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Hanford Site Radionuclide National Emission Standards for Hazardous Air Pollutants Unregistered Stack (Powered Exhaust) Source Assessment

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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7. Abstract The assessment of potential emissions for 39 unregistered stacks was performed. Three stacks were identified as requiring continuous monitoring as specified in 40 CFR 61, Subpart H. These stacks have potential emissions which would cause a dose to the maximum exposed individual of >0.1 mrem/yr.		
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**HANFORD SITE RADIONUCLIDE NATIONAL EMISSION
STANDARDS FOR HAZARDOUS AIR POLLUTANTS
UNREGISTERED STACK (POWERED EXHAUST)
SOURCE ASSESSMENT**

WHC-SD-EN-RPT-025, REV 0

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**HANFORD SITE RADIONUCLIDE NATIONAL EMISSION
STANDARDS FOR HAZARDOUS AIR POLLUTANTS
UNREGISTERED STACK (POWERED EXHAUST)
SOURCE ASSESSMENT**

EXECUTIVE SUMMARY

On February 3, 1993, the U.S. Department of Energy, Richland Operations Office received a Compliance Order and Information Request from the Director of the Air and Toxics Division of the U.S. Environmental Protection Agency, Region 10. The Compliance Order requires the Richland Operations Office to evaluate all radionuclide emission points at the Hanford Site to determine which are subject to continuous emission measurement requirements in 40 Code of Federal Regulations (CFR) 61, Subpart H, and to continuously measure radionuclide emissions in accordance with 40 CFR 61.93. The Information Request required the Richland Operations Office to provide a written Compliance Plan to meet the requirements of the Compliance Order. A Compliance Plan was submitted to the U.S. Environmental Protection Agency, Region 10, on April 30, 1993.

The Compliance Plan set as one of the milestones: developing a Federal Facility Compliance Agreement (FFCA). An FFCA was negotiated between RL and EPA, Region 10, and was entered into on February 7, 1994. One of the milestones of the FFCA was an assessment of the Hanford Site unregistered stacks (powered exhaust), i.e., not registered with the Washington State Department of Health, by August 31, 1994. This evaluation provides an assessment of the 39 unregistered stacks, under Westinghouse Hanford Company's management, and their potential radionuclide emissions, i.e., emissions with no control devices in place. The evaluation also determined if the effective

dose equivalent from any of these stack emissions exceeded 0.1 mrem/yr, which will require the stack to have continuous monitoring.

The result of this assessment identified three stacks, 107-N, 296-P-26 and 296-P-28, as having potential emissions that would cause an effective dose equivalent greater than 0.1 mrem/yr. These stacks, as noted by 40 CFR 61.93, would require continuous monitoring.

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1.0 INTRODUCTION

On December 15, 1989, the U.S. Environmental Protection Agency (EPA) promulgated in the *Code of Federal Regulations* (CFR) the "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities" (40 CFR Part 61, Subpart H). Subpart H requires that the emissions of radionuclides from DOE facilities shall not exceed those amounts that would cause any member of the public to receive an effective dose equivalent (EDE) of 10 mrem in a year. In addition, potential emissions of radionuclides from a facility that exceed 0.1 mrem/yr require continuous monitoring.

To determine compliance, 40 CFR 61.93 provides requirements for monitoring of radionuclide emissions from point sources. These monitoring requirements became effective upon promulgation of the regulation on December 15, 1989. Also, RL, as defined in 40 CFR 61, is an "owner or operator" of a "facility," i.e., the Hanford Site. Some monitoring systems on the Hanford Site that meet the continuous monitoring requirement do not use EPA-approved methods as specified in the regulations.

On February 3, 1993, RL received a Compliance Order and Information Request from the Director of the Air and Toxics Division of the EPA, Region 10 (McCormick 1993). The Compliance Order requires RL to evaluate all radionuclide emission points at the Hanford Site to determine which are subject to continuous emission measurement requirements in 40 CFR 61, Subpart H, and to continuously measure radionuclide emissions in accordance with 40 CFR 61.93. The Information Request required RL to provide a written Compliance Plan to meet the requirements of the Compliance Order. A Compliance Plan was submitted to EPA, Region 10, on April 30, 1993. The Compliance Plan called for developing a Federal Facility Compliance Agreement (FFCA). An FFCA was negotiated between RL and EPA, Region 10, and was entered into on February 7, 1994. The milestones in the FFCA were set to assess all radionuclide emissions. However, the schedule established a priority for the assessments. All stacks registered with the Washington State Department of Health were assessed by December 17, 1993 (WHC, 1994a). The unregistered stacks with powered exhaust and the potential to emit radionuclides are to be assessed by August 31, 1994. The assessment of diffuse and fugitive emissions of radionuclides are to be covered in the Title V air permit application to the Washington State Department of Health.

The purpose of this document is to present the assessment results for the unregistered stacks on the Hanford Site for potential emissions, i.e., emissions with no control devices in place. The document also will identify those stacks requiring continuous monitoring, i.e., the EDE from potential emissions >0.1 mrem/yr.

2.0 SCOPE

The stack assessment of potential radionuclide emissions was performed on all unregistered stacks with powered exhaust which had the potential to emit radionuclides on the Hanford Site (Table A-1, Appendix A). These emission sources represent 39 individual point sources. The methods used in assessing the potential emissions from the stacks are described.

3.0 METHODS FOR CALCULATING POTENTIAL STACK EMISSIONS

The calculation of potential emissions for the unregistered stacks were made using one of five methods:

1. Source term estimation based on Appendix D release factors
2. Back calculations based on a decontamination factor of $3,000^n$, where n equals the number of high-efficiency particulate air (HEPA) filter banks in series
3. Nondestructive assessment (NDA)
4. Upstream of HEPA filter air concentration measurements
5. Back calculations to dose rate from waste barrels

Calculations based on the first two methods are considered extremely conservative, while the calculations made using the third and fourth methods should produce realistic estimates of emissions. The last method is a screening method and was only applied to one stack: 105-N 14 ft Decon Room. This method is considered conservative in that the release factors from Appendix D are used in estimating an inventory required to produce a 0.1 mrem/yr dose to the maximum exposed individual.

3.1 APPENDIX D RELEASE FACTORS

The potential emissions for a system without control devices can be estimated based on release factors presented in 40 CFR 61, Appendix D: gases = 1, liquids or particulate solids = 1×10^{-3} , and solids = 1×10^{-6} . This method is extremely conservative, because accidents involving liquids and loose particulates have a release fraction orders of magnitude less than the 1×10^{-3} release fraction. In an accident condition for a spill of powder from a 1-m height, a 4×10^{-5} release fraction would be used. Likewise, a liquid spill from the same height would use a 1×10^{-6} release fraction. Both of these cases use a release fraction less than a 1×10^{-3} release fraction that is used for powders and liquids from Appendix D. In cases where the assessment was performed on waste tanks, if the inventory was covered by supernate the supernate was evaluated using the release factor for liquids, while the covered salt cake was estimated using a release factor for solids.

3.2 BACK CALCULATIONS BASED ON A DECONTAMINATION FACTOR OF 3,000ⁿ

This method for estimating potential emissions assumes the *Nuclear Air Cleaning Handbook* (Buchsted et al. 1976) decontamination factor (DF) of 3,000 ($DF \approx 1/[1.0 - 0.9997]$) for a HEPA filter. The method assumes that each bank in series acts independently of a preceding bank and will remove contamination with the same 3,000 decontamination factor. For a system with n banks of HEPA filters in series, the decontamination factor is 3,000ⁿ. This method can be extremely conservative for a contaminated system. When processing no longer occurs, the resuspension of contamination downstream of the HEPA filters can dominate the airborne releases from a facility. Multiplying these releases by 3,000ⁿ will overestimate the potential emissions by orders of magnitude.

3.3 NONDESTRUCTIVE ASSESSMENT

The NDA method provides a technical basis for measuring potential emissions. NDA measures gamma radiation emanating from HEPA filters and prefilters using portable gamma spectrometry. The collected data may be decay corrected to determine the curie content on the filters. This content is annualized to produce annual potential emissions for an unabated release. The drawback to this method is that alpha and beta radiation is not directly measured. However, alpha and beta activities can be conservatively estimated based on the ratios determined from measured emissions at a facility. If the HEPA filters have not been changed out since processing occurred, the curie content of the HEPA filters may reflect essentially the potential release during processing and would overestimate present releases (WHC 1994b).

3.4 UPSTREAM OF HEPA FILTER AIR CONCENTRATION MEASUREMENTS

The upstream air concentrations provide direct information on the potential emissions from a facility. This method can be applied by using continuous air monitoring (CAM) data, inserting an air sample probe for upstream measurements, or radiological analysis of removed HEPA filters. CAM data can be used if the data are taken from the process area, which contains the radionuclide inventory. Air measurements may also be collected in the ventilation system upstream of the HEPA filters. In this case, a sampling port is selected, a probe inserted, and air concentrations are measured. The final method is the sampling of the furthest upstream HEPA filters for the facility. In this case one or more HEPA filters are removed and the radiological content is analyzed either by destructive assay or by a gamma spectrometer. The airflow during the time the HEPA filter is online is used to determine the annual release rate. Each of these measurements are technically based in that the measurements represent the potential concentrations emitted from a facility without control devices.

