05	4.04E-02	9.74E-01	PF	6		
NO ₃ ⁹	5.87E+02	4.71E-05	7.23E-02	1.74E+00	PF	6		
OH ⁹	1.96E-02	7.44E-08	8.79E-06	2.12E-04	PF	6	2.88E+00	C2 as NaOH
PO ₄ ⁹	4.49E+01	3.68E-05	4.34E-03	1.05E-01	PF	6		
SiO ₃ ⁹	1.22E+01	1.03E-05	1.22E-03	2.95E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	4.07E+01	3.04E-06	3.24E-03	7.81E-02	PF	6		
Am 241 ^{9, 18}	6.28E-03	1.73E-11	1.95E-09	4.94E-08	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.14E-06	1.15E-14	1.29E-12	3.27E-11	PF	6	2.0E-11	B
C 14 ⁹	1.57E+02	4.36E-07	4.91E-05	1.24E-03	PF	6	6.0E-06	B
Cm 242 ⁹	1.86E-05	1.03E-16	1.16E-14	2.93E-13	PF	6	7.0E-10	B
Cm 244 ⁹	3.71E-02	8.85E-11	9.96E-09	2.52E-07	PF	6	4.0E-11	B
Ga 137 ⁹	1.06E+06	1.77E-04	2.98E-01	7.54E+00	PF	6	4.0E-07	B
I 129 ⁹	4.28E-01	1.65E-07	5.96E-06	3.39E-06	PF	6	7.0E-08	B
Np 237 ⁹	1.06E+00	2.94E-09	3.30E-07	8.36E-06	PF	6	1.2E-12	B

Tank Farm 241-U Vapor Estimates

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Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Pu 238 ⁹	1.06E-01	2.84E-10	3.20E-08	8.10E-07	PF	6	2.1E-12	B
Pu 239/240 ⁹	2.57E-04	7.14E-13	8.03E-11	2.03E-09	PF	6	2.0E-12	B
Pu 241 ⁹	8.43E-07	1.94E-15	2.18E-13	5.52E-12	PF	6	1.0E-10	B
RuRh 106 ⁹	5.28E-08	1.43E-19	1.03E-15	2.61E-14	PF	6	3.0E-08	B
Se 79 ⁹	5.28E+00	1.47E-08	1.65E-06	4.18E-05	PF	6	1.0E-06	B
Sr 89/90 ⁹	1.06E+03	1.77E-08	2.99E-04	7.57E-03	PF	6	9.0E-09	B
Tc 99 ⁹	2.71E+02	7.54E-07	8.48E-05	2.15E-03	PF	6	2.0E-06	B
U 238 ⁹	1.06E-07	2.94E-16	3.30E-14	8.36E-13	PF	6	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	SN		Tank:	241-U-202				
Sample Date	9/25/75		Contents:	Sludge/SN				
Sample ID	T-8245		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	8.5E-03		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.14							
Temperature, °R	526							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	4.54E-09	2.11E-15	4.52E-13	1.07E-11	PF	6	2.27E-03	C1
Al	7.93E+00	1.47E-05	3.15E-03	7.47E-02	PF	5	9.06E+00	C1
Ba ⁹	2.59E-03	9.47E-10	2.03E-07	4.81E-06	PF	6	8.92E-02	C1
Ce ⁹	5.18E-02	1.85E-08	3.97E-06	9.41E-05	PF	6		
Cl	8.83E-01	7.90E-08	2.71E-04	6.42E-03	PF	5		
CO ₃	1.08E+01	9.02E-06	1.93E-03	4.58E-02	PF	5		
F	1.81E-02	2.81E-09	1.02E-05	2.42E-04	PF	5	3.22E+00	C1
Na	8.99E+01	1.96E-04	4.19E-02	9.95E-01	PF	5	2.13E+00	C2 as NaOH
NO ₂	1.09E+01	9.13E-07	2.54E-03	6.03E-02	PF	5		
NO ₃	9.11E+01	5.66E-06	1.58E-02	3.74E-01	PF	5		
OH	2.09E+01	6.16E-05	1.32E-02	3.13E-01	PF	5	2.88E+00	C2 as NaOH
Pb	6.76E-13	1.64E-19	3.50E-17	8.32E-16	PF	6	5.91E-03	C1, A, D
PO ₄	1.33E+00	8.44E-07	1.81E-04	4.28E-03	PF	5		
Pu	9.99E-07	2.05E-13	4.39E-11	1.04E-09	PF	5		
SiO ₃ ⁹	1.59E+01	1.05E-05	2.24E-03	5.31E-02	PF	6	1.93E+00	C1 (Amorphous)
SO ₄ ⁹	3.54E+01	2.05E-06	3.95E-03	9.39E-02	PF	6		
ZrO ⁹	7.40E-06	3.46E-12	7.41E-10	1.76E-08	PF	6	1.14E+00	C1 as Zr
Am 241 ^{9, 18}	6.28E-03	1.73E-11	2.74E-09	8.81E-08	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	4.28E-06	1.19E-14	1.88E-12	6.04E-11	PF	6	2.0E-11	B
C 14 ⁹	1.57E+02	4.36E-07	6.89E-05	2.22E-03	PF	6	6.0E-06	B
Cm 242 ⁹	5.28E-06	2.93E-17	4.63E-15	1.49E-13	PF	6	7.0E-10	B
Cm 244 ⁹	4.71E-02	1.12E-10	1.77E-08	5.70E-07	PF	6	4.0E-11	B

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ca 137	3.27E+04	3.72E-06	8.80E-03	2.83E-01	PF	5	4.0E-07	B
Cs 134	4.38E-03	2.25E-14	3.56E-12	1.14E-10	PF	5	4.0E-07	B
I 129 ⁹	4.28E-01	1.65E-07	5.96E-06	6.04E-06	PF	6	7.0E-08	B
Np 237 ⁹	1.06E+00	2.94E-09	4.64E-07	1.49E-05	PF	6	1.2E-12	B
Pu 238 ⁹	1.57E-01	4.23E-10	6.68E-08	2.15E-06	PF	6	2.1E-12	B
Pu 239/240	6.14E-02	1.70E-10	2.69E-08	8.65E-07	PF	5	2.0E-12	B
Pu 241 ⁹	1.06E-06	2.43E-15	3.84E-13	1.23E-11	PF	6	1.0E-10	B
RuRh 106 ⁹	4.71E-08	1.27E-19	1.29E-15	4.14E-14	PF	6	3.0E-08	B
Se 79 ⁹	5.28E+00	1.47E-08	2.32E-06	7.45E-05	PF	6	1.0E-06	B
Sr 89/90	9.41E-01	1.09E-11	2.58E-07	8.29E-06	PF	5	9.0E-09	B
Tc 99 ⁹	2.71E+02	7.54E-07	1.19E-04	3.83E-03	PF	6	2.0E-06	B
U 238 ⁹	1.57E-21	4.36E-30	6.89E-28	2.22E-26	PF	6	1.0E-10	B
water		2.04E+04	2.04E+04	2.04E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	Sludge		Tank:	241-U-203				
Sample Date	12/4/78		Contents:	Sludge/SN				
Sample ID	1766		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	6.7E-04		Retr. Method	Pumping/Sluicing				
pH	N/A							
Density ^{1A} , g/ml	1.6							
Temperature, °R	527							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Ag ⁹	6.69E-09	2.70E-15	4.74E-13	2.23E-10	PF	6	2.27E-03	C1
Al	3.78E+02	6.09E-04	1.07E-01	5.04E+01	PF	5	9.06E+00	C1
Ba ⁹	4.32E-03	1.37E-09	2.41E-07	1.13E-04	PF	6	8.92E-02	C1
Bi	1.60E-01	3.33E-08	5.85E-06	2.76E-03	PF	5		
Ca ⁹	5.34E-03	5.80E-09	1.02E-06	4.80E-04	PF		6.11E+00	C1 as CaCO ₃
Ce ⁹	7.40E-02	2.30E-08	4.04E-06	1.90E-03	PF	6		
Cd	8.00E-03	3.10E-09	5.46E-07	2.57E-04	PF	5	5.46E-04	C1, C2, D
CO ₃	1.12E+01	8.11E-06	1.43E-03	6.72E-01	PF	5		
CrO ₄	1.44E+01	5.40E-06	9.48E-04	4.47E-01	PF	5	2.11E-02	C2
Cu ⁹	2.13E+00	1.45E-06	2.54E-04	1.20E-01	PF		3.82E-01	C1
F ⁹	8.37E+00	1.13E-06	3.36E-03	1.59E+00	PF	6	3.22E+00	C1
Fe	6.45E+00	5.01E-06	8.80E-04	4.15E-01	PF	5	2.18E+00	C1
Hg	4.80E-01	1.04E-07	1.82E-05	8.60E-03	PF	5	6.08E-03	B, C1, C2
K	8.00E-02	8.92E-08	1.57E-05	7.39E-03	PF	5		
Mn	8.00E-03	6.32E-09	1.11E-06	5.24E-04	PF	5	2.22E+00	C2, D
Na ⁹	5.06E+02	9.57E-04	1.58E-01	7.93E+01	PF	6	2.11E+00	C2 as NaOH
NO ₂	8.00E+00	5.81E-07	1.33E-03	6.26E-01	PF	5		
NO ₃	5.44E+01	2.93E-06	6.70E-03	3.16E+00	PF	5		
OH	2.40E+01	6.14E-05	1.08E-02	5.08E+00	PF	5	2.88E+00	C2 as NaOH
Pb	1.60E-02	3.36E-09	5.91E-07	2.78E-04	PF	5	5.91E-03	C1, A, D
PO ₄	1.65E+02	9.08E-05	1.60E-02	7.52E+00	PF	5		
Si	6.40E-01	9.94E-07	1.75E-04	8.23E-02	PF	5	8.73E+00	C1
SiO ₃ ⁹	2.03E+01	1.16E-05	2.04E-03	9.60E-01	PF	6	1.93E+00	C1 (Amorphous)

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Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
SO ₄	3.20E+00	1.61E-07	2.55E-04	1.20E-01	PF	5		
TOC gC/l ¹⁷	2.40E+00	8.69E-06	1.53E-03	7.20E-01	PF	5		
ZrO ⁹	1.23E-05	5.01E-12	8.80E-10	4.15E-07	PF	6	1.14E+00	Cl as Zr
Am 241 ^{9,18}	9.52E-03	2.63E-11	2.96E-09	2.18E-06	PF	6	2.0E-11	B ¹⁹
Am 243 ⁹	6.66E-06	1.85E-14	2.08E-12	1.53E-09	PF	6	2.0E-11	B
C 14 ⁹	1.76E+02	4.89E-07	5.50E-05	4.05E-02	PF	6	6.0E-06	B
Cm 242 ⁹	8.57E-06	4.75E-17	5.35E-15	3.94E-12	PF	6	7.0E-10	B
Cm 244 ⁹	7.14E-02	1.70E-10	1.91E-08	1.41E-05	PF	6	4.0E-11	B
Cs 137	1.62E+03	1.98E-07	3.35E-04	2.47E-01	PF	5	4.0E-07	B
CePr 144	6.57E+01	1.09E-13	1.23E-11	9.03E-09	PF	5	3.0E-08	B
I 129 ⁹	6.19E-01	2.39E-07	8.60E-06	1.42E-04	PF	6	7.0E-08	B
Np 237 ⁹	1.76E+00	4.89E-09	5.50E-07	4.05E-04	PF	6	1.2E-12	B
Pu 238 ⁹	2.62E-01	7.05E-10	7.93E-08	5.84E-05	PF	6	2.1E-12	B
Pu 239/240 ⁹	5.24E-04	1.45E-12	1.64E-10	1.20E-07	PF	6	2.0E-12	B
Pu 241 ⁹	1.59E-06	3.67E-15	4.13E-13	3.04E-10	PF	6	1.0E-10	B
RuRh 106 ⁹	7.14E-08	1.93E-19	1.39E-15	1.02E-12	PF	6	3.0E-08	B
Se 79 ⁹	8.81E+00	2.45E-08	2.75E-06	2.03E-03	PF	6	1.0E-06	B
Sr 89/90	3.43E+03	4.28E-08	7.21E-04	5.31E-01	PF	5	9.0E-09	B
Tc 99 ⁹	3.57E+02	9.92E-07	1.12E-04	8.22E-02	PF	6	2.0E-06	B
U 238 ⁹	2.62E-21	7.27E-30	8.18E-28	6.02E-25	PF	6	1.0E-10	B
water		2.14E+04	2.14E+04	2.14E+04	Stm Tabl	1		

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Tank Farm 241-U Vapor Estimates

Sample Type	Sludge		Tank:	241-U-204				
Sample Date	12/4/78		Contents:	Sludge/SN				
Sample ID	RAT-U204-1		Watchlist:	N/A				
Properties	Value		Status:	IS/II				
Visc., lbm/ft-s ¹	1.1E-02		Retr. Method	Pumping/Sluicing				
pH	13.59							
Density ^{1A} , g/ml	1.31							
Temperature, °R	528							
Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Al	2.57E+02	4.43E-04	8.88E-02	1.69E+00	PF	5	9.06E+00	C1
Ba ⁹	8.09E-05	2.75E-11	5.51E-09	1.05E-07	PF	6	8.92E-02	C1
Bi	1.31E+00	2.92E-07	5.85E-05	1.11E-03	PF	5		
Ce ⁹	7.55E-04	2.51E-10	5.03E-08	9.55E-07	PF	6		
Cl	1.31E-01	1.09E-08	3.49E-05	6.63E-04	PF	5		
CO ₃	7.86E+00	6.10E-06	1.22E-03	2.32E-02	PF	5		
Cr	3.93E-01	7.81E-08	7.05E-05	1.34E-03	PF	5	2.35E-01	C1, D
F	5.37E+00	7.74E-07	2.64E-03	5.01E-02	PF	5	3.22E+00	C1
Fe	3.93E-01	3.27E-07	6.55E-05	1.24E-03	PF	5	2.18E+00	C1
Hg	1.31E-01	3.03E-08	6.08E-06	1.15E-04	PF	5	6.08E-03	B, C1, C2
K	7.86E-02	9.38E-08	1.88E-05	3.57E-04	PF	5		
La	3.28E+01	1.10E-05	2.20E-03	4.18E-02	PF	5		
Mn	9.17E-03	7.76E-09	1.56E-06	2.95E-05	PF	5	2.22E+00	C2, D
Na	1.31E+01	2.65E-05	5.32E-03	1.01E-01	PF	5	2.13E+00	C2 as NaOH
Ni	5.24E+00	4.14E-06	8.29E-04	1.57E-02	PF	5	4.14E-02	C1, D
NO ₂	3.93E+00	3.06E-07	7.97E-04	1.51E-02	PF	5		
NO ₃	1.57E+01	9.07E-07	2.36E-03	4.48E-02	PF	5		
OH	6.55E+00	1.79E-05	3.60E-03	6.82E-02	PF	5	2.88E+00	C2 as NaOH
PO ₄	9.17E+00	5.41E-06	1.08E-03	2.06E-02	PF	5		
Pu	2.56E-06	4.89E-13	9.79E-11	1.86E-09	PF	5		
SiO ₃ ⁹	4.10E-01	2.51E-07	5.03E-05	9.55E-04	PF	6	3.22E+00	C1
SiO ₂	1.14E+02	8.85E-05	1.77E-02	3.37E-01	PF	5	2.45E+00	C1 (Amorphous)
SO ₄	9.17E+00	4.94E-07	8.91E-04	1.69E-02	PF	5		
U, g/l	1.35E-03	2.64E-10	5.29E-08	1.00E-06	PF	5	5.14E-03	C1
ZrO ⁹	2.91E-07	1.27E-13	2.54E-11	4.82E-10	PF	6	1.14E+00	C1 as Zr

Tank Farm 241-U Vapor Estimates

Analyte ²	Value ³	Present Vapor Composition ⁴	Future Vapor Source ⁵	Future Vapor Receiver ⁵	Method	Data Rel ⁶	Allowable ⁷	Regulatory Citation
Am 241 18	2.52E-02	6.83E-11	9.18E-09	2.60E-07	PF	5	2.0E-11	B ¹⁹
Am 243 9	1.08E-07	2.99E-16	4.11E-14	1.14E-12	PF	6	2.0E-11	B
C 14 9	3.21E+00	8.90E-09	1.22E-06	3.39E-05	PF	6	6.0E-06	B
Cm 242 9	2.19E-07	1.21E-18	1.67E-16	4.61E-15	PF	6	7.0E-10	B
Cm 244 9	1.60E-03	3.82E-12	5.25E-10	1.45E-08	PF	6	4.0E-11	B
Cs 137	5.19E-03	6.37E-07	1.31E-03	3.63E-02	PF	5	4.0E-07	B
I 129 9	1.08E-02	4.16E-09	1.50E-07	1.14E-07	PF	6	7.0E-08	B
Np 237 9	2.77E-02	7.69E-11	1.06E-08	2.93E-07	PF	6	1.2E-12	B
Pu 238 9	5.39E-03	1.45E-11	1.99E-09	5.52E-08	PF	6	2.1E-12	B
Pu 239/240	1.57E-02	4.35E-07	5.98E-05	1.66E-03	PF	5	2.0E-12	B
Pu 241	1.24E+00	1.61E-09	2.22E-07	6.14E-06	PF	5	1.0E-10	B
RuRh 106 9	1.60E-09	4.33E-21	3.81E-17	1.06E-15	PF	6	3.0E-08	B
Se 79 9	1.60E-01	4.45E-10	6.12E-08	1.69E-06	PF	6	1.0E-06	B
Sr 89/90	1.20E+01	1.50E-10	3.09E-06	8.55E-05	PF	5	9.0E-09	B
Tc 99 9	5.39E+00	1.50E-08	2.06E-06	5.70E-05	PF	6	2.0E-06	B
U 238	9.51E-04	2.64E-12	3.63E-10	1.01E-08	PF	5	1.0E-10	B
Water		2.25E+04	2.25E+04	2.25E+04	Stm Tabl	1		

Tank Farm 241-U Vapor Estimates

- Note:** 1. Viscosity of all tanks except U-104 estimated assuming 40 vol.% solids. Tank U-104 viscosity estimated using model with 0 vol.% solids.
- Note:** 1A. No density reported for tanks U-110, 112, 201, 202, 203, and 204, density estimated to achieve minimal moles of water. Tank U-111 chemical data from 9/23/89 sludge sample, radiochemical data from 8/14/75 sludge sample.
- Note:** 2. Units in g/l or microcurie/l (radionuclides) except where noted.
- Note:** 3. Less than (<) values were used, when indicated, assuming the analyte was at the detectable limit. For all tanks in the U tank farm Al, Fe, Na, carbonate, nitrite, nitrate, phosphate, and sulfate estimated from alumina, FeOOH, sodium carbonate, nitrite, nitrate, phosphate, and sulfate.
- Note:** 4. Estimated current vapor composition ppm by volume, microcurie/l for radionuclides.
- Note:** 5. Estimated future vapor composition based on stated retrieval model.
- Note:** 6. TRAC data reliability deemed 6. To obtain minimal positive moles of water sodium was reduced by a factor of 2, 4, 10, and 4 in tanks U-101, 112, 201, and 203 respectively, nitrate reduced by a factor of 4 and 10 in tanks U-112, and 201. Data for tanks U-102, 106, 109, and 202 denoted 5 invalidated due to post sample tank transfers. Tanks U-103, 104, 105, 107, 108, 111, 203, and 204 data deemed 5 due to use of sludge/saltcake samples.
- Note:** 7. Allowable concentration, vapor component in ppm by volume for vapors, ppm by weight (@STP) for non-volatiles.
- Note:** 9. TRAC data used to estimate concentration.
- Note:** 10. As maleic anhydride.
- Note:** 11. As methylethyl ketone.
- Note:** 12. Amine derivatives-triethylamine and diethylamine are hazardous air pollutants (D).
- Note:** 13. As cyanide compounds.
- Note:** 14. Ammonia expected to be generated in tanks containing Al and/or Zn and nitrite and/or nitrate.
- Note:** 15. Annual arithmetic mean over calendar year.
- Note:** 17. Sample data reported only unspciated total organic carbon. Some species may be volatile.
- Note:** 18. Radionuclides decayed to current year (rounded to nearest year).
- Note:** 19. Allowable data based on DCG's in microcurie/l.

APPENDIX B
A SUMMARY OF EMISSIONS REGULATIONS

Following are detailed discussions of some of the criteria that apply to the vapors and aerosols generated during rotary mode core sampling of single shell tanks.

B.1 FEDERAL REGULATIONS

Federal regulations that apply to air emissions are 40 CFR 50, "National Primary and Secondary Ambient Air Quality Standards"; 40 CFR 60, "Standards of Performance for New Stationary Sources;" and 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants." Each is addressed below.

B.1.1 National Primary and Secondary Ambient Air Quality Standards (NAAQS) 40 CFR 50

These standards are set for criteria pollutants that "may reasonably be anticipated to endanger" public health or welfare. The primary standard specifies the level of air quality that based on the criteria and allowing an adequate margin of safety will protect the public health. The secondary standard specifies the level of air quality that protects the public welfare from any known or anticipated adverse effects associated with the presence of that pollutant in the ambient air.

These standards are not directly enforceable. They are the controlling force behind the development and implementation of emission limitations. They are also the basis for designation of "nonattainment" areas. The NAAQS establish ceilings for individual pollutants and should not be exceeded.

B.1.2 Standards of Performance for New Stationary Sources, 40 CFR 60

Part 60 of 40 CFR is made up of numerous subparts. Subpart A contains general provisions. Subpart B addresses adoption and submittal of State plans for designated facilities. Subpart C contains emission guidelines and compliance times. The remaining subparts contain rules and standards of performance for specific source types, such as steam generators, incinerators, cement plants, acid plants, etc. None of the specific source types is applicable to Hanford's tank farms.

- **Subpart A GENERAL PROVISIONS**

This subpart states that 40 CFR Part 60 applies to stationary sources that contain an affected facility, the construction or modification of which is commenced after the date of publication, in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility. An "affected facility" is any apparatus to which a standard is applicable. A "standard" is a standard of performance proposed or promulgated in 40 CFR Part 60. The Hanford Tank Farms do not have any applicable standards published in 40 CFR 60. As a result, 40 CFR 60 does not, at the present time, apply.

B.1.3 National Emission Standards for Hazardous Air Pollutants, 40 CFR 61

Part 61 of 40 CFR is also made up of numerous subparts. Subpart A contains general provisions. The remaining subparts contain rules for either specific chemicals or for specific types of facilities. Those appearing to apply to Hanford's Tank Farms are as follows:

Subpart H - National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities.

Subpart Q - National Emission Standards for Radon Emissions from Department of Energy Facilities.

Areas of interest to operation of rotary mode core drilling with nitrogen purge in the tank farms are summarized below.

- **Subpart A - GENERAL PROVISIONS**

Subpart A lists eight substances designated as hazardous air pollutants. Included in the list are radionuclides.

An additional 25 substances are listed because a Federal Register notice has been published that included consideration of the serious health effects, including cancer, from ambient air exposure to them. This list includes cadmium, chromium, and nickel.

The State of Washington is authorized, according to this subpart, to implement and enforce some of the standards of 40 CFR 61. (EPA retains authority for Subpart H, and others.) As a result, information submitted to EPA must also be submitted to the Washington Department of Ecology.

40 CFR 61.05 Prohibited Activities

Construction or modification of any affected source is prohibited after the effective date of any standard without the approval of the EPA Administrator, except under an exemption granted by the President. The prohibition also applies to the publication date of proposed standards.

After the effective date of any standard, no owner or operator shall operate a new stationary source subject to that standard in violation of the standard, except under a Presidential exemption.

40 CFR 61.06 Determination of Construction or Modification

This determination is made by the EPA after a written application is submitted regarding the actions intended by the operator. Response to the application is required within 30 days after the EPA receives sufficient information to evaluate the application.

40 CFR 61.07 Application for Approval of Construction or Modification

An application for approval of construction or modification is required. It must be submitted before the construction or modification is planned to commence, or within 30 days after the effective date if the construction/modification began before the effective date and initial startup has not occurred. Contents of the application are defined. (NOTE: The Washington State Department of Ecology Regulations require approval of a notice of construction before any construction or modifications may begin.)

40 CFR 61.08 Approval of Construction or Modification

The EPA is required to notify the operator of approval or intention to deny approval within 60 days after receipt of sufficient information to evaluate the application. Additional details of approvals/denials are given.

40 CFR 61.09 Notification of Startup

The owner/operator must notify EPA of startup within 60 to 30 days before the expected startup date. Notification must also be made of actual startup. EPA will accept a copy of any similar notification required for any State or local agency, as long as it contains all the required information.

40 CFR 61.10 Source Reporting and Request for Waiver of Compliance

The owner or operator of each existing source or each new source that had an initial startup before the effective date shall provide a report to the EPA within 90 days after the effective date. The standards of Subparts H and Q are not new. As a result, this work would ordinarily already be complete. The report is to describe capacities, control equipment, compliance information, controls and a compliance schedule, etc. A waiver may be requested for a period of two years after the effective date. (Two years have elapsed since the last changes to Subparts H and Q, which occurred in 1989.)

Note: Both subparts H and Q explicitly state that facilities affected by them are exempt from the reporting requirements of this subsection.

40 CFR 61.11 Waiver of Compliance

This section describes the waiver that might have been obtained for existing sources or new sources with an initial startup date before the effective date.

40 CFR 61.12 Compliance with Standards and Maintenance Requirements

Compliance with numerical emission limits is to be determined by specified emission tests. Use of good operating practices is required. Provisions are made for EPA to accept alternate means of emission limitation that will achieve emission reductions equivalent to a published standard.

40 CFR 61.13 Emission Tests and Waiver of Emission Tests

This section provides rules for emissions testing, in the event the tests are required according to the applicable subpart (H or Q), unless a waiver is obtained. The section describes provisions for requesting a waiver or for requesting use of an alternate method for emissions testing.

40 CFR 61.14 Monitoring Requirements

This section establishes detailed monitoring requirements for those subparts that require monitoring. Included are maintenance, operation, and evaluation of the monitoring system, etc.

40 CFR 61.15 Modification

This section defines what EPA considers to be a "modification." The definition is as follows:

"Any physical or operations change to a stationary source which results in an increase in the rate of emission to the atmosphere of a hazardous pollutant to which a standard applies [in this case, radionuclides] shall be considered a modification."

Upon modification, an existing source becomes a new source for each hazardous pollutant for which the rate of emission to the atmosphere increases and to which a standard applies.

Emission rate shall be expressed as kg/hr for any hazardous pollutant for which the rate of emission to the atmosphere increases and for which a standard is applicable. The EPA determines whether the emission rate will increase based on emission factors from certain EPA background documentation, or material balances, monitoring data, etc. Specific references are given.

The following are not, by themselves, considered modifications:

- Maintenance, repair, and replacement considered routine by EPA.
- Increase in production rate, if accomplished without capital expenditure on the stationary source.
- Increase in the hours of operation.
- Certain conversions to coal.
- Relocation or change in ownership of a stationary source. (Such changes must, however, be reported.)

40 CFR 61.19 Circumvention

No operator may build, erect, install, or use any article, machine, equipment, process, or method, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous dilutants to achieve compliance with a visible emissions standard, and the piecemeal carrying out of an operation to avoid coverage by a standard that applies only to operations larger than a specified size.

- **Subpart H - NATIONAL EMISSION STANDARDS FOR EMISSIONS OF RADIONUCLIDES OTHER THAN RADON FROM DEPARTMENT OF ENERGY FACILITIES**

40 CFR 61.90 Designation of Facilities

This subpart applies to any DOE facility that emits any radionuclide other than radon-222 and radon-220 into the air, except for disposal at certain facilities. Rotary mode core sampling is not a disposal facility activity, so this subpart is applicable.

40 CFR 61.92 Standard

Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. Note: This standard is more stringent than the State of Washington limit.

40 CFR 61.93 Emission Monitoring and Test Procedures

This section specifies detailed methods for monitoring and testing to determine compliance with the standard. Included are criteria for determining where monitoring must occur. For example, measurements must be taken at all release points that have a potential to discharge radionuclides in quantities that could cause a effective dose equivalent in excess of 1% of the standard.

40 CFR 61.94 Compliance and Reporting

This section specifies methods of determining compliance with the standard and contents of annual reports. Additional rules apply for facilities that have a noncompliance and for handling classified information.

40 CFR 61.95 Recordkeeping Requirement

This subsection addresses the types of records that must be kept, and how long they must be kept.

40 CFR 61.96 Application to Construct or Modify

In addition to any activity that is defined as construction under 40 CFR Part 61, Subpart A, any fabrication, erection, or installation of a new building or structure within a facility that emits radionuclides is also defined as new construction for purposes of 40 CFR Part 61, Subpart A. Rotary mode core drilling activities with nitrogen purge would likely be considered a modification in the single shell tank farms.

If the effective dose equivalent caused by all emissions from the new construction or modification is less than 1% of the standard given in 40 CFR 61.92, an application for approval need not be filed for an existing facility. Methods for determining the effective dose equivalent from the modification are specified. This exemption is only available if the facility is in compliance with this subpart, according to its last annual report. Note: The Washington Department of Ecology does not allow this type of exemption.

40 CFR 61.97 Exemption from the Reporting and Testing Requirements of 40 CFR 61.10

All facilities designated under this subpart are exempt from the reporting requirements of 40 CFR 61.10.

- **Subpart Q - NATIONAL EMISSION STANDARDS FOR RADON EMISSIONS FROM DEPARTMENT OF ENERGY FACILITIES**

40 CFR 61.190 Designation of Facilities

This subpart states that the radon standard applies to the design and operation of all storage and disposal facilities for radium-containing material (i.e., byproduct material as defined under section 11.e(2) of the Atomic Energy Act of 1954 (as amended) that are owned or operated by the Department of Energy that emit radon-222 into the air. A list of included facilities follows that does not include Hanford, however, the Tank Farms do store byproduct material and therefore are probably affected.

40 CFR 61.191 Definitions

This section defines "facility" as all buildings, structures, and operations on one contiguous site. It defines "source" as any building, structure, pile, impoundment or area used for interim storage or disposal that is or contains waste material in sufficient concentration to emit radon-222 in excess of this standard prior to remedial action.

Note: I have not seen an evaluation of Hanford tank farms to show whether they would be considered sources.

40 CFR 61.192 Standard

No source at a Department of Energy Facility shall emit more than 20 pCi/m³-s of radon-222 as an average for the entire source, into the air. This requirement will be part of any Federal Facilities Agreement reached between EPA and DOE.

40 CFR 61.193 Exemption from the Reporting and Testing Requirements of 40 CFR 61.10

All facilities designated under this subpart are exempt from the reporting requirements of 40 CFR 61.10.

B.2 STATE REGULATIONS

B.2.1 Washington General Regulations for Air Pollution Sources (WAC 173-400)

The State of Washington regulates discharges to the air primarily through the Washington Air Pollution Control Regulations, WAC 173-400 through WAC 173-490 (Ecology, March 1991). The regulations, which apply state-wide, are intended to control and/or prevent the emission of air contaminants.

Section 173-400-030 defines many of the terms used in these regulations. In these definitions, "source" means all of the emissions units (including quantifiable fugitive emissions) that are located on the contiguous or adjacent properties under the control of the same person and those activities that are secondary to the production of a single product or functionally related group of products. In short, the Hanford Site is considered a single source.

The definitions further explain that an "emissions unit" is any part of a source that emits or would have the potential to emit any pollutant subject to regulation. Since pollutants subject to regulation specifically include radionuclides from Department of Energy Facilities, a pressurized tank or tank farm would be considered an emissions unit.

"Fugitive emissions" are defined as emissions that do not pass and that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.

A "new source" is a source that commences construction after the effective date of WAC Chapter 173-400. Any addition to, enlargement, modification, replacement, restart after a period of five years of nonoperation, or any alteration of any process or source that may increase emissions or ambient air concentrations of any contaminant for which federal or state ambient or emission standards have been established shall be construed as construction or installation or establishment of a new source.

Consequently, modifications to tank farm ventilation systems to increase flow rate to handle the nitrogen purge could be considered a new source, particularly since most of the older single shell tank farm ventilation systems were shut down more than five years ago. (The current source term, however, is likely lower than it was in earlier single shell tank operations due to the decay of radionuclides and the shut down of air lift circulators that were formerly used in some of the single shell tanks.)

"General process unit" is defined as an emissions unit using a procedure or a combination of procedures for the purpose of causing a change in material by either chemical or physical means, excluding combustion. Tank farm exhausters, which, as a minimum, include HEPA filtration, would be considered general process units.

"Best Available Control Technology" (BACT) means an emission limitation based on the maximum degree of reduction for each air pollutant subject to the WAC 173-400 regulations that would be emitted from any proposed new or modified source which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such sources or modification through application of production processes, available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such air pollutant. Application of BACT may not result in emissions of any air pollutant that would exceed the emissions allowed by any applicable standard under 40 CFR Part 60 and Part 61. If the reviewing authority determines that technological or economic limitations on the application of measurement methodology to a particular class of sources would make the imposition of an emission standard infeasible, it may instead prescribe a design, equipment, work practice or operational standard, or combination thereof, to meet the requirement of BACT. (The objective is to achieve equivalent results.) BACT is defined as meaning the same as "all known available and reasonable methods of emission control," a phrase used in Washington State Law.

Selected requirements of the Washington Air Pollution Control Regulations that apply to rotary mode core sampling are as follow:

- **WAC 173-400-040 GENERAL STANDARDS FOR MAXIMUM EMISSIONS**

This section contains standards that all sources and emissions units must meet.

Section (1) restricts visible emissions to less than 20% opacity during 57 minutes of each hour, except under certain circumstances.

Section (2) prohibits fallout of particulates from any source from being deposited beyond the owner's property in sufficient amounts to interfere with the use and enjoyment of the affected property.

Section (3) addresses fugitive emissions. Operations that are sources of fugitive emissions are to take "reasonable precautions to prevent the release of air contaminants from the operation," if they are in an attainment area and not impacting any nonattainment area. Best Available Control Technology (BACT) is required for fugitive emissions that are significant contributors to the nonattainment status of a designated nonattainment area. Please Note: Hanford is located in an attainment area so "reasonable precautions" to prevent fugitive emissions are required.

Section (4) requires use of good practices and procedures to minimize the generation of any odor that might reasonably interfere with any other property owner's use and enjoyment of his or her property.

Section (5) prohibits the emission of any air contaminant if it is detrimental to the health, safety, or welfare of any person, or causes damage to property or business.

Section (6) prohibits the emission of sulfur dioxide gas from any emissions unit in excess of 1000 ppm on a dry basis, based on the average of any period of 60 consecutive minutes, except under certain circumstances.

Section (7) prohibits the concealing or masking of any emission that would otherwise violate the provisions of the air pollution control regulations.

Section (8) requires that reasonable precautions be taken to prevent fugitive dust from becoming airborne and that the operation be maintained and operated to minimize fugitive dust emissions. (Fugitive dust is defined as a particulate emission, which is a subset of fugitive emissions. "Particulate matter" is defined as any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 100 micrometers. "Particulate matter emissions" are defined as all finely divided solid or liquid material, other than uncombined water, emitted to the ambient air as measured by applicable reference methods, or an equivalent or alternative method specified in 40 CFR Part 60 or by a test method specified in the Washington State implementation plan. In addition, if the source of fugitive dust has been identified as a significant contributor to a "Category 1 PM-10 Area," (not applicable to Hanford), reasonably available control technology to control emissions is required.

- **WAC 173-400-060 EMISSION STANDARDS FOR GENERAL PROCESS UNITS**

This section prohibits the emission of particulate material from any general process operation in excess of 0.23 grams per dry cubic meter (0.1 grain/dscf) of exhaust gas at standard conditions (20°C and 760mm Hg). Test methods are referenced.

- **WAC 173-400-070 EMISSION STANDARDS FOR CERTAIN SOURCE CATEGORIES**

This section further regulates specific types of sources, including wigwam burners, hog fuel boilers, orchard heating, grain elevators, catalytic cracking units, and sulfuric acid plants. Hanford facilities do not fall into these categories.

- **WAC 173-400-075 EMISSIONS STANDARDS FOR SOURCES EMITTING HAZARDOUS AIR POLLUTANTS**

This section adopts by reference the EPA emission standards for hazardous air pollutants, and the source testing, monitoring and analytical methods as given in 40 CFR Part 61 prior to July 1, 1989. This section does not apply to any source operating under an EPA waiver or Presidential exemption.

- **WAC 173-400-100 REGISTRATION**

This section specifies types of sources that must register with Ecology or with an air pollution authority. Included is any source that emits a contaminant subject to a national emission standard for hazardous air pollutants (NESHAPS). Since NESHAPS, which is codified in 40 CFR Part 61, applies to emissions of radionuclides from Department of Energy Facilities, Hanford is required to register.

- **WAC 173-400-105 RECORDS, MONITORING, AND REPORTING**

This section contains requirements for monitoring sources and for reporting the annual emissions from the source. Fugitive emissions of particulate matter may be included. Emissions from the tank farms would be part of the overall Hanford annual report. Startups, shutdowns, breakdowns, etc. are also to be reported. Subsection (6) requires continuous monitoring and recording for fossil fuel-fired steam generators, sulfuric acid plants, fluid bed catalytic cracking units catalyst regenerators at petroleum refineries, or wood residue fuel fired steam generators. Continuous monitoring does not appear to be required for tank farm rotary mode core drilling under this subsection.

- **WAC 173-400-110 NEW SOURCE REVIEW**

This section requires that Ecology or the air pollution control authority approve a notice of construction prior to the construction, installation, or establishment of a new source or emissions unit that is required to register per WAC 173-400-100. Active tank exhaust during rotary mode core drilling would fall into this category. The notice of construction and new source review apply only to the affected emissions units and the contaminants involved. Subsection 1 (d) requires (for WAC 173-400 registered sources) the notification of Ecology or the authority prior to the replacement of air pollution control equipment or process equipment other than equivalent replacement for routine maintenance and repair. Ecology or the authority may determine that a notice of construction is required.

New sources (such as a new application in the tank farms) must be in accord with federal and state rules and regulations, including NSPS (New Source Performance Standards, 40 CFR 60) and NESHAPS (National Emission Standards for Hazardous Air Pollutants, 40 CFR 61). New sources must use Best Available Control Technology (BACT) for emissions control. Special requirements apply to new sources that are located in nonattainment areas (not applicable to Hanford).

New sources located in attainment areas for contaminants and for ozone must meet additional restrictions if the source will emit VOCs (Volatile Organic Compounds). A volatile organic compound is defined as any organic compound that participates in atmospheric photochemical reactions; that is, any organic compound other than those that the USEPA Administrator designates as having negligible photochemical reactivity. Methods of measurement are referenced. Specific exemptions are given for methane, ethane, trichlorofluoromethane, dichlorodifluoromethane, chlorodifluoromethane, trifluoromethane, trichlorotrifluoroethane, dichlorotetrafluoroethane, chloropentafluoroethane, methylene chloride, and 1,1,1-trichloroethane (methyl chloroform). This section may or may not apply to a new tank farm HVAC application. Organics remaining in the tanks are not particularly volatile. Offsetting emissions reductions are allowed to meet some discharge criteria.

Visibility impairment must be evaluated for all "Class I" Areas in Washington and neighboring states. Counties around Hanford are not designated Class I (per WAC 173-400-141 (6)), so this evaluation is not required.

If acceptable, Ecology will issue a regulatory order to approve the notice of construction of the source modification.

Subsection (7) of WAC 173-400-110 addresses portable sources. The subsection states that a portable source may be allowed to operate at a temporary location without filing a notice of construction, as long as Ecology is given 30 days notice of the intent to operate at a new location and supplies compliance information. (The portable source must comply with all applicable emission standards.) This subsection would not apply long term to new portable exhausters in the tank farms, because the subsection also states that the permission to operate the portable source will be for a limited period of time - "one year or less." Rotary mode sampling is an activity that will require more than one year for completion. There is a possibility that Ecology would give permission to operate an existing portable exhauster without a notice of construction for a period of one year or less. In this case, the exhauster application would have to be shown to meet all of the emission standards, something that might be possible, for example, in tanks that do not contain organics. The portable exhauster would have to have the proper capacity to handle the extra gas flow contributed by the nitrogen purge system.

Construction may not commence until the notice of construction has been approved.

- **WAC 173-400-115 STANDARDS OF PERFORMANCE FOR NEW SOURCES**

In Subsection (1), Ecology adopts by reference the federal standards of 40 CFR 60, "Standards of Performance for New Stationary Sources," as they existed prior to July 1, 1989, with a couple of exceptions.

The exceptions are for 40 CFR 60.5 and 40 CFR 60.6, which provide for preconstruction review of sources only on request. The State program requires preconstruction review and approval prior to construction of a new source.

The specific standards of performance adopted by reference affect many types of facilities, none of which is represented by a Hanford Tank Farm.

- **WAC 173-400-120 BUBBLE RULES**

This section establishes a framework for accounting for emissions. Allowable emissions are expressed in weight of pollutant per unit time for each emissions unit involved in the application.

- **WAC 173-400-180 VARIANCE**

This section describes the terms under which a variance may be requested.

