ENCLOSURE 1

NEDC 05-031, Rev. 1

Radiological Dose Analysis for a Fuel Handling Accident (FHA) At Cooper Nuclear Station

Title: Review of Alion Calculation ALION-CAL-NPPD-3236-001, Radiological Dose Analysis for a Fuel Handling Accident (FHA) at Cooper Nuclear Station	Calculation Number: NEDC 05-031 CED/EE Number: N/A
System/Structure: HV, SGT, SC	Setpoint Change/Part Eval Number: N/A
Component: N/A	Discipline: Mechanical Design
Classification: [X] Essential; [ ] Non-Essential	SQAP Requirements Met? [ ] Yes; [X] N/A

Proprietary Information Included? [ ] Yes; [X] No

Description:

PURPOSE:
This calculation incorporates by attachment Alion Science & Technology Calculation No. ALION-CAL-NPPD-3236-001, Rev. 0, in accordance with CNS Engineering Procedure 3.4.7. The calculation determines the dose to a Control Room occupant and to a person at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ) at the Cooper Nuclear Station site following a design basis Fuel Handling Accident (FHA). The analysis is performed using an Alternate Source Term (AST) in accordance with the guidance provided by the NRC in Regulatory Guide 1.183 (July 2000) and as authorized by 10 CFR 50.67. This calculation has been prepared as a Status 2 calculation for NRC review and will be as-built upon NRC approval.

Rev. 1 incorporates Rev. 1 of Alion's calculation, which was revised primarily to incorporate an additional Case 1 analysis to determine total Control Room dose assuming 168 hour fuel decay time before fuel movement and without CREFS operation.

RESULTS AND CONCLUSIONS:
The results are tabulated in Section 5 of Alion's calculation for each of the three (3) receptor locations:
1. Control Room,
2. Low Population Zone (LPZ), and
3. Exclusion Area Boundary (EAB).

All calculated doses were found to be below the stipulated limits. It is therefore concluded that the regulatory dose limits will not be exceeded following a postulated design basis FHA at Cooper Nuclear Station.

ATTACHMENTS:
1. Alion calculation ALION-CAL-NPPD-3236-001, Rev. 1 (including attachments thereto)
2. GE Letters REK:99-152 and REK:99-211 (References 6.10 and 6.9 of Alion's calculation)

Rev. Number	Status	Prepared By/Date	Reviewed By/Date	IDVed By/Date	Approved By/Date
1	2	Alion Science & Technology 9/26/05	Jim Drasler 9/28/05	N/A	Kyle Hilgenfeld 9/29/05
0	2	Alion Science & Technology 8/25/05	Jim Drasler	N/A	Todd Stevens

Status Codes
1. Active
2. Information Only
3. Pending
4. Superseded or Deleted
5. OD/OE Support Only
6. Maintenance Activity Support Only
7. PRA/PSA

Nebraska Public Power District

DESIGN CALCULATION CROSS-REFERENCE INDEX

ITEM NO.	DESIGN INPUTS	REV. NO.	PENDING CHANGES TO DESIGN INPUTS
1	Refer to Attachment 1 listing, page 4		

Nebraska Public Power District

DESIGN CALCULATION CROSS-REFERENCE INDEX

ITEM NO.	AFFECTED DOCUMENTS	REV. NUMBER
	N/A for a Status 2 calculation	

Page: 4 of 6
NEDC: 05-031
Rev. Number: 1

The purpose of this form is to assist the Preparer in screening new and revised design calculations to determine potential impacts to procedures and plant operations.®[1]

	SCREENING QUESTIONS	YES	NO	UNCERTAIN
1.	Does it involve the addition, deletion, or manipulation of a component or components which could impact a system lineup and/or checklist for valves, power supplies (breakers), process control switches, HVAC dampers, or instruments?	[ ]	[X]	[ ]
2.	Could it impact system operating parameters (e.g., temperatures, flowrates, pressures, voltage, or fluid chemistry)?	[ ]	[X]	[ ]
3.	Does it impact equipment operation or response such as valve closure time?	[ ]	[X]	[ ]
4.	Does it involve assumptions or necessitate changes to the sequencing of operational steps?	[ ]	[X]	[ ]
5.	Does it transfer an electrical load to a different circuit, or impact when electrical loads are added to or removed from the system during an event?	[ ]	[X]	[ ]
6.	Does it influence fuse, breaker, or relay coordination?	[ ]	[X]	[ ]
7.	Does it have the potential to affect the analyzed conditions of the environment for any part of the Reactor Building, Containment, or Control Room?	[ ]	[X]	[ ]
8.	Does it affect TS/TS Bases, USAR, or other Licensing Basis documents?	[ ]	[X]	[ ]
9.	Does it affect DCDs?	[ ]	[X]	[ ]
10.	Does it have the potential to affect procedures in any way not already mentioned (refer to review checklists in Procedure EDP-06)? If so, identify:	[ ]	[X]	[ ]

_____

_____

_____

If all answers are NO, then additional review or assistance is not required.

If any answers are YES or UNCERTAIN, then the Preparer shall obtain assistance from the System Engineer and other departments, as appropriate, to determine impacts to procedures and plant operations. Affected documents shall be listed on Attachment 2.

Nebraska Public Power District

DESIGN CALCULATIONS SHEET

PURPOSE

This calculation incorporates by attachment Alion Science & Technology Calculation No. ALION-CAL-NPPD-3236-001, Rev. 0, in accordance with CNS Engineering Procedure 3.4.7. The calculation determines the dose to a Control Room operator and to a person at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ) at the Cooper Nuclear Station site following a design basis Fuel Handling Accident (FHA). The analysis is performed using an Alternate Source Term (AST) in accordance with the guidance provided by the NRC in Regulatory Guide 1.183 (July 2000) and as authorized by 10 CFR 50.67. This calculation has been prepared as a Status 2 calculation for NRC review and will be as-built upon NRC approval.

Rev. 1 incorporates Rev. 1 of Alion's calculation, which was revised primarily to incorporate an additional Case 1 analysis to determine total Control Room dose assuming 168 hour fuel decay time before fuel movement and without CREFS operation. In addition, Rev. 1:

- Added additional Assumption (9)
- Added Bromine source term table (Table 3)
- Added un-decayed activity source term table (Table 4)
- Added Bromine evaluation per RG1.183 conformance
- Nuclear inventory modified to 29 isotopes to accommodate bromines
- Shine analysis modified to provide a qualitative estimate of dose.
- Incorporated various typos and rewording

EXTENT OF REVIEW

Alion's calculation was performed under their own QA program, which included an independent technical review. Therefore, the NPPD review does not include in-depth checks of mathematical calculations, but rather focuses on general acceptability of design inputs, assumptions, methodology, and conclusions. Any significant comments or concerns identified during the review have been resolved with Alion and incorporated.

REVIEW SUMMARY

Alion's calculation is organized into a single main portion along with Attachments A through H, which include the computer files as well as Alion's Design Review Checklist.

1. **Purpose** - The purpose of the calculation is as given above and as stated in Section 1 of Alion's calculation. This section was reviewed and found to be acceptable.

2. Design Inputs - Design Inputs are contained in the Cross Reference Index given on page 4 of Alion's calculation and are discussed in Section 2 of Alion's calculation. The design inputs were reviewed and found to be acceptable. Non-status 1 inputs were verified using additional information and were found to be acceptable for use in this calculation.

Although Alion identified some documents as having been affected in the Cross Reference Index, it is noted that this calculation is Status 2, awaiting review by the NRC. The affected documents will be identified when the NRC has completed its review, the calculation changes to Status 1, and an implementing document is completed. Until that occurs, there are no affected documents.

3. Assumptions - Major assumptions are identified in Section 3 of Alion's calculation. Additional assumptions are inferred in the input documents used and identified throughout Alion's calculation by inference according to context and use. The assumptions were reviewed and found to be acceptable.

4. Methodology - The methodology is described in Section 4 of Alion's calculation. The methodology was reviewed and found to be acceptable.

5. Results / Conclusions - Results and conclusions are given in Section 5 of Alion's calculation. The results and conclusions were reviewed and found to be acceptable.

All calculated doses are below the corresponding regulatory limits.

6. References - References are listed in Section 6 of Alion's calculation. The references were reviewed and found to be acceptable.

7. Attachments

1. Alion calculation ALION-CAL-NPPD-3236-001, Rev. 1 (including attachments thereto)
2. GE Letters REK:99-152 and REK:99-211 (References 6.10 and 6.9 of Alion's calculation)

ALION
SCIENCE AND TECHNOLOGY

TECHNICAL DOCUMENT COVER SHEET

Document No: ALION-CAL-NPPD-3236-001	Revision: 1	Page 1 of 168

Document Title: Radiological Dose Analysis for a Fuel Handling Accident (FHA) at Cooper Nuclear Station

Project No: NPPD-3236

Project Name: AST Methodology Implementation at CNS

Client: Nebraska Public Power District (NPPD)

Document Purpose/Summary:
The purpose of this calculation is to determine the dose to the control room occupant and to a person at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ) at the Cooper Nuclear Station site following a design basis Fuel Handling Accident (FHA). The analysis is performed using an Alternate Source Term (AST) in accordance with the guidance provided by the NRC in Regulatory Guide 1.183 (July 2000) and as allowed by 10 CFR 50.67.
All calculated doses are shown to be below the regulatory limits for all three stipulated locations.

Per NPPD General Services Agreement No. 05A-MS3, Task Authorization 4700000649, Revision 0, July 15, 2005, the format of this calculation meets the requirements of Nebraska Public Power District procedure NPPD CNS Operations Manual Engineering Procedure 5.4.7 "Design Calculations", revision 26. Although the calculation format of the NPPD procedure differs slightly from ALION procedure QAP 3.4, Design Calculation and Analysis, revision 5, the formats are similar enough to ensure that the technical and programmatic content of the calculation is neither jeopardized nor compromised and meets the intent of the ALION and NPPD Quality Assurance programs.

This calculation is safety related and complies with the Alion Science and Technology QA Program.

All software used in the preparation of this calculation was done so in accordance with QAP 3.5, *Use of Computer Software and Error Reporting* latest revision.

Preparer Signature: Date:

Design Verification Method:	QA Applicability Level:
X Design Review	X Nuclear Safety Related
___ Alternative Calculation	___ Quality Significant
___ Qualification Testing	___ Nuclear Non-Safety Related

Professional Engineer (if required) Approval NA Date

Prepared By:	Peter Broglio (Printed/Typed Name)	Peter Broglio (Signature)	9/24/2005 (Date)
Section 5.3 Prepared By: Reviewed By 1-5.2	Jan Bostelman (Printed/Typed Name)	Jan Bostelman (Signature)	9/26/2005 (Date)
Reviewed By: Section 5.3	Terry Heames (Printed/Typed Name)	Terry Heames (Signature)	9/26/2005 (Date)
Approved By:	D.F. Lincoln (Printed/Typed Name)	D.F. Lincoln (Signature)	9/26/05 (Date)

NEDC 05-031 Rev 1
Att 1 page 1 of 170

ALION SCIENCE AND TECHNOLOGY	REVISION HISTORY LOG			
	Form 6.1.3	Revision: 0	Effective Date: 6/28/05	Page 1 of 1

Instructions:
Project Manager to provide a brief description of each document revision, including rationale for the change and, if applicable, identification of source documents used for the change.

Revision	Description
0	Original Issue
1	♦ Calculation revised to incorporate additional Case 1 analysis to determine total Control Room dose assuming 168 hour fuel decay time before fuel movement and without CREFS operation. ♦ Added additional Assumption (9) ♦ Added Bromine source term table (Table 3) ♦ Added un-decayed activity source term table (Table 4) ♦ Added Bromine evaluation per RG1.183 conformance ♦ Nuclear inventory modified to 29 isotopes to accommodate bromines ♦ Shine analysis modified to provide a qualitative estimate of dose. ♦ Incorporated various typos and rewording

TABLE OF CONTENTS

DESIGN CALCULATION CROSS-REFERENCE INDEX 4
ACRONYMS AND UNITS 6

1 PURPOSE 7
2 DESIGN INPUT DEVELOPMENT 8
2.1 Postulated Accident 8
2.2 Source Term 9
2.3 Release Rate from Secondary Containment 10
2.4 Control Room Parameters 11
2.5 Atmospheric Dispersion (χ/Q) Factors 13
2.6 Additional Design Inputs 14
3 ASSUMPTIONS 15
4 ANALYSIS METHODOLOGY/CALCULATION 17
4.1 Fuel Handling Accident Scenario 17
4.2 RADTRAD Computer Model 18
4.3 RADTRAD FILES 19
5 RESULTS AND CONCLUSIONS 23
5.1 Base Case Results 23
5.2 Case 1 - 168 Hour Fuel Decay Time with CREFS not Operating 23
5.3 External Airborne Shine Dose and CREFS Shine Dose to the Control Room 24
6 REFERENCES 28
7 ATTACHMENTS 30

DESIGN CALCULATION CROSS-REFERENCE INDEX

ITEM NO.	DESIGN INPUTS	REV. NO.	PENDING CHANGES TO DESIGN INPUTS
1	NEDC 99-031	5	N/A
2	NEDC 99-036	3	N/A
3	Burns and Roe Dwg 2019, sheet 1	N39	N/A
4	Burns and Roe Dwg 2051,	N20	DCN 04-0913
5	Burns and Roe Dwg 2052	N22	DCN 04-0916, DCN 98-1043
6	TS 1.1	Adm. 178	N/A
7	TS 3.7.4	Adm. 178	N/A
8	TS 3.9.6	Adm. 178	N/A
9	TS 5.5.7	Adm. 195	N/A
10	NPPD Response letter, NLS990117	12/2/1999	N/A
11	USAR XIV-6.4	04/06/05	N/A
12	NCS CR Inleakage Final Report	8/20/2004	N/A
13	Burns and Roe Calculation - Book 4, Retrieval No. 00103-0487	4/16/69	N/A
14	GE NEDC-32868P	Rev.0, 1998	N/A
15	NUREG/CR-6331	Rev.1,1997	N/A
16	NUREG/CR-6604	Dec. 1997	N/A
17	NUREG-1465	Feb. 1995	N/A
18	Reg Guide 1.183	July 2000	N/A
19	USAEC TID-14844	1962	N/A
20	Industrial Ventilation: Engineering Principles	1/ 1991	N/A
21	GE Letter REK:99-152	9/1/99	N/A
22	GE Letter REK:99-211	11/9/99	N/A
23	GE Letter GE-MIG-1H69L-062	2/29/2000	N/A
24	Federal Guidance Report 11 (FGR 11)	1988	N/A
25	Federal Guidance Report 12 (FGR 12)	1993	N/A
26	UCR 2002-019, Item 59	5/28/2002	N/A
27	General Operating Procedure 2.1.20.1	Rev. 12	N/A
28	The Health Physics and Radiological Health ~~Physics~~ Handbook, Exposure and Shielding from External Radiation, pages 188-193 TMP 8/24/05	N/A	N/A
29	NEDC 01-065, Revision 1	5/19/2004	N/A
30	NEDC 94-072, Revision 2	12/02/1996	N/A
31	NEDC 94-070, Revision 2	12/02/1996	N/A

DESIGN CALCULATION CROSS-REFERENCE INDEX

ITEM NO.	AFFECTED DOCUMENTS	REV. NUMBER
1	Cooper Nuclear Station Updated Safety Analysis Report (USAR)	Various Sections

Acronyms and Units

Acronym	Definition
ALARA	As Low as is Reasonably Achievable
AST	Alternate Source Term
BWR	Boiling Water Reactor
CEDE	Committed Effective Dose Equivalent
CREFS	Control Room Emergency Filtration System
DBA	Design Basis Accident
DCF	Dose Conversion Factor
DDE	Deep Dose Equivalent
EAB	Exclusion Area Boundary
ESF	Engineered Safety Features
FHA	Fuel Handling Accident
FSAR	Final Safety Analysis Report
GUI	Graphical User's Interface
REM	Roentgen Equivalent Man
RP	Regulatory Position
RPF	Radial Peaking Factor
RADTRAD	A Simplified Model for RADionuclide Transport and Removal And Dose Estimation
SFP	Spent Fuel Pool
SGTS	Standby Gas Treatment System
TEDE	Total Effective Dose Equivalent
USAR	Updated Safety Analysis Report
V&V	Verification and Validation

Variable	Definition and Units of Measure
A	Fission Product Activity (Ci/Mwt)
C	Dilution Concentration (dimensionless)
t	Time (seconds)
Q	Flow (ft^3/min.)
V	Volume (ft^3)
χ/Q	Atmospheric Dispersion Factor (sec/m^3)

1 PURPOSE

The purpose of this calculation is to determine the dose to the control room occupant and to a person at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ) at the Cooper Nuclear Station site following a design basis Fuel Handling Accident (FHA). The analysis is performed using an Alternate Source Term (AST) in accordance with the guidance provided by the NRC in Regulatory Guide 1.183 (July 2000) (Ref. 1) and as allowed by 10 CFR 50.67. The RADTRAD Version 3.03 (Ref. 2) computer code (currently used by the USNRC in performing radiological consequences assessments) is used to estimate the dose values at the above mentioned locations.

This analysis will be used by CNS in support of a License Amendment Request (LAR) for the implementation of various sections of Technical Specification Task Force (TSTF) Standard Technical Specifications Change Traveler TSTF-51.

2 DESIGN INPUT DEVELOPMENT

2.1 Postulated Accident

FUEL HANDLING ACCIDENTS WITHIN THE REACTOR CAVITY

The limiting postulated FHA event (accidents within the SFP were also considered) begins with the drop of a fuel assembly into the reactor core during refueling operations from a height of 32.95 feet (Ref. 3), which is the maximum height allowed by the fuel handling equipment. The resulting impact of the fuel assembly onto the top of the core will damage a number of fuel rods sufficiently to cause a release of radionuclides to the water pool above the core. Assuming primary containment remains open during refueling, it is assumed the radionuclides will be released to the refueling area and then to the environment over the following 2 hour period. The water pool above the core serves as a barrier to the release of a significant amount of the radionuclides. Release of the radionuclides to the environment may result in a dose to the control room occupants and to personnel located both within and beyond the site boundary.

The radionuclide source term generated during a fuel handling accident is based on the total number of fuel rods in the reactor core damaged as a result of the dropped fuel assembly (including attached rigging) on the irradiated fuel rods. General Electric provided CNS with a revised analysis for G14 fuel Compliance with Amendment 22 of NEDE-24011-P-A (GESTAR II) regarding a refueling accident (Ref. 8). The analysis addresses the worst fuel drop using a comparison to validate the GE14 10x10 fuel. The activity released in a FHA for 10x10 core is based on 151 rods assumed to have been damaged. Each bundle has an equivalent of 87.33 full length fuel rods. With a total of 548 fuel bundles in the core the fraction of the core damaged is calculated to be 151 damaged rods/(548x87.33)total rods = 0.003155.

FUEL HANDLING ACCIDENTS WITHIN THE SPENT FUEL POOL

The CNS USAR (Ref. 3) specifically states the following, "Similarly, the most severe accident of the second variety is the dropping of a fuel assembly into the fuel pool, but this results in a smaller radioactivity release to the environs than that resulting from dropping a fuel assembly on the fuel in the reactor vessel during refueling." With reference to the "second variety" meaning accidents that result in release directly to secondary containment or the environment. Therefore the limiting fuel handling accident and related accident source term is analyzed as occurring within the reactor core based on the amount of fuel rods damaged and their related activity level.

2.2 Source Term

Since the publication of TID-14844 (Ref. 9), significant advances have been made in understanding the timing, magnitude, and chemical form of fission product releases from severe nuclear power plant accidents. In 1995, the NRC published NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants" (Ref. 10). NUREG-1465 used this research to provide estimates of the accident source term that were more physically based and that could be applied to the design of future light-water power reactors. NUREG-1465 presents a representative accident source term for a boiling-water reactor (BWR) and for a pressurized-water reactor (PWR). These source terms are characterized by the composition and magnitude of the radioactive material, the chemical and physical properties of the material, and the timing of the release to the containment. This analysis utilizes an accident specific nuclide inventory (Halogens, Noble Gases, and Alkali Metals for FHA) as matched to the CNS site inventory (Ref. 11) and as modified for gap release in accordance with Regulatory Guide 1.183, RP 3.2 Table 3 presented as Figure 1 below.

Table 3[11]
Non-LOCA Fraction of Fission Product Inventory in Gap

Group	Fraction
I-131	0.08
Kr-85	0.10
Other Noble Gases	0.05
Other Halogens	0.05
Alkali Metals	0.12

[11] The release fractions listed here have been determined to be acceptable for use with currently approved LWR fuel with a peak burnup up to 62,000 MWD/MTU provided that the maximum linear heat generation rate does not exceed 6.3 kw/ft peak rod average power for burnups exceeding 54 GWD/MTU. As an alternative, fission gas release calculations performed using NRC-approved methodologies may be considered on a case-by-case basis. To be acceptable, these calculations must use a projected power history that will bound the limiting projected plant-specific power history for the specific fuel load. For the BWR rod drop accident and the PWR rod ejection accident, the gap fractions are assumed to be 10% for iodines and noble gases.

Figure 1

All the gap activity in the damaged fuel rods is assumed to be instantaneously released to the pool per Regulatory Guide 1.183 Appendix B. Radionuclides considered include xenons, krytons, halogens, cesiums, and rubidiums. The chemical form of radioiodine released from the fuel to the pool is assumed to be 95% aerosol (cesium iodide, CsI), 4.85 percent elemental iodine, and 0.15 percent organic iodide. The CsI released from the fuel is assumed to completely dissociate in the pool water. Because of the low pH of the pool water, the iodine re-evolves as elemental iodine

which is assumed to occur instantaneously. Regulatory Guide 1.183 Appendix B states if the depth of water above the damaged fuel is 23 feet or greater, as is the case at CNS (Ref. 3, 4, 5, and 6), the decontamination factors for the elemental and organic species are 500 and 1, respectively, giving an overall effective decontamination factor of 200 (i.e., 99.5% of the total iodine released is retained within the pool water). The difference in decontamination factors for elemental and organic iodine species results in the iodine above the water being composed of 57% elemental and 43% organic species. Appendix B goes on to state the retention of noble gases in the pool water is considered negligible (i.e., decontamination factor of 1) which is assumed in this analysis.

The inventory of fission products in the fuel rods and available for release to the containment is based on the maximum full power operation of the core with an assumed core power equal to the current licensed rated thermal power of 2381 Mwt (Ref. 7). In addition, this value is multiplied by factor of 1.02 to account for maximum possible measurement uncertainty as required by Appendix K to 10 CFR 50 for nuclear reactor power operation. The core is assumed to have operated at this power level for an extended period of time such that fission product equilibrium is reached. For radionuclides which have not reached equilibrium the core inventory at time of shutdown is used. The source term used for this accident is based on General Electric's GE14 Amendment 22 for a bounding core inventory source term (References 8, 11, 12, and 13). The GE14 Amendment 22 source term was calculated using the isotope generation and depletion code ORIGEN2, incorporating the BWR extended burnup library BWRUE. In addition, a radial peaking factor of 2.0 is applied to the radionuclide inventory calculation to reflect the maximum possible value as provide by the fuel provider (GE).

2.3 Release Rate from Secondary Containment

The approximate free volume of the refueling floor area is 7.95×10^5 ft^3 based on Reference 14. The radioactive material that immediately escapes from the pool to the refueling floor area is then assumed to be released to the environment over a 2-hour period using the relationship for dilution with 100% makeup for an enclosed space (Ref. 15). For an enclosed containment the following equation can be applied:

$$C_{(t)}/C_{ss} = 1 - \exp^{(-Qt/V)} \qquad \text{Equation 1}$$

Where:

- $C_{(t)}$ – Concentration of volume at time t (fraction 0-1.0, representing 0 to 100%)
- C_{ss} – Steady-State concentration at end of dilution period (fraction ~~%~~ 0-1.0, representing 0 to 100%) 7/L 9/26/05
- Q – Constant flow rate of contaminate out of space (ft^3 /min.)
- V – Refueling floor (7.95E+05 ft^3)
- t – time duration of dilution period (120 minutes)

As $C_{(t)}$ approaches steady state or complete dilution (assume a value of 99.9%) $C_{(t)}/C_{ss}$ approaches a value of 1 and the equation can be simplified to:

$$.999 = 1 - [\exp^{(-Qt/V)}] \quad \text{or} \quad 0.001 = [\exp^{(-Qt/V)}] \qquad \text{Equation 2}$$

Taking the natural log (ln) of both sides gives:

$$\ln(.001) = \ln [\exp^{(-Qt/V)}] \text{ or } -6.9077 = -Qt/V \qquad \text{Equation 3}$$

Substituting all values and solving for Q (flow rate leaving the structure) yields:

$$Q = (6.9077 \times 7.95 \times 10^5)/120 = 4.576 \times 10^4 \ (ft^3/min.)$$

This is the flow rate that will be used to simulate the rejection of the source term from the reactor building as a ground release to the outside environment within a 2 hour period.

2.4 Control Room Parameters

The air intake rate to the control room, the control room HVAC system filter efficiency, and the control room volume are needed to determine the portion of radiological dose received within the control room area.

The total control room volume is made up of the control room proper and the cable spreading room area (Ref. 17 and 18). The volume of the control room is calculated below (rounded to the 3rd significant figure), assuming 20% of the total volume is occupied by walls, floors, equipment, etc.