3.5 BACK CALCULATIONS TO DOSE RATE FROM WASTE BARRELS

This method uses the measured radionuclides emitted from the stack and back calculates the dose rates necessary to produce a 0.1 mrem/yr to the MEI. The EDE to the MEI is calculated using the measured release in the CAP88 dose model. A factor is formed using the calculated EDE and 0.1 mrem/yr: factor = $0.1/\text{calculated EDE}$. This factor when multiplied to each of the measured radionuclides emitted yields the limiting potential emissions from the facility which would be less than the >0.1 mrem/yr regulatory limit from 40 CFR 61, Subpart H. Next a release factor from 40 CFR 61, Appendix D was applied: 1×10^{-3} for particulates and liquids (no solids were assumed) to determine the limiting inventory. The limiting inventory can then be compared to the actual inventory within the facility. If the actual inventory is greater than the limiting inventory then the stack is a designated stack. This method was only applied to a single stack — 105-N 14 ft Decon Room. The comparison of the limiting inventory was applied to the inventory in compacted waste drums.

Low level waste is received in the facility in drums and cardboard cartons. The waste is opened under a hood and is sorted and placed in 55 gallon drums for compaction. When the drum is filled it is sealed and radiologically surveyed before release. The radiological survey must be less than 50 mrem/hr at 1 cm before the drum can be released for shipment to the burial ground. The assessment in Appendix A for this stack provides a comparison of the measured dose rate in the drums with the dose rate calculated for the limiting inventory.

4.0 CAP88 DOSE MODELING

One of the five methods were applied to the 39 unregistered stacks to produce a potential source term for each stack. (A complete listing of the radionuclides with curies emissions are provided on individual stack assessment worksheets in Appendix A.) Once the potential source terms were determined, the source term, location, and stack height were used in a computer model to predict dose for the maximum exposed individual. The dispersion modeling was performed using an EPA-approved computer model, CAP88, with Hanford Site meteorology (Beres 1990).

The CAP88 model is able to incorporate plume rise from the stack based on the flow rate and stack diameter. After leaving the stack, the plume dispersion is modeled based on χ/Q values derived from using five years of meteorological data and a chronic release. Modeled concentrations are decreased based on dry deposition (dry deposition velocity = 1.8 cm/s). However, wet deposition is ignored because of the low incident of precipitation on the Hanford Site. The modeled concentrations are used to calculate an EDE for an offsite maximum exposed individual.

Normalized source terms were used in CAP88 for each of the major areas on site, i.e., 100, 200E, 200W, 300, 400, and 600 Areas. Five-year averaged Hanford Site meteorological data (1983-1987) taken on the site were used to compute normalized air concentrations, i.e., χ/Q , where χ is the air concentration (Ci/m³) normalized by the source term Q (Ci/s). Two stack release heights were used: 89 m (200-ft stack with a 100-ft plume rise) and 10 m (33 ft). To model an individual stack the following input was needed: the potential radiological source terms, the stack release height chosen, and the location of the stack in one of the major areas. Potential dose data were produced by the CAP88 model for each unregistered stack. When the data were analyzed, 3 stacks were identified as a potential emission that would cause an EDE greater than 0.1 mrem/yr.

5.0 RESULTS OF DOSE ASSESSMENT

Results of the dose assessment are provided in Appendix A (see Table A-1) for each of the unregistered stacks. The 107-N, 296-P-26, and 296-P-28 stacks have potential emissions to cause an EDE >0.1 mrem/yr and requires continuous monitoring (Table 1).

Table 1. Designated Stacks

Stack number	Facility	Number of HEPA filters
107-N	100N	2-3*
296-P-2	Tank Farms	2
296-P-28	Tank Farms	2

* Exhaust is through 2 or 3 stages of filtration depending on pathway.

6.0 REFERENCES

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APPENDIX A

UNREGISTERED STACK ASSESSMENTS

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UNREGISTERED STACK ASSESSMENTS

A summary table is provided to indicate the assessment method used for each stack and the result of the assessment (Table A-1). The worksheets have been included in this appendix. The headings on the worksheets indicate whether release factors from Appendix D, back calculations, nondestructive assessment or upstream air samples were used to perform the assessment. When worksheets using release factors from Appendix D are used, the inventory at risk is provided and a release fraction is applied to the inventory to provide an estimated emission. For back calculations, the 1992 or 1993 annual air concentrations¹ are multiplied by a high-efficiency particulate air (HEPA) filter factor $3,000^n$, where n indicates the number of banks of HEPA filters in series and if a prefilter exists, by a prefilter factor (3 to 20). The resulting number is the estimate of potential emissions. The worksheet for nondestructive assessment provides the curie content collected on the HEPA filters and the potential annual emissions. From the curie content an annual emission was estimated. For all of the assessments, the CAP88 model was applied with an appropriate source release height and location. The CAP88 model then used Hanford Site meteorology for the transport and diffusion to produce an effective dose equivalent to the offsite maximum exposed individual.

Appendix A is divided into 8 sections:

A1.0	B PLANT
A2.0	TANK FARMS
A3.0	222-S LABORATORY
A4.0	T PLANT
A5.0	UO ₂ PLANT
A6.0	300 AREA
A7.0	400 AREA
A8.0	100 AREA

¹WHC, 1993, *Environmental Releases for Calendar Year 1992*, WHC-EP-0527-2, Westinghouse Hanford Company, Richland, Washington.

Table A-1. Hanford Site Unregistered Stacks. (3 sheets)

Stack	NEPA Filter Stages	NESHAP Assessment method				Status of stack
		Appendix D release factors	NDA	Upstream	Back calculations	
B Plant						
296-B-12	2	Minor				Minor
296-B-22	1			Minor		Minor
296-B-23	1			Minor		Minor
296-B-24	1			Minor		Minor
296-B-25	1			Minor		Minor
296-B-26	1			Minor		Minor
296-B-27	1			Minor		Minor
Tank Farms						
296-P-26	2	Designated				Designated
296-P-28	2	Designated				Designated
296-U-11	2	Minor				Minor
222-S Laboratory						
296-S-23			Minor			Minor
T Plant						
291-T-7	1				Minor	Minor

Table A-1. Hanford Site Unregistered Stacks. (3 sheets)

Stack	HEPA Filter Stages	NESHAP Assessment method				Status of stack
		Appendix D release factors	NDA	Upstream	Back calculations	
UO ₃ Plant						
224-UA-RV-1	0			Minor		Minor
224-UA-RV-2	0			Minor		Minor
224-UA-RV-3	0			Minor		Minor
224-UA-RV-4	0			Minor		Minor
224-UA-RV-5	0			Minor		Minor
224-UA-RV-6	0			Minor		Minor
224-UA-RV-7	0			Minor		Minor
224-UA-RV-1	0			Minor		Minor
224-U-RE-1	0			Minor		Minor
224-U-RE-3	0			Minor		Minor
224-U-RE-4	0			Minor		Minor
224-U-RE-83	0			Minor		Minor
224-U-RE-84	0			Minor		Minor
224-U-RE-86	0			Minor		Minor
224-U-RE-87	0			Minor		Minor
224-U-RE-88	0			Minor		Minor
224-U-RE-91	0			Minor		Minor
224-U-RE-92	0			Minor		Minor

Table A-1. Hanford Site Unregistered Stacks. (3 sheets)

Stack	HEPA Filter Stages	NESHAP Assessment method				Status of stack
		Appendix D release factors	NDA	Upstream	Back calculations	
300 Area						
309-PR-TR	1				Minor	Minor
309-RTF-EX			Minor			Minor
340-B-BLDG	1		Minor			Minor
340-DECON	3		Minor			Minor
400 Area						
437-MN&ST	2		Minor			Minor
100 Areas						
105-N 14-ft decon room	1-2				Minor ^a	Minor
105-N transfer area	0				Minor	Minor
107-N	2				Designated	Designated
1706-KEL	0		Minor			Minor

HEPA = high-efficiency particulate air.

NDA = nondestructive assessment.

NESHAP = National Emission Standards for Hazardous Air Pollutants.

^a Back Calculation performed using a dose factor (see Section 3.5)

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A1.0 B PLANT

B Plant has seven unregistered stacks: 296-B-12, 296-B-22, 296-B-23, 296-B-24, 296-B-25, 296-B-26, and 296-B-27. None of the stacks are designated stacks.

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR 40 CFR 61, SUBPART H

RELEASE FACTORS FROM APPENDIX D SOURCE ASSESSMENT

FACILITY B-Plant/WESF DISCHARGE POINT 296-B-12

FACILITY RADIOLOGICAL INVENTORY AT RISK

Radionuclide	Physical/ Chemical Form	Quantity (curies)	Release Factor	Potential Quantity Released (curies)	Projected ^{**} Dose (mrem/yr)
1. ⁹⁰ Sr	Solid	8.625-30.000	10 ⁻⁶	.009-.03	.0004-.0013
2. ¹³⁷ Cs	Solid	1.275-4.335	10 ⁻⁶	.0013-.0043	.00003-.0001
3. _____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____	_____
11. _____	_____	_____	_____	_____	_____
12. _____	_____	_____	_____	_____	_____
13. _____	_____	_____	_____	_____	_____
14. _____	_____	_____	_____	_____	_____
15. _____	_____	_____	_____	_____	_____
16. _____	_____	_____	_____	_____	_____
Total Dose: .00043-.0014 mrem/yr					

Method Used to Project Dose (CAP88) CAP-88

COMMENTS

Stack 296-B-12 is the emergency steam jet for Stack 296-B-10. Quantities taken from 85% ¹³⁷Cs and 15% ⁹⁰Sr inventory estimate found in PNL-3397 "An Estimate of the Radioisotope Inventory Inside the K-3 Ventilation Duct, WESF" (Soldat and Brackenbrush, 1980). CAP-88 unit dose factors taken from WHC-EP-0498 (pg. A3-12), the values used were for the 10 meter stacks.