- **WAC 173-400-200 CREDITABLE STACK HEIGHT AND DISPERSION TECHNIQUES**

This section addresses stack height and good engineering practices. Dispersion techniques or excess stack height may not be used to meet air quality standards.

- **WAC 173-400-210 ADJUSTMENT FOR ATMOSPHERIC CONDITIONS**

Varying the rate of emission of a pollutant according to atmospheric conditions or ambient concentrations of that pollutant is prohibited, except as directed according to air pollution episode regulations.

B.2.2 Washington Toxic Air Pollutants Regulations (WAC 173-460)

The regulations of this chapter apply to sources that emit a contaminant subject to a national emission standard for hazardous air pollutants (NESHAPS, 40 CFR 61). Since 40 CFR 61 specifically regulates emissions of radionuclides from Department of Energy facilities, WAC 173-460 is applicable at Hanford. Subsections of interest are discussed below.

- **WAC 173-460-030 REQUIREMENTS, APPLICABILITY AND EXEMPTIONS**

Tanks are exempt from Chapter 173-460 requirements unless they are equipped with vents other than those required solely as safety pressure relief devices. This exemption will not apply to tanks on active ventilation systems.

Nonprocess fugitive emissions of toxic air pollutants from stationary sources, such as construction sites, unpaved roads, coal piles, waste piles, and fuel and ash handling operations are exempt from the control technology requirements of WAC 173-460-060. This exemption does not appear to address tanks.

- **WAC 173-460-040 NEW SOURCE REVIEW**

This section adds to the requirements of WAC 173-400-110, described in section 4.3.1 of this engineering analysis. If a notice of construction is required under both chapters, the written applications are to be combined.

An approved notice of construction is required for proposed emissions units that are new toxic air pollutant sources.

A notice of construction is not required for exempt tanks (with pressure relief vents only), when routine maintenance or repair requires equivalent replacement of air pollution control equipment, or the new source is a minor process change that does not increase capacity and total toxic air pollutant emissions do not exceed the emission rates specified in small quantity emission rate tables in WAC 173-460-080, or the new source is the result of minor changes in raw material composition and the total toxic air pollutant emissions do not exceed the WAC 173-460-080 small quantity emissions rates.

New sources requiring a notice of construction are required to use "T-BACT" (Best Available Control Technology for Toxics) for emissions control for toxic air pollutants that are likely to increase. The sources are required to use "T-RACT" (Reasonably Available Control Technology for Toxics) for control of toxic air pollutants that are likely to remain the same or decrease. T-BACT must as a minimum, meet the standards of 40 CFR 60 and 40 CFR 61. T-RACT is defined as the lowest emission limit that a particular source is capable of meeting by the application of control technology that is reasonable available considering technological and economic feasibility. Procedures required to demonstrate compliance with T-BACT are specified in this subsection.

Construction is prohibited until the notice of construction is approved. Submission of an operation and maintenance plan may be required.

- **WAC 173-460-050 REQUIREMENT TO QUANTIFY EMISSIONS**
This subsection requires that a notice of construction be accompanied by an estimate of quantities of toxic air pollutants that are used in modeling procedures and that may be discharged after applying the required control technology. Methods are specified.
- **WAC 173-460-060 CONTROL TECHNOLOGY REQUIREMENTS**
This subsection states that Best Available Control Technology for Toxics (T-BACT) is required for new sources that are likely to increase toxic air pollutant emissions if T-BACT is not installed and operated. Ecology may approve other requirements as equivalent to T-BACT. Specific requirements are then listed for several specific processes, such as dry cleaners, chromic acid plating, etc. None of the specific processes mentioned is found in the Hanford Tank Farms.
- **WAC 173-460-070 AMBIENT IMPACT REQUIREMENT**
This subsection requires that a notice of construction be accompanied by a demonstration that emissions from the source will be sufficiently low to protect human health and safety from potential carcinogenic/toxic effects, if toxic air pollutants are likely to increase. Compliance is to be demonstrated in any area that does not have restricted or controlled public access.
- **WAC 173-460-080 DEMONSTRATING AMBIENT IMPACT COMPLIANCE**
This section specifies methods for demonstrating ambient impact compliance. It requires an "acceptable source impact level" (ASIL) analysis to accompany the notice of construction, if toxic air pollutants are likely to increase. The analysis is required for Class A and Class B toxic air pollutants, which are listed in WAC 173-460-150 and WAC 173-460-160. Methods, models, and averaging times, etc., are specified. An alternate, simplified method is available for small quantity emission rates. The purpose of the demonstration is to show that Class A or Class B acceptable source impact levels are not exceeded, or that small quantity emissions rates are not exceeded.
- **WAC 173-460-090 SECOND TIER ANALYSIS**
This subsection provides for additional analysis in the event compliance cannot be demonstrated using the acceptable source impact level analysis. The second tier analysis is initiated by petition.
- **WAC 173-460-100 REQUEST FOR RISK MANAGEMENT DECISION**
The operator of a source that emits Class A toxic air pollutants that are likely to result in an increased cancer risk of more than one in one hundred thousand may request that Ecology establish allowable emissions for the source. Application contents, criteria for approval, and other additional information and actions are discussed in this section.
- **WAC 173-460-110 ACCEPTABLE SOURCE IMPACT LEVELS**
This subsection describes how acceptable source impact levels have been calculated. Levels are published in WAC 173-460-150 and WAC 173-460-160.
- **WAC 173-460-120 SCIENTIFIC REVIEW AND AMENDMENT OF ACCEPTABLE SOURCE IMPACT LEVELS AND LISTS**
This subsection discusses Ecology's program for conducting an ongoing review of information concerning whether to add or delete toxic air pollutants to WAC 173-460-150 or WAC 173-460-160, and what acceptable source impact levels should be.

- **WAC 173-460-150 CLASS A TOXIC AIR POLLUTANTS: KNOWN, PROBABLE AND POTENTIAL HUMAN CARCINOGENS AND ACCEPTABLE SOURCE IMPACT LEVELS**
This subsection lists the Class A Toxic Air Pollutants (about 125 substances). Acceptable Source Impact Levels are provided for about 54 of these substances.

A preliminary review of the list shows some entries that might be of interest in tank farm application of the rotary mode core sampler with nitrogen purge. They are (there may be others):

Cadmium and compounds
Chromium, hexavalent metal and compounds
Nickel and compounds

- **WAC 173-460-160 CLASS B TOXIC AIR POLLUTANTS AND ACCEPTABLE SOURCE IMPACT LEVELS**
This subsection lists the Class B Toxic Air Pollutants (about 511 entries) along with acceptable source impact levels for each.

A preliminary review of this list shows some entries that might be of interest in tank farm application of the rotary mode core sampler with nitrogen purge. They are (there may be others):

Aluminum, as aluminum soluble salts
Ammonia
Chromium (II) compounds
Chromium (III) compounds
Cyanides
Fluorides
Iron salts, soluble
Potassium hydroxide
Sodium hydroxide
Tributyl phosphate
Uranium, insoluble and soluble
Zirconium compounds

B.2.3 Washington Ambient Air Quality Standards and Emission Limits for Radionuclides (WAC 173-480)

The emission limits of this chapter apply to all radionuclide emission units. Sections of interest to rotary mode core sampling operations are as follow:

- **WAC 173-480-030 DEFINITIONS**
This subsection defines Best Available Radionuclide Control Technology, "BARCT," as technology "that will result in a radionuclide emission limitation based on the maximum degree of reduction for radionuclides that would be emitted from any proposed new or modified emission units which the permitting authority on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such emission unit or modification through application of production processes or available methods, systems and techniques. In no event shall application of best available radionuclide control technology result in emissions of radionuclides which would exceed the ambient annual standard limitation specified in this chapter."

- **WAC 173-480-040 AMBIENT STANDARD**

This subsection requires that emissions of radionuclides in the air shall not cause a maximum accumulated dose equivalent of more than 25 mrem/yr to the whole body or 75 mrem/yr to a critical organ of any member of the public. Doses due to radon-220, radon-222, and their respective decay products are excluded from these limits. Compliance with the standard shall be determined by procedures in WAC 173-480-070.

- **WAC 173-480-050 GENERAL STANDARDS FOR MAXIMUM PERMISSIBLE EMISSIONS**

This subsection states that all radionuclide emission units are required to meet the standards of this chapter. At a minimum, all emission units shall meet WAC 246-220-007 requiring every reasonable effort to maintain radioactive materials in effluents to unrestricted areas, as low as reasonably achievable (ALARA). For the purposes of this chapter, control equipment of facilities operating under ALARA are defined as reasonably available control technology (RACT). This section also states that, where another, more stringent, radionuclide emission regulation applies, the more stringent regulation shall govern.

- **WAC 173-480-060 EMISSION STANDARDS FOR NEW AND MODIFIED EMISSION UNITS**

"Whenever the construction, installation or establishment of a new emission unit subject to this chapter is contemplated, the project shall utilize best available radionuclide control technology (BARCT). Addition to, enlargement, modification, replacement, alteration of any process or emission unit or replacement of air pollution control equipment which will significantly change potential radionuclide emissions or significantly change the dose equivalent will require the proposed project to utilize best available radionuclide control technology (BARCT) for emission control."

This subsection appears to apply to rotary mode operations when they add nitrogen purge gas to a tank. The nitrogen purge creates a potential for a significant increase in radionuclide emissions.

- **WAC 173-480-060 EMISSION MONITORING AND COMPLIANCE PROCEDURES**

This subsection identifies procedures for determining compliance with the radionuclide emission standards.

B.2.4 Radiation Protection - Air Emissions (WAC 246-247)

The purpose of this chapter is to establish procedures for the monitoring, control, and reporting of airborne radionuclide emissions from specific sources to assure compliance with applicable standards. This chapter is administered by the Washington Department of Health. Areas of interest to rotary mode core sampling are summarized below.

Note: The regulations of WAC 246-247 are currently being revised, with an expected issue date before the end of calendar year 1992. The revised requirements will likely be much more detailed.

- **WAC 246-247-010 APPLICABILITY**

This subsection specifically states that the chapter applies to U. S. Department of Energy Facilities.

- **WAC 246-247-040 STANDARDS**

This subsection refers to the standards discussed above, in WAC 173-480.

- **WAC 246-247-050 REGISTRATION**

This section requires U. S. Department of Energy Facilities that own or operate sources of airborne radionuclide emissions to register the sources with the Washington Department of Health, unless specifically exempted in WAC 402-80-030, which is now WAC 246-247-020. (State licensees under the authority of other chapters of Title 402 WAC stay registered.)

- **WAC 246-247-060 AIRBORNE EMISSION PERMITS**

This subsection requires operators of sources of radioactive airborne emissions to obtain a permit. "For emission sources at the U. S. DOE Hanford Site, the Department (of Health) shall issue one permit for each major production, processing, or research area, e.g., 200 East Area."

- **WAC 246-247-070 NEW AND MODIFIED SOURCES**

This subsection requires a notice of construction for new sources that are required to register per WAC 402-80-060. New sources are required to use Best Available Radionuclide Control Technology (BARCT).

- **WAC 246-247-080 MONITORING AND REPORTING**

This subsection describes the Department of Health's environmental surveillance activities and requirements. Monitoring, semiannual inventory reporting, dose equivalent calculations, and emissions source testing are discussed.

- **WAC 246-247-090 SPECIAL REPORTS**

This subsection requires reporting to the Department of Health of any unusual/abnormal events that could result in airborne radionuclide emissions in violation of applicable standards.

APPENDIX C

NOTES AND CONVERSIONS

C.1 Accounting For Radioactive Decay

Radioactive decay must be accounted for since much of the data is older and some of it is averaged over several years. Radioactive decay can be modeled as a first order, irreversible chemical reaction,

$$\int \frac{dN}{N} = -k \int dt \quad (C-1)$$

Where N is the number of moles or curies, t is time, and k is the decay constant.

The decay constant, k, is ln2 over the half-life,

$$k = \ln \frac{2}{t_{1/2}} \quad (C-2)$$

The integrated form is,

$$N = N_0 \exp(-kt) \quad (C-3)$$

The equation above can be used to determine the corrected amount.

C.2 Conversions

C.2.1 Determine moles of water using the basis of 1 liter of solution:

$$g\text{-moles} = \frac{1000 SP.G. - \sum x_i}{18 g/g\text{-mole}} \quad (C-4)$$

C.2.2 Converting radionuclides from $\mu C/l$ to moles/l:

$$x_i (mole/l) = x_i (\mu C/l) \frac{(37000 dps./\mu C)}{Avogadros No. * k, S^{-1}} \quad (C-5)$$

C.2.3 Where pH is not reported, the following is used to calculate it:

$$pH = 14 + \log[OH^-] \quad (C-6)$$

C.2.4 Calculating vapor constituents from vapor mole fractions:

C.2.4.1 Non-volatiles in ppm m/m (by weight)

$$y(ppm, m/m) = y(mole\ fraction) * \frac{MW}{MW_{air}} * 10^6 \quad (C-7)$$

C.2.4.2 Volatiles in ppm v/v (by volume)

$$y(ppm, v/v) = y(mole\ fraction) * 10^6 \quad (C-8)$$

C.2.4.3 PPM v/v to g/m³ at Constant Pressure

$$g/m^3 = \frac{ppm \times MW}{22.4 \times 10^3 \times \frac{T}{T_s}} \quad (C-9)$$

Where T is the vapor temperature and T_s is the standard temperature (units in Kelvin or Rankine, T_s = 273 °K). Also, OSHA assumes 25°C for this calculation so the correct temperature ratio is:

$$\frac{T}{T_s} = \frac{273+25}{273} \quad (C-10)$$

The conversion then becomes:

$$mg/m^3 = \frac{ppm \times MW}{24.45} \quad (C-11)$$

C.2.4.5 Bequerels/l to μCi/l

$$\frac{Bequerels}{37000} \frac{\mu Ci}{l} \quad (C-12)$$

C.3 Notes on Equilibria

C.3.1 Fugacity

At equilibrium, the chemical potentials of any given component in all phases of a multi-component system are identical (Hougen 1962). Fugacity is analogous to the partial pressure and is related to the chemical potential as

$$\Delta\mu = RT \ln\left(\frac{f_i^{\alpha}}{f_i^{\pi}}\right) \quad (\text{C-13})$$

Since

$$\mu_i^{\alpha} = \mu_i^{\beta} = \dots = \mu_i^{\pi} \quad (\text{C-14})$$

$$f_i^{\alpha} = f_i^{\beta} = \dots = f_i^{\pi} \quad (\text{C-15})$$

It follows that

Where μ = the chemical potential
 R = the gas constant
 f = the fugacity

Therefore, fugacity equality can be used as a criterion of phase equilibrium. Fugacity is also more useful since fugacities can be found in absolute terms where chemical potential cannot.

C.3.2 Activity

Activity is analogous to mole fraction, i.e., activity is used in lieu of mole fraction in nonideal solutions and mole fractions are used in ideal solutions. This is shown by subtracting the ideal chemical potential from the nonideal chemical potential,

$$\mu_{i,ideal} - \mu_{i,nonideal} = RT \ln \frac{a_i}{x_i} \quad (\text{C-16})$$

Where a_i = the activity and x_i is the mole fraction

The activity coefficient is defined as,

$$\gamma_i = \frac{a_i}{x_i} \quad (C-17)$$

γ_i approaches 1 as the solution becomes dilute and is identical to 1 for ideal solutions and is a measure of the systems departure from ideal behavior.

C.4 Viscosity

Tank solution viscosity, as well as density and fall height, has a large impact on future vapor concentration since it is an inverse square in the Archimedes Number (Arch). Errors in viscosity will cause major errors in "mass transfer" partition factors, K_i , as shown below:

$$K_i(\epsilon) = \frac{\partial K_i}{\partial \rho}(\epsilon \rho) + \frac{\partial K_i}{\partial H}(\epsilon H) + \frac{\partial K_i}{\partial \mu}(\epsilon \mu) \quad (C-18)$$

Where ϵ is the fractional error

From the above, it is estimated that a 10% error in viscosity can propagate a 50% error in K_i . Therefore, viscosity needs to be estimated as close as possible.

Since there are very little data available for tank solution viscosity, estimates are required based on solution physical and chemical properties. Solution viscosity is a function of temperature, chemical composition, and solids content or:

$$\mu = f(x_i, T, \% \text{solids}) \quad (C-19)$$

Where μ in this case is the viscosity. Perry's 5th (Perry & Chilton 1973) provides the following correlation for viscosity versus solids content:

$$\mu_s = \frac{1 + 0.5\phi_s}{(1 - \phi_s)^4} \mu_l \quad (C-20)$$

Where subscript s and l refer to the slurry and the pure solution respectively and ϕ_s is the volume% solids. There are also changes due to mixtures. Perry's 6th (Perry & Green 1984) provides several viscosity correlations for liquid mixtures. The most accurate requires determining experimental parameters. Therefore, the correlation for non-polar liquids is used which errs on the low side and is conservative.

$$\ln \mu_{mix} = \sum w_j \ln \mu_j \quad (C-21)$$

Where μ_{mix} is the viscosity of the mixture, μ_i is the pure component viscosity, and w_i is the weight fraction. First, the pure component viscosities for the major components at the tank temperature are determined. The mixture viscosity is then determined using the equation above. Finally, the mixture viscosity is multiplied by the solids correlation when the solid content is known. This correlation has been compared to viscosity data results from B-202. The comparison indicates quite good representation when correct solids content is used. Figures D-3, -4, -5, are plotted from the data used to determine pure component viscosities.

APPENDIX D

FIGURES

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Figure D-2

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Figure D-3

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Part 2

Assessment of Vapor Space Control Technologies

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LIST OF TERMS FOR PART 2

ALARA	DOE Nuclear Safety Program, meaning: "As Low As Reasonably Achievable"
BAR	Barometric Pressure (absolute atmospheric pressure in inches of Mercury)
BTU	British Thermal Unit (Unit of heat, work or energy)
CFM	Cubic Feet per Minute (Volumetric Flow in ft ³ /min)
DB	Dry-Bulb (thermometer reading indicating sensible heat content of the air)
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
DOE-RL	Richland, WA Field Office of DOE
°F	Degree Fahrenheit (Indicator of thermodynamic temperature)
FT	Feet or Foot (basic unit of length in U.S. Engineering System of Measurements)
GPM	Gallons per Minute (Fluid-volumetric flow)
HEPA	High Efficiency Particulate Air filter
HR	Hour (derived unit of time)
LATA	Los Alamos Technical Associates, Inc.
M	Meter (std. unit of length in SI system)
MIL-STD-	Military Standard
MIN	Minute (derived unit of time)
PSI	Pound-per-square-inch (unit of pressure)
PUREX	Plutonium Reprocessing Plant at 200 East Area of Hanford Site
RAD	Radiation Absorbed Dose
RH	Relative Humidity of Moist Air (%)
S	Second (basic unit of time)
SD	Supporting Document (WHC Engineering Standard)
SP	Static Pressure (inch w.g.)
T	Ton, Ton of Refrigeration (12,000 Btu/hr)
THA	Thermal & Hydraulic Analysis Department of WHC
TP	Total Pressure (inch w.g.)
TPA	"Tri-Party Agreement" (between EPA, DOE and State of Washington)
TWRS	Tank Waste Remediation Systems (operating group of WHC)
VP	Velocity Pressure (inch w.g.)
VEL	Velocity (ft/min)
WB	Wet-Bulb (thermometer reading indicating latent heat content of the air)
W.G.	Water Gauge (Column height equivalent of pressure)
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

Los Alamos Technical Associates, Inc. (LATA) received a contract from Westinghouse Hanford Company (WHC) under a Task 008 of MBJ-SWV-312057 to conduct an engineering study for Waste Storage Technical Support, dealing with identification of the waste tank vapors/particulates (Sub-Task 1) and associated mitigation requirements (Sub-Task 2). For Sub-Task 2 of this contract, LATA conducted vapor treatment/removal analysis to identify the best available technologies for use in conceptual and final design. The design phase of this project would be conducted by an external A/E firm.

1.1 PROBLEM STATEMENT

As part of the effort to commence with the actual tank waste remediation system process, WHC has initiated a program of extensive tank waste characterization and vapor sampling. This task is extremely important from the standpoint of both tank operations and safety since the area of vapor-space control will play an important role since it is an integral part of the overall process of waste retrieval, transport, and treatment.

Early waste characterization sampling and analysis have shown that each tank may contain as many as sixty chemical constituents in the vapor space. This revelation has driven a requirement for extensive vapor data base development. Complete characterization of all Hanford Site tanks will generate thousands of data points which must be correlated and analyzed. The data base development must be, therefore, a critical component of tank vapor issue resolution.

This task has been clearly identified by DOE Undersecretary Tom Grimley in his September 1993 "Safety Initiatives." Also, there are four TPA Milestones identifiable with the waste retrieval element of the Program; namely, M-06-01 (Oct. 1990), M-06-02 (Oct. 1992), M-06-00 (June 1994), and M-07-00 (Oct. 1997.)

Gases that pose health hazards may be present in the waste tank vapor spaces. Such vapors have been found in several Hanford tank storage facilities, namely in 241-C-103. Nineteen exposure events, involving thirty-four people, occurred between July of 1987 and May of 1993. All of the vapor exposures involved first-aid medical attentions, and some resulted in significant amounts of lost-time to workers. Ten of these vapor exposure events, involving eighteen people, were associated with the 241-C Tank Farm.

The above described exposure events have occurred during the period of interim tank stabilization. The future waste retrieval operations may result in even greater potential health and safety concerns. It is obvious that the waste perturbation during such operations will cause much greater liberation of gases and particles into the tank vapor space. These products of the retrieval processes must be safely and effectively collected, handled and/or treated, such that, the danger to the workers and the public in general will be minimized.

1.2 SCOPE

The main purpose of this sub-task is to identify the currently available technologies for vapor treatment and removal. The study will also evaluate the feasibility of combining tanks with similar waste types for a unified ventilation system. Some design alternatives of specifying currently available modular components, possibly connected in series, will also be offered.

This final report contains the following major topics of technical discussions:

- The first required step is determine, to the extent possible, the vapors and/or aerosols present in the tanks. The results of this characterization were presented in Part I. This entailed a thorough compilation and evaluation of the individual tank vapor constituent sheets and their summaries, including evaluation of the ranges and peaks of constituent concentrations. Such data is necessary for setting up a preliminary design envelope that, in turn, will determine the vapor removal and treatment equipment selection and sizing.
- Identification of available technologies for vapor treatment and removal
- Evaluation of the basic vapor treatment equipment requirements
- Assessment of the tank grouping possibilities
- Development of one or more modular system approaches

1.3 METHODOLOGY USED

The methodology for the Vapor-space Control Technologies Assessment has been developed as shown schematically in Figure 1-1.

The absence of an existing, fully characterized database for both DST's and SST's vapor constituents other information was researched from several WHC documents and personal communications with various TWRS experts. An extensive literature search has been conducted to collect and systemize the data previously developed by WHC and as described in numerous Supporting Documents. Emphasis was placed on familiarization with the recommended tank retrieval methods and their influence on vapor space loading during waste handling, transport, intermittent storage, treatment, and ultimate disposal.

Figure 1-1. Vapor-Space Control Study--Logistics and Flowsheet Diagram.

A computer model was developed to derive, when necessary, and to organize the vapor data estimated from the physical, chemical, and radiological properties of the waste. The final spreadsheets provide a database of tank vapor composition space during both waste storage and the retrieval process. Two retrieval concepts were evaluated and included in the spreadsheet:

- Pumping of liquid and slurry from a SST to a holding tank.
- Limited water sluicing by means of intermediate-pressure water jets for those tanks containing significant quantities of solids/saltcake, followed by pumping of the resultant slurry as above.

Based on our team's technical experience and literature search, several technological concepts of vapor space control were selected that are further described in the Technical Discussion section of this report. Consultations and visits with various equipment vendors have produced additional information that will aid in the development of a prospective collection system and its individual components.

2.0 BACKGROUND

2.1 TANK FARMS CONFIGURATION

The byproducts and wastes produced by reprocessing of spent nuclear fuels from plutonium, uranium and neptunium production at the Hanford Site are stored in one hundred and seventy-seven underground tanks. These waste storage facilities were constructed within the 1943 to 1985 period and are located in the 200 East and 200 West Areas. The twenty-eight double-shell tanks were constructed from 1970 to 1985, and are designed to hold 3,500 m³ of waste, while the older single-shell tanks can contain 200 m³ (16 tanks), 2,000 m³ (60 tanks), 2,900 m³ (48 tanks), and 3,800 m³ (25 tanks) of waste.

2.1.1 Tank Farm Hardware

The 149 single-shell tanks are located in twelve tank farms, each containing between 4 and 18 tanks. The first wastes were put into the tanks in 1944, however, no wastes have been added since 1980. Pumpable interstitial liquid and supernatant wastes have been and are continuing to be removed from SST's and transferred to DST's. The SST's are fabricated of a ¼" carbon steel plate and set in a concrete footing, while the DST's are, de facto, of a tank-in-tank construction.

It is important to consider the tank farm hardware (such as the number and size of risers, quantity of in-tank equipment, location in the tank-farm soundness, etc.) due to suitability and safety aspects during the waste retrieval operations. The tank hardware tabulation is presented in the eight tables located in the Appendix A.

2.1.2 Tank Waste Contents

At various times since 1944, four major chemical processing operations have been conducted at the Hanford Site. Three of these processes, the bismuth phosphate, reduction-oxidation (REDOX), and the plutonium uranium extraction (PUREX) were specifically designed for uranium and/or plutonium recovery. The tributyl phosphate (TBP) process was designed for the recovery of relatively large amounts of uranium that remained in the bismuth phosphate waste. The more advanced REDOX and PUREX processes were capable of recovering both uranium and plutonium. The byproducts and wastes from these processes, which contained most of the fission products and relatively small quantities of uranium, plutonium, and other actinides, were originally stored as liquid wastes (with significant amounts of solids in the form of precipitated sludge) in the SST's.

Liquid waste accumulation and storage continued until 1980, when the DST's were completed and used exclusively for receiving new wastes. The 149 SST's presently contain over 37,000,000 gallons, and the 28 DST's contain approximately 35,000,000 gallons of waste. In 1968, the interim stabilization program was started. Under this operation the pumpable liquid is removed from the SST's, which results in a semi-dry sludge and saltcake type residue. This program is primarily intended to reduce the leakage potential from the SST's and is scheduled for completion in 1996. Wastes contained in the SSTs vary from 5% to 95% of the total tank capacities and vary in consistency from pumpable liquid to sludge and to hard saltcakes. The tank wastes contain both chemically hazardous and radioactive constituents.

Although the tank waste information has been used as input into the LATA's database, it is important to emphasize the waste origin and mass in evaluating the feasibility of a vapor/gas/particle collection system. The overview of the waste contents in the tanks and respective tank farms, as well as the waste origin are tabulated and described in tables located in Appendix B.

2.2 DESCRIPTION OF WASTE RETRIEVAL CONCEPTS

Although, much has been written on the subject of waste retrieval technologies, there is still no identified, selected alternative. Based on the WHC literature search (results of which are shown in Figure 2-1) and consultations with TWRS experts, unlimited sluicing and liquid sludge transfer pumping were identified as the candidate concepts. The waste retrieval process flowsheet is depicted in Figure 2-2, and the graphical representation of the sluicing/pumping principle is depicted in Figure 2-3. However, some of the SST's contain exclusively sludge and hardened saltcake, and therefore, some form of mechanical/mining methods may necessary.

Several WHC documents prescribe technical criteria for both the environmental and safety conditions and the equipment performance requirements during the tank waste retrieval operations. Numerous technical and operational assumptions had to be taken in lieu of a pending ruling on the retrieval process by the federal and state agencies. The most important exemption must be the one bypassing the rigid requirement of no more than 500 gallons of water be allowed to be added to a tank. Other exceptions, like for the Tank 241-C-106, have already been granted, WHC has assumed that unlimited water additions would be allowed and used during sluicing.

The following is the list of present waste retrieval criteria:

- Liquid quantities should be such that the total supernatant liquid volume remaining in a SST would not exceed 5,000 gal for 75-ft-dia tanks, and 400 gal for 20-ft-dia tanks.
- Maximum dose rates for the retrieval equipment operating personnel shall not exceed 0.2 mrem/h,
- Maximum allowable loads on the soil overburden should be concentrated as much as possible directly above the center of the tank and must be distributed over at least 10-ft radius and should be limited to:
 - 50 tons for the 200 Series Tanks (20-ft-dia)
 - 100 tons for the 100 Series Tanks (75-ft-dia)
- Mechanical loads from installing and operating the waste retrieval equipment should not result in excessive loads on the tank liner, dome, or the risers,
- In-tank obstructions like risers and airlift circulators as well as other in-tank hardware and debris should not interfere with waste removal by the retrieval equipment,

Figure 2-1. Waste Retrieval Concepts.

Hanford Document	Year	Comm. Mining Methods														Mech. Arm
		Dredging	Large Hole (Top-off)	Borehole Mining	Self-propelled Vehicle	Side Entry	Retrieval Platform	Unlimited Sluicing	Limited Sluicing	Confined Sluicing	Mixer Pump	Focused Ultrasonics	Chem. Decomposition	Liquifaction	Vaporization	
BNWL-2234	1977	✓				✓										✓
RHO-CD-1533	1982	✓					⊗	⊗	✓	✓						✓
WHC-SD-WM-TI-302	1987						✓									✓
QX-90-1	1990	✓			✓											
WHC-EP-0352	1990	⊗		✓	⊗	⊗		⊗	⊗	✓		⊗				
WHC-SD-ER-TRP-001	1990															
WHC-SD-ER-TPR-002	1990		✓				⊗	⊗	✓	✓						
WHC-SD-W139-ES-001	1990	✓						✓	✓	✓	✓		✓			
WHC-SD-W139-ES-002	1991		✓					⊗	✓	✓	⊗					
WHC-SD-ER-DA-001	1991			✓		⊗				✓						✓
WHC-SP-0680	1991			⊗		⊗				✓						✓
WHC-SD-TD-TI-002	1991	⊗		✓						✓						✓
WHC-SD-TI-002, Rev 0	1992						✓	✓	✓							
WHC-SD-W139-ES-005	1992					⊗						⊗				✓
DOE-RL-92-TRB-123	1992	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
WHC-SD-WM-ER-128	1992	⊗								✓						⊗
WHC-SD-WM-TPR-119	1993	✓								✓	✓					

Legend: ✓ ... Concept studied and recommended
 ⊗ ... Concept studied and rejected

Figure 2-2. Waste Retrieval Flowsheet.

Figure 2-3. Sluicing System Principles.

Sluicer Design.

Sluicing System.

- Waste properties with specific gravities up to 3.0, should become transportable by pumping at the flow rate of at least 30 gal/min and 125 psi discharge pressure (to provide 50 psi residual pressure at the surface level),
- Retrieval equipment will operate within the following range:
 - Contacting Waste Temperature of 50°F to 300°F
 - In-Tank (No Waste Contact) Temperature of 50°F to 150°F
 - Outside Tank Temperature of 0°F to 150°F
- Total materials exposure during retrieval operations may accumulate up to equivalent exposure of 10^7 Rad,
- Waste transport capabilities shall be capable of moving the retrieved waste, in all forms, to the ground surface above the tank,
- The temperature of the waste, as a direct consequence of the retrieval operations, shall be kept below 464°F,
- Retrieval shall achieve a minimum of 95% removal of the total waste contents,
- Retrieval rate shall not be less than TBD lbs/hr, or 30 gal/min (whichever is greater),
- Ventilation system should be capable of removing all harmful constituents found in the vapor space and operation should be continuous during all phases of waste retrieval operations.

2.3 MODEL OF VAPOR SPACE CONSTITUENT LOADING

The vapor and particulate loading in the vapor space of individual tanks has been based on data contained in Part I of this report. The constituent concentration estimates of vapor/gas of concern are presented in Table 2-1. To enhance the accuracy and reliability of the data input, a limited amount of recent experimental vapor data from ten (10) SST's was included. The raw data are presented in the tables located in Appendix C.

2.4 OVERVIEW OF AVAILABLE AIR CLEANING TECHNOLOGIES

An extensive literature search was conducted to identify and evaluate the best available technology for the tank vapor and aerosols. The direction of the search was conducted from more general and progressing to highly specialized techniques. Two main types of control technologies explored were investigated: control of gas and vapor, and particulate capture. A schematic of these technologies is represented in Figure 2-4, while each system effectiveness is shown in Figure 2-5.

Table 2-1. Selected Vapor/Gas Constituents Deemed to Represent a Control Problem.

Vapor/Gas Constituent	Concentration in Vapor Phase
Acetone	1.43E5 $\mu\text{g}/\text{m}^3$
1-Butanol	3.92E6 $\mu\text{g}/\text{m}^3$
Carbon Tetrachloride	1.71 $\mu\text{g}/\text{m}^3$
Benzene	5733 $\mu\text{g}/\text{m}^3$
Tributyl Phosphate	1.9E5 $\mu\text{g}/\text{m}^3$
n-paraffin hydrocarbons (C ₁₀ -C ₁₄)	221.9E6 $\mu\text{g}/\text{m}^3$
4-Methyl-2-Pentanone (MIBK)	4.04E5 $\mu\text{g}/\text{m}^3$
Ammonia	1.95 lb/day generation rate
Hydrogen	1./69 lb/day generation rate

Note: Highest concentrations from all tanks or tank farms.

Figure 2-4. Vapor Space Controls.

Figure 2-5. Vapor-Space Control Options.

CONTROL TECHNOLOGY	VAPOR SPACE CONSTITUENT						
	Organic Vapors	Inorgan. Vapors	Radio-nuclides	Particul. Matter	Ammonia	Hydrogen	NO _x
Thermal Incineration	☺						
Adsorption	☺		☺				
Condensation	☺						
Absorption	☺	☺					
Filtration			☺	☺			
Electrostatic Precipitation				☺			
Wet Scrubbing		☺	☺	☺	☺	☺	☺
Chemical Reduction					☺	☺	☺

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The particle size distribution in the tank vapor space is critical for predicting control equipment performance. It is obvious that the volumetric flow rate (and thus in-tank suction pressure), dust collection efficiencies, equipment reliability and maintainability will be greatly influenced by this size distribution. A crude estimate of a particle distribution model was made based on sketchy WHC data and previous experience on hard-rock and coal mining dust emissions. This topic should be thoroughly researched in the future, so that a more realistic model would be available for the A/E firm conducting the conceptual design of a system.

The typical dust size classification and the control equipment application is depicted in Figure 2-6. It is expected that the vapor-space constituent collection in the tank exhaust ventilation systems will be vastly effected by the total mass loading and the particle distribution in the airstream.

2.5 ALLOWABLE EMISSIONS

A full list of applicable federal, state and local requirements pertaining to environmentally acceptable Emissions from the tank ventilation system with annotated bibliography is provided in Appendix B of Part 1 of this study.

[illegible]

3.0 TECHNICAL DISCUSSIONS

3.1 DEFINITION OF MISSION REQUIREMENTS

This section defines the functional and system requirements of a system that will mitigate the air quality between the tank vapor-space and the discharge stack during the waste retrieval operations. These requirements and design criteria will govern the ensuing process of technology assessment and evaluation of the system suitability. The reader should also refer to Section 2.2 for more details on retrieval equipment operating requirements.

3.1.1 Operational Requirements

- Table or list of organic and inorganic compounds and aerosols and their expected concentrations which are to be removed.
- Other constituents in the vapor stream which are present but aren't to be removed.

3.1.2 Functional Requirements

The following Functional Requirements have been identified:

- Assure that the air constituent concentration and radioactivity emissions from the discharge will comply with all federal, state and local laws and regulations,
- Continuously and remotely monitor performance of each individual component and the entire system,
- Streamline the component connections in order to minimize the pressure losses,
- Arrange the components such that the larger particles and vapor/gases of greater concentrations will be captured and collected first,
- Avoid frequent and rapid changes of air stream temperature,
- Design a common mounting platform to allow transfer of the system between tank farms and individual tanks,
- Connection to the tank should be simple, utilizing the existing risers as much as possible. Try to avoid creating the need for extra risers.
- The piping carrying the return condensate back to the tank(s) should be of a double-wall design (consideration could also be given to all ducts and equipment enclosures),
- Minimize the physical dimensions and the mass of the components,

- Maintain the required tank OSR and OSD limits.

3.1.3 System Requirements

The following system requirements have been selected:

- Use proven technologies as much as possible,
- Minimize any interruption of the waste retrieval process,
- Allow normal conduct of tank farm operations,
- System design should be simple, easy to install, relocate, maintain, and, decontaminate,
- Minimize the potential for releasing hazardous materials and radioactive particles to the surrounding environment during handling or operating the system, as well as exposures to workers in accordance with the ALARA principles,
- Maximize the use of automatic controls to minimize the amount of necessary human interface,
- Minimize the cost and equipment production schedule,
- Maximize the safety margins and redundancy of the system,
- Minimize the electrical and other utility requirements of the system.

3.2 PRELIMINARY VAPOR SPACE CONTROL TECHNOLOGIES EVALUATION

Based on the functional and system requirements outlined in Section 3.1, a preliminary evaluation of candidate technologies and associated components for a tank ventilation train was initiated. This evaluation considers the major vapor-space control requirements for eighteen Hanford Site tank farms comprising 177 DSTs/SSTs. Vapor-space constituent concentrations derived from the modeling analysis performed by the LATA project team, and discussed in Part 1 of this report, provided the quantitative basis for this task. However, several serious constraints that currently impede a more detailed evaluation of a tank ventilation system will be addressed.

The lack of pertinent information related to vapor/particulate concentrations within an active tank ventilation system during tank retrieval operations hampers selection of appropriate components for the tank ventilation system train. Final selection of tank retrieval method(s) to be used for the TWRS program, if different than pumping and sluicing techniques modeled in Subtask 1, may cause revision of the selected vapor treatment technology.

Limited availability of characterization data for tank vapor-space constituents contained within the DSTs/SSTs currently also precludes a comparison of the results of the current LATA modeling analysis with concurrent data derived from an ongoing tank vapor sampling/laboratory

analysis program. Likewise, the very limited availability of pertinent experimental data to establish vapor/particulate mass loadings and particle size distributions for evaluation of candidate tank ventilation system components is also a very serious constraint at this time.

3.2.1 Tank Retrieval Methods

As previously discussed in Section 2, two retrieval methods were developed on a preliminary basis for inclusion in the spreadsheet model. For those DSTs/SSTs containing predominately pumpable liquids and slurries, waste transfer by means of in-tank mixer pump(s) to holding tank(s) prior to additional pretreatment and/or permanent disposal is an obvious choice. However, for DSTs/SSTs containing significant quantities of solids, primarily in the form of saltcake, alternative retrieval methods will be required. Retrieval operations for these tanks will probably entail a "mechanical mining" technique (e.g., drilling, cutting, sawing, etc.), or an intermediate pressure water jet sluicing (e.g., hydraulic mining) method to break up the solids prior to transfer of a water slurry by means of mixer pumps or via a pneumatic (air transport) conveyor system.

The limited water sluicing method was selected for several reasons. Sluicing remains the only demonstrated means of waste retrieval (Krieg, 1990). It also affords a means of reducing the mass loading of respirable particulates into the vapor dome space of the tank, and, hence, into the tank exhaust system. Disadvantages of a limited sluicing technique include the following:

- (1) Sluicing adds additional liquid to the tank which, ultimately, must be treated as mixed waste.
- (2) If a pumpable liquid slurry cannot be obtained by sluicing, a mechanical mining system, including a hopper for solids will be required.

However, based on both laboratory and field investigations conducted by Bureau of Mines to study the effectiveness of medium-pressure (up to 30,000 psi) water jets in controlling the generation of airborne respirable dust during the hydraulic fragmentation of coal, a limited sluicing scenario was developed (Lohn and Frank, 1975).

The limited sluicing scenario assumes sufficient size reduction and dissolution of the saltcake is affected to allow pumping of the resultant slurry from the waste tank to another holding tank prior to subsequent pretreatment operations and/or LLW/HLV waste disposal operations.

Based upon the results of the underground tests from the above reference, an average particulate concentration for all laboratory samples was 0.60 mg/m^3 at a ventilation rate of about 1,000 cfm. If a single large concentration (2.56 mg/m^3 , suspected to be an erroneous measurement) is eliminated, the average is then 0.39 mg/m^3 . However, a particulate concentration of 0.5 mg/m^3 is recommended for vapor space loading for this scenario to be appropriately conservative. The Bureau of Mines study also indicated a particle size of $\leq 1.07 \mu\text{m}$ for about 75% of the particulates collected with the midjet impinger. A Coulter counter measured both the size distribution and the total particle count for all laboratory samples.

A total of 51 samples was collected. Pressures from 5,000 to 30,000 psi were used and the jets were traversed across the face at speeds from 26 to 720 ipm. The standoff distance (the distance from the nozzle to the coal face) was approximately 3 inches. Maximum flow rates per nozzle (0.06 in. diameter) were 10 gpm.

3.2.2 Vapor Space Mass Loading and Particulate Size Distribution

Particulate mass loadings and particle size distributions were roughly estimated from the results derived from a prior off-gas sampling status report for the Building 702A ventilation system (WHC Internal Memorandum, Tank Farm Process Technology Section to N.R. Kerr, 1989.) This report is the only reliable reference to tank ventilation system particulate sampling and analysis found during these current investigations.