Control Room Volume drawing takeoff

Width = 72' (Ref. 17)
Length = 80'-9" minus 13'-3" = 67.5' (Ref. 18)
Floor Elevation = 932'-6" (Ref. 18)
High point of roof slab = 949'-1.5"

Cable Room

west of column H7
- Outside wall to H7 = 80'-9" – 13'-3" = 67.5' (Ref. 18)
- N-S = 72' (Ref. 17)
- Floor El = 918' (Ref. 17)

column H7 to G
- H7 to G = 35' + 13'-3" = 48.25' (Ref. 18)
- E-W = 37'-3" (Ref. 17)
- Floor El = 918' (Ref. 17)

Control Room proper

Height = 949'-1.5" – 932'-6" = 16.625'
Volume = 72' x 67.5' x 16.625' = 80,800 ft^3

Cable Room

Height = 932'-6" – 918' = 14.5'
Volume = (72' x 67.5' x 14.5') + (37.25' x 48.25' x 14.5') = 96,530 ft^3

Total Volume = 80,800 ft^3 + 96,530 ft^3 = 177,330 ft^3

Assuming 20% of the volumes include walls, floors, and equipment, (Refer to Assumption 8) the net volumes equate to the following:

Control Room proper = 64,640 ft^3
Control Center (CR Envelope) = 141,860 ft^3

The air intake to the control room is modeled using two flow rates in order to represent the two distinct operating modes of normal fresh air intake prior to a high radiation isolation signal and operation in the Control Room Emergency Filtration (CREFs) lineup following isolation and pressurization.

Prior to isolation:

- 3235 normal ventilation system fresh air intake flow per reference (Ref. 19)
- Unfiltered inleakage was set constant at a value of 400 CFM (see Section 3 Assumption 1). The 400 CFM CR inleakage is also greater than the actual CNS inleakage measured during tracer gas testing for the recirculation only mode of operation (64 CFM). This value includes the standard value of 10 CFM recognized by the industry for access/egress to the control room envelope.

Total air intake rate = **3,635 CFM**

After CREFS isolation:

- 900 +/- 10% CFM used 810 CFM CREFS design air intake flow per reference (Ref. 20 and 21) (lower value picked for conservative removal rate of radionuclides from control room space)
- Unfiltered inleakage was set constant at a value of 400 CFM. The 400 CFM CR inleakage is also greater than the actual CNS inleakage measured during tracer gas testing for the recirculation only mode of operation (64 CFM). This value includes the standard value of 10 CFM recognized by the industry for access/egress to the control room envelope.

Total air intake rate = **1,210** CFM

The control room emergency filtration system is currently specified as having 95% efficiency (associates to a maximum methyl iodide penetration of 2.5% when tested

in accordance with Regulatory Guide 1.52, Revision 2) for all iodine species (Ref. 21). This efficiency is reduced by 1% to account for maximum bypass (Ref. 22). For this analysis in order to provide future analytical and operational margin a filter efficiency of 90% (using an appropriate penetration test criteria) for all iodine species will be assumed with a reduction of 1% for maximum bypass flow.

2.5 Atmospheric Dispersion (χ/Q) Factors

The χ/Q values are taken from existing CNS calculations developed specifically for various Control Room Intake, Exclusion Area Boundary (EAB), and Low Population Zone (LPZ) receptor points for use in the development of the bounding Design Basis Accidents (DBA) Radiological Analysis. These receptor locations were previously determine to be the most limiting in determining compliance with the dose criteria established.

The control room intake χ/Q values were taken from reference 23 for a release emanating from the Reactor Building. The reactor building vent release case was analyzed as a ground release for three release rates through the reactor building vent. The lowest release flow which coincides with the highest χ/Q values was chosen for the most conservative approach. The values were developed using the ARCON96 computer code (Ref. 24) and are presented in Table 1 below.

0 - 2 hours	2 - 8 hours	8 - 24 hours	1 - 4 days	4 - 30 days
4.15E-3	3.24E-3	1.32E-3	9.01E-4	7.22E-4

Note: Units = sec/m^3

Table 1

The EAB and LPZ Atmospheric Dispersion χ/Q values were taken from reference 25 for a ground release emanating from the Reactor Building. The χ/Q values were developed from figures presented in Regulatory Guides 1.3 and 1.25 and corrected for building wake effects as appropriate. The values are presented in Table 2 below.

	χ/Q (sec/m^3)
EAB	
0 – 0.5 hours	5.2E-4 (1)
0.5 – 2 hours (2)	5.2E-4 (1)
LPZ	
0 – 0.5 hours	2.9E-4 (1)
0.5 – 8 hours	2.9E-4 (1)
8 – 24 hours	7.3E-5
1 – 4 days	2.5E-5
4 – 30 days	5.2E-6

Table 2

Note: 1. Includes building wake considerations
2. Based on worst 2-hour period for the EAB which is the 0 to 2-hour period for this event.

2.6 Additional Design Inputs

The following inputs are used by the RADTRAD code in determining the TEDE for persons located at or beyond the boundary of the exclusion area which are consistent with the Regulatory Guide 1.183 RP 4.0 guidelines:

- Dose calculations are based on the TEDE. The TEDE is determined as the sum of the committed effective dose equivalent (CEDE) from inhalation and the deep dose equivalent (DDE) from external exposure.
- All doses are estimated by RADTRAD using the Federal Guidance Reports 11 and 12 (Ref. 26 and 27) (FGR 11 and 12) dose conversion factors (DCFs) for the following organs and pseudoorgans:
  - Gonads
  - Breast
  - Lungs
  - Red bone marrow
  - Bone surface
  - Thyroid
  - Skin
  - Effective dose equivalent
- EAB and LPZ - For the first 8 hours, the breathing rate of persons is assumed to be 3.5 x E-4 m^3/sec. From 8 to 24 hours following the accident, the breathing rate is assumed to be 1.8 x E-4 m^3/sec. After that and until the end of the accident, the rate is assumed to be 2.3 x E-4 m^3/sec.
- Control Room - The dose receptor for this analysis is the hypothetical maximum exposed individual who is present in the control room for 100% of the time during the first 24 hours after the event, 60% of the time between 1 and 4 days, and 40% of the time from 4 days to 30 days. For the duration of the event, the breathing rate of this individual is assumed to be 3.5 x E-4 m^3/sec.
- The radiological acceptance criteria for the EAB, the outer boundary of the LPZ, and for the control room are in 10 CFR 50.67. These criteria are stated for evaluating reactor accidents of exceedingly low probability of occurrence and low risk of public exposure to radiation. For the FHA the EAB and LPZ dose criteria is presented in Table 6 of Regulatory Guide 1.183 and stated as 6.3 Rem TEDE for the 2 hour accident duration. The acceptance criteria for the control room dose is stated by both 10 CFR50.67 (b) (2) (iii) and General Design Criteria 19 (GDC 19) from Appendix A to 10 CFR Part 50 as 5 Rem TEDE. Both the LPZ and control room dose criteria are based on a total period of 30 days.

3 ASSUMPTIONS

1. A control room unfiltered inleakage value of 400 CFM was assumed for this analysis in order to provide future analytical and operational margin in lieu of the current tracer gas testing results (Ref. 16) measuring an inleakage value of 64 CFM with the CREF system in the pressurization mode in recirculation. This value includes the standard value of 10 CFM recognized by the industry for access/egress to the control room envelope.

2. The required time for isolation of the control room intake upon the start of the FHA is assumed to be 1 minute (60 seconds). This was selected as a conservative value in order to provide future analytical and operational margin in lieu of the current CNS CREF system having an auto-isolation time of 11 seconds upon receipt of a high radiation signal.

3. The control room emergency filtration system is currently specified as having a 95% efficiency (associates to a maximum methyl iodide penetration of 2.5% when tested in accordance with Regulatory Guide 1.52, Revision 2) for all iodine species (Ref. 21). This efficiency is reduced by 1% to account for maximum bypass (Ref. 22). For this analysis in order to provide future analytical and operational margin a filter efficiency of 90% (using an appropriate penetration test criteria) for all iodine species will be assumed with a reduction of 1% for maximum bypass flow.

4. No credit is taken for reduction in the amount of radioactive material released from the reactor building as a result of operation of engineered safety feature (ESF) filter systems (i.e., SGTS).

5. The current source term decay time is 67 hours. For this analysis (Base Case), a decay time of 24 hours was assumed, which represents the earliest expected start of refueling activities at CNS. Fuel which has had less than 24 hours of decay time constitutes "recently irradiated fuel" for application of TSTF-51. A second analysis (Case 1) was performed assuming a decay time of 168 hours before fuel movement and not crediting the operation of CREFS.

6. No credit is taken for the use of personal protective equipment or prophylactic drugs.

7. The CNS Technical Specification Bases for AC Source -- Shutdown states that, having to assume a single failure and concurrent loss of all offsite power (LOOP) is not required when the unit is shutdown. Notwithstanding, it is determined a LOOP will not have an adverse impact on the radiological consequences of the Fuel Handling Accident. The basis for this is supported by the fact that a LOOP will cause the control circuit for the Group 6 PCIS signal to de-energize, resulting in Group 6 PCIS Control Room Emergency Filter System (CREFS) initiation (at T = 0 of the event). Therefore, the one-minute CREFS initiation time assumed in this analysis will bound diesel generator start time considerations associated with a LOOP which are determined to occur well within that time frame.

8. An occupied* volume of 20% of the control room envelope was assumed based on review of applicable drawings and simple volumetric estimates.

*by floor, walls, equipment, etc.
TK 9/26/05

9. No correction is made for depletion of the effluent plume by deposition on the ground (Ref. 1, Regulatory Position 4.1.7)

4 ANALYSIS METHODOLOGY/CALCULATION

A V&V version (developed by Alion Science & Technology, ITSCO) of the NRC computer code RADTRAD Version 3.03 was used to analyze a postulated Fuel Handling Accident (FHA) at the Cooper Nuclear Station. The radiological consequences of an accident in a nuclear power plant depend upon the quantity of the radioactive material that escapes to the environment and/or enters the plant's control room. RADTRAD is designed to calculate doses at offsite locations, such as the low population zone, and in the control room. The code has two default source terms to describe fission product release to the containment: those from TID-14844 (Ref. 9) and those from NUREG-1465 (Ref. 10). As the material is transported through the containment and other buildings, credit is given for several natural and engineered removal mechanisms. Containment sprays remove aerosols, elemental iodine, and organic iodine. The flow between buildings or rooms may be through HEPA filters or a suppression pool. Leakage to the environment may occur. Aerosols can deposit on surfaces within rooms and also in connecting paths. Models are provided within RADTRAD for these different removal mechanisms. Alternatively, the user may elect to input time-dependent values for a specific removal coefficient. After transporting the nuclides to different locations, RADTRAD calculates the dose at user-specified locations (i.e., EAB, LPZ, control room, etc.).

4.1 Fuel Handling Accident Scenario

Currently by CNS procedure, fuel handling activities in the fuel pool and containment areas cannot be initiated until 67 hours after reactor shut down (this analysis will assume a period of 24 hours[1] as described in Section 3 Assumption 5). It is postulated that the accident results in the damage of 151 fuel rods thus releasing all of the fuel gap activity associated with those rods. As discussed in Section 2, the gap fractions utilized for Non-LOCA analyses follow the recommended values stated in Regulatory Guide 1.183 Table 3. A radial peaking factor of 2.0 is applied to the activity release based on recommendation by the CNS fuel vendor. The activity (consisting of noble gases, halogens, and alkali metals) is instantaneously released to the pool which has a minimum of 23 ft of water above the damaged fuel assembly.

The radioiodine release from the water is assumed to escape into the reactor building area and out through the reactor building vent over a two (2) hour period. The radioiodine released from the fuel gap is assumed to be 95% CsI, 4.85% elemental, and 0.15% organic. Due to the nature of the water in the pool, the CsI is assumed to immediately disassociate, thus changing the chemical form of the iodine in the water to 99.85% elemental and 0.15% organic. Based on decontamination factors of 500 and 1 for the elemental and organic iodines, respectively the chemical form of the iodines above the pool is 57% elemental and 43% organic. Noble gas and unscrubbed iodines are assumed to rise to the water surface where they are mixed in the available air space. Per Regulatory Guide 1.183 it is assumed all of the alkali metals released from the gap are retained in the pool.

(1) note - fuel handling can occur at any time within the spent fuel pool, as long as the fuel has experienced a minimum of at least 24 hours of decay time.

The radiological activity associated with a FHA is collected within the reactor building (secondary containment). Since it is assumed there is no means of isolating the area release (no credit is taken for maintaining secondary containment boundary) all of the airborne activity is postulated to be exhausted out of the building within a period of 2 hours.

The worst case atmospheric dispersion factors (χ/Q) assuming a ground release from the reactor building release point were used based on the guidance in Regulatory Guide 1.183 Appendix B, Section 4 considering the assumption of direct openings to the environment (i.e., railroad airlock, ground level doors, etc.).

4.2 RADTRAD Computer Model

Figure 2 below represents a simplified representation of the radiological release and transport model used in the CNS FHA analysis. The model simulates an accident which has initially released within the containment. Radionuclides are then released to the environment (pathway 1). Once released to the environment radionuclides are diluted as a function of the atmospheric conditions (χ/Q values), thus leaving a smaller fraction available for intake into adjacent buildings (i.e., control room) or site boundary defined locations. The radionuclides may enter the control room from either the Control Room Emergency Filtration System (CREFS) air intake (pathway 2) or indirectly as unfiltered inleakage (pathway 3). Radionuclides mixed within the control room volume are then exhausted (pathway 4).

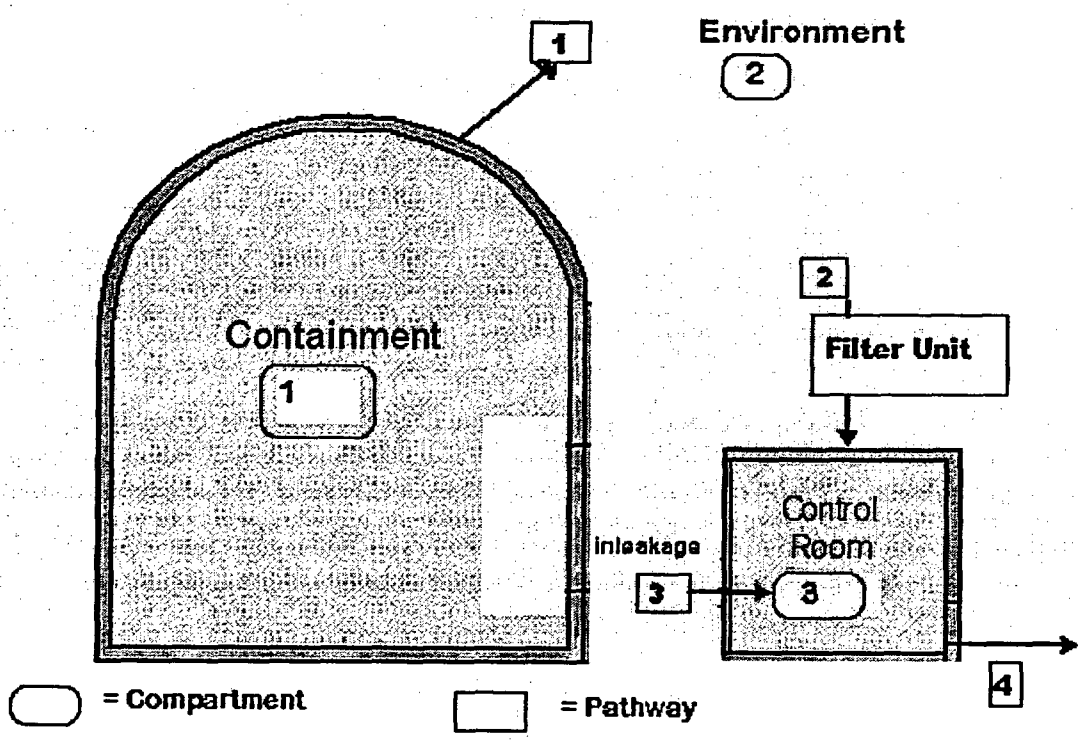

Figure 2

Radionuclide release and transport model

4.3 RADTRAD FILES

RADTRAD 3.03 requires the use/development of four individual input files in order to perform a radiological dose analysis. These files include; the plant specific compartment/pathway model file (PSF), the nuclide inventory file (NIF), the release fraction and timing file (RFT), and the dose conversion factor file (INP).

Plant Specific File (PSF)

This file was created using the RADTRAD Graphical User's Interface (GUI) and defines all the plant specific parameters required to perform the analysis including specifying all compartments and pathways as detailed in Figure 2 above. The pathways for the FHA model were developed using the filtered pathway option in RADTRAD in order to specify fixed flow rate values. The following major parameters were inputted based on values documented/determined in Section 2 of this analysis:

Plant Power Level – Is based on the rated thermal power multiplied by the fraction of fuel damaged, maximum power uncertainty, and the fuel peaking factor. The radionuclide inventory is multiplied within RADTRAD by this value to determine the total amount of radionuclides released to the pool. The following value was calculated:

Power level = 2381 x 3.156E-3 x 1.02 x 2.0 = 15.329 Mwt

Model Compartments and Pathways

Compartment 1 – Refueling floor volume (7.95E+05 ft^3)
Compartment 2 – Environment volume (0.00E+00 ft^3) Note: treated as an infinite space within the code
Compartment 3 – Control room volume (1.4186E+05 ft^3)
Pathway 1 – primary to environment (flow = 4.571E+04) CFM in order to remove 99.9% of the radionuclides from the containment envelope in the first 2 hours)
Pathway 2 – environment to control room (flow = 3235 CFM at time 0 to 1 min., flow = 810 CFM at time 1 min. to end of event using a filter efficiency of 89%)
Pathway 3 – environment to control room (flow = 400 CFM of unfiltered inleakage for duration of event. The 400 CFM CR inleakage is also greater than the actual CNS inleakage measured during tracer gas testing for the recirculation only mode of operation (64 CFM)..
Pathway 4 –control room to environment (flow = 3635 CFM outflow at time 0 to 1 min., flow = 1210 CFM at time 1 min. to end of event)

Source Term

Decay time = 24 hours
Iodine chemical fractions = Aerosol = .95, Elemental = .0485, Organic = .0015
Decay and Daughter products is invoked and generated by RADTRAD

Dose Locations

Three dose locations were defined as control room, EAB, and LPZ. Input values for χ/Q values, breathing rates, and occupancy factors for the control room were provided.

Attachment A of this analysis provides the associated RADRAD input file.

Nuclide Inventory File (NIF)

The nuclear inventory file was created by modifying the RADTRAD default file bwr_non_loca.nif based on the CNS specific nuclide activity values (Ci/Mwt) as defined in Section 2 of this analysis.

All of the Bromine isotopes identified by the CNS specific GE Fission Product Inventory (Ref. 11) had been initially considered as possible dose sources. Those Bromine isotopes are listed below, along with their half lives.

Nuclide Name	Half life (seconds)	Half life (hours)
Br-82	1.27E+05	35.30400
Br-82m	3.66E+02	0.10167
Br-83	8.64E+03	2.40000
Br-84	1.91E+03	0.53000
Br-84m	3.60E+02	0.10000
Br-85	1.72E+02	0.04784
Br-86	5.55E+01	0.01542
Br-87	5.59E+01	0.01553
Br-88	1.64E+01	0.00456
Br-89	4.37E+00	0.00121
Br-90	1.90E+00	0.00053
Br-91	5.40E-01	0.00015
Br-92	3.40E-01	0.00009
Br-93	1.00E-01	0.00003
Br-94	7.00E-02	0.00002

Bromine Isotopes Included in GE (CNS Specific) Inventory with Half Lives
Table 3

Examination of this data revealed that all of the Bromine isotopes present in the core except for Br-82, 83, and 84 would decay to negligible amounts over the duration of the 24 hour delay period following a FHA. It was therefore hypothesized that only these Bromine isotopes could potentially be a factor in this analysis.

A nuclide inventory file that contained 29 isotopes was created based on the CNS GE14 source term library. These 29 isotopes were all halogens and noble gases that were previously evaluated in CNS GE 14 EQ dose calculations (Ref. 29), with the exception of Xe 137, Br 84m, Br85, Br 87 and Kr 89. These nuclides were excluded since their half life is less than 3.9 minutes.

Isotope	RADTRAD Ci/MWt[1]	MWt	Power Uncertainty Factor	Total Core Inventory (Ci)	Radioactive Half Life (sec)[2]	Time After Shutdown (sec)	Core Inventory at Time After Shutdown (Ci)[3]	Fraction of Core Inventory Released	Water Pool Decon Factor	Radial Peaking Factor	Fraction of Core Failed	FHA Source Term (Ci)
Br-82	1.800E+02	2381	1.02	4.372E+05	1.271E+05	86400	2.729E+05	0.05	0.005	2.00	0.003155123	4.305E-01
Br-83	3.260E+03	2381	1.02	7.917E+06	8.604E+03	86400	7.522E+03	0.05	0.005	2.00	0.003155123	1.187E-02
Br-84	5.610E+03	2381	1.02	1.362E+07	1.908E+03	86400	3.204E-07	0.05	0.005	2.00	0.003155123	5.054E-13
Kr-83m	3.270E+03	2381	1.02	7.942E+06	6.588E+03	86400	8.970E+02	0.05	1	2.00	0.003155123	2.830E-01
Kr-85	3.660E+02	2381	1.02	8.889E+05	3.383E+08	86400	8.887E+05	0.10	1	2.00	0.003155123	5.608E+02
Kr-85m	6.810E+03	2381	1.02	1.654E+07	1.613E+04	86400	4.038E+05	0.05	1	2.00	0.003155123	1.274E+02
Kr-87	1.300E+04	2381	1.02	3.157E+07	4.578E+03	86400	6.595E+01	0.05	1	2.00	0.003155123	2.081E-02
Kr-88	1.830E+04	2381	1.02	4.444E+07	1.022E+04	86400	1.272E+05	0.05	1	2.00	0.003155123	4.013E+01
I-128	4.190E+02	2381	1.02	1.018E+06	1.499E+03	86400	4.575E-12	0.05	0.005	2.00	0.003155123	7.217E-18
I-130	1.060E+03	2381	1.02	2.574E+06	4.450E+04	86400	6.703E+05	0.05	0.005	2.00	0.003155123	1.057E+00
I-131	2.720E+04	2381	1.02	6.606E+07	6.947E+05	86400	6.060E+07	0.08	0.005	2.00	0.003155123	1.530E+02
I-132	3.930E+04	2381	1.02	9.544E+07	8.280E+03	86400	6.906E+04	0.05	0.005	2.00	0.003155123	1.089E-01
I-133	5.510E+04	2381	1.02	1.338E+08	7.488E+04	86400	6.015E+07	0.05	0.005	2.00	0.003155123	9.489E+01
I-134	6.040E+04	2381	1.02	1.467E+08	3.156E+03	86400	8.453E-01	0.05	0.005	2.00	0.003155123	1.334E-06
I-135	5.160E+04	2381	1.02	1.253E+08	2.380E+04	86400	1.012E+07	0.05	0.005	2.00	0.003155123	1.597E+01
Te-129[4]	8.790E+03	2381	1.02	2.135E+07	4.176E+03	86400	1.266E+01	0.00	0.00	2.00	0.003155123	0.000E+00
Te-131[4]	2.420E+04	2381	1.02	5.877E+07	1.500E+03	86400	2.713E-10	0.00	0.00	2.00	0.003155123	0.000E+00
Te-131m[4]	3.960E+03	2381	1.02	9.617E+06	1.080E+05	86400	5.524E+06	0.00	0.00	2.00	0.003155123	0.000E+00
Te-132[4]	3.850E+04	2381	1.02	9.350E+07	2.815E+05	86400	7.559E+07	0.00	0.00	2.00	0.003155123	0.000E+00
Te-133[4]	3.240E+04	2381	1.02	7.869E+07	7.470E+02	86400	1.217E-27	0.00	0.00	2.00	0.003155123	0.000E+00
Te-133m[4]	1.980E+04	2381	1.02	4.809E+07	3.324E+03	86400	7.229E-01	0.00	0.00	2.00	0.003155123	0.000E+00
Te-134[4]	4.500E+04	2381	1.02	1.093E+08	2.508E+03	86400	4.681E-03	0.00	0.00	2.00	0.003155123	0.000E+00
Xe-129m	2.060E-01	2381	1.02	5.003E+02	6.912E+05	86400	4.588E+02	0.05	1	2.00	0.003155123	1.448E-01
Xe-131m	3.040E+02	2381	1.02	7.383E+05	1.028E+06	86400	6.965E+05	0.05	1	2.00	0.003155123	2.198E+02
Xe-133	5.260E+04	2381	1.02	1.277E+08	4.532E+05	86400	1.119E+08	0.05	1	2.00	0.003155123	3.532E+04
Xe-133m	1.580E+03	2381	1.02	3.837E+06	1.890E+05	86400	2.796E+06	0.05	1	2.00	0.003155123	8.820E+02
Xe-135	1.860E+04	2381	1.02	4.517E+07	3.272E+04	86400	7.248E+06	0.05	1	2.00	0.003155123	2.287E+03
Xe-135m	1.090E+04	2381	1.02	2.647E+07	9.174E+02	86400	1.197E-21	0.05	1	2.00	0.003155123	3.776E-25
Xe-138	4.500E+04	2381	1.02	1.093E+08	8.502E+02	86400	2.841E-23	0.05	1	2.00	0.003155123	8.963E-27

(1) From Reference 11
(2) From RADTRAD nuclide inventory file (NIF) Attachment B
(3) Calculated from standard equation $N = N_i \times e^{-(.693/\text{Half Life}) \times \text{Decay Time}}$
(4) Tellurium Metals were included in the nuclide inventory file (NIF) based on their daughtering contribution to iodine as analyzed by RADTRAD

Post-FHA Activity Released to Refueling Floor Used In RADTRAD (24 hrs. After Shutdown)

Table 4

The nif file was further modified to account for the increased Gap Fractions of I-131 (8% versus the 5% assumed for all other halogens) and Kr-85 (10% versus the 5% assumed for all other noble gases). The following values were calculated:

I-131 activity level = .08/.05 x 2.72E+04 = 4.352E+04 (Ci/Mwt)

Kr-85 activity level = .10/.05 x 3.66E+02 = 7.32E+02 (Ci/Mwt)

Attachment B of this analysis provides the associated RADRAD input file.