** = CAP-88 unit dose factor used for ⁹⁰Sr was 4.38E-2 and for ¹³⁷Cs was 2.39E-2 mrem/yr*Ci.

EVALUATOR James M. P. Lee
MANAGER, ENVIRONMENTAL _____
FACILITY MANAGER _____

DATE 5-4-94
DATE 5-11-94
DATE 5/17/94

6-2-94

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR 40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE SOURCE ASSESSMENT

FACILITY: B-Plant DISCHARGE POINT: 296-B-22 YEAR: 1992

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μcuries/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. LL Alpha	<u>3.32E-14</u>	<u>1.19E14</u>	<u>3.95E-6</u>	<u>8.67</u>	<u>3.42E-5</u>
2. LL Beta	<u>1.13E-13</u>	<u>1.19E14</u>	<u>13.45E-6</u>	<u>4.38E-2</u>	<u>5.89E-7</u>
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
Total Dose:					<u>3.48E-5</u>

Method Used to Project Dose (CAP88) CAP-88

COMMENTS

LL = Long Lived: Radon was suppressed when sample was analyzed. The Cap-88 Unit Dose Factors for ²³⁹Pu and ⁹⁰Sr were used to calculate the potential dose for long lived alpha and long lived beta, respectively. ²³⁹Pu and ⁹⁰Sr were used to yield conservative values for potential dose. CAP-88 dose factors were taken from WHC-EP-0498 (pg. A3-1), the values used were for the 10 meter stacks.

EVALUATOR Jim M. Riden
MANAGER, ENVIRONMENTAL on no factor
FACILITY MANAGER on no factor

DATE 5-4-94
DATE 5/11/94
DATE 5/17/94

6-6-94

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR
40 CFR 61, SUBPART N

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY: B-Plant DISCHARGE POINT: 296-B-23 YEAR: 1992

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (pcuries/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. LL Alpha	<u>3.27E-14</u>	<u>2.38E14</u>	<u>7.78E-6</u>	<u>8.67</u>	<u>6.75E-5</u>
2. LL Beta	<u>1.56E-13</u>	<u>2.38E14</u>	<u>37.13E-6</u>	<u>4.38E-2</u>	<u>1.63E-6</u>
3. _____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____	_____
11. _____	_____	_____	_____	_____	_____
12. _____	_____	_____	_____	_____	_____
13. _____	_____	_____	_____	_____	_____
14. _____	_____	_____	_____	_____	_____
15. _____	_____	_____	_____	_____	_____
16. _____	_____	_____	_____	_____	_____
Total Dose:					<u>6.91E-5</u>

Method Used to Project Dose (CAP88)

CAP-88

COMMENTS

LL = Long Lived; Radon was suppressed when sample was analyzed. The Cap-88 Unit Dose Factors for ²³⁹Pu and ⁹⁰Sr were used to calculate the potential dose for long lived alpha and long lived beta, respectively. ²³⁹Pu and ⁹⁰Sr were used to yield conservative values for potential dose. The air concentration values are the result of averaging two samples. CAP-88 dose factors were taken from WHC-EP-0498 (pg. A3-1), the values used were for the 10 meter stacks.

EVALUATOR James M. Ridge
MANAGER, ENVIRONMENTAL Health & Safety
FACILITY MANAGER [Signature]

DATE 5-4-94
DATE 5-11-94
DATE 5-15-94

C-6-94

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY: B-Plant DISCHARGE POINT: 296-B-24 YEAR: 1992

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μcuries/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. LL Alpha	<u>4.49E-14</u>	<u>2.38E14</u>	<u>10.67E-6</u>	<u>8.67</u>	<u>9.25E-5</u>
2. LL Beta	<u>1.72E-13</u>	<u>2.38E14</u>	<u>40.94E-6</u>	<u>4.38E-2</u>	<u>1.79E-6</u>
3.					
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5.					
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7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
Total Dose:					<u>9.43E-5</u>

Method Used to Project Dose (CAP88) CAP-88

COMMENTS

LL = Long Lived: Radon was suppressed when sample was analyzed. The Cap-88 Unit Dose Factors for ²³⁹Pu and ⁹⁰Sr were used to calculate the potential dose for long lived alpha and long lived beta, respectively. ²³⁹Pu and ⁹⁰Sr were used to yield conservative values for potential dose. The air concentration values are the result of averaging two samples. CAP-88 dose factors were taken from WHC-EP-0498 (pg. A3-1), the values used were for the 10 meter stacks.

EVALUATOR Jim M. Ridge
MANAGER, ENVIRONMENTAL Integrity
FACILITY MANAGER David J. [Signature]

DATE 5-4-94
DATE 5-14-94
DATE 5/15/94
6-6-94

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR
40 CFR 61, SUBPART N

UPSTREAM AIR SAMPLE SOURCE ASSESSMENT

FACILITY: B-Plant DISCHARGE POINT: 296-B-25 YEAR: 1992

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. LL Alpha	<u>2.93E-14</u>	<u>1.19E14</u>	<u>3.49E-6</u>	<u>8.67</u>	<u>3.02E-5</u>
2. LL Beta	<u>1.64E-13</u>	<u>1.19E14</u>	<u>19.51E-6</u>	<u>4.38E-2</u>	<u>8.55E-7</u>
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					

Total Dose: 3.11E-5

Method Used to Project Dose (CAP88) CAP-88

COMMENTS

LL = Long Lived: Radon was suppressed when sample was analyzed. The Cap-88
Unit Dose Factors for ^{239}Pu and ^{90}Sr were used to calculate the potential
dose for long lived alpha and long lived beta, respectively. ^{239}Pu and ^{90}Sr
were used to yield conservative values for potential dose. CAP-88 dose
factors were taken from WHC-EP-0498 (pg. A3-1). the values used were for the
10 meter stacks.

EVALUATOR Jim M. Ridge
MANAGER, ENVIRONMENTAL W. H. H. H. H.
FACILITY MANAGER W. H. H. H. H.

DATE 5-4-94
DATE 5-11-94
DATE 5-17-94
6-6-94

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR 40 CFR 61, SUBPART N

UPSTREAM AIR SAMPLE SOURCE ASSESSMENT

FACILITY: B-Plant DISCHARGE POINT: 296-B-26 YEAR: 1992

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>LL Alpha</u>	<u>6.29E-14</u>	<u>1.19E14</u>	<u>5.11E-6</u>	<u>8.67</u>	<u>6.43E-5</u>
2. <u>LL Beta</u>	<u>1.33E-13</u>	<u>1.19E14</u>	<u>15.83E-6</u>	<u>4.38E-2</u>	<u>6.93E-7</u>
3. _____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____	_____
11. _____	_____	_____	_____	_____	_____
12. _____	_____	_____	_____	_____	_____
13. _____	_____	_____	_____	_____	_____
14. _____	_____	_____	_____	_____	_____
15. _____	_____	_____	_____	_____	_____
16. _____	_____	_____	_____	_____	_____
Total Dose: <u>6.50E-5</u>					

Method Used to Project Dose (CAP88) CAP-88

COMMENTS

LL = Long Lived: Radon was suppressed when sample was analyzed. The Cap-88
Unit Dose Factors for ^{239}Pu and ^{90}Sr were used to calculate the potential
dose for long lived alpha and long lived beta, respectively. ^{239}Pu and ^{90}Sr
were used to yield conservative values for potential dose. CAP-88 dose
factors were taken from WHC-EP-0498 (pg. A3-1), the values used were for the
10 meter stacks.

EVALUATOR Jim M. Parker
 MANAGER, ENVIRONMENTAL _____
 FACILITY MANAGER _____

DATE 5-4-94
 DATE 5-11-94
 DATE 5-15-94
C-C-94

WHC-SD-EN-RPT-025, REV 0

STACK ASSESSMENT FOR 40 CFR 61, SUBPART M

UPSTREAM AIR SAMPLE SOURCE ASSESSMENT

FACILITY: B-Plant DISCHARGE POINT: 296-B-27 YEAR: 1992

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. LL Alpha	<u>3.39E-14</u>	<u>2.38E14</u>	<u>8.07E-6</u>	<u>8.67</u>	<u>7.00E-5</u>
2. LL Beta	<u>1.40E-13</u>	<u>2.38E14</u>	<u>33.32E-6</u>	<u>4.38E-2</u>	<u>1.46E-6</u>
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
Total Dose:					<u>7.15E-5</u>

Method Used to Project Dose (CAP88) CAP-88

COMMENTS

LL = Long Lived: Radon was suppressed when sample was analyzed. The Cap-88 Unit Dose Factors for ^{239}Pu and ^{90}Sr were used to calculate the potential dose for long lived alpha and long lived beta, respectively. ^{239}Pu and ^{90}Sr were used to yield conservative values for potential dose. The air concentration values are the result of averaging two samples. CAP-88 dose factors were taken from WHC-EP-0498 (pg. A3-1), the values used were for the 10 meter stacks.

EVALUATOR Jim M. Piche
MANAGER, ENVIRONMENTAL WHC
FACILITY MANAGER WHC

DATE 5-4-94
DATE 5-10-94
DATE 5-15-94
6-6-94

A2.0 TANK FARMS

Tank Farms has 3 unregistered stacks: 296-P-26, 296-P-28, and 296-U-11. The 296-P-26 and 296-P-28 are designated stacks.