The aging waste tanks are being ventilated by the 241-A-702 system comprised of condensers, de-entrainers and HEPA filters. All aging wastes originated from the first decontamination cycle of the PUREX process. The acid waste was neutralized with sodium hydroxide to 1M excess hydroxide. The resultant neutralized high-level waste was transferred from PUREX to one of the two operating aging waste tanks in the 241-AZ Tank Farm.

The sampling station was located at the isolation valve pit between the 241-A-401 condenser and the K1-5-2A de-entrainer. Thus sampling was performed at the condensation point of the gas stream. Results showed that the temperature of the saturated off-gas leaving the condenser, with the range between 76.8°F and 93.8°F, affected both the mass and the β -emission concentration (principally due to the presence of ^{137}Cs) in the gas stream. As the vapor discharge temperature of the condensate increased, so did the mass concentration in the off-gas. The mass concentration varied from 0.9 to 64.8 $\mu\text{g}/\text{m}^3$, averaging 16.5 $\mu\text{g}/\text{m}^3$. Beta concentration also increased with the increasing condenser discharge temperature, varying between 507 and 2,935 pCi/ m^3 . The gamma concentration in the off-gas varied between 408 and 1,294 pCi $^{137}\text{Cs}/\text{m}^3$, but there was apparent correlation with the condenser off-gas temperature.

The off-gas stream had two separate bi-modal mass size distributions; most of the mass loading and the β/γ activity was concentrated in the smaller size range of the aerodynamic diameter, between 0.05 and 0.4 μm . The average mass mean aerodynamic diameter (MMAD) of the particulate in the gas stream was 0.073 micron. The beta mean aerodynamic diameter (BMAD) of the particulate containing β -activity was 0.084 micron. The estimated mean of the larger diameter mass and beta distribution was about 2 μm . The ensuing statistical analysis indicated that the mean particle size was a function of the sample point in the duct. The larger particulate size was found in the center of the duct where both the air velocity and gas temperature was the highest.

The maximum estimated tank concentrations of substances for which there exists a regulatory exposure limit has been summarized in Table 3-1. The most stringent applicable exposure standard has been used. These standards are listed in Federal Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1000 tables 2-1-A and 2.2, and the State of Washington General Occupational Health Standards of WAC 296-62-07515, Table 1. An employee's exposure to any substance listed in Table 1 shall be limited in accordance with the requirements outlined in WAC 296-62-07501 through 296-62-07513. All permissible exposure limits are time weighted averages (TWA) unless otherwise noted. The tank farm where the highest estimated concentration occurs is included in Table 3-1.

Table 3-1. DST/SST Constituent Regulatory Exposure Limits.

	Maximum Estimated Concentration (ppm)	Permissible Exposure Limit (ppm) ¹	Tank Farm
Ag	0.11	0.0023	T
Al	50.4	9.0	U
Ba	0.134	0.089	B
Be	0.0043	0.00136	AW
Bi	7.035	1.8	B
Cd	0.021	0.0005	B
Cr	1.4	0.24	SX
CrO ₄ (hexavalent)	0.447	0.021 (ceiling) ²	U
Cyclohexene	6763.5	300	AP
Dibutylphthalate	177	0.44	AN
F (as Fluoride)	22.62	0.1	TX
Fe	7.92	2.2	AX
Hg	0.125	0.006	AX
Na	278.25	1.2 (ceiling) ²	TX
NH ₃	23,600	25	AX
Ni	0.218	0.04	T
N ₂ O	880	30	C
OH (as NaOH)	15.4	1.2 (ceiling) ₂	C
Pb	0.072	0.006	B
Rh	0.003	0.0002	SY
SiO ₂ (amorphous silica)	15.218	1.93	TX
U	0.578	0.02	BX
ZrO (as Zr)	9.534	1.14	A

¹ Permissible Exposure Limits: Permissible exposure limits (PELs) refer to airborne concentrations of substances without regard to the use of respiratory protection and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the permissible limit, a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness. Permissible exposure limits refer to time-weighted concentrations for an 8-hour workday within a 40-hour workweek which shall not be exceeded. Time weighted average (TWA) is the employee's average airborne exposure to any 8-hour work shift of a 40-hour work week which shall not be exceeded.

² Ceiling Limit: Ceiling is the employee's exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time over a working day.

The maximum estimated tank concentration of ammonia (NH_3) is 23,600 ppm. This exceeds the Immediately Dangerous To Life and Health (IDLH) value of 500 ppm. At varying concentrations, ammonia can cause coughing, chest pain, breathing difficulty, bronchopneumonia, pulmonary edema, and death from bronchial spasm. It is a severe eye irritant which can penetrate the eye quickly causing permanent blindness. Initial eye irritation occurs at a concentration of around 70 ppm.

Emissions of radionuclides to the ambient air from DOE facilities shall not exceed any amount that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr (40 CFR 61, Subpart H). Compliance with this standard shall be determined by using EPA approved sampling procedures and computer models.

The emission standard is the same for non-DOE facilities however there are simplified procedures to reduce the burden in determining compliance. A facility will be in compliance if the average annual radionuclide emission concentration is less than that listed in 40 CFR 61, Subpart I, Appendix E, Table 2--Concentration Levels for Environmental Compliance. Numbers from this table have been used as a guideline for determining potential non-compliance with the emission standard as a result of tank waste retrieval operations. Compliance must be confirmed using EPA approved procedures and models.

The following Table 3-2 identifies tank farms with postulated maximum concentrations in excess of the annual average emission concentration that would be compliant for non-DOE facilities. Current tank farm operations must limit the emission of these radionuclides. Retrieval operations must be designed and conducted to limit radionuclide emissions in the tank farms identified below as well as to comply with the ALARA policy. The radionuclide concentrations shown in parentheses are in the units of $\mu\text{Ci/L}$.

3.3 SUMMARY OF DST/SST VAPOR/PARTICULATE CHARACTERIZATION

To establish basic requirements for a ventilation system exhaust train, maximum concentrations of tank vapor space constituents for each of the 177 DSTs/SSTs were developed from the modeling analysis results presented and discussed in Part 1 of this Final Report. These estimated concentrations are presented in Sub-Task 1 for the tanks in each of the six DST farms and the twelve SST farms. Note that all concentrations for the identified radionuclides are presented in units of $\mu\text{Ci/L}$. Similarly, vapor/gas constituent concentrations and particulate constituent concentrations are given in units of ppmv.

The maximum concentration for each of the identified analytes or constituents is given in the Sub-Task 1 database for two separate tank conditions. One set of values represents the maximum or peak concentration for each constituent, assuming that the tank waste is in a relatively stable (stagnant) condition, i.e., no waste mixing or waste transfer operations are being performed. The other set of values represents the maximum constituent concentrations derived from the modeling analysis under either of results for the two different waste retrieval options (previously discussed in Sections 2.1.1 and 3.2.1).

Table 3-2. DST/SST Radionuclides Exceeding Non-Regulated Facility Standards.

Radionuclide	Tank Farm Exceeding Value
Am 241 (1.9E - 15)	All
Am 242m (2.0E - 15)	None/All table values 0
Am 243 (1.8E - 15)	AP, AW, A, AX, B, BX, BY, C, S, SX, T, TX, TY, U
CA (1.0E - 11)	A, AX, B, BX, BY, C, S, SX, T, TX, TY, U, AN, AP, AW, AZ
Cm 242 (5.3E - 14)	All except SY, AP, AW, AY
Cm 244 (3.3E - 15)	AN, AW, AX, A, AX, B, BX, BY, C, S, SX, T, TX, TY, U
Cm 243 (2.6E - 15)	AN, AP
Cs 137 (1.9E - 14)	All
CePr 144 (6.2E-13, Ce)	None
Co60 (1.7E - 14)	NOT AY, SY, TX, BY
Cs 134 (2.7E - 14)	NOT TY, AX, AY, SY
Eu 154 (2.3E - 14)	AP, AZ, A, AX, B, T, TY, S, SX, AN
H ₃ (1.5 E-9)	AN, AP, AW
I 129 (7.1E - 15)	NOT SY
Eu 155 (5.9E - 13)	AP, S, A, AX, B, T, TX, U
Nb 94 (7.1E - 15)	AN, AP
Nb 95 (2.2E - 12)	None
Np 237 (1.2E - 15)	NOT Ay, SY
Pm 147 (1.1E - 11)	AN, AW
Pu 238 (2.1E - 15)	NOT AY, SY
Pu 239/240 (2.0E - 15)	All
Pu 241 (1.0E - 13)	Not AP, AW, AY, SY
Ra 226 (3.3E - 15)	AP
RuRh 106. 3.4E-13, Ru)	All
Ru 103 (2.6E - 12)	AP
Se 79 (1.1E - 13)	NOT AY, AZ, SY
Sn 113 (1.4E - 12)	AP
Sr 89/90 (1.8E - 12)	All
Sb 125 (1.6E - 13)	T, A, AX, B, C, S, SX, AP
Tc 99 (1.4E - 13)	All
U 234 (7.7E - 15)	SX, AP
U 235 (7.1E - 15)	AP
U 238 (8.3E - 15)	NOT AW, AY, SY
Y 90 (1.3E - 11)	None/All table values 0
Zr 95 (6.7E - 13)	None

Perusal of the data presented in Sub-Task 1 demonstrates that the higher of the two maximum constituent concentrations occurs for tanks undergoing waste retrieval operations. This data is supported, in part, by experimental observations on an operating DST with an active ventilation system (Kimura, 1987). The highest partition factors (ratio of vapor to liquid concentration) for Cs-137 in the system was observed in a tank having airlift circulators. Conversely, the lowest partition factors for Cs-137 and other radionuclides were observed in stagnant tanks not actively receiving wastes or having airlift circulators.

Prior to evaluating alternative technologies for the treatment and removal of vapor-space constituents, the extensive database compilation presented in Sub-Task 1 was reduced with further analysis to reflect maximum concentrations for the most significant constituents. This data is presented in Table 3-3 for 18 selected constituents in each of six DST farms and in Table 3-4 for 25 selected constituents in each of twelve SST farms.

In general, those constituents shown in Tables 3-2 and 3-3 were selected because they exhibit the highest maximum concentrations (ppmv for inorganic/organic chemicals) or the highest radioactivity levels ($\mu\text{Ci/L}$ for radionuclides) for each tank farm. Hence, those constituents listed in Tables 3-2 and 3-3 should have a correspondingly higher probability of significantly impacting the eventual design of the DST/SST ventilation system.

For example, ammonia (NH_3) maximum concentration levels range from 920 to 9,600 ppmv for five of the six DST farms as shown in Table 3-2. Similarly, ammonia concentrations, varying from 370 to 24,000 ppm, are exhibited in Table 3-3 for several of the SST farms. These maximum ammonia concentrations probably dictate the inclusion of ammonia removal/control in the ventilation exhaust train for the affected tank farms. Likewise, a high maximum concentration of methane gas (16 ppmv) is noted in Table 3-3 for the C farm. Therefore, these gases must be considered in the overall design and specification of the control component for the C tank farm.

Cs-137 maximum radioactivity levels also are shown to be consistently higher for both DST and SST farms as shown in Tables 3-3 and 3-4. I-129 has a significant vapor pressure was included in the list of significant constituents for both DST and SST farms because it is at normal temperature and it has a very long half-life of about 17 million years. Similarly, Tc-99 has a half-life of approximately 212,000 years. The remaining radionuclides shown in Tables 3-2 and 3-3 were included because they are considered toxic, high-level wastes (e.g., Am-241, Pu-241, Eu-154, Pu-239/40) and/or exhibited relatively high maximum radioactivity levels (e.g., Sr-89/90, C-14, Co-60).

Significant tritium (H-3) levels are noted in Table 3-2 for the AN, AW, and AP DST farms. Tritium would be present as tritiated water vapor in the vapor space for these tank farms.

A number of organic constituents were included in Tables 3-2 and 3-3 because they have been uniquely identified in relatively significant concentrations for a limited number of SST/DST farms.

Table 3-3. Selected Maximum DST Vapor Space Constituent Concentrations
(28 Tanks, 6 Tank Farms).

Constituent		Tank Farm						Comments
Symbol	Unit	AN	AW	AP	AY	AZ	SY	
Cs-137	μCi/L	3.0E+01	4.7E+01	7.5E+01	7.3E+01	5.0E+02	2.9E+01	
Sr-89/90	μCi/L	5.7E+00	9.2E-01	7.8E+00	7.6E+00	4.0E+00	2.9E-01	
Tc-99	μCi/L	1.7E-02	2.4E-02	3.2E-03	9.1E-04	7.6E-02	1.9E-03	
Am-241	μCi/L	7.0E-01	2.2E-04	7.9E-04	1.1E-03	9.9E-04	4.0E-04	
C-14	μCi/L	8.4E-05	7.15E-04			8.0E-04		
Eu-154	μCi/L	7.3E-02		1.2E-02		2.4E-01		
H ₃	μCi/L	4.4E-04	4.7E-07	5.7E-04				
I-129	μCi/L	7.3E-06	1.9E-05	2.3E-05	6.9E-06	3.0E-05		
NH ₃	ppm(V)	1.1E+03	9.2E+02	9.6E+03	4.0E+02		1.3E+03	
H ₂ O	ppm(V)	9.0E+04	6.4E+04	3.3E+04	2.5E+04	2.5E+04	1.2E+05	
EDTA	ppm(V)	2.2E-02					3.6E-04	
HEDTA	ppm(V)	2.5E-02						
IDA	ppm(V)	1.6E-01						
Cyclohexene	ppm(V)			6.8E+03				
2-Ethyl-1-Hexanol	ppm(V)						1.2E-02	
2-Butanone	ppm(V)						3.9E-02	
Na	ppm(V)	9.5E+00	3.1E+01	5.6E+00	2.0E+00	2.2E+01	1.1E+01	
Al	ppm(V)	1.7E+00	5.8E-01	3.0E-01	5.3E-02	7.2E-02	1.9E+00	

Table 3-4. Selected Maximum SST Vapor Space Co

CONSTITUENT							
Symbol	Unit	A	AX	B	BX	BY	
Cs-137	$\mu\text{Ci/L}$	3.4E+01	2.0E+01	3.7E+01	8.6E+00	1.4E+01	1.1
Sr-89/90	$\mu\text{Ci/L}$	1.2E+03	5.0E+00	4.1E+01	3.5E+00	7.0E+00	7.7
Tc-99	$\mu\text{Ci/L}$	1.0E-02	5.2E-03	1.3E-01	1.8E-01	1.2E-02	4.3
Am-241	$\mu\text{Ci/L}$	3.4E-01	1.9E-02	8.2E-03	2.2E-02	4.3E-03	1.3
C-14	$\mu\text{Ci/L}$	3.0E-01	1.6E-02	9.5E-02	1.6E-01	4.0E-03	2.3
CO-60	$\mu\text{Ci/L}$	9.3E-01	1.1E-02				1.8
Eu-154	$\mu\text{Ci/L}$	1.9E+00	1.4E-01	7.9E-03			
Eu-155	$\mu\text{Ci/L}$	5.9E-01	6.8E-02	2.0E-03			
I-129	$\mu\text{Ci/L}$			2.3E-04	3.7E-04		
Pu-241	$\mu\text{Ci/L}$	3.5E-01	1.5E-01	6.2E-02	3.5E-02	2.6E-03	6.3
Pu-239/240	$\mu\text{Ci/L}$	3.0E-01	4.3E-02	7.7E-02	7.8E-02	3.0E-03	4.3
CO	ppm(V)	4.5E+00	1.1E+00	2.4E+00	7.3E-01	3.5E+00	4.6
NH ₃	ppm(V)		1.8E-02	2.4E+04	8.0E+01	1.0E+01	3.7
OH	ppm(V)	4.6E+00	2.3E+00	1.2E+00	2.9E+00	1.7E+00	1.5
CH ₄	ppm(V)						1.6
H ₂ O	ppm(V)	1.8E+05	1.2E+05	8.8E+04	3.6E+04	1.1E+05	1.5
EDTA	ppm(V)	1.7E-01			1.2E-02		
HEDTA	ppm(V)	2.6E-1			1.9E-02		
Dodecane	ppm(V)			9.2E+00	1.1E+01		5.3
Tridecane	ppm(V)			3.1E-00	3.9E+00		
Tetradecane	ppm(V)			6.5E-01	8.4E-01		
Decane	ppm(V)	1.1E+01		1.1E+02			
Undecane	ppm(V)			3.2E+01	3.9E-15		
C ₆ H ₅ O ₇ ⁻	ppm(V)	7.0E-01	7.1E-02	4.4E+00	5.23E+00	3.3E+00	3.0
Na	ppm(V)	1.6E+01	4.5E+00	2.2E+01	4.1E+00	1.3E+01	7.3

stituent Concentrations (149 Tanks, 12 Tank Farms).

TANK FARM							COMMENTS
	S	SX	T	TX	TY	U	
-01	1.2E+01	1.3E-03	5.1E+00	1.4E+-1	6.11E-01	7.5E+00	
-00	1.6E+01	1.4E+03	6.2E+00	1.5E+01	3.7E+01	5.3E+00	
03	2.7E-02	7.5E+02	2.3E-03	1.5E-02	2.6E-02	8.2E-02	
02	1.4E-02	4.1E+00	3.3E-03		1.8E-03	3.2E-03	
02	1.4E-02	1.0E-02	3.0E-03	1.6E-02	8.1E-03	4.1E-02	
03		1.2E+00					
	6.2E-03	8.4E-01	2.4E-03			1.2E-02	
	4.8E-03					4.0E-03	
	1.9E-03				3.4E-03	1.4E-04	
02	5.4E-02	2.0E-02	7.6E-03	5.5E-02	9.2E-03	4.8E-03	
02	2.0E-01	1.6E+00	1.1E-02			8.4E-02	
-00	3.2E+00	4.2E+00	1.9E+00	7.7E-01	4.6E-01	5.0E+01	
-02							
-01	3.8E+00	8.9E+00	3.8E-01	1.2E+00	1.8E+00	5.1E+00	
-01							
-04	9.8E+04	1.9E+05	3.8E+04	5.9E+04	5.0E+04	5.4E+04	
		1.5E-02		4.4E-02			
		2.9E-02		8.4E-02			
-01			8.7E+00				
			2.9E+00				
			6.1E-01				
			1.1E+02				
			3.1E+01				
-00	5.23+00	3.5E+00	3.8E-02	5.2E-01	2.3E-01	2.4E-02	
-00	2.1E+01	3.0E+01	2.5E+00	2.8E+02	1.3E+01	7.9E+01	

3.4 ALTERNATIVE TECHNOLOGIES FOR VAPOR SPACE CONSTITUENTS TREATMENT AND REMOVAL

The ventilation system capabilities must be fully compatible with the expected waste retrieval methods (see sections 2.1.1 and 3.2.1). However, alternative methods of retrieval, i.e. certain forms of sluicing, or mechanical mining may be required. Specifically, some of the retrieval concepts for SST's could drastically alter the composition, mass loading, and particle distribution in the tank vapor-space, and, hence, the selection and design of the ventilation system components and their arrangement in the equipment train. It is expected that the particle separation processes may become the most effective means of particle/vapor collection in the tank exhaust system. Typical ranges of separation processes for either liquid or gas are shown in Figure 3-1.

The following components have been preliminarily selected from the roster of available technologies and their functions and relative merits of operations are discussed below. Supplementary information obtained from manufacturers and/or vendors of these prospective components during the conduct of this study is included in Appendix G.

3.4.1 Chevron Separator

The chevron based, located either at the tank outlet of the exhaust riser, will prevent large droplets, water splashes, and large-size particles from entering the exhaust ductwork. The removal of large particles will prevent salt or sludge buildup in the ductwork. It will also reduce the downstream loading on other devices, namely the moisture separator, thus increasing the period between necessary back-flushes. The chevron may require periodic removal of accumulated debris, especially dissolved solids. The equipment design must include the function of easy maintainability and clean up. Generally, metal chevrons can remove over 95% of all liquid aerosols with a diameter of greater than 5 microns.

3.4.2 Cyclone Separator

This device is usually located upstream of an impact type separator. It would be most suitable on those SST's using alternative retrieval methods which produce particulate high level (i.e., mechanical mining.) The optimum range of collection efficiency is for particulates over the size of $5.0 \mu\text{m}$ and can handle high dust load levels. The cyclones have no moving parts and/or replaceable filters, and can withstand relatively high temperatures. Pressure drop varies between 2" and 8" w.g. and is relatively stable over wide range of flow. The greatest benefit of this active system component is its ability to remove the majority of large particles, thus protecting downstream components of the exhaust train. The disadvantage lies in its rather large size and the need for extensive maintenance of the active equipment sections. It will also require a limited amount of operator oversight during retrieval operations.

Particle Control Technologies For Both Gas & Liquid Phase

Figure 3-1. Typical Ranges of Various Separation Processes.

3.4.3 Moisture Separator (Demister)

A demister is capable of removing entrained liquids from a gas stream. It can also function as a roughing filter by removing relatively large-size particulates. If equipped with back-flush capabilities to remove particulates, it will require a relatively small amount of maintenance and will not have to be replaced when dirty; as a typical fiber media device does. The need for back-washing, however, will generate additional waste. This waste water can be returned to the tank being retrieved or routed to a catch-tank. The waste from such a holding tank will have to be pumped out occasionally and disposed of as a mixed-waste.

3.4.4 Condenser

The main purpose of a condenser is to remove water vapor by lowering the gas stream temperature to or below 40°F. By cooling the exhaust flow most of the moisture and some quantities of gaseous contaminants and radionuclides (ammonia, acetone, butanol, and tritium, as tritiated water vapor, depending on the dew point) can conceivably be removed. The removal efficiency is greatest for high humidity and temperature (to 140°F) air streams. At lower relative humidities and/or lower gas stream temperatures, the quantity of organics/ammonia which will be removed is dependent on both temperatures and humidities. The condenser for this design should be a pass through device with countercurrent heat transfer fluid flow. This arrangement would eliminate the use of either tubes or fins. This, in turn, would reduce the potential for buildup of highly radioactive solids and the subsequent need for decontamination.

The condenser effectiveness will be critical to the entire exhaust train operation, especially if the downstream components use adsorption control technology. The condensate from the condenser will be returned to the tank being retrieved, otherwise a catch tank would have to be required, similar to the application of a cyclone separator.

3.4.5 High Efficiency Mist Eliminator (HEME)

The mist eliminator is designed to efficiently remove entrained liquids from the air stream. It uses a filter media constructed of glass or plastic fibers. The HEME will remove up to 99% of all particles over 1 micron and also entrap some soluble contaminants. The most significant operating problems of a HEME is its tendency for plugging, and the need to keep the filter media constantly wetted to allow for the efficient capture of the particles. High solids particulate and liquid aerosol loadings can cause frequent plugging, requiring high-pressure water washing. If a relatively dry air stream is handled, some moisture would have to be added to the HEME media to boost its removal efficiency. Specific removal efficiencies of soluble by a HEME have not been documented. Some soluble contaminants (e.g., ammonia, acetone, butanol) may be removed.

3.4.6 Scrubber

The main purpose of a scrubber for this system would be for the mitigation of ammonia. A scrubber will also remove other contaminants depending on their solubility in the scrubber liquid and a large portion of the airstream particulates. These devices are generally considered

as the best available technology for ammonia removal. Scrubbers have the ability to remove ammonia from both high temperature and high humidity gas streams. If used in the exhaust train, a moisture separator (demister) would not be needed in the system, since the scrubber introduces additional moisture.

Preliminary calculations for a horizontal, crossflow packed bed wet scrubber show that 12-16 feet of Tellurite® packing would be required to reduce the highest maximum concentrations of ammonia (23,600 ppmv for the AX farm as shown in Table 3-1) to acceptable ALARA levels of about 5-50 ppmv. Using a sulfuric acid scrubber solution would produce a mixed waste solution comprised primarily of ammonium sulfate $[(\text{NH}_4)_2 \text{SO}_4]$. Approximately 3.9 lbs of ammonium sulfate solution are produced per lb of ammonia being treated.

Freeze protection is required for the active system components. The power requirements of a sensible heater device located downstream from a scrubber are greater due to the added moisture.

Although, the fluid in the scrubber's bed is constantly recirculated by a pump, additions of make-up liquid are necessary to replace the lost volume introduced into the airstream. Such a liquid make-up system requires constant monitoring and frequent adjustments of its chemical composition. A periodic replacement of the entire liquid contents of the scrubber is necessary, and such a fluid will be classified as a mixed waste and require proper disposal. All accidental spills and leaks from the scrubber will require containment in order to prevent contamination releases.

A cyclone spray scrubber may have the lowest pressure drop between 1.5 and 5.0" w.g.. The pressure drop would exceed 10" w.g. if an orifice or venturi scrubber would be used. However, a venturi scrubber would probably be a more efficient device for particulate removal.

3.4.7 Heater

The main function of a heater is to increase the dry-bulb temperature of the gas stream to about 50°F above the dewpoint. Thus, the 40°F airstream would be heated to about 90°F. This prevents problems caused by moisture or liquid droplets on with HEPA filters and poor removal efficiency by any activated carbon adsorbers located downstream of the heater unit in a ventilation system exhaust train. A spark-proof heater is needed due to the potential for concentrations of flammable gas (hydrogen, methane, carbon monoxide, etc.), above the lower explosive limit (LEL). Controlled surface temperature electrical heaters, or heaters which use heat transfer fluids such as hot oils, should be considered. However, the heater unit would add to both the pressure drop and energy consumption of the system.

3.4.8 High Efficiency Metal Fiber Filter (HEMF)

The HEMF provides minimum efficiencies of 99.95% for 0.3 μm diameter particles or larger. They have the high efficiency exhibited by the standard HEPA filter, but can be constructed of stainless steel and to be seismically qualified. HEMF filters would not be damaged by most corrosive vapors, large amounts of moisture droplets, or heavy dust loadings

in the gas stream. HEMF filters are essentially non-replaceable and can be cleaned in-place using water, nitric acid, or other chemical solutions compatible with a specific process application. For example, preliminary estimates indicate that 500 gal of periodic water backflushes would be required for applications on the proposed DST/SST ventilation system exhaust train. Several manufacturers claim that 20-30 cleaning cycles are possible before permanent replacement is required. As with any other cleanable device, this filter will generate additional liquid mixed waste, necessitating return into the existing waste tank or installation of an appropriate catch-tank.

3.4.9 High Efficiency Gas Adsorber (HEGA)

The HEGA (a.k.a granular activated carbon [GAC]) will mitigate the volatile organics (VOC) from the gas stream by adsorbing these compounds on activated sites of the carbon media. The affinity of contaminants to the carbon is dependent on the properties of the carbon and the molecular weight and bonding properties of the contaminants. In general, compounds with a molecular weight range of 50 to 200 and a boiling point range from 20°C to 175°C are most suitable for carbon adsorption. The affinities of specific contaminants to the carbon are called adsorption isotherms and can be stated in terms of kilograms of contaminant per kilogram of carbon at equilibrium conditions. The following are representative isotherms which are common to the activated carbon industry:

Acetone: 0.05 kg Acetone/kg Carbon

Butanol: 0.15 kg Butanol/kg Carbon

Normal paraffinic hydrocarbons (NPH): 0.30 kg NPH/kg Carbon

It can be seen from the above adsorption isotherms that carbon requirements without regeneration can be excessively high. However, the HEGA can be regenerated in place by an on-line regenerative activated carbon system that uses a hot gas to remove the organics from the activated sites. The removed organics are condensed from the gas and would be stored as hazardous waste. The process of regeneration will reduce both the overall amount of waste and the cost of new carbon. The use of the carbon for the adsorption of VOC's is commonly considered the best available technology. Although, the HEGA can be regenerated as described above, the total number of regeneration cycles is limited. Therefore, the eventual disposal of the carbon as a hazardous, or possibly as mixed-waste, is of significant concern with a sizeable cost impact.

Due to the deep bed design of most GAC units, particulate removal would be significant. Regeneration would not remove these particulate, in most cases.

3.4.10 Impregnated Carbon Adsorber (ICA)

The normal, best available control technology (BACT) for ammonia is a liquid scrubbing/absorption system; due to the high solubility of ammonia in water. The generation of large quantities of waste water is highly unfavorable. This technology, ICA, uses activated carbon impregnated with a reactant coating for the removal of ammonia. The actual reactant materials are usually vendor's proprietary compounds; however, the resultant product normally is an ammonia salt and a metal cation. The efficiencies of these units have been documented at about 95% with an adsorption/reactant isotherm of approximately 20 weight percent. For

a gas stream containing 200 ppmv of ammonia it was calculated that approximately 600 kg (1,320 lb) probably could provide adequate removal efficiencies for the gas stream without requiring excessive amounts of ICA. The greatest disadvantage of this adsorber is that it requires periodic replacement and disposal of the ICA unit(s) as chemically hazardous and/or mixed waste.

3.4.11 Electrostatic Precipitator (ESP)

This active system has the potential to provide system collection efficiencies up to 99.5% for the particles over 0.1 micron in size. The electrostatic precipitator is, therefore, suitable for mitigation of fine particulates. It can be operated at high temperatures in a saturated airstream. Only periodic cleaning is required for this device. In order to achieve maximum collection efficiencies, the fine particles should have an electrical resistivity on the order of 10^6 to $10^8 \Omega \cdot \text{cm}$. The optimum throughput gas velocity is between 200 and 300 ft/min, relative collection plate area between 100 and 300 ft²/1000 cfm of gas flow, and the average particle mitigation velocity is between 0.2 and 0.7 ft/s. The entrapped dust particles, requiring a bin or hopper for collection and accumulation, would require disposal as hazardous, or possibly, mixed waste. The use of ESP would necessitate secondary dielectric confinement, and the high-voltage power supply may represent a significant energy consumption at the site.

3.4.12 High Efficiency Particulate Air (HEPA) Filter

HEPA filters can remove at least 99.97% of particulates or aerosols $\geq 0.3 \mu\text{m}$ in size. HEPA's represent the best available radiological control technology for radionuclides and common small dust particles. They are, however, very sensitive to moisture in the airstream, require relatively frequent replacement, and, subsequent disposal as solid mixed waste. The pressure drop under prolonged usage can be more than 1.0" w.g.

3.4.13 Catalytic Oxidation

Catalytic oxidation devices provide a means of controlling ammonia omissions with a minimum of secondary liquid waste generation. In the catalytic oxidation process, NH_3 in the airstream is oxidized to nitrogen gas and nitrous oxide compounds (NO_x) when exposed to a catalyst at high gas temperatures. The catalyst used in the catalytic oxidation unit is subject to poisoning by tributyl phosphate (TBP), which is also found as the off-gas waste constituent in a number of the DST's and SST's. This equipment can possibly achieve satisfactory control of SST/DST air exhaust streams at the influent concentrations $\leq 3,000$ ppm of ammonia. The rather large size of catalytic oxidizers may become somewhat prohibitive for use of this concept.

3.5 WASTE TANK FACILITY GROUPING

Recently, PNL has conducted a preliminary evaluation of blending Hanford Site tank wastes prior to pretreatment and separation into high level and low level waste forms for immobilization (Geeting and Kurath, 1993). Blending has been considered because many feeds have chemical constituents that limit the proposed loading in both immobilized waste forms

to less than its maximum. The basic concept is that a feed high in one constituent, relative to feed limits, would be mixed with another feed that contains a low level of the same constituent, thereby producing a blended stream with an overall lower concentration. The blend could, therefore, be immobilized with a greater overall waste loading.

Obviously, such waste-form production estimates are highly sensitive to individual tank composition data and sludge wash partitioning factors. Since the process of selecting individual tank feeds is based upon finding compatible feed compositions, considerably more precise tank characterization data than is currently available will be required. Moreover, species identification and quantification of vapor-space constituents for individual tanks is considerably more limited than precise characterization data for tank liquids and solids at the present time.

From a practical engineering standpoint, a campaign involving waste retrieval/transfer operations from single tanks in more than one tank farm would add considerably more complexity to the design, construction, and operation of a universal exhaust system for at the Hanford Site tank farms. It would instead require multiple ventilation system exhaust trains for each waste retrieval/transfer campaigns, or, alternatively, development of a single, selectable module ventilation system exhaust train that could be skid-mounted and transported from one tank farm location to another during a single campaign.

In lieu of the above constraints, the LATA team decided to group the vapor-space modeling results for the present study by tank farm, as previously described in Section 3.3. Should single tanks within any of the tank farms require priority waste retrieval/transfer operations for any reason (e.g., tanks SY-101, C-103 for safety reasons), the maximum vapor-space constituents concentrations for that tank can be obtained from the overall database included in Sub-Task I of the final report.

3.6 PRELIMINARY EXHAUST TRAIN ARRANGEMENT

A preliminary ventilation exhaust train arrangement for the DST/SST farms is presented in Figure 3-2. The proposed exhaust train arrangement is based upon the information presented in Section 3.3, Summary of DST/SST Vapor/Particulate Characterization and Section 3.4, Alternative Technologies for Vapor Space Constituents Treatment and Removal. Figure 3-2 is intended to provide a preliminary basis for the conceptual design of the DST/SST ventilation system exhaust train.

As shown in Figure 3-2, the primary gas stream from the DST/SST is fed through a common inlet header to one of two branches of the proposed exhaust. Isolation valves located at both the inlet and outlet headers allow one branch to operate continuously while the other branch serves as a standby. Although not shown in Figure 3-2, it is recommended that each major control component subsystem (including all equipment items, devices, and controls) have this capability to be totally isolated within the overall ventilation system. It is also recommended that each major component have complete interchange capability with either branch of the exhaust system train. This would assure continuous operations capability of the entire ventilation system exhaust train down to the major control component subsystem level. In addition, an appropriate spare parts inventory should be maintained based upon failure rates for each part/equipment item/device included in that subsystem.

Figure 3-2. Preliminary Ver

Note: Only one branch opera

ation System Exhaust Train Arrangement.

continuously while the other serves as standby.

4.0 CONCLUSIONS

The vapor-phase modeling analysis, presented in 1 of this Final Report has provided an extensive database of maximum, estimated, vapor-space constituent concentrations based upon the best available DST/SST characterization data for the Hanford Site tank farms. The present database includes acceptably conservative constituent concentrations for stagnant tank vapor-space and retrieval operations employing slurry/liquid waste transfer by pumping. However, it is believed that during an actual retrieval process, especially when using more radical retrieval methods, i.e., limited intermediate-pressure sluicing or some forms of hydraulic or mechanical mining, higher vapor-space particulate loadings would be generated. This, in turn, would have a significant effect on the design and operation of a tank exhaust system. Presently, there is very limited experimental data on particle generation, mass loading, and size distribution available from the existing DST/SST ventilation systems. It is highly recommended that a general particle characterization program be implemented on several operating tank exhaust systems. If possible, a small-scale, waste retrieval testing program should be conducted in the future, during which the aforementioned particulate data would be collected and analyzed.

We believe that the eventual installation of a new tank exhaust systems may be constrained not only by known requirements and restrictions (riser availability, tank farm congestion, allowable quantities of added water, etc.), but also by the structural integrity and the soundness of the tanks. It is a well-known fact that about 40% of all SST's may be leaking and that most of the tanks have exceeded their projected design life-time.

The pre-conceptual DST/SST ventilation system design effort has centered on the utilization of modular/mobile tank exhaust train components. Some environmental and safety-related difficulties are expected to arise from the large size and weight of some of the representative component modules. The equipment sizes also will be dependent on the final determination of the exhaust flow requirements for vapor/particulate removal during the conceptual design phase. The need for the condensate/effluent return system back to the original tanks, or into new holding tanks has been established for several of the candidate exhaust train components. This requirement needs to be evaluated, since these effluents must be treated as hazardous and/or mixed waste. The grouping of tanks by tank farm appears to be the simplest and most effective method to retrieve the tank constituents based upon a preliminary evaluation of the anticipated requirements for the design, installation, and operation of a DST/SST ventilation system exhaust train.

- Review "particulate/aerosol loading during sluicing" by researching HEPA filter change rates during these 1960 and 1970's operations.

