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1	WHC-SD-WM-CN-056	N/A	0	Fire in Contaminated Area	N/A	1,2	1	1	
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1	1	Cog. Eng. G. W. Ryan	<i>G. W. Ryan</i>	8/1/96	13-37				
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Fire in a Contaminated Area

G. W. Ryan

Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 602625 UC: 510
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B&R Code: EW3120071 Total Pages: 27

Key Words: fire, contaminated fire, radioactive materials, TWRS, tank farms

Abstract: This document supports the development and presentation of the following accident scenario in the TWRS Final Safety Analysis Report:

Fire in Contaminated Area.

The calculations needed to quantify the risk associated with this accident scenario are included within.

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James Bishop 8-2-96
Release Approval Date

Release Stamp

Approved for Public Release

WHC-SD-WM-CN-056 REV 0
Calculation Cover Sheet

1 of 26

Project WHC FSAR Accident Analysis		Calculation Number M-CLC-G-00235		Project Number N/A	
Title Fire in a Contaminated Area (u)		Functional Classification N/A		Sheet 1 of 26	
		Discipline MECHANICAL			
☐ Preliminary ☐ Committed ☒ Confirmed					
Computer Program No. (s) ☐ N/A				Version/Release No.	
Purpose and Objective The purpose of this calculation is to determine the onsite and offsite dose consequences resulting from a fire in a contaminated area.					
Summary of Conclusion Analysis of the Fire in a Contaminated Area accident shows that the calculated radiological dose consequences (48 rem) are above the onsite risk evaluation guidelines for an anticipated event. The calculated offsite radiological dose of 0.0046 rem is well below the risk acceptance guidelines for an anticipated event. The calculated toxic dose consequences are within the risk evaluation guidelines for both onsite and offsite receptors. Administrative controls to prohibit the movement in and around pits of vehicles without protected fuel tanks are recommended.					
Revisions					
Rev. No.	Revision Description				
0	Original Issue				
Sign Off					
Rev No.	Originator (Print) Sign / Date	Verification / Checking Method	Verifier / Checker (Print) Sign / Date	Manager (Print) Sign / Date	
0	Ronald D. Graves <i>Ronald D. Graves</i> 6-27-96	Individual Review per 57 11.41	Ted A. Long <i>Ted A. Long</i> 6-27-96	L. A. Wooten <i>L. A. Wooten</i> 6/23/96	
Classification <div style="text-align: center;"> <p>DOES NOT CONTAIN UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION</p> <p>Reviewed by: <i>K. J. D. McKenney</i> Criticality: <i>7/1/96</i> Date: <i>7/1/96</i></p> </div>					

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Fire in a Contaminated Area

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COMPUTER PROGRAMS USED

NAME	CONFIGURATION		If NO Description on page/in reference
	Control	Version	
	Yes	No	
	Yes	No	
	Yes	No	
	Yes	No	

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Fire in a Contaminated Area

CALC-NOTE CHECKLIST

REVIEWER(S):

NAME (PRINT OR TYPE)

SIGNATURE

DATE

Ted A. LongTed A. Long6-27-96

CIRCLE ONE

1. Is the Subject and/or Purpose clearly stated? ☒ Yes ☐ No
2. Are the required Input Data and their references and source provided and are they consistent with the Calc-note purpose? ☒ Yes ☐ No
3. Are the Assumptions clearly identified, valid, and consistent with the Calc-note purpose? ☒ Yes ☐ No
4. Are the Analytical Methods clearly identified? ☒ Yes ☐ No
5. Are all pages consecutively numbered and identified by the calc-note number? ☒ Yes ☐ No
6. Is/are the version(s) of the computer program(s) used identified? Yes ☐ No ☒ N/A
7. Are input listings for all computer programs documented in this calc-note? Yes ☐ No ☒ N/A
8. Are the Results and Conclusions clearly stated? ☒ Yes ☐ No
9. Are all OUTPUT documents (if not part of the calculation) clearly referenced in the results section? ☒ Yes ☐ No