STACK ASSESSMENT FOR 40 CFR 61, SUBPART E
APPENDIX D SOURCE ASSESSMENT

FACILITY 241-AV/AZ Backup DISCHARGE POINT Stack 296-P-26

FACILITY RADIOLOGICAL INVENTORY AT RISK

Radionuclide	Physical/ Chemical Form	Quantity (curies) (4)	Release Factor (4)	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. C-14	Particulate	4.97E+00	1.00E-03	4.97E-03	1.30E-03
2. Co-60	Particulate	1.74E+03	1.00E-03	1.74E+00	5.05E-02
3. Se-79 (1)	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
4. Sr-89/90	Particulate	3.95E+04	1.00E-03	3.95E+01	1.73E+00
5. Y-90 (2)	Particulate	3.95E+04	1.00E-03	3.95E+01	1.49E-02
6. Tc-99	Particulate	1.29E+05	1.00E-03	1.29E+02	1.41E-01
7. Ru/Rh-106	Gas (3)	0.00E+00	1.00E+00	0.00E+00	0.00E+00
8. Sb-125	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
9. I-129	Gas	2.48E+00	1.00E+00	2.48E+00	7.22E-01
10. Cs-134	Particulate	2.89E+00	1.00E-03	2.89E-03	9.05E-05
11. Cs-137	Particulate	9.24E+06	1.00E-03	9.24E+03	2.21E+02
12. Ce-144	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
13. Pm-147	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
14. Eu-154 (1)	Particulate	1.88E+04	1.00E-03	1.88E+01	8.23E-01
15. Nat.U	Particulate	1.88E+00	1.00E-03	1.88E-03	5.34E-03
16. Np-237	Particulate	2.44E-01	1.00E-03	2.44E-04	2.90E-03
17. Pu-238	Particulate	2.63E-01	1.00E-03	2.63E-04	2.11E-03
18. Pu-239/240	Particulate	2.50E+00	1.00E-03	2.50E-03	2.17E-02
19. Pu-241	Particulate	1.18E+01	1.00E-03	1.18E-02	1.63E-03
20. Am-241	Particulate	1.46E+02	1.00E-03	1.46E-01	1.91E+00
21. Cm-242/244	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
Total Dose:					2.26E+02

Method Used to Project Dose: CAP88

COMMENTS

1. Sr-90 used as the beta emitter; dose factors were not included in the radionuclide library for this specific radionuclide.
2. Y-90 is assumed to be in secular equilibrium with Sr-90.
3. This is a conservative estimate.
4. Supernatant data used; sludge/slurry contribution is less than 1% of the supernatant contribution to the total dose.
5. This stack is not currently registered. Operational time requires that this stack be designated.

STACK STATUS: ☒ DESIGNATED (5) ☐ NON-DESIGNATED

EVALUATOR [Signature] DATE 12/7/93

MANAGER, ENVIRONMENTAL [Signature] DATE 12-8-93

FACILITY MANAGER [Signature] DATE 12-8-93

QUALITY ASSURANCE [Signature] DATE 12/7/93

WHC-SD-EN-RPT-025, REV 0
STACK ASSESSMENT FOR 40 CFR 61, SUBPART H
APPENDIX D SOURCE ASSESSMENT

FACILITY SY Tank Farm Backup DISCHARGE POINT Stack 296-P-28

FACILITY RADIOLOGICAL INVENTORY AT RISK

Radionuclide	Physical/ Chemical Form	Quantity (curies) (4)	Release Factor (4)	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. C-14	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
2. Co-60	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
3. Se-79 (1)	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
4. Sr-89/90	Particulate	5.21E+03	1.00E-03	5.21E+00	1.35E-01
5. Y-90 (2)	Particulate	5.21E+03	1.00E-03	5.21E+00	1.16E-03
6. Tc-99	Particulate	1.04E+01	1.00E-03	1.04E-02	6.71E-06
7. Ru/Rh-106	Gas (3)	0.00E+00	1.00E+00	0.00E+00	0.00E+00
8. Sb-125	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
9. I-129	Gas	0.00E+00	1.00E+00	0.00E+00	0.00E+00
10. Cs-134	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
11. Cs-137	Particulate	7.29E+05	1.00E-03	7.29E+02	1.04E+01
12. Ce-144	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
13. Pm-147	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
14. Eu-154 (1)	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
15. Nat.U	Particulate	5.81E-04	1.00E-03	5.81E-07	9.82E-07
16. Np-237	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
17. Pu-238	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
18. Pu-239/240	Particulate	6.75E-01	1.00E-03	6.75E-04	3.48E-03
19. Pu-241	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
20. Am-241	Particulate	2.27E+00	1.00E-03	2.27E-03	1.77E-02
21. Cm-242/244	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
Total Dose:					1.05E+01

Method Used to Project Dose: CAP88

COMMENTS

1. Sr-90 used as the beta emitter; dose factors were not included in the radionuclide library for this specific radionuclide.
2. Y-90 is assumed to be in secular equilibrium with Sr-90.
3. This is a conservative estimate.
4. Supernatant data used; sludge/slurry contribution is less than 1% of the supernatant contribution to the total dose.
5. This stack is not currently registered.

STACK STATUS: X DESIGNATED (5) NON-DESIGNATED

EVALUATOR Gary M. Cannon DATE 7/14/94
 MANAGER, ENVIRONMENTAL [Signature] DATE 7-18-94
 FACILITY MANAGER [Signature] DATE 7-26-94
 QUALITY ASSURANCE [Signature] DATE 7/27/94

STACK ASSESSMENT FOR 40 CFR 61, SUBPART H
APPENDIX D SOURCE ASSESSMENT

FACILITY 244-U DCRT DISCHARGE POINT Stack 296-U-11

FACILITY RADIOLOGICAL INVENTORY AT RISK

Radionuclide	Physical/ Chemical Form	Quantity (curies)	Release Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. C-14	Particulate	1.24E-02	1.00E-03	1.24E-05	2.05E-08
2. Co-60	Particulate	1.15E+02	1.00E-03	1.15E-01	1.98E-03
3. Se-79 (1)	Particulate	4.39E-04	1.00E-03	4.39E-07	1.14E-08
4. Sr-89/90	Particulate	3.45E+04	1.00E-03	3.45E+01	8.97E-01
5. Y-90 (2)	Particulate	3.45E+04	1.00E-03	3.45E+01	7.66E-03
6. Tc-99	Particulate	1.46E-02	1.00E-03	1.46E-05	9.42E-09
7. Ru/Rh-106	Gas (3)	9.70E-03	1.00E+00	9.70E-03	1.16E-04
8. Sb-125	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
9. I-129	Gas	2.53E-05	1.00E+00	2.53E-05	2.88E-06
10. Cs-134	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
11. Cs-137 ;	Particulate	5.47E+04	1.00E-03	5.47E+01	7.77E-01
12. Ce-144	Particulate	1.15E-03	1.00E-03	1.15E-06	9.36E-09
13. Pm-147	Particulate	0.00E+00	1.00E-03	0.00E+00	0.00E+00
14. Eu-154 (1)	Particulate	7.49E+02	1.00E-03	7.49E-01	1.95E-02
15. Nat.U	Particulate	1.46E+00	1.00E-03	1.46E-03	2.47E-03
16. Np-237	Particulate	9.30E-05	1.00E-03	9.30E-08	6.56E-07
17. Pu-238	Particulate	1.99E+00	1.00E-03	1.99E-03	9.47E-03
18. Pu-239/240	Particulate	3.02E+01	1.00E-03	3.02E-02	1.56E-01
19. Pu-241	Particulate	1.20E+01	1.00E-03	1.20E-02	9.80E-04
20. Am-241	Particulate	9.84E-04	1.00E-03	9.84E-07	7.67E-06
21. Cm-242/244	Particulate	1.37E-05	1.00E-03	1.37E-08	5.64E-08

Total Dose: 1.87E+00

Method Used to Project Dose: CAP88

Operational Dose (4): 3.70E-01

COMMENTS

1. Sr-90 used as the beta emitter; dose factors were not included in the radionuclide library for this specific radionuclide.

2. Y-90 is assumed to be in secular equilibrium with Sr-90.

3. This is a conservative estimate.

4. Incorporates volumetric and time factors based on projected usage.

5. This stack is not currently registered, and is inactive. *JK 12/5/93*

STACK STATUS: DESIGNATED X NON-DESIGNATED (5)

EVALUATOR *[Signature]* DATE 12/7/93

MANAGER, ENVIRONMENTAL *[Signature]* DATE 12-8-93

FACILITY MANAGER *[Signature]* DATE 12-9-93

QUALITY ASSURANCE *[Signature]* DATE 12.12.93

A3.0 222-S LABORATORY

The 222-S Laboratory has one unregistered stacks: 296-S-23. The stacks is not designated.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

NONDESTRUCTIVE ASSESSMENT [NDA]
(In Situ Gamma Spectroscopy)

FACILITY 222 S LABORATORIES DISCHARGE POINT 296-S-23

NUMBER OF HEPA FILTER BANKS (n) 2

Emission and Effective Dose Equivalent (CAP88) values reported in the
Radionuclide Air Emissions Report for the Hanford Site, CY 1992.

Radionuclide	Empirical Quantity (Curies)	Emitted Quantity (Curies)	Unabated Potential (Curies)	Projected Dose (mrem/yr)
1. <u>Cs-137</u>	<u>$6.3 \cdot 10^{-8}$</u>	<u>—</u>	<u>$6.3 \cdot 10^{-8}$</u>	<u>$1.5 \cdot 10^{-9}$</u> (EAD = 0.0239)
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____
Total Dose				<u>$1.5 \cdot 10^{-9}$</u>

COMMENTS

No recorded emissions. Stack is unregistered.

EVALUATOR JM Bennett

DATE 18 July 94

MANAGER, ENVIRONMENTAL [Signature]

DATE 7-20-94

FACILITY MANAGER Mc Thompson

DATE 7/27/94

(for) RP Marshall

A4.0 T PLANT

T Plant has one unregistered stack: 291-T-7. The stacks is not designated.