APPENDIX A
TANK FARM INVENTORY TABULATION

TANK FARM INVENTORY

FARM	TANK NO.	RISER				In-Tank Hard-ware Code	Structural Integrity Comments	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)				Type (Code)	Flow (cfm)	Max. Suction ΔP (" w.g.)	
A	101-A	22	1	8	13	10	Sound	Corner				All large risers are $\phi 42"$
	102-A	20	1	6	13	6	Sound	Side				
	103-A	19	1	6	11	6	Asm'd Lkr	Corner				
	104-A	21	1	6	14	9	Asm'd Lkr	Corner				
	105-A	25	1	6	18	16	Asm'd Lkr	Side				
	106-A	21	2	7	12	11	Sound	Corner				
AX	101-AX	37	2	7	28	17	Sound	Corner				Five extra plug risers
	102-AX	36	3	5	28	15	Asm'd Lkr	Corner				
	103-AX	35	3	4	28	20	Sound	Corner				One extra plug riser
	104-AX	38	3	4	31	16	Asm'd Lkr	Corner				Three plug risers
B	101-B	12	2	5	5	3	Asm'd Lkr	Corner				All large risers are $\phi 42"$
	102-B	10	1	5	4	5	Sound	Edge				
	103-B	10	1	5	4	7	Asm'd Lkr	Edge				
	104-B	10	1	5	4	4	Sound	Edge				
	105-B	12	1	5	6	5	Asm'd Lkr	Interior				
	106-B	10	1	5	4	4	Sound	Interior				
	107-B	11	2	4	5	3	Asm'd Lkr	Edge				
	108-B	11	2	5	4	4	Sound	Interior				
	109-B	11	2	5	4	4	Sound	Interior				
	110-B	12	2	5	5	5	Asm'd Lkr	Corner				

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TANK FARM INVENTORY

2

FARM	TANK NO.	RISER				In-Tank	Structural	In-Farm	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)	Hard-ware Code	Integrity Comments	Location	Type (Code)	Flow (cfm)	Max. Suction ΔP (" w.g.)	
B Cont	111-B	11	2	5	4	5	Asm'd Lkr	Edge				All large risers are $\phi 42"$
	112-B	11	2	5	4	4	Asm'd Lkr	Edge				
	201-B	8		4	4	3	Asm'd-Lkr	Corner				
	202-B	9	1	4	4	3	Sound	Edge				
	203-B	9	1	4	4	3	Asm'd Lkr	Edge				
	204-B	9	1	4	4	4	Asm'd Lkr	Corner				
BX	101-BX	10	2	4	4	8	Asm'd Lkr	Corner				
	102-BX	10	1	5	4	9	Asm'd Lkr	Edge				
	103-BX	10	2	4	4	7	Sound	Corner				
	104-BX	10	1	5	4	7	Sound	Edge				
	105-BX	10	1	5	4	4	Sound	Interior				
	106-BX	10	1	5	4	4	Sound	Edge				
	107-BX	12	2	5	5	3	Sound	Edge				Large risers have $\phi 42"$ only
	108-BX	11	2	5	4	4	Asm'd Lkr	Interior				↓
	109-BX	10	1	5	4	4	Sound	Edge				↓
	110-BX	11	2	5	4	4	Asm'd Lkr	Corner				↓
	111-BX	11	2	5	4	5	Asm'd Lkr	Edge				↓
	112-BX	9		5	4	3	Sound	Corner				↓
BY	101-BY	18	5	7	6	7	Sound	Corner				
	102-BY	17	5	4	7	4	Sound	Edge				An extra $\phi 26"$ riser

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TANK FARM INVENTORY

FARM	TANK NO.	RISER				In-Tank Hard-ware Code	Structural Integrity Comments	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small ($\phi 10"$ below)				Type (Code)	Flow (cfm)	Max. Suction ΔP ("w.g.)	
BY	103-BY	22	3	9	10	8	Asm'd Lkr	Corner				All large risers are $\phi 42"$
	104-BY	15	4	5	6	4	Sound	Edge				
	105-BY	19	3	8	8	7	Asm'd-Lkr	Interior				
	106-BY	19	3	8	7	9	Asm'd Lkr	Edge				
	107-BY	17	1	10	5	7	Asm'd Lkr	Edge				
	108-BY	17	1	9	6	5	Asm'd Lkr	Interior				
	109-BY	19	2	10	7	4	Sound	Edge				
	110-BY	16	1	9	4	10	Sound	Corner				
	111-BY	19	4	7	8	7	Sound	Edge				
	112-BY	21	4	5	12	4	Sound	Corner				
C	101-C	9		5	4	4	Asm'd Lkr	Corner				All large risers are $\phi 42"$
	102-C	10	1	4	4	9	Sound	Edge				An extra $\phi 26"$ riser
	103-C	10	1	4	4	7	Sound	Edge				†
	104-C	12	1	4	5	8	Sound	Edge				†
	105-C	12	1	5	4	7	Sound	Interior				†
	106-C	15	1	5	7	4	Sound	Interior				†
	107-C	9		5	4	5	Sound	Edge				
	108-C	9		5	4	4	Sound	Interior				
	109-C	9		5	4	3	Sound	Interior				
	110-C	9		5	4	3	Asm'd Lkr	Corner				

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TANK FARM INVENTORY

FARM	TANK NO.	RISER				In-Tank Hardware Code	Structural Integrity Comments	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)				Type (Code)	Flow (cfm)	Max. Suction ΔP (" w.g.)	
C Cont	111-C	9		5	4	3	Asm'd Lkr	Edge				All large risers are $\phi 42"$
	112-C	9		5	4	4	Sound	Edge				
	201-C	6		4	2	2	Asm'd-Lkr	Corner				
	202-C	6		4	2	2	Asm'd Lkr	Edge				
	203-C	6		4	2	2	Asm'd Lkr	Edge				
	204-C	6		4	2	2	Asm'd Lkr	Corner				
S	101-S	12	1	4	7	4	Sound	Corner				All large risers are $\phi 42"$
	102-S	12	1	4	7	5	Sound	Edge				
	103-S	12	1	4	7	5	Sound	Corner				
	104-S	9	1	4	4	3	Asm'd Lkr	Edge				
	105-S	12	1	4	7	5	Sound	Interior				
	106-S	12	1	4	7	6	Sound	Edge				
	107-S	12	1	4	7	4	Sound	Edge				
	108-S	12	1	4	7	6	Sound	Interior				
	109-S	12	1	4	7	5	Sound	Edge				
	110-S	12	1	4	7	5	Sound	Corner				
	111-S	12	1	4	7	6	Sound	Edge				
	112-S	12	1	4	7	5	Sound	Corner				

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TANK FARM INVENTORY

9

FARM	TANK NO.	RISER				In-Tank Hardware Code	Structural Integrity Comments	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)				Type (Code)	Flow (cfm)	Max. Suction ΔP (" w.g.)	
SX	101-SX	17	1	6	9	8	Sound	Corner				An extra $\phi 3"$ riser
	102-SX	13	1	5	7	7	Sound	Edge				All large risers are $\phi 42"$
	103-SX	13	1	5	7	6	Sound	Corner				
	104-SX	12	1	4	7	8	Asm'd Lkr	Edge				
	105-SX	20	1	8	9	10	Sound	Interior				Two extra $\phi 25"$ risers
	106-SX	12	1	4	7	7	Sound	Edge				
	107-SX	22	1	8	5	12	Asm'd Lkr	Edge				Eight extra $\phi 25"$ risers
	108-SX	22		9	5	14	Asm'd Lkr	Interior				↓
	109-SX	21		7	6	15	Asm'd Lkr	Edge				↓
	110-SX	21		8	5	16	Asm'd Lkr	Edge				↓
	111-SX	20		8	4	13	Asm'd Lkr	Interior				↓
	112-SX	21		8	5	13	Asm'd Lkr	Edge				↓
	113-SX	11	1	4	6	5	Asm'd Lkr	Corner				
	114-SX	21		7	5	15	Asm'd Lkr	Edge				Nine extra $\phi 25"$ risers
	115-SX	10	1	4	4	3	Asm'd Lkr	Corner				An extra $\phi 24"$ riser
T	101-T	13	1	7	4	4	Sound	Corner				All large risers are $\phi 42"$
	102-T	10	1	5	4	2	Sound	Edge				
	103-T	10	1	5	4	8	Asm'd Lkr	Edge				
	104-T	9		5	4	6	Sound	Edge				
	105-T	9		5	4	3	Sound	Interior				

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TANK FARM INVENTORY

6

FARM	TANK NO.	RISER				In-Tank Hardware Code	Structural Integrity Comments	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)				Type (Code)	Flow (cfm)	Max. Suction ΔP (" w.g.)	
T Cont	106-T	9		5	4	2	Asm'd Lkr	Interior				All large risers are $\phi 42"$
	107-T	9		5	4	3	Asm'd Lkr	Edge				
	108-T	9		5	4	3	Asm'd Lkr	Interior				
	109-T	9		5	4	3	Asm'd Lkr	Interior				
	110-T	9		5	4	6	Sound	Corner				
	111-T	9		5	4	4	Asm'd Lkr	Edge				
	112-T	9		5	4	3	Sound	Edge				
	201-T	8		4	4	2	Sound	Corner				
	202-T	8		4	4	2	Sound	Edge				
	203-T	8		4	4	3	Sound	Edge				
	204-T	8		4	4	3	Sound	Corner				
TX	101-TX	16	5	4	7	5	Sound	Corner				All large risers are $\phi 42"$
	102-TX	23	5	9	7	10	Sound	Edge				Two extra $\phi 3"$ risers
	103-TX	16	5	4	7	4	Sound	Edge				
	104-TX	16	5	5	6	3	Sound	Corner				
	105-TX	16	5	4	7	4	Asm'd Lkr	Edge				
	106-TX	19	5	6	8	6	Sound	Interior				
	107-TX	16	5	4	7	2	Asm'd Lkr	Interior				
	108-TX	17	5	5	7	4	Sound	Edge				
	109-TX	15	5	3	7	5	Sound	Edge				

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TANK FARM INVENTORY

FARM	TANK NO.	RISER				In-Tank Hardware Code	Structural Integrity Comments	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)				Type (Code)	Flow (cfm)	Max. Suction ΔP (" w.g.)	
TX Cont	110-TX	20	5	6	9	8	Asm'd Lkr	Interior				All large risers are $\phi 42"$
	111-TX	21	5	6	10	8	Sound	Interior				
	112-TX	16	5	3	8	5	Sound	Corner				
	113-TX	17	5	7	5	7	Asm'd Lkr	Edge				
	114-TX	21	5	7	9	9	Asm'd Lkr	Interior				
	115-TX	19	5	6	8	8	Asm'd Lkr	Edge				
	116-TX	18	5	5	7	7	Asm'd Lkr	Corner				
	117-TX	16	5	5	6	7	Asm'd Lkr	Edge				
	118-TX	21	5	7	9	4	Sound	Corner				
TY	101-TY	17	3	6	6	3	Asm'd Lkr	Corner				All large risers are $\phi 42"$
	102-TY	15	3	6	6	2	Sound	Corner				
	103-TY	14	1	6	6	5	Asm'd Lkr	Edge				
	104-TY	13	1	6	6	4	Asm'd Lkr	Edge				
	105-TY	11	1	4	6	3	Asm'd Lkr	Corner				
	106-TY	10	1	5	4	2	Asm'd Lkr	Corner				
U	101-U	10	1	4	4	8	Asm'd Lkr	Corner				An extra $\phi 36"$ riser.
	102-U	13	1	5	6	9	Sound	Edge				↓
	103-U	12	1	4	6	9	Sound	Edge				↓
	104-U	10	1	4	4	7	Asm'd Lkr	Edge				↓
	105-U	12	1	4	6	9	Sound	Interior				↓

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TANK FARM INVENTORY

8

FARM	TANK NO.	RISER INFO ¹⁾				In-Tank Hardware Code ²⁾	Structural Integrity Comments ³⁾	In-Farm Location	Ventilation			COMMENTS
		Total Number	Large ϕ ($\geq 34"$ $\leq 42"$)	Med. ϕ ($\geq 12"$ $\leq 20"$)	Small (bellow $\phi 10"$)				Type ⁴⁾ (Code)	Flow (cfm)	Max. ⁵⁾ Suction ΔP (" w.g.)	
U Cont	106-U	13	1	4	7	9	Sound	Interior				An extra $\phi 36"$ riser.
	107-U	13	1	5	7	10	Sound	Edge				All large risers are $\phi 42"$.
	108-U	13	1	5	7	9	Sound	Interior				
	109-U	14	1	5	8	9	Sound	Interior				
	110-U	13		5	8	6	Asm'd Lkr	Corner				
	111-U	12		5	7	6	Sound	Edge				
	112-U	9		5	4	4	Asm'd Lkr	Edge				
	201-U	8		4	4	4	Sound	Corner				
	202-U	8		4	4	4	Sound	Edge				
	203-U	8		4	4	4	Sound	Edge				
	204-U	8		4	4	4	Sound	Corner				

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NOTE:

1) Riser information was adopted from: Alstead, A.T. et al., 1991 *Riser Configuration Document for Single Shell Tanks*, WHC-SD-RE-TI-053. The risers listed are not necessarily all useable. Please use the above reference to find out more about informatio, including notes about broken risers, riser encast in concrete, those with lead plugs, and the ones located under boxes, etc.

2) Designates a simple number of hardware components attached to the tank, however, the actual contents of some risers is unknown. In-tank hardware inventory contains typically one or more pieces of equipment, like observation wells, airlift circulators, thermocouples, and liquid level, pressure and other instrumentation.

3) Information related to the structural soundness of the individual tanks has been taken from: Hanlon, B.M., 1991 *Tank Farm Surveillance and Waste Status Report for August 1991*, WHC-EP-0182-41.

4) The ventilation type code:

- I/V Active induced ventilation system
- B/F Passive ventilation with breather filters, and
- N/A Non-ventilated tank

5) The maximum allowable negative pressure taken from _____ and _____; the actual operating pressure is always lower, resulting from the system resistance, network connection, and the actual ventilation flow.

APPENDIX B
TANK WASTE TABULATION

TANK WASTE INFORMATION

DST ①

FARM	TANK NO.	STATUS		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST [®]	COMMENTS
		When Constructed ¹⁾	Operational?	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³⁾	Status ⁴⁾		
AN	101-AN	80-81	yes	1140	595			595	n/a		DN			
	102-AN	80-81	yes	1140	1100		24	1124	n/a		CC			
	103-AN	80-81	no	1140	10		937	947	117		DSS		H	Potential for flam. gas accumul.
	104-AN	80-81	no	1140	346			346	116		DSSF		H	
	105-AN	80-81	no	1140	1108			1108	n/a		DSSF		H	
	106-AN	80-81	yes	1140	1010		17	1027	114		CP			
	107-AN	80-81	yes	1140	1100			1100	n/a		CC			
AP	101-AP	83-88	yes	1140					n/a		DN			
	102-AP	83-88	yes	1140	1080			1080	n/a		DN			
	103-AP	83-88	yes	1140	662			662	n/a		DN			
	104-AP	83-88	yes	1140	1070			1070	n/a		DN			
	105-AP	83-88	yes	1140					n/a		DSSF			
	106-AP	83-88	yes	1140					n/a		DN			
	107-AP	83-88	yes	1140					n/a		DN			
	108-AP	83-88	yes	1140					n/a		DN			
AW	101-AW	78-80	no	1140				1137	109		DSSF			Potential for flam. gas accumul.
	102-AW	78-80	yes	1140	864			864	n/a		DN			
	103-AW	78-80	yes	1140	282		363	645	n/a		PN/DP			
	104-AW	78-80	yes	1140	297		14	311	n/a		DN			
	105-AW	78-80	yes	1140	582	85	173	840	n/a		PN/DP			

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TANK WASTE INFORMATION

FARM	TANK NO.	YEAR		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ⁵	COMMENTS
		Constructed ¹⁾	Decommissioned	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³⁾	Status ⁴⁾		
B Cont	111-B	43-44	1977	500					58		NCPLX	IS/II		
	112-B	43-44	1977	500					63		NCPLX	IS/II		
	201-B	43-44	1977	55			29	29	66		NCPLX	IS/II		
	202-B	43-44	1977	55			24	65	65		NCPLX	IS/II		
	203-B	43-44	1977	55	6		44	50	65		NCPLX	IS/II		
	204-B	43-44	1977	55	3		46	49	67		NCPLX	IS/II		
BX	101-BX	46-47	1972	500			46	46	67		NCPLX	IS/II		
	102-BX	46-47	1971	500					66	≤0.1	NCPLX	IS/II	FeCN	Tank contains ferrocyanides
	103-BX	46-47	1977	500	124		65	189	79		NCPLX	IS/II		
	104-BX	46-47	1980	500	37		86	123	78		NCPLX	IS/II		
	105-BX	46-47	1980	500	29		46	75	66		NCPLX	IS/II		
	106-BX	46-47	1971	500	15		31	46	68	≤0.2	NCPLX	IS/PI	FeCN	Tank contains ferrocyanides
	107-BX	46-47	1977	500	46		324	370	69		NCPLX	IS/II		
	108-BX	46-47	1974	500					73		NCPLX	IS/II		
	109-BX	46-47	1974	500	18		181	199	n/a		NCPLX	IS/PI		
	110-BX	46-47	1977	500	20	9	180	209	65		NCPLX	IS/PI	FeCN	Tank contains ferrocyanide
	111-BX	46-47	1977	500	69	93	18	180	70		NCPLX	PI	FeCN	
	112-BX	46-47	1977	500	24		146	170	70		NCPLX	IS/PI		
BY	101-BY	48-49	1971	750	325	289	109	723	76	0.02	NCPLX	IS/II	FeCN	Tank contains ferrocyanide
	102-BY	48-49	1977	750	191	241		432	n/a		NCPLX	PI		

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TANK WASTE INFORMATION

DST 2

FARM	TANK NO.	STATUS		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ⁶	COMMENTS
		When Constructed ¹⁾	Operational?	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³⁾	Status ⁴⁾		
AZ	101-AZ	71/77	yes	980	930		37	967	n/a		AGING			
	102-AZ	71/77	yes	980	851		88	939	n/a		AGING			
SY	101-SY	74-78	no	1140		52 ⁷⁾		995	130		CC		H	Potential for flam. gas accumul.
	102-SY	74-78	yes	1140	710		71	781	n/a		DN/PT			
	103-SY	74-75	no	1140				550	n/a		CC		H	Potential for flam. gas accumul.

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NOTES: 1) Indicates only two last digits of the century, i.e., "19" prefix should be added to all numbers.

2) The header should read "Supernatant and Drainable Liquid." Values adopted from VanVleet, R.J., 1993: "Radionuclide and Chemical Inventories for the Single-Shell Tanks" WHC-SD-WM-TI-565, Rev.1.

3) Waste type code is as follows:

- CC Complexant Concentrate Waste
- CP Concentrated Phosphate Waste
- DC Dilute Complexed Waste
- DN Dilute Non-complexed Waste
- DN/PD Dilute Non-complexed/PUREX TRU Solid
- DN/PT Dilutenon-complexed/PFP TRU Solid
- DSSF Double-shell Slurry Feed
- NCPLX Non-complex Waste

4) Waste isolation and stabilization code is as follows:

- II Interim Isolated
- IS Interim Stabilized
- PI Partially Interim Isolated

4) - Cont'd: Data taken from Hanlon, B.M., 1991 "Tank Farm Surveillance and Waste Status Report for August of 1991", WHC-EP-0182-41.

5) Watch List code is as follows:

- H Hydrogen
- FeCN Ferrocyanides
- ORG Organics
- HC Hydrocarbons

6) Temperature data and Comments taken from: Borshelm & Kirch, 1991 "Summary of Single-Shell Tank Waste Stability", WHC-EP-0347.

7) Heat Load data adopted from: Stephens, V.J., 1992 "An Engineering Review of Tank Farm Ventilation Systems", LATA document.

⁷⁾ Tank 101-SY Saltcake contains 19" of crust.

TANK WASTE INFORMATION

FARM	TANK NO.	YEAR		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ¹⁰	COMMENTS
		Constructed ¹¹	Decommissioned	Total Oper.	Supern. + Drain Liquid ¹²	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³	Status ⁴		
BY Cont	103-BY	48-49	1973	750	108	287	5	400	82	0.03	NCPLX	IS/PI	FeCN	Tank contains ferrocyanides
	104-BY	48-49	1977	750		366	40	406	129	0.04	NCPLX	IS/II	FeCN	↓
	105-BY	48-49	1974	750	194	265	44	503	117	0.07	NCPLX	PI	FeCN	↓
	106-BY	48-49	1977	750	235	312	95	642	134	0.02	NCPLX	PI	FeCN	↓
	107-BY	48-49	1974	750					80	0.05	NCPLX	IS/II	FeCN	↓
	108-BY	48-49	1974	750					n/a	0.1	NCPLX	IS/PI	FeCN	↓
	109-BY	48-49	1972	750	164	207	87	458	n/a		NCPLX	PI		No data available
	110-BY	48-49	1979	750					135	≤0.06	NCPLX	IS/PI	FeCN	Tank contains ferrocyanides
	111-BY	48-49	1977	750					83	≤0.07	NCPLX	IS/PI	FeCN	↓
	112-BY	48-49	1978	750		295	15	310	76	≤0.03	NCPLX	IS/PI	FeCN	↓
C	101-C	43-44	1970	500					97		NCPLX	IS/II		
	102-C	43-44	1976	500	48		379	427	96		NCPLX	PI		
	103-C	43-44	1979	500	133		62	195	125		NCPLX	PI	ORG	
	104-C	43-44	1980	500	32		266	298	90		CC	IS/II		
	105-C	43-44	1979	500	1		150	161	97	≤0.28	NCPLX	PI	HEAT	High heat load tank
	106-C	43-44	1979	500	16		197	213	161	≤0.66	NCPLX	PI	HEAT	Highest temp. tank
	107-C	43-44	1978	500	34		303	337	132		NCPLX	n/a		
	108-C	43-44	1975	50	4		61	65	77	≤0.15	NCPLX	IS/II	FeCN	Tank contains ferrocyanides
	109-C	43-44	1976	500	4		58	62	78	≤0.15	NCPLX	IS/II	FeCN	↓
	110-C	43-44	1976	500	109		180	201	85		NCPLX	PI		

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TANK WASTE INFORMATION

FARM	TANK NO.	YEAR		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ^a	COMMENTS
		Constructed ¹⁾	Decommissioned	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³⁾	Status ⁴⁾		
C Cont	111-C	43-44	1978	500					74	≤0.18	NCPLX	IS/II	FeCN	Tank contains ferrocyanides
	112-C	43-44	1976	500	13		96	109	83		NCPLX	IS/II		
	201-C	43-44	1977	55	4			4	69		NCPLX	IS/II	H	
	202-C	43-44	1977	55					69		NCPLX	IS/II		
	203-C	43-44	1977	55					70		NCPLX	IS/II		
	204-C	43-44	1977	55	44			44	68		NCPLX	IS/II		
S	101-S	50-51	1980	750	387	88	244	719	123		NCPLX	PI		
	102-S	50-51	1980	750	99	506	4	609	108		DSSF	PI	H, ORG	Potential for flam. gas accumul.
	103-S	50-51	1980	750	157		37	194	91		DSSF	PI		
	104-S	50-51	1968	750	30		264	294	116		NCPLX	IS/II		
	105-S	50-51	1974	750		484	57	541	86		NCPLX	IS/II		
	106-S	50-51	1979	750	27	622	51	700	91		NCPLX	PI		
	107-S	50-51	1979	750	52		293	345	113		NCPLX	PI		
	108-S	50-51	1979	750	24	680	26	730	102		NCPLX	PI		
	109-S	50-51	1979	750		492	131	623	97		NCPLX	PI		
	110-S	50-51	1979	750		555	134	689	124		NCPLX	PI		
	111-S	50-51	1972	750		484	139	623	100		NCPLX	PI	H	Potential for flam. gas accumul.
	112-S	50-51	1974	750		682	24	706	93		NCPLX	PI	H	

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WHC-SD-314B-DA-002, Rev. 0

TANK WASTE INFORMATION

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FARM	TANK NO.	YEAR		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ^u	COMMENTS
		Constructed ¹⁾	Decommissioned	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³⁾	Status ⁴⁾		
SX	101-SX	53-54	1980	1000	146	198	112	456	137		DC	PI	H	Potential for flam. gas accumul.
	102-SX	53-54	1980	1000	20	401	117	538	147		DSSF	PI	H	↓
	103-SX	53-54	1980	1000	338	511	112	961	166		NCPLX	PI	H	↓
	104-SX	53-54	1980	1000	250	333	169	752	161		DSSF	PI	H	↓
	105-SX	53-54	1980	1000	211	666	73	950	173		DSSF	PI	H	↓
	106-SX	53-54	1980	1000					98		NCPLX	PI	H, ORG	↓
	107-SX	53-54	1964	1000			109	109	169	0.4	NCPLX	IS/II		High heat tank
	108-SX	53-54	1962	1000					195	0.39	NCPLX	IS/II		↓
	109-SX	53-54	1965	1000					150	0.2	NCPLX	IS/II	H	↓
	110-SX	53-54	1976	1000					172	0.63	NCPLX	IS/II		↓
	111-SX	53-54	1974	1000			125	125	189	0.35	NCPLX	IS/II		↓
	112-SX	53-54	1969	1000					155	0.47	NCPLX	IS/II		↓
	113-SX	53-54	1958	1000					81		NCPLX	IS/II		
	114-SX	53-54	1972	1000					185	0.32	NCPLX	IS/II		High heat tank
	115-SX	53-54	1965	1000			10	10	117		NCPLX	IS/II		
T	101-T	43-44	1979	500	35		98	133	81	≤0.08	NCPLX	PI	FeCN	Tank contains ferrocyanides
	102-T	43-44	1976	500				62	67		NCPLX	IS/II		
	103-T	43-44	1974	500			35	35	63		NCPLX	IS/II		
	104-T	43-44	1974	500			483	483	64		NCPLX	PI		
	105-T	43-44	1976	500	505		58	563	75		NCPLX	IS/II		

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TANK WASTE INFORMATION

FARM		TANK NO.		YEAR		CAPACITY (Kgal)				THERMAL DATA		WASTE		WATCH LIST ²	COMMENTS
		Constructed ¹	Decommissioned	Total Oper.	Supern. Liquid ²	Salt-water	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³	Status ⁴			
T	106-T	43-44	1973	500			26	26	65		NCPLX	IS/II			
	107-T	43-44	1976	500	22	158	180	65	65		NCPLX	PI	FeCN	Tank contains reticoyanides	
	108-T	43-44	1974	500		35	35	63			NCPLX	IS/II			
	109-T	43-44	1974	500			147	147	77		NCPLX	IS/II			
	110-T	43-44	1976	500		466	466	64	64		NCPLX	PI	H	Potential for form. gas accumul.	
	111-T	43-44	1974	500	82	430	512	64			NCPLX	PI			
	112-T	43-44	1977	500	56	407	463	81			NCPLX	IS/II			
	201-T	43-44	1976	55				59			NCPLX	IS/II			
	202-T	43-44	1976	55				65			NCPLX	IS/II			
	203-T	43-44	1976	55				65			NCPLX	IS/II			
TX	204-T	43-44	1976	55				65			NCPLX	IS/II			
	101-TX	47-48	1980	750	99	73	172	128			NCPLX	IS/II		Error before failure	
	102-TX	47-48	1977	750		15	15	97			NCPLX	IS/II			
	103-TX	47-48	1980	750	467	145	612	69			NCPLX	IS/II			
	104-TX	47-48	1977	750	707	18	725	59			NCPLX	IS/II			
	105-TX	47-48	1977	750				90			NCPLX	IS/II	ORG		
	106-TX	47-48	1977	750				89			NCPLX	IS/II			
	107-TX	47-48	1973	750	693	24	717	70			NCPLX	IS/II			
	108-TX	47-48	1977	750				66			NCPLX	IS/II			
	109-TX	47-48	1977	750				126			NCPLX	IS/II			

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Part 2

W5147 WHC-SD-314B-DA-002, Rev. 0

TANK WASTE INFORMATION

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FARM	TANK NO.	YEAR		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ³	COMMENTS
		Constructed ¹⁾	Decommissioned	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ²⁾	Status ⁴⁾		
TX Cont	110-TX	47-48	1977	750					91		NCPLX	IS/II		
	111-TX	47-48	1976	750					92		NCPLX	IS/II		
	112-TX	47-48	1974	750					73		NCPLX	IS/II		
	113-TX	47-48	1971	750		681		681	74		NCPLX	IS/II		
	114-TX	47-48	1971	750					90		NCPLX	IS/II		
	115-TX	47-48	1977	750					81		NCPLX	IS/II		
	116-TX	47-48	1969	750					89		NCPLX	IS/II		
	117-TX	47-48	1969	750					95		NCPLX	IS/II		
	118-TX	47-48	1980	750	13	347		360	78	0.01	NCPLX	IS/II	FeCN	Tank contains ferrocyanide
TY	101-TY	51-52	1973	750			118	118	65	≤0.08	NCPLX	IS/II	FeCN	Tank contains ferrocyanide
	102-TY	51-52	1979	750	14	50		64	90		NCPLX	IS/II		
	103-TY	51-52	1973	750	5		157	162	69	≤0.06	NCPLX	IS/II	FeCN	Tank contains ferrocyanides
	104-TY	51-52	1974	750	3		43	46	81	≤0.23	NCPLX	IS/II	FeCN	
	105-TY	51-52	1980	750			231	231	71		NCPLX	IS/II		
	106-TY	51-53	1959	750			17	17	66		NCPLX	IS/II		
U	101-U	43-44	1960	500					71		NCPLX	IS/II		
	102-U	43-44	1979	500	456		43	499	85		NCPLX	PI		
	103-U	43-44	1978	500			32	32	87		NCPLX	PI	H	Potential for flam. gas accumd.
	104-U	43-44	1951	500			125	125	64		NCPLX	IS/II		
	105-U	43-44	1978	500	25	349	32	406	89		NCPLX	PI	H	Potential for flam. gas accumd.

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TANK WASTE INFORMATION

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FARM	TANK NO.	YEAR		CAPACITY (Kgal)					THERMAL DATA		WASTE		WATCH LIST ^a	COMMENTS
		Constructed ¹⁾	Decommissioned	Total Oper.	Supern. + Drain Liquid ²⁾	Salt-cake	Sludge	Total Waste	Max. Temp. (°F)	Heat Load (Btu/gal/hr)	Type ³⁾	Status ⁴⁾		
U Cont	106-U	43-44	1977	500	336		26	362	80		NCPLX	PI	ORG	
	107-U	43-44	1980	500	435		15	450	76		DSSF	PI	ORG	
	108-U	43-44	1979	500	313	165	35	513	87		NCPLX	PI	H	Potential for flam. gas accumul.
	109-U	43-44	1978	500	258		48	306	85		NCPLX	PI	H	
	110-U	43-44	1975	500					75		NCPLX	IS/II		
	111-U	43-44	1980	500	462		26	488	79		DSSF	PI		
	112-U	43-44	1970	500					66		NCPLX	IS/II		
	201-U	43-44	1970	55					66		NCPLX	IS/II		
	202-U	43-44	1977	55	47		4	51	66	0.01	NCPLX	IS/II		
	203-U	43-44	1977	55	1		2	3	67		NCPLX	IS/II		
	204-U	43-44	1978	500	1		1	2	68		NCPLX	PI		

Lene/Brodeky 3-29-84

NOTES: 1) Indicates only two last digits of the century, i.e., "19" prefix should be added to all numbers.

2) The header should read "Supernatant and Drainable Liquid." Values adopted from VanVleet, R.J., 1993: "Radionuclide and Chemical Inventories for the Single-Shell Tanks" WHC-SD-WM-TI-585, Rev.1.

3) Waste type code is as follows:

- CC Complexant Concentrate Waste
- CP Concentrated Phosphate Waste
- DC Dilute Complexed Waste
- DN Dilute Non-complexed Waste
- DN/PD Dilute Non-complexed/PUREX TRU Solid
- DN/PT Dilutenon-complexed/PFP TRU Solid
- DSSF Double-shell Slurry Feed
- NCPLX Non-complex Waste

4) Waste isolation and stabilization code is as follows:

- II Interim Isolated
- IS Interim Stabilized
- PI Partially Interim Isolated

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4) - Cont'd: Data taken from Hanlon, B.M., 1991 "*Tank Farm Surveillance and Waste Status Report for August of 1991*", WHC-EP-0182-41.

5) Watch List code is as follows:

- H Hydrogen
- FeCN Ferrocyanides
- ORG Organics
- HC Hydrocarbons

6) Temperature data and Comments taken from: Borsheim & Kirch, 1991 "*Summary of Single-Shell Tank Waste Stability*", WHC-EP-0347.

7) Heat Load data adopted from: Stephens, V.J., 1992 "*An Engineering Review of Tank Farm Ventilation Systems*", LATA document.

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APPENDIX C
EXPERIMENTAL TANK VAPOR DATA

BX-106

Recorded as a WP60 file VAPOR1.108

- Short @ 21'-0"
- Medium @ 26'-11"
- Long @ 31'-11"

3) The N_2H_4 conversions are as follows:

- 1 ppm = 1.33 mg/m³
- 1 mg/m³ = 0.75 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method codes are: · D/T Draeger Tube
 · OVC Organic Vapor Monitor

IV's Indicated Values

Experimental Tank Vapor Data

BX-110

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
HCN & CN ⁻	≤2.0 ppm ⁹		3	WHC	6/9/93	6/10/93	D/T	
N ₂ H ₄	≤0.2 ppm ⁹	±10-15%	3	WHC	6/9/93	6/10/93	D/T	No IV's recorded
NO _x	≤0.5 ppm ⁹	±10-15%	3	WHC	6/9/93	6/10/93	D/T	
NH ₃	80.2 ppm ⁹ 80.3 ppm 70.2 ppm	±10-15%	3	WHC	6/9/93	6/10/93	D/T	
TOTAL ORGANICS	5.3 ppm 7.0 ppm 5.3 ppm		3	WHC	6/17/93	7/19/93	OVM	

Recorded as a WP60 file VAPOR2.108

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 21'-0"
- Medium @ 26'-11"
- Long @ 31'-11"

2) The HCN conversions are as follows:

- 1 ppm = 1.13 mg/m³
- 1 mg/m³ = 0.89 ppm

3) The N₂H₄ conversions are as follows:

- 1 ppm = 1.33 mg/m³
- 1 mg/m³ = 0.75 ppm

4) The NO₂ conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method codes are:

- D/T Draeger Tube
- OVC Organic Vapor Monitor

Experimental Tank Vapor Data

BX-111

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁶ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
HCN & CN ⁻	≤2.0 ppm ³⁾		3	WHC	6/8/93	6/10/93	D/T	
N ₂ H ₄	≤0.2 ppm ³⁾	±10-15%	3	WHC	6/8/93	6/10/93	D/T	No IV's recorded
NO _x	≤0.5 ppm ⁴⁾	±10-15%	3	WHC	6/8/93	6/10/93	D/T	
NH ₃	70.0 ppm ⁵⁾ 70.0 ppm 35.0 ppm	±10-15%	3	WHC	6/8/93	6/10/93	D/T	
TOTAL ORGANICS								No data on TO's taken

Recorded as a WP60 file VAPOR3.108

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 21'-0"
- Medium @ 26'-11"
- Long @ 31'-11"

2) The HCN conversions are as follows:

- 1 ppm = 1.13 mg/m³
- 1 mg/m³ = 0.89 ppm

3) The N₂H₄ conversions are as follows:

- 1 ppm = 1.33 mg/m³
- 1 mg/m³ = 0.75 ppm

4) The NO_x conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20° C and 1013 mbar.)

6) Analytical method codes are:

- D/T Draeger Tube
- OVC Organic Vapor Monitor

Experimental Tank Vapor Data

BY-111

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
HCN & CN ⁻	≤2.0 ppm ²⁾		3	WHC	3/26/93	3/29/93	D/T	
N ₂ H ₄	≤0.2 ppm ²⁾	±10-15%	3	WHC	3/26/93	3/29/93	D/T	
NO _x	≤0.5 ppm ⁴⁾	±10-15%	3	WHC	3/26/93	3/29/93	D/T	
NH ₃	10.2 ppm ²⁾ 5.1 ppm 10.2 ppm	±10-15%	3	WHC	6/26/93	6/29/93	D/T	
TOTAL ORGANICS	6.0 ppm 6.3 ppm 6.3 ppm		3	WHC	3/26/93	3/29/93	OVM	

Recorded as a WP60 file VAPOR11.108

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 13'-0"
- Medium @ 24'-6"
- Long @ 36'-0"

2) The HCN conversions are as follows:

- 1 ppm = 1.13 mg/m³
- 1 mg/m³ = 0.89 ppm

3) The N₂H₄ conversions are as follows:

- 1 ppm = 1.33 mg/m³
- 1 mg/m³ = 0.75 ppm

4) The NO₂ conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method codes are:

- D/T Draeger Tube
- OVC Organic Vapor Monitor

BY-112

Recorded as a WP60 file VAPOR4.108

- Short @ 13'-0"
- Medium @ 24'-6"
- Long @ 36'-0"

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

6) Analytical method codes are:

- D/T Draeger Tube
- OVC Organic Vapor Monitor

Experimental Tank Vapor Data

C-103

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value	Standard Deviation						
N ₂ O	880 ppm ¹⁾	±40 ppm	21	OGIS&T	1/27/94	2/94	GC/MS	
Σ NON-METHANE HC's	2.3 ppm		21	OGIS&T	1/27/94	2/94	GC/MS	Arithmetic average used w/ 5.8% uncertainty
H ₂	805 ppm	±18 ppm	21	OGIS&T	1/27/94	2/94	GC/MS	
CrO ₂ Co	23.9 ppm	±0.9 ppm	21	OGIS&T	1/27/94	2/94	GC/MS	
CH ₄	15.9 ppm	±0.6 ppm	21	OGIS&T	1/27/94	2/94	GC/MS	
n-C ₁₁ H ₂₄ n-C ₁₂ H ₂₆ n-C ₁₃ H ₂₈ n-C ₁₄ H ₃₀ n-C ₁₅ H ₃₂ Total NPH	≤0.027 mg/l 0.301 mg/l 0.443 mg/l 0.105 mg/l ≤0.027 mg/l 0.850 mg/l		10	WHC	12/93	1/94	GC/MS	Averages used

Recorded as a WP60 file VAPOR9.108

NOTE: 1) The NO₂ conversion is as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method code is: GC/MS Gas Canister/Mobile Sampling

HC's Hydrocarbons

Experimental Tank Vapor Data

C-104

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
NO _x	0.003 ppm ⁹		6	PNL/WHC	3/3/94	3/25/94	H/P	No sample validation done by PNL
NH ₃	40.0 ppm ⁹	±0.5 ppm	6	PNL/WHC	3/3/93	3/25/94	H/P	!
WATER	14.8 g/m ³	±0.8 g/m ³	6	PNL/WHC	3/3/94	3/25/94	H/P	!

Recorded as a WP60 file VAPOR5.108

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 13'-0"
- Medium @ 24'-6"
- Long @ 36'-0"

4) The NO₂ conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method code is: • H/P Heated probe Inserted into the vapor space

Experimental Tank Vapor Data

C-105

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
NO _x	0.06 ppm ⁴		6	PNL/WHC	3/3/94	3/25/94	H/P	No sample validation done by PNL
NH ₃	3.2 ppm ⁵⁾	±0.4 ppm	6	PNL/WHC	3/3/93	3/25/94	H/P	!
WATER	7.6 g/m ³	±0.9 g/m ³	6	PNL/WHC	3/3/94	3/25/94	H/P	!

Recorded as a WP60 file VAPOR6.106

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 13'-0"
- Medium @ 24'-6"
- Long @ 36'-0"

4) The NO₂ conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method code is: • H/P Heated probe inserted into the vapor space

Experimental Tank Vapor Data

C-106

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
NO _x	0.047 ppm ⁴⁾		6	PNL/WHC	3/3/94	3/25/94	H/P	No sample validation done by PNL
NH ₃	0.7-11.0 ppm ¹⁾	±0.5 ppm	6	PNL/WHC	3/3/93	3/25/94	H/P	1
WATER	20.0 g/m ³	±3.0 g/m ³	6	PNL/WHC	3/3/94	3/25/94	H/P	1

Recorded as a WP60 file VAPOR7.106

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 13'-0"
- Medium @ 24'-6"
- Long @ 36'-0"

4) The NO₂ conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20° C and 1013 mbar.)

6) Analytical method code is: • H/P Heated probe inserted into the vapor space

Experimental Tank Vapor Data

C-108

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁵ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
CN ⁻	0.11-0.22 ppm ²⁾		n/a	PNL/WHC	n/a	8/25/93	FTGB	Dennis Mahlum (92) reported values < than NIOSH STEL of 4.7 ppm, and concluded that there should be no toxicological problem

Recorded as a WP60 file VAPORS.108

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 21'-0"
- Medium @ 26'-11"
- Long @ 31'-11"

2) The CN⁻ conversion is as follows:

- 1 ppm = 1.13 mg/m³
- 1 mg/m³ = 0.89 ppm

(The above constituent conversion given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method code is:

- FTGB Flow-Through Gas Bubbles

Experimental Tank Vapor Data

C-111

CONSTITUENT	CONCENTRATION		No. of Samples	Report. Organiz.	Sample Date	Report Date	Analyt ⁹ Method	COMMENTS
	Reported Value ¹⁾	Standard Deviation						
HCN & CN ⁻	≤2.0 ppm ¹⁾		3	WHC	8/11/93	8/11/93	D/T	No IV's recorded
N ₂ H ₄	≤0.2 ppm ¹⁾	±10-15%	3	WHC	8/11/93	8/11/93	D/T	No IV's recorded
NO _x	≤0.6 ppm ¹⁾	±10-15%	3	WHC	8/11/93	8/11/93	D/T	No IV's recorded
NH ₃	≤2.0 ppm ¹⁾	±10-15%	3	WHC	8/11/93	8/11/93	D/T	Basic amines also indicated
CN Ion	≤0.04 ppm		1	WHC	8/12/93	8/21/93	FTGB	

Recorded as a WP60 file VAPOR10.108

NOTE: 1) If only one value is shown in this column it signifies that an individual measurement of constituent was taken, probably from the exhaust pipe port. Three values are indicative of the fact that an extendable probe was used to collect samples from the following distances from the top of the riser:

- Short @ 21'-0"
- Medium @ 26'-11"
- Long @ 31'-11"

2) The HCN conversions are as follows:

- 1 ppm = 1.13 mg/m³
- 1 mg/m³ = 0.89 ppm

3) The N₂H₄ conversions are as follows:

- 1 ppm = 1.33 mg/m³
- 1 mg/m³ = 0.75 ppm

4) The NO₂ conversions are as follows:

- 1 ppm = 1.92 mg/m³
- 1 mg/m³ = 0.52 ppm

5) The NH₃ conversions are as follows:

- 1 ppm = 0.71 mg/m³
- 1 mg/m³ = 1.41 ppm

(All the above constituent conversions are given at the standard atmospheric conditions of 20°C and 1013 mbar.)

6) Analytical method codes are:

- D/T Draeger Tube (Colorimetric)
- FTGB Flow-Through Gas Bubbles

IV's Indicated Values

APPENDIX D
ANNOTATED BIBLIOGRAPHY

HANFORD LITERATURE SEARCH SUMMARY

WASTE TANK RETRIEVAL CONCEPTS

DOCUMENT	YEAR	AUTHOR	TITLE	COMMENTS
BNWL-2234	1977	R.C. Lawrence	<i>Preliminary Concept of Waste Retrieval System</i>	
RHO-CD-1533	1982	J.P. Vanicek	<i>Equipment Development for Hydraulic Recovery of SST Sludge</i>	
WHC-SD-WM-TI-302	1987	N.W. Kirch	<i>Hanford Waste Tank Sluicing History</i>	
WHC-SP-0352	1990	S.A. Krieg	<i>Single-Shell Tank Waste Retrieval Study</i>	
Q-90-1	1990	QUADREX	<i>Hanford SST Waste Retrieval Methodology</i>	Industrial Survey
WHC-SD-ER-TPR-001	1990	R.E. Barker	<i>Feature Test of Air Conveyance System</i>	
WHC-SD-ER-TPR-002	1990	K.G. Squires	<i>Feature Test of Pneumatic Needle Scaler</i>	
WHC-SD-W139-ES-001	1990	J.D. Ludowise	<i>Interim Tank Stabilization</i>	241-C-106
WHC-SD-W139-ES-002	1991	G.A. Barnes	<i>Engineering Study on Tank Retrieval System</i>	
WHC-SD-ER-DA-001	1991	S.A. Krieg	<i>Retrieval Equipment Concept Selection Decision Analysis</i>	
WHC-SP-0680	1991	A.F. Wellner	<i>Single Shell Tank Waste Retrieval System Concept Review</i>	
WHC-SD-TD-TI-002	1991	W.W. Jenkins	<i>Retrieval Equipment Concept Selection Decision Analysis</i>	
WHC-SD-TD-TI-002	1992	S.A. Krieg	<i>Description of Concepts for Retrieving Waste from Hanford SST's</i>	
WHC-SD-W139-ES-005	1992	D.W. Hornberger	<i>Tank Penetration Study</i>	241-C-106
DOE-RL-Ltr-92-TRB-123	1992	J.H. Anttonen	<i>Tank Waste Remediation Systems</i>	National Technology Workshop Proceedings

DOCUMENT	YEAR	AUTHOR	TITLE	COMMENTS
WHC-SD-WM-ER-128	1992	Discovery Report	<i>SST Waste Retrieval New Technologies</i>	
WHC-SD-WM-TPR-119	1993	J.F. Thompson	<i>SST Soft Waste Dislod- ging and Conveyance System Test</i>	

ANNOTATED BIBLIOGRAPHY

Waste Retrieval Methods

WHC-SD-ER-TPR-001

The first of a series of engineering reports dealing with the results of the waste removal testing as called by the SST Waste Feature Test Plan (J. F. Thompson, 1990). Feature testing of air conveyance was reported in this document. The test was designed to determine the applicability and efficiency of air as media for the waste transport from the SST retrieval. The air conveyance system tested had deficiencies in moving the waste into the feed nozzle. The sludge stimulant tended to stick to the inner hose walls and accumulate in the horizontal sections. With the addition of water that was injected into the feed nozzle, these problems were somehow minimized. The report recommended to repeat the tests in the future in order to optimize the air conveyance system.