Radionuclide Release Fractions and Timing File (RFT)

The radionuclide release fractions and timing file was created by modifying the RADTRAD default file non_LOCA.rft (which is based on RG 1.183 Table 3 and retention of all particulate radionuclides per Appendix B of the guide) for the decontamination factor of iodine (200). This was accomplished by modifying the release percentage (based on gap fraction) by the following:

Release fraction =.05 (iodine group gap fraction)/200 = 0.25E-03

The release fraction for noble gases was maintained at .05 (having a decontamination factor of 1) while all other radionuclide groups were given a zero (0) release fraction based on their retention in the pool. Cs and Rb isotopes, as well as all other particulates, are excluded from nuclide inventory and release fraction files since they are assumed to be retained by the water in the fuel pool or reactor cavity (i.e., infinite decontamination factor) per the guidance in RG 1.183.

Attachment C of this analysis provides the associated RADRAD input file.

Nuclide Dose Conversion File (INP)

The nuclide dose conversion file used the RADTRAD default file fgr11&12.inp which is based on the Federal Guidance Reports 11 and 12 as documented in Section 2 of this analysis. This file was modified to match the CNS specific nuclide group defined by the Nuclear Inventory File .nif mentioned above.

Attachment D of this analysis provides the associated RADRAD input file.

Detailed Output File (oO)

RADTRAD develops a detailed output file sequentially numbered (.o0, o1, o2, etc). as a function of the amount of cases generated (only one for this analysis) that documents all input parameters and output detail.

Attachment E of this analysis provides the associated RADRAD output file.

5 RESULTS AND CONCLUSIONS

5.1 Base Case Results

The results of the Base Case RADTRAD generated dose analysis as documented in Attachment E are summarized in Table 5 below:

Dose Location	Accumulated Dose (rem TEDE)	Accident Dose Criteria (rem TEDE)
Control Room	4.507	5.0 (1)
EAB	1.459	6.3 (2,3)
LPZ	.815	6.3 (2)

Table 5

Note: (1) based on both General Design Criteria (GDC) 19 from Appendix A to 10 CFR Part 50 and 10 CFR50.67 (b) (2) (iii)
(2) based on Regulatory Guide 1.183 Table 6 (based on the analysis release duration of 2 hours)
(3) Since the event is based on a 2-hour release, the worst 2-hour period for the EAB is the 0 to 2-hour period.

All calculated doses were found to be below the stipulated limits. It is therefore concluded that the regulatory dose limits will not be exceeded following a postulated design basis FHA at Cooper Nuclear Station.

5.2 Case 1 - 168 Hour Fuel Decay Time with CREFS not Operating

An additional RADTRAD analysis was performed to evaluate the accumulated dose at the identified receptor points assuming an initial decay period of 168 hours before fuel movement and no credit for CREFS filtration (assumes CREFS non-operable). The results of the Case 1 RADTRAD generated dose analysis as documented in Attachment F are summarized in Table 6 below: All calculated doses were found to be below the stipulated limits.

Dose Location	Accumulated Dose (rem TEDE)	Accident Dose Criteria (rem TEDE)
Control Room	4.446	5.0 (1)
EAB	0.627	6.3 (2,3)
LPZ	0.350	6.3 (2)

Table 6

Note: (1,2,&3) Refer to Table 5 notes above.

5.3 External Airborne Shine Dose and CREFS Shine Dose to the Control Room

The purpose of this discussion is to qualitatively assess potential gamma shine from external sources to the control room proper during FHA using alternative source terms to assess contained radioactivity while considering limited geometry. The radiation sources external to the control room would be from airborne external cloud and CREFS filters (located within the Control Room Envelope). The following were considered and should be evaluated for local administrative controls on occupant dose:

1. Doses were conservatively evaluated with credit for Control Room occupancy per RG 1.183 of 1.0 for the first day, 0.6 for the next 3 days, and 0.4 for the following 26 days. If occupancy is limited the actual control room occupant dose would be lowered.
2. Administrative controls would be important for evaluating and maintaining control room occupant doses as low as is reasonably achievable (ALARA).

Cloud Shine Dose Comparison

A qualitative comparison was made to the CNS calculation (Ref. 30) for cloud shine dose contribution to the control room. The calculation noted a 0.004 Rem Gamma dose as a result of LOCA Cloud Shine for 30 day dose. This dose was calculated based on looking at Krypton 87, 88, 89 and Xe 138 isotopes. The calculation indicated that at 0.5 hrs after LOCA the following activity levels were available and released to the Environment with the largest combination of χ/Qs for atmospheric dispersion (after this time period the χ/Qs dropped significantly to 10^{-8}s/m^3, and thus the dose was not a significant contributor after 0.5 hrs):

Isotope	LOCA Activity Released Curies (at t=0.5 hrs)
Kr87	1.06E+03
Kr88	1.75E+03
Kr89	83
Xe138	1.43E+03

Table 7

In comparison to the RADTRAD output for the CNS FHA the amount of material that is released to the Environment (24 hour decay, see Table 4) is as follows for the same isotopes:

Isotope	FHA Activity Released Curies (at t=24 hrs)
Kr87	2.08E-02
Kr88	4.01E+01
Kr89	0
Xe138	0

Table 8

In comparison, the amount of Kr88 available for shine contribution is a factor of: 40.1Ci/1750Ci = 0.023 or 2.3% of the LOCA source term available for shine. Thus, it is anticipated that the FHA cloud shine would be significantly less than the LOCA cloud shine for the 30 day period.

CREFS Shine Dose to the Control Room

A qualitative assessment was made in comparing the Cooper 24 hour decay FHA RADTRAD output to the existing analysis of record for CNS (Ref. 31). This qualitative assessment utilized RADTRAD v. 3.10 which calculates decay and resulting amount of Curies on a filter. The RADTRAD v.3.03 .psf file for a 24 hour decay was directly read into RADTRAD v.3.10 and run to develop the inventory on the control room filter. The output file is provided as Attachment G.

The existing Post-LOCA 30 day cumulative shine dose from airborne radioactivity accumulated on the CREFS filter was documented in Reference 31 as 0.0183 Rem @ 375 cfm. The Control Room Intake Filter Halogen Activities calculated on the filter banks is provided below for peak activity utilizing the 375 cfm flowrate.

Isotope	CR Filter Activity at Post LOCA (μCi)
I129	5.00E-04
I131	1.43E+04
I132	1.75E+04
I133	2.31E+04
I134	2.04E+04
I135	2.28E+04
I136	2.9E-03

Table from Ref. 31 (Activity at 0.5 hr)

Table 9

The Control Room Intake Filter Halogen Activities calculated in the RADTRAD Output file Attachment G (for the Iodine nuclides used in the FHA) on the filter banks for the 24 hour decay release for peak activity was compared to the Ref. 31 values.

	FHA RAD v 3.10(1,2) (Ci)	FHA RAD v 3.10 converted to (µCi)		Ref. 31(3) (µCi)	Ratio of Curies RAD 3.10 vs. Ref. 31
I130	1.16E-03	1.16E+03		NA	NA
I131	1.88E-01	1.88E+05		1.43E+04	1.32E+01
I132	8.38E-02	8.38E+04		1.75E+04	4.79E+00
I133	1.12E-01	1.12E+05		2.31E+04	4.83E+00
I134	1.33E-09	1.33E-03		2.04E+04	6.52E-08
I135	1.59E-02	1.59E+04		2.28E+04	6.98E-01

Notes:
(1) Based on CREFS flow of 810 CFM
(2) Activity based on 26 hours, representing full release of source term to environment following 24 hr. decay
(3) Activity based on .5 hours post LOCA accident

RADTRAD v. 3.10 Activity Compared to Ref. 31 (2 hour Post Accident FHA)

Table 10

The amount of activity on filter at 720 hours (30 days) was also compared as follows.

	FHA RAD v 3.10(1,2) (Ci)	FHA RAD v 3.10 converted to (µCi)		Ref. 31(3) (µCi)	Ratio of Curies RAD 3.10 vs. Ref. 31
I130	0.00E+00	0.00E+00		0.00E+00	0.00E+00
I131	1.43E-02	1.43E+04		1.21E+03	1.18E+01
I132	0.00E+00	0.00E+00		0.00E+00	0.00E+00
I133	4.54E-12	4.54E-06		0.00E+00	0.00E+00
I134	0.00E+00	0.00E+00		0.00E+00	0.00E+00
I135	0.00E+00	0.00E+00		0.00E+00	0.00E+00

Notes:
(1) Based on CREFS flow of 810 CFM
(2) Activity based on 744 hours representing full release of source term to environment following 24 hr. decay
(3) Activity based on 720 hours post LOCA accident

RADTRAD v. 3.10 Activity Compared to Ref. 31 (720 hour Post Accident FHA)

Table 11

The dose at 720 hours after accident indicates that I131 is the predominant source term and as such applying a conservative factor over time will be qualitatively appropriate. The RADTRAD v 3.10 FHA output file indicates a factor of 13.2 higher I131 activity at 2 hours post accident (representing full release) versus the post LOCA analysis of record at peak activity point. Therefore it can be conservatively assumed the FHA source term captured on the CREFS is greater by a factor of 13.2 (with the contributing isotope for shine dose being I131). The resulting dose from CREFs shine for the FHA at 30 days would then be conservatively qualitatively estimated as 0.0183 Rem x 13.2 = 0.242 Rem.

When combined with the 30 Day Control Room Dose for inhalation the resultant total dose would still be below the regulatory criteria of 5 Rem TEDE.

6 REFERENCES

1. Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors", July 2000.
2. NUREG/CR-6604, "RADTRAD: A Simplified Model for RADionuclide Transport and Removal And Dose Estimation", dated December 1997, including Supplement 1 (dated June 8, 1999) and Supplement 2 (dated October 2, 2002).
3. Cooper Nuclear Station Updated Safety Analysis Report (USAR), Chapter XIV, Section 6.4., dated 4/06/2005.
4. Cooper Nuclear Station UFSAR Change Request (UCR) 2002-019, Item 59, dated 5/21/2002.
5. Cooper Nuclear Station Technical Specification, Section 3.9.6., Adm. 178.
6. Cooper Nuclear Station General Operating Procedure, 2.1.20.1, "Restoration From RPV Refueling", Rev. 12, dated 12/17/2004.
7. Cooper Nuclear Station Technical Specification, Section 1.1., Adm. 178.
8. GE NEDC-32868P, GE14 Compliance With Amendment 22 of NEDE-24011-P-A (GESTAR II), Proprietary Document, Rev. 0 1998.
9. J.J. DiNunno et al., "Calculation of Distance Factors for Power and Test Reactors Sites," USAEC TID-14844, U.S. Atomic Energy Commission, 1962.
10. L. Soffer et al., "Accident Source Terms for Light-Water Nuclear Power Plants," NUREG-1465, USNRC, February 1995.
11. GE letter GE-MIG-1H69L-062, Erik Stromqvist to Paul Ballinger, dated February 29, 2000, GE14 Source Term Letter Report.
12. GE letter REK: 99-211, R.E. Kingston to J. L. Lewis, dated November 9, 1999.
13. GE letter REK: 99-152, R.E. Kingston to J. L. Lewis, dated September 1, 1999.
14. Burns and Roe Calculation – System Sizing, Standby Gas Treatment System, Book 4, CNS Retrieval 00103-0487, dated 2/8/1968.
15. Robert Jennings Heinsohn PhD, PE, Industrial Ventilation: Engineering Principles, January 1991, John Wiley & Sons Canada, Ltd.
16. NCS Corporation, "Control Room Envelope Inleakage Testing at Cooper Nuclear Station", Final Report, dated August 20, 2004.
17. Cooper Nuclear Station, Burns & Roe Drawing No. 2051, Rev. N22.
18. Cooper Nuclear Station, Burns & Roe Drawing No. 2052, Rev. N14.
19. Cooper Nuclear Station, Burns & Roe Drawing No. 2019, Rev. N36.
20. Cooper Nuclear Station Technical Specification, Section 3.7.4., Adm. 178

21. Cooper Nuclear Station Technical Specification, Section 5.5.7 as supplemented by NPPD Response to Generic Letter 99-02, NLS990117, December 2, 1999.

22. Cooper Nuclear Station Technical Specification, Section 5.5.7., Adm. 178.

23. Cooper Nuclear Station, Calculation NEDC 99-031, Revision 5, "Review of Scientech Calculation 17080-M-01, χ/Q Values for Control Room Intake Using ARCON96", dated March 20, 2003.

24. J.V. Ramsdell Jr. and C. A. Simonen, "Atmospheric Relative Concentration in Building Wakes, "NUREG/CR-6331, PNNL-10521, Revision 1, U.S. Nuclear Regulatory Commission, Washington, D.C., 1997.

25. Cooper Nuclear Station, Calculation NEDC 99-036, Revision 3, "EAB and LPZ Meteorological Dispersion Accident Analysis", dated April 20, 2003.

26. K.F. Eckerman et al., "Limiting Values of Radionuclide Intake and Air Concentrations and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," Federal Guidance Report 11, EPA-520/1-88-020, Environmental Protection Agency, 1988.

27. K.F. Eckerman and J.C. Ryman, "External Exposure to Radionuclides in Air, Water, and Soil," Federal Guidance Report 12, EPA-402-R-93-081, Environmental Protection Agency, 1993.

28. The Health and Radiological Health Physics Handbook, Exposure and Shielding from External Radiation, pages 188-193.

29. Cooper Nuclear Station, NEDC 01-065, Revision 1, "Liquid & Gaseous EQ Source Terms Based on GE14 Fuel and a LOCA" dated 5/19/2004

30. Cooper Nuclear Station, NEDC 94-072, "Control Room Operator Dose due to Reactor Bldg. 10" Core Spray Line, and LOCA Cloud Shine", dated 12/02/1996.

31. Cooper Nuclear Station, NEDC 94-070, Revision 2, "Control Room Operator Dose due to Emergency Bypass Filter Shine", dated 12/02/1996.

7 ATTACHMENTS

A. **RADTRAD Plant Specific Input File (PSF)**

B. **RADTRAD Nuclear Inventory File (NIF)**

C. **RADTRAD Radionuclide Release Fractions and Timing File (RFT)**

D. **RADTRAD Nuclide Dose Conversion File (INP)**

E. **RADTRAD Base Case Detailed Output File (oO)**

F. **RADTRAD Case 1 Detailed Output File (oO)**

G. **RADTRAD v 3.10 Detailed Output File (oO) Qualitative CREFS Shine Analysis**

H. **Design Calculations and Analysis Review Checklist**

ATTACHMENT A

RADTRAD Plant Specific Input File (PSF)

```
Radtrad 3.03 4/15/2001

Nuclide Inventory File:
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\cooper29fha.nif
Plant Power Level:
 1.5329E+01
Compartments:
  3
Compartment 1:
primary
  3
 7.9500E+05
  0
  0
  0
  0
  0
Compartment 2:
Environment
  2
 0.0000E+00
  0
  0
  0
  0
  0
Compartment 3:
Control Room
  1
 1.4186E+05
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
primary to Environment
  1
  2
  2
Pathway 2:
Environment to Control Room
  2
  3
  2
Pathway 3:
Environment to Control Room
  2
  3
  2
Pathway 4:
Control Room to Environment
  3
  2
  2
End of Plant Model File
Scenario Description Name:
```

```
Plant Model Filename:

Source Term:
  1
  1   1.0000E+00
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\cooper29fha.inp
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\RG1_183FHA.RFT
  2.4000E+01
  1
  9.5000E-01   4.8500E-02   1.5000E-03   1.0000E+00
Overlying Pool:
  0
  0.0000E+00
  0
  0
  0
  0
Compartments:
  3
Compartment 1:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Compartment 2:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Compartment 3:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
  0
  0
  0
  0
  0
  1
  1
  2.4000E+01   4.5760E+04   0.0000E+00   0.0000E+00   0.0000E+00
```

```
  0
  0
  0
  0
  0
  0
Pathway 2:
  0
  0
  0
  0
  0
  1
  2
  2.4000E+01   3.2350E+03   0.0000E+00   0.0000E+00   0.0000E+00
  2.4017E+01   8.1000E+02   8.9000E+01   8.9000E+01   8.9000E+01
  0
  0
  0
  0
  0
  0
Pathway 3:
  0
  0
  0
  0
  0
  1
  1
  2.4000E+01   4.0000E+02   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Pathway 4:
  0
  0
  0
  0
  0
  1
  2
  2.4000E+01   3.6350E+03   0.0000E+00   0.0000E+00   0.0000E+00
  2.4017E+01   1.2100E+03   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Dose Locations:
  3
Location 1:
EAB
  2
  1
  2
```

```
  2.4000E+01   5.2000E-04
  2.6000E+01   0.0000E+00
  1
  4
  2.4000E+01   3.5000E-04
  3.2000E+01   1.8000E-04
  4.8000E+01   2.3000E-04
  7.4400E+02   0.0000E+00
  0
Location 2:
LPZ
  2
  1
  5
  2.4000E+01   2.9000E-04
  3.2000E+01   7.3000E-05
  4.8000E+01   2.5000E-05
  1.2000E+02   5.2000E-06
  7.4400E+02   0.0000E+00
  1
  4
  2.4000E+01   3.5000E-04
  3.2000E+01   1.8000E-04
  4.8000E+01   2.3000E-04
  7.4400E+02   0.0000E+00
  0
Location 3:
Control Room
  3
  0
  1
  2
  2.4000E+01   3.5000E-04
  7.4400E+02   0.0000E+00
  1
  4
  2.4000E+01   1.0000E+00
  4.8000E+01   6.0000E-01
  1.2000E+02   4.0000E-01
  7.4400E+02   0.0000E+00
Effective Volume Location:
  1
  6
  2.4000E+01   4.1500E-03
  2.6000E+01   3.2400E-03
  3.2000E+01   1.3200E-03
  4.8000E+01   9.0100E-04
  1.2000E+02   7.2200E-04
  7.4400E+02   0.0000E+00
Simulation Parameters:
  0
Output Filename:
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\FHAcooper 9-21-
05.o1
  1
  1
  1
  0
  0
End of Scenario File
```

ATTACHMENT B

RADTRAD Nuclide Inventory File (NIF)

```
 Nuclide Inventory Name:
 Cooper GE14 Fission Product Inventory Kr85 and I131 Adjusted for
NonLOCA
 Power Level:
  1.0000E+00
 Nuclides:
  29
 Nuclide 001:
 Br-82
   2
  1.2708000000E+05
  8.2000E+01
  1.8000E+02
 none      0.0000E+00
 none      0.0000E+00
 none      0.0000E+00
 Nuclide 002:
 Br-83
   2
  8.6040000000E+03
  8.3000E+01
  3.2600E+03
 Kr-83m    1.0000E+00
 none      0.0000E+00
 none      0.0000E+00
 Nuclide 003:
 Br-84
   2
  1.9080000000E+03
  8.4000E+01
  5.6100E+03
 none      0.0000E+00
 none      0.0000E+00
 none      0.0000E+00
 Nuclide 004:
 Kr-83m
   1
  6.5880000000E+03
  8.3000E+01
  3.2700E+03
 none      0.0000E+00
 none      0.0000E+00
 none      0.0000E+00
 Nuclide 005:
 Kr-85
   1
  3.3829747200E+08
  8.5000E+01
  7.3200E+02
 none      0.0000E+00
 none      0.0000E+00
 none      0.0000E+00
 Nuclide 006:
 Kr-85m
   1
  1.6128000000E+04
  8.5000E+01
  6.8100E+03
 Kr-85     2.1000E-01
 none      0.0000E+00
```

```
none      0.0000E+00
Nuclide 007:
Kr-87
  1
 4.5780000000E+03
 8.7000E+01
 1.3000E+04
Rb-87     1.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 008:
Kr-88
  1
 1.0224000000E+04
 8.8000E+01
 1.8300E+04
Rb-88     1.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 009:
I-128
  2
 1.4994000000E+03
 1.2800E+02
 4.1900E+02
none      0.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 010:
I-130
  2
 4.4496000000E+04
 1.3000E+02
 1.0600E+03
none      0.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 011:
I-131
  2
 6.9465600000E+05
 1.3100E+02
 4.3520E+04
Xe-131m   1.1000E-02
none      0.0000E+00
none      0.0000E+00
Nuclide 012:
I-132
  2
 8.2800000000E+03
 1.3200E+02
 3.9300E+04
none      0.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 013:
I-133
  2
 7.4880000000E+04
 1.3300E+02
```

```
  5.5100E+04
 Xe-133m  2.9000E-02
 Xe-133   9.7000E-01
 none     0.0000E+00
 Nuclide 014:
 I-134
   2
  3.1560000000E+03
  1.3400E+02
  6.0400E+04
 none     0.0000E+00
 none     0.0000E+00
 none     0.0000E+00
 Nuclide 015:
 I-135
   2
  2.3796000000E+04
  1.3500E+02
  5.1600E+04
 Xe-135m  1.5000E-01
 Xe-135   8.5000E-01
 none     0.0000E+00
 Nuclide 016:
 Te-129
   4
  4.1760000000E+03
  1.2900E+02
  8.7900E+03
 I-129    1.0000E+00
 none     0.0000E+00
 none     0.0000E+00
 Nuclide 017:
 Te-131
   4
  1.5000000000E+03
  1.3100E+02
  2.4200E+04
 I-131    1.0000E+00
 none     0.0000E+00
 none     0.0000E+00
 Nuclide 018:
 Te-131m
   4
  1.0800000000E+05
  1.3100E+02
  3.9600E+03
 I-131    7.7800E-01
 Te-131   2.2200E-01
 none     0.0000E+00
 Nuclide 019:
 Te-132
   4
  2.8152000000E+05
  1.3200E+02
  3.8500E+04
 I-132    1.0000E+00
 none     0.0000E+00
 none     0.0000E+00
 Nuclide 020:
 Te-133
```

```
  4
 7.4700000000E+02
 1.3300E+02
 3.2400E+04
I-133     1.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 021:
Te-133m
  4
 3.3240000000E+03
 1.3300E+02
 1.9800E+04
I-133     8.7000E-01
Te-133    1.3000E-01
none      0.0000E+00
Nuclide 022:
Te-134
  4
 2.5080000000E+03
 1.3400E+02
 4.5000E+04
I-134     1.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 023:
Xe-129m
  1
 6.9120000000E+05
 1.2900E+02
 2.0600E-01
none      0.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 024:
Xe-131m
  1
 1.0281600000E+06
 1.3100E+02
 3.0400E+02
none      0.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 025:
Xe-133
  1
 4.5316800000E+05
 1.3300E+02
 5.2600E+04
none      0.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 026:
Xe-133m
  1
 1.8904320000E+05
 1.3300E+02
 1.5800E+03
Xe-133    1.0000E+00
none      0.0000E+00
```

```
none      0.0000E+00
Nuclide 027:
Xe-135
  1
 3.2724000000E+04
 1.3500E+02
 1.8600E+04
Cs-135    1.0000E+00
none      0.0000E+00
none      0.0000E+00
Nuclide 028:
Xe-135m
  1
 9.1740000000E+02
 1.3500E+02
 1.0900E+04
Cs-135    4.5000E-05
Xe-135    9.9990E-01
none      0.0000E+00
Nuclide 029:
Xe-138
  1
 8.5020000000E+02
 1.3800E+02
 4.5000E+04
Cs-138    1.0000E+00
none      0.0000E+00
none      0.0000E+00
End of Nuclear Inventory File
```

ATTACHMENT C

RADTRAD Radionuclide Release Fractions and Timing File (RFT)

```
 Release Fraction and Timing Name:
RG 1.183, Tables 3, FHA  with DF iodine=200, all aerosols
Duration (h):   NON-LOCA Accident chk inventory
 0.0036E+00  0.0000E+00  0.0000E+00  0.0000E+00
Noble Gases:
 0.0500E+00  0.0000E+00  0.0000E+00  0.0000E+00
Iodine:
 0.2500E-03  0.0000E+00  0.0000E+00  0.0000E+00
Cesium:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Tellurium:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Strontium:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Barium:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Ruthenium:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Cerium:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Lanthanum:
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
Non-Radioactive Aerosols (kg):
 0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
End of Release File
```

ATTACHMENT D

RADTRAD Nuclide Dose Conversion File (INP)

FGRDCF 10/24/95 03:24:50 beta-test version 1.10, minor FORTRAN fixes 5/4/95
Implicit daughter halflives (m) less than 90 and less than 0.100 of parent

9 ORGANS DEFINED IN THIS FILE:

GONADS
BREAST
LUNGS
RED MARR
BONE SUR
THYROID
REMAINDER
EFFECTIVE
SKIN(FGR)