**STACK ASSESSMENT FOR
40 CFR 61, SUBPART H**

BACK CALCULATION (3000ⁿ) SOURCE ASSESSMENT

FACILITY 2706-T (T-Plant) DISCHARGE POINT 296-T-7
 NUMBER OF HEPA FILTER BANKS (n) 1 BACK CALCULATION FACTOR 3000
 (3000ⁿ)
 Annual Air Emissions Report (year) 1993

Radionuclide	Quantity Released (Curies)	Back Calculation Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. Total Beta	6.85 E-7	3000	2.06 E-3	5.34 E-5
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____
Total Dose				<u>5.34 E-5</u>

Method Used to Project Dose (CAP88) CAP88

COMMENTS:

Calculations based on 40 hrs/wk of operation and an average flow of 10,200 CFM
Used Minimum Detectable Concentrations from 222-S Lab
296-T-7 is currently an unregistered stack
No alpha contamination present in the 2706-T Facility

Calculations:

10,200 cu ft/min x 60 min/hr x 8 hr/day x 260 days/yr = 1.27 E+9 cu ft/yr
 1.27 E+9 cu ft/yr x 28,317 cc/cu ft = 3.60 E+13 cc/yr
 3.60 E+13 cc/yr x 1.9 E-14 μ ci/cc (MDC) x 1 ci/1.0 E+6 μ ci = 6.85 E-7 ci/yr
 6.85 E-7 ci/yr x 3000 x 0.026 (CAP88 Factor) = 5.34 E-5 mrem/yr EDE

EVALUATOR

RJ Boon

DATE

4/1/94

MANAGER, ENVIRONMENTAL

[Signature]

DATE

4-4-94

FACILITY MANAGER

[Signature]

DATE

4/1/94

A5.0 UO₂ PLANT

UO₂ Plant has 17 unregistered stacks: 224-UA-RV-1, 224-UA-RV-2, 224-UA-RV-3, 224-UA-RV-4, 224-UA-RV-5, 224-UA-RV-6, 224-UA-RV-7, 224-U-RE-1, 224-U-RE-3, 224-U-RE-4, 224-U-RE-83, 224-U-RE-84, 224-U-RE-86, 224-U-RE-87, 224-U-RE-88, 224-U-RE-91, and 224-U-RE-92. None of these stacks are designated stacks.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HUPSTREAM AIR SAMPLE
SOURCE ASSESSMENTFACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-1 (G-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>2.96E-14</u>	<u>8.33E+13</u>	<u>2.47E-06</u>	<u>1.9E+00</u>	<u>4.7E-6</u>
2. <u>Gross Beta</u>	<u>2.98E-13</u>	<u>8.33E+13</u>	<u>2.48E-05</u>	<u>2.6E-02</u>	<u>6.4E-7</u>
			Total Dose		<u>5.3E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U005, 3 OTR 93, Roof Exhauster Design Flow 5,600 SCFMEVALUATOR RS JohnsonDATE 5/13/94MANAGER, ENVIRONMENTAL SP SmithDATE 5-16-94FACILITY MANAGER sa J E GiffellDATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HUPSTREAM AIR SAMPLE
SOURCE ASSESSMENTFACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-2 (H-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>4.13E-14</u>	<u>8.33E+13</u>	<u>3.44E-06</u>	<u>1.9E+00</u>	<u>6.5E-6</u>
2. <u>Gross Beta</u>	<u>2.52E-13</u>	<u>8.33E+13</u>	<u>2.10E-05</u>	<u>2.6E-02</u>	<u>5.5E-7</u>
				Total Dose	<u>7.1E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U006, 3 QTR 93, Roof Exhauster Design Flow 5.600 SCFMEVALUATOR PE JohnsonDATE 5/13/94MANAGER, ENVIRONMENTAL [Signature]DATE 5-16-94FACILITY MANAGER JE CottrellDATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-3 (J-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>5.92E-14</u>	<u>8.33E+13</u>	<u>4.93E-06</u>	<u>1.9E+00</u>	<u>9.4E-6</u>
2. <u>Gross Beta</u>	<u>1.68E-13</u>	<u>8.33E+13</u>	<u>1.40E-05</u>	<u>2.6E-02</u>	<u>3.6E-7</u>
Total Dose					<u>9.8E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U007, 3 QTR 93, Roof Exhauster Design Flow 5.600 SCFM

EVALUATOR <u>RS Johnson</u>	DATE <u>5/13/94</u>
MANAGER, ENVIRONMENTAL <u>JP Smith</u>	DATE <u>5-16-94</u>
FACILITY MANAGER <u>RS Cottrell</u>	DATE <u>5/16/94</u>

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-4 (K-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>6.24E-14</u>	<u>8.33E+13</u>	<u>5.20E-06</u>	<u>1.9E+00</u>	<u>9.9E-6</u>
2. <u>Gross Beta</u>	<u>2.44E-13</u>	<u>8.33E+13</u>	<u>2.03E-05</u>	<u>2.6E-02</u>	<u>5.3E-7</u>
Total Dose					<u>1.0E-5</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U008, 3 QTR 93, Roof Exhauster Design Flow 5,600 SCFM

EVALUATOR *R. E. Johnson*

DATE 5/13/94

MANAGER, ENVIRONMENTAL *J. E. Cottrell*

DATE 5-16-94

FACILITY MANAGER *ja J. E. Cottrell*

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-5 (L-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>4.89E-14</u>	<u>8.33E+13</u>	<u>4.07E-06</u>	<u>1.9E+00</u>	<u>7.7E-6</u>
2. <u>Gross Beta</u>	<u>2.81E-13</u>	<u>8.33E+13</u>	<u>2.34E-05</u>	<u>2.6E-02</u>	<u>6.1E-7</u>
Total Dose					<u>8.3E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U009, 3 QTR 93, Roof Exhauster Design Flow 5.600 SCFM

EVALUATOR [Signature]

DATE 5/13/94

MANAGER, ENVIRONMENTAL [Signature]

DATE 5-16-94

FACILITY MANAGER [Signature]

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HUPSTREAM AIR SAMPLE
SOURCE ASSESSMENTFACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-6 (M-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>2.89E-14</u>	<u>8.33E+13</u>	<u>2.41E-06</u>	<u>1.9E+00</u>	<u>4.6E-6</u>
2. <u>Gross Beta</u>	<u>2.47E-13</u>	<u>8.33E+13</u>	<u>2.06E-05</u>	<u>2.6E-02</u>	<u>5.4E-7</u>
				Total Dose	<u>5.1E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U010, 3 QTR 93, Roof Exhauster Design Flow 5,600 SCFMEVALUATOR RS JohnsonDATE 5/13/94MANAGER, ENVIRONMENTAL J. E. CottrellDATE 5-16-94FACILITY MANAGER J. E. CottrellDATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-UA Bldg. DISCHARGE POINT 224-UA-RV-7 (Tower Roof)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>7.34E-14</u>	<u>7.89E+13</u>	<u>5.79E-06</u>	<u>1.9E+00</u>	<u>1.1E-5</u>
2. <u>Gross Beta</u>	<u>2.89E-13</u>	<u>7.89E+13</u>	<u>2.28E-05</u>	<u>2.6E-02</u>	<u>5.9E-7</u>
Total Dose					<u>1.2E-5</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U001, 3 QTR 93, Roof Exhauster Design Flow 5.300 SCFM

EVALUATOR RS Johnson

DATE 5/13/94

MANAGER, ENVIRONMENTAL [Signature]

DATE 5-16-94

FACILITY MANAGER SE Cottrell

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-1 (E-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>-2.22E-14</u>	<u>1.19E+14</u>	<u>0.00E+00</u>	<u>1.9E+00</u>	<u>0.0E+0</u>
2. <u>Gross Beta</u>	<u>6.51E-13</u>	<u>1.19E+14</u>	<u>7.75E-05</u>	<u>2.6E-02</u>	<u>2.0E-6</u>
Total Dose					<u>2.0E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U141, 3 QTR 93, Roof Exhauster Design Flow 4,300 SCFM

EVALUATOR *RF Johnson*

DATE 5/13/94

MANAGER, ENVIRONMENTAL *AF Smith*

DATE 5-16-94

FACILITY MANAGER *JE Cottrell*

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-3 (Lucky Pot)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>8.60E-14</u>	<u>3.72E+13</u>	<u>3.20E-06</u>	<u>1.9E+00</u>	<u>6.1E-6</u>
2. <u>Gross Beta</u>	<u>4.17E-13</u>	<u>3.72E+13</u>	<u>1.55E-05</u>	<u>2.6E-02</u>	<u>4.0E-7</u>
Total Dose					<u>6.5E-6</u>

Method Used to Project Dose (CAP88) 10 m stack. 200-W Area. WHC-EP-0498

COMMENTS

Upstream Sample U131. 3 QTR 93. Roof Exhauster Design Flow 2.500 SCFM

EVALUATOR AE Johnson

DATE 5/13/94

MANAGER, ENVIRONMENTAL [Signature]

DATE 5-16-94

FACILITY MANAGER ae [Signature]

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-4 (Lucky Pot)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>8.60E-14</u>	<u>3.72E+13</u>	<u>3.20E-06</u>	<u>1.9E+00</u>	<u>6.1E-6</u>
2. <u>Gross Beta</u>	<u>4.17E-13</u>	<u>3.72E+13</u>	<u>1.55E-05</u>	<u>2.6E-02</u>	<u>4.0E-7</u>
Total Dose					<u>6.5E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U131, 3 QTR 93, Roof Exhauster Design Flow 2,500 SCFM