WHC-SD-ER-TPR-002

This report contained the test result of the pneumatic needle scaler that was designed to aid liberation of wastes in SST's, or for the general wall/floor cleaning purposes. The scaler proved to be an effective method of dislodging the wastes and cleaning the tank walls.

WHC-SD-ER-TPR-003

A sine pump was tested to determine the applicability of the pump as a conveying method for transporting the SST wastes. The pump can produce desired flow rates, suction pressure and discharge head. The major disadvantage proved to be its control components made off elastomers. These parts exhibited excessive wear under the harsh tank environment. The sine pump should be considered if the system uses a positive displacement pump.

WHC-SD-ER-TPR-004 to -006

Several models of air and water jet scarifiers were tested as potential tools for retrieving wastes from SST's. These scarifiers were tested on hard saltcake, soft saltcake, and simulated sludge materials. The air jets (500 cfm at 100 to 300 psig) were found effective in cutting and dislodging soft saltcake and sludge, while only water jets 200 psig at 400 fpm traversing jet speed) performed satisfactorily in hard saltcake cutting operations. They also seemed to be effective in aiding the final tank cleanup.

RHO-CD-1533

This study compared several methods for recovering the tank waste during future retrieval of 241-C-106. Tests were conducted with a commercially available, truck-mounted pneumatic conveying systems. These tests were successful in retrieving soupy and granule synthetic wastes from the drums to the heights between 16 and 60 ft, however, the systems failed to handle solid materials. An attempt was made to aid the system with a high-pressure water, initially between 1000 and 2000 psi; the tests were successful only when the water pressure was increased to about 10000 psi (at 4 to 5 gpm flow rate). The confined sluicing method of tank waste transport was also discussed in his study. The advantage of this technique is the prediction that the sluicing jets at low flow rate and high pressure within a confined space will have the same or greater impact on the sludge transport as the large flow rate sluicers operating over a large surface area. This study recommended to use a pneumatic conveying system to remove the sludge slurry from the sluicing module, and that the end effector be attached to an articulated arm manipulator deployed from a central SST riser.

WHC-EP-0352

Discussed were several methods of waste retrieval technologies related to pumping, sluicing, air transport, and mechanical mining. The components evaluated under this study for various performance functions were:

❖ ROBOTIC ARM	Delivery and maneuvering of tooling, pumps, and other small devices
❖ POSITIVE-DISPLACEMENT PUMPS	Three different methods of sludge pumping
❖ SCARIFIER	Breaking up and transport of wastes (using air and water jets)
❖ AIR JETS	Simplified scarifier design for sludge and soft salt-cake retrieval
❖ WATER JETS	Simplified scarifier for hard saltcake retrieval
❖ STEAM JETS	Simplified scarifier for sludge and salt cake retrieval
❖ SHEAR	Small parts, and tool cutting (pipes, tubing, etc.)
❖ GRABBER	Gripping, grabbing, holding, lifting, and other maneuvering of solid materials and components
❖ GRINDER	Grinding of hard saltcake
❖ ABRASIVE WATER JET	Cutting of steel pipes and tubing

❖ ABRASIVE CUT-OFF SAW	Cutting of steel pipes and tubing
❖ PULVERIZER	Breaking and pulverizing of hard saltcake
❖ IMPACT HAMMER	Dislodging of saltcake
❖ CLAMSHELL BUCKET	Removing of sludge, saltcake and other solid debris from the tank

WHC-SD-WM-ER-128

This report summarized the findings, conclusions and recommendations of available literature describing the equipment for dislodging and conveying the waste materials and the installed components from the SST's at the Hanford Site. The past studies recommended sluicing, piping, or mechanical mining as best methods of waste retrieval. The search for new technologies covered off-the shelf components and systems that could be readily adapted to the retrieval operations. Identified were new types of pumps, robotic arms, abrasive water jets, remote-control vehicle, elevators and air conveyance systems.

WHC-SD-W139-ES-001

This engineering study developed and evaluated retrieval, conveyance and storage method alternatives for the removal of a high-heat sludge. Certain recommendations were made to assure that interim waste stabilization and isolation can be completed on time as required by the Tri-party Agreement Milestone M-05-08 by September of 1996. The study areas included the removal of a sufficient amount of sludge to allow interim stabilization while identifying suitable waste storage locations, as well as sludge transport and waste treatment options. Limited sluicing was the waste retrieval method selected as optimal by this study. As an sludge storage alternative, recommended was to send it to tank AY-101. Although, waste treatment alternatives were discussed, none was selected as a winning concept. The study also listed a summary of action items to be taken in order to implement the above mentioned TPA milestone.

WHC-SD-W139-ES-002

The continuation of internal project WE-139 provided the criteria, limitations, assumptions and preliminary design criteria for tank C-106 stabilization. The retrieval options listed and evaluated under this engineering study were:

- ❖ Limited Sluicing
- ❖ Confined Sluicing, and

❖ Waste Dredging

It was recommended to further develop the confined sluicing method as an optimum. This finding was supported by the attribute of favorable operating conditions under which the water additions to the tank would be minimized. This is an important factor for both the tank safety and waste retrieval since it is possible that, soon, the tank may become a leaker.

BNWL-2234

This is a pre-conceptual design study evaluating the merits of underground mining methods that may be utilized for the retrieval of solidified high level radioactive wastes presently stored at the Hanford site. The remote-control mining methods proposed under this study would be capable of handling varieties of waste forms, ranging from solid objects to saltcake, sludge, liquids and certain combinations of all above mentioned forms.

WHC-SD-ER-DA-001

This document evaluated eleven possible alternatives of waste retrieval. Nine of these eleven met most of the performance criteria set forth in this study. The Kepner-Tregoe engineering analysis method was used to narrow the number of concepts to final five. The five methods recommended for further development were:

- ❖ Top-Off
- ❖ Enlarged Hole
- ❖ Reference Concept
- ❖ Contained Sluicing Pump-Out, and
- ❖ Contained Sluicing Air-Conveyance

All these method fit the two general approaches of Central Arm and Large Opening concepts. These methods, along with sluicing, were further evaluated by WHC-SP--0680.

WHC-SD-WM-TPR-119

This report documents the effort made as a part of the Underground Storage Tank Integration Demonstration Program during FY-92. The main objective was to identify additional waste retrieval technologies applicable to STT's. The study investigated three separate issues: (1) Identifying a generic or baseline tank suitable for retrieval system application, (2) Identify the best available methods of waste retrieval, and (3) Investigate the fluid dynamics/mechanical system that may be used for the waste

mobilization and tank retrieval. The three methods identified were:

- ❖ Borehole Mining
- ❖ Extendable Arm (as an enhancement of borehole mining), and
- ❖ Integrated Waste Retrieval/Closure System

WHC-SD-DD-ES-008

As a part of the efforts associated with decommissioning the Strontium Semiworks Facility in 1986, tank CX-72 was filled with grout to reduce the volume of voids. The purpose of this study was to develop alternatives and recommend preferred methods for sampling and decommissioning of this tank the would be conducted in the following three phases:

- ❖ Excavation of the overburden, removal of the tank top and the top layer of the grout,
- ❖ Sampling of the sludge layer, and
- ❖ Mining and sluicing of the waste, and eventual removal and transport of the tank to the handling facility.

There is about 75.5 inches of sludge, and 1 inch of liquid in the tank that has 40" diam. The waste stored there contained the following concentrations of radionuclides:

- ❖ $1.13 \cdot 10^{-8}$ g/gal Pu (Total tank Pu contents is below 200g)
- ❖ $2.43 \cdot 10^{-3}$ g/gal U, and
- ❖ 4.33 nCi/gal $^{89/90}\text{Sr}$ (No ^{137}Cs was detected).

There is the possibility that the grout contained appreciable quantities of TRU material, especially close to the sludge layer. Should the tank become a leaker, removal of the sludge via sluicing would be prohibited. Dry mining techniques have the inherent risk of releasing radioactive particles into the environment. Therefore, a temporary 10-ft diam. caisson may have to be installed, extending from the present grade level to the top of the tank.

WHC-SD-TD-TI-002

This technical information study describes the principle of operations and physical arrangement of forty-five (45) tank waste retrieval methods. An illustration of each concept is provided with each description as well as highlits of the relative advantages and disadvantages.

WHC-SD-W139-ES-005

The main purpose of this engineering study was to evaluate the various methods of remotely cutting a 42" diam. hole on the top and near the center of tank C-106. The four principal operations evaluated were:

- ❖ Soil/Overburden Removal
- ❖ Heel Pit Removal
- ❖ Riser Removal, and
- ❖ Concrete Cutting Methods

There have been nineteen optional methods described in this study on how to perform the individual tasks. The field survey data and extrapolated tank readings showed the radiation levels to be between 540 R/hr in the waste and 20 mR/hr 100 ft from the center riser. The selected alternative was to stabilize the overburden by grouting methods, leave the heel pit in place, and core-drill through the pit, soil and the dome.

WHC-SP-0680

The goal of this informal paper was to establish a system design baseline for waste retrieval from single-shell tanks (SST). The need for concept evaluation has been induced by the provisions of the Tri-party Agreement Milestone M-07-00 which calls for "full demonstration of waste retrieval technology."

The following concepts have been studied by the panel of WHC experts:

- ❖ Reference
- ❖ Enlarged Hole
- ❖ Top Off
- ❖ Contained Sluicing Air-Conveyance
- ❖ Contained Sluicing Pump-Out
- ❖ Turret Tank
- ❖ Reference Multi-Hole
- ❖ Parazin
- ❖ Tuesday Marvel

Data Base Search

Optimization of air stripping/air emission control systems Puglionesi, P. S.
 Proceedings of national research and development conference on the control of hazardous materials
 Feb 1991
 Hazardous Materials Control Research Institute Greenbelt, MD

Air stripping has become one of the most widely applied ground-water and wastewater treatment technologies for removal of volatile organic contaminants (VOC). Considerable effort has been expended on the optimization of air stripper systems without air emissions control, but little or no consideration is typically given to system optimization when air emission controls are required. In design, each unit process is often treated independently, resulting in higher than necessity overall project costs. Roy F. Weston, Inc. has funded R D Projects with direct or near future applications. In this WESTON R D project, system optimization techniques were applied to a range of representative groundwater treatment applications to confirm that the economic benefits of air stripping/air emission control system optimization justify the additional efforts in engineering and cost estimation. This paper presents the protocols utilized for this emission control equipment design protocols. The Onda correlation was used to estimate the mass transfer coefficient for use in column sizing determination. Liquid loading rate, VOC influent concentration, stripping factor (air-to-waste ratio times the Henry's Law constant for the VOC of concern) and air pressure drop across the packed bed were identified as critical design parameters for the air stripping. For purposes of this study, the liquid loading rate to the stripping. For purposes of this study, the liquid loading rate to the stripper was held constant. The main factors affecting cost sensitivity in activated carbon emission control are the specific VOC of concern and its concentration, the airflow rate to the control device and moisture content (or humidity). For purposes of this study, humidity was assumed to be reduced to less than 50% by a heater to maximize adsorption capacity. The economic analysis is summarized in the form of cost curves and tables for the most significant design parameters. 15 refs., 13 figs., 1 tab.

Catalytic fabric filtration for simultaneous NO [sub x] and particulate control Weber, G.F.
Environmental Research Center
DOE
Washington, DC
Nov 1992

The overall objective of this project is the development of a catalyst-coated fabric filter for simultaneous NO[sub x] and particulate control. The catalyst-coated fabric filter must provide high removal efficiency of NO[sub x] and particulate matter. An acceptable bag and catalyst life must be demonstrated, and process economics must show a significant cost savings when compared to a commercial SCR process and conventional particulate control. Specific goals include the following: Reduce NO [sub x] emissions to 60 ppM or less; demonstrate particulate removal efficiency of > 99.5%; demonstrate a bag/catalyst life of . 1 year; control ammonia slip to <25 ppM; show that catalytic fabric filtration can achieve a 50% cost savings over conventional fabric filtration and SCR control technology; determine compatibility with SO[sub 2] removal systems; and show that the concept results in a nonhazardous waste product. Specific project activities during the past quarter were to include the following: Fundamental Testing; process Testing/Reverse-Gas System; process Testing/Pulse-Jet System; and Fabric Durability Testing/Pulse-Jet System.

An assessment of off-gas treatment technologies for application to thermal treatment of
Department of Energy wastes
Dalton, J.D. DOE
Washington, DC
Sep 1992

The purpose of this report is to describe available air pollution control technologies for pollutants generated by thermal treatment of DOE wastes. A basic process for selecting air pollution control devices is summarized. Types of air pollutants generated by thermal treatment units are described, as well as the factors that influence the types and quantities of pollutants generated. This report also reviews applicable regulatory emission requirements. A listing of available and emerging air pollution control technologies and a brief introduction to the basic engineering principles involved in collecting each of the pollutants are presented. Section 7 of this report contains two types of evaluations for air pollution control devices. First, comparative evaluations of individual technologies are presented, based upon criteria generally relevant to DOE facilities. Using this evaluation system, the spray dryer absorber received the highest rating for acid-gas removal; high-efficiency particulate air (HEPA) filters received the highest rating for particulate removal; activated carbon adsorption received the highest rating for the removal of both toxic metals and residual hydrocarbons; and selective catalytic reduction received the highest rating for nitrogen oxide abatement. Also evaluated in Sect. 7 is the expected performance of different types of pollution control systems on two hypothetical waste streams. The waste streams were defined based upon typical DOE wastes and thermal treatment technologies. Section 8 presents conclusions for this report. Two appendixes are included with this report. The first appendix contains a brief description of all the technologies evaluated and the second lists of some of the vendors for each of the technologies that was evaluated.

VOC emission control technologies for site remediation

Chu, R.J.

National research and development conference on the control of hazardous materials

Anaheim, CA

22 Feb 1991

Hazardous Materials Control Research Institute, 7237 Hanover Parkway, Greenbelt, MD 20770-3602 (United States)

Vapor extraction and air stripping are common treatment techniques used for the removal of volatile organic compounds (VOCs) from soil and groundwater. In the past, the extracted or stripped VOCs were simply discharged to the air. However, in locales such as Southern California, VOCs must be controlled and removed to nondetectable levels or health-based limits. Often, the final airstream must not pose a health risk of more than one in a million. There are several technologies available to control VOC emissions. Granular activated carbon is one of the most effective materials for use in removing VOCs. When the use of activated carbon becomes prohibitive or not feasible, other methods such as thermal oxidation, catalytic oxidation, vapor condensation and wet scrubber absorption must be employed. This paper describes the different types of feasible VOC control technologies in use today. Descriptions of process operation, limitations, applicability, advantages and disadvantages are included. A few innovative technologies are described. Finally, factors which should be considered by the remedial designer in his selection of the appropriate off-gas control technology are listed. 11 refs., 7 figs., 2 tabs.

A novel fine particulate control approach based on a confined vortex scrubber
Loftus, P.J.

Proceedings: Ninth particulate control symposium. Volume 2, Baghouses and advanced
particulate control technologies

Research Triangle, NC

Oct 1991

An innovative cleanup concept, based on a Confined Vortex Scrubber (CVS), for fine particulate removal from combustion flue gases has been developed, tested and verified. The CVS consists of a cylindrical vortex chamber with multiple tangential flue gas inlets. The clean gas exit is via two central tubes. Water is introduced into the chamber and is confined within the vortex chamber by the extremely high centrifugal forces generated by the gas flow. The confined water forms a layer through which the flue gas is forced to bubble. Due to the high radial acceleration field, the bubbles generated are very small, leading to a strong gas/liquid interaction, high inertial separation forces and excess of 99.5% have been measured for extremely fine fly ash (mean particle size 0.3 micron diameter particles).

Sampling Strategies for determining soil filter control efficiencies

Berry, R. S.

EPA/AWMA international symposium on measurement of toxic and related air pollutants

May 1991

Washington, DC

Environmental Protection Agency

This paper is of interest to those evaluating air emissions and pollutant removal efficiencies from control devices that include dispersed sources. A testing program was designed and conducted to evaluate the effectiveness of a soil filter for reduction of ammonia. The soil filter was used to control ammonia emissions from a sludge composting facility for solid wastes from the food industry. The testing program presented a unique challenge, because emissions from the control device were distributed over a 15,000 ft² area. The soil filter consisted of eight cells; each cell was used to control ammonia emissions from one of eight exhaust headers venting the compost facility. The program employed conventional source sampling techniques for measuring inlet ammoniacal loadings to the filter. Two sampling strategies were considered for measuring controlled emissions from the filter outlet: direct soil flux measurements were chosen over the upwind/downwind sampling because of the potential for detectability problems with the ambient samples. A variety of concerns were addressed in order to develop an effective test program. Some of these concerns were addressed in order to develop an effective test program. Some of these concerns included determining volumetric flow rates through the filter, coordinating the tests with specific compost operations, detecting exhaust gas channeling problems, and performing an effective pretest screening.

Catalytic fabric filtration for simultaneous NO_x and particulate control
Weber, G.F.
DOE
Washington DC
Feb 1992

The overall objective of this project is the development of a catalytic fabric filter for simultaneous NO_x and particulate control. The catalytic fabric filter must provide high removal efficiency of NO_x and particulate matter. An acceptable bag and catalyst life must be demonstrated, and process economics must show a significant cost savings when compared to a commercial SCR process and conventional particulate control. Specific goals include the following: (1) Reduce NO_x emissions to 60 ppm or less. (2) Demonstrate particulate removal efficiency of >99.5%. (3) Demonstrate a bag/catalyst life of >1 year. (4) Control ammonia slip to >25 ppm. (5) Show that catalytic fabric filtration can achieve a 50% cost savings over conventional fabric filtration and SCR control technology. (6) Determine compatibility with SO₂ removal systems. (7) Show that the concept results in a nonhazardous waste product.

Development of technologies for the waste management of I-129, Kr-85, C-14 and tritium in the Fed. Rep. of Germany

Heinrich, E/

USDOE, Washington, DC

Aug 1984

The main source of I-129, Kr-85, C-14 and tritium in Germany will be a 10-15 GWe LWR fuel reprocessing plant (FRP), expected to be in operation in the mid nineties. Guidelines for release regulations and development efforts are discussed. It has been recommended to limit the annual I-129 released to less than 0.2 curie. The uncontrolled release of Kr-85, C-14 or tritium via the stack resulting from the 15 GWe power will not exceed the limits derived from the German radiation protection ordinary. The development and hot demonstration and hot demonstration of a Kr-85 control technology is recommended in view of the anticipated increasing use of nuclear power in the future. Commercial use of Xe and Kr may also contribute to the incentive for recovery. It would be simple to recover $^{14}\text{CO}/\text{sub } 2/$ once separated in the course of processing, should not be deliberately released. Therefore tritium control technology is being developed. General concepts and the present status of reference and back-up technologies as well as additional research in view of advanced processes are summarized.

Design study of fuel circulating system using Pd alloy membrane isotope separation method

Naito, T.

Tokyo (Japan)

Proceedings of the US/ Japan workshop on fusion fuel handling.

Oct 1980

It is expected that the method of permeating through Pd-alloy membranes is effective for isotope separation and the refining of fuel gas. In this paper, the design study of the Fuel Circulating System (FCS) using Pb-alloy membranes is described. The study is mainly focused on the main vacuum, fuel gas refining, isotope separating, and tritium containment systems. In the fuel gas refining system, impurities are effectively removed by using Pd-alloy membranes. For the isotope separation system, the diffusion method through Pd-alloy membranes was adopted. From the standpoint of the safety and economy, a three-stage tritium containment system was adopted to control tritium release to the environment as low as possible. The principal conclusion drawn from the design study was as follows. In the FCS, while cryogenic distillation method appears to be practicable, Pd-alloy membrane method is attractive for isotope separation and the refining of fuel gas. For a large amount of tritium inventory, handling and control technologies should be completed by the experimental evaluation and development of the components and materials used for the FCS. A three-stage containment system was adopted to control tritium release to environment as low as possible. Consideration to prevent tritium release to environment as low as possible. Consideration to prevent tritium escape will be necessary for fuel gas refiners and isotope separators.

Nobe, K.

Catalysts for automotive pollution control devices. Final report

California Univ., Los Angeles (USA)

Sep 1973

Over 100 catalysts were investigated for use in the control of nitrogen oxides, carbon monoxide, and hydrocarbon emissions from motor vehicle engines. Catalysts were tested in the laboratory for reactions between nitric oxide and CO, NO, and carbon dioxide, nitrogen dioxide, NH₃, hydrocarbons, nitrous oxide, and O₂ were monitored. Catalysts tested included rare earth and transition metal oxides, noble metals, Monel, tungsten bronzes, nickel, and stainless steel. The best catalysts were exposed to exhaust gases from a dynamometer-mounted engine in a small reactor under simulated oxidizing or reducing conditions. Several catalysts were tested in a prototype two-stage converter. A strontium yttrium ruthenium oxide in the first stage reduced NO emissions 90 percent. Ruthenium and ruthenium oxides selectively reduced NO to N₂ rather than to NH₃. A nickel/platinum catalyst in the second stage totally removed CO for at least 150 hr.

APPENDIX E

REFERENCES

- Bendixsen, 1990, R.B., 702A Ventilation System Flowsheet, WHC-SD-WM-TA-020, Westinghouse Hanford Company, Richland, WA, April 4, 1990.
- Kimura, 1987, R.T., Lindsey, D.W., Characterization of Airborne Radionuclide Particulates in Ventilated Liquid Waste Tanks, RHO-RE-SA-216, Rockwell Hanford Company, Richland, WA, June 1987.
- Ballinger, M.Y., et. al., 1988, Methods for Describing Airborne Fractions of Free Fall Spills of Powders and Liquids, NUREG/CR-4997, PNL-6300, Pacific Northwest Laboratory, January 1988.
- Perry, Robert, 1984, Perry's Chemical Engineering Handbook, 7th ed., McGraw-Hill, New York, NY, 1984.
- Schweitzer, P. A., Editor in Chief, 1979, Handbook of Separation Techniques for Chemical Engineers, McGraw-Hill, New York, NY, 1979.
- Thibodeaux, 1979, L.J., Chemodynamics, John Wiley & Sons, New York, NY, 1979.
- Hesketh, 1983, H.E., Cross, Frank L. Jr., Fugitive Emissions and Controls, Ann Arbor Science Publishers, Ann Arbor, MI, 1983.
- Kimura, 1987, R.T., Lindsey, D.W., Characterization of Airborne Radionuclide Particulates in Ventilated Liquid Waste Tanks, RHO-RE-SA-216, Rockwell Hanford Operations, Richland, WA June 1987.
- Geeting, 1993, J.G.H. and D.E. Kurath, Preliminary Assessment of Blending Hanford Tank Wastes, PNL-8589, Pacific Northwest Laboratory, Richland, WA, March 1993.
- Kidder, R.J., 1991, Preliminary Safety Analysis Report (SAR) for the Tank Farm Ventilation Upgrade, Project W-030, WHC-SD-W030-PSAR-001, Rev. 0, Westinghouse Hanford Company, Richland, WA, September 27, 1991.
- Raymond, R.E., 1986, Double-Shell Tank Farm Facility (241-AN,AW,AP, and SY), Safety Analysis Report, SD-WM-SAR-016, Rev. 1, Westinghouse Hanford Company, Richland, WA, May 16, 1986.
- Postma, A.K. et. al., 1994, Safety Analysis of Exothermic Reaction Hazards Associated with the Organic Liquid Layer in Tank 241-C-103, WHC-SD-SARR-001, Rev.0, Westinghouse Hanford Company, Richland, WA, March 1994.
- Huckaby, J.L., 1994, Tank 241-C-103 Headspace Flammability, WHC-EP-0734, Westinghouse Hanford Company, Richland, WA, January 1994.
- Lane, A.G. and R.A. Kirkbride, 1993, Annual Report of Tank Waste Treatability, WHC-EP-0365-3, Westinghouse Hanford Company, Richland, WA, September 1993.
- Burchstead, et. al., 1976, Nuclear Air Cleaning Handbook, ERDA 76-21, Oak Ridge National Laboratory, Oak Ridge, TN, 1976.

Krieg, S.A., et. al., 1990, Single-Shell Waste Retrieval Study, WHC-EP-0352, Westinghouse Hanford Company, Richland, WA, June 1990.

Baumgartner, W.V., et. al., 1983, Aging Waste Facility Safety Analysis Report, SD-HS-SAR-010, Rev. 1, Rockwell International, Rockwell Hanford Operations, Richland, WA, December, 1983.

Internal Memorandum 13314-89-032, From: Tank Farm Process Technology Section, To: N.R.Kerr, Subject: Aging Waste Off-Gas Sampling Status Report, Dated: April 12, 1989, Westinghouse Hanford Company, Richland, WA.

Rasmussen, R.A. and W. Einfeld, 1994, Initial Gas and Vapor Analysis Results, Hanford Tank Sampling Job 6B, Tank 241-C-103 February 1994.

Oscarson, Eric E. and Leslie A. Tusler, 1993, Radionuclide and Chemical Inventories for the Double-Shell Tanks, WHC-SD-WM-TI-543, Rev. 1, Westinghouse Hanford Company, Richland, WA, July 30, 1993.

Wastren, Inc., 1993, Radionuclide and Chemical Inventories for the Single-Shell Tanks, WHC-SD-WM-TI-565, Rev. 1, Westinghouse Hanford Company, Richland, WA, July 30, 1993.

Borsheim, G.L. and N.W. Kirsch, 1991, Summary of Single- Shell Tank Waste Stability, WHC-EP-0347, Westinghouse Hanford Company, Richland, WA, March 1991.

Crowe, R.D., et. al., 1993, Estimation of Heat Load in Waste Tanks Using Vapor Space Temperatures, WHC-EP-0709, Westinghouse Hanford Company, Richland, WA, December 1993.

Fox, G.L., et. al., 1992, Tank 241-SY-101 Crust Burn Analysis, WHC-SD-WM-SAR-046, Rev. 1, Westinghouse Hanford Company, Richland, WA, June 1992.

McGrew, Dick L., 1994, Double Shell Tank Ventilation Upgrades, Project W-314B Engineering Study, WHC-SD-WM-ES-284, Rev. 0, Westinghouse Hanford Company, Richland, WA, February 1994.

Hanlon, B.M., 1994, Tank Farm Surveillance and Waste Status Summary Report for November 1993, WHC-EP-0182-68, Westinghouse Hanford Company, Richland, WA, February 1994.

Garber, M.A., et. al., 1992, Assessment of Concentration Mechanisms for Organic Wastes In Underground Storage Tanks at Hanford, PNL-8339, Pacific Northwest Laboratory, Richland, WA, September 1992.

Straalsund, J.L., et. al., 1992, Clean Option: An Alternative Strategy for Hanford Tank Waste Remediation, PNL-8388, Vols. 1 and 2, Pacific Northwest Laboratory, Richland, WA, December 1992.

McCarthy, D., et. al., 1986, Rheological Evaluation of Pretreated Cladding Removal Waste, PNL-5589, Pacific Northwest Laboratory, Richland, WA, January, 1986.

- Kidder, R.J., 1993, Preliminary Safety Evaluation for 101-SY Initial Tank Retrieval System, Project W-211, WHC-SD-W211-PSE-001, Rev. 0, Westinghouse Hanford Company, Richland, WA, August 27, 1993.
- Henley, Ernest J. and J.D. Seeder, 1981, Equilibrium Stage Separation Operations in Chemical Engineering, John Wiley & Sons, New York, NY, 1981.
- Benedict, Manson W., et. al., 1982, Nuclear Chemical Engineering, 2nd Edition, McGraw-Hill, New York, NY, 1982.
- Liu, Benjamin Y.H., Editor, 1976, Fine Particles: Aerosol Generation, Measurement, Sampling, and Analysis, Academic Press, New York, NY, 1976.
- Garfield, J.S., 1975, "Maximum Anticipated Hydrogen Concentrations in Underground Tank Atmospheres from Radiolysis of Water." ARH-CD-267. Atlantic Richfield Hanford Company, Richland, WA, 1975.
- Rockwell International, September, 1983. "PUREX Technical Manual. RHO-MA-116. Rockwell International, Hanford Operations, Richland, WA, 1983.
- Hanley, James and John J. Petchonka, 1993, "Equipment Selection for Solid-Gas Separation". Chemical Engineering, July 1993 issue.
- McInnes, Robert and Mary B. Van Wormer, 1990. "Cleaning up NO_x Emissions", Chemical Engineering, September 1990 issue.
- McInnes, Robert et al, 1990. "Scrubbing Toxic Inorganics", Chemical Engineering, September 1990 issue.
- McInnes, Robert, et. al., 1990. "Cutting Toxic Pollution", Chemical Engineering, September 1990 issue.
- Stengel, Mark H., 1993. "Remove Organics by Activated Carbon Adsorption". Chemical Engineering Progress, April 1993 issue.
- Shucosky, Anthony C., 1988, "Select the Right Cartridge Filter", Chemical Engineering, January 18, 1988 issue.
- Calvert, Seymour, 1984, and Englund, Harold M., Handbook of Air Pollution Technology, John Wiley & Sons, New York, NY, 1984.
- Post, Roy G., Editor, 1993, "Proceedings of the Symposia on Waste Management at Tucson, Arizona, February 28-March 4, 1993."
- Danielson, John A., Editor, 1973. Air Pollution Engineering Manual, 2nd Edition, Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, 1973.
- Handbook: Control Technologies for Hazardous Air Pollutants, June 1991. EPA/625/6-91/014. United States Environmental Protection Agency, Washington, DC, 1991.

The Workers' Compensation Board of British Columbia, 1986. Ammonia--A Manual of Standard Practice. Vancouver, B.C.

U.S. Dept. of Health and Human Services, June 1990. NIOSH Pocket Guide to Chemical Hazards, DHHS (NIOSH) Publication No. 90-117.

U.S. Dept. of Labor (OSHA), 1980. Industrial Hygiene Technical Manual, Volume VI, OSHA 3058.

APPENDIX F
TABLES OF ALLOWABLE EMISSIONS

W314B

TABLE 2—CONCENTRATION LEVELS FOR ENVIRONMENTAL COMPLIANCE

Radionuclide	Concentration (Ci/m ³)	Radionuclide	Concentration (Ci/m ³)
Ac-225	9.1E-14	Bi-207	1.0E-14
Ac-227	1.6E-16	Bi-210	2.9E-13
Ac-228	3.7E-12	Bi-212	5.6E-11
Ag-106	1.9E-09	Bi-213	7.1E-11
Ag-106m	1.2E-12	Bi-214	1.4E-10
Ag-108m	7.1E-15	Bk-249	5.6E-13
Ag-110m	9.1E-14	Bk-250	9.1E-11
Ag-111	2.5E-12	Br-77	4.2E-11
Al-26	4.8E-15	Br-80	1.4E-08
Am-241	1.9E-15	Br-80m	1.8E-09
Am-242	1.5E-11	Br-82	1.2E-11
Am-242m	2.0E-15	Br-83	1.2E-08
Am-243	1.8E-15	Br-84	6.7E-10
Am-244	4.0E-11	C-11	1.5E-09
Am-245	8.3E-09	C-14	1.0E-11
Am-246	1.2E-09	Ca-41	4.2E-13
Ar-37	1.6E-03	Ca-45	1.3E-12
Ar-41	1.7E-09	Ca-47	2.4E-12
As-72	2.4E-11	Cd-109	5.9E-13
As-73	1.1E-11	Cd-113	9.1E-15
As-74	2.2E-12	Cd-113m	1.7E-14
As-76	5.0E-11	Cd-115	1.6E-11
As-77	1.6E-10	Cd-115m	8.3E-13
At-211	1.1E-11	Cd-117	6.7E-11
Au-193	3.8E-10	Cd-117m	1.6E-10
Au-194	3.2E-11	Ce-139	2.6E-12
Au-195	3.1E-12	Ce-141	6.3E-12
Au-198	2.1E-11	Ce-143	3.0E-11
Au-199	4.8E-11	Ce-144	6.2E-13
Ba-131	7.1E-12	Cf-248	1.8E-14
Ba-133	5.9E-14	Cf-249	1.4E-15
Ba-133m	5.9E-11	Cf-250	3.2E-15
Ba-135m	1.8E-10	Cf-251	1.4E-15
Ba-139	5.6E-09	Cf-252	5.6E-15
Ba-140	1.3E-12	Cf-253	3.1E-13
Ba-141	1.4E-09	Cf-254	3.0E-15
Ba-142	1.3E-09	Cf-255	2.7E-15
Ba-7	2.3E-11	Cf-38	7.7E-10
Ba-10	1.6E-12	Cm-242	5.3E-14
Be-206	2.3E-12	Cm-243	2.6E-15
Cm-244	3.3E-15	Eu-156	1.9E-12
Cm-245	1.8E-15	F-18	6.7E-10
Cm-246	1.9E-15	Fe-52	5.6E-11
Cm-247	1.9E-15	Fe-55	9.1E-12
Cm-248	5.0E-16	Fe-59	6.7E-13
Cm-249	3.7E-09	Fm-254	2.0E-11
Cm-250	9.1E-17	Fm-255	4.3E-12
Co-56	1.6E-13	Fr-223	3.3E-11
Co-57	1.3E-12	Ga-66	6.2E-11
Co-58	6.7E-13	Ga-67	7.1E-11
Co-58m	1.2E-10	Ga-68	9.1E-10
Co-60	1.7E-14	Ga-72	3.8E-11
Co-60m	4.3E-09	Gd-152	5.0E-15

TABLE 2—CONCENTRATION LEVELS FOR ENVIRONMENTAL COMPLIANCE—Continued

Radionuclide	Concentration (Ci/m ³)	Radionuclide	Concentration (Ci/m ³)
Co-61	4.5E-09	Gd-153	2.1E-12
Cr-49	1.1E-09	Gd-159	2.9E-10
Cr-51	3.1E-11	Ge-68	2.0E-13
Cs-129	1.4E-10	Ge-71	2.4E-10
Cs-131	3.3E-11	Ge-77	1.0E-10
Cs-132	4.8E-12	H-3	1.5E-09
Cs-134	2.7E-14	Hf-181	1.9E-12
Cs-134m	1.7E-10	Hg-193m	1.0E-10
Cs-135	4.0E-13	Hg-197	8.3E-11
Cs-136	5.3E-13	Hg-197m	1.1E-10
Cs-137	1.9E-14	Hg-203	1.0E-12
Cs-138	5.3E-10	Ho-166	7.1E-11
Cu-61	4.8E-10	Ho-166m	7.1E-15
Cu-64	5.3E-10	I-123	4.3E-10
Cy-57	5.0E-11	I-124	6.2E-13
Dy-157	5.0E-10	I-125	1.2E-13
Dy-165	6.7E-09	I-126	1.1E-13
Dy-166	1.1E-11	I-128	1.1E-08
Er-169	2.9E-11	I-129	9.1E-15
Er-171	4.0E-10	I-130	4.5E-11
Es-253	2.4E-13	I-131	2.1E-13
Es-254	2.0E-14	I-132	2.3E-10
Es-254m	1.8E-12	I-133	2.0E-11
Eu-152	2.0E-14	I-134	3.6E-10
Eu-152m	3.6E-10	I-135	1.2E-10
Eu-154	2.3E-14	In-111	3.6E-11
Eu-155	5.9E-13	In-113m	2.5E-09
In-114m	9.1E-13	Nb-95	2.2E-12
In-115	7.1E-14	Nb-95m	1.4E-11
In-115m	1.6E-09	Nb-96	2.4E-11
In-116m	4.2E-10	Nb-97	1.2E-09
In-117	1.6E-09	Nd-147	7.7E-12
In-117m	9.1E-11	Nd-149	7.1E-10
Ir-190	2.6E-12	Ni-56	1.7E-12
Ir-192	9.1E-13	Ni-57	1.8E-11
K-194	1.1E-10	Ni-59	1.5E-11
K-194m	1.7E-13	Ni-63	1.4E-11
K-40	2.7E-14	Ni-65	8.3E-10
K-42	2.6E-10	Np-235	2.5E-11
K-43	6.2E-11	Np-237	1.2E-15
K-44	5.9E-10	Np-238	1.4E-11
Kr-79	8.3E-09	Np-239	3.8E-11
Kr-81	2.1E-07	Np-240	7.7E-10
Kr-83m	2.3E-05	Np-240m	5.6E-09
Kr-85	1.0E-06	Os-185	1.0E-12
Kr-85m	1.3E-08	Os-191m	2.9E-10
Kr-87	2.4E-09	Os-191	1.1E-11
Kr-88	5.0E-10	Os-193	9.1E-11
La-140	1.2E-11	P-32	3.3E-13
La-141	7.7E-10	P-33	2.4E-12
La-142	2.7E-10	Pa-230	3.2E-13
Lu-177	2.4E-11	Pa-231	5.9E-16
Lu-177m	3.6E-13	Pa-233	4.8E-12
Mg-28	1.5E-11	Pa-234	1.1E-10
Mn-52	2.8E-12	Pb-203	6.2E-11
Mn-52m	6.2E-10	Pb-205	5.6E-12
Mn-53	1.5E-11	Pb-209	1.3E-08
Mn-54	2.8E-13	Pb-210	2.8E-15
Mn-56	2.9E-10	Pb-211	1.4E-10
Mo-93	1.1E-12	Pb-212	6.3E-12
Mo-99	1.4E-11	Pb-214	1.2E-10
Mo-101	1.0E-09	Pd-103	3.8E-11
Na-22	2.6E-14	Pd-107	3.1E-11
Na-24	2.6E-11	Pd-109	4.8E-10
Nb-90	2.6E-11	Pm-143	9.1E-13
Nb-93m	1.0E-11	Pm-144	1.3E-13
Nb-94	7.1E-15	Pm-145	6.2E-13

* 40 CFR 61, Appendix E

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As-76	5.0E-11	Cd-115	1.6E-11
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Au-193	3.8E-10	Cd-117m	1.6E-10
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Au-195	3.1E-12	Ce-141	6.3E-12
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Ba-140	1.3E-12	Cf-253	3.1E-13
Ba-141	1.4E-09	Cf-254	3.0E-15
Ba-142	1.3E-09	Cf-36	2.7E-15
Be-7	2.3E-11	Cf-38	7.7E-10
Be-10	1.6E-12	Cm-242	5.3E-14
Be-206	2.3E-12	Cm-243	2.6E-15
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Cm-246	1.9E-15	Fe-52	5.6E-11
Cm-247	1.9E-15	Fe-55	9.1E-12
Cm-248	5.0E-16	Fe-59	6.7E-13
Cm-249	3.7E-09	Fm-254	2.0E-11
Cm-250	9.1E-17	Fm-255	4.3E-12
Co-56	1.8E-13	Fr-223	3.3E-11
Co-57	1.3E-12	Ga-66	6.2E-11
Co-58	6.7E-13	Ga-67	7.1E-11
Co-58m	1.2E-10	Ga-68	9.1E-10
Co-60	1.7E-14	Ga-72	3.8E-11
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Cs-134	2.7E-14	Hf-181	1.9E-12
Cs-134m	1.7E-10	Hg-193m	1.0E-10
Cs-135	4.0E-13	Hg-197	8.3E-11
Cs-136	5.3E-13	Hg-197m	1.1E-10
Cs-137	1.9E-14	Hg-203	1.0E-12
Cs-138	5.3E-10	Ho-166	7.1E-11
Cu-61	4.8E-10	Ho-166m	7.1E-15
Cu-64	5.3E-10	I-123	4.3E-10
Cu-67	5.0E-11	I-124	6.2E-13
Dy-157	5.0E-10	I-125	1.2E-13
Dy-165	6.7E-09	I-126	1.1E-13
Dy-166	1.1E-11	I-128	1.1E-08
Er-169	2.9E-11	I-129	9.1E-15
Er-171	4.0E-10	I-130	4.5E-11
Es-253	2.4E-13	I-131	2.1E-13
Es-254	2.0E-14	I-132	2.3E-10
Es-254m	1.8E-12	I-133	2.0E-11
Eu-152	2.0E-14	I-134	3.8E-10
Eu-152m	3.6E-10	I-135	1.2E-10
Eu-154	2.3E-14	In-111	3.6E-11
Eu-155	5.9E-13	In-113m	2.5E-09
In-114m	9.1E-13	Nb-95	2.2E-12
In-115	7.1E-14	Nb-95m	1.4E-11
In-115m	1.6E-09	Nb-96	2.4E-11
In-116m	4.2E-10	Nb-97	1.2E-09
In-117	1.6E-09	Nd-147	7.7E-12
In-117m	9.1E-11	Nd-149	7.1E-10
Ir-190	2.6E-12	Ni-56	1.7E-12
Ir-192	9.1E-13	Ni-57	1.8E-11
Ir-194	1.1E-10	Ni-59	1.5E-11
Ir-194m	1.7E-13	Ni-63	1.4E-11
K-40	2.7E-14	Ni-65	8.3E-10
K-42	2.6E-10	Np-235	2.5E-11
K-43	6.2E-11	Np-237	1.2E-15
K-44	5.9E-10	Np-238	1.4E-11
Kr-79	8.3E-09	Np-239	3.8E-11
Kr-81	2.1E-07	Np-240	7.7E-10
Kr-83m	2.3E-05	Np-240m	5.6E-09
Kr-85	1.0E-06	Os-185	1.0E-12
Kr-85m	1.3E-08	Os-191m	2.9E-10
Kr-87	2.4E-09	Os-191	1.1E-11
Kr-88	5.0E-10	Os-193	9.1E-11
La-140	1.2E-11	P-32	3.3E-13
La-141	7.7E-10	P-33	2.4E-12
La-142	2.7E-10	Pa-230	3.2E-13
Lu-177	2.4E-11	Pa-231	5.9E-16
Lu-177m	3.6E-13	Pa-233	4.8E-12
Mg-28	1.5E-11	Pa-234	1.1E-10
Mn-52	2.8E-12	Pb-203	6.2E-11
Mn-52m	6.2E-10	Pb-205	5.6E-12
Mn-53	1.5E-11	Pb-209	1.3E-08
Mn-54	2.8E-13	Pb-210	2.8E-15
Mn-56	2.9E-10	Pb-211	1.4E-10
Mo-93	1.1E-12	Pb-212	6.3E-12
Mo-99	1.4E-11	Pb-214	1.2E-10
Mo-101	1.0E-09	Pd-103	3.8E-11
Na-22	2.6E-14	Pd-107	3.1E-11
Na-24	2.6E-11	Pd-109	4.8E-10
Nb-90	2.6E-11	Pm-143	9.1E-13
Nb-93m	1.0E-11	Pm-144	1.3E-13
Nb-94	7.1E-15	Pm-145	6.2E-13

[illegible]

TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS.