29 NUCLIDES DEFINED IN THIS FILE:

Br-82	D	
Br-83	D	
Br-84	D	
Kr-83m		
Kr-85		
Kr-85m		
Kr-87		
Kr-88		
I-128	D	
I-130	D	
I-131	D	
I-132	D	
I-133	D	
I-134	D	
I-135	D	Including:Xe-135m
Te-129	W	
Te-131	W	
Te-131m	W	Including:Te-131
Te-132	W	
Te-133	W	
Te-133m	W	
Te-134	W	
Xe-129m		
Xe-131m		
Xe-133		
Xe-133m		
Xe-135		
Xe-135m		
Xe-138		

	CLOUDSHINE	GROUND SHINE	GROUND 8HRSHINE	GROUND 7DAYSHINE	INHALED RATE	INHALED ACUTE	INHALED CHRONIC	INGESTION
Br-82								
GONADS	1.270E-13	7.116E-11	4.714E-10	2.670E-15	-1.000E+00	2.520E-10	4.480E-10	
BREAST	1.440E-13	6.796E-11	4.502E-10	2.550E-15	-1.000E+00	2.370E-10	3.810E-10	
LUNGS	1.270E-13	6.530E-11	4.326E-10	2.450E-15	-1.000E+00	7.820E-10	3.840E-10	
RED MARR	1.240E-13	6.663E-11	4.414E-10	2.500E-15	-1.000E+00	2.540E-10	4.140E-10	
BONE SUR	1.990E-13	9.355E-11	6.198E-10	3.510E-15	-1.000E+00	2.310E-10	3.800E-10	
THYROID	1.300E-13	6.690E-11	4.432E-10	2.510E-15	-1.000E+00	2.380E-10	3.830E-10	

REMAINDER	1.220E-13	6.450E-11	4.273E-10	2.420E-15	-1.000E+00	3.150E-10	5.800E-10
EFFECTIVE	1.300E-13	6.796E-11	4.502E-10	2.550E-15	-1.000E+00	3.310E-10	4.620E-10
SKIN(FGR)	1.540E-13	8.129E-11	5.385E-10	3.050E-15	-1.000E+00	0.000E+00	0.000E+00
Br-83							
GONADS	3.740E-16	9.637E-14	1.069E-13	8.610E-18	-1.000E+00	3.280E-12	7.350E-12
BREAST	4.290E-16	9.302E-14	1.032E-13	8.310E-18	-1.000E+00	3.290E-12	7.340E-12
LUNGS	3.690E-16	8.608E-14	9.546E-14	7.690E-18	-1.000E+00	1.500E-10	7.350E-12
RED MARR	3.540E-16	8.630E-14	9.570E-14	7.710E-18	-1.000E+00	3.300E-12	7.350E-12
BONE SUR	6.750E-16	1.422E-13	1.576E-13	1.270E-17	-1.000E+00	3.290E-12	7.330E-12
THYROID	3.800E-16	9.033E-14	1.002E-13	8.070E-18	-1.000E+00	3.290E-12	7.330E-12
REMAINDER	3.520E-16	8.440E-14	9.359E-14	7.540E-18	-1.000E+00	1.130E-11	6.540E-11
EFFECTIVE	3.820E-16	9.100E-14	1.009E-13	8.130E-18	-1.000E+00	2.330E-11	2.470E-11
SKIN(FGR)	1.850E-14	2.339E-11	2.594E-11	2.090E-15	-1.000E+00	0.000E+00	0.000E+00
Br-84							
GONADS	9.160E-14	4.569E-12	4.569E-12	1.660E-15	-1.000E+00	2.840E-12	6.750E-12
BREAST	1.020E-13	4.349E-12	4.349E-12	1.580E-15	-1.000E+00	3.310E-12	6.620E-12
LUNGS	9.270E-14	4.239E-12	4.239E-12	1.540E-15	-1.000E+00	1.560E-10	6.990E-12
RED MARR	9.260E-14	4.377E-12	4.377E-12	1.590E-15	-1.000E+00	3.270E-12	6.210E-12
BONE SUR	1.280E-13	5.725E-12	5.726E-12	2.080E-15	-1.000E+00	2.990E-12	5.560E-12
THYROID	9.500E-14	4.101E-12	4.101E-12	1.490E-15	-1.000E+00	3.120E-12	5.200E-12
REMAINDER	8.990E-14	4.267E-12	4.267E-12	1.550E-15	-1.000E+00	1.870E-11	1.480E-10
EFFECTIVE	9.410E-14	4.404E-12	4.404E-12	1.600E-15	-1.000E+00	2.610E-11	4.910E-11
SKIN(FGR)	1.880E-13	3.523E-11	3.523E-11	1.280E-14	-1.000E+00	0.000E+00	0.000E+00
Kr-83m							
GONADS	1.710E-18	5.572E-15	5.855E-15	6.160E-19	-1.000E+00	0.000E+00	0.000E+00
BREAST	5.050E-18	9.498E-15	9.980E-15	1.050E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.640E-19	1.266E-16	1.331E-16	1.400E-20	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.830E-19	5.617E-16	5.902E-16	6.210E-20	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.250E-18	3.437E-15	3.612E-15	3.800E-19	-1.000E+00	0.000E+00	0.000E+00
THYROID	6.430E-19	7.698E-16	8.088E-16	8.510E-20	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.300E-19	1.393E-15	1.464E-15	1.540E-19	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.500E-18	3.437E-15	3.612E-15	3.800E-19	-1.000E+00	0.000E+00	

```
0.000E+00
SKIN(FGR)   3.560E-17 1.167E-13 1.226E-13 1.290E-17-1.000E+00 0.000E+00
0.000E+00
Kr-85
GONADS      1.170E-16 8.121E-14 1.704E-12 2.820E-18-1.000E+00 0.000E+00
0.000E+00
BREAST      1.340E-16 7.891E-14 1.656E-12 2.740E-18-1.000E+00 0.000E+00
0.000E+00
LUNGS       1.140E-16 7.056E-14 1.481E-12 2.450E-18-1.000E+00 0.000E+00
0.000E+00
RED MARR    1.090E-16 6.998E-14 1.469E-12 2.430E-18-1.000E+00 0.000E+00
0.000E+00
BONE SUR    2.200E-16 1.287E-13 2.702E-12 4.470E-18-1.000E+00 0.000E+00
0.000E+00
THYROID     1.180E-16 7.459E-14 1.565E-12 2.590E-18-1.000E+00 0.000E+00
0.000E+00
REMAINDER   1.090E-16 6.941E-14 1.457E-12 2.410E-18-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   1.190E-16 7.603E-14 1.596E-12 2.640E-18-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   1.320E-14 2.304E-11 4.835E-10 8.000E-16-1.000E+00 0.000E+00
0.000E+00
Kr-85m
GONADS      7.310E-15 2.594E-12 3.653E-12 1.570E-16-1.000E+00 0.000E+00
0.000E+00
BREAST      8.410E-15 2.527E-12 3.560E-12 1.530E-16-1.000E+00 0.000E+00
0.000E+00
LUNGS       7.040E-15 2.379E-12 3.351E-12 1.440E-16-1.000E+00 0.000E+00
0.000E+00
RED MARR    6.430E-15 2.346E-12 3.304E-12 1.420E-16-1.000E+00 0.000E+00
0.000E+00
BONE SUR    1.880E-14 5.286E-12 7.446E-12 3.200E-16-1.000E+00 0.000E+00
0.000E+00
THYROID     7.330E-15 2.395E-12 3.374E-12 1.450E-16-1.000E+00 0.000E+00
0.000E+00
REMAINDER   6.640E-15 2.313E-12 3.257E-12 1.400E-16-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   7.480E-15 2.511E-12 3.537E-12 1.520E-16-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   2.240E-14 2.247E-11 3.164E-11 1.360E-15-1.000E+00 0.000E+00
0.000E+00
Kr-87
GONADS      4.000E-14 4.962E-12 5.026E-12 7.610E-16-1.000E+00 0.000E+00
0.000E+00
BREAST      4.500E-14 4.740E-12 4.802E-12 7.270E-16-1.000E+00 0.000E+00
0.000E+00
LUNGS       4.040E-14 4.603E-12 4.663E-12 7.060E-16-1.000E+00 0.000E+00
0.000E+00
RED MARR    4.000E-14 4.708E-12 4.769E-12 7.220E-16-1.000E+00 0.000E+00
0.000E+00
BONE SUR    6.020E-14 6.514E-12 6.598E-12 9.990E-16-1.000E+00 0.000E+00
0.000E+00
THYROID     4.130E-14 4.473E-12 4.531E-12 6.860E-16-1.000E+00 0.000E+00
0.000E+00
REMAINDER   3.910E-14 4.590E-12 4.650E-12 7.040E-16-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   4.120E-14 4.773E-12 4.835E-12 7.320E-16-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   1.370E-13 8.802E-11 8.916E-11 1.350E-14-1.000E+00 0.000E+00
0.000E+00
```

```
Kr-88
GONADS      9.900E-14 2.278E-11 2.655E-11 1.800E-15-1.000E+00 0.000E+00
0.000E+00
BREAST      1.110E-13 2.177E-11 2.537E-11 1.720E-15-1.000E+00 0.000E+00
0.000E+00
LUNGS       1.010E-13 2.139E-11 2.493E-11 1.690E-15-1.000E+00 0.000E+00
0.000E+00
RED MARR    1.000E-13 2.190E-11 2.552E-11 1.730E-15-1.000E+00 0.000E+00
0.000E+00
BONE SUR    1.390E-13 2.886E-11 3.363E-11 2.280E-15-1.000E+00 0.000E+00
0.000E+00
THYROID     1.030E-13 2.012E-11 2.345E-11 1.590E-15-1.000E+00 0.000E+00
0.000E+00
REMAINDER   9.790E-14 2.139E-11 2.493E-11 1.690E-15-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   1.020E-13 2.202E-11 2.567E-11 1.740E-15-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   1.350E-13 5.607E-11 6.534E-11 4.430E-15-1.000E+00 0.000E+00
0.000E+00
I-128
GONADS      4.070E-15 2.007E-13 2.007E-13 9.280E-17-1.000E+00 6.800E-13
1.390E-12
BREAST      4.670E-15 1.938E-13 1.938E-13 8.960E-17-1.000E+00 7.150E-13
1.440E-12
LUNGS       4.010E-15 1.795E-13 1.795E-13 8.300E-17-1.000E+00 7.220E-11
1.470E-12
RED MARR    3.850E-15 1.804E-13 1.804E-13 8.340E-17-1.000E+00 7.170E-13
1.430E-12
BONE SUR    7.470E-15 2.920E-13 2.920E-13 1.350E-16-1.000E+00 7.030E-13
1.390E-12
THYROID     4.130E-15 1.882E-13 1.882E-13 8.700E-17-1.000E+00 5.340E-11
1.080E-10
REMAINDER   3.830E-15 1.761E-13 1.761E-13 8.140E-17-1.000E+00 7.020E-12
6.710E-11
EFFECTIVE   4.160E-15 1.897E-13 1.897E-13 8.770E-17-1.000E+00 1.280E-11
2.430E-11
SKIN(FGR)   5.380E-14 1.899E-11 1.899E-11 8.780E-15-1.000E+00 0.000E+00
0.000E+00
I-130
GONADS      1.010E-13 5.105E-11 1.412E-10 2.200E-15-1.000E+00 2.810E-11
5.520E-11
BREAST      1.160E-13 4.897E-11 1.354E-10 2.110E-15-1.000E+00 4.870E-11
7.320E-11
LUNGS       1.010E-13 4.664E-11 1.290E-10 2.010E-15-1.000E+00 6.030E-10
7.180E-11
RED MARR    9.820E-14 4.734E-11 1.309E-10 2.040E-15-1.000E+00 4.550E-11
6.740E-11
BONE SUR    1.680E-13 6.869E-11 1.900E-10 2.960E-15-1.000E+00 4.030E-11
6.120E-11
THYROID     1.040E-13 4.850E-11 1.342E-10 2.090E-15-1.000E+00 1.990E-08
3.940E-08
REMAINDER   9.660E-14 4.572E-11 1.265E-10 1.970E-15-1.000E+00 8.020E-11
1.970E-10
EFFECTIVE   1.040E-13 4.873E-11 1.348E-10 2.100E-15-1.000E+00 7.140E-10
1.280E-09
SKIN(FGR)   1.360E-13 9.956E-11 2.754E-10 4.290E-15-1.000E+00 0.000E+00
0.000E+00
I-131
GONADS      1.780E-14 1.119E-11 1.789E-10 3.940E-16-1.000E+00 2.530E-11
4.070E-11
```

BREAST	2.040E-14	1.082E-11	1.730E-10	3.810E-16	-1.000E+00	7.880E-11
1.210E-10						
LUNGS	1.760E-14	1.016E-11	1.626E-10	3.580E-16	-1.000E+00	6.570E-10
1.020E-10						
RED MARR	1.680E-14	1.022E-11	1.635E-10	3.600E-16	-1.000E+00	6.260E-11
9.440E-11						
BONE SUR	3.450E-14	1.675E-11	2.679E-10	5.900E-16	-1.000E+00	5.730E-11
8.720E-11						
THYROID	1.810E-14	1.053E-11	1.685E-10	3.710E-16	-1.000E+00	2.920E-07
4.760E-07						
REMAINDER	1.670E-14	9.908E-12	1.585E-10	3.490E-16	-1.000E+00	8.030E-11
1.570E-10						
EFFECTIVE	1.820E-14	1.067E-11	1.707E-10	3.760E-16	-1.000E+00	8.890E-09
1.440E-08						
SKIN(FGR)	2.980E-14	1.825E-11	2.920E-10	6.430E-16	-1.000E+00	0.000E+00
0.000E+00						
I-132						
GONADS	1.090E-13	2.523E-11	2.771E-11	2.320E-15	-1.000E+00	9.950E-12
2.330E-11						
BREAST	1.240E-13	2.414E-11	2.652E-11	2.220E-15	-1.000E+00	1.410E-11
2.520E-11						
LUNGS	1.090E-13	2.305E-11	2.532E-11	2.120E-15	-1.000E+00	2.710E-10
2.640E-11						
RED MARR	1.070E-13	2.360E-11	2.592E-11	2.170E-15	-1.000E+00	1.400E-11
2.460E-11						
BONE SUR	1.730E-13	3.327E-11	3.655E-11	3.060E-15	-1.000E+00	1.240E-11
2.190E-11						
THYROID	1.120E-13	2.381E-11	2.616E-11	2.190E-15	-1.000E+00	1.740E-09
3.870E-09						
REMAINDER	1.050E-13	2.283E-11	2.509E-11	2.100E-15	-1.000E+00	3.780E-11
1.650E-10						
EFFECTIVE	1.120E-13	2.403E-11	2.640E-11	2.210E-15	-1.000E+00	1.030E-10
1.820E-10						
SKIN(FGR)	1.580E-13	8.199E-11	9.007E-11	7.540E-15	-1.000E+00	0.000E+00
0.000E+00						
I-133						
GONADS	2.870E-14	1.585E-11	6.748E-11	6.270E-16	-1.000E+00	1.950E-11
3.630E-11						
BREAST	3.280E-14	1.519E-11	6.468E-11	6.010E-16	-1.000E+00	2.940E-11
4.680E-11						
LUNGS	2.860E-14	1.446E-11	6.156E-11	5.720E-16	-1.000E+00	8.200E-10
4.530E-11						
RED MARR	2.770E-14	1.466E-11	6.242E-11	5.800E-16	-1.000E+00	2.720E-11
4.300E-11						
BONE SUR	4.870E-14	2.161E-11	9.202E-11	8.550E-16	-1.000E+00	2.520E-11
4.070E-11						
THYROID	2.930E-14	1.502E-11	6.393E-11	5.940E-16	-1.000E+00	4.860E-08
9.100E-08						
REMAINDER	2.730E-14	1.418E-11	6.038E-11	5.610E-16	-1.000E+00	5.000E-11
1.550E-10						
EFFECTIVE	2.940E-14	1.509E-11	6.425E-11	5.970E-16	-1.000E+00	1.580E-09
2.800E-09						
SKIN(FGR)	5.830E-14	1.150E-10	4.897E-10	4.550E-15	-1.000E+00	0.000E+00
0.000E+00						
I-134						
GONADS	1.270E-13	1.200E-11	1.202E-11	2.640E-15	-1.000E+00	4.250E-12
1.100E-11						
BREAST	1.440E-13	1.145E-11	1.147E-11	2.520E-15	-1.000E+00	6.170E-12
1.170E-11						
LUNGS	1.270E-13	1.100E-11	1.102E-11	2.420E-15	-1.000E+00	1.430E-10

1.260E-11						
RED MARR	1.250E-13	1.127E-11	1.129E-11	2.480E-15	-1.000E+00	6.080E-12
1.090E-11						
BONE SUR	1.960E-13	1.568E-11	1.571E-11	3.450E-15	-1.000E+00	5.310E-12
9.320E-12						
THYROID	1.300E-13	1.127E-11	1.129E-11	2.480E-15	-1.000E+00	2.880E-10
6.210E-10						
REMAINDER	1.220E-13	1.091E-11	1.093E-11	2.400E-15	-1.000E+00	2.270E-11
1.340E-10						
EFFECTIVE	1.300E-13	1.150E-11	1.152E-11	2.530E-15	-1.000E+00	3.550E-11
6.660E-11						
SKIN(FGR)	1.870E-13	4.477E-11	4.485E-11	9.850E-15	-1.000E+00	0.000E+00
0.000E+00						
I-135						
GONADS	8.078E-14	3.113E-11	5.489E-11	1.599E-15	-1.000E+00	1.700E-11
3.610E-11						
BREAST	9.143E-14	2.971E-11	5.240E-11	1.526E-15	-1.000E+00	2.340E-11
3.850E-11						
LUNGS	8.145E-14	2.886E-11	5.089E-11	1.482E-15	-1.000E+00	4.410E-10
3.750E-11						
RED MARR	8.054E-14	2.965E-11	5.228E-11	1.523E-15	-1.000E+00	2.240E-11
3.650E-11						
BONE SUR	1.184E-13	3.983E-11	7.024E-11	2.046E-15	-1.000E+00	2.010E-11
3.360E-11						
THYROID	8.324E-14	2.852E-11	5.030E-11	1.465E-15	-1.000E+00	8.460E-09
1.790E-08						
REMAINDER	7.861E-14	2.883E-11	5.084E-11	1.481E-15	-1.000E+00	4.700E-11
1.540E-10						
EFFECTIVE	8.294E-14	2.989E-11	5.271E-11	1.535E-15	-1.000E+00	3.320E-10
6.080E-10						
SKIN(FGR)	1.156E-13	9.826E-11	1.733E-10	5.047E-15	-1.000E+00	0.000E+00
0.000E+00						
Te-129						
GONADS	2.710E-15	3.889E-13	3.922E-13	6.510E-17	-1.000E+00	5.050E-13
1.590E-12						
BREAST	3.120E-15	3.800E-13	3.832E-13	6.360E-17	-1.000E+00	5.390E-13
6.050E-13						
LUNGS	2.640E-15	3.298E-13	3.326E-13	5.520E-17	-1.000E+00	1.530E-10
4.910E-13						
RED MARR	2.540E-15	3.298E-13	3.326E-13	5.520E-17	-1.000E+00	6.190E-13
7.640E-13						
BONE SUR	4.880E-15	5.753E-13	5.802E-13	9.630E-17	-1.000E+00	6.220E-13
5.400E-13						
THYROID	2.740E-15	3.525E-13	3.555E-13	5.900E-17	-1.000E+00	5.090E-13
3.360E-13						
REMAINDER	2.520E-15	3.262E-13	3.289E-13	5.460E-17	-1.000E+00	7.280E-12
1.790E-10						
EFFECTIVE	2.750E-15	3.590E-13	3.621E-13	6.010E-17	-1.000E+00	2.090E-11
5.450E-11						
SKIN(FGR)	3.570E-14	3.429E-11	3.458E-11	5.740E-15	-1.000E+00	0.000E+00
0.000E+00						
Te-131						
GONADS	1.990E-14	9.284E-13	9.284E-13	4.290E-16	-1.000E+00	2.170E-12
1.570E-11						
BREAST	2.280E-14	8.937E-13	8.937E-13	4.130E-16	-1.000E+00	2.670E-12
4.960E-12						
LUNGS	1.960E-14	8.440E-13	8.440E-13	3.900E-16	-1.000E+00	2.990E-10
3.390E-12						
RED MARR	1.880E-14	8.483E-13	8.483E-13	3.920E-16	-1.000E+00	2.940E-12
6.600E-12						

BONE SUR	3.800E-14	1.459E-12	1.459E-12	6.740E-16	1.000E+00	2.610E-12
3.690E-12						
THYROID	2.030E-14	8.678E-13	8.678E-13	4.010E-16	1.000E+00	2.660E-09
4.210E-09						
REMAINDER	1.870E-14	8.267E-13	8.267E-13	3.820E-16	1.000E+00	2.210E-11
3.730E-10						
EFFECTIVE	2.040E-14	8.873E-13	8.873E-13	4.100E-16	1.000E+00	1.240E-10
2.440E-10						
SKIN(FGR)	6.890E-14	1.809E-11	1.809E-11	8.360E-15	1.000E+00	0.000E+00
0.000E+00						
Te-131m						
GONADS	7.292E-14	4.020E-11	2.343E-10	1.535E-15	1.000E+00	2.345E-10
7.415E-10						
BREAST	8.286E-14	3.853E-11	2.246E-10	1.472E-15	1.000E+00	9.309E-11
1.361E-10						
LUNGS	7.265E-14	3.657E-11	2.131E-10	1.397E-15	1.000E+00	2.296E-09
6.335E-11						
RED MARR	7.097E-14	3.736E-11	2.178E-10	1.427E-15	1.000E+00	1.417E-10
2.435E-10						
BONE SUR	1.174E-13	5.467E-11	3.189E-10	2.090E-15	1.000E+00	2.276E-10
3.248E-10						
THYROID	7.471E-14	3.741E-11	2.181E-10	1.429E-15	1.000E+00	3.669E-08
4.383E-08						
REMAINDER	6.965E-14	3.626E-11	2.113E-10	1.385E-15	1.000E+00	9.509E-10
3.153E-09						
EFFECTIVE	7.463E-14	3.825E-11	2.229E-10	1.461E-15	1.000E+00	1.758E-09
2.514E-09						
SKIN(FGR)	1.038E-13	1.033E-10	6.188E-10	4.056E-15	1.000E+00	0.000E+00
0.000E+00						
Te-132						
GONADS	1.020E-14	6.812E-12	7.706E-11	2.450E-16	1.000E+00	4.150E-10
5.410E-10						
BREAST	1.180E-14	6.756E-12	7.643E-11	2.430E-16	1.000E+00	3.630E-10
3.500E-10						
LUNGS	9.650E-15	5.727E-12	6.479E-11	2.060E-16	1.000E+00	1.670E-09
3.300E-10						
RED MARR	8.950E-15	5.588E-12	6.322E-11	2.010E-16	1.000E+00	4.270E-10
4.440E-10						
BONE SUR	2.420E-14	1.273E-11	1.441E-10	4.580E-16	1.000E+00	7.120E-10
8.300E-10						
THYROID	1.020E-14	5.978E-12	6.762E-11	2.150E-16	1.000E+00	6.280E-08
5.950E-08						
REMAINDER	9.160E-15	5.644E-12	6.385E-11	2.030E-16	1.000E+00	7.890E-10
1.490E-09						
EFFECTIVE	1.030E-14	6.339E-12	7.171E-11	2.280E-16	1.000E+00	2.550E-09
2.540E-09						
SKIN(FGR)	1.390E-14	8.313E-12	9.405E-11	2.990E-16	1.000E+00	0.000E+00
0.000E+00						
Te-133						
GONADS	4.490E-14	1.007E-12	1.007E-12	9.340E-16	1.000E+00	3.590E-13
1.850E-12						
BREAST	5.100E-14	9.656E-13	9.656E-13	8.960E-16	1.000E+00	6.050E-13
1.230E-12						
LUNGS	4.470E-14	9.236E-13	9.236E-13	8.570E-16	1.000E+00	4.640E-11
1.220E-12						
RED MARR	4.360E-14	9.408E-13	9.408E-13	8.730E-16	1.000E+00	5.830E-13
1.180E-12						
BONE SUR	7.500E-14	1.390E-12	1.390E-12	1.290E-15	1.000E+00	5.210E-13
7.730E-13						
THYROID	4.590E-14	9.333E-13	9.333E-13	8.660E-16	1.000E+00	5.910E-10

```
9.390E-10
REMAINDER  4.290E-14 9.117E-13 9.117E-13 8.460E-16-1.000E+00 1.180E-12
6.050E-11
EFFECTIVE  4.600E-14 9.635E-13 9.635E-13 8.940E-16-1.000E+00 2.390E-11
4.730E-11
SKIN(FGR)  1.060E-13 1.088E-11 1.088E-11 1.010E-14-1.000E+00 0.000E+00
0.000E+00
Te-133m
GONADS     1.120E-13 1.110E-11 1.113E-11 2.320E-15-1.000E+00 3.390E-12
3.680E-11
BREAST     1.270E-13 1.062E-11 1.065E-11 2.220E-15-1.000E+00 4.910E-12
1.140E-11
LUNGS      1.120E-13 1.019E-11 1.021E-11 2.130E-15-1.000E+00 2.060E-10
8.330E-12
RED MARR   1.090E-13 1.043E-11 1.045E-11 2.180E-15-1.000E+00 4.890E-12
1.310E-11
BONE SUR   1.750E-13 1.478E-11 1.482E-11 3.090E-15-1.000E+00 4.130E-12
6.610E-12
THYROID    1.150E-13 1.038E-11 1.041E-11 2.170E-15-1.000E+00 2.630E-09
4.170E-09
REMAINDER  1.070E-13 1.009E-11 1.012E-11 2.110E-15-1.000E+00 1.430E-11
2.890E-10
EFFECTIVE  1.140E-13 1.062E-11 1.065E-11 2.220E-15-1.000E+00 1.100E-10
2.260E-10
SKIN(FGR)  1.740E-13 4.832E-11 4.843E-11 1.010E-14-1.000E+00 0.000E+00
0.000E+00
Te-134
GONADS     4.160E-14 3.299E-12 3.300E-12 9.120E-16-1.000E+00 7.900E-12
2.030E-11
BREAST     4.750E-14 3.176E-12 3.177E-12 8.780E-16-1.000E+00 7.960E-12
1.370E-11
LUNGS      4.100E-14 2.980E-12 2.981E-12 8.240E-16-1.000E+00 6.600E-11
1.290E-11
RED MARR   3.940E-14 3.009E-12 3.010E-12 8.320E-16-1.000E+00 8.380E-12
1.490E-11
BONE SUR   7.560E-14 4.883E-12 4.885E-12 1.350E-15-1.000E+00 7.780E-12
1.230E-11
THYROID    4.230E-14 3.100E-12 3.101E-12 8.570E-16-1.000E+00 5.560E-10
8.820E-10
REMAINDER  3.910E-14 2.923E-12 2.924E-12 8.080E-16-1.000E+00 1.090E-11
9.650E-11
EFFECTIVE  4.240E-14 3.136E-12 3.137E-12 8.670E-16-1.000E+00 3.230E-11
6.630E-11
SKIN(FGR)  6.350E-14 7.813E-12 7.815E-12 2.160E-15-1.000E+00 0.000E+00
0.000E+00
Xe-129m
GONADS     1.230E-15 1.993E-12 3.183E-11 7.020E-17-1.000E+00 0.000E+00
0.000E+00
BREAST     1.600E-15 2.135E-12 3.410E-11 7.520E-17-1.000E+00 0.000E+00
0.000E+00
LUNGS      7.550E-16 9.425E-13 1.506E-11 3.320E-17-1.000E+00 0.000E+00
0.000E+00
RED MARR   6.450E-16 7.438E-13 1.188E-11 2.620E-17-1.000E+00 0.000E+00
0.000E+00
BONE SUR   2.840E-15 4.287E-12 6.847E-11 1.510E-16-1.000E+00 0.000E+00
0.000E+00
THYROID    1.070E-15 1.340E-12 2.140E-11 4.720E-17-1.000E+00 0.000E+00
0.000E+00
REMAINDER  7.600E-16 1.042E-12 1.664E-11 3.670E-17-1.000E+00 0.000E+00
0.000E+00
```