IF NO TO ANY OF THE ABOVE, SHEET NUMBER(S) WITH JUSTIFICATION:

REVIEWER'S NOTES (use additional pages as necessary)

Review method used: Alternate calculation ☐ Attached: Y ☐ N ☐

Approximated Originator steps _____

line by line review

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Fire in a Contaminated Area

Introduction:Accident Description

The analyzed accident is one of a set of hazardous conditions related to fires in contaminated areas selected for analysis because of the potentially bounding combination of expected consequences and frequency of occurrence. The accident is initiated by human error in positioning a crane. The fuel tank of the crane or nearby support vehicle hits the pit curb and spills gasoline into the open pit. An ignition source is conservatively assumed and the fire results in an uncontrolled release of radioactive and toxic materials. Convection from the fire sweeps the hazardous material into the atmosphere where it is transported away from the accident via atmospheric dispersion.

The material at risk for the analyzed accident is the radioactive and toxic chemicals on the floor and walls of the pit due to leaks from waste transfers. Other hazardous conditions bounded by this accident are material waste samples carried in support vehicles, material on contaminated equipment, and fuel in vehicle gas tanks.

Reference:

1. Van Keuren, J. C. and A. V. Savino, 1996, "Tank Farm Compositions and Atmosphere Dispersion Coefficients for use in Safety Analysis Consequence Assessments", WHC-SD-WM-SARR-016, Rev. 2, Westinghouse Hanford Company, Richland, Washington.
2. DOE-HDBK-3010-94, 1994, "DOE Handbook Airborne Release Fractions/Rates and Restorable Fraction for Nonreactor Nuclear Facilities," U.S. Department of Energy, Richland, Washington.
3. WHC-SD-WM-SARR-037, 1996, "Development of Radiological Consequences and Unit Liter Doses for TWRS FSAR Radiological Consequence Calculations", Rev. 0, Westinghouse Hanford Company, Richland, Washington.
4. RDG.1 - Chapter 3, Input Validation Form (IVF) for the Fire in Contaminated Area Accident Analysis (Attachment 1)
5. Van Keuren, J. C., 1996, "Toxic Chemical Considerations for Tank Farm Releases," WHC-SD-WM-SARR-011, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

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6. D. W. Harwood and E. R. Russel, 1990, "Present Practices of Highway Transportation of Hazardous Materials", FHWA-RD-89-013, U. S. Department of Transportation.
7. H & R 522-1, 1995, "Recommended Onsite Transportation Risk Management Methodology", H & R Technical Associates, Inc. Oak Ridge, Tennessee, (prepared for Westinghouse Hanford Company Packaging Engineering)

Open Items:

This calcnote contains no open items.

Input:

- Unit Liter Doses (ULD) for aging waste are given below in Table 2 [Ref. 3, p. 10]

Table 2 ULD for Aging Waste

Waste Material	Inhalation ULD (Sv/L)	Ingestion ULD (s-m ³ /s-L)
AWF Solids	1.7×10^6	8.1
AWF Liquids	1.4×10^3	0.092

Integrated Atmospheric Dispersion Coefficients for both onsite and offsite receptors from Ref. 1 are given in Table 2. The integrated χ/Q' values are used for releases less than 2 hours in duration.

Table 4 Atmospheric Dispersion Coefficients

Receptor	Integrated χ/Q' (s/m ³)
Onsite	0.0341
Offsite	2.83×10^{-5}

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Fire in a Contaminated Area

- Dimensions of typical valve pit - The typical valve pit is 12 feet in length and 10 feet wide (inside dimension). A drain is located in one corner approximately 1 foot from the walls. The floor of the pit is sloped from the 4 walls to the drain. The elevation of the floor at walls of the pit is 1.5 inches higher than at the drain (see Attachment 2 for a sketch of a typical valve pit). [Ref. 4]

Assumptions:

- It is assumed that the material at risk is bounded by a 1 inch deep layer of dried out aging waste material on the floor of a valve pit around the drain. This is based on the observation that the lip of the drain may protrude as much as 1 inch above the floor in some pits. A typical valve pit was chosen because it is larger than the other types of pits that may contain contaminated material.
- Waste composition is assumed to be 57 vol% Aging Waste Facility (AWF) liquids and 33 vol% AWF solids. This is bounding for all possible Hanford waste transfers [Ref. 3]
- It is assumed that all of the hazardous material is available to be released during the fire and that the resuspension of any hazardous material left at the bottom of the pit as a result of the fire is negligible. This is a reasonable assumption since resuspension rate from the floor of a pit several feet below ground would be several orders of magnitude below the suspension rate due to thermal stress [Ref. 2].
- For purposes of calculating radiological dose consequences, the fire is assumed to last for less than 2 hours. This means that the more conservative annual average integrated atmospheric dispersion coefficient χ/Q' without plume meander is used to calculate dose consequence [Ref. 1]
- The airborne release fraction (ARF) and respirable fraction (RF) discussed in Mishima for the thermal stress of noncombustible powders was used in the analysis [Ref. 2, p.4-61]. This assumption bounds the release of powders and the release from contaminated surfaces [Ref. 2, p.4-61 and p. 5-21] due to thermal stress. The ARF x RF for liquid UNH under a gasoline fire with a 1 m/s wind is about a factor of 3 greater than the ARF x RF for powders.. This accident, however, will most likely involve the release of particulate from a contaminated surface rather than from a boiling liquid. For this reason the assumed ARF x RF value for noncombustible powders is believed to be sufficiently conservative.

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Fire in a Contaminated Area

- Toxicological consequences depend on the concentration of toxic material in the air [Ref. 5]. Since the risk acceptance guideline is stated in 15 minute averages, it was conservatively assumed that all of the combustible material was consumed and released in the first 15 minutes of the fire.
- A crane or a support vehicle travels no more than 150 m per day close enough to a pit for fuel from a ruptured fuel tank to flow into the pit. An assumption regarding the distance traveled by vehicles in an around pits is required in order to estimate an accident frequency.

Analytical Methods and Calculations:

The analyzed accident bounds the consequences for any of the hazards associated with fires in contaminated areas. The accident scenario assumes a 1 inch layer of dried out waste in the form of a powdery residue on the bottom of a valve pit. Fuel spills into the pit from a ruptured fuel tank and ignites. Both radioactive and toxic particulates are released to the atmosphere as influenced by the fire.

Dose consequences were calculated using the methods given in Ref. 1 for the release of both radioactive and toxic materials.

Airborne Source Term

The determination of the airborne source term follows that of Equation 1.1 in Ref. 2:

$$Q = \text{MAR} \times \text{DR} \times \text{ARF} \times \text{RF} \times \text{LPF}$$

where

Q = Source term
 MAR= Material at risk
 DR= Damage ratio
 ARF= Airborne release fraction
 RF= Respirable fraction
 LPF= Leakpath Factor

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For aerodynamic entrainment/resuspension events, the airborne release rate (ARR) is given. It is multiplied by the time that the hazardous material is subjected to the entrainment/resuspension mechanism to obtain the ARF.

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Material at Risk and Damage Ratio

The MAR is calculated for a 1 inch layer of aging waste on the floor of a valve pit that is 10 feet wide and 12 feet long. The drain is located near the corner of the pit. The elevation of the pit at the drain is 1.5 inches lower than at the walls (see Input Section). Based on the above dimensions the volume of aging waste on the pit floor is

$$MAR = 12 \text{ ft} \cdot \frac{2}{3} \cdot 10 \text{ ft} \cdot \frac{2}{3} \cdot 1 \text{ in} \cdot \frac{\text{ft}}{12 \text{ in}} \cdot \frac{1}{2} \cdot \frac{(0.3048 \text{ m})^3}{\text{ft}^3} \cdot \frac{1000 \text{ L}}{\text{m}^3} = 62.9 \text{ L}$$

The above takes in account the fact that the floor slopes towards the drain from all four walls (See the sketch of the pit floor in attachment 2). The calculation assumes that the four floor segments intersect at the drain. No credit is taken for volume occupied by the protruding drain. Since all of the waste material in the pit is assumed to be involved in the fire, DR=1.