[illegible]

Paragraph (c) of this section since May

000101615

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TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	ppm (a)†	mg/m³ (b)†	Skin designation
2-Chloro-6-(trichloromethyl) pyridine ..	1929-82-4		15	
Total dust			6	
Respirable fraction			(?)	
Chromic acid and chromates (as CrO₃)	(4)			
Chromium (II) compounds	7440-47-3		0.5	
(as Cr)				
Chromium (III) compounds	7440-47-3		0.5	
(as Cr)				
Chromium metal and insol. salts (as Cr)	7440-47-3		1	
Chrysene; see Coal tar pitch volatiles.				
Clopidol	2971-90-8		15	
Total dust			6	
Respirable fraction			(?)	
Coal dust (less than 5% SiO₂), respirable fraction			(?)	
Coal dust (greater than or equal to 5% SiO₂), respirable fraction			(?)	
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridene, chrysene, pyrene	65966-93-2		0.2	
Cobalt metal, dust, and fume (as Co)	7440-48-4		0.1	
Coke oven emissions; see 1910.1029.				
Copper	7440-50-8		0.1	
Fume (as Cu)			1	
Dusts and mists (as Cu)			1	
Cotton dust; see 1910.1043				
Crag herbicide (Sesone)	138-78-7		15	
Total dust			6	
Respirable fraction			22	X
Cresol, all isomers	1319-77-3	5	2	
Crotonaldehyde	123-73-0	2	6	
	4170-30-3			
Cumene	96-82-6	50	245	X
Cyanides (as CN)	(4)		5	
Cyclohexane	110-82-7	300	1050	
Cyclohexanol	106-93-0	50	200	
Cyclohexanone	106-94-1	50	200	
Cyclohexene	110-83-6	300	1015	
Cyclopentadiene	542-92-7	75	200	
2,4-D (Dichlorophenoxyacetic acid)	94-75-7		10	
Decaborane	17702-41-9	0.05	0.3	X
Demeton (Systox)	8065-48-3		0.1	X
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	
1,2-Diaminoethane; see Ethylene diamine				
Diazomethane	334-88-3	0.2	0.4	
Diborane	19287-45-7	0.1	0.1	
1,2-Dibromo-3-chloropropane (CBCP); see 1910.1044.	96-12-6			
1,2-Dibromoethane; see Ethylene dibromide				
Dibutyl phosphate	107-68-4	1	5	
Dibutyl phthalate	84-74-2		5	
o-Dichlorobenzene	95-50-1	(C)50	(C)300	
p-Dichlorobenzene	106-48-7	75	450	
3,3'-Dichlorobenzidine, see 1910.1007	91-04-1			
Dichlorodifluoromethane	75-71-6	1000	4950	
1,3-Dichloro-5,5-dimethyl hydantoin	118-62-6		0.2	
Dichlorodiphenyltrichloroethane (DDT)	50-29-3		1	X
1,1-Dichloroethane	75-34-3	100	400	
1,2-Dichloroethane, see Ethylene dichloride				
1,2-Dichloroethylene	840-69-0	200	790	
Dichloroethyl ether	111-44-4	(C)15	(C)100	X
Dichloromethane, see Methylene chloride				
Dichloromonomethane	75-43-4	1000	4200	
1,1-Dichloro-1-nitroethane	584-72-9	(C)10	(C)100	

TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	ppm (a)†	mg/m³ (b)†	Skin designation
1,2-Dichloropropane; see Propylene dichloride				
Dichlorotetrafluoroethane	78-14-8	1000	7000	
Dichlorvos (DDVP)	62-73-7		1	X
Dicyclopentadienyl iron	102-64-6		15	
Total dust			6	
Respirable fraction			0.25	X
Dieldrin	60-67-1		75	
Diethylamine	109-69-7	25	50	X
2-Diethylaminoethanol	100-37-8	10		
Diethyl ether; see Ethyl ether				
Difluorodibromomethane	75-81-6	100	800	
Diglycidyl ether (DGE)	2236-07-6	(C)0.8	(C)2.8	
Dihydrobenzene; see Benzene				
Hydroquinone				
Disobutyl ketone	106-63-8	50	290	
Disopropylamine	105-18-9	5	20	X
4-Dimethylaminobenzene; see 1910.1016.	60-11-7			
Dimethoxymethane; see Methylal				
Dimethyl acetamide	127-19-5	10	35	X
Dimethylamine	124-40-3	10	18	
Dimethylaminobenzene; see Xylidine				
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	X
Dimethylbenzene; see Xylene				
Dimethyl-1,2-dibromo-2,2-dichloroethyl phosphate	300-78-5		3	
Dimethylformamide	66-12-2	10	30	X
2,6-Dimethyl-4-heptanone; see Diisobutyl ketone				
1,1-Dimethylhydrazine	57-14-7	0.5	1	X
Dimethylphthalate	131-11-3		5	X
Dimethyl sulfate	77-78-1	1	5	X
Dinitrobenzene (all isomers)				
(ortho)	529-29-0			
(meta)	99-65-0			
(para)	100-25-4			
Dinitro-o-cresol	834-62-1		0.2	X
Dinitrophenol	25321-14-6		1.6	X
Dioxane (Diethylene dioxide)	123-91-1	100	300	X
Diphenyl (Biphenyl)	62-52-4	0.2	1	
Diphenylmethane diisocyanate; see Methylene bisphenyl isocyanate				
Dipropylene glycol methyl ether	34590-94-8	100	600	X
Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate)	117-81-7		5	
Emery	12415-34-8		15	
Total dust			6	
Respirable fraction			0.1	X
Endosulfan	115-29-7		0.1	X
Endrin	72-20-6		19	X
Epichlorohydrin	106-89-6	5	0.5	X
EPN	2104-64-6			
1,2-Epoxypropane; see Propylene oxide				
2,3-Epoxy-1-propanol; see Glycidol				
Ethanedithiol; see Ethyl mercaptan				
Ethanolamine	141-43-5	3	740	X
2-Ethoxyethanol (Cellosolve)	110-80-5	200	540	X
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	100		
Ethyl acetate	141-78-6	400	1400	
Ethyl acrylate	140-68-6	25	100	X
Ethyl alcohol (Ethanol)	64-17-6	1000	1900	
Ethylamine	75-04-7	10	18	
Ethyl amyl ketone (5-Methyl-3-heptanone)	641-65-6	25	130	
Ethyl benzene	100-41-4	100	435	
Ethyl bromide	74-96-4	200	890	
Ethyl butyl ketone (3-Heptanone)	100-35-4	50	230	
Ethyl chloride	75-00-3	1000	2800	
Ethyl ether	60-29-7	400	1200	

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TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	Ppm (a)	mg/m ³ (b)	Safe designation
Ethyl formate	100-94-4	100	300	
Ethyl mercaptan	75-08-1	(C)10	(C)25	
Ethyl silicate	78-10-4	100	550	X
Ethylene dichloride	107-07-3	8	16	
Ethylene diamine	107-15-3	10	25	(F)
Ethylene dibromide	106-93-4		(F)	
Ethylene dichloride (1,2-Dichloroethane)	107-06-2			
Ethylene glycol diethers	628-96-6	(C)0.2	(C)1	X
Ethylene glycol methyl acetate; see Methyl ethoxycarbonyl				
Ethylene oxide; see 1910 1012	151-56-4			
Ethylene oxide; see 1910 1047	75-31-6			
Ethylene chloride; see 1,1-Dichloroethane				
Ethylmorpholine	100-74-3	20	94	X
Fenol	14884-64-1		16	
Total dust			1	
Enoxyanilinium dust	12804-56-9		2.5	
Fluorides (as F)	7782-43-5	0.1	0.2	
Fluorine	75-50-3	1000	5800	
Fluorobenzene				
Fluorobenzonitrile (Trichlorobenzene)	80-06-9			
Formaldehyde; see 1910 1048	84-10-4	8	8	
Formic acid	80-01-1		20	X
Furfural	98-00-0	50	200	
Furfuryl alcohol			10	
Gran dust (st. wheat, barley)	59-81-5		16	
Glycerol (mit)			6	
Total dust			150	
Respirable fraction				
Glycol	559-53-5	50		
Glycol monoethyl ether; see 2-Ethoxyethanol				
Graphite, natural; respirable dust	7782-43-5		(F)	
Graphite, synthetic			15	
Total dust			5	
Respirable fraction				
Gumron; see Asphaltic methyl Gypsum	13397-34-5		15	
Total dust			5	
Respirable fraction			0.9	X
Halothane	7440-58-6		0.5	
Heptachlor	76-44-8		2000	X
Heptane (n-Heptane)	142-82-0	500	10	X
Hexachlorobenzene	67-72-1		0.2	X
Hexachlorocyclopentadiene	1335-67-1			
Hexachlorophthalene	110-64-3	500	1800	
Hexane	59-17-8	100	410	
Hexanone (Methyl n-butyl ketone)	100-10-1	100	410	
Hexanone (Methyl isobutyl ketone)	100-84-9	50	300	
sec-Hexyl acetate	302-01-2		1.3	X
Hydrazine	10035-10-4		10	
Hydrogen bromide	7647-01-0	(C)5	(C)7	X
Hydrogen chloride	74-80-4	10	11	X
Hydrogen fluoride (as F)	7664-39-3	1	1.4	
Hydrogen peroxide	7722-84-1	0.05	0.2	
Hydrogen selenide (as Se)	7783-07-5		(F)	
Hydrogen sulfide	123-31-9	(C)0.1	2	
Hydroquinone	7553-66-2		(C)1	
Isocyanic acid	1306-37-1		10	
Iron oxide fume	123-62-3	100	625	
Isobutyl acetate	123-61-3	100	360	
Isobutyl alcohol (primary and second-ary)				
Isobutyl acetate	110-18-0	100	700	
Isobutyl alcohol	78-43-1	100	300	
Isoparane	78-08-1	25	140	
Isopropyl acetate	108-31-4	200	900	
Isopropyl alcohol	67-63-0	400	960	
Isopropylamine	75-31-0	5	12	
Isopropyl ether	108-20-3	600	2100	

TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

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TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	ppm (a) ¹	mg/m ³ (b) ¹	Skin designation
Methyl methacrylate	80-62-6	100	410	
Methyl propyl ketone, see 2-Pentanone				
alpha Methyl styrene	98-83-9	(C)100	(C)400	
Methylene bisphenyl isocyanate (MDI)	101-68-6	(C)0.02	(C)0.2	
Mica, see Silicates				
Molybdenum (as Mo)	7439-98-7			
Soluble compounds			5	
Insoluble compounds				
Total dust			15	
Monomethyl aniline	100-61-6	2	9	X
Monomethyl hydrazine, see Methyl hydrazine				
Morpholine	110-91-8	20	70	X
Naphthalene (Coal tar)	8030-30-6	100	400	
Naphthalene	91-20-3	10	50	
alpha Naphthylamine, see 1910.1004	134-32-7			
beta Naphthylamine, see 1910.1009	91-59-6			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	
Nickel, metal and insoluble compounds (as Ni)	7440-02-0		1	
Nickel, soluble compounds (as Ni)	7440-02-0		0.5	X
Nicotine	54-11-5		5	
Nitric acid	7697-37-2	2	30	
Nitric oxide	10102-43-9	25	30	
p-Nitroaniline	100-01-6	1	6	X
Nitrobenzene	98-05-3	1	5	X
p-Nitrochlorobenzene	100-00-5		1	X
4-Nitrophenyl, see 1910.1003	92-93-3			
Nitroethane	79-24-3	100	310	
Nitrogen dioxide	10102-44-0	(C)5	(C)20	
Nitrogen trifluoride	7783-54-2	10	29	
Nitropropane	55-63-0	(C)2	(C)12	X
Nitromethane	75-52-5	100	250	
1 Nitropropane	108-03-2	25	90	
2 Nitropropane	79-46-9	25	90	
N Nitrosodimethylamine, see 1910.1016				
Nitroloams (all isomers)		5	30	X
o-isomer	88-72-2			
m-isomer	99-08-1			
p-isomer	99-09-0			
Nitrotrichloromethane, see Chloropicrin				
Octachloronaphthalene	2234-13-1		0.1	X
Octane	111-65-9	500	2350	
Oil mist, mineral	8012-95-1		5	
Osmium tetroxide (as Os)	20816-12-0		0.002	
Oxalic acid	144-62-7		1	
Oxygen difluoride	7783-41-7	0.05	0.1	
Ozone	10026-15-6	0.1	0.2	
Paraquat respirable dust	4685-14-7		0.5	X
	1910-42-5			
	2074-50-2			
Parathion	56-38-2		0.1	X
Particulates not otherwise regulated (PNOR)				
Total dust			15	
Respirable fraction			5	
PCB, see Chlorodiphenyl (42% and 54% chlorine)				
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-84-8		0.5	X
Pentachlorophenol	87-86-6		0.5	X
Pentaerythritol	115-77-6			
Total dust			15	
Respirable fraction			5	
Pentane	109-66-0	1000	2950	
2 Pentanone (Methyl propyl ketone)	107-87-9	200	700	
Perchlorodifluoride	127-18-4		(?)	
(Infrared methylfluoride)				
Pentfluoromethyl mercaptan	504-42-3	0.1	0.8	

TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	ppm (a) ¹	mg/m ³ (b) ¹	Skin designation
Perchloryl fluoride	7818-04-6	3	13.8	
Perlite	93763-70-3			
Total dust			18	
Respirable fraction			8	
Petroleum distillates (Naphtha) (Rubber Solvent)		500	2000	
Phenol	108-95-2	5	19	X
p-Phenylene diamine	108-60-3		0.1	X
Phenyl ether, vapor	101-84-8	1	7	
Phenyl ether-biphenyl mixture, vapor		1	7	
Phenylethylene; see Styrene				
Phenyl glycidyl ether (PGE)	122-00-1	10	60	
Phenylhydrazine	100-63-0	5	22	X
Phosdrin (Mevinphos)	7766-34-7		0.1	X
Phosgene (Carbonyl chloride)	75-44-5	0.1	0.4	
Phosphine	7803-61-2	0.3	0.4	
Phosphoric acid	7664-38-2		1	
Phosphorus (yellow)	7723-14-0		0.1	
Phosphorus pentachloride	13026-13-6		1	
Phosphorus pentasulfide	1314-80-3		1	
Phosphorus trichloride	7719-12-2	0.5	3	
Phthalic anhydride	85-44-9	2	12	
Picloram	1918-02-1			
Total dust			15	
Respirable fraction			5	
Picric acid	88-69-1		0.1	X
Pindone (2-Phenyl-1,3-indandione)	83-26-1		0.1	
Plaster of Paris	26499-65-0			
Total dust			15	
Respirable fraction			5	
Platinum (as Pt)	7440-06-4			
Metal				
Soluble salts			0.002	
Portland cement	65097-15-1			
Total dust			15	
Respirable fraction			5	
Propane	74-98-6	1000	1800	
beta-Propiolactone; see 1910.1013				
n-Propyl acetate	57-57-6		840	
n-Propyl alcohol	109-60-4	200	600	
n-Propyl nitrate	71-23-6	200	110	
Propylene dichloride	78-67-6	75	350	
Propyleneimine	75-55-8	2	5	X
Propylene oxide	75-56-0	100	240	
Propyne; see Methyl acetylene				
Pyrethrum	6003-34-7		5	
Pyridine	110-86-1	5	15	
Quinone	108-61-4	0.1	0.4	
RDX; see Cyclotrite				
Rhodium (as Rh), metal fume and insoluble compounds	7440-18-6		0.1	
Rhodium (as Rh), soluble compounds	7440-18-6		0.001	
Ronnel	299-84-3		15	
Rotenone	83-79-4		5	
Rouge				
Total dust			15	
Respirable fraction			5	
Selenium compounds (as Se)	7782-49-2		0.2	
Selenium hexafluoride (as Se)	7783-70-1	0.05	0.4	
Silica, amorphous, precipitated and gel	112926-00-6		(?)	
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	61790-63-2		(?)	
Silica, crystalline cristobalite, respirable dust	14464-48-1		(?)	
Silica, crystalline quartz, respirable dust	14808-60-7		(?)	
Silica, crystalline tripoli (as quartz), respirable dust	1317-65-6		(?)	
Silica, crystalline tridymite, respirable dust	15466-32-3		(?)	

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TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	ppm (a) ¹	mg/m ³ (b) ¹	Skin designation
Silica, fused, respirable dust	60678-88-0		(f)	
Silicates (less than 1% crystalline silica)				
Mica (respirable dust)	12001-20-2		(f)	
Soapstone, total dust			(f)	
Soapstone, respirable dust			(f)	
Talc (containing asbestos), use asbestos limit, see 29 CFR 1910.1001			(f)	
Talc (containing no asbestos), respirable dust	14807-06-6		(f)	
Tremolite, asbestosiform, see 1910.1001				
Sicon	7440-21-3		15	
Total dust			5	
Respirable fraction				
Sicon carbide	409-21-2		15	
Total dust			5	
Respirable fraction	7440-22-4		0.01	
Silver, metal and soluble compounds (as Ag)			0.05	X
Soapstone, see Silicates				
Sodium fluoroacetate	62-74-8		2	
Sodium hydroxide	1310-73-2			
Sodium hydrosulfide	6005-25-0		15	
Starch			5	
Total dust			0.5	
Respirable fraction			0.1	
Stibine	7803-84-3		2000	
Stoddard solvent	8052-41-3		500	
Strychnine	57-24-9		0.15	
Styrene	100-42-5		(f)	
Sucrose	57-60-1		15	
Total dust			5	
Respirable fraction			13	
Sulfur dioxide	7446-09-5		5	
Sulfur hexafluoride	2551-82-4		1000	
Sulfuric acid	7664-93-9		1	
Sulfur monochloride	10025-67-0		6	
Sulfur pentachloride	5714-22-7		0.025	
Sulfuryl fluoride	2699-79-8		5	
Syntron, see Dacron				
2,4,5-T (2,4,5-trichlorophenoxyacetic acid)	93-76-5		10	
Talc, see Silicates				
Tantalum, metal and oxide dust	7440-25-7		5	X
TEBP (Sulfonate)	3689-24-5		0.2	
Tellurium and compounds (as Te)	13494-80-0		0.1	
Tellurium hexafluoride (as Te)	7783-80-4		0.2	
Temephos	3383-96-6		15	
Total dust			5	
Respirable fraction			0.05	X
TEPP (Tetraethyl pyrophosphate)	107-49-3		(C)1	
Tetraphenyls	26140-60-3		500	
1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9		500	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0		500	
1,1,2,2-Tetrachloroethane	70-34-5		35	X
Tetrachloroethylene				
Perchloroethylene				
Tetrachloromethane, see Carbon tetrachloride				
Tetrachlorophthalene	1335-60-2		0.075	X
Tetraethyl lead (as Pb)	76-00-2		500	
Tetrahydrofuran	109-69-9		200	
Tetramethyl lead (as Pb)	75-74-1		0.075	X
Tetramethyl succinonitrile	3333-52-6		0.5	
Tetrahydrofuran	109-69-9		1	
Tetrahydrofuran (2,4,6-trinitrophenylmethylamine)	470-45-8		1.5	X
Titanium soluble compounds (as Ti)	7440-28-0		0.1	X
4-Thiobis (6-tert-butyl-4-methylphenyl) ether	96-69-5		15	
Total dust			5	
Respirable fraction				

TABLE Z-1.—LIMITS FOR AIR CONTAMINANTS—Continued

Substance	CAS No. (c)	ppm (a) ¹	mg/m ³ (b) ¹	Skin designation
Thiam	137-28-8		8	
Th, inorganic compounds (except oxides) (as Sn)	7440-31-6		2	
Th, organic compounds (as Sn)	7440-31-6		0.1	
Titanium dioxide	13463-67-7		18	
Total dust			(f)	
Toluene	108-88-3		(C)0.02	
Toluene-2,4-diisocyanate (TDI)	584-84-0		(C)0.14	X
o-Toluidine	95-63-4		22	
Toxaphene, see Chlorinated camphene				
Tremolite, see Silicates				
Tributyl phosphate	126-73-8		8	
1,1,1-Trichloroethane, see Methyl chloroform				
1,1,2-Trichloroethane	79-00-5	10	45	X
Trichloroethylene	79-01-0		(f)	
Trichloromethane, see Chloroform				
Trichloronaphthalene	1321-65-0		8	X
1,2,3-Trichloropropane	96-18-4	50	300	
1,1,2-Trichloro-1,2,2-trifluoroethane	78-13-1	1000	7000	
Triethylamine	121-44-8	25	100	
Trifluorobromomethane	73-63-8	1000	6100	
2,4,6-Trinitrophenyl; see Picric acid				
2,4,6-Trinitrophenylmethanamine; see Tetralin				
2,4,6-Trinitrophenyl (TNT)	118-96-7		1.5	X
Trichlorophenyl phosphate	78-30-6		0.1	
Triphenyl phosphate	115-85-6		3	
Turpentine	8008-64-2	100	600	
Uranium (as U)	7440-61-1		0.05	
Soluble compounds			0.05	
Insoluble compounds				
Vanadium	1314-62-1		(C)0.5	
Respirable dust (as V ₂ O ₅)			(C)0.1	
Vine (as V ₂ O ₅)				
Vegetable oil mist			18	
Total dust			8	
Respirable fraction				
Vinyl benzene; see Styrene				
Vinyl chloride; see 1910.1017				
Vinyl cyanide; see Acrylonitrile				
Vinyl toluene	25013-15-4	100	480	
Warfarin	81-81-2		0.1	
Xylenes (o, m, p-isomers)	1330-20-7	100	435	
Xylidine	1300-73-8	5	25	X
Yttrium	7440-65-6		1	
Zinc chloride fume	7648-05-7		1	
Zinc oxide fume	1310-13-2		5	
Zinc oxide	1310-13-2		15	
Total dust			5	
Respirable fraction				
Zinc stearate	557-05-1		15	
Total dust			5	
Respirable fraction			5	
Zirconium compounds (as Zr)	7440-67-7		5	

¹The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 °C and 760 torr.

(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound, measured as the metal, the CAS number for the metal is given—not CAS numbers for the individual compounds.

(d) The final benzene standard in 1910.1026 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the petroleum exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1026 for specific circumstances.

(e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and winnowing) and ginning. See also 1910.1043 for cotton dust limits applicable to other sectors.

(f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

²See Table Z-2.

^aSee Table Z-3.
^bVaries with compound.

TABLE Z-2.

Substance	8-hour time-weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
Benzene (Z37.40-1969)	10 ppm	25 ppm	50 ppm	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970)	2 µg/m ³	5 µg/m ³	25 µg/m ³	30 minutes.
Cadmium fume (Z37.5-1970)	0.1 mg/m ³	0.3 mg/m ³		
Cadmium dust (Z37.5-1970)	0.2 mg/m ³	0.6 mg/m ³		
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 minutes.
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min. in any 4 hrs.
Chronic acid and chromates (Z37.7-1971)		1 mg/10m ³		
Ethylene dibromide (Z37.31-1970)	20 ppm	30 ppm	50 ppm	5 minutes.
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 min. in any 3 hrs.
Fluoride as dust (Z37.28-1969)	2.5 mg/m ³			
Formaldehyde: see 1910.1048				
Hydrogen fluoride (Z37.26-1969)	3 ppm			
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 min. once, only if no other meas. exp. occurs.
Mercury (Z37.8-1971)		1 mg/10m ³		
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs.
Methylene chloride (Z37.23-1969)	300 ppm	1,000 ppm	2,000 ppm	5 min. in any 2 hrs.
Organic (alkyl) mercury (Z37.30-1969)	0.01 mg/m ³	0.04 mg/m ³		
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min. in any 3 hrs.
Tarachlorobenzene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs.
Toluene (Z37.12-1967)	200 ppm	300 ppm	600 ppm	10 minutes.
Trichlorobenzene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs.

This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.

This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.

TABLE Z-3 MINERAL DUSTS

Substance	mppcf ^a	mg/m ³
Silica: Crystalline	250 ^b	10 mg/m ³ ^c
Quartz (Respirable)	%SiO ₂ +5	%SiO ₂ +2
Quartz (Total Dust)		30 mg/m ³
Cristobalite: Use 1/2 the value calculated from the count or mass formulae for quartz		%SiO ₂ +2
Tridymite: Use 1/2 the value calculated from the formulae for quartz		
Amorphous, including natural diatomaceous earth	20	80 mg/m ³
Silicates (less than 1% crystalline silica):		%SiO ₂
Mica	20	

TABLE Z-3 MINERAL DUSTS—Continued

Substance	mppcf ^a	mg/m ³
Soapstone	20	
Talc (not containing asbestos)	20 ^c	
Talc (containing asbestos) Use asbestos limit.		
Tremolite, asbestiform (see 29 CFR 1910.1001)	50	
Portland cement		
Graphite (Natural)	15	
Coal Dust:		
Respirable fraction less than 5% SiO ₂		2.4 mg/m ³ ^c
		%SiO ₂ +2
Respirable fraction greater than 5% SiO ₂		10 mg/m ³ ^c
		%SiO ₂ +2
Inert or Nuisance Dust: ^d		
Respirable fraction	15	5 mg/m ³
Total dust	50	15 mg/m ³

Note—Conversion factors - mppcf X 35.3 = million particles per cubic meter = particles per c.c.

^aMillions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

^bThe percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

^cContaining less than 1% quartz; if 1% quartz or more, use quartz limit.

^dAll inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.

^eBoth concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	80
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of 2.4 mg/m³ in the table for coal dust is 4.6 mg/m³ (58 FR 36340, June 30, 1993; 58 FR 40791, July 27, 1993)

§ 1910.1001. Asbestos.

(a) Scope and application. (1) This section applies to all occupational exposures to asbestos in all industries covered by the Occupational Safety and Health Act, except as provided in paragraph (a)(2) of this section.

(2) This section does not apply to construction work as defined in 29 CFR 1910.12(b). [Exposure to asbestos in construction work is covered by 29 CFR 1926.58.]

(b) Definitions. Action level means an airborne concentration of asbestos, of 0.1 fiber per cubic centimeter (100) of

air calculated as an eight (8)-hour time-weighted average.

Asbestos includes chrysotile, amosite, crocidolite, tremolite, asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Authorized person means any person authorized by the employer and re-

APPENDIX G

**CANDIDATE VENTILATION SYSTEM COMPONENTS;
SUPPLEMENTARY MANUFACTURER/VENDOR DATA**

SPECIFICATIONS

ECO MOISTURE SEPARATOR

ECO MOISTURE SEPARATORS are highly effective in significantly reducing oil mist, water mist, fog or droplets from OSA or recirculated air. In addition, they are useful downstream of DX or chilled water coils, and steam or mist-type humidifiers which allows saturated air to condense out.

CONSTRUCTION — The 2" deep media pack is encased in a 4" deep, 16-gauge galvanized steel enclosing frame and is comprised of multiple, alternate layers of flat and crimped, galvanized screen.

PERFORMANCE — The separator is 98% efficient at 20 micron droplet size at 500 FPM. Velocity should not exceed 550 FPM or go below 450 FPM without consulting factory.

INSTALLATION — The ECO Moisture Separator must be vertically installed in order to operate at peak efficiency. A "TOP" marker is provided for proper orientation during installation. Mounting hardware must be designed to support the moisture separator with adequate drainage. For built-up banks, Farr's Type 8 Holding Frames can be joined to create a functional system. Additionally, Farr offers two drainage equipped side access housings:

1. Moisture/Pack — Single-stage housing, 12" deep, with drain. It is ideal where minimal space is available, or where particulate filters are utilized elsewhere in the system.

2. ECO Glide/Pack — Three-stage housing with drainage provided in the first stage. Second stage accommodates a 2" 30/30. The third stage has universal holding frames to accept a variety of filters and efficiencies.

EFFICIENCY vs DROPLET SIZE @ 500 FPM (2.54 m/s)

AIRFLOW RESISTANCE

How to Specify

Moisture Separators shall be Farr Type ECO.

They shall be permanent, cleanable, all metal, panel type. Each separator shall consist of steel screen media and enclosing frame.

Media pack shall be constructed of 15 corrugated and flat layers of galvanized screen wire. It shall be 2" (51 mm) deep and be permanently fastened together to ensure rigidity.

Enclosing frame shall be 16-gauge galvanized steel, 3.94" (100 mm) deep, with flush, mitered and rein-

forced corners. Frame bottoms shall be equipped with a minimum of three .375" (10 mm) dia. drain holes.

To ensure proper installation and drainage, a "TOP" marker shall be placed by the manufacturer on the top of the enclosing frame.

Built-up banks shall consist of Farr Type 8 Holding Frames. A drain trough must be provided by the installer under each row of separators and frames to carry off accumulated liquids.

PERFORMANCE

When installed vertically, the separator shall be 98% efficient on 20 micron moisture droplets at 500 FPM (3 m/s) face velocity.

Airflow resistance at 500 FPM (3 m/s) shall not be greater than .25" WG (.06 kPa). Airflow shall not exceed 550 FPM (3 m/s) to avoid liquid carry-over.

NOTE: Stainless steel may be inserted as an option in lieu of galvanized steel.

NOTE: Drawing C-67125 details installation, trough construction, and drainage requirements.

ECO Moisture Separator in first stage of side access housing

FARR ORDERING NO.	USE	DIMENSIONS				RATED AIRFLOW		WEIGHT	
		WIDTH		HEIGHT					
		INCHES	MM	INCHES	MM	CFM	m³/h	LBS	KGS
64649-001	FOR BUILT-UP BANKS	23.38	594	23.38	594	2000	3400	19	8.7
64649-002		11.38	289	23.38	594	1000	1700	10	4.5
64649-003		23.38	594	11.38	289	1000	1700	10	4.5
64649-004	FOR SIDE ACCESS HOUSINGS*	23.38	594	23.38	594	2000	3400	19	8.7
64649-005		11.38	289	23.38	594	1000	1700	10	4.5
64649-006		23.38	594	11.38	289	1000	1700	10	4.5

*Groups 004, 005 and 006 are equipped with a sponge neoprene gasket on each side for ECO side access housings

FARR COMPANY Sales Offices and Plants

P.O. BOX 92187, LOS ANGELES, CA 90009
 Telephone: (800) 333-7320 Fax: (800) 441-0003
 500 S. MAIN ST., CRYSTAL LAKE, IL 60014
 Telephone: (800) 777-5260 Fax: (800) 441-0103
 Jonesboro, AR □ Corcoran, CA □ El Segundo, CA
 Rialto, CA □ Albany, GA □ Crystal Lake, IL
 Conover, NC □ Hazleton, PA □ Copperas Cove, TX
 Longview, WA □ Antwerp, Belgium □ Singapore
 Birmingham, England □ Montreal and Toronto, Canada

Farr Company has a policy of uninterrupted research, development and product improvement and reserves the right to change design and specifications without notice. Metric equivalents have been rounded for convenience.

EFFICIENCY VS DROPLET SIZE

ECO MOISTURE SEPARATOR C-64649

500 FT/MIN. (12.54 M/S) FACE VELOCITY

FARR COMPANY

AIR FLOW RESISTANCE

ECO MOISTURE SEPARATOR

23-3/8 X 23-3/8 X 3-15/16

FARR COMPANY

AFTER-FILTER		(2)
TYPE	DEPTH	
N/S	21"	5.25
	27.2"	11.50
	32"	16.25
HP	12"	—
30/30	3 7/8	—
RIGA-FLO	11 1/2	—

SECTION Y-Y
(SHOWN WITH DRAIN
TUBE REMOVED)
SCALE: 1/2" = 1'

CETA-X
26A-E 12.1

DETAIL 7
SCALE NONE

1. FOR APPLICATION INFORMATION, INSTALLED WEIGHT, CAPACITY, ETC., SEE GALS BULLETIN .
2. UNIT IS COMPLETELY FACTORY ASSEMBLED EXCEPT FOR DRAIN TUBE .
3. DRAIN TUBE SHIPPED LOOSE . MUST BE USED ON ALL MODELS . DRAIN EXCEPT FOR DRAIN IS EXTERNALLY PIPED THROUGH A SUITABLE "S" TRAP TO A DRAIN OR COLLECTING TANK .
4. STRIPPED FOR PANEL TYPES PRE-FILTERS ARE STANDARD IN ALL FILTER HOUSINGS .
5. ORDERING INFORMATION:
 - a. SPECIFY ECO GLOD/PACK, SIZE, TYPE OF AIR/FILTER, AND WHICH HARDWARES AND/OR FASTENERS SHOULD BE FURNISHED .
 - b. ADD "PREMI" IF DESIRED .
 - c. SAMPLE:
ECO GLOD/PACK
SIZE 2 1/2" (W) AFTER-FILTER
6. PRIMER AT EXTRA COST: ONE COAT OF PRIMER ON EXTERIOR SURFACES OF HOUSING AND ODORS .
7. FILTERS AND MOISTURE SEPARATORS ARE NOT INCLUDED . ORDER SEPARATELY .
8. STATING QUANTITIES / TYPES AND SIZES .
9. REFERENCE TO DRAWING NO. 64-649 FOR MOISTURE SEPARATOR .

[illegible]

A		24	00	40.00	50.00	72.00	94.00	50.00	108.00	120.00	182.00	144.00	
NO OF FILTERS AND		1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	
LOW WIDTH FEET		2	3	4	5	6	7	8	9	10	11	12	
B	NO OF FILTERS HIGH	SIZE DESIGNATION											F
5.25	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	3.00
27.25	1	2	3	4	5	6	7	8	9	10	11	12	4.00
33.50	1 1/2	3	4	5	6	7	8	9	10	11	12		4.12
51.50	2	4	5	6	7	8	9	10	11	12			
63.75	2 1/2	5	6	7	8	9	10	11	12				
75.75	3	6	7	8	9	10	11	12					
C		12.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	60.00	66.00	72.00	
D		—	—	—	48.00	54.00	60.00	66.00	72.00	78.00	84.00	90.00	
E		—	—	—	—	—	—	90.00	101.00	108.00	114.00	120.00

- NOTES:
1. ORDERING INFORMATION:
SPECIFY GLIDE/PACK WATER SEPARATOR SECTION AND SIZE OF HOUSING AND "PRIMED" IF DESIRED.
EXAMPLE:
GLIDE/PACK WATER SEPARATOR SECTION
2 x 4 1/2"
 2. MOISTURE SEPARATORS ARE NOT INCLUDED. ORDER SEPARATELY STATING QUANTITIES AND SIZES. SEE DWG C-64648.
 3. OPTIONAL AT EXTRA COST: COAT OR PRIMER ON EXTERIOR SURFACES OF HOUSING AND DOORS. SPECIFY "PRIMED".
 4. DRAIN TUBE SHIPPED LOOSE. MUST BE USED ON ALL INSTALLATIONS EXCEPT WHERE DRAIN OFF IS EXTERNALLY PIPED THROUGH A SUITABLE "S" TRAP TO A DRAIN OR COLLECTING TANK.
 5. UNIT IS COMPLETELY FACTORY ASSEMBLED EXCEPT FOR DRAIN TUBE.

MHC-SD-314B-DA-002		Rev. 0	
GLIDE/PACK WATER SEPARATOR SECTION		2 x 4 1/2"	
FARM COMPANY		D-78681	

G-7

Part 2

NO. OF YEARS TO PAY	NO. OF YEARS TO PAY	NO. OF YEARS TO PAY
100.00	3 1/2	7
100.00	4	8

- △

[illegible]

AIR CONTROL, INC.

4609 - 14th AVENUE N.W., SEATTLE, WASHINGTON 98107

PRODUCTS GUIDE

(206) 789-6990

FAX (206) 789-5693

AIR FILTERS.....FARR COMPANY, HEFCO, LUWA, AIRGUARD

HEPA FILTERS.....FARR, HEFCO, ATMOS-TECH, HEPA

CARBON FILTERS.....FARR, BARNEBEY & SUTCLIFFE CO.,
CAMERON-YAKIMA, D-MARK

PAINT BOOTH FILTRATION.....RESEARCH PRODUCTS, STYRO AIR,
FILTRATION GROUP

FILTER HOUSINGS (SIDE ACCESS).....BARNEBEY & SUTCLIFFE CO., HESA
(BY AIR CONTROL, INC.)

BAG-IN/BAG-OUT FILTER HOUSING.....BARNEBEY & SUTCLIFFE CO.

FILTER GAGES.....DWYER CONTROLS & GAGES

FILTER MANUFACTURING-ODD SIZE,.....AIR CONTROL, INC.
PARTICLE COUNT ANALYSIS

GRILLES, REGISTERS & DIFFUSERS.....CARNES, J&J REGISTER (COMMERCIAL)

VAV DIFFUSERS.....WARREN MANUFACTURING, THERMAL
PRODUCTS

FIRE/CEILING RADIATION DAMPERS.....NCA MANUFACTURING, VENT PRODUCTS,
FIRE DAMPERS, CONTROL DAMPERS, POTTORFF CO., ELMDOR, CARNES,
BACKDRAFT DAMPERS, LOUVERS, EMPCO
ACCESS DOORS, FIRE/SMOKE
DAMPERS, FIRE BLANKET

VIBRATION ISOLATION, SEISMIC.....AMBER/BOOTH
DESIGN AND ANALYSIS

AIR FLOW MEASURING STATIONS.....PARAGON

ELECTRIC HEATERS.....WARREN MANUFACTURING, ELECTROMODE

COMMERCIAL KITCHEN HOODS AND.....AEROLATOR, MOLI-TRON
INDUSTRIAL HOODS

ENERGY RECOVERY.....CARNES

FANS.....CARNES, PEERLESS, LEADING EDGE

HUMIDIFIERS.....CARNES

CHIMNEY & EXHAUSTING INDUSTRY.....VAN-PACKER COMPANY PRODUCTS

G-11

4/94

Representatives for: Air Filters / Filter Cleaning Service / Grilles / Registers / Diffusers / Mixing boxes / Dust Collectors / Vibration Isolators /

Part 2

CEILCOTE

IWSTM
System
Air Pollution
Control Division

PRINCIPLES OF OPERATION

The Ceilcote Ionizing Wet Scrubber* (IWS)TM system is a proven means for the removal of pollutants from industrial process gas streams. The IWS combines the established principles of electrostatic particle charging, image force attraction, inertial impaction, and gas absorption to collect submicron solid particles, liquid particles and noxious and malodorous gases simultaneously. The IWS system requires little energy and its collection efficiency is high for both submicron and micron size particles.

The Ionizing Wet Scrubber utilizes high voltage ionization to electrostatically charge particulate in the gas stream before the particles enter a Tellerette[®] packed scrubber section where they are removed by attraction of the charged particles to neutral surfaces. Larger particles of three to five microns and larger are collected through inertial impaction. As small particles flow through the scrubber, they pass close to the surfaces of Tellerettes and scrubbing liquid droplets. The electrostatic charge on the particles cause them to be attracted to these neutral surfaces by image force attraction. All particles are eventually washed out of the scrubber with the exit liquor. Noxious and malodorous gases are absorbed and reacted in the same scrubbing liquor.

*Patent Nos. 3,874,858 and 3,958,958

® Registered trademark of The Ceilcote Co.

OPERATING ADVANTAGES

Particle Collection—The IWS system utilizes Tellerette packing as its collection surface to achieve particulate removal. Scrubbing liquid droplets also act as collection surfaces. Particles of any size or composition are collected by the IWS. Fine particles (0.05 to 2 microns) are collected with high efficiency as well as coarse particles (2 microns and larger), regardless of their composition (organic or inorganic with either high or low resistivity). Particle collection efficiency over long term service remains consistently high.

Gas Absorption—The IWS system simultaneously absorbs gases. Noxious gases are removed through physical absorption and/or absorption that is accompanied by chemical reaction.

Low Energy Consumption—Pressure drop through a single stage IWS is only 1/2 in. to 1 1/2 in. water column. Energy for particle charging is low—approximately 0.2 to 0.4 KVA per 1000 CFM.