EVALUATOR R E Johnson

DATE 5/13/94

MANAGER, ENVIRONMENTAL J. E. Cottrell

DATE 5-16-94

FACILITY MANAGER J. E. Cottrell

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HUPSTREAM AIR SAMPLE
SOURCE ASSESSMENTFACILITY UO3 - 224-U Bldg. DISCHARGE POINT 224-U-RE-83 (A-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>3.25E-14</u>	<u>6.70E+13</u>	<u>2.18E-06</u>	<u>1.9E+00</u>	<u>4.1E-6</u>
2. <u>Gross Beta</u>	<u>4.86E-13</u>	<u>6.70E+13</u>	<u>3.26E-05</u>	<u>2.6E-02</u>	<u>8.5E-7</u>
			Total Dose		<u>5.0E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample UO11, 3 QTR 93, Roof Exhauster Design Flow 4,500 SCFM

EVALUATOR

SE JohnsonDATE 5/13/97

MANAGER, ENVIRONMENTAL

JP SmithDATE 5-16-97

FACILITY MANAGER

JA J E. CottrellDATE 5/16/97

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-84 (B-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>-1.83E-14</u>	<u>7.44E+13</u>	<u>0.00E+00</u>	<u>0.0E+00</u>	<u>0.0E+0</u>
2. <u>Gross Beta</u>	<u>6.03E-13</u>	<u>7.44E+13</u>	<u>4.49E-05</u>	<u>2.6E-02</u>	<u>1.2E-6</u>
Total Dose					<u>1.2E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U136, 3 QTR 93, Roof Exhauster Design Flow 5,000 SCFM

EVALUATOR	<u>[Signature]</u>	DATE	<u>5/13/94</u>
MANAGER, ENVIRONMENTAL	<u>[Signature]</u>	DATE	<u>5-16-94</u>
FACILITY MANAGER	<u>[Signature]</u>	DATE	<u>5/16/94</u>

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HUPSTREAM AIR SAMPLE
SOURCE ASSESSMENTFACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-86 (C-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>5.14E-14</u>	<u>7.14E+13</u>	<u>3.67E-06</u>	<u>1.9E+00</u>	<u>7.0E-6</u>
2. <u>Gross Beta</u>	<u>3.49E-13</u>	<u>7.14E+13</u>	<u>2.49E-05</u>	<u>2.6E-02</u>	<u>6.5E-7</u>
			Total Dose		<u>7.7E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U012, 3 QTR 93, Roof Exhauster Design Flow 4,800 SCFM

EVALUATOR

RF JohnsonDATE 5/13/94

MANAGER, ENVIRONMENTAL

JP SmithDATE 5-16-94

FACILITY MANAGER

JA J. E. CottrellDATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY UO3 - 224-U Bldg. DISCHARGE POINT 224-U-RE-87 (D-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>1.32E-13</u>	<u>5.66E+13</u>	<u>7.47E-06</u>	<u>1.9E+00</u>	<u>1.4E-5</u>
2. <u>Gross Beta</u>	<u>3.39E-13</u>	<u>5.66E+13</u>	<u>1.92E-05</u>	<u>2.6E-02</u>	<u>5.0E-7</u>
Total Dose					<u>1.5E-5</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U138, 3 OTR 93, Roof Exhauster Design Flow 3,800 SCFM

EVALUATOR RF Johnson

DATE 5/13/94

MANAGER, ENVIRONMENTAL RF Johnson

DATE 5-16-94

FACILITY MANAGER J.E. Cottrell

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HUPSTREAM AIR SAMPLE
SOURCE ASSESSMENTFACILITY UO3 - 224-U Bldg. DISCHARGE POINT 224-U-RE-88 (E-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>-2.22E-14</u>	<u>6.40E+13</u>	<u>0.00E+00</u>	<u>1.9E+00</u>	<u>0.0E+0</u>
2. <u>Gross Beta</u>	<u>6.51E-13</u>	<u>6.40E+13</u>	<u>4.17E-05</u>	<u>2.6E-02</u>	<u>1.1E-6</u>
			Total Dose		<u>1.1E-6</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U141, 3 QTR 93, Roof Exhauster Design Flow 4,300 SCFM

EVALUATOR

RE Johnson

DATE

5/13/94

MANAGER, ENVIRONMENTAL

J. E. Cottrell

DATE

5-16-94

FACILITY MANAGER

JA J. E. Cottrell

DATE

5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-91 (F-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>1.59E-14</u>	<u>1.49E+14</u>	<u>2.37E-06</u>	<u>1.9E+00</u>	<u>4.5E-6</u>
2. <u>Gross Beta</u>	<u>3.32E-12</u>	<u>1.49E+14</u>	<u>4.95E-04</u>	<u>2.6E-02</u>	<u>1.3E-5</u>
Total Dose					<u>1.8E-5</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U017, 3 QTR 93, Roof Exhauster Design Flow 10,000 SCFM

EVALUATOR RS Johnson

DATE 5/13/94

MANAGER, ENVIRONMENTAL [Signature]

DATE 5-16-94

FACILITY MANAGER RS Cottrell

DATE 5/16/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

UPSTREAM AIR SAMPLE
SOURCE ASSESSMENT

FACILITY U03 - 224-U Bldg. DISCHARGE POINT 224-U-RE-92 (F-Cell)

POTENTIAL RADIOLOGICAL RELEASE

Radionuclide	Air Concentration (μ curies/ml)	Annual Volume (ml)	Potential Release (curies)	Unit Dose Factor	Potential Dose (mrem/yr)
1. <u>Gross Alpha</u>	<u>1.59E-14</u>	<u>1.49E+14</u>	<u>2.37E-06</u>	<u>1.9E+00</u>	<u>4.5E-6</u>
2. <u>Gross Beta</u>	<u>3.32E-12</u>	<u>1.49E+14</u>	<u>4.95E-04</u>	<u>2.6E-02</u>	<u>1.3E-5</u>
Total Dose					<u>1.8E-5</u>

Method Used to Project Dose (CAP88) 10 m stack, 200-W Area, WHC-EP-0498

COMMENTS

Upstream Sample U017, 3 QTR 93, Roof Exhauster Design Flow 10,000 SCFM

EVALUATOR RE John

DATE 5/13/94

MANAGER, ENVIRONMENTAL [Signature]

DATE 5-18-94

FACILITY MANAGER [Signature]

DATE 5/16/94

A6.0 300 AREA

The 300 Area has four unregistered stacks: 309-PR-TR, 309-RTF-EX, 340-B-BLDG, and 340-DECON. None of these are designated stacks.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

BACK CALCULATION (3000ⁿ) SOURCE ASSESSMENT

FACILITY 309 DISCHARGE POINT 309-PR-TR
NUMBER OF HEPA FILTER BANKS (n) 1 BACK CALCULATION FACTOR 3000
(3000ⁿ)
Annual Air Emissions Report (year) 1990

Radionuclide	Quantity Released (Curies)	Back Calculation Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. <u>Pu-239</u>	<u>2.7E-7</u>	<u>3000</u>	<u>8.1E-4</u>	<u>0.04</u>
2. <u>Sr-90</u>	<u>1.5E-6</u>	<u>3000</u>	<u>4.5E-3</u>	<u>0.004</u>
3. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
4. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
5. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
6. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
7. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
8. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
9. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
10. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
11. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
12. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
13. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
14. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
15. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
16. <u></u>	<u></u>	<u></u>	<u></u>	<u></u>
Total Dose				<u>0.044</u>

Method Used to Project Dose (CAP88) WHC-EP-0498

COMMENTS

Stack height was modified during CY 1990 from 150 ft to 100 ft.

EVALUATOR J. K. Perry
MANAGER, ENVIRONMENTAL
FACILITY MANAGER

DATE 4/14/94
DATE 5-2-94
DATE 4/27/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HNONDESTRUCTIVE ASSESSMENT [NDA]
(In Situ Gamma Spectroscopy)

FACILITY 309 Building DISCHARGE POINT 309-RTF-EX
 NUMBER OF HEPA FILTER BANKS (n) 1

Emission and Effective Dose Equivalent (CAP88) values reported in the
 Radionuclide Air Emissions Report for the Hanford Site, CY 1992.

Radionuclide	Empirical Quantity (Curies)	Emitted Quantity (Curies)	Unabated Potential (Curies)	Projected Dose (mrem/yr)
1. <u>CS-137</u>	<u>$1.9 \cdot 10^{-8}$</u>	<u>—</u>	<u>$1.9 \cdot 10^{-8}$</u>	<u>$9.0 \cdot 10^{-9}$</u> (CDF = 0.472)
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____
Total Dose				<u>$9.0 \cdot 10^{-9}$</u>

COMMENTS

No recorded emissions. Stack is unregistered.

EVALUATOR gmcarnett
 MANAGER, ENVIRONMENTAL SP Smith
 FACILITY MANAGER E. Hutton

DATE 19 July 94DATE 7-20-94DATE 7-22-94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HNONDESTRUCTIVE ASSESSMENT [NDA]
(In Situ Gamma Spectroscopy)

FACILITY 340 DISCHARGE POINT 340-B
 NUMBER OF HEPA FILTER BANKS (n) 1

Emission and Effective Dose Equivalent (CAP88) values reported in the
 Radionuclide Air Emissions Report for the Hanford Site, CY 1992.