Airborne Release Rates/Fractions, Respirable Fraction, and Leak Path Factor

In the above scenario release and dispersion of airborne particles comes from the heating of waste material in a gasoline fire. The airborne release due to the fire was conservatively assumed to be sufficiently bounded by the ARF and RF for noncombustible powders under thermal stress [Ref. 2, p.4-61]. These values are:

$$ARF = 0.006$$

$$RF = 0.02$$

Once the waste is aerosolized by the fire it leaks directly to the atmosphere, LPF=1.

Airborne Source Term

$$Q = 62.9 \text{ L} \cdot 0.006 \cdot 0.02 = 0.00755 \text{ L}$$

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Radioactive Dose Consequence Analysis

The radiological inhalation dose for the burning of waste material is given [Ref. 1]

$$D = Q \cdot \frac{\chi}{Q'} \cdot R \cdot ULD_{inhal}$$

where

Q = Quantity of respirable material released (l)

χ/Q' = Atmosphere dispersion coefficient without plume meander (s/m³)

R = Breathing rate (3.3×10^{-4} m³/s)

ULD_{inhal} = Inhalation unit liter dose

The ingestion radiological dose consequences is given by [Ref. 5]:

$$D = Q \cdot \frac{\chi}{Q'} \cdot ULD_{ing}$$

where,

ULD_{ing} = Ingestion unit liter dose

Calculation of ULD

The source material for this accident was assumed to be AWF waste composed of 33 vol% solids and 67 vol% liquids. Therefore, using the ULDs for AWF liquids and solids given in Table 2 gives

$$ULD_{inhal} = (1.7 \cdot 10^6 \cdot 0.33 + 1.4 \cdot 10^3 \cdot 0.67) \frac{Sv}{L} = 5.68 \cdot 10^5 \frac{Sv}{L}$$

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$$ULD_{inR} = (8.1 \cdot 0.33 + 0.092 \cdot 0.67) \frac{Sv}{L} = 2.76 \frac{Sv}{L}$$

Radiological Inhalation Dose Consequence

$$D_{onsite} = 0.00755L \cdot 0.0341 \frac{s}{m^3} \cdot \overset{3.3 \times 10^{-4}}{3.3} \frac{m^3}{s} \cdot 5.68 \cdot 10^5 \frac{Sv}{L} = 48.2 mSv$$

$$D_{offsite} = 0.00755L \cdot 0.0000283 \frac{s}{m^3} \cdot \overset{3.3 \times 10^{-4}}{3.3} \frac{m^3}{s} \cdot 5.68 \cdot 10^5 \frac{Sv}{L} = 0.04 mSv$$

Radiological Ingestion Dose Consequence

$$\cancel{D_{onsite}} = 0.00755L \cdot 0.0341 \frac{s}{m^3} \cdot 2.76 \frac{Sv m^3}{sL} = \cancel{1.02 mSv}$$

INGESTION DOSES ARE ONLY
CALCULATED FOR THE
OFFSITE RECEPTOR.

SEE REF. 3.

$$D_{offsite} = 0.00755L \cdot \overset{2.83 \times 10^{-5}}{0.0000283} \frac{s}{m^3} \cdot 2.76 \frac{Sv m^3}{sL} = \cancel{0.006 mSv}$$

Toxicological Dose Consequence

Toxicological dose consequences were calculated using the sum-of-fractions method of Ref.

1. In this method the released quantity is multiplied by the ARR and then multiplied by the appropriate value for Table 3-8 of Ref. 1. Table 3-8 of Ref. 1 is included as Attachment 3.