Corrosion Resistance—The shell and most internal parts of the IWS are commonly fabricated of Duracor[®] (fiberglass reinforced plastic) and thermoplastic materials. This predominance of plastic construction assures corrosion-free operation in the presence of acid gases such as HCl, HF, Cl₂, NH₃, SO₂ and SO₃. For non-corrosive applications, metallic construction is also available.

Fractional Collector—The IWS system acts as a fractional collector. The percent of particulate removed varies little with load and particle size distribution over a wide range. As particulate load increases, the percent removed remains nearly constant. The collection efficiency for fine particles is nearly as great as for coarse particles.

Turn Down—Collection efficiency improves with turn down from 100% to 0% load.

Size Range—Factory assembled modules, available in standard capacities from 900 to 54,000 ACFM, can also be grouped together to handle virtually any gas volume

SUBMICRON PARTICULATE AND NOXIOUS GASES REMOVED SIMULTANEOUSLY

IWS SYSTEM COMPONENTS

Ionizer (Charging) Section

Particles are first electrostatically charged within an ionizer section that utilizes a high voltage, D.C. power source. Discharge electrodes have negative polarity and wetted "mini-plates" serve as grounded electrodes.

High Voltage Transformer/Rectifier

High voltage D.C. power for the ionizing section is provided by a high voltage transformer/rectifier. This is a sealed, water-tight, oil-filled unit. Rectification is accomplished by silicon diodes which are suitably protected against transient voltages for efficient and long-term, trouble-free service.

Control Cabinet

All control and remaining power functions for the IWS are combined in a single, standard, factory pre-wired control cabinet which can be located at any convenient location, either adjacent to or remotely located from the IWS. Field hook-up is simple. The control cabinet is connected to the high voltage transformer/rectifier by five leads attached to cabinet terminals. Maximum voltage on the interconnecting wiring is 480 volts.

Voltage control for high voltage is achieved by thyristor control through phase-angle variation. An ultra-fast response, solid state, plug-in type standard control module automatically controls high voltage levels and spark rate for optimum performance. A manual control is also provided for backup and for trouble shooting.

Operation is simple and straightforward. All functions are automatic. Necessary meters and indicator lights are provided to monitor the operation. Protective interlocks and circuits safeguard the equipment against overloads or malfunctions.

Flushing

The grounded electrode plate surfaces of the IWS are continuously flushed by a flow of water or other suitable liquid. This assures that optimum electrical performance is maintained at all times by washing away any resistive solids or residues that could collect on the "mini plates" and cause reduced performance.

A second flushing system is also provided which periodically deluge flushes all internal areas of the ionizer section.

The deluge flushing is completely automatic and is set to provide a flushing cycle every eight hours or as experience dictates. Water for the periodic deluge flush is recycled liquid from the scrubber recycle system.

Charged Particle Scrubber

The IWS incorporates a crossflow scrubber section following the ionization section. The scrubber section employs Tellerette packing to absorb gases and collect both liquid and solid particles from the gas stream.

The contaminated gas stream moves horizontally through a Tellerette packing bed that is irrigated by scrubbing liquid flowing vertically down through the packing. The inherent advantages of the crossflow design result in high operating reliability, high air flow rate, low pressure drop and low operating cost.

Sump

The IWS contains an integral sump to recirculate the scrubbing liquid directly after it passes through the packed-bed section. Use of an integral sump reduces cost and minimizes floor space requirements.

Recycle Pump and Piping

Pump(s) and complete recirculation piping for the IWS is normally provided for continuous wetting of the ionizer plates, deluge flushing of the ionizer section and continuous irrigation of the crossflow scrubber.

Alternate design approaches can be adapted for use in the IWS liquid distribution system. The method employed is contingent upon the customer's requirements and job site restrictions.

Construction and Corrosion Resistance

The IWS shell and most internal parts are normally fabricated of Duracor® fiberglass reinforced plastic (FRP) and other polymeric materials. The preponderance of plastic as a material of construction assures corrosion-free operation in the presence of gases such as HCl, HF, NH₃, SO₂ and SO₃. Additionally, structural support requirements are minimized by the units' light-weight.

Extensive use of proven, long service life plastics throughout the IWS is possible because of its unique design, construction and operating principles. The only metal required is for the electrical components employed within the ionizing section. These metallic components are fabricated of alloy materials chosen for each application to provide maximum corrosion resistance in the service environment.

The IWS can also be constructed of metallic components where corrosive conditions are not a problem and the use of FRP materials are not economical or practical in a specific application.

IWS OPERATING CHARACTERISTICS

Particle Collection

Results from pilot tests and more than 50 actual full size operating systems verify that particles of virtually any size and composition are collected by the IWS™. Submicron solid/liquid particles as minute as 0.05 microns, coarse particles having organic or inorganic structures and conductive or highly resistive particles are all collected at high efficiency.

Image Force Attraction

The predominant influence acting within the IWS to collect submicron size particulate is the mechanism of "Image Force Attraction".

Image force attraction occurs whenever an electrostatically charged particle comes within the boundary layer (usually within one millimeter) of a neutral surface. As the charged particle comes close to the neutral surface, an electrostatic charge of opposite polarity is induced at the neutral surface. The force of attraction is similar to that which would exist between a charged particle and an imaginary particle of equal but opposite polarity located at an equal distance behind the surface. It is as though the charged particle was seeing its "mirror image".

Image Force Attraction

Inertial Impaction

Particles of three to five microns in size ($3-5 \mu$) and larger are collected by inertial impaction. Particles impinge on a Tellerette packing surface, are captured, and flushed away. Tellerette packing is used exclusively in the IWS.

The unique geometrical design configuration of the Tellerette makes it an excellent impingement target. Highly efficient collection is due to the large number of small target areas. Greater particulate collection efficiency, higher gas absorption efficiency and greater flow capacities are all characteristic of Tellerette packing, as opposed to extended surface packings.

Scrubbing and Gas Absorption (Mass Transfer)

Removal of gaseous contaminants in the scrubber is achieved by the principles of mass transfer whereby gaseous molecules from the air stream are transferred to the scrubbing liquid. Transfer is achieved by a combination of diffusion, physical absorption and/or chemical reaction.

Gaseous collection efficiency is directly dependent upon the irrigation rate, the horizontal depth of packing and the gas velocity through the scrubber. Depending on the depth of the Tellerette packed bed, the liquid flow rate, and composition of the scrubbing liquid, efficiencies up to 99.9% gas absorption can be obtained.

In an application where two or more gaseous contaminants are to be removed, it is often desirable to scrub with chemically different liquids. This can readily be achieved with the cross-flow scrubber geometry which easily accommodates two or more separate scrub beds.

The use of two or more packed beds is usually associated with applications requiring odor abatement, multiple gas/solids removal, solids/odor removal and other complex scrubbing problems

Collection Efficiency

IWS collection efficiency in the fine particle range decreases only slightly as the particles become smaller. In conventional electrostatic precipitators, collection efficiency drops in the submicron area, especially in the 0.2 to 0.6 micron range. For cloth collectors, collection efficiency decreases sharply when particles are 0.5 microns and smaller. A comparison of the collection efficiency characteristics versus particle size of these devices are depicted below.

Staging For Higher Efficiency

The IWS is a fractional collector. A single-stage IWS unit will remove a nearly constant percentage of incoming particles regardless of particle size distribution. Where a higher collection efficiency is required than is possible with a single-stage IWS, a second IWS stage can be used. The percent collection efficiency of the second-stage IWS will be approximately the same as the first-stage IWS despite the reduction in loading to it.

Shown below are typical collection efficiency curves for single and two-stage systems. Consider the application where a single-stage unit will remove 83% of the entering particulate. By adding a second-stage and obtaining a similar collection efficiency of 83%, an overall efficiency of 97% is achieved. Because of the fractional collector characteristics of the IWS, the performance of an existing unit can be upgraded with a second stage to meet more stringent code requirements.

Liquid Irrigation

The IWS is designed to maximize efficient use of the scrubbing liquid. To achieve optimum scrubbing liquid distribution, the scrubber contains spray header assemblies with low pressure, large orifice nozzles. Droplets formed by the spray nozzles enhance the absorption capacity of the scrubber.

Scrubbing Liquid

Liquid flow rates are based on specific operating conditions. The scrubbing liquid is usually recirculated, thus reducing both consumption of fresh liquid and overflow or blowdown from the scrubber. A small amount of fresh makeup liquid is usually fed continuously to the scrubber system. The fresh liquid keeps the absorbed gaseous pollutant concentration in the recycled liquid at a sufficiently low level to maintain efficient gas absorption. Fresh makeup liquid is also required to balance evaporation losses. Liquid can be fresh water, clean process water, or chemically treated liquids. Water treated with chemicals such as caustic soda, or soda ash is used only when fresh water or process water will not achieve the desired collection efficiency, or when treated water suits the waste treatment criteria of the specific plant.

Opacity Reduction

The IWS can remove the light loadings of submicron particulate that cause a "blue haze" emission. Generally, an emission having an opacity of 20% (Ringemann 1) or less is acceptable. The IWS can be designed to obtain opacities of 5% or less to give clear or nearly clear stack discharges.

Energy

Pressure drop through a single-stage IWS is only 1/2 to 1.5 inches water column and is controlled primarily by the pressure drop through the wet scrubber section. Additional small amounts of energy are required for high-voltage charging and for the recycle pump.

Total system energy usage is approximately 2.0-2.5 BHP/1000 ACFM for a single-stage IWS and 4.0-5.0 BHP/1000 ACFM for a two-stage IWS installation.

IWS COMPARISONS

Other types of Air Pollution Control Equipment i.e. venturi scrubbers, electrostatic precipitators, and baghouses generally require metal hardware/components. Therefore, use of this equipment in corrosive environments is severely limited. Additionally, sophisticated design configurations makes this equipment extremely costly and/or difficult to operate and maintain. These problems do not exist with the IWS because of the simplified design, minimum use of metallic hardware, low pressure drop and low operating/maintenance costs.

Venturi Scrubbers which are specifically designed for fine particulate removal in corrosive environments can be constructed of corrosion resistant materials. However, these require high-speed, high-energy fans constructed of exotic alloys which makes the venturi expensive to fabricate, difficult to maintain and costly to operate. Also, venturi scrubbers frequently require expensive reduced voltage starting equipment, costly electrical substation installation and elaborate controls to handle fluctuating loads.

Operating energy costs of the IWS are only a fraction of that of a venturi. The accompanying graph provides a comparison, and is based on the following parameters and use of a two-stage system:

Capacity	50,000 CFM @ (Standard Conditions)
Pump	Includes 15 BHP for both systems
Duty	24 hrs. x 365 days = 8760 hrs.
Energy Costs	6¢/KWH assumed 1 BHP/yr. @ 6¢/KWH = \$490/yr.
Fan Efficiency	60%
Motor Efficiency	80%

NOTE: TWO STAGE UNIT* (FOR SINGLE-STAGE UNIT OPERATION COST IS ½ OF THAT SHOWN)

Conventional Electrostatic Precipitators (ESP) require large metallic collection surfaces and contain a multitude of internal hardware components which are exposed to the gas stream. If ESP's are used in corrosive environments, non-corrosion resistant metallic surfaces must be covered with corrosion resistant materials or expensive, corrosion-resistant alloys must be used.

Baghouses are susceptible to corrosive operating environments particularly when water vapor content is high and condensation can occur; where the particulate to be collected is sticky, gummy, and cannot be removed by normal bag shaking or pulsing; or where the service conditions seriously degrade the bag fabric.

W314B

PILOT TESTING EQUIPMENT AND FACILITIES

Portable pilot test units having 1000 to 2000 CFM capacity are available for test purposes. These units permit tests to be conducted in the field using actual process slip streams or under laboratory conditions at the Ceilcote Brea, Ohio facility.

Pilot tests should be conducted whenever possible to confirm performance and effectiveness of the IWS for the application, and to provide engineering data for designing full size equipment.

The test equipment is complete so that the potential user has only to duct a slip stream to the unit and supply the necessary utility services; i.e., electrical supply, fresh water make-up, and drain lines.

Field Performance Testing Services

Field performance testing to verify the performance and efficiency of the IWS can be conducted by experienced personnel from the Ceilcote Engineering Development Department if desired. The test team has extensive experience in gas and particulate testing techniques utilizing methods approved by EPA and other air pollution control agencies. The test method and equipment employed for evaluation and/or performance verification testing depends on the nature of the contaminants, applicable codes, and as mutually agreed upon by all parties.

Ceilcote portable pilot equipment in field service

Ceilcote Capabilities

Ceilcote has the design expertise, engineering knowhow and field installation experience to undertake contracts ranging from consulting engineering only to complete green field turnkey jobs. The matrix below shows the six basic types of contracts and related services which are offered to solve a broad range of customers' needs.

	• Green field turnkey job
	• Field install major equipment items
	• Supply major equipment items
	• Project management
	• Performance warranty on emission control requirements
	• Detailed plans and specifications which client can use for purchasing and installing a complete system
• Startup and debugging	
• Quality assurance	
• Process duty for major equipment	
• Piping and instrumentation diagram	
• Heat and material balances	
• Final process flow diagram	
• Pilot test (if required)	
• Develop design conditions

APPLICATIONS

The energy efficient IWS can be applied to a wide variety of air pollution control problems. It offers the greatest advantages in applications requiring the collection of submicron particulate, mist, and gases, especially where corrosive conditions exist. A partial listing of potential IWS applications and representative contaminants is listed below:

Process	Contaminants	Process	Contaminants
Petroleum Coke Calciners	SO ₃ Mist, SO ₂ , Carbon Particles, Smoke, Inorganic Fumes	Phosphate/Fertilizer and Phosphoric Acid Plants	HF Gas, Fluoride Fumes, Non-Fluoride Fumes, P ₂ O ₅ Fumes, Dust
Liquid and Solid Waste Incinerators for Chemical Plants	HCl gas, SiO ₂ Fumes, SO ₃ Mists, Organic Mists, Smoke, Inorganic Fumes	Feed, Food and Beverage Processing	Dust, Smoke, Odors, Aldehydes, Organic Acid Mist
Solid Waste Incinerators for Municipal Plants	HCl Gas, Smoke, Organic Mists, Odoriferous Gases, Inorganic Fumes	Zinc Galvanizing Lines	NH ₄ Cl Fumes, ZnO Fumes, Oil Vapors
Copper, Lead, Magnesium and Zinc Smelters with Sulphuric Acid Plants	Dust, Inorganic Fumes, SO ₃ Mist	Ferro-Alloy Production	SiO ₂ Fumes, Inorganic Fumes, Carbon Particles
Aluminum Refining and Process Operations	Smoke, AlCl ₃ Fumes, HCl, Dust, SO ₂ , SO ₃ , HF, Carbon Particles, Al ₂ O ₃ Fumes, Fluoride Fumes	Refractory Manufacture	HF Gas, NH ₃ Gas, SO ₂ Gas, Na ₂ SO ₄ and (NH ₄) ₂ SO ₃ Fumes, H ₂ SO ₄ mist
Driers - Feed and Grain Mills	Dust, Vapors, Smoke, Malodorous Gases	Pulp, Paper, Plywood Manufacture	(NH ₄) ₂ SO ₃ Fumes, Lime Dust, TRS, Soda Fumes, H ₂ S and SO ₂ Gases, Mercaptans, Salt Fumes, Na ₂ SO ₄ Particulate, Hydrocarbon Mists, Fine Particulates

INSTALLATIONS

CUSTOMER	INST. DATE	EMISSION APPLICATION	PROBLEM	VOLUME	CUSTOMER	INST. DATE	EMISSION APPLICATION	PROBLEM	VOLUME
Borden Inc. Plant City, Fl.	Oct., 1977	Deflorination of Phosphate Rock	HF, Fluoride Salt	25,000 ACFM at 100 deg. F.	General Electric Waterford, N.Y.	Oct., 1979	Liquid & Solid Waste Incin	HCl, SO ₂ , Particulate, PCB's	16,000 ACFM at 100 deg F
Gniffith Lab Chicago, Il	Oct., 1978	Food Processing Spray Drier	NaCl, Condensibles & Solids	23,000 ACFM at 230 deg. F.	General Electric Cleveland, Ohio	Nov., 1979	Halo Phos. Furnace	Phosphohalides, HCl	6,000 ACFM at 140 deg F
Oak Ridge Gaseous Diffusion Plant Oak Ridge, Tenn	Dec., 1986	Chemical Waste Incinerations	HCl, SO ₂ , HF, Particulates	17,000 ACFM at 180 deg. F.	General Electric Waterford, N.Y.	Mar., 1980	Liquid Waste Incineration	HCl, SiO ₂	850 ACFM at 100 deg F
Int'l Paper Longview, Wa	Sept., 1979	Green Flake Drier (Wood Products)	Wood Combust. products and condensible hydrocarbons	10,000 ACFM at 210 deg. F	Dow Chemical Plaquemine, La.	Sept., 1981	Industrial & Waste Incin	HCl, Particulate	30,000 ACFM at 178 deg F
Kogap Medford, Oregon	Feb., 1980	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	104,000 ACFM at 400 deg. F.	Union Carbide S.Charleston, W.V.	Mar., 1982	Chemical Waste Incineration	SiO ₂ , HCl	4800 ACFM at 190 deg F
Lynn Plywood Albany, Or.	Apr., 1986	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	34,000 ACFM at 125 deg. F.	Weyerhaeuser Elkin, NC	Jan., 1987	Wood Fired Board Drier	Condensable Hydrocarbons, Ash Particulate	120,000 ACFM at 160 deg F
S.W. Forest Ind. Albany, Oregon	Apr., 1981	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Globe Refrac. Newell, W.Va.	Nov., 1978	Refractory Tunnel Kiln	NH ₄ HSO ₃ , HF, HCl	42,000 ACFM at 110 deg F
S.W. Forest Ind. Albany, Oregon	July, 1981	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Globe Refrac. Newell, W.Va.	Sept., 1979	Refractory Tunnel Kiln	NH ₄ HSO ₃ , HF, HCl	42,000 ACFM at 100 deg F
Murphy, Plywood Sutherlin, Or	Dec., 1985	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Fiberglas Canada Sarnia, Ontario	Mar., 1980	Fiberglass Insul curing & forming area exhaust	Phenolic binder glass fibers	15,500 ACFM at 120 deg F
S W Forest Ind Springfield, Or	Dec., 1982	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	20,000 ACFM at 135 deg. F.	Fiberglas Canada Sarnia, Ontario	Aug., 1982	Fiberglass Insul	Phenolic binder Glass Fiber	15,500 ACFM at 120 deg F
S.W. Forest Ind Grants Pass, Or	Apr., 1982	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F	Gulfiber Billsholm, Sweden	Mar., 1979	Fiberglass Insul	Phenolic Binder Glass Fiber	
Union Carbide Sistersville, W V	May, 1975	Liquid & Solid Waste Incin	SiO ₂ , HCl	12,650 ACFM at 90 deg. F	Union Carbide Italy	Sept., 1981	Liquid & Solid Waste Incin	HCl, SiO ₂ , Ash Particulate	13,000 ACFM at 110 deg F
Union Carbide Sistersville, W Va	July, 1979	Liquid & Waste Incin	SiO ₂ , HCl Solid	12,500 ACFM at 110 deg F	City of Fall River Fall River, Mass	July, 1979	Municipal Solid Waste Incineration	Particulates Chlorides & Fluorides	17,800 ACFM at 165 deg F
General Electric Waterford, N Y	Dec., 1972	Liquid Waste Incineration	SiO ₂ , HCl	16,900 ACFM at 90 deg F	R. Ross & Sons Grafton, Ohio	Nov., 1979	Industrial Waste Incineration	HCl, Particulate	50,000 ACFM at 140 deg F
					SCA Chem Svs. Chicago, Il.	Dec., 1981	Chemical Waste Incineration	HCl, Particulate, PCB's	83,000 ACFM at 178 deg F
					Rollins Env Svs Baton Rouge, La.	Mar., 1982	Chemical Waste Incineration	HCl, SO ₂ , Particulate	41,000 ACFM at 100 deg F
					General Electric Waterford, N Y	Oct 1979	Liquid Waste Incineration (Upgrade of original unit)	SiO ₂ , HCl	16 at 90 deg F

IWS EQUIPMENT SPECIFICATIONS

IWS equipment is available in standard factory assembled modules having 900 to 54,000 ACFM capacities. The IWS modules can be arranged in parallel to handle an infinite variety of gas stream flow rates having capacities much greater than the maximum module available.

For example, five IWS Model 700's can be placed in parallel to handle a 208,000 ACFM gas stream.

In addition to standard IWS modules Ceilcote can provide custom designed IWS equipment to suit the application whether it is a retrofit or new installation. Individual units for applications having requirements greater than 54,000 ACFM capacity can be field erected.

Standard factory assembled IWS module specifications are given below:

Model No.		50	100	200	300	400	500	600	700	800	900
Capacity Range ACFM(1)		900	1800	3600	5400	7200	9000	10,800	12,600	14,400	16,200
		3000	6000	12000	18000	24000	30000	36000	42000	48000	54000
Inlet Dia.	A	18"	24"	36"	42"	48"	54"	60"	66"	72"	72"
Outlet Dia.	B	12"	14"	20"	24"	30"	30"	36"	36"	42"	42"
Centerline Height	C	6'5"	6'5"	7'5"	7'5"	8'5"	8'5"	8'5"	8'5"	8'9"	8'9"
Inlet Transition	D	48"	48"	60"	60"	60"	60"	72"	72"	72"	84"
Outlet Transition	E	24"	24"	30"	36"	42"	42"	42"	48"	48"	48"
Body Length	F	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'
Overall Length	G	18'	18'	19'6"	20'	20'6"	20'6"	21'6"	22'	22'	23'
Width	H	2'	3'4"	4'6"	6'	7'	8'	10'	11'4"	12'	13'6"
Height	J	15'	15'	17'	17'	19'	19'	19'	19'	20'	20'
Water Make-Up (GPM) (2)		3	5	10	15	19	24	29	34	38	43
Recirculation Rate (GPM)		90	140	220	300	330	430	520	600	650	740
P - Inch W.C. (3)		1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"
BHP - Fan (3)		2	4	9	13	16	24	26	32	34	40
BHP - Pump		3	5	7	8	9	11	13	14	15	17
BHP - H. Voltage (Equiv.)		4	5	7	9	12	13	13	14	15	16
BHP - Total		9	14	23	30	37	48	52	60	64	73
Operating Weight		6,700	9,700	12,000	14,700	17,000	19,000	22,200	24,700	26,500	29,000
Dry Weight		4,500	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000

(1) Capacity varies with application & efficiency requirements.

(2) Make-up depends on process conditions.

(3) Assumes no external requirements.

NOTE: All Dimensions Approximate. P varies from 1/2" to 1 1/2" depending on air velocity. For multi-stage applications, multiply dimension F by number of stages.

IWS™
System
Air Pollution
Control Division

PRINCIPLES OF OPERATION

The Ceilcote Ionizing Wet Scrubber* (IWS)TM system is a proven means for the removal of pollutants from industrial process gas streams. The IWS combines the established principles of electrostatic particle charging, image force attraction, inertial impaction, and gas absorption to collect submicron solid particles, liquid particles and noxious and malodorous gases simultaneously. The IWS system requires little energy and its collection efficiency is high for both submicron and micron size particles.

The Ionizing Wet Scrubber utilizes high voltage ionization to electrostatically charge particulate in the gas stream before the particles enter a Tellerette® packed scrubber section where they are removed by attraction of the charged particles to neutral surfaces. Larger particles of three to five microns and larger are collected through inertial impaction. As small particles flow through the scrubber, they pass close to the surfaces of Tellerettes and scrubbing liquid droplets. The electrostatic charge on the particles cause them to be attracted to these neutral surfaces by image force attraction. All particles are eventually washed out of the scrubber with the exit liquor. Noxious and malodorous gases are absorbed and reacted in the same scrubbing liquor.

*Patent Nos. 3,874,858 and 3,958,958

® Registered trademark of The Ceilcote Co.

OPERATING ADVANTAGES

Particle Collection—The IWS system utilizes Tellerette packing as its collection surface to achieve particulate removal. Scrubbing liquid droplets also act as collection surfaces. Particles of any size or composition are collected by the IWS. Fine particles (0.05 to 2 microns) are collected with high efficiency as well as coarse particles (2 microns and larger), regardless of their composition (organic or inorganic with either high or low resistivity). Particle collection efficiency over long term service remains consistently high.

Gas Absorption—The IWS system simultaneously absorbs gases. Noxious gases are removed through physical absorption and/or absorption that is accompanied by chemical reaction.

Low Energy Consumption—Pressure drop through a single stage IWS is only 1/2 in. to 1 1/2 in. water column. Energy for particle charging is low—approximately 0.2 to 0.4 KVA per 1000 CFM.

Corrosion Resistance—The shell and most internal parts of the IWS are commonly fabricated of Duracor® (fiberglass reinforced plastic) and thermoplastic materials. This predominance of plastic construction assures corrosion-free operation in the presence of acid gases such as HCl, HF, Cl₂, NH₃, SO₂ and SO₃. For non-corrosive applications, metallic construction is also available.

Fractional Collector—The IWS system acts as a fractional collector. The percent of particulate removed varies little with load and particle size distribution over a wide range. As particulate load increases, the percent removed remains nearly constant. The collection efficiency for fine particles is nearly as great as for coarse particles.

Turn Down—Collection efficiency improves with turn down from 100% to 0% load.

Size Range—Factory assembled modules in a table standard capacities from 900 to 54 000 ACFT³ can also be grouped together to handle virtually any gas volume.

SUBMICRON PARTICULATE AND NOXIOUS GASES REMOVED SIMULTANEOUSLY

IWS SYSTEM COMPONENTS

Ionizer (Charging) Section

Particles are first electrostatically charged within an ionizer section that utilizes a high voltage, D.C. power source. Discharge electrodes have negative polarity and wetted "mini-plates" serve as grounded electrodes.

High Voltage Transformer/Rectifier

High voltage D.C. power for the ionizing section is provided by a high voltage transformer/rectifier. This is a sealed, water-tight, oil-filled unit. Rectification is accomplished by silicon diodes which are suitably protected against transient voltages for efficient and long-term, trouble-free service.

Control Cabinet

All control and remaining power functions for the IWS are combined in a single, standard, factory pre-wired control cabinet which can be located at any convenient location, either adjacent to or remotely located from the IWS. Field hook-up is simple. The control cabinet is connected to the high voltage transformer/rectifier by five leads attached to cabinet terminals. Maximum voltage on the interconnecting wiring is 480 volts.

Voltage control for high voltage is achieved by thyristor control through phase-angle variation. An ultra-fast response, solid state, plug-in type standard control module automatically controls high voltage levels and spark rate for optimum performance. A manual control is also provided for backup and for trouble shooting.

Operation is simple and straightforward. All functions are automatic. Necessary meters and indicator lights are provided to monitor the operation. Protective interlocks and circuits safeguard the equipment against overloads or malfunctions.

Flushing

The grounded electrode plate surfaces of the IWS are continuously flushed by a flow of water or other suitable liquid. This assures that optimum electrical performance is maintained at all times by washing away any resistive solids or residues that could collect on the "mini plates" and cause reduced performance.

A second flushing system is also provided which periodically deluge flushes all internal areas of the ionizer section.

The deluge flushing is completely automatic and is set to provide a flushing cycle every eight hours or as experience dictates. Water for the periodic deluge flush is recycled liquid from the scrubber recycle system.

Charged Particle Scrubber

The IWS incorporates a crossflow scrubber section following the ionization section. The scrubber section employs Tellerette packing to absorb gases and collect both liquid and solid particles from the gas stream.

The contaminated gas stream moves horizontally through a Tellerette packing bed that is irrigated by scrubbing liquid flowing vertically down through the packing. The inherent advantages of the crossflow design result in high operating reliability, high air flow rate, low pressure drop and low operating cost.

Sump

The IWS contains an integral sump to recirculate the scrubbing liquid directly after it passes through the packed-bed section. Use of an integral sump reduces cost and minimizes floor space requirements.

Recycle Pump and Piping

Pump(s) and complete recirculation piping for the IWS is normally provided for continuous wetting of the ionizer plates, deluge flushing of the ionizer section and continuous irrigation of the crossflow scrubber.

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The IWS is designed to maximize efficient use of the scrubbing liquid. To achieve optimum scrubbing liquid distribution, the scrubber contains spray header assemblies with low pressure, large orifice nozzles. Droplets formed by the spray nozzles enhance the absorption capacity of the scrubber.

Scrubbing Liquid

Liquid flow rates are based on specific operating conditions. The scrubbing liquid is usually recirculated, thus reducing both consumption of fresh liquid and overflow or blowdown from the scrubber. A small amount of fresh makeup liquid is usually fed continuously to the scrubber system. The fresh liquid keeps the absorbed gaseous pollutant concentration in the recycled liquid at a sufficiently low level to maintain efficient gas absorption. Fresh makeup liquid is also required to balance evaporation losses. Liquid can be fresh water, clean process water, or chemically treated liquids. Water treated with chemicals such as caustic soda, or soda ash is used only when fresh water or process water will not achieve the desired collection efficiency, or when treated water suits the waste treatment criteria of the specific plant.

Opacity Reduction

The IWS can remove the light loadings of submicron particulate that cause a "blue haze" emission. Generally, an emission having an opacity of 20% (Ringemann 1) or less is acceptable. The IWS can be designed to obtain opacities of 5% or less to give clear or nearly clear stack discharges.

Energy

Pressure drop through a single-stage IWS is only 1/2 to 1.5 inches water column and is controlled primarily by the pressure drop through the wet scrubber section. Additional small amounts of energy are required for high-voltage charging and for the recycle pump.

Total system energy usage is approximately 2.0-2.5 BHP/1000 ACFM for a single-stage IWS and 4.0-5.0 BHP/1000 ACFM for a two-stage IWS installation.

IWS COMPARISONS

Other types of Air Pollution Control Equipment i.e. venturi scrubbers, electrostatic precipitators, and baghouses generally require metal hardware/components. Therefore, use of this equipment in corrosive environments is severely limited. Additionally, sophisticated design configurations makes this equipment extremely costly and/or difficult to operate and maintain. These problems do not exist with the IWS because of the simplified design, minimum use of metallic hardware, low pressure drop and low operating/maintenance costs.

Venturi Scrubbers which are specifically designed for fine particulate removal in corrosive environments can be constructed of corrosion resistant materials. However, these require high-speed, high-energy fans constructed of exotic alloys which makes the venturi expensive to fabricate, difficult to maintain and costly to operate. Also, venturi scrubbers frequently require expensive reduced voltage starting equipment, costly electrical substation installation and elaborate controls to handle fluctuating loads.

Operating energy costs of the IWS are only a fraction of that of a venturi. The accompanying graph provides a comparison, and is based on the following parameters and use of a two-stage system:

Capacity	50,000 CFM @ (Standard Conditions)
Pump	Includes 15 BHP for both systems
Duty	24 hrs. x 365 days = 8760 hrs.
Energy Costs	6¢/KWH assumed 1 BHP/yr. @ 6¢/KWH = \$490/yr.
Fan Efficiency	60%
Motor Efficiency	80%

NOTE: TWO STAGE UNIT* (FOR SINGLE-STAGE UNIT OPERATION COST IS ½ OF THAT SHOWN)

Conventional Electrostatic Precipitators (ESP) require large metallic collection surfaces and contain a multitude of internal hardware components which are exposed to the gas stream. If ESP's are used in corrosive environments, non-corrosion resistant metallic surfaces must be covered with corrosion resistant materials or expensive, corrosion-resistant alloys must be used.

Baghouses are susceptible to corrosive operating environments particularly when water vapor content is high and condensation can occur; where the particulate to be collected is sticky, gummy, and cannot be removed by normal bag shaking or pulsing; or where the service conditions seriously degrade the bag fabric.

PILOT TESTING EQUIPMENT AND FACILITIES

Portable pilot test units having 1000 to 2000 CFM capacity are available for test purposes. These units permit tests to be conducted in the field using actual process slip streams or under laboratory conditions at the Ceilcote Berea, Ohio facility.

Pilot tests should be conducted whenever possible to confirm performance and effectiveness of the IWS for the application, and to provide engineering data for designing full size equipment.

The test equipment is complete so that the potential user has only to duct a slip stream to the unit and supply the necessary utility services; i.e., electrical supply, fresh water make-up, and drain lines.

Field Performance Testing Services

Field performance testing to verify the performance and efficiency of the IWS can be conducted by experienced personnel from the Ceilcote Engineering Development Department if desired. The test team has extensive experience in gas and particulate testing techniques utilizing methods approved by EPA and other air pollution control agencies. The test method and equipment employed for evaluation and/or performance verification testing depends on the nature of the contaminants, applicable codes, and as mutually agreed upon by all parties.

Ceilcote portable pilot equipment in field service

Ceilcote Capabilities

Ceilcote has the design expertise, engineering knowhow and field installation experience to undertake contracts ranging from consulting engineering only to complete green field turnkey jobs. The matrix below shows the six basic types of contracts and related services which are offered to solve a broad range of customers' needs.

APPLICATIONS

The energy efficient IWS can be applied to a wide variety of air pollution control problems. It offers the greatest advantages in applications requiring the collection of submicron particulate, mist, and gases, especially where corrosive conditions exist. A partial listing of potential IWS applications and representative contaminants is listed below:

Process	Contaminants	Process	Contaminants
Petroleum Coke Calciners	SO ₃ Mist, SO ₂ , Carbon Particles, Smoke, Inorganic Fumes	Phosphate/Fertilizer and Phosphoric Acid Plants	HF Gas, Fluoride Fumes, Non-Fluoride Fumes, P ₂ O ₅ Fumes, Dust
Liquid and Solid Waste Incinerators for Chemical Plants	HCl gas, SiO ₂ Fumes, SO ₃ Mists, Organic Mists, Smoke, Inorganic Fumes	Feed, Food and Beverage Processing	Dust, Smoke, Odors, Aldehydes, Organic Acid Mist
Solid Waste Incinerators for Municipal Plants	HCl Gas, Smoke, Organic Mists, Odoriferous Gases, Inorganic Fumes	Zinc Galvanizing Lines	NH ₄ Cl Fumes, ZnO Fumes, Oil Vapors
Copper, Lead, Magnesium and Zinc Smelters with Sulphuric Acid Plants	Dust, Inorganic Fumes, SO ₃ Mist	Ferro-Alloy Production	SiO ₂ Fumes, Inorganic Fumes, Carbon Particles
Aluminum Refining and Process Operations	Smoke, AlCl ₃ Fumes, HCl, Dust, SO ₂ , SO ₃ , HF, Carbon Particles, Al ₂ O ₃ Fumes, Fluoride Fumes	Refractory Manufacture	HF Gas, NH ₃ Gas, SO ₂ Gas, Na ₂ SO ₄ and (NH ₄) ₂ SO ₃ Fumes, H ₂ SO ₄ mist
Driers - Feed and Grain Mills	Dust, Vapors, Smoke, Malodorous Gases	Pulp, Paper, Plywood Manufacture	(NH ₄) ₂ SO ₃ Fumes, Lime Dust, TRS, Soda Fumes, H ₂ S and SO ₂ Gases, Mercaptans, Salt Fumes, Na ₂ SO ₄ Particulate, Hydrocarbon Mists, Fine Particulates

INSTALLATIONS

CUSTOMER	INST. DATE	EMISSION APPLICATION	PROBLEM	VOLUME	CUSTOMER	INST. DATE	EMISSION APPLICATION	PROBLEM	VOLUME
Borden Inc. Plant City, Fl.	Oct., 1977	Deflorination of Phosphate Rock	HF, Fluoride Salt	25,000 ACFM at 100 deg. F.	General Electric Waterford, N.Y.	Oct., 1979	Liquid & Solid Waste Incin	HCl, SiO ₂ , Particulate, PCB's	16,000 ACFM at 100 deg. F
Griffith Lab. Chicago, Il.	Oct., 1978	Food Processing Spray Drier	NaCl, Condensibles & Solids	23,000 ACFM at 230 deg. F.	General Electric Cleveland, Ohio	Nov., 1979	Halo Phos. Furnace	Phosphorhalides, HCl	6,000 ACFM at 140 deg. F
Oak Ridge Gaseous Diffusion Plant Oak Ridge, Tenn.	Dec., 1986	Chemical Waste Incinerations	HCl, SO ₂ , HF, Particulates	17,000 ACFM at 180 deg. F.	General Electric Waterford, N.Y.	Mar., 1980	Liquid Waste Incineration	HCl, SiO ₂	850 ACFM at 100 deg. F
Int'l Paper Longview, Wa.	Sept., 1979	Green Flake Drier (Wood Products)	Wood Combust. products and condensible hydrocarbons	10,000 ACFM at 210 deg. F.	Dow Chemical Elkin, La.	Sept., 1981	Industrial & Waste Incin	HCl, Particulate	30,000 ACFM at 178 deg. F
Kogap Medford, Oregon	Feb., 1980	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	104,000 ACFM at 400 deg. F.	Union Carbide S.Charleston, W.V.	Mar., 1982	Chemical Waste Incineration	SiO ₂ , HCl	4800 ACFM at 190 deg. F
Lynn Plywood Albany, Or.	Apr., 1986	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	34,000 ACFM at 125 deg. F.	Weyerhaeuser Eikin, NC	Jan., 1987	Wood Fired Board Drier	Condensable Hydrocarbons, Ash Particulate	120,000 ACFM at 160 deg. F
S.W. Forest Ind. Albany, Oregon	Apr., 1981	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Globe Refrac. Newell, W.Va.	Nov., 1978	Refractory Tunnel Kiln	NH ₄ HSO ₃ , HF, HCl	42,000 ACFM at 110 deg. F
S.W. Forest Ind. Albany, Oregon	July, 1981	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Globe Refrac. Newell, W.Va.	Sept., 1979	Refractory Tunnel Kiln	NH ₄ HSO ₃ , HF, HCl	42,000 ACFM at 100 deg. F
Murphy, Plywood Sutherlin, Or.	Dec., 1985	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Fiberglas Canada Sarnia, Ontario	Mar., 1980	Fiberglass Insul curing & forming area exhaust	Phenolic binder glass fibers	15,500 ACFM at 120 deg. F
S.W. Forest Ind. Springfield, Or.	Dec., 1982	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	20,000 ACFM at 135 deg. F.	Fiberglas Canada Sarnia, Ontario	Aug., 1982	Fiberglass Insul	Phenolic binder Glass Fiber	15,500 ACFM at 120 deg. F
S.W. Forest Ind. Grants Pass, Or.	Apr., 1982	Wood Fired Veneer Drier	Wood Combust. products and condensible hydrocarbons	32,000 ACFM at 135 deg. F.	Gulfiber Billesholm, Sweden	Mar., 1979	Fiberglass Insul	Phenolic Binder Glass Fiber	
Union Carbide Sistersville, W V	May, 1975	Liquid & Solid Waste Incin	SiO ₂ , HCl	12,650 ACFM at 90 deg. F	Union Carbide Italy	Sept., 1981	Liquid & Solid Waste Incin	HCl, SiO ₂ , Ash Particulate	13,000 ACFM at 110 deg. F
Union Carbide Sistersville, W Va	July, 1979	Liquid & Waste Incin	SiO ₂ , HCl Solid	12,500 ACFM at 110 deg. F	City of Fall River Fall River, Mass	July, 1979	Municipal Solid Waste Incineration	Particulates Chlorides & Fluorides	17,800 ACFM at 165 deg. F
General Electric Waterford, N Y	Dec 1972	Liquid Waste Incineration	SiO ₂ , HCl	16,900 ACFM at 90 deg. F	R. Ross & Sons Grafton, Ohio	Nov., 1979	Industrial Waste Incineration	HCl, Particulate	50,000 ACFM at 140 deg. F
					SCA Chem Svs. Chicago, Il.	Dec. 1981	Chemical Waste Incineration	HCl Particulate PCB's	83,000 ACFM at 178 deg. F
					Rollins Env. Svs Baton Rouge, La	Mar 1982	Chemical Waste Incineration	HCl SO ₂ Particulate	41,000 ACFM at 100 deg. F
					General Electric Waterford, N Y	Oct 1979	Liquid Waste Incineration (Upgrade of original unit)	SiO ₂ , HCl	16,900 ACFM at 90 deg. F

IWS EQUIPMENT SPECIFICATIONS

IWS equipment is available in standard factory assembled modules having 900 to 54,000 ACFM capacities. The IWS modules can be arranged in parallel to handle an infinite variety of gas stream flow rates having capacities much greater than the maximum module available.

For example, five IWS Model 700's can be placed in parallel to handle a 208,000 ACFM gas stream.

In addition to standard IWS modules Ceilcote can provide custom designed IWS equipment to suit the application whether it is a retrofit or new installation. Individual units for applications having requirements greater than 54,000 ACFM capacity can be field erected.