Radionuclide	Empirical Quantity (Curies)	Emitted Quantity (Curies)	Unabated Potential (Curies)	Projected Dose (mrem/yr)	EDR
1. <u>Sr-90</u>	<u>$1.9 \cdot 10^{-5}$</u>	<u>$4.8 \cdot 10^{-7}$</u>	<u>$1.8 \cdot 10^{-5}$</u>	<u>$1.5 \cdot 10^{-5}$</u>	<u>0.872</u>
2. <u>Cs-137</u>	<u>$6.5 \cdot 10^{-6}$</u>	<u>$1.8 \cdot 10^{-7}$</u>	<u>$6.7 \cdot 10^{-6}$</u>	<u>$3.3 \cdot 10^{-6}$</u>	<u>0.472</u>
3. <u>Pu-239</u>	<u>$3.7 \cdot 10^{-6}$</u>	<u>$1.0 \cdot 10^{-7}$</u>	<u>$3.8 \cdot 10^{-6}$</u>	<u>$6.5 \cdot 10^{-4}$</u>	<u>173</u>
4. _____	_____	_____	_____	_____	
5. _____	_____	_____	_____	_____	
6. _____	_____	_____	_____	_____	
7. _____	_____	_____	_____	_____	
Total Dose				<u>$6.6 \cdot 10^{-4}$</u>	

COMMENTS

The two-sigma error is 50%.
The emitted quantity is the minimum detectable activity
because no emissions were reported above that level.

EVALUATOR [Signature]DATE 3/29/94MANAGER, ENVIRONMENTAL [Signature]DATE 3-29-94FACILITY MANAGER [Signature]DATE 3/31/94

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HNONDESTRUCTIVE ASSESSMENT [NDA]
(In Situ Gamma Spectroscopy)FACILITY 340DISCHARGE POINT 340-DECONNUMBER OF HEPA FILTER BANKS (n) 3Emission and Effective Dose Equivalent (CAP88) values reported in the
Radionuclide Air Emissions Report for the Hanford Site, CY 1992.

Radionuclide	Empirical Quantity (Curies)	Emitted Quantity (Curies)	Unabated Potential (Curies)	Projected Dose (mrem/yr)	EDE
1. <u>Sr-90</u>	<u>$1.6 \cdot 10^{-3}$</u>	<u>$4.8 \cdot 10^{-2}$</u>	<u>$1.6 \cdot 10^{-3}$</u>	<u>$2.14 \cdot 10^{-3}$</u>	<u>0.822</u>
2. <u>Cs-137</u>	<u>$5.9 \cdot 10^{-4}$</u>	<u>$1.8 \cdot 10^{-2}$</u>	<u>$5.9 \cdot 10^{-4}$</u>	<u>$2.8 \cdot 10^{-4}$</u>	<u>0.492</u>
3. <u>Pu-239</u>	<u>$3.4 \cdot 10^{-4}$</u>	<u>$1.0 \cdot 10^{-2}$</u>	<u>$3.4 \cdot 10^{-4}$</u>	<u>$5.9 \cdot 10^{-2}$</u>	<u>123</u>
4. _____	_____	_____	_____	_____	
5. _____	_____	_____	_____	_____	
6. _____	_____	_____	_____	_____	
7. _____	_____	_____	_____	_____	
Total Dose				<u>0.06</u>	

COMMENTS

The two-sigma error is 61%.
The emitted quantity is the minimum detectable activity because
no emissions were reported above that level.

EVALUATOR Matthew BarnettDATE 3/29/94MANAGER, ENVIRONMENTAL [Signature]DATE 3-29-94FACILITY MANAGER [Signature]DATE 3/31/94

A7.0 400 AREA

The 400 Area has one unregistered stacks: 437-1-61. This stack is not a designated stack.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HNONDESTRUCTIVE ASSESSMENT [NDA]
(In Situ Gamma Spectroscopy)FACILITY MAF - 400 AreaDISCHARGE POINT 437-1-61UnregisteredNUMBER OF HEPA FILTER BANKS (n) 2Emission and Effective Dose Equivalent (CAP88) values reported in the
Radionuclide Air Emissions Report for the Hanford Site, CY 1992.

Radionuclide	Empirical Quantity (Curies)	Emitted Quantity (Curies)	Unabated Potential (Curies)	Projected Dose (mrem/yr)	
1. <u>Cs-137</u>	<u>$5.6 \cdot 10^{-7}$</u>	<u>< detect.</u>	<u>$5.6 \cdot 10^{-7}$</u>	<u>$1.8 \cdot 10^{-8}$</u>	<u>EDE = 0.0317</u>
2. _____	_____	_____	_____	_____	
3. _____	_____	_____	_____	_____	
4. _____	_____	_____	_____	_____	
5. _____	_____	_____	_____	_____	
6. _____	_____	_____	_____	_____	
7. _____	_____	_____	_____	_____	
Total Dose				<u>$1.8 \cdot 10^{-8}$</u>	

COMMENTS

Cs-137 detection threshold: MDC = $7.0 \cdot 10^{-15}$ μ Ci $\cdot$ cc⁻¹.
No alpha or beta emissions expected.

EVALUATOR *[Signature]*DATE 26 April 1994MANAGER, ENVIRONMENTAL *[Signature]*DATE 4-26-94FACILITY MANAGER *[Signature]*DATE 4-27-94

A8.0 100 AREA

The 100 Area has four unregistered stacks: 105-N 14-ft decon room, 105-N Transfer Area, 107-N, and 1706-KEL. The 107-N stack is a designated stack.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

RELEASE FACTORS FROM APPENDIX D
SOURCE ASSESSMENT

FACILITY 100-N Reactor DISCHARGE POINT 14' Decon Stack

FACILITY RADIOLOGICAL INVENTORY AT RISK

See attached memo for details.

COMMENTS

The observed stack releases provide the ratio of the curies of radionuclides released from a facility. Using these ratios and the EDE to the MEI, a factor can be calculated for the potentially released radionuclides that could cause an EDE of $\leq 0.1 \text{ mrem y}^{-1}$. This factor used with the ratio of the radionuclides provides the potential emissions from the stack that would still be less than the $>0.1 \text{ mrem y}^{-1}$ requirement for requiring continuous monitoring of a stack. With knowledge of the inventory a proper release fraction can be chosen from 40 CFR 61 Appendix D (see 3.1) to determine the limiting inventory in a facility that ventilates to the stack. This method was applied to the 105-N-Decon stack. The facility that ventilates to this stack is used for repackaging low level radionuclide contaminated material into drums using a compactor. Further calculations were made to determine the curie content of the drums and the dose for the drums based on the limiting condition of $\leq 0.1 \text{ mrem y}^{-1}$. The average dose rate for a drum at the 105-N-Decon was calculated to be approximately 1300 mrem/hr at 1 cm. Since each drum is surveyed before release a comparison can be made with the observed dose rate to the 1300 mrem/hr. All of the drums from this facility are shipped to a low level burial ground with a limiting dose rate per drum of 50 mrem hr^{-1} at 1 cm. Since all drums have met this criteria, the stack was declared a non designated stack (. see appendix A.8.)

D. J. Lubman
EVALUATOR

DATE 7-18-94

A. Smith
MANAGER, EFFLUENT EMISSIONS MONITORING

DATE 7-18-94

M. R. Horta
ENVIRONMENTAL COMPLIANCE OFFICER

DATE 7/21/94

R. Sumner
FACILITY MANAGER

DATE 7.21.94

105-N Waste Facility - Calculation to Demonstrate Compliance with Effluent Monitoring Requirements

Nuclide	---From CAP88-PC--- 1993		Multiplier for 0.1 mrem/y: 3.29E+05	Hypothetical Facility Effluent and Inventory Resulting in a dose of 0.1 mrem/y to MEI	
	Releases (Ci/y)	Dose at 8500 m WNW (mrem/y)		Release (Ci/y)	Inventory (Ci/y)**
CO-60	5.30E-08	2.10E-08		1.74E-02	1.74E+01
SR-90	6.90E-08	3.39E-08		2.27E-02	2.27E+01
Y-90*	6.90E-08	1.05E-10		2.27E-02	2.27E+01
CS-137	6.90E-08	1.90E-09		2.27E-02	2.27E+01
BA-137M*	6.90E-08	2.39E-08		2.27E-02	2.27E+01
EU-154	4.30E-07	1.38E-07		1.41E-01	1.41E+02
PU-239	5.10E-10	4.26E-08		1.68E-04	1.68E-01
AM-241	2.10E-09	4.30E-08		6.90E-04	6.90E-01
Total		3.04E-07			

Estimated External Dose Rate for Waste Drums using Hypothetical Building Inventory

Nuclide	Hypothetical Facility Inventory (Ci/y)	Average Waste Drum Content*** (Ci/drum)	Unit Dose Rate (rem/h per Ci in drum)		Total Dose Rate (mrem/h per avg. drum)	
			Detector Distance:		Detector Distance:	
			1 cm	1 m	1 cm	1 m
CO-60	1.74E+01	6.96E-02	3.80E+00	2.55E-01	2.65E+02	1.78E+01
SR-90	2.27E+01	9.07E-02	7.81E-05	6.13E-06	7.08E-03	5.56E-04
Y-90*	2.27E+01	9.07E-02	6.28E-03	4.49E-04	5.69E-01	4.07E-02
CS-137/BA-137M*	2.27E+01	9.07E-02	6.93E-01	4.76E-02	6.28E+01	4.32E+00
EU-154	1.41E+02	5.65E-01	1.71E+00	1.16E-01	9.66E+02	6.55E+01
PU-239	1.68E-01	6.70E-04	3.81E-05	2.88E-06	2.55E-05	1.93E-06
AM-241	6.90E-01	2.76E-03	8.97E-04	1.05E-04	2.48E-03	2.90E-04
Total					1.29E+03	8.77E+01

* These decay products were assumed to be in equilibrium with the parent radionuclide

** Based on 40 CFR 61 Appendix D Method - i.e. release fraction of 0.001 for all nuclides and no emission controls

*** Assumes hypothetical annual inventory for facility is equally distributed among the 250 drums processed annually

WHC-SD-EN-RPT-025, REV 0
WHC ENVIRONMENTAL RELEASE SUMMARY

03/28/94

09:45

1AN05DCN: 14' DECON FACILITY PARTICULATE (Y259, Y260)