For purposes of calculating toxic releases an accident duration time 30 minutes (1800 s) is assumed. This gives an ARR of

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Fire in a Contaminated Area

$$ARR = 1/900 \text{ s}$$

The values used from Table 33-8 of Ref. 1 to calculate the toxicological consequences are given below in Table 5.

Table 5 Sum-of-Fraction of Risk Guidelines for a Unit Release of Chemicals
(From Table 3-8, Ref. 1)

Tank Waste (Units of Sum of Fractions follow Tank Waste Type)	Maximum Individual	Accident Frequency $> 10^{-2}$
Double Shell Liquids (s/L)	Onsite	1.0×10^4
Double Shell Liquids (s/L)	Offsite	8.4
Double Shell Solids (s/L)	Onsite	1.8×10^4
Double Shell Solids (s/L)	Offsite	1.9×10^2

The toxicological dose consequence are the
ore

$$D_{toxic} = \left(\frac{0.00755L}{900s} \right) \cdot \left(\frac{3.8 \cdot 10^4 s}{3L} \right) = 0.106$$

for an onsite receptor and

$$D_{toxic} = \left(\frac{0.00755L}{900s} \right) \cdot \left(\frac{(2 \cdot 8.4 + 150)}{3L} \right) = \frac{0.00057}{5.8 \times 10^{-4}}$$

After 7/31/96

for an offsite receptor.

Unmitigated Accident Frequency

This accident is caused by a human error in positioning a crane or support vehicle. The hazard analysis placed this accident in the "Anticipated" category with frequency $> 10^{-2}$ per year. However, an unmitigated accident frequency can be calculated for this given the

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number of miles per year traveled by a crane or support vehicle near a pit and the vehicle accident statistics involving fires compiled by the U. S. Department of Transportation (DOT)[Ref. 6]

The highest accident frequency per mile for trucks operating on a rural roadway is according to data compiled in [Ref. 6].

$$f_{ini} = 4.5 \cdot 10^{-6} \frac{\text{collision}}{\text{mile}}$$

This is approximately the per mile accident rate recommended for Hanford Site and is considered to be conservative for congested areas [Ref. 7, p. B-7].

The total distance traveled in a year by a crane or a support vehicle near a pit is

$$d = 365 \frac{\text{day}}{\text{year}} \cdot 150 \frac{\text{m}}{\text{day}} \cdot \frac{\text{mile}}{1609\text{m}} = 34 \frac{\text{mile}}{\text{year}}$$

The accident initiation frequency per year for the collision of a vehicle with a pit is

$$d = 4.5 \cdot 10^{-6} \frac{\text{collision}}{\text{mile}} \cdot 34 \frac{\text{mile}}{\text{year}} = .5 \cdot 10^{-4} \frac{\text{collision}}{\text{year}}$$

The frequency of a fire resulting from a collision not involving another vehicle is [Ref. 6]

$$f_{fore} = 6 \cdot 10^{-3} \frac{\text{fire}}{\text{collision}}$$

Therefore, the unmitigated event frequency for a fire in a pit due to a collision with a pit curb is estimated to be

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$$f = 6 \cdot 10^{-3} \frac{\text{fire}}{\text{collision}} \cdot 1.5 \cdot 10^{-4} \frac{\text{collision}}{\text{year}} = 9.0 \cdot 10^{-7} / \text{year}$$

Results:

The results of the calculations are given in Table 6. The radiological results are well within risk evaluation guidelines for offsite receptors but over the risk evaluation guidelines for an onsite receptor for an anticipated event.

The toxicological dose consequence results are well within the guidelines for both onsite and offsite receptors.