Standard factory assembled IWS module specifications are given below:

Model No.		50	100	200	300	400	500	600	700	800	900
Capacity Range ACFM(1)		900	1800	3600	5400	7200	9000	10,800	12,600	14,400	16,200
		3000	6000	12000	18000	24000	30000	36000	42000	48000	54000
Inlet Dia.	A	18"	24"	36"	42"	48"	54"	60"	66"	72"	72"
Outlet Dia.	B	12"	14"	20"	24"	30"	30"	36"	36"	42"	42"
Centerline Height	C	6'5"	6'5"	7'5"	7'5"	8'5"	8'5"	8'5"	8'5"	8'9"	8'9"
Inlet Transition	D	48"	48"	60"	60"	60"	60"	72"	72"	72"	84"
Outlet Transition	E	24"	24"	30"	36"	42"	42"	42"	48"	48"	48"
Body Length	F	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'
Overall Length	G	18'	18'	19'6"	20'	20'6"	20'6"	21'6"	22'	22'	23'
Width	H	2'	3'4"	4'6"	6'	7'	8'	10'	11'4"	12'	13'6"
Height	J	15'	15'	17'	17'	19'	19'	19'	19'	20'	20'
Water Make-Up (GPM) (2)		3	5	10	15	19	24	29	34	38	43
Recirculation Rate (GPM)		90	140	220	300	330	430	520	600	650	740
P - Inch W.C. (3)		1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"
BHP - Fan (3)		2	4	9	13	16	24	26	32	34	40
BHP - Pump		3	5	7	8	9	11	13	14	15	17
BHP - H. Voltage (Equiv.)		4	5	7	9	12	13	13	14	15	16
BHP - Total		9	14	23	30	37	48	52	60	64	73
Operating Weight		6,700	9,700	12,000	14,700	17,000	19,000	22,200	24,700	26,500	29,000
Dry Weight		4,500	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000

(1) Capacity varies with application & efficiency requirements.

(2) Make-up depends on process conditions.

(3) Assumes no external requirements.

NOTE: All Dimensions Approximate. P varies from 1/2" to 1 1/2" depending on air velocity. For multi-stage applications, multiply dimension F by number of stages

Part 2

CIRCUL-AIRE

MM-7000 MEDIA SPECIFICATION

MM-7000 is a pelletized activated carbon impregnated for enhanced performance in removing basic gases such as NH_3 from air streams. It is manufactured from a unique bituminous coal substrate. MM-7000 has low pressure drop and high adsorptive capacity.

TYPICAL PROPERTIES

NH_3 Capacity (minimum)	.05g NH_3 /cc
Moisture	15 wt%
Hardness	95 wt%
Particle Diameter	4 mm
Substrate CTC	60 wt%
Substrate Surface Area	1000 m^2/g
Shape	Pellet
Apparent Density	.8g/cc, 50 lb/ft ³
Pressure Drop @ 50 fpm	1.8" of water/ft of bed

PACKAGING

3999, Côte Vertu
Montréal (Québec)
H4R 1R2

Tél.: (514) 336-3330
Fax: (514) 336-3023

MM-7000 is available in 1 cu.ft. containers, 55 gallon fiber drums and 35 ft³ super sacks.

SAFETY PRECAUTIONS

151 Nashdene Road
Units 10-11
Scarborough (Ontario)
M1V 2T3

Tel.: (416) 292-4928
Fax: (416) 292-8387

Wet activated carbon readily adsorbs atmospheric oxygen. Dangerously low oxygen levels may exist in closed vessels or poorly ventilated areas. Workers should follow federal, provincial and state safety guidelines for entering oxygen depleted areas.

MATERIAL SAFETY DATA SHEET

WHC-SD-3145-DA-002, Rev. 0

W3145

MSDS File Number

SECTION I - MATERIAL IDENTIFICATION AND USE					Controlled Product Yes ☐ No ☐	
Material Name MM-7000			Product Identification Number			
Manufacturer's Name			Supplier's Name CIRCUL-AIRE INC.			
Street Address			Street Address 3999 COTE VERTU			
City	Province	City	Province	<div> <div>Flammability</div> <div>Health</div> <div>Reactivity</div> <div>Personal Protection</div> </div>		
Postal Code	Emergency Telephone No	Postal Code	Emergency Telephone No			
		H4R 1R2		(613)-996-6666		
Chemical Name ACTIVATED **	Chemical Family INORGANIC	Chemical Formula C + H₂O + H₃ PO₄				
Molecular Weight N/A	Trade Name and Synonyms MM-7000	Material Use AIR PURIFICATION				
SECTION II - HAZARDOUS INGREDIENTS OF MATERIAL						
Hazardous Ingredients	Approximate Concentration %	C.A.S. No. or U.N. Numbers	"Exposure limits"	LD ₅₀ /LC ₅₀ Specify Species and Route		
PHOSPHORICACID	10		N/A	N/A		
** CARBON AND AQUEOUS PHOSPORIC ACID						
SECTION III - PHYSICAL DATA FOR MATERIAL						
Physical State ☐ Liquid ☒ Solid	Odour and Appearance BLACK ODORLESS GRANULES		Odour Threshold (p.p.m.)	Specific Gravity		
Vapour Pressure (mm)	Vapour Density (Air = 1)	Evaporation Rate	Boiling Point (°C)	Freezing Point (°C)		
N/A	N/A	N/A	N/A	N/A		
Solubility in Water (20°C)	% Volatile (by volume)	pH (10% SUSPENSION)	Coefficient of water/oil distribution			
10-15%	10-15% AS WATER VAPOUR	2.5	N/A			
SECTION IV - FIRE AND EXPLOSION HAZARD OF MATERIAL						
Flammability Yes ☐ No ☐ If yes, under which conditions:						
Means of Extinction FLOOD WITH WATER OR USE FOAM, CO₂ OR DRY CHEMICAL						
Special Procedures						
Flashpoint (°C) and Method	Upper explosion limit (% by volume)		Lower explosion limit (% by volume)			
N/A	N/A		N/A			
Auto Ignition Temperature (°C)	Hazardous Combustion Products					
>175°C	CO MAY BE GENERATED IN CASE OF COMBUSTION					
Explosion Data Sensitivity to Mechanical Impact	Rate of Burning	Explosive Power	Sensitivity to Static Discharge			
N/A	N/A	N/A	N/A			
SECTION V - REACTIVITY DATA						
Chemical Stability If no, under which conditions?						
Yes ☒ No ☐						
Incompatibility to other substances If so, which ones?						
Yes ☒ No ☐ ORGANIC LIQUIDS, STRONG OXIDIZERS						
Reactivity and under what conditions						
CONTACT WITH STRONG OXIDIZERS SUCH AS OZONE, LIQUID OXYGEN, CHLORINE, ETC. MAY RESULT IN A FIRE.						
Hazardous Decomposition Products						
CARBON MONOXIDE MAYBE GENERATED IN THE EVENT OF COMBUSTION

top tape & label ltd.

416-335-4423

G-35

Part 2

PALL ADVANCED SEPARATIONS SYSTEMS GROUP

The world leader in the manufacture of fine filtration equipment, Pall Corporation is dedicated to meeting its customers

needs through organizational and technical innovation. Today, with increased environmental awareness, the resulting tightening of emission guidelines, and the constant push for finer removal efficiencies, our customers' needs are becoming increasingly complex. To respond to them more quickly and completely, Pall Corporation has assembled a team of senior staff with proven expertise that results in the Pall Advanced Separations Systems (PASS) Group. The PASS Group develops filtration systems incorporating Pall filter technology in the following areas: microfiltration, blowback, backwash, ultrafiltration, and dynamic microfiltration. The systems approach requires complete installation of the entire process, which translates to more efficient operation, less waste, and easier conformance to EPA and other government agency regulations. In addition, every PASS Group system is fully automated and self-cleaning, reducing worker exposure to hazardous materials.

PALL ULTRAMET™ AIR FILTERS

Description

Pall UltraMet™ air filters are rugged constructions that meet or exceed the physical characteristics of HEPA filters, yet can meet Ultra Low Penetration Air (ULPA) aerosol penetration values, i.e., less than 0.01% at the most penetrating particle size.

The filter medium consists of a mat of random small-diameter 316L stainless steel fibers sintered together at their points of contact to produce a uniform structure having high void volume, exceptional dirt-holding capacity, high mechanical strength, and outstanding service life.

*Statement of Removal Efficiencies and Test Capabilities, L.D. Weher, PASS T.R. 3, August 1993.
Pall Corporation.

ULTRAMET AIR FILTER GRADES AND THEIR CHARACTERISTICS

Pall Ultramet
Air Filter.

SPECIFICATIONS

Filter Medium

Wet Tensile Strength: 25 lb./in. width, minimum, after 15-minute soak in water.

Tensile Strength After Radiation: 25 lb./in. width, minimum, after exposure to an integrated gamma radiation dose of 6.4×10^7 RAD.

Water Repellency: Zero penetration under 30 inches of water per MIL-STD-282.

Water Repellency After Radiation: Zero penetration under 6 inches of water after exposure to 6.4×10^7 RAD.

Filter Elements

Resistance to Heated Air: Resistant to air at 750°F for 48 hours or at 1000°F for 5 minutes per UL-586 and MIL-F51068.

Spot Flame Resistance: No sustained flame on downstream side and no transmittal of flame to outside surfaces per ANSIB132.1.

Resistance to Moisture and Overpressure: No permanent damage after 10 psi water differential for 1 hour.

Resistance to Rough Handling: No damage per MIL-STD-282, method 105.9.

Quality Assurance: To ASME-NQA-1-1989 and in accordance with MIL-F-51079. Certified to ISO9001.

Dust Capacity: 29 gm/ft.² per ASHRAE 52-76.

GRADE	
HEPA-1	ULPA-1
PENETRATION	
0.05 μm	0.01 μm
PRESSURE DROP (in w.g./mbar)*	
1.0 ft./min. / 0.6 cm/s	1.5 in. / 2 mbar
2.0 ft./min. / 1.2 cm/s	1.5 in. / 2 mbar
5.0 ft./min. / 2.5 cm/s	5.0 in. / 2.4 mbar
6.5 ft./min. / 3.3 cm/s	6.5 in. / 3.2 mbar

*As measured with standard UltraMet air filter, 6-inch O.D. x 48 inches long.

TABLE 2. FILTER MODULES

GRADE	CAPACITY (ACFM/m ³ /h)			
	1,000/1,700	5,000/8,500	8,500/14,450	12,000/20,400
VESSEL O.D. (in./cm)				
HEPA-1	16/41	38/97	48/122	54/137
VESSEL INLET/OUTLET (in./cm)				
HEPA-1	6/15	14/36	20/51	24/61
VESSEL MATERIAL OF CONSTRUCTION (stainless steel)				
HEPA-1	304	304	304	304
VESSEL WEIGHT (lb./kg — with filters)				
HEPA-1	850/386	4,200/1,909	7,200/3,273	9,500/4,318
PRESSURE DROP (in w.g./mbar)* (initial — with filters)				
HEPA-1	3/7.5	3/7.5	3/7.5	3/7.5

Applications

There is increasing demand at U.S. Department of Energy sites for design of improved off-gas treatment facilities. The DOE Environmental Restoration and Waste Management Five Year Plan, dated August 1991, states: "The development of solvent substitutes and reusable stainless steel high efficiency particulate air (HEPA) filters have contributed to the attainment of waste minimization objectives. Comparative estimates show that current HEPA filtration costs \$122 million and that reusable HEPA filtration costs \$24 million. Net savings of \$96 million annually are likely if reusable filters are chosen."

High-efficiency particulate air (HEPA) filters now in use are subject to structural damage when subjected to high air flow (such as shocks created by an explosion), high-temperature (above 250°C), high humidity, heavy dust loads, or combinations of these factors.

At a dust loading of 20 grams per square foot or less, the filters will be exhausted, and according to the Nuclear Air Cleaning Handbook, "no satisfactory device protects the HEPA filter against the extremely high concentrations of particulate matter produced by a fire . . . which leads to its eventual plugging and probable rupture."

By specification, HEPA filters are capable of withstanding a pressure drop of at least 10 inches w.g.; however, most are replaced at 4 to 5 inches w.g. to prevent loss of integrity.

By specification, HEPA filters exhibit a particle removal efficiency of 99.97% when challenged by thermally generated monodisperse DOP smoke particles with a diameter of 0.3 microns (μm).

Pall UltraMet air filters are available in HEPA and ULPA grades. For example, Pall UltraMet air filters supplied to Lawrence Livermore Laboratories were reported by Bergman⁽¹⁾ to have a maximum penetration of 3.2×10^{-8} at $0.1 \mu\text{m}$ particle diameter. Whereas conventional HEPA filters are designed to 10-inch w.g. differentials, Pall UltraMet air filters are rated to 50 psid to provide enhanced safety of operation and protection against breach of integrity.

In addition, Pall UltraMet air filters are designed for automated clean-in-place operation to minimize operator exposure and handling of radioactive waste and to provide added protection in case of system upsets created by fires, explosions, quakes, etc.

Pall UltraMet air filters are high-surface-area constructions of the finest metal fibers. The rugged sinter-bonded medium is relatively thin and pleated so that high flows (such as for defense facility building ventilation systems) can be handled at low pressure differentials in compact assemblies.

For added safety at defense plants, Pall UltraMet air filters having design penetrations up to 1×10^{-5} for the most penetrating particles would serve as prefilters to conventional fiberglass HEPA's to reduce occupational exposure, downtime, and radioactive waste disposal costs and afford protection in cases of system upsets or fires. In such applications one stage of UltraMet air filters could replace two stages of conventional HEPA filters.

CROSS-SECTIONAL

Pall UltraMet air filters were tested at Battelle Pacific Laboratories to document filter performance on melter off-gas from a pilot high-level waste vitrifier to qualify the ULPA elements for service at the Hanford Waste Vitrification Plant (HWVP).

Installations

UltraMet air filters enhance safety of operation when installed as:

- Facility Zone 1 exhaust system vents
- Process vessel vents
- Radioactive waste storage drum vents
- Vents on high-level radioactive waste storage tanks
- Glove box exhaust filters

(1) High Efficiency Steel Filters for Nuclear Air Cleaning, W. Bergman et al., 21st DOE/NRC Nuclear Air Cleaning Conference

VIEW OF VENTILATION BUILDING AND ULTRAMET AIR FILTER ASSEMBLY

INLET FROM
VENTILATION BUILDING

EXHAUST AIR TUNNEL

WASTE
VITRIFICATION
PLANT
RENDERING

Economy of Use

Comparing Pall UltraMet air filters to conventional fiberglass HEPA constructions, the prominent differences are:

- projected service life of 40 years or more (based on corrosion resistance)
- higher wet tensile strength
- higher differential pressure rating
- higher temperature rating
- cleanable *in situ*
- maintenance of integrity during system upsets (within design conditions), which can result in temperature and/or pressure surges, or high humidity

BUT WHAT ARE THE RELATIVE COSTS?

According to DOE budget estimates, approximately 97% of the cost of operating HEPA filters goes to testing, handling, and disposal.

Hanford has cited costs up to \$12,000 for panel, test and disposal.

A comparative analysis for a new plant is shown below. The Pall proposal consists of two filter stages, i.e., a Pall UltraMet air filter followed by a conventional HEPA stage, and it is compared to a typical three-stage HEPA installation.

As a second comparison, consider the case where Pall metal filters are supplied as direct retrofits (panels) for an existing installation. In this case the first HEPA stage is replaced by Pall high-efficiency metal filter-panel assemblies.

Cost Summary — Pall vs. HEPA Filters

	PALL (\$ million)	HEPA (\$ million)
Equipment Cost	7.0	1.7
Installation Cost	1.0	1.0
BCP Testing	0.4	0.6
HEPA Changeouts	—	11.0
Decommissioning	0.6	0.5
	9.0	14.8

Basis

- 1. Air flow of 1000 CFM
- 2. HEPA changeout every 3 years at \$300 each
- 3. Pall assembly being single 14 inch Dia. and HEPA stage
- 4. Commissioning for 42 inch stage

Cost Summary — Direct Retrofit of HEPA Panels

	PALL (\$ million)	HEPA (\$ million)
Equipment Cost	0.9	—
BCP Testing	0.3	—
HEPA Changeouts	—	11.0
Chemical Cleaning	0.6	—
	1.8	11.0

Basis

- 1. Air flow of 1000 CFM
- 2. Pall Changeout of \$100 each
- 3. HEPA Changeout of \$300 each
- 4. Chemical cleaning cost of \$0.60 per sq. ft.
- 5. Commissioning for 42 inch stage

MIASMACT™

Automatic-Cleaning HEPA Filters

Tighter emission standards require new approaches to particulate filtration . . .

Beat the high cost of high efficiency HEPA filtration with the MIASMACT™ Automatic-Cleaning HEPA Filter . . .

HEPA filtration provides the best collection efficiency available in a particulate/dust collector. MIASMACT™ Filter systems use HEPA filter elements which capture at least 99.97% of 0.3 micron-sized particles. Collection of particles greater than 1 micron is virtually 100%.

But unlike conventional HEPA filters, the MIASMACT™ Automatic-Cleaning HEPA Filter is designed for long life in heavy dust loads.

Because of this breakthrough capability, the MIASMACT™ Filter makes HEPA filtration practical for the first time.

MAC
Environmental

MI-AS'MA: (me-az-muh) is a Greek word meaning toxic gas.

MACT: is an acronym for Maximum Achievable Control Technology.

Outstanding Performance

The MIASMACT™ Automatic-Cleaning HEPA Filter meets or exceeds the most stringent pollution control regulations, including MACT, LAER, or all other standards of the Clean Air Act Amendments. Our specially developed filter fabric removes up to 99.97+% of particles.

Even without the optional back-up safety filter, the MIASMACT™ Automatic-Cleaning HEPA Filter will typically deliver an emission rate of only 0.000 003 grains/SCF (0.007 mg/m³)!

It combines all the best features of HEPA filtration with those of an automatic-cleaning dust collector to bring the following benefits:

- **No pre-filter needed.** Because it is designed for heavy dust loading, pre-filters are normally not required.
- **Long filter element life.** Maintenance, cartridge replacement costs, and process downtime are minimized. Operator exposure and disposal costs of contaminated filter elements are greatly reduced.
- **Reduce energy costs.** Recirculation of cleaned air will greatly reduce energy costs and equipment requirements for heating and air conditioning.

- **Pollution control.** Maximum achievable collection efficiency available in a particulate/dust collector; meets existing and future pollution control regulations, improves health, reduces contamination and extends equipment life.
- **Improved safety.** Unique secondary back-up filter improves protection, even with the finest toxic or harmful particulates.
- **Avoid EPA permits.** Since the clean air can be recirculated, it eliminates the need for an EPA permit. This is in accordance with EPA's 1990 Clean Air Act Amendments and OSHA regulations in most states. Contact MAC for more information.
- **Allows reuse of dust.** If the material is valuable, it can now be reclaimed. If it is a harmful pollutant, it can now be recycled rather than disposed of into the environment.
- **Easy installation.** Simple, rugged modular design makes application and installation easy for a variety of industries.
- **Lower operating costs.** Automatic self-cleaning maintains low pressure drop across the filter elements. Ease of maintenance is evident throughout.

Contact MAC for more information.

A variety of equipment can be used to hold the dust which is collected. A removable dust container is standard. Options include an isolation valve, rotary airlock valve, pneumatic conveyor, screw conveyor, etc.

UNIQUE PERFORMANCE CHARACTERISTICS

- Our filter media is reinforced with a laminate on each side. This provides much greater tensile and burst strength than conventional HEPA filters.
- The MIASMACT™ filter media is pleated and formed in a long cylinder. This adds structural strength and integrity to the assembly.
- Our specially-controlled air pulse cleaning thoroughly cleans the media without damaging it.

APPLICATIONS INFORMATION & TYPICAL APPLICATIONS

OSHA and EPA regulations are continually requiring stricter standards. Now, the MIASMACT™ Automatic-Cleaning HEPA Filter offers the Maximum Achievable Emission Technology available in a particulate/dust collector. Many industrial processes produce harmful or toxic dust, e.g., pharmaceuticals, chemicals, plastics, mining, heavy metal compounds, pigments, coatings, paper, asbestos, textiles, food processing, animal feed, battery manufactures, foundries, pesticides, herbicides, lead, hazardous waste treatment, welding, metalworking, and radioactive materials. The MIASMACT™ Automatic-Cleaning HEPA Filter opens up a vast range of applications for the processes of these industries. The MAC unit is also ideal for capturing valuable materials, such as gold and silver.

MODULAR FLEXIBILITY

Our modular design reduces space requirements with a lower head height and smaller footprint. Individual modules have a capacity of up to 3000 cfm. A maximum of six modules can be combined into one unit (18000 cfm). Units can be combined to meet a wide variety of application requirements.

COST OF OWNERSHIP

Actual data from a typical installation

U.S. and Foreign Patents Pending

Filter Collection Efficiencies

The distinction between particle collection efficiency and weight collection efficiency is important. Most air pollution control devices (except HEPA filters) are rated by weight collection efficiencies because it is easier to measure and it gives a bigger number.

Many filters claim collection efficiencies of 99.99% or better. But since this is measured by weight, it overstates the efficiency since only the larger, heavier particles have been collected. Depending on size distribution, 99.9% by weight may be less than 15% of the total particles!

To determine the stricter standards for HEPA efficiencies, each particle must be detected and counted. HEPA filters are rated to capture at least 99.97% of 0.3 micron-sized particles. This is measured on 0.3 micron dioctyl phthalate smoke particles (DOP test).

The particle size of 0.3 microns is actually the most difficult size to capture. The diagrams below explain why.

1. Inertial Collection

Large particles cannot change direction to follow streamlines. Instead, their inertia causes them to directly impact the fiber.

2. Direct Interception

Smaller particles down to about 0.3 microns will follow the streamline, and their trajectory will miss the fiber. But if they come close enough to touch the fiber, they will be collected.

3. Brownian Movement

Very small particles will be diffused and follow an erratic path due to their collisions with gas molecules. This actually increases collection efficiency as particles get smaller than 0.3 microns.

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1316/10-93

General Considerations in Removing Entrained Liquids from Gas Streams

Bulletin 55B-1

OTTO YORK

Why Entrainment Occurs

In any process equipment where gas and liquid come into contact, the gas will always entrain some liquid. This entrainment is generated by two basic mechanisms: mechanical action and condensation as shown in Figure 1.

Droplets in mists generated by mechanical means are almost always over $5\text{-}10\mu$ in diameter. For example, hydraulic spray nozzles generate mists of particle diameter greater than 50μ while pneumatic nozzles form mists with particle diameters over 10μ . Gas bubbles breaking on a boiling or bubbling liquid surface will form droplets from 1000μ down to just a few microns in diameter, so careful consideration to performance requirements must be given to equipment such as evaporators, tray columns and steam boilers.

Although entrainment swept off the surface of packing or the surface of heat exchanger tubes consists mainly of relatively large, easily removed droplets, some types of condensation entrainment are not so easy to collect. Extremely fine entrainment, for instance, is often generated when a liquid condenses from a saturated vapor, as in a compressor where lubricating oil is locally heated and vaporized, and then quickly condenses causing very fine smokelike entrainment. Condensation, having a smokelike appearance, can also occur when two gases such as SO_2 and water react to form a liquid product, sulfuric acid. These latter types of entrainment require high efficiency separation equipment.

Physical properties of the liquid also have significant effects on particle size. In most cases, the higher the viscosity, the larger the droplet size—and the lower the surface tension, the smaller the droplets.

Figure 1. Typical particle size distribution ranges for entrainment caused by various mechanisms.

Figure 2. Efficiency of droplet capture vs particle diameter shown for four different types of mist eliminators. This performance is based on typical design conditions for the various entrainment separators. Gas velocity, liquid density, and mist loading, as well as style and thickness of the medium will affect the exact location of the curves.

When to Use a Mist Eliminator

- **To reduce loss of valuable product**—mist eliminators can stop liquid losses in absorbers, evaporators and distillation columns, markedly cut glycol, amine or catalyst consumption.
- **To increase throughput capacity**—anywhere gases and liquids come into contact in process equipment, significant velocity increases will be made possible by installing a mist eliminator.
- **To improve product purity**—mist eliminators can prevent contamination of side draws and overheads in refinery atmospheric and vacuum towers, and other distillation columns.
- **To eliminate contamination**—mist eliminators can prevent poisoning expensive downstream catalysts—provide boiler feed water quality condensate from evaporator overheads.
- **To stop downstream corrosion**—mist eliminators can protect ductwork and heat exchangers—prevent solids build-up on fan, turbine and compressor blades, eliminating serious maintenance problems.
- **To prevent air pollution**—mist eliminators help reduce emissions from acid plants to environmentally acceptable levels—prevent ammonia and sulfite plumes—stop stack entrainment from settling in nearby parking lots.
- **To reduce water pollution**—mist eliminators installed upstream of evaporator barometric condensers can prevent entrainment of polluting substances in the water effluent.

Mechanisms of Entrainment Removal

Mist capture can occur by three mechanisms as shown in Figure 3. It should be kept in mind that there are no sharply defined limits where one mechanism takes over from another. Since momentum of a droplet varies directly with liquid density and the cube of diameter, heavier or larger particles tend to resist following the streamline of a flowing gas and will strike targets placed in their line of travel. This is inertial impaction, the mechanism responsible for removing most particles $\geq 10\mu$. Smaller particles that do follow streamlines may collide with solid objects if their distance of approach is less than their radius. This is direct interception. It is often the governing mechanism for droplets in the 1-10 μ range.

With sub-micron mists, Brownian capture becomes the dominant collection mechanism. This depends on Brownian motion—the continuous random motion of droplets in elastic collision with gas molecules. The smaller the particles and the lower the velocity, the greater the efficiency of Brownian capture.

Figure 3. Three basic mechanisms of mist capture.

Types of Mist Eliminators

Almost all mist elimination equipment falls into three classes: DEMISTER® knitted mesh types, assemblies of chevron-shaped blades, and fiberbeds.

The practical starting point for mist eliminator selection is always the mesh pad type. Experience with more than 250,000 mist elimination installations over the past 46 years has shown Otto York that, in most cases, DEMISTER® knitted mesh mist eliminators provide required separation efficiency at lowest installed cost. If the mist contains high loadings of solid particulates, or is highly viscous or sticky, York-Vane™ chevron types may offer a better solution. For the most difficult applications involving sub-micron particles, York-Fiberbed™ or DEMISTER®-PLUS mist eliminators often provide excellent solutions.

While these discussions and calculations will help clarify selection, your final selection should be made only after reviewing your application with an equipment manufacturer of proven expertise. The enormous fund of experience and know-how that Otto York has built up over the years can help you to make an optimum choice for your particular application. We invite you to take full advantage of this assistance.

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DEMISTER® Knitted Mesh Mist Eliminators

Bulletin 55B-2

- Easy to install in all process equipment
- Increase throughput capacity
- Prevent product loss
- Protect compressors, turbines and heat exchangers
- Improve product purity
- Available for emergency delivery

DEMISTER® Mist Eliminators What They Are

The DEMISTER® is an assembly of Yorkmesh™ knitted mesh supported on, and held down by high open area grids. It is made to any size and shape and may be installed in all new and existing process vessels. Wire used in DEMISTER® fabrication is smooth, clean, and bright for rapid liquid drainage. Stainless steels and exotic alloys are fully annealed to provide maximum corrosion resistance. Perfect fit is assured even in out-of-round vessels, eliminating all vapor by-passing.

DEMISTER® Mist Eliminators How They Work

When a vapor stream carrying entrained liquid droplets passes through a DEMISTER®, the vapor moves freely through the Yorkmesh™ but the inertia of the droplets causes them to contact the wire surfaces and be held there briefly. As more droplets collect, they grow in size, run off and fall free. Properly applied to specific process conditions, DEMISTER® mist eliminators achieve 99.9+wt % separation of liquid entrainment from any vapor stream.

Figure 1. Schematic representation of DEMISTER® operation

Design Parameters

For general design, equation 1 has been used as a velocity guideline for many years:

Equation 1: $V = K [(p_l - p_v) / p_v]^{1/2}$

	Metric	English
V = design velocity	m/sec	ft/sec
p_l = liquid density	Kg/m ³	lb/ft ³
p_v = vapor density	Kg/m ³	lb/ft ³
K = capacity factor	m/sec	ft/sec

The maximum recommended value of "K" will vary depending on a variety of factors, including mesh style and thickness, liquid viscosity and surface tension, liquid entrainment loading, content of dissolved and suspended solids, and the operating temperature and pressure.

For over 40 years, the industry has used $K = 0.107$ m/sec (0.35 ft/sec) as a standard guideline for calculations. Traditional Otto York styles (see Table 1) have become the world-wide standard in the process industry. Excellent performance is obtained from 30-110% of the calculated value. ΔP is usually negligible. <25 mm H₂O (1" WC). For high vacuum applications, high performance is routinely achieved with ΔP on the order of 2-3mm H₂O (0.1" WC).

Where to use a DEMISTER®

- **knockout drums and separators**—save on capital costs by decreasing vessel size—reduce compressor maintenance by preventing scale build-up
- **absorbers**—reduce overhead losses of glycols in dehydrators to no more than 0.0013 m³ liq/MMm³ (0.01 gal/MMSCF) natural gas—cut losses of absorption oil and amines in CO₂ systems
- **scrubbers**—reduce chemical discharges from Kraft mill smelt dissolver tank to less than 0.11 Kg/dry ton of pulp—improve scrubber efficiency by removing particulates carried in entrained liquids
- **distillation columns**—improve product purities and increase throughput capacities for petrochemicals, organic intermediates, fine chemicals
- **evaporators**—prevent carryover loss of valuable products, keep condensate TDS <10 ppm for highest quality boiler feed water—clean up vacuum ejector stream discharge—lower maintenance in vapor recompression systems
- **high pressure steam systems**—provide dry steam—cut TDS to <10 ppb in condensate—eliminate build-up on turbine blades
- **refinery towers**—increase throughput capacity—take deeper cuts for greater product yields—prolong catalyst life in downstream cracking and reforming units by reducing carbon and metals in side draws—use lower grade crudes

Over the past several years, Otto York has developed and refined a new family of styles, replacing the traditional styles Otto York originally introduced in 1950. These styles take advantage of improved knowledge on the internal wire geometry and how it affects capacity and performance. Compared to the older styles, the new Otto York styles provide:

- 20 to 40% higher design velocity (see Figure 3)
- 10 to 15% lower pressure drop (see Figure 3)
- Equal efficiency (see Figure 2)
- Equal or better corrosion and fouling resistance

For particular equipment and processes, Otto York engineers also utilize special families of mesh styles based on years of actual, in-plant performance experience to meet customer efficiency requirements. For example:

- Evaporator mist eliminators are customized to obtain customer specified steam condensate purity levels from 1 to 50 PPM.
- Steam drum mist eliminators will meet any specified steam condensate purity levels from <5 PPB to 1 PPM.
- Natural gas dehydration glycol losses to below 0.0013 m³/liquid/MMm³ (0.01 gal/MMSCF) gas have been demonstrated.

Figure 3. Pressure drop vs capacity factor. Liquid loading= 0.04m³ min/m².

Table 1: Typical DEMISTER¹ Style Improvements

Traditional Style	New Style	Capacity Gain	Efficiency Gain	Description
371	215	>35%	Same	Glass fiber & metal for maximum efficiency
326	194	>25%	Same	Ultra efficient design for fine particles
421	709	>20%	Same	Heavy duty, high efficiency design
431	172	>20%	Same	General purpose style
931	708	>20%	Same	High open area for viscous on dirty liquid

Materials of construction

All 300 and 400 series SS, alloys 200, 400, 600, 800, etc., alloy 20, titanium, tantalum, aluminum and copper, polypropylene, Teflon[®], Halar[®] and Kynar[®] and any other materials which can be drawn or extruded. Teflon[®] is a registered trademark of E.I. DuPont de Nemours and Halar[®] is a registered trademark of Ausimont. Kynar[®] is a registered trademark of Atochem.

Figure 2. Capture efficiency vs particle size for four traditional DEMISTER² knitted mesh mist eliminators.

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York-Vane™ Chevron Mist Eliminators

Bulletin 55B-3

OTTO YORK

- High gas velocities
- High liquid loadings
- For very viscous liquids
- Excellent resistance to solids fouling
- Sturdy, durable construction
- Wide variety of construction materials
- Custom-designed

York-Vane Mist Eliminators What They Are

York-Vane mist eliminators are inertial impaction devices composed of multiple parallel blades. They are assembled with wide clear channels to minimize fouling, provide unrestricted draining and enhance cleanability. Blade spacing, number of passes, turning angle and presence or absence of drainage hooks are all engineered for specific process requirements. Sturdy construction eliminates fluttering and vibration.

Figure 1. Typical York-Vane mist eliminator for vertical flow units can be fabricated up to 15.24 m (50 ft) diameter or more.

York-Vane Mist Eliminators How They Work

As liquid-laden gas enters the element, it is forced to change direction through the multiple passages of the York-Vane separator. Entrained droplets impinge on blade surfaces due to their greater inertia. Droplets coalesce into larger drops and drain by gravity. In horizontal flow design, drainage hooks channel collected liquid to the bottom of the unit. This permits higher throughput capacity. Most entrained liquid and solids are removed in the first pass. Subsequent passes remove remaining liquids and solids. Multiple pass designs result in higher efficiencies. Open channels give very low pressure drop and minimize fouling.

Materials of construction
Carbon steel all 300 and 400 series SS, Alloy 400 and nickel 200 Alloy 20, titanium, polypropylene FRP, other materials are also available

Figure 2. Left: vertical-up-flow York-Vane mist eliminator. Right: horizontal flow York-Vane mist eliminator. Note drainage hooks for higher throughput capacity.

Where to Use a York-Vane Mist Eliminator

- **scrubbers**—improve particulate removal in flue gas desulfurization systems—prevent entrainment and fouling in blast furnace, open hearth, BOF and coke oven scrubbers—reduce entrainment in asphalt heaters
- **evaporators**—limit dissolved solids to 10 ppm or less in overhead steam condensate—reduce carry-over of fibrous and dissolved solids in black liquor and other pulp mill evaporators—handle high liquid loads common in long tube rising film evaporators
- **knockout drums**—reduce drum size with horizontal flow chevron design—improve wellhead separation of crude, gas, and water—remove slugs of liquid hydrocarbons and water in pipeline separators
- **atmospheric and vacuum pipe stills**—reduce entrainment from wash oil zones where coking is a concern—minimize carbon and metals levels in side draws for deeper cuts and greater throughputs
- **other distillation columns**—remove viscous, tacky liquids to improve capacity and product purity in dewaxing, de-asphalting and de-oiling

Selected York-Vane Styles

Flow Direction		Description
Vertical	Horizontal	
1	2	Economical design, severe fouling service, lowest pressure drop
3	4	High capacity, high efficiency

W314B

Design Parameters

As with other types of mist eliminators, selection of the proper York-Vane is affected by gas and liquid properties, temperature, pressure, quantity of entrainment, particle size distribution and, of course, desired performance. For purposes of preliminary selection, determine actual velocity by using Equation 1. K values in Figure 3 usually provide good estimates of space requirements. It is good practice to over-size equipment by 10-30%. Note in Figure 5 that Δp is low—generally less than 12 mm H₂O (0.5" WC)—and is slightly higher for horizontal flow because of the drainage hooks. (Types 2 and 4)

Flow rate will vary in most processes. Figure 3 indicates turndown ratio achievable at reasonable efficiency. Using York-Vane eliminators it is possible to efficiently remove droplets as small as 10-15 microns in diameter. Figure 4 shows the performance of four standard chevrons in an air/water system. Actual droplet size separation efficiency in other systems will be affected by gas velocity and liquid and gas densities.

Equation 1: $V = K[(\rho_l - \rho_v)/\rho_v]^{1/2}$

	Metric	English
V = velocity	m/sec	ft/sec
ρ_v = vapor density	kg/m ³	lb/ft ³
ρ_l = liquid density	kg/m ³	lb/ft ³
K = capacity factor	m/sec	ft/sec

TURNDOWN CAPABILITY

	operating K value		re-entrainment point
	minimum	maximum	
vertical flow	0.04 (0.12)	0.12 (0.40)	0.16 (0.54)
horizontal flow	0.04 (0.12)	0.20 (0.65)	0.24 (0.80)

Figure 3. Turndown capability for vertical flow and horizontal flow York-Vane mist eliminators (English units in parentheses.)

Figure 4. Capture efficiency vs. particle size for four standard York-Vane mist eliminators.

Figure 5. Pressure drop vs. K-factor for standard York-Vane mist eliminators.

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Advanced Engineering Solutions for Difficult Separations Using DEMISTER®-PLUS Technology

Bulletin 55B-4

In most mist control applications, the use of a conventional DEMISTER®, York-Vane™ or York-Fiberbed™ mist eliminator alone will provide the most cost efficient solution. In some situations, however, Otto York must extend mist elimination performance using newer technology, such as DEMISTER®-PLUS or other advanced mist elimination designs, to achieve desired results. When properly engineered, these designs can increase separation efficiency, obtain higher throughput capacity, handle solids or high liquid loadings.

Increase Throughput Capacity by 50%

- Reduce new knockout drum diameter by 1/4
- Increase capacity of existing drums by 50%
- Cut debottlenecking costs & turnaround time
- Accommodate difficult installation geometries
- Minimize plot area requirements

Many mist eliminators are installed in equipment where the packing, trays or other internals determine the required flow area. In these cases, conventional capacity mist eliminators will readily meet the capacity needs. In other cases such as knockout drums and flash tanks, the mist eliminator itself establishes the required equipment size. In existing plants, debottlenecking for increased capacity often results in undersized mist eliminators at the same time that increased velocities will generate higher liquid loading.

A variety of solutions have been proposed to increase capacity. These include inclining the element or adding mesh rolls for improving liquid drainage, increasing mesh thickness or changing mesh density. Side-by-side testing of these concepts, confirmed by in plant experience, have shown that the Advanced Designs described in Bulletin 55B-2 provide more capacity than any alternative.

Even greater capacity increases are possible using Demister-Plus technology. The design, as shown in Figure 1, uses a special horizontal flow two-stage design which combines the efficiency of the Yorkmesh mist eliminator and the throughput capacity of the horizontal flow York-Vane. These designs use a space efficient concept which optimizes the utilization of the separator vessel volume. It allows throughput capacity increases of 20 to 50 percent above traditional design levels, depending on drum geometry and plant needs. In new plant construction, knockout drum and flash tank diameter can often be reduced to two-thirds of that required by conventional design. Since vessel thickness is a

direct function of vessel diameter, the actual weight of the vessel is often reduced by 50 percent. This is accomplished while maintaining separation efficiency and without increased pressure drop.

Typical Applications

- Multistage compressor knockout drums in ethylene, LNG & refinery light ends
- Flash tanks in organic and inorganic chemical processes
- Accommodates difficult geometries in sulfur condensers
- Tower retrofits to minimize glycol and amine losses in Natural Gas Treating
- Increases allowable gas capacity for existing Urea Prill Towers

Figure 1. Horizontal flow Demister-Plus system allows substantial increases in throughput capacity in any knockout or flash drum.

Efficiency Improvements

- Reduce downstream corrosion and fouling
- Assure compliance to stricter pollution regulations
- Improve recovery of high value chemicals
- Obtain highest purity overhead products

Extending the efficiency of mist removal beyond traditional levels requires an in-depth understanding of both the variables affecting mist eliminator performance, and the process itself. Otto York can choose from several efficiency improvement techniques utilizing knowledge developed from over 250,000 successful installations.

W314B

One Otto York technique for providing ultra-high efficiency separation in the 2-4 micron range is the use of a composite Yorkmesh design. A fine fiber yarn made from such materials as fluoropolymer, polypropylene, polyester or fiber glass is knitted with a metallic wire which provides the support structure for the fibers. Using special design and manufacturing techniques Otto York is now able to provide this high efficiency at gas velocities equal to that achieved with lower efficiency designs.

Even more efficient Demister-Plus mist eliminators are available for the most difficult separation problems, involving fog type entrainment below 0.5 micron diameter. As shown in Figure 2, a two stage arrangement is commonly used, where the first stage serves to coalesce the incoming entrainment at velocities significantly above its flooding velocity. A high efficiency second stage mist eliminator, matched to the performance requirements needed to collect the reentrained droplets, completes the separation.

Typical Applications

- Sulfuric acid drying tower and absorption towers
- Recovery of valuable glycol and amine solutions in natural gas treating
- Blue smoke from compressor lube oil vents
- Phosphoric acid plant emissions
- Prevent fatty acid carryover from edible oil deodorizers
- Recovery of high value catalyst from acetic acid manufacturing

Figure 2. High efficiency two stage mist eliminator, removing entrainment below 0.5 microns.

High Performance When Solids or Heavy Liquid Loads are Present

- Improve flash tank performance and reduce drum size
- Extend service life while still obtaining high efficiency

Demister-Plus systems also provide high efficiency operation in applications where capacity would be limited by unusually high liquid loadings. Using the high liquid handling capacity of the York-Vane, Demister or York-Fiberbed mist elimina-

tors can operate successfully in locations which they would otherwise flood, as shown in Figure 3.

In applications where high solids or fibrous entrainment exists, Yorkmesh or York-fiberbed operating service life is often unacceptably short. By properly combining the foul resistant York-Vane with the high efficiency of these elements it is often possible to substantially extend operating life, without sacrificing efficiency.

Typical Applications

- Black liquor and other pulping chemical evaporators
- Flash zones of lube oil vacuum towers
- Asphalt plant scrubber emissions

Figure 3. DEMISTER-PLUS up-flow system for extremely high liquid loadings. York-Vane first stage removes bulk of entrainment. DEMISTER-PLUS second stage "polishes" final gas effluent.

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