01/01/93 through 12/31/93

Total System Flow: 9.5E+10 Liters = 3.4E+09 Cubic Ft

Radionuclide	Release, Ci	Concentrations, $\mu\text{Ci/ml}$	
		Average	Peak
K-40	7.1E-06	7.5E-14	2.7E-13
Co-60	5.3E-08	5.6E-16	4.9E-15
Sr-90	6.9E-08	7.2E-16	6.5E-15
Zr-95	ND	72.3E-15	n/a
Ru-106	ND	74.3E-16	n/a
Sb-125	ND	79.6E-16	n/a
Cs-134	ND	<2.2E-17	n/a
Cs-137	6.9E-08	7.3E-16	3.4E-15
Ce-144	ND	71.2E-15	n/a
Eu-154	4.3E-07	4.5E-15	2.6E-14
Eu-155	ND	79.5E-16	n/a
Pu-238	ND	71.4E-18	n/a
Pu239/40	5.1E-10	5.4E-18	1.7E-17
Am-241	2.1E-09	2.2E-17	2.1E-16
Total α	2.7E-09	2.8E-17	2.9E-16
Total β	1.2E-07	1.3E-15	8.0E-15

? A question mark ("?") indicates an average concentration less than a negative value.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART HBACK CALCULATION (3000ⁿ) SOURCE ASSESSMENT

FACILITY 100N DISCHARGE POINT 105 N TRANSFER AREA
 NUMBER OF HEPA FILTER BANKS (n) 0 BACK CALCULATION FACTOR 1
 (3000ⁿ)
 Annual Air Emissions Report (year) 1993

Radionuclide	Quantity Released (Curies)	Back Calculation Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. _____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____
11. _____	_____	_____	_____	_____
12. _____	_____	_____	_____	_____

Method Used to Project Dose (CAP88) X Total Dose 1.4×10^{-7} mrem/yr

COMMENTS

SEE ATTACHMENTS FOR DETAILS

Dale P. Duchman
EVALUATOR

DATE 5-12-94

Mark R. Mota
MANAGER, EFFLUENT EMISSIONS MONITORING

DATE 5-15-94

Mark R. Mota
ENVIRONMENTAL COMPLIANCE OFFICER

DATE 5/23/94

Mark R. Mota
FACILITY MANAGER

DATE 5-25-94

CAP-88 and GENII Dose Calculations for Annual Emissions

CAPDF.WR1 by Paul D. Rittmann, PhD CHP

Revision 1.0 Dec 1991

Reference: WHC-EP-0498, "Unit Dose Calculation Methods and Summary of Facility Effluent Monitoring Plan Determinations", November 1991

Step 1: If you are using GENII doses, you have a choice of dose factor libraries, so answer the question on the next line.

N

Use the Worst Case GENII Library? (Y/N) n

PNL GENII

Currently: The PNL Default library will be used.

Step 2: Page down to the area which has the release.

(Choices are 100, 200-E, 200-W, 300, or 400 Area)

Step 3: Enter the total curies released during the year in the columns labelled "Release Amount Ci/yr". Note that the 89 meter column is strictly for releases out the 200 foot stacks.

Step 4: Read the total dose (mrem/yr) at the top of the columns labelled "CAP-88 (mrem/yr)" and "GENII (mrem/yr)".

100-N Area			Maximum Individual is 9.9 km West				PNL GENII 100-N Area				GENII Version 1.485	
Totals:			1.4E-07 mrem/yr		1.1E-07 mrem/yr							
Release Amount Ci/yr			CAP-88 (mrem/yr)		GENII (mrem/yr)		CAP-88 (mrem)			PNL Default		
Nuclide	10 meter	89 meter	10 m	89 m	10 m	89 m	Nuclide	10 meter	89 meter	10 m	89 m	
Co-60	2.30E-07	0.00E+00	9.8E-09	0.0E+00	3.7E-09	0.0E+00	Co-60	4.28E-02	1.29E-02	1.6E-02	4.7E-03	
Sr-90	1.00E-07	0.00E+00	6.5E-09	0.0E+00	5.9E-09	0.0E+00	Sr-90	6.45E-02	1.94E-02	5.9E-02	1.8E-02	
Ru-106	1.80E-06	0.00E+00	5.5E-08	0.0E+00	4.3E-08	0.0E+00	Ru-106	3.08E-02	9.26E-03	2.4E-02	7.1E-03	
Sb-125	5.40E-07	0.00E+00	3.3E-09	0.0E+00	1.1E-09	0.0E+00	Sb-125	6.13E-03	1.84E-03	2.1E-03	6.3E-04	
Eu-155	3.30E-07	0.00E+00	9.0E-10	0.0E+00	6.6E-10	0.0E+00	Eu-155	2.73E-03	8.20E-04	2.0E-03	5.8E-04	
Pu-239	1.40E-09	0.00E+00	1.8E-08	0.0E+00	1.5E-08	0.0E+00	Pu-239	1.28E+01	3.85E+00	1.1E+01	3.3E+00	
Am-241	2.30E-09	0.00E+00	4.5E-08	0.0E+00	3.9E-08	0.0E+00	Am-241	1.94E+01	5.82E+00	1.7E+01	5.1E+00	
(end of 100 Area)												

WHC-SD-EN-RPT-025, REV 0
WHC ENVIRONMENTAL RELEASE SUMMARY

03/28/94

09:46

1AN05TRN: TRANSFER AREA PARTICULATE (Y261, Y262)

01/01/93 through 12/31/93

Total System Flow: 3.1E+11 Liters = 1.1E+10 Cubic Ft

Radionuclide	Release, Ci	Concentrations, $\mu\text{Ci/ml}$	
		Average	Peak
K-40	2.4E-05	7.7E-14	2.2E-13
Co-60	2.3E-07	7.4E-16	3.2E-15
Zn-65	ND	-1.3E-15	1.2E-14
Sr-90	1.0E-07	3.2E-16	2.1E-15
Zr-95	1.1E-06	3.6E-15	4.2E-15
Ru-106	1.8E-06	5.8E-15	2.3E-14
Sb-125	5.4E-07	1.7E-15	6.2E-15
Cs-134	ND	?1.1E-15	n/a
Cs-137	ND	-2.7E-16	3.8E-15
Ce-144	ND	<6.8E-15	n/a
Eu-154	ND	?1.0E-15	n/a
Eu-155	3.3E-07	1.1E-15	1.0E-14
Pu-238	ND	<1.6E-19	n/a
Pu239/40	1.4E-09	4.6E-18	1.4E-17
Am-241	2.3E-09	7.5E-18	1.4E-17
Total α	ND	?5.4E-17	n/a
Total β	ND	-3.0E-16	5.4E-15

? A question mark ("?) indicates an average concentration less than a negative value.

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

BACK CALCULATION (3000ⁿ) SOURCE ASSESSMENT

FACILITY 100-N DISCHARGE POINT 107-N
NUMBER OF HEPA FILTER BANKS (n) 2 BACK CALCULATION FACTOR 9x10⁶
(3000ⁿ)
Annual Air Emissions Report (year) 1993

Radionuclide	Quantity Released (Curies)	Back Calculation Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
1. ⁶⁰ Co	3.7x10 ⁻⁸	9x10 ⁶	0.333	0.014
2. ⁹⁰ Sr	1.0x10 ⁻⁸	9x10 ⁶	0.09	0.006
3. ¹⁰⁶ Ru	7.6x10 ⁻⁷	9x10 ⁶	6.84	0.210
4. ¹³⁴ Cs	6.0x10 ⁻⁹	9x10 ⁶	0.054	0.002
5. ¹³⁷ Cs	2.4x10 ⁻⁸	9x10 ⁶	0.216	0.008
6. ¹⁵⁵ Eu	1.6x10 ⁻⁸	9x10 ⁶	0.144	0.0004
7. ²³⁸ Pu	6.6x10 ⁻¹⁰	9x10 ⁶	0.006	0.070
8. ^{239,240} Pu	7.3x10 ⁻¹⁰	9x10 ⁶	0.007	0.084
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
Total Dose				0.40

Method Used to Project Dose (CAP88) X

COMMENTS

EVALUATOR WE Davis
MANAGER, ENVIRONMENTAL
FACILITY MANAGER [Signature]

DATE 8/2/94
DATE 8-2-94
DATE 8/2/94

**STACK ASSESSMENT FOR
40 CFR 61, SUBPART H**

**NONDESTRUCTIVE ASSESSMENT [NDA]
(In Situ Gamma Spectroscopy)**

FACILITY 100 K Area DISCHARGE POINT 1706-KEL
 NUMBER OF HEPA FILTER BANKS (n) 1

Emission and Effective Dose Equivalent (CAP88) values reported in the Radionuclide Air Emissions Report for the Hanford Site, CY 1992.

Radionuclide	Empirical Quantity (Curies)	Emitted Quantity (Curies)	Unabated Potential (Curies)	Projected Dose (mrem/yr)
1. <u>Cs-137</u>	<u>$2.0 \cdot 10^{-7}$</u>	<u>0</u>	<u>$2.0 \cdot 10^{-7}$</u>	<u>$7.0 \cdot 10^{-9}$</u>
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____

Total Dose $7.0 \cdot 10^{-9}$

COMMENTS

Cs-137 RDE = 0.0353
No emissions recorded or other isotopes expected
in air stream.

EVALUATOR J. M. Bennett
 MANAGER, ENVIRONMENTAL A. P. Smith
 FACILITY MANAGER R. B. Quinn

DATE 2 Aug 94
 DATE 8-2-94
 DATE 8/2/94

**DATE
FILMED**

9/16/94

END

[Redacted]

[Redacted]

[Redacted]