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Fire in a Contaminated Area

Table 5 Radiological and Toxicological Dose Consequences for Fire in a Contaminated Area

<p>Frequency: Extremely Unlikely ($10^{-6} < F \leq 10^{-4}$)</p> <p>Consequences: Calculated radiological dose exceeds the onsite guideline for an anticipated event but is within guideline for the estimated event frequency of extremely unlikely.</p>				
Receptor/ Hazard	Calculated Dose/Exposure	Risk Guidelines		
		Anticipated	Unlikely	Extremely Unlikely
Offsite/ Radiological	0.0046 rem 0.0041 rem <i>4.41E-05 7/31/96</i>	0.1 rem	0.5 rem	4 rem
Onsite/ Radiological	4.92 rem 4.82 rem <i>4.92E-05 7/31/96</i>	0.5 rem	5 rem	10 rem
Offsite/ Toxicological	0.0006	1	1	1
Onsite/ Toxicological	0.106	1	1	1

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Conclusion:

For an offsite receptor the calculated dose consequences are well within the risk evaluation guidelines. However, for an onsite receptor the calculated radiological dose is above the risk guidelines for an anticipated event. The calculations are very sensitive to the amount of material at risk and to the ARF x RF values used in the calculations. The values assumed for these quantities are believed to be sufficiently conservative; however, not enough confidence can be placed in these values to ensure that the release will remain within the calculated bin.

On the other hand, the accident frequency analysis performed above shows that the probability for this fire is "beyond extremely unlikely" using the assumed miles of vehicle travel near pits. Since the margin of error to remain in at least the "extremely unlikely" category is over 2 orders of magnitude, the consequences of this accident should be considered to be within the risk guideline.

The following Technical Safety Requirement (TSR) and Defense in Depth controls are recommended to prevent this accident. These TSRs will further reduce the accident frequency.

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Fire in a Contaminated Area

Table 6 Safety Significant Administrative Controls

Administrative Control	Safety Function	Comment
Prohibit the operation of vehicles with unprotected fuel tanks near pits	Prevent volatile fuel from flowing into a pit from a ruptured fuel tank	This would prevent the representative accident but would not prevent all of the identified hazardous conditions
Require that vehicles that operate near pits have their fuel tanks certified as rupture proof	Prevent the rupture of a fuel tank by a collision	
Require that vehicles with certified rupture proof fuel tanks be marked with an easily recognized symbol	Provide access control	
Require that barrier be erected around contaminated pits in uncontrolled areas outside of Tank Farms	Preventative	

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Table 7 Defense in Depth Controls

Administrative Control	Safety Function	Comment
Fire Protection Program at Hanford Site	Fire Prevention	The program contains a number of provision that would prevent fires in pit from causes other than ruptured fuel tanks
Fire Protection Manual (WHC-CM-4-41)	<ol style="list-style-type: none"> 1. Contains provisions for the use, storage, and handling of flammable or combustible materials at Hanford Site 2. Provides requirements for minimizing and controlling the use of combustible materials 3. Provides requirements of the use of flammable or combustible materials in nuclear facilities, stating the use and installation of such materials shall be maintained as low as reasonable achievable (ALARA) 	

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Fire in a Contaminated Area

Attachments:

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Fire in a Contaminated Area

Attachment 1

FSAR Input Validation Form for Fire in Contaminated Area

Tracking # RDG.1

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Name of Originator 1 Ronald D. Graves	Organization or Team 2 FSAR CHAPTER 3	Date 3 5/1/96
<p>Statement of Problem For the Fire in Contaminated Area accident the material at risk (MAR) is required. This is defined as the waste material that could accumulate in a pit/riser and be available for combustion.</p> <p>Assumptions:</p> <p>(1) The material at risk in this accident is bounded by a 1 in layer of waste at the bottom of a typical valve pit. The typical pit is 10 ft by 12 ft with a drain in one corner. The drain may have a 1 in lip above the floor that could cause waste from a leak to stagnate in the pit up to a depth of 1 inch at the drain. The floor of the pit slopes towards the drain from all sides of the pit. The floor elevation at the walls of the pit is 1.0 inches above the drain. Based on this fact the volume of waste is bounded by 5 ft³.</p> <p>(2) The composition of waste is 67 percent AWF liquids and 33 percent AWF solids.</p>		
4		
Alternatives 5	Consequences to Alternatives 6	
Decision Reached 7	Basis for Decision 8	
Date Requested 9	Sent To 10	Date Requested By 5/13/96
Response #1 For the purpose of this analysis, the numbers you have provided can be used. I would offer that you look at Double Shell Tank Part B Permit Application Chapt. 4.0, which has tables with pit dimensions if it becomes necessary. For the Plant response to composition of waste, see IVF-Chapter 3-H1.		
12		
Response #2 13		
Attachments (List) 14	References (List) 15	
Responder #1 Name and Signature 16 Lankford Ruffin <i>L Ruffin</i> 5-3-96	Responder #2 Name and Signature 17	
POC:	Filed:	Routed:

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Attachment 2

Sketch of Valve Pit 244-AX-A and -B

Figure 1-53. Valve Pits 241-AX-A and -B.

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Attachment 3

Sum of Fraction of Risk Guideline for a Unit Liter Release of Chemicals

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Table 3-8. Sum-of-Fraction of Risk Guidelines for a Unit Release of Chemicals and Gases. (3 sheets)

*The sum of fractions are multiplied by the release rate for continuous release and release amount for a puff releases. Release rates for continuous releases are in units of liters per second for liquids and solids, and m3/s for gases. Puff release quantities are in units of liters for solids and liquids and m3 for gases.

Tank waste type (Units of sum of fractions follow tank waste type)	Maximum individual	Accident frequency, 1/yr		
		1 - 10-2	10-2 - 10-4	10-4 - 10-6
DST or SST solid or liquid continuous release				
Single-shell liquids(s/L)	Onsite	9.6 E+03	7.5 E+02	2.0 E+02
Single-shell liquids(s/L)	Offsite	8.0 E+00	8.0 E+00	6.2 E-01
Single-shell solids(s/L)	Onsite	4.0 E+04	2.1 E+03	1.0 E+03
Single-shell solids(s/L)	Offsite	9.4 E+01	3.3 E+01	1.7 E+01
Double-shell liquids(s/L)	Onsite	1.0 E+04	7.5 E+02	2.1 E+02
Double-shell liquids(s/L)	Offsite	8.4 E+00	8.4 E+00	6.2 E-01
Double-shell solids (s/L)	Onsite	1.8 E+04	3.3 E+03	6.3 E+02
Double-shell solids(s/L)	Offsite	1.9 E+02	1.5 E+01	2.8 E+00
DST or SST liquid or solid puff release				
Single-shell liquids (L-1)	Onsite	2.8 E+03	2.2 E+02	5.7 E+01
Single-shell liquids (L-1)	Offsite	3.2 E-02	3.2 E-02	2.5 E-03
Single-shell solids (L-1)	Onsite	1.2 E+04	6.0 E+03	2.9 E+02
Single-shell solids (L-1)	Offsite	3.8 E-01	1.3 E-01	6.9 E-02
Double-shell liquids (L-1)	Onsite	2.9 E+03	2.2 E+02	6.0 E+01
Double-shell liquids (L-1)	Offsite	3.4 E-02	3.4 E-02	2.5 E-03
Double-shell solids (L-1)	Onsite	5.2 E+03	9.7 E+02	1.8 E+02
Double-shell solids (L-1)	Onsite	7.7 E-01	5.9 E-02	1.1 E-02
Flammable gas watch list composite				
Continuous Release (s/L)	Onsite	1.3 E+04	1.1 E+03	2.6 E+02
Continuous Release (s/L)	Offsite	1.4 E+01	7.2 E+00	6.1 E-01
Puff Release (L-1)	Onsite	3.7 E+03	3.2 E+02	7.7 E+01
Puff Release (L-1)	Offsite	3.4 E-02	1.7 E-02	1.4 E-03

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	G. W. Ryan	Date 8/1/96
Project Title/Work Order		EDT No. N/A 602625
Fire in a Contaminated Area		ECN No. 602625

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
C. Carro	A2-34	X			
D. S. Leach	A3-34	X			
TWRS S & L Project Files (6)	A2-26	X			
G. W. Ryan	A3-37	X			
Central Files (Original + 1)	A3-88	X			