EFFECTIVE	1.060E-15	1.502E-12	2.399E-11	5.290E-17	-1.000E+00	0.000E+00
0.000E+00						
SKIN(FGR)	8.290E-15	3.151E-12	5.034E-11	1.110E-16	-1.000E+00	0.000E+00
0.000E+00						
Xe-131m						
GONADS	4.570E-16	7.872E-13	1.371E-11	2.760E-17	-1.000E+00	0.000E+00
0.000E+00						
BREAST	6.020E-16	8.471E-13	1.475E-11	2.970E-17	-1.000E+00	0.000E+00
0.000E+00						
LUNGS	2.670E-16	3.565E-13	6.209E-12	1.250E-17	-1.000E+00	0.000E+00
0.000E+00						
RED MARR	2.270E-16	2.792E-13	4.863E-12	9.790E-18	-1.000E+00	0.000E+00
0.000E+00						
BONE SUR	1.060E-15	1.677E-12	2.920E-11	5.880E-17	-1.000E+00	0.000E+00
0.000E+00						
THYROID	3.910E-16	5.220E-13	9.089E-12	1.830E-17	-1.000E+00	0.000E+00
0.000E+00						
REMAINDER	2.710E-16	3.993E-13	6.954E-12	1.400E-17	-1.000E+00	0.000E+00
0.000E+00						
EFFECTIVE	3.890E-16	5.876E-13	1.023E-11	2.060E-17	-1.000E+00	0.000E+00
0.000E+00						
SKIN(FGR)	4.820E-15	1.266E-12	2.205E-11	4.440E-17	-1.000E+00	0.000E+00
0.000E+00						
Xe-133						
GONADS	1.610E-15	1.465E-12	2.052E-11	5.200E-17	-1.000E+00	0.000E+00
0.000E+00						
BREAST	1.960E-15	1.505E-12	2.107E-11	5.340E-17	-1.000E+00	0.000E+00
0.000E+00						
LUNGS	1.320E-15	1.045E-12	1.464E-11	3.710E-17	-1.000E+00	0.000E+00
0.000E+00						
RED MARR	1.070E-15	8.791E-13	1.231E-11	3.120E-17	-1.000E+00	0.000E+00
0.000E+00						
BONE SUR	5.130E-15	4.254E-12	5.958E-11	1.510E-16	-1.000E+00	0.000E+00
0.000E+00						
THYROID	1.510E-15	1.181E-12	1.653E-11	4.190E-17	-1.000E+00	0.000E+00
0.000E+00						
REMAINDER	1.240E-15	1.042E-12	1.460E-11	3.700E-17	-1.000E+00	0.000E+00
0.000E+00						
EFFECTIVE	1.560E-15	1.299E-12	1.819E-11	4.610E-17	-1.000E+00	0.000E+00
0.000E+00						
SKIN(FGR)	4.970E-15	1.953E-12	2.734E-11	6.930E-17	-1.000E+00	0.000E+00
0.000E+00						
Xe-133m						
GONADS	1.420E-15	1.337E-12	1.188E-11	4.890E-17	-1.000E+00	0.000E+00
0.000E+00						
BREAST	1.700E-15	1.383E-12	1.230E-11	5.060E-17	-1.000E+00	0.000E+00
0.000E+00						
LUNGS	1.190E-15	8.609E-13	7.656E-12	3.150E-17	-1.000E+00	0.000E+00
0.000E+00						
RED MARR	1.100E-15	7.844E-13	6.975E-12	2.870E-17	-1.000E+00	0.000E+00
0.000E+00						
BONE SUR	3.230E-15	2.599E-12	2.311E-11	9.510E-17	-1.000E+00	0.000E+00
0.000E+00						
THYROID	1.360E-15	1.028E-12	9.138E-12	3.760E-17	-1.000E+00	0.000E+00
0.000E+00						
REMAINDER	1.150E-15	8.855E-13	7.874E-12	3.240E-17	-1.000E+00	0.000E+00
0.000E+00						
EFFECTIVE	1.370E-15	1.112E-12	9.892E-12	4.070E-17	-1.000E+00	0.000E+00
0.000E+00						
SKIN(FGR)	1.040E-14	1.894E-12	1.684E-11	6.930E-17	-1.000E+00	0.000E+00

```
0.000E+00
Xe-135
GONADS      1.170E-14 5.455E-12 1.194E-11 2.530E-16-1.000E+00 0.000E+00
0.000E+00
BREAST      1.330E-14 5.325E-12 1.166E-11 2.470E-16-1.000E+00 0.000E+00
0.000E+00
LUNGS       1.130E-14 4.959E-12 1.086E-11 2.300E-16-1.000E+00 0.000E+00
0.000E+00
RED MARR    1.070E-14 4.959E-12 1.086E-11 2.300E-16-1.000E+00 0.000E+00
0.000E+00
BONE SUR    2.570E-14 9.120E-12 1.997E-11 4.230E-16-1.000E+00 0.000E+00
0.000E+00
THYROID     1.180E-14 5.023E-12 1.100E-11 2.330E-16-1.000E+00 0.000E+00
0.000E+00
REMAINDER   1.080E-14 4.829E-12 1.058E-11 2.240E-16-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   1.190E-14 5.217E-12 1.142E-11 2.420E-16-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   3.120E-14 4.506E-11 9.867E-11 2.090E-15-1.000E+00 0.000E+00
0.000E+00
Xe-135m
GONADS      2.000E-14 5.929E-13 5.929E-13 4.480E-16-1.000E+00 0.000E+00
0.000E+00
BREAST      2.290E-14 5.691E-13 5.691E-13 4.300E-16-1.000E+00 0.000E+00
0.000E+00
LUNGS       1.980E-14 5.347E-13 5.347E-13 4.040E-16-1.000E+00 0.000E+00
0.000E+00
RED MARR    1.910E-14 5.400E-13 5.400E-13 4.080E-16-1.000E+00 0.000E+00
0.000E+00
BONE SUR    3.500E-14 8.246E-13 8.246E-13 6.230E-16-1.000E+00 0.000E+00
0.000E+00
THYROID     2.040E-14 5.612E-13 5.612E-13 4.240E-16-1.000E+00 0.000E+00
0.000E+00
REMAINDER   1.890E-14 5.241E-13 5.241E-13 3.960E-16-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   2.040E-14 5.612E-13 5.612E-13 4.240E-16-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   2.970E-14 1.866E-12 1.866E-12 1.410E-15-1.000E+00 0.000E+00
0.000E+00
Xe-138
GONADS      5.590E-14 1.312E-12 1.312E-12 1.070E-15-1.000E+00 0.000E+00
0.000E+00
BREAST      6.320E-14 1.251E-12 1.251E-12 1.020E-15-1.000E+00 0.000E+00
0.000E+00
LUNGS       5.660E-14 1.223E-12 1.223E-12 9.970E-16-1.000E+00 0.000E+00
0.000E+00
RED MARR    5.600E-14 1.251E-12 1.251E-12 1.020E-15-1.000E+00 0.000E+00
0.000E+00
BONE SUR    8.460E-14 1.729E-12 1.729E-12 1.410E-15-1.000E+00 0.000E+00
0.000E+00
THYROID     5.770E-14 1.171E-12 1.171E-12 9.550E-16-1.000E+00 0.000E+00
0.000E+00
REMAINDER   5.490E-14 1.219E-12 1.219E-12 9.940E-16-1.000E+00 0.000E+00
0.000E+00
EFFECTIVE   5.770E-14 1.263E-12 1.263E-12 1.030E-15-1.000E+00 0.000E+00
0.000E+00
SKIN(FGR)   1.070E-13 9.383E-12 9.383E-12 7.650E-15-1.000E+00 0.000E+00
0.000E+00
```

ATTACHMENT E

RADTRAD Base Case Detailed Output File (oO)

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:27:16
#######################################################################

#######################################################################
                      File information
#######################################################################

 Plant file           = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\FHAcooper 9-21-05.psf
 Inventory file       = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\cooper29fha.nif
 Release file         = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\RG1_183FHA.RFT
 Dose Conversion file = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\cooper29fha.inp



     #####    ####   #####    #  #     #  #####   #    #  #####
     #    #  #       #        #  ##    #  #    #  #    #    #
     #    #  #       #        #  # #   #  #    #  #    #    #
     #####    ####   ####     #  #  #  #  #####   #    #    #
     #            #  #        #  #   # #  #       #    #    #
     #            #  #        #  #    ##  #       #    #    #
     #        ####   #        #  #     #  #        ####     #

 Radtrad 3.03 4/15/2001

 Nuclide Inventory File:
 C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\cooper29fha.nif
 Plant Power Level:
  1.5329E+01
 Compartments:
   3
 Compartment 1:
 primary
   3
  7.9500E+05
   0
   0
   0
   0
   0
 Compartment 2:
 Environment
   2
  0.0000E+00
   0
   0
   0
   0
   0
 Compartment 3:
 Control Room
   1
```

```
 1.4186E+05
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
primary to Environment
  1
  2
  2
Pathway 2:
Environment to Control Room
  2
  3
  2
Pathway 3:
Environment to Control Room
  2
  3
  2
Pathway 4:
Control Room to Environment
  3
  2
  2
End of Plant Model File
Scenario Description Name:

Plant Model Filename:

Source Term:
  1
  1   1.0000E+00
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\cooper29fha.inp
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\RG1_183FHA.RFT
  2.4000E+01
  1
  9.5000E-01   4.8500E-02   1.5000E-03   1.0000E+00
Overlying Pool:
  0
  0.0000E+00
  0
  0
  0
  0
Compartments:
  3
Compartment 1:
  1
  1
  0
  0
  0
  0
  0
  0
  0
```

```
Compartment 2:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Compartment 3:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
  0
  0
  0
  0
  0
  1
  1
  2.4000E+01   4.5760E+04   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Pathway 2:
  0
  0
  0
  0
  0
  1
  2
  2.4000E+01   3.2350E+03   0.0000E+00   0.0000E+00   0.0000E+00
  2.4017E+01   8.1000E+02   8.9000E+01   8.9000E+01   8.9000E+01
  0
  0
  0
  0
  0
  0
Pathway 3:
  0
  0
  0
  0
  0
  1
```

```
  1
  2.4000E+01   4.0000E+02   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Pathway 4:
  0
  0
  0
  0
  0
  1
  2
  2.4000E+01   3.6350E+03   0.0000E+00   0.0000E+00   0.0000E+00
  2.4017E+01   1.2100E+03   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Dose Locations:
  3
Location 1:
EAB
  2
  1
  2
  2.4000E+01   5.2000E-04
  2.6000E+01   0.0000E+00
  1
  4
  2.4000E+01   3.5000E-04
  3.2000E+01   1.8000E-04
  4.8000E+01   2.3000E-04
  7.4400E+02   0.0000E+00
  0
Location 2:
LPZ
  2
  1
  5
  2.4000E+01   2.9000E-04
  3.2000E+01   7.3000E-05
  4.8000E+01   2.5000E-05
  1.2000E+02   5.2000E-06
  7.4400E+02   0.0000E+00
  1
  4
  2.4000E+01   3.5000E-04
  3.2000E+01   1.8000E-04
  4.8000E+01   2.3000E-04
  7.4400E+02   0.0000E+00
  0
Location 3:
Control Room
  3
```

```
  0
  1
  2
  2.4000E+01   3.5000E-04
  7.4400E+02   0.0000E+00
  1
  4
  2.4000E+01   1.0000E+00
  4.8000E+01   6.0000E-01
  1.2000E+02   4.0000E-01
  7.4400E+02   0.0000E+00
Effective Volume Location:
  1
  6
  2.4000E+01   4.1500E-03
  2.6000E+01   3.2400E-03
  3.2000E+01   1.3200E-03
  4.8000E+01   9.0100E-04
  1.2000E+02   7.2200E-04
  7.4400E+02   0.0000E+00
Simulation Parameters:
  0
Output Filename:
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\FHAcooper 9-21-
05.o0
  1
  1
  1
  0
  0
End of Scenario File
```

This page intentionally left blank.

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:27:16
#######################################################################

#######################################################################
                      Plant Description
#######################################################################

Number of Nuclides =  29

Inventory Power =   1.0000E+00 MWth
Plant Power Level =   1.5329E+01 MWth

Number of compartments    =   3

Compartment information

Compartment number  1  (Source term fraction =   1.0000E+00
)
Name: primary
Compartment volume =   7.9500E+05 (Cubic feet)
Compartment type is Normal
Pathways into and out of compartment  1
   Exit Pathway Number    1: primary to Environment

Compartment number  2
Name: Environment
Compartment type is Environment
Pathways into and out of compartment  2
   Inlet Pathway Number   1: primary to Environment
   Inlet Pathway Number   4: Control Room to Environment
   Exit Pathway Number    2: Environment to Control Room
   Exit Pathway Number    3: Environment to Control Room

Compartment number  3
Name: Control Room
Compartment volume =   1.4186E+05 (Cubic feet)
Compartment type is Control Room
Pathways into and out of compartment  3
   Inlet Pathway Number   2: Environment to Control Room
   Inlet Pathway Number   3: Environment to Control Room
   Exit Pathway Number    4: Control Room to Environment

Total number of pathways =   4
```

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:27:16
#######################################################################

#######################################################################
                      Scenario Description
#######################################################################
```

Time between shutdown and first release = 2.4000E+01 (Hours)

Radioactive Decay is enabled
Calculation of Daughters is enabled

Release Fractions and Timings

	GAP	EARLY IN-VESSEL	LATE RELEASE	RELEASE MASS
	0.003600 hr	0.0000 hrs	0.0000 hrs	(gm)
NOBLES	5.0000E-02	0.0000E+00	0.0000E+00	1.659E+00
IODINE	2.5000E-04	0.0000E+00	0.0000E+00	1.615E-03
CESIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
TELLURIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
STRONTIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
BARIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
RUTHENIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
CERIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
LANTHANUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00

Inventory Power = 15. MWt

Nuclide Name	Group	Specific Inventory (Ci/MWt)	half life (s)	Whole Body DCF (Sv-m3/Bq-s)	Inhaled Thyroid (Sv/Bq)	Inhaled Effective (Sv/Bq)
Br-82	2	1.800E+02	1.271E+05	1.300E-13	2.380E-10	3.310E-10
Br-83	2	3.260E+03	8.604E+03	3.820E-16	3.290E-12	2.330E-11
Br-84	2	5.610E+03	1.908E+03	9.410E-14	3.120E-12	2.610E-11
Kr-83m	1	3.270E+03	6.588E+03	1.500E-18	0.000E+00	0.000E+00
Kr-85	1	7.320E+02	3.383E+08	1.190E-16	0.000E+00	0.000E+00
Kr-85m	1	6.810E+03	1.613E+04	7.480E-15	0.000E+00	0.000E+00
Kr-87	1	1.300E+04	4.578E+03	4.120E-14	0.000E+00	0.000E+00
Kr-88	1	1.830E+04	1.022E+04	1.020E-13	0.000E+00	0.000E+00
I-128	2	4.190E+02	1.499E+03	4.160E-15	5.340E-11	1.280E-11
I-130	2	1.060E+03	4.450E+04	1.040E-13	1.990E-08	7.140E-10
I-131	2	4.352E+04	6.947E+05	1.820E-14	2.920E-07	8.890E-09
I-132	2	3.930E+04	8.280E+03	1.120E-13	1.740E-09	1.030E-10
I-133	2	5.510E+04	7.488E+04	2.940E-14	4.860E-08	1.580E-09
I-134	2	6.040E+04	3.156E+03	1.300E-13	2.880E-10	3.550E-11
I-135	2	5.160E+04	2.380E+04	8.294E-14	8.460E-09	3.320E-10
Xe-129m	1	2.060E-01	6.912E+05	1.060E-15	0.000E+00	0.000E+00
Xe-131m	1	3.040E+02	1.028E+06	3.890E-16	0.000E+00	0.000E+00
Xe-133	1	5.260E+04	4.532E+05	1.560E-15	0.000E+00	0.000E+00
Xe-133m	1	1.580E+03	1.890E+05	1.370E-15	0.000E+00	0.000E+00
Xe-135	1	1.860E+04	3.272E+04	1.190E-14	0.000E+00	0.000E+00
Xe-135m	1	1.090E+04	9.174E+02	2.040E-14	0.000E+00	0.000E+00
Xe-138	1	4.500E+04	8.502E+02	5.770E-14	0.000E+00	0.000E+00

Nuclide	Daughter	Fraction	Daughter	Fraction	Daughter	Fraction
Br-83	Kr-83m	1.00	none	0.00	none	0.00
Kr-85m	Kr-85	0.21	none	0.00	none	0.00
Kr-87	Rb-87	1.00	none	0.00	none	0.00

Kr-88	Rb-88	1.00	none	0.00	none	0.00
I-131	Xe-131m	0.01	none	0.00	none	0.00
I-133	Xe-133m	0.03	Xe-133	0.97	none	0.00
I-135	Xe-135m	0.15	Xe-135	0.85	none	0.00
Te-129	I-129	1.00	none	0.00	none	0.00
Te-131	I-131	1.00	none	0.00	none	0.00
Te-131m	I-131	0.78	Te-131	0.22	none	0.00
Te-132	I-132	1.00	none	0.00	none	0.00
Te-133	I-133	1.00	none	0.00	none	0.00
Te-133m	I-133	0.87	Te-133	0.13	none	0.00
Te-134	I-134	1.00	none	0.00	none	0.00
Xe-133m	Xe-133	1.00	none	0.00	none	0.00
Xe-135	Cs-135	1.00	none	0.00	none	0.00
Xe-135m	Cs-135	0.00	Xe-135	1.00	none	0.00
Xe-138	Cs-138	1.00	none	0.00	none	0.00

Iodine fractions
Aerosol = 9.5000E-01
Elemental = 4.8500E-02
Organic = 1.5000E-03

COMPARTMENT DATA

Compartment number 1: primary

Compartment number 2: Environment

Compartment number 3: Control Room

PATHWAY DATA

Pathway number 1: primary to Environment

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	4.5760E+04	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 2: Environment to Control Room

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	3.2350E+03	0.0000E+00	0.0000E+00	0.0000E+00
2.4017E+01	8.1000E+02	8.9000E+01	8.9000E+01	8.9000E+01

Pathway number 3: Environment to Control Room

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	4.0000E+02	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 4: Control Room to Environment

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	3.6350E+03	0.0000E+00	0.0000E+00	0.0000E+00
2.4017E+01	1.2100E+03	0.0000E+00	0.0000E+00	0.0000E+00

LOCATION DATA

Location EAB is in compartment 2

Location X/Q Data

Time (hr)	X/Q (s * m^-3)
2.4000E+01	5.2000E-04
2.6000E+01	0.0000E+00

Location Breathing Rate Data

Time (hr)	Breathing Rate (m^3 * sec^-1)
2.4000E+01	3.5000E-04
3.2000E+01	1.8000E-04
4.8000E+01	2.3000E-04
7.4400E+02	0.0000E+00

Location LPZ is in compartment 2

Location X/Q Data

Time (hr)	X/Q (s * m^-3)
2.4000E+01	2.9000E-04
3.2000E+01	7.3000E-05
4.8000E+01	2.5000E-05
1.2000E+02	5.2000E-06
7.4400E+02	0.0000E+00

Location Breathing Rate Data

Time (hr)	Breathing Rate (m^3 * sec^-1)
2.4000E+01	3.5000E-04
3.2000E+01	1.8000E-04
4.8000E+01	2.3000E-04
7.4400E+02	0.0000E+00

Location Control Room is in compartment 3

Location X/Q Data

Time (hr)	X/Q (s * m^-3)
2.4000E+01	4.1500E-03
2.6000E+01	3.2400E-03
3.2000E+01	1.3200E-03
4.8000E+01	9.0100E-04
1.2000E+02	7.2200E-04
7.4400E+02	0.0000E+00

Location Breathing Rate Data

Time (hr)	Breathing Rate (m^3 * sec^-1)
2.4000E+01	3.5000E-04
7.4400E+02	0.0000E+00

Location Occupancy Factor Data

Time (hr)	Occupancy Factor
2.4000E+01	1.0000E+00
4.8000E+01	6.0000E-01
1.2000E+02	4.0000E-01
7.4400E+02	0.0000E+00

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:27:16
#######################################################################
```

```
 ####   #    #  #####  #####   #    #  #####
#    #  #    #    #    #    #  #    #    #
#    #  #    #    #    #    #  #    #    #
#    #  #    #    #    #####   #    #    #
#    #  #    #    #    #       #    #    #
#    #  #    #    #    #       #    #    #
 ####    ####     #    #        ####     #
```

```
#######################################################################
           Dose, Detailed model and Detailed Inventory Output
#######################################################################
```

EAB Doses:

Time (h) = 24.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.7183E-03	2.0885E-01	9.1494E-03
Accumulated dose (rem)	2.7183E-03	2.0885E-01	9.1494E-03

LPZ Doses:

Time (h) = 24.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.5160E-03	1.1648E-01	5.1026E-03
Accumulated dose (rem)	1.5160E-03	1.1648E-01	5.1026E-03

Control Room Doses:

Time (h) = 24.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.1953E-06	3.5896E-03	1.1273E-04
Accumulated dose (rem)	2.1953E-06	3.5896E-03	1.1273E-04

primary Compartment Nuclide Inventory:

Time (h) = 24.0036	Ci	kg	Atoms	Decay
Br-82	4.2789E-01	3.9523E-10	2.9026E+15	1.5659E+11
Br-83	1.1766E-02	7.4478E-13	5.4038E+12	4.3073E+09
Kr-83m	9.2688E+00	4.4924E-10	3.2595E+15	3.3936E+12
Kr-85	5.5752E+02	1.4210E-03	1.0068E+22	2.0402E+14
Kr-85m	1.2648E+02	1.5369E-08	1.0889E+17	4.6295E+13
Kr-87	2.0586E-02	7.2677E-13	5.0307E+12	7.5391E+09
Kr-88	3.9805E+01	3.1745E-09	2.1724E+16	1.4571E+13
I-130	1.0506E+00	5.3869E-10	2.4954E+15	3.8450E+11
I-131	1.5319E+02	1.2356E-06	5.6802E+18	5.6057E+13
I-132	1.2356E+02	1.1970E-08	5.4610E+16	4.5232E+13
I-133	9.6439E+01	8.5132E-08	3.8547E+17	3.5292E+13
I-134	5.2119E-06	1.9537E-16	8.7803E+08	1.9094E+06
I-135	1.5858E+01	4.5155E-09	2.0143E+16	5.8038E+12
Xe-129m	1.4389E-01	1.1372E-09	5.3088E+15	5.2654E+10
Xe-131m	2.3831E+02	2.8451E-06	1.3079E+19	8.7205E+13
Xe-133	3.8763E+04	2.0709E-04	9.3767E+20	1.4185E+16
Xe-133m	1.1043E+03	2.4611E-06	1.1144E+19	4.0412E+14

Xe-135	1.0706E+04	4.1923E-06	1.8701E+19	3.9181E+15
Xe-135m	5.4903E+02	6.0272E-09	2.6886E+16	2.0165E+14

primary Transport Group Inventory:

Time (h) = 24.0036	Atmosphere	Sump	
Noble gases (atoms)	1.1049E+22	0.0000E+00	
Elemental I (atoms)	2.9807E+17	0.0000E+00	
Organic I (atoms)	9.2188E+15	0.0000E+00	
Aerosols (kg)	1.2713E-06	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		7.5708E-09
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		8.2062E-09
Total I (Ci)			3.8904E+02

primary to Environment Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.8825E+19
Elemental I (atoms)	0.0000E+00	1.8568E+15
Organic I (atoms)	0.0000E+00	5.7428E+13
Aerosols (kg)	0.0000E+00	7.9193E-09

Environment Integral Nuclide Release:

Time (h) = 24.0036	Ci	kg	Atoms	Bq
Br-82	2.6655E-03	2.4620E-12	1.8081E+13	9.8623E+07
Br-83	7.3299E-05	4.6398E-15	3.3665E+10	2.7121E+06
Kr-83m	5.7743E-02	2.7987E-12	2.0306E+13	2.1365E+09
Kr-85	3.4730E+00	8.8521E-06	6.2716E+19	1.2850E+11
Kr-85m	7.8793E-01	9.5745E-11	6.7834E+14	2.9154E+10
Kr-87	1.2826E-04	4.5279E-15	3.1342E+10	4.7455E+06
Kr-88	2.4798E-01	1.9776E-11	1.3533E+14	9.1751E+09
I-130	6.5448E-03	3.3557E-12	1.5545E+13	2.4216E+08
I-131	9.5425E-01	7.6971E-09	3.5384E+16	3.5307E+10
I-132	7.6969E-01	7.4567E-11	3.4019E+14	2.8479E+10
I-133	6.0075E-01	5.3032E-10	2.4013E+15	2.2228E+10
I-134	3.2473E-08	1.2173E-18	5.4707E+06	1.2015E+03
I-135	9.8786E-02	2.8129E-11	1.2548E+14	3.6551E+09
Xe-129m	8.9632E-04	7.0840E-12	3.3071E+13	3.3164E+07
Xe-131m	1.4845E+00	1.7723E-08	8.1473E+16	5.4926E+10
Xe-133	2.4147E+02	1.2900E-06	5.8410E+18	8.9342E+12
Xe-133m	6.8792E+00	1.5331E-08	6.9418E+16	2.5453E+11
Xe-135	6.6692E+01	2.6115E-08	1.1650E+17	2.4676E+12
Xe-135m	3.4209E+00	3.7554E-11	1.6752E+14	1.2657E+11

Environment Transport Group Inventory:

Time (h) = 24.0036	Total Release	Release Rate/s	
Noble gases (atoms)	6.8825E+19	5.3106E+18	
Elemental I (atoms)	1.8568E+15	1.4327E+14	
Organic I (atoms)	5.7427E+13	4.4311E+12	
Aerosols (kg)	7.9191E-09	6.1105E-10	
Dose Effective (Ci)	I-131 (Thyroid)		1.0617E+00
Dose Effective (Ci)	I-131 (ICRP2 Thyroid)		1.1508E+00
Total I (Ci)			2.4235E+00

primary to Environment Transport Group Inventory:

Pathway

Time (h) = 24.0036	Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.8825E+19
Elemental I (atoms)	0.0000E+00	1.8568E+15
Organic I (atoms)	0.0000E+00	5.7428E+13
Aerosols (kg)	0.0000E+00	7.9193E-09

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 24.0036	Filtered	Transported
Noble gases (atoms)	0.0000E+00	4.3608E+17
Elemental I (atoms)	0.0000E+00	1.1765E+13
Organic I (atoms)	0.0000E+00	3.6386E+11
Aerosols (kg)	0.0000E+00	5.0177E-11

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 24.0036	Filtered	Transported
Noble gases (atoms)	0.0000E+00	5.3920E+16
Elemental I (atoms)	0.0000E+00	1.4547E+12
Organic I (atoms)	0.0000E+00	4.4991E+10
Aerosols (kg)	0.0000E+00	6.2042E-12

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 24.0036	Filtered	Transported
Noble gases (atoms)	9.0338E+14	0.0000E+00
Elemental I (atoms)	2.4372E+10	0.0000E+00
Organic I (atoms)	7.5378E+08	0.0000E+00
Aerosols (kg)	1.0395E-13	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 24.0036	Ci	kg	Atoms	Decay
Br-82	1.8942E-05	1.7496E-14	1.2849E+11	6.4473E+06
Br-83	5.2085E-07	3.2970E-17	2.3922E+08	1.7735E+05
Kr-83m	4.1030E-04	1.9887E-14	1.4429E+11	1.3972E+08
Kr-85	2.4680E-02	6.2906E-08	4.4568E+17	8.4004E+09
Kr-85m	5.5991E-03	6.8037E-13	4.8203E+12	1.9061E+09
Kr-87	9.1131E-07	3.2172E-17	2.2270E+08	3.1040E+05
Kr-88	1.7621E-03	1.4053E-13	9.6167E+11	5.9995E+08
I-130	4.6509E-05	2.3847E-14	1.1047E+11	1.5831E+07
I-131	6.7812E-03	5.4698E-11	2.5145E+14	2.3081E+09
I-132	5.4692E-03	5.2986E-13	2.4173E+12	1.8623E+09
I-133	4.2691E-03	3.7686E-12	1.7064E+13	1.4531E+09
I-134	2.3072E-10	8.6487E-21	3.8868E+04	7.8610E+01
I-135	7.0199E-04	1.9989E-13	8.9168E+11	2.3897E+08
Xe-129m	6.3695E-06	5.0341E-14	2.3501E+11	2.1680E+06
Xe-131m	1.0549E-02	1.2594E-10	5.7897E+14	3.5906E+09
Xe-133	1.7159E+00	9.1672E-09	4.1508E+16	5.8405E+11
Xe-133m	4.8886E-02	1.0895E-10	4.9331E+14	1.6639E+10
Xe-135	4.7392E-01	1.8558E-10	8.2785E+14	1.6132E+11
Xe-135m	2.4293E-02	2.6669E-13	1.1897E+12	8.2973E+09

Control Room Transport Group Inventory:

Time (h) = 24.0036	Atmosphere	Sump
Noble gases (atoms)	4.8909E+17	0.0000E+00
Elemental I (atoms)	1.3195E+13	0.0000E+00

Organic I (atoms)	4.0809E+11	0.0000E+00	
Aerosols (kg)	5.6276E-11	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.8782E-12
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		2.0358E-12
Total I (Ci)			1.7222E-02

Environment to Control Room Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	4.3608E+17
Elemental I (atoms)	0.0000E+00	1.1765E+13
Organic I (atoms)	0.0000E+00	3.6386E+11
Aerosols (kg)	0.0000E+00	5.0177E-11

Environment to Control Room Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	5.3920E+16
Elemental I (atoms)	0.0000E+00	1.4547E+12
Organic I (atoms)	0.0000E+00	4.4991E+10
Aerosols (kg)	0.0000E+00	6.2042E-12

Control Room to Environment Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (atoms)	9.0338E+14	0.0000E+00
Elemental I (atoms)	2.4372E+10	0.0000E+00
Organic I (atoms)	7.5378E+08	0.0000E+00
Aerosols (kg)	1.0395E-13	0.0000E+00

EAB Doses:

Time (h) = 24.0170	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.9724E-02	1.5162E+00	6.6412E-02
Accumulated dose (rem)	2.2443E-02	1.7251E+00	7.5562E-02

LPZ Doses:

Time (h) = 24.0170	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.1000E-02	8.4557E-01	3.7038E-02
Accumulated dose (rem)	1.2516E-02	9.6205E-01	4.2140E-02

Control Room Doses:

Time (h) = 24.0170	Whole Body	Thyroid	TEDE
Delta dose (rem)	9.6149E-05	1.5728E-01	4.9393E-03
Accumulated dose (rem)	9.8344E-05	1.6087E-01	5.0521E-03

primary Compartment Nuclide Inventory:

Time (h) = 24.0170	Ci	kg	Atoms	Decay
Br-82	4.0843E-01	3.7726E-10	2.7706E+15	8.8568E+11
Br-83	1.1190E-02	7.0834E-13	5.1394E+12	2.4319E+10
Kr-83m	8.8049E+00	4.2676E-10	3.0964E+15	1.9149E+13
Kr-85	5.3231E+02	1.3568E-03	9.6125E+21	1.1541E+15
Kr-85m	1.2051E+02	1.4644E-08	1.0375E+17	2.6162E+14
Kr-87	1.9512E-02	6.8886E-13	4.7683E+12	4.2494E+10

Kr-88	3.7881E+01	3.0210E-09	2.0674E+16	8.2295E+13
I-130	1.0024E+00	5.1394E-10	2.3808E+15	2.1743E+12
I-131	1.4625E+02	1.1797E-06	5.4231E+18	3.1710E+14
I-132	1.1749E+02	1.1383E-08	5.1930E+16	2.5537E+14
I-133	9.2036E+01	8.1246E-08	3.6788E+17	1.9960E+14
I-134	4.9238E-06	1.8457E-16	8.2949E+08	1.0744E+07
I-135	1.5119E+01	4.3053E-09	1.9205E+16	3.2809E+13
Xe-129m	1.3737E-01	1.0857E-09	5.0685E+15	2.9785E+11
Xe-131m	2.2752E+02	2.7163E-06	1.2487E+19	4.9331E+14
Xe-133	3.7007E+04	1.9771E-04	8.9520E+20	8.0240E+16
Xe-133m	1.0542E+03	2.3494E-06	1.0638E+19	2.2859E+15
Xe-135	1.0212E+04	3.9988E-06	1.7838E+19	2.2153E+16
Xe-135m	5.0552E+02	5.5496E-09	2.4756E+16	1.1204E+15

primary Transport Group Inventory:

Time (h) = 24.0170	Atmosphere	Sump	
Noble gases (atoms)	1.0549E+22	0.0000E+00	
Elemental I (atoms)	2.8456E+17	0.0000E+00	
Organic I (atoms)	8.8009E+15	0.0000E+00	
Aerosols (kg)	1.2136E-06	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		7.2276E-09
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		7.8335E-09
Total I (Ci)			3.7090E+02

primary to Environment Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	5.6848E+20
Elemental I (atoms)	0.0000E+00	1.5337E+16
Organic I (atoms)	0.0000E+00	4.7433E+14
Aerosols (kg)	0.0000E+00	6.5410E-08

Environment Integral Nuclide Release:

Time (h) = 24.0170	Ci	kg	Atoms	Bq
Br-82	2.2011E-02	2.0331E-11	1.4931E+14	8.1441E+08
Br-83	6.0333E-04	3.8191E-14	2.7710E+11	2.2323E+07
Kr-83m	4.7479E-01	2.3012E-11	1.6697E+14	1.7567E+10
Kr-85	2.8686E+01	7.3116E-05	5.1802E+20	1.0614E+12
Kr-85m	6.4961E+00	7.8936E-10	5.5925E+15	2.4036E+11
Kr-87	1.0525E-03	3.7156E-14	2.5719E+11	3.8941E+07
Kr-88	2.0422E+00	1.6287E-10	1.1146E+15	7.5563E+10
I-130	5.4022E-02	2.7699E-11	1.2831E+14	1.9988E+09
I-131	7.8815E+00	6.3574E-08	2.9225E+17	2.9162E+11
I-132	6.3348E+00	6.1371E-10	2.7999E+15	2.3439E+11
I-133	4.9601E+00	4.3786E-09	1.9826E+16	1.8352E+11
I-134	2.6569E-07	9.9596E-18	4.4760E+07	9.8306E+03
I-135	8.1493E-01	2.3205E-10	1.0351E+15	3.0152E+10
Xe-129m	7.4031E-03	5.8510E-11	2.7314E+14	2.7391E+08
Xe-131m	1.2261E+01	1.4638E-07	6.7293E+17	4.5366E+11
Xe-133	1.9943E+03	1.0654E-05	4.8243E+19	7.3790E+13
Xe-133m	5.6812E+01	1.2661E-07	5.7329E+17	2.1020E+12
Xe-135	5.5038E+02	2.1552E-07	9.6141E+17	2.0364E+13
Xe-135m	2.7365E+01	3.0041E-10	1.3401E+15	1.0125E+12

Environment Transport Group Inventory:

Time (h) = 24.0170	Total Release	Release Rate/s

Noble gases (atoms)	5.6848E+20	9.2888E+18
Elemental I (atoms)	1.5335E+16	2.5058E+14
Organic I (atoms)	4.7428E+14	7.7498E+12
Aerosols (kg)	6.5404E-08	1.0687E-09

Dose Effective (Ci)	I-131 (Thyroid)	8.7684E+00
Dose Effective (Ci)	I-131 (ICRP2 Thyroid)	9.5036E+00
Total I (Ci)		1.9991E+01

primary to Environment Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	5.6848E+20
Elemental I (atoms)	0.0000E+00	1.5337E+16
Organic I (atoms)	0.0000E+00	4.7433E+14
Aerosols (kg)	0.0000E+00	6.5410E-08

Environment to Control Room Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	3.6019E+18
Elemental I (atoms)	0.0000E+00	9.7174E+13
Organic I (atoms)	0.0000E+00	3.0054E+12
Aerosols (kg)	0.0000E+00	4.1444E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	4.4537E+17
Elemental I (atoms)	0.0000E+00	1.2015E+13
Organic I (atoms)	0.0000E+00	3.7161E+11
Aerosols (kg)	0.0000E+00	5.1245E-11

Control Room to Environment Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (atoms)	4.7552E+16	0.0000E+00
Elemental I (atoms)	1.2829E+12	0.0000E+00
Organic I (atoms)	3.9677E+10	0.0000E+00
Aerosols (kg)	5.4714E-12	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 24.0170	Ci	kg	Atoms	Decay
Br-82	1.5486E-04	1.4304E-13	1.0505E+12	2.8289E+08
Br-83	4.2429E-06	2.6857E-16	1.9487E+09	7.7651E+06
Kr-83m	3.3385E-03	1.6181E-13	1.1740E+12	6.1136E+09
Kr-85	2.0183E-01	5.1443E-07	3.6447E+18	3.6864E+11
Kr-85m	4.5693E-02	5.5524E-12	3.9338E+13	8.3548E+10
Kr-87	7.3983E-06	2.6119E-16	1.8079E+09	1.3564E+07
Kr-88	1.4363E-02	1.1454E-12	7.8386E+12	2.6278E+10
I-130	3.8006E-04	1.9487E-13	9.0270E+11	6.9444E+08
I-131	5.5452E-02	4.4729E-10	2.0562E+15	1.0129E+11
I-132	4.4548E-02	4.3158E-12	1.9690E+13	8.1537E+10
I-133	3.4896E-02	3.0805E-11	1.3948E+14	6.3753E+10
I-134	1.8669E-09	6.9982E-20	3.1451E+05	3.4285E+03
I-135	5.7327E-03	1.6324E-12	7.2818E+12	1.0478E+10

Xe-129m	5.2086E-05	4.1166E-13	1.9218E+12	9.5138E+07
Xe-131m	8.6267E-02	1.0299E-09	4.7346E+15	1.5757E+11
Xe-133	1.4032E+01	7.4962E-08	3.3942E+17	2.5630E+13
Xe-133m	3.9971E-01	8.9080E-10	4.0335E+15	7.3013E+11
Xe-135	3.8719E+00	1.5162E-09	6.7635E+15	7.0754E+12
Xe-135m	1.9166E-01	2.1041E-12	9.3859E+12	3.5665E+11

Control Room Transport Group Inventory:

Time (h) = 24.0170	Atmosphere	Sump	
Noble gases (atoms)	3.9997E+18	0.0000E+00	
Elemental I (atoms)	1.0789E+14	0.0000E+00	
Organic I (atoms)	3.3369E+12	0.0000E+00	
Aerosols (kg)	4.6016E-10	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.5358E-11
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.6645E-11
Total I (Ci)			1.4063E-01

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 24.0170	Filtered	Transported
Noble gases (atoms)	0.0000E+00	3.6019E+18
Elemental I (atoms)	0.0000E+00	9.7174E+13
Organic I (atoms)	0.0000E+00	3.0054E+12
Aerosols (kg)	0.0000E+00	4.1444E-10

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 24.0170	Filtered	Transported
Noble gases (atoms)	0.0000E+00	4.4537E+17
Elemental I (atoms)	0.0000E+00	1.2015E+13
Organic I (atoms)	0.0000E+00	3.7161E+11
Aerosols (kg)	0.0000E+00	5.1245E-11

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 24.0170	Filtered	Transported
Noble gases (atoms)	4.7552E+16	0.0000E+00
Elemental I (atoms)	1.2829E+12	0.0000E+00
Organic I (atoms)	3.9677E+10	0.0000E+00
Aerosols (kg)	5.4714E-12	0.0000E+00

EAB Doses:

Time (h) = 26.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	4.0120E-01	3.1913E+01	1.3836E+00
Accumulated dose (rem)	4.2364E-01	3.3638E+01	1.4591E+00

LPZ Doses:

Time (h) = 26.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.2374E-01	1.7798E+01	7.7160E-01
Accumulated dose (rem)	2.3626E-01	1.8760E+01	8.1374E-01

Control Room Doses:

Time (h) = 26.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	9.0974E-02	8.4654E+01	2.6948E+00

Accumulated dose (rem) 9.1072E-02 8.4814E+01 2.6998E+00

primary Compartment Nuclide Inventory:

Time (h) = 26.0000	Ci	kg	Atoms	Decay
Br-82	4.1683E-04	3.8502E-13	2.8276E+12	1.3986E+13
Br-83	6.6807E-06	4.2289E-16	3.0683E+09	3.5720E+11
Kr-83m	4.4131E-03	2.1389E-13	1.5519E+12	2.7499E+14
Kr-85	5.6482E-01	1.4396E-06	1.0200E+19	1.8325E+16
Kr-85m	9.4089E-02	1.1433E-11	8.1002E+13	3.9817E+15
Kr-87	7.0249E-06	2.4801E-16	1.7167E+09	5.8564E+11
Kr-88	2.4773E-02	1.9757E-12	1.3520E+13	1.2232E+15
I-130	9.5166E-04	4.8795E-13	2.2604E+12	3.3990E+13
I-131	1.5408E-01	1.2429E-09	5.7135E+15	5.0299E+15
I-132	6.8584E-02	6.6444E-12	3.0313E+13	3.7398E+15
I-133	9.1414E-02	8.0697E-11	3.6539E+14	3.1400E+15
I-134	1.0892E-09	4.0831E-20	1.8350E+05	1.3980E+08
I-135	1.3031E-02	3.7106E-12	1.6552E+13	5.0610E+14
Xe-129m	1.4472E-04	1.1438E-12	5.3398E+12	4.7245E+12
Xe-131m	2.4027E-01	2.8685E-09	1.3187E+16	7.8274E+15
Xe-133	3.8854E+01	2.0758E-07	9.3988E+17	1.2721E+18
Xe-133m	1.0898E+00	2.4287E-09	1.0997E+16	3.6162E+16
Xe-135	9.3304E+00	3.6536E-09	1.6298E+16	3.4459E+17
Xe-135m	4.7375E-03	5.2008E-14	2.3200E+11	1.0207E+16

primary Transport Group Inventory:

Time (h) = 26.0000	Atmosphere	Sump	
Noble gases (atoms)	1.1180E+19	0.0000E+00	
Elemental I (atoms)	2.9735E+14	0.0000E+00	
Organic I (atoms)	9.1963E+12	0.0000E+00	
Aerosols (kg)	1.2681E-09	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		7.5553E-12
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		8.0880E-12
Total I (Ci)			3.2711E-01

primary to Environment Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1098E+22
Elemental I (atoms)	0.0000E+00	2.9887E+17
Organic I (atoms)	0.0000E+00	9.2433E+15
Aerosols (kg)	0.0000E+00	1.2746E-06

Environment Integral Nuclide Release:

Time (h) = 26.0000	Ci	kg	Atoms	Bq
Br-82	4.2730E-01	3.9468E-10	2.8986E+15	1.5810E+10
Br-83	1.0763E-02	6.8131E-13	4.9433E+12	3.9824E+08
Kr-83m	8.2490E+00	3.9982E-10	2.9009E+15	3.0521E+11
Kr-85	5.6043E+02	1.4284E-03	1.0120E+22	2.0736E+13
Kr-85m	1.2081E+02	1.4680E-08	1.0401E+17	4.4700E+12
Kr-87	1.7418E-02	6.1493E-13	4.2566E+12	6.4448E+08
Kr-88	3.6946E+01	2.9464E-09	2.0163E+16	1.3670E+12
I-130	1.0365E+00	5.3145E-10	2.4619E+15	3.8351E+10
I-131	1.5380E+02	1.2406E-06	5.7030E+18	5.6906E+12
I-132	1.1262E+02	1.0911E-08	4.9778E+16	4.1671E+12
I-133	9.5866E+01	8.4627E-08	3.8318E+17	3.5470E+12
I-134	4.1063E-06	1.5393E-16	6.9178E+08	1.5193E+05
I-135	1.5395E+01	4.3837E-09	1.9555E+16	5.6962E+11

Xe-129m	1.4446E-01	1.1418E-09	5.3301E+15	5.3451E+09
Xe-131m	2.3935E+02	2.8576E-06	1.3136E+19	8.8561E+12
Xe-133	3.8895E+04	2.0779E-04	9.4087E+20	1.4391E+15
Xe-133m	1.1052E+03	2.4631E-06	1.1153E+19	4.0892E+13
Xe-135	1.0500E+04	4.1116E-06	1.8341E+19	3.8850E+14
Xe-135m	2.7283E+02	2.9951E-09	1.3361E+16	1.0095E+13

Environment Transport Group Inventory:

Time (h) = 26.0000	Total Release	Release Rate/s	
Noble gases (atoms)	1.1104E+22	1.5422E+18	
Elemental I (atoms)	2.9880E+17	4.1500E+13	
Organic I (atoms)	9.2413E+15	1.2835E+12	
Aerosols (kg)	1.2743E-06	1.7699E-10	
Dose Effective (Ci) I-131 (Thyroid)			1.7087E+02
Dose Effective (Ci) I-131 (ICRP2 Thyroid)			1.8477E+02
Total I (Ci)			3.7768E+02

primary to Environment Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1098E+22
Elemental I (atoms)	0.0000E+00	2.9887E+17
Organic I (atoms)	0.0000E+00	9.2433E+15
Aerosols (kg)	0.0000E+00	1.2746E-06

Environment to Control Room Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0317E+19
Elemental I (atoms)	4.0057E+14	1.4668E+14
Organic I (atoms)	1.2389E+13	4.5366E+12
Aerosols (kg)	1.7084E-09	6.2559E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.6997E+18
Elemental I (atoms)	0.0000E+00	2.3427E+14
Organic I (atoms)	0.0000E+00	7.2456E+12
Aerosols (kg)	0.0000E+00	9.9915E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	1.6957E+19	0.0000E+00
Elemental I (atoms)	2.2515E+14	0.0000E+00
Organic I (atoms)	6.9635E+12	0.0000E+00
Aerosols (kg)	9.6022E-10	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 26.0000	Ci	kg	Atoms	Decay
Br-82	2.1364E-04	1.9734E-13	1.4493E+12	8.3295E+10
Br-83	3.4242E-06	2.1675E-16	1.5726E+09	1.8022E+09

Kr-83m	4.7510E-03	2.3027E-13	1.6708E+12	2.6585E+12
Kr-85	6.0836E-01	1.5506E-06	1.0986E+19	2.2477E+14
Kr-85m	1.0134E-01	1.2315E-11	8.7247E+13	4.4152E+13
Kr-87	7.5665E-06	2.6713E-16	1.8491E+09	5.1466E+09
Kr-88	2.6683E-02	2.1280E-12	1.4562E+13	1.2825E+13
I-130	4.8777E-04	2.5009E-13	1.1585E+12	1.9777E+11
I-131	7.8975E-02	6.3702E-10	2.9284E+15	3.0267E+13
I-132	3.5152E-02	3.4055E-12	1.5537E+13	1.8745E+13
I-133	4.6854E-02	4.1361E-11	1.8728E+14	1.8537E+13
I-134	5.5829E-10	2.0928E-20	9.4053E+04	5.4033E+05
I-135	6.6790E-03	1.9018E-12	8.4838E+12	2.8558E+12
Xe-129m	1.5588E-04	1.2320E-12	5.7515E+12	5.7811E+10
Xe-131m	2.5879E-01	3.0896E-09	1.4203E+16	9.5856E+13
Xe-133	4.1849E+01	2.2358E-07	1.0123E+18	1.5548E+16
Xe-133m	1.1737E+00	2.6159E-09	1.1844E+16	4.3968E+14
Xe-135	1.0049E+01	3.9349E-09	1.7553E+16	4.0219E+15
Xe-135m	3.8250E-03	4.1990E-14	1.8731E+11	3.9555E+13

Control Room Transport Group Inventory:

Time (h) = 26.0000	Atmosphere	Sump	
Noble gases (atoms)	1.2042E+19	0.0000E+00	
Elemental I (atoms)	1.5240E+14	0.0000E+00	
Organic I (atoms)	4.7135E+12	0.0000E+00	
Aerosols (kg)	6.4993E-10	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		2.1702E-11
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		2.3232E-11
Total I (Ci)			1.6766E-01

Environment to Control Room Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0317E+19
Elemental I (atoms)	4.0057E+14	1.4668E+14
Organic I (atoms)	1.2389E+13	4.5366E+12
Aerosols (kg)	1.7084E-09	6.2559E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.6997E+18
Elemental I (atoms)	0.0000E+00	2.3427E+14
Organic I (atoms)	0.0000E+00	7.2456E+12
Aerosols (kg)	0.0000E+00	9.9915E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (atoms)	1.6957E+19	0.0000E+00
Elemental I (atoms)	2.2515E+14	0.0000E+00
Organic I (atoms)	6.9635E+12	0.0000E+00
Aerosols (kg)	9.6022E-10	0.0000E+00

EAB Doses:

Time (h) = 32.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2364E-01	3.3638E+01	1.4591E+00

LPZ Doses:

Time (h) = 32.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.0193E-04	1.8627E-02	7.7409E-04
Accumulated dose (rem)	2.3646E-01	1.8778E+01	8.1451E-01

Control Room Doses:

Time (h) = 32.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	5.2733E-02	5.4555E+01	1.7270E+00
Accumulated dose (rem)	1.4381E-01	1.3937E+02	4.4269E+00

primary Compartment Nuclide Inventory:

Time (h) = 32.0000	Ci	kg	Atoms	Decay
Kr-85	5.6579E-10	1.4421E-15	1.0217E+10	1.8343E+16
Kr-85m	3.7251E-11	4.5265E-21	3.2070E+04	3.9846E+15
I-131	1.5106E-10	1.2185E-18	5.6015E+06	5.0348E+15
I-133	7.4979E-11	6.6189E-20	2.9970E+05	3.1429E+15
Xe-131m	2.3724E-10	2.8323E-18	1.3020E+07	7.8351E+15
Xe-133	3.7694E-08	2.0138E-16	9.1183E+08	1.2734E+18
Xe-133m	1.0087E-09	2.2481E-18	1.0179E+07	3.6197E+16
Xe-135	5.9186E-09	2.3177E-18	1.0339E+07	3.4489E+17

primary Transport Group Inventory:

Time (h) = 32.0000	Atmosphere	Sump	
Noble gases (atoms)	1.1162E+10	0.0000E+00	
Elemental I (atoms)	2.8708E+05	0.0000E+00	
Organic I (atoms)	8.8788E+03	0.0000E+00	
Aerosols (kg)	1.2240E-18	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		7.2767E-21
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		7.6445E-21
Total I (Ci)			2.4426E-10

primary to Environment Transport Group Inventory:

	Pathway	
Time (h) = 32.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment Integral Nuclide Release:

Time (h) = 32.0000	Ci	kg	Atoms	Bq
Br-82	4.2771E-01	3.9507E-10	2.9014E+15	1.5825E+10
Br-83	1.0769E-02	6.8169E-13	4.9461E+12	3.9846E+08
Kr-83m	8.2529E+00	4.0000E-10	2.9023E+15	3.0536E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2090E+02	1.4691E-08	1.0408E+17	4.4733E+12
Kr-87	1.7424E-02	6.1514E-13	4.2580E+12	6.4470E+08
Kr-88	3.6968E+01	2.9482E-09	2.0176E+16	1.3678E+12
I-130	1.0375E+00	5.3193E-10	2.4641E+15	3.8386E+10
I-131	1.5395E+02	1.2418E-06	5.7087E+18	5.6963E+12
I-132	1.1269E+02	1.0917E-08	4.9805E+16	4.1694E+12
I-133	9.5956E+01	8.4707E-08	3.8354E+17	3.5504E+12
I-134	4.1072E-06	1.5396E-16	6.9192E+08	1.5197E+05
I-135	1.5408E+01	4.3873E-09	1.9571E+16	5.7008E+11

Xe-129m	1.4461E-01	1.1429E-09	5.3354E+15	5.3504E+09
Xe-131m	2.3959E+02	2.8605E-06	1.3150E+19	8.8650E+12
Xe-133	3.8934E+04	2.0800E-04	9.4181E+20	1.4405E+15
Xe-133m	1.1063E+03	2.4655E-06	1.1163E+19	4.0932E+13
Xe-135	1.0509E+04	4.1152E-06	1.8357E+19	3.8883E+14
Xe-135m	2.7283E+02	2.9951E-09	1.3361E+16	1.0095E+13

Environment Transport Group Inventory:

Time (h) = 32.0000	Total Release	Release Rate/s	
Noble gases (atoms)	1.1115E+22	3.8594E+17	
Elemental I (atoms)	2.9910E+17	1.0385E+13	
Organic I (atoms)	9.2504E+15	3.2120E+11	
Aerosols (kg)	1.2756E-06	4.4292E-11	
Dose Effective (Ci) I-131 (Thyroid)			1.7104E+02
Dose Effective (Ci) I-131 (ICRP2 Thyroid)			1.8495E+02
Total I (Ci)			3.7800E+02

primary to Environment Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment to Control Room Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (atoms)	2.8450E+19	0.0000E+00
Elemental I (atoms)	3.6916E+14	0.0000E+00
Organic I (atoms)	1.1417E+13	0.0000E+00
Aerosols (kg)	1.5743E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 32.0000	Ci	kg	Atoms	Decay
Br-82	8.8249E-06	8.1513E-15	5.9864E+10	1.3341E+11
Br-83	2.7926E-08	1.7677E-18	1.2826E+07	2.3528E+09

Kr-83m	2.2807E-05	1.1054E-15	8.0206E+09	3.3490E+12
Kr-85	2.8279E-02	7.2078E-08	5.1066E+17	3.7219E+14
Kr-85m	1.8618E-03	2.2624E-13	1.6029E+12	6.3561E+13
Kr-87	1.3363E-08	4.7175E-19	3.2654E+06	6.0757E+09
Kr-88	2.8680E-04	2.2872E-14	1.5652E+11	1.7366E+13
I-130	1.6191E-05	8.3015E-15	3.8456E+10	3.0575E+11
I-131	3.5918E-03	2.8972E-11	1.3319E+14	4.9286E+13
I-132	2.6782E-04	2.5946E-14	1.1837E+11	2.4321E+13
I-133	1.7828E-03	1.5737E-12	7.1258E+12	2.9288E+13
I-135	1.6544E-04	4.7109E-14	2.1015E+11	4.2291E+12
Xe-129m	7.0910E-06	5.6044E-14	2.6163E+11	9.5360E+10
Xe-131m	1.1857E-02	1.4155E-10	6.5072E+14	1.5832E+14
Xe-133	1.8839E+00	1.0065E-08	4.5572E+16	2.5600E+16
Xe-133m	5.0412E-02	1.1235E-10	5.0871E+14	7.1799E+14
Xe-135	2.9570E-01	1.1579E-10	5.1653E+14	6.1791E+15
Xe-135m	2.9488E-05	3.2371E-16	1.4440E+09	3.9876E+13

Control Room Transport Group Inventory:

Time (h) = 32.0000	Atmosphere	Sump	
Noble gases (atoms)	5.5791E+17	0.0000E+00	
Elemental I (atoms)	6.8258E+12	0.0000E+00	
Organic I (atoms)	2.1111E+11	0.0000E+00	
Aerosols (kg)	2.9104E-11	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		9.6960E-13
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.0186E-12
Total I (Ci)			5.8078E-03

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 32.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 32.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 32.0000	Filtered	Transported
Noble gases (atoms)	2.8450E+19	0.0000E+00
Elemental I (atoms)	3.6916E+14	0.0000E+00
Organic I (atoms)	1.1417E+13	0.0000E+00
Aerosols (kg)	1.5743E-09	0.0000E+00

EAB Doses:

Time (h) = 48.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2364E-01	3.3638E+01	1.4591E+00

LPZ Doses:

Time (h) = 48.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.7020E-14	2.3228E-12	1.0816E-13
Accumulated dose (rem)	2.3646E-01	1.8778E+01	8.1451E-01

Control Room Doses:

Time (h) = 48.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.9039E-03	2.5557E+00	8.0147E-02
Accumulated dose (rem)	1.4571E-01	1.4193E+02	4.5070E+00

primary Compartment Nuclide Inventory:

Time (h) = 48.0000	Ci	kg	Atoms	Decay

primary Transport Group Inventory:

Time (h) = 48.0000	Atmosphere	Sump	
Noble gases (atoms)	1.1129E-14	0.0000E+00	
Elemental I (atoms)	2.6647E-19	0.0000E+00	
Organic I (atoms)	8.2415E-21	0.0000E+00	
Aerosols (kg)	1.1358E-42	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		6.6938E-45
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		6.8951E-45
Total I (Ci)			1.8889E-34

primary to Environment Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment Integral Nuclide Release:

Time (h) = 48.0000	Ci	kg	Atoms	Bq
Br-82	4.2771E-01	3.9507E-10	2.9014E+15	1.5825E+10
Br-83	1.0769E-02	6.8169E-13	4.9461E+12	3.9846E+08
Kr-83m	8.2529E+00	4.0000E-10	2.9023E+15	3.0536E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2090E+02	1.4691E-08	1.0408E+17	4.4733E+12
Kr-87	1.7424E-02	6.1514E-13	4.2580E+12	6.4470E+08
Kr-88	3.6968E+01	2.9482E-09	2.0176E+16	1.3678E+12
I-130	1.0375E+00	5.3193E-10	2.4641E+15	3.8386E+10
I-131	1.5395E+02	1.2418E-06	5.7087E+18	5.6963E+12
I-132	1.1269E+02	1.0917E-08	4.9805E+16	4.1694E+12
I-133	9.5956E+01	8.4707E-08	3.8354E+17	3.5504E+12
I-134	4.1072E-06	1.5396E-16	6.9192E+08	1.5197E+05
I-135	1.5408E+01	4.3873E-09	1.9571E+16	5.7008E+11
Xe-129m	1.4461E-01	1.1429E-09	5.3354E+15	5.3504E+09
Xe-131m	2.3959E+02	2.8605E-06	1.3150E+19	8.8650E+12
Xe-133	3.8934E+04	2.0800E-04	9.4181E+20	1.4405E+15
Xe-133m	1.1063E+03	2.4655E-06	1.1163E+19	4.0932E+13
Xe-135	1.0509E+04	4.1152E-06	1.8357E+19	3.8883E+14
Xe-135m	2.7283E+02	2.9951E-09	1.3361E+16	1.0095E+13

Environment Transport Group Inventory:

Time (h) = 48.0000	Total Release	Release Rate/s
Noble gases (atoms)	1.1115E+22	1.2865E+17
Elemental I (atoms)	2.9910E+17	3.4618E+12
Organic I (atoms)	9.2504E+15	1.0707E+11
Aerosols (kg)	1.2756E-06	1.4764E-11

Dose Effective (Ci) I-131 (Thyroid)	1.7104E+02
Dose Effective (Ci) I-131 (ICRP2 Thyroid)	1.8495E+02
Total I (Ci)	3.7800E+02

primary to Environment Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment to Control Room Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	2.9007E+19	0.0000E+00
Elemental I (atoms)	3.7592E+14	0.0000E+00
Organic I (atoms)	1.1626E+13	0.0000E+00
Aerosols (kg)	1.6031E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 48.0000	Ci	kg	Atoms	Decay
Br-82	1.7911E-09	1.6543E-18	1.2150E+07	1.3553E+11
Kr-85	7.8569E-06	2.0026E-11	1.4188E+14	3.7924E+14
Kr-85m	4.3519E-08	5.2882E-18	3.7466E+07	6.3921E+13
Kr-88	1.6050E-09	1.2800E-19	8.7593E+05	1.7415E+13
I-130	1.8341E-09	9.4041E-19	4.3563E+06	3.0940E+11
I-131	9.4231E-07	7.6008E-15	3.4941E+10	5.0174E+13
I-132	5.9919E-10	5.8049E-20	2.6483E+05	2.4364E+13
I-133	2.9065E-07	2.5658E-16	1.1618E+09	2.9706E+13
I-135	8.5866E-09	2.4450E-18	1.0907E+07	4.2635E+12
Xe-129m	1.8598E-09	1.4699E-17	6.8619E+07	9.7114E+10
Xe-131m	3.1695E-06	3.7840E-14	1.7395E+11	1.6126E+14

Xe-133	4.8044E-04	2.5667E-12	1.1622E+13	2.6065E+16
Xe-133m	1.1343E-05	2.5280E-14	1.1446E+11	7.3024E+14
Xe-135	2.4270E-05	9.5039E-15	4.2395E+10	6.2436E+15
Xe-135m	3.9852E-09	4.3749E-20	1.9516E+05	3.9882E+13

Control Room Transport Group Inventory:

Time (h) = 48.0000	Atmosphere	Sump	
Noble gases (atoms)	1.5383E+14	0.0000E+00	
Elemental I (atoms)	1.7523E+09	0.0000E+00	
Organic I (atoms)	5.4196E+07	0.0000E+00	
Aerosols (kg)	7.4694E-15	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		2.4668E-16
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		2.5410E-16
Total I (Ci)			1.2421E-06

Environment to Control Room Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (atoms)	2.9007E+19	0.0000E+00
Elemental I (atoms)	3.7592E+14	0.0000E+00
Organic I (atoms)	1.1626E+13	0.0000E+00
Aerosols (kg)	1.6031E-09	0.0000E+00

EAB Doses:

Time (h) = 120.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2364E-01	3.3638E+01	1.4591E+00

LPZ Doses:

Time (h) = 120.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	7.4459E-39	9.3609E-37	3.6044E-38
Accumulated dose (rem)	2.3646E-01	1.8778E+01	8.1451E-01

Control Room Doses:

Time (h) = 120.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.9559E-07	3.9934E-04	1.2394E-05
Accumulated dose (rem)	1.4571E-01	1.4193E+02	4.5070E+00

primary Compartment Nuclide Inventory:

Time (h) = 120.0000	Ci	kg	Atoms	Decay

primary Transport Group Inventory:

Time (h) = 120.0000	Atmosphere	Sump	
Noble gases (atoms)	1.1073-122	0.0000E+00	
Elemental I (atoms)	2.0402-127	0.0000E+00	
Organic I (atoms)	6.3100-129	0.0000E+00	
Aerosols (kg)	8.6934-151	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		5.0495-153
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		5.0679-153
Total I (Ci)			1.1709-142

primary to Environment Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment Integral Nuclide Release:

Time (h) = 120.0000	Ci	kg	Atoms	Bq
Br-82	4.2771E-01	3.9507E-10	2.9014E+15	1.5825E+10
Br-83	1.0769E-02	6.8169E-13	4.9461E+12	3.9846E+08
Kr-83m	8.2529E+00	4.0000E-10	2.9023E+15	3.0536E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2090E+02	1.4691E-08	1.0408E+17	4.4733E+12
Kr-87	1.7424E-02	6.1514E-13	4.2580E+12	6.4470E+08
Kr-88	3.6968E+01	2.9482E-09	2.0176E+16	1.3678E+12
I-130	1.0375E+00	5.3193E-10	2.4641E+15	3.8386E+10
I-131	1.5395E+02	1.2418E-06	5.7087E+18	5.6963E+12
I-132	1.1269E+02	1.0917E-08	4.9805E+16	4.1694E+12
I-133	9.5956E+01	8.4707E-08	3.8354E+17	3.5504E+12
I-134	4.1072E-06	1.5396E-16	6.9192E+08	1.5197E+05
I-135	1.5408E+01	4.3873E-09	1.9571E+16	5.7008E+11
Xe-129m	1.4461E-01	1.1429E-09	5.3354E+15	5.3504E+09
Xe-131m	2.3959E+02	2.8605E-06	1.3150E+19	8.8650E+12
Xe-133	3.8934E+04	2.0800E-04	9.4181E+20	1.4405E+15
Xe-133m	1.1063E+03	2.4655E-06	1.1163E+19	4.0932E+13
Xe-135	1.0509E+04	4.1152E-06	1.8357E+19	3.8883E+14
Xe-135m	2.7283E+02	2.9951E-09	1.3361E+16	1.0095E+13

Environment Transport Group Inventory:

Time (h) = 120.0000	Total Release	Release Rate/s	
Noble gases (atoms)	1.1115E+22	3.2162E+16	
Elemental I (atoms)	2.9910E+17	8.6544E+11	
Organic I (atoms)	9.2504E+15	2.6766E+10	
Aerosols (kg)	1.2756E-06	3.6910E-12	
Dose Effective (Ci)	I-131 (Thyroid)		1.7104E+02
Dose Effective (Ci)	I-131 (ICRP2 Thyroid)		1.8495E+02
Total I (Ci)			3.7800E+02

primary to Environment Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment to Control Room Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (atoms)	2.9007E+19	0.0000E+00
Elemental I (atoms)	3.7592E+14	0.0000E+00
Organic I (atoms)	1.1626E+13	0.0000E+00
Aerosols (kg)	1.6031E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 120.0000	Ci	kg	Atoms	Decay

Control Room Transport Group Inventory:

Time (h) = 120.0000	Atmosphere	Sump	
Noble gases (atoms)	1.4894E-02	0.0000E+00	
Elemental I (atoms)	1.3055E-07	0.0000E+00	
Organic I (atoms)	4.0378E-09	0.0000E+00	
Aerosols (kg)	5.5629E-31	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.8108E-32
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.8174E-32
Total I (Ci)			7.4926E-23

Environment to Control Room Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Pathway

Time (h) = 120.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 120.0000	Filtered	Transported
Noble gases (atoms)	2.9007E+19	0.0000E+00
Elemental I (atoms)	3.7592E+14	0.0000E+00
Organic I (atoms)	1.1626E+13	0.0000E+00
Aerosols (kg)	1.6031E-09	0.0000E+00

EAB Doses:

Time (h) = 744.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2364E-01	3.3638E+01	1.4591E+00

LPZ Doses:

Time (h) = 744.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	7.7703-148	1.4687-145	5.2504-147
Accumulated dose (rem)	2.3646E-01	1.8778E+01	8.1451E-01

Control Room Doses:

Time (h) = 744.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	6.5128E-24	1.9576E-20	6.0274E-22
Accumulated dose (rem)	1.4571E-01	1.4193E+02	4.5070E+00

primary Compartment Nuclide Inventory:

Time (h) = 744.0000	Ci	kg	Atoms	Decay

primary Transport Group Inventory:

Time (h) = 744.0000	Atmosphere	Sump	
Noble gases (atoms)	0.0000E+00	0.0000E+00	
Elemental I (atoms)	0.0000E+00	0.0000E+00	
Organic I (atoms)	0.0000E+00	0.0000E+00	
Aerosols (kg)	0.0000E+00	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		0.0000E+00
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		0.0000E+00
Total I (Ci)			0.0000E+00

primary to Environment Transport Group Inventory:

	Pathway	
Time (h) = 744.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment Integral Nuclide Release:

Time (h) = 744.0000	Ci	kg	Atoms	Bq
Br-82	4.2771E-01	3.9507E-10	2.9014E+15	1.5825E+10

Br-83	1.0769E-02	6.8169E-13	4.9461E+12	3.9846E+08
Kr-83m	8.2529E+00	4.0000E-10	2.9023E+15	3.0536E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2090E+02	1.4691E-08	1.0408E+17	4.4733E+12
Kr-87	1.7424E-02	6.1514E-13	4.2580E+12	6.4470E+08
Kr-88	3.6968E+01	2.9482E-09	2.0176E+16	1.3678E+12
I-130	1.0375E+00	5.3193E-10	2.4641E+15	3.8386E+10
I-131	1.5395E+02	1.2418E-06	5.7087E+18	5.6963E+12
I-132	1.1269E+02	1.0917E-08	4.9805E+16	4.1694E+12
I-133	9.5956E+01	8.4707E-08	3.8354E+17	3.5504E+12
I-134	4.1072E-06	1.5396E-16	6.9192E+08	1.5197E+05
I-135	1.5408E+01	4.3873E-09	1.9571E+16	5.7008E+11
Xe-129m	1.4461E-01	1.1429E-09	5.3354E+15	5.3504E+09
Xe-131m	2.3959E+02	2.8605E-06	1.3150E+19	8.8650E+12
Xe-133	3.8934E+04	2.0800E-04	9.4181E+20	1.4405E+15
Xe-133m	1.1063E+03	2.4655E-06	1.1163E+19	4.0932E+13
Xe-135	1.0509E+04	4.1152E-06	1.8357E+19	3.8883E+14
Xe-135m	2.7283E+02	2.9951E-09	1.3361E+16	1.0095E+13

Environment Transport Group Inventory:

Time (h) = 744.0000	Total Release	Release Rate/s	
Noble gases (atoms)	1.1115E+22	4.2882E+15	
Elemental I (atoms)	2.9910E+17	1.1539E+11	
Organic I (atoms)	9.2504E+15	3.5688E+09	
Aerosols (kg)	1.2756E-06	4.9213E-13	
Dose Effective (Ci) I-131 (Thyroid)			1.7104E+02
Dose Effective (Ci) I-131 (ICRP2 Thyroid)			1.8495E+02
Total I (Ci)			3.7800E+02

primary to Environment Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.1110E+22
Elemental I (atoms)	0.0000E+00	2.9916E+17
Organic I (atoms)	0.0000E+00	9.2525E+15
Aerosols (kg)	0.0000E+00	1.2759E-06

Environment to Control Room Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	2.9007E+19	0.0000E+00
Elemental I (atoms)	3.7592E+14	0.0000E+00
Organic I (atoms)	1.1626E+13	0.0000E+00
Aerosols (kg)	1.6031E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 744.0000	Ci	kg	Atoms	Decay

Control Room Transport Group Inventory:

Time (h) = 744.0000	Atmosphere	Sump
Noble gases (atoms)	2.8691-141	0.0000E+00
Elemental I (atoms)	2.8212-147	0.0000E+00
Organic I (atoms)	8.7254-149	0.0000E+00
Aerosols (kg)	1.2021-170	0.0000E+00
Dose Effective (Ci/cc)	I-131 (Thyroid)	3.9052-172
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)	3.9052-172
Total I (Ci)		1.5687-162

Environment to Control Room Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	2.0331E+19
Elemental I (atoms)	4.0089E+14	1.4672E+14
Organic I (atoms)	1.2399E+13	4.5378E+12
Aerosols (kg)	1.7098E-09	6.2576E-10

Environment to Control Room Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.7065E+18
Elemental I (atoms)	0.0000E+00	2.3446E+14
Organic I (atoms)	0.0000E+00	7.2512E+12
Aerosols (kg)	0.0000E+00	9.9993E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (atoms)	2.9007E+19	0.0000E+00
Elemental I (atoms)	3.7592E+14	0.0000E+00
Organic I (atoms)	1.1626E+13	0.0000E+00
Aerosols (kg)	1.6031E-09	0.0000E+00

839

##
I-131 Summary
##

Time (hr)	primary I-131 (Curies)	Environment I-131 (Curies)	Control Room I-131 (Curies)
24.000	2.3765E+01	2.2805E-02	1.6231E-04
24.004	1.5319E+02	9.5425E-01	6.7812E-03
24.017	1.4625E+02	7.8815E+00	5.5452E-02
24.417	3.6688E+01	1.1731E+02	1.3770E-01

24.717	1.3005E+01	1.4096E+02	1.3870E-01
25.017	4.6096E+00	1.4935E+02	1.2617E-01
25.317	1.6339E+00	1.5232E+02	1.1070E-01
25.617	5.7917E-01	1.5337E+02	9.5768E-02
25.917	2.0529E-01	1.5375E+02	8.2376E-02
26.000	1.5408E-01	1.5380E+02	7.8975E-02
26.300	5.4617E-02	1.5390E+02	6.7730E-02
26.600	1.9360E-02	1.5393E+02	5.8051E-02
26.900	6.8623E-03	1.5395E+02	4.9744E-02
27.200	2.4324E-03	1.5395E+02	4.2621E-02
27.500	8.6220E-04	1.5395E+02	3.6517E-02
27.800	3.0562E-04	1.5395E+02	3.1286E-02
28.100	1.0833E-04	1.5395E+02	2.6805E-02
28.400	3.8399E-05	1.5395E+02	2.2965E-02
28.700	1.3611E-05	1.5395E+02	1.9675E-02
29.000	4.8246E-06	1.5395E+02	1.6857E-02
29.300	1.7101E-06	1.5395E+02	1.4442E-02
29.600	6.0618E-07	1.5395E+02	1.2373E-02
29.900	2.1487E-07	1.5395E+02	1.0601E-02
30.200	7.6162E-08	1.5395E+02	9.0821E-03
30.500	2.6997E-08	1.5395E+02	7.7811E-03
30.800	9.5693E-09	1.5395E+02	6.6665E-03
31.100	3.3920E-09	1.5395E+02	5.7115E-03
31.400	1.2023E-09	1.5395E+02	4.8933E-03
31.700	4.2618E-10	1.5395E+02	4.1924E-03
32.000	1.5106E-10	1.5395E+02	3.5918E-03
32.300	5.3546E-11	1.5395E+02	3.0773E-03
32.600	1.8980E-11	1.5395E+02	2.6365E-03
32.900	6.7278E-12	1.5395E+02	2.2588E-03
33.200	2.3847E-12	1.5395E+02	1.9352E-03
33.500	8.4530E-13	1.5395E+02	1.6580E-03
33.800	2.9963E-13	1.5395E+02	1.4205E-03
34.100	1.0621E-13	1.5395E+02	1.2170E-03
34.400	3.7646E-14	1.5395E+02	1.0427E-03
48.000	1.4329E-34	1.5395E+02	9.4231E-07
120.000	1.1299-142	1.5395E+02	7.2304E-23
744.000	0.0000E+00	1.5395E+02	1.5687-162

```
#######################################################################
                        Cumulative Dose Summary
#######################################################################
```

	EAB		LPZ		Control Room	
Time (hr)	Thyroid (rem)	TEDE (rem)	Thyroid (rem)	TEDE (rem)	Thyroid (rem)	TEDE (rem)
24.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
24.004	2.0885E-01	9.1494E-03	1.1648E-01	5.1026E-03	3.5896E-03	1.1273E-04
24.017	1.7251E+00	7.5562E-02	9.6205E-01	4.2140E-02	1.6087E-01	5.0521E-03
24.417	2.5671E+01	1.1182E+00	1.4316E+01	6.2363E-01	1.6566E+01	5.2681E-01
24.717	3.0839E+01	1.3402E+00	1.7199E+01	7.4740E-01	3.2366E+01	1.0305E+00
25.017	3.2669E+01	1.4181E+00	1.8219E+01	7.9089E-01	4.7356E+01	1.5081E+00
25.317	3.3317E+01	1.4456E+00	1.8580E+01	8.0619E-01	6.0703E+01	1.9331E+00

25.617 3.3546E+01 1.4552E+00 1.8708E+01 8.1158E-01 7.2310E+01
2.3024E+00
25.917 3.3627E+01 1.4586E+00 1.8754E+01 8.1348E-01 8.2307E+01
2.6202E+00
26.000 3.3638E+01 1.4591E+00 1.8760E+01 8.1374E-01 8.4814E+01
2.6998E+00
26.300 3.3638E+01 1.4591E+00 1.8772E+01 8.1424E-01 9.3034E+01
2.9609E+00
26.600 3.3638E+01 1.4591E+00 1.8776E+01 8.1441E-01 1.0007E+02
3.1842E+00
26.900 3.3638E+01 1.4591E+00 1.8778E+01 8.1448E-01 1.0610E+02
3.3754E+00
27.200 3.3638E+01 1.4591E+00 1.8778E+01 8.1450E-01 1.1126E+02
3.5388E+00
27.500 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.1567E+02
3.6787E+00
27.800 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.1945E+02
3.7983E+00
28.100 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.2269E+02
3.9006E+00
28.400 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.2546E+02
3.9881E+00
28.700 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.2783E+02
4.0630E+00
29.000 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.2986E+02
4.1271E+00
29.300 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3159E+02
4.1819E+00
29.600 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3308E+02
4.2288E+00
29.900 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3435E+02
4.2689E+00
30.200 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3544E+02
4.3032E+00
30.500 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3637E+02
4.3326E+00
30.800 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3717E+02
4.3577E+00
31.100 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3786E+02
4.3792E+00
31.400 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3844E+02
4.3976E+00
31.700 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3894E+02
4.4134E+00
32.000 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3937E+02
4.4269E+00
32.300 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.3974E+02
4.4384E+00
32.600 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4005E+02
4.4483E+00
32.900 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4032E+02
4.4567E+00
33.200 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4055E+02
4.4639E+00
33.500 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4075E+02
4.4701E+00
33.800 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4092E+02
4.4754E+00
34.100 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4106E+02
4.4800E+00

```
   34.400 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4118E+02
4.4838E+00
   48.000 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4193E+02
4.5070E+00
  120.000 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4193E+02
4.5070E+00
  744.000 3.3638E+01 1.4591E+00 1.8778E+01 8.1451E-01 1.4193E+02
4.5070E+00

 ######################################################################
                          Worst Two-Hour Doses
 ######################################################################

 EAB
    Time    Whole Body    Thyroid        TEDE
    (hr)      (rem)        (rem)         (rem)
    24.0    4.2364E-01   3.3638E+01   1.4591E+00
```

ATTACHMENT F

RADTRAD CASE 1 Detailed Output File (oO)

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:30:35
#######################################################################

#######################################################################
                    File information
#######################################################################

 Plant file           = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\FHACooper 9-21-05 NoCREFS.psf
 Inventory file       = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\cooper29fha.nif
 Release file         = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\RG1_183FHA.RFT
 Dose Conversion file = C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-
21-05\cooper29fha.inp



     #####    ####   #####    #  #     #  #####   #    #  #####
     #    #  #       #        #  ##    #  #    #  #    #    #
     #    #  #       #        #  # #   #  #    #  #    #    #
     #####    ####   ####     #  #  #  #  #####   #    #    #
     #            #  #        #  #   # #  #       #    #    #
     #            #  #        #  #    ##  #       #    #    #
     #        ####   #        #  #     #  #        ####     #


 Radtrad 3.03 4/15/2001
 Case 1- 168 hour decay
 Nuclide Inventory File:
 C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\cooper29fha.nif
 Plant Power Level:
  1.5329E+01
 Compartments:
   3
 Compartment 1:
 primary
   3
  7.9500E+05
   0
   0
   0
   0
   0
 Compartment 2:
 Environment
   2
  0.0000E+00
   0
   0
   0
   0
   0
 Compartment 3:
 Control Room
   1
```

```
 1.4186E+05
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
primary to Environment
  1
  2
  2
Pathway 2:
Environment to Control Room
  2
  3
  2
Pathway 3:
Environment to Control Room
  2
  3
  2
Pathway 4:
Control Room to Environment
  3
  2
  2
End of Plant Model File
Scenario Description Name:

Plant Model Filename:

Source Term:
  1
  1   1.0000E+00
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\cooper29fha.inp
C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\RG1_183FHA.RFT
  1.6800E+02
  1
  9.5000E-01   4.8500E-02   1.5000E-03   1.0000E+00
Overlying Pool:
  0
  0.0000E+00
  0
  0
  0
  0
Compartments:
  3
Compartment 1:
  1
  1
  0
  0
  0
  0
  0
  0
  0
```

```
Compartment 2:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Compartment 3:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
  0
  0
  0
  0
  0
  1
  1
  1.6800E+02   4.5760E+04   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Pathway 2:
  0
  0
  0
  0
  0
  1
  1
  1.6800E+02   3.2350E+03   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Pathway 3:
  0
  0
  0
  0
  0
  1
  1
```

```
  1.6800E+02   4.0000E+02   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Pathway 4:
  0
  0
  0
  0
  0
  1
  1
  1.6800E+02   3.6350E+03   0.0000E+00   0.0000E+00   0.0000E+00
  0
  0
  0
  0
  0
  0
Dose Locations:
  3
Location 1:
EAB
  2
  1
  2
  1.6800E+02   5.2000E-04
  1.7000E+02   0.0000E+00
  1
  4
  1.6800E+02   3.5000E-04
  1.7600E+02   1.8000E-04
  1.9200E+02   2.3000E-04
  8.8800E+02   0.0000E+00
  0
Location 2:
LPZ
  2
  1
  5
  1.6800E+02   2.9000E-04
  1.7600E+02   7.3000E-05
  1.9200E+02   2.5000E-05
  2.6400E+02   5.2000E-06
  8.8800E+02   0.0000E+00
  1
  4
  1.6800E+02   3.5000E-04
  1.7600E+02   1.8000E-04
  1.9200E+02   2.3000E-04
  8.8800E+02   0.0000E+00
  0
Location 3:
Control Room
  3
  0
  1
```

```
  2
  1.6800E+02   3.5000E-04
  8.8800E+02   0.0000E+00
  1
  4
  1.6800E+02   1.0000E+00
  1.9200E+02   6.0000E-01
  2.6400E+02   4.0000E-01
  8.8800E+02   0.0000E+00
 Effective Volume Location:
  1
  6
  1.6800E+02   4.1500E-03
  1.7000E+02   3.2400E-03
  1.7600E+02   1.3200E-03
  1.9200E+02   9.0100E-04
  2.6400E+02   7.2200E-04
  8.8800E+02   0.0000E+00
 Simulation Parameters:
  1
  1.6800E+02   0.0000E+00
 Output Filename:
 C:\Cooper FHA Analysis\Cooper FHA Files\Rev 1 9-21-05\FHACooper 9-21-05
NoCREFS.o0
  1
  1
  1
  0
  0
 End of Scenario File
```

This page intentionally left blank.

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:30:35
#######################################################################

#######################################################################
                     Plant Description
#######################################################################

Number of Nuclides =  29

Inventory Power =   1.0000E+00 MWth
Plant Power Level =   1.5329E+01 MWth

Number of compartments    =   3

Compartment information

Compartment number  1  (Source term fraction =   1.0000E+00
)
Name: primary
Compartment volume =   7.9500E+05 (Cubic feet)
Compartment type is Normal
Pathways into and out of compartment  1
   Exit Pathway Number    1: primary to Environment

Compartment number  2
Name: Environment
Compartment type is Environment
Pathways into and out of compartment  2
   Inlet Pathway Number   1: primary to Environment
   Inlet Pathway Number   4: Control Room to Environment
   Exit Pathway Number    2: Environment to Control Room
   Exit Pathway Number    3: Environment to Control Room

Compartment number  3
Name: Control Room
Compartment volume =   1.4186E+05 (Cubic feet)
Compartment type is Control Room
Pathways into and out of compartment  3
   Inlet Pathway Number   2: Environment to Control Room
   Inlet Pathway Number   3: Environment to Control Room
   Exit Pathway Number    4: Control Room to Environment

Total number of pathways =   4
```

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:30:35
#######################################################################

#######################################################################
                    Scenario Description
#######################################################################
```

Time between shutdown and first release = 1.6800E+02 (Hours)

Radioactive Decay is enabled
Calculation of Daughters is enabled

Release Fractions and Timings

	GAP	EARLY IN-VESSEL	LATE RELEASE	RELEASE MASS
	0.003600 hr	0.0000 hrs	0.0000 hrs	(gm)
NOBLES	5.0000E-02	0.0000E+00	0.0000E+00	1.659E+00
IODINE	2.5000E-04	0.0000E+00	0.0000E+00	1.615E-03
CESIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
TELLURIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
STRONTIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
BARIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
RUTHENIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
CERIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
LANTHANUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00

Inventory Power = 15. MWt

Nuclide Name	Group	Specific Inventory (Ci/MWt)	half life (s)	Whole Body DCF (Sv-m3/Bq-s)	Inhaled Thyroid (Sv/Bq)	Inhaled Effective (Sv/Bq)
Br-82	2	1.800E+02	1.271E+05	1.300E-13	2.380E-10	3.310E-10
Br-83	2	3.260E+03	8.604E+03	3.820E-16	3.290E-12	2.330E-11
Br-84	2	5.610E+03	1.908E+03	9.410E-14	3.120E-12	2.610E-11
Kr-83m	1	3.270E+03	6.588E+03	1.500E-18	0.000E+00	0.000E+00
Kr-85	1	7.320E+02	3.383E+08	1.190E-16	0.000E+00	0.000E+00
Kr-85m	1	6.810E+03	1.613E+04	7.480E-15	0.000E+00	0.000E+00
Kr-87	1	1.300E+04	4.578E+03	4.120E-14	0.000E+00	0.000E+00
Kr-88	1	1.830E+04	1.022E+04	1.020E-13	0.000E+00	0.000E+00
I-128	2	4.190E+02	1.499E+03	4.160E-15	5.340E-11	1.280E-11
I-130	2	1.060E+03	4.450E+04	1.040E-13	1.990E-08	7.140E-10
I-131	2	4.352E+04	6.947E+05	1.820E-14	2.920E-07	8.890E-09
I-132	2	3.930E+04	8.280E+03	1.120E-13	1.740E-09	1.030E-10
I-133	2	5.510E+04	7.488E+04	2.940E-14	4.860E-08	1.580E-09
I-134	2	6.040E+04	3.156E+03	1.300E-13	2.880E-10	3.550E-11
I-135	2	5.160E+04	2.380E+04	8.294E-14	8.460E-09	3.320E-10
Xe-129m	1	2.060E-01	6.912E+05	1.060E-15	0.000E+00	0.000E+00
Xe-131m	1	3.040E+02	1.028E+06	3.890E-16	0.000E+00	0.000E+00
Xe-133	1	5.260E+04	4.532E+05	1.560E-15	0.000E+00	0.000E+00
Xe-133m	1	1.580E+03	1.890E+05	1.370E-15	0.000E+00	0.000E+00
Xe-135	1	1.860E+04	3.272E+04	1.190E-14	0.000E+00	0.000E+00
Xe-135m	1	1.090E+04	9.174E+02	2.040E-14	0.000E+00	0.000E+00
Xe-138	1	4.500E+04	8.502E+02	5.770E-14	0.000E+00	0.000E+00

Nuclide	Daughter	Fraction	Daughter	Fraction	Daughter	Fraction
Br-83	Kr-83m	1.00	none	0.00	none	0.00
Kr-85m	Kr-85	0.21	none	0.00	none	0.00
Kr-87	Rb-87	1.00	none	0.00	none	0.00

Kr-88	Rb-88	1.00	none	0.00	none	0.00
I-131	Xe-131m	0.01	none	0.00	none	0.00
I-133	Xe-133m	0.03	Xe-133	0.97	none	0.00
I-135	Xe-135m	0.15	Xe-135	0.85	none	0.00
Te-129	I-129	1.00	none	0.00	none	0.00
Te-131	I-131	1.00	none	0.00	none	0.00
Te-131m	I-131	0.78	Te-131	0.22	none	0.00
Te-132	I-132	1.00	none	0.00	none	0.00
Te-133	I-133	1.00	none	0.00	none	0.00
Te-133m	I-133	0.87	Te-133	0.13	none	0.00
Te-134	I-134	1.00	none	0.00	none	0.00
Xe-133m	Xe-133	1.00	none	0.00	none	0.00
Xe-135	Cs-135	1.00	none	0.00	none	0.00
Xe-135m	Cs-135	0.00	Xe-135	1.00	none	0.00
Xe-138	Cs-138	1.00	none	0.00	none	0.00

Iodine fractions
Aerosol = 9.5000E-01
Elemental = 4.8500E-02
Organic = 1.5000E-03

COMPARTMENT DATA

Compartment number 1: primary

Compartment number 2: Environment

Compartment number 3: Control Room

PATHWAY DATA

Pathway number 1: primary to Environment

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
1.6800E+02	4.5760E+04	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 2: Environment to Control Room

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
1.6800E+02	3.2350E+03	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 3: Environment to Control Room

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
1.6800E+02	4.0000E+02	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 4: Control Room to Environment

Pathway Filter: Removal Data

Time (hr) Flow Rate Filter Efficiencies (%)

```
                    (cfm)        Aerosol     Elemental    Organic
  1.6800E+02    3.6350E+03   0.0000E+00   0.0000E+00   0.0000E+00

LOCATION DATA
     Location EAB     is in compartment   2

     Location X/Q Data
      Time (hr)         X/Q (s * m^-3)
       1.6800E+02          5.2000E-04
       1.7000E+02          0.0000E+00

     Location Breathing Rate Data
      Time (hr)         Breathing Rate (m^3 * sec^-1)
       1.6800E+02                3.5000E-04
       1.7600E+02                1.8000E-04
       1.9200E+02                2.3000E-04
       8.8800E+02                0.0000E+00
     Location LPZ     is in compartment   2

     Location X/Q Data
      Time (hr)         X/Q (s * m^-3)
       1.6800E+02          2.9000E-04
       1.7600E+02          7.3000E-05
       1.9200E+02          2.5000E-05
       2.6400E+02          5.2000E-06
       8.8800E+02          0.0000E+00

     Location Breathing Rate Data
      Time (hr)         Breathing Rate (m^3 * sec^-1)
       1.6800E+02                3.5000E-04
       1.7600E+02                1.8000E-04
       1.9200E+02                2.3000E-04
       8.8800E+02                0.0000E+00
     Location Control Room     is in compartment   3

     Location X/Q Data
      Time (hr)         X/Q (s * m^-3)
       1.6800E+02          4.1500E-03
       1.7000E+02          3.2400E-03
       1.7600E+02          1.3200E-03
       1.9200E+02          9.0100E-04
       2.6400E+02          7.2200E-04
       8.8800E+02          0.0000E+00

     Location Breathing Rate Data
      Time (hr)         Breathing Rate (m^3 * sec^-1)
       1.6800E+02                3.5000E-04
       8.8800E+02                0.0000E+00

     Location Occupancy Factor Data
      Time (hr)         Occupancy Factor
       1.6800E+02            1.0000E+00
       1.9200E+02            6.0000E-01
       2.6400E+02            4.0000E-01
       8.8800E+02            0.0000E+00

USER SPECIFIED TIME STEP DATA - SUPPLEMENTAL TIME STEPS
     Time            Time step
      0.0000E+00       0.0000E+00
```

```
#######################################################################
   RADTRAD Version 3.03 (Spring 2001) run on  9/22/2005  at  7:30:35
#######################################################################
```

```
 ####   #    #  #####  #####   #    #  #####
#    #  #    #    #    #    #  #    #    #
#    #  #    #    #    #    #  #    #    #
#    #  #    #    #    #####   #    #    #
#    #  #    #    #    #       #    #    #
#    #  #    #    #    #       #    #    #
 ####    ####     #    #        ####     #
```

```
#######################################################################
            Dose, Detailed model and Detailed Inventory Output
#######################################################################
```

EAB Doses:

Time (h) = 168.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	4.3640E-04	1.1337E-01	3.8956E-03
Accumulated dose (rem)	4.3640E-04	1.1337E-01	3.8956E-03

LPZ Doses:

Time (h) = 168.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.4338E-04	6.3226E-02	2.1726E-03
Accumulated dose (rem)	2.4338E-04	6.3226E-02	2.1726E-03

Control Room Doses:

Time (h) = 168.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.5245E-07	1.9485E-03	5.9807E-05
Accumulated dose (rem)	3.5245E-07	1.9485E-03	5.9807E-05

primary Compartment Nuclide Inventory:

Time (h) = 168.0036	Ci	kg	Atoms	Decay
Br-82	2.5312E-02	2.3380E-11	1.7171E+14	9.2630E+09
Kr-85	5.5693E+02	1.4195E-03	1.0057E+22	2.0380E+14
Kr-85m	2.6673E-08	3.2411E-18	2.2963E+07	9.7627E+03
I-130	3.2682E-04	1.6757E-13	7.7625E+11	1.1960E+08
I-131	9.2217E+01	7.4384E-07	3.4195E+18	3.3746E+13
I-132	3.4478E+01	3.3402E-09	1.5239E+16	1.2622E+13
I-133	7.9469E-01	7.0152E-10	3.1764E+15	2.9082E+11
I-135	4.3879E-06	1.2494E-15	5.5736E+09	1.6059E+06
Xe-129m	8.5555E-02	6.7619E-10	3.1567E+15	3.1308E+10
Xe-131m	2.4500E+02	2.9249E-06	1.3446E+19	8.9653E+13
Xe-133	1.9474E+04	1.0404E-04	4.7107E+20	7.1262E+15
Xe-133m	2.1688E+02	4.8335E-07	2.1886E+18	7.9367E+13
Xe-135	3.2535E-01	1.2740E-10	5.6832E+14	1.1907E+11
Xe-135m	1.5192E-04	1.6677E-15	7.4395E+09	5.5795E+07

primary Transport Group Inventory:

Time (h) = 168.0036	Atmosphere	Sump

Noble gases (atoms)	1.0544E+22	0.0000E+00	
Elemental I (atoms)	1.6675E+17	0.0000E+00	
Organic I (atoms)	5.1571E+15	0.0000E+00	
Aerosols (kg)	7.1051E-07	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		4.1114E-09
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		4.1610E-09
Total I (Ci)			1.2749E+02

primary to Environment Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.5681E+19
Elemental I (atoms)	0.0000E+00	1.0387E+15
Organic I (atoms)	0.0000E+00	3.2126E+13
Aerosols (kg)	0.0000E+00	4.4261E-09

Environment Integral Nuclide Release:

Time (h) = 168.0036	Ci	kg	Atoms	Bq
Br-82	1.5768E-04	1.4564E-13	1.0696E+12	5.8342E+06
Kr-85	3.4693E+00	8.8427E-06	6.2649E+19	1.2836E+11
Kr-85m	1.6616E-10	2.0191E-20	1.4305E+05	6.1479E+00
I-130	2.0359E-06	1.0439E-15	4.8356E+09	7.5328E+04
I-131	5.7445E-01	4.6336E-09	2.1301E+16	2.1255E+10
I-132	2.1478E-01	2.0808E-11	9.4930E+13	7.9469E+09
I-133	4.9504E-03	4.3700E-12	1.9787E+13	1.8317E+08
I-135	2.7334E-08	7.7834E-18	3.4721E+07	1.0114E+03
Xe-129m	5.3295E-04	4.2122E-12	1.9664E+13	1.9719E+07
Xe-131m	1.5262E+00	1.8220E-08	8.3760E+16	5.6468E+10
Xe-133	1.2131E+02	6.4807E-07	2.9344E+18	4.4884E+12
Xe-133m	1.3510E+00	3.0110E-09	1.3634E+16	4.9989E+10
Xe-135	2.0268E-03	7.9365E-13	3.5403E+12	7.4990E+07
Xe-135m	9.4656E-07	1.0391E-17	4.6354E+07	3.5023E+04

Environment Transport Group Inventory:

Time (h) = 168.0036	Total Release	Release Rate/s	
Noble gases (atoms)	6.5681E+19	5.0680E+18	
Elemental I (atoms)	1.0387E+15	8.0148E+13	
Organic I (atoms)	3.2125E+13	2.4788E+12	
Aerosols (kg)	4.4260E-09	3.4151E-10	
Dose Effective (Ci)	I-131 (Thyroid)		5.7656E-01
Dose Effective (Ci)	I-131 (ICRP2 Thyroid)		5.8352E-01
Total I (Ci)			7.9418E-01

primary to Environment Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.5681E+19
Elemental I (atoms)	0.0000E+00	1.0387E+15
Organic I (atoms)	0.0000E+00	3.2126E+13
Aerosols (kg)	0.0000E+00	4.4261E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported

Noble gases (atoms)	0.0000E+00	4.1616E+17
Elemental I (atoms)	0.0000E+00	6.5814E+12
Organic I (atoms)	0.0000E+00	2.0355E+11
Aerosols (kg)	0.0000E+00	2.8044E-11

Environment to Control Room Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	5.1457E+16
Elemental I (atoms)	0.0000E+00	8.1377E+11
Organic I (atoms)	0.0000E+00	2.5168E+10
Aerosols (kg)	0.0000E+00	3.4675E-12

Control Room to Environment Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	8.6211E+14	0.0000E+00
Elemental I (atoms)	1.3634E+10	0.0000E+00
Organic I (atoms)	4.2167E+08	0.0000E+00
Aerosols (kg)	5.8095E-14	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 168.0036	Ci	kg	Atoms	Decay
Br-82	1.1205E-06	1.0350E-15	7.6011E+09	3.8140E+05
Kr-85	2.4654E-02	6.2839E-08	4.4521E+17	8.3915E+09
I-130	1.4467E-08	7.4179E-18	3.4363E+07	4.9246E+03
I-131	4.0822E-03	3.2928E-11	1.5137E+14	1.3895E+09
I-132	1.5262E-03	1.4786E-13	6.7455E+11	5.1967E+08
I-133	3.5179E-05	3.1055E-14	1.4061E+11	1.1974E+07
I-135	1.9424E-10	5.5310E-20	2.4673E+05	6.6122E+01
Xe-129m	3.7873E-06	2.9933E-14	1.3974E+11	1.2891E+06
Xe-131m	1.0845E-02	1.2948E-10	5.9522E+14	3.6914E+09
Xe-133	8.6205E-01	4.6054E-09	2.0853E+16	2.9342E+11
Xe-133m	9.6009E-03	2.1397E-11	9.6884E+13	3.2679E+09
Xe-135	1.4402E-05	5.6398E-15	2.5158E+10	4.9026E+06
Xe-135m	6.7220E-09	7.3793E-20	3.2918E+05	2.2959E+03

Control Room Transport Group Inventory:

Time (h) = 168.0036	Atmosphere	Sump	
Noble gases (atoms)	4.6675E+17	0.0000E+00	
Elemental I (atoms)	7.3814E+12	0.0000E+00	
Organic I (atoms)	2.2829E+11	0.0000E+00	
Aerosols (kg)	3.1453E-11	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.0200E-12
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.0323E-12
Total I (Ci)			5.6436E-03

Environment to Control Room Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	4.1616E+17
Elemental I (atoms)	0.0000E+00	6.5814E+12
Organic I (atoms)	0.0000E+00	2.0355E+11
Aerosols (kg)	0.0000E+00	2.8044E-11

Environment to Control Room Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	5.1457E+16
Elemental I (atoms)	0.0000E+00	8.1377E+11
Organic I (atoms)	0.0000E+00	2.5168E+10
Aerosols (kg)	0.0000E+00	3.4675E-12

Control Room to Environment Transport Group Inventory:

Time (h) = 168.0036	Pathway Filtered	Transported
Noble gases (atoms)	8.6211E+14	0.0000E+00
Elemental I (atoms)	1.3634E+10	0.0000E+00
Organic I (atoms)	4.2167E+08	0.0000E+00
Aerosols (kg)	5.8095E-14	0.0000E+00

EAB Doses:

Time (h) = 170.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	6.9402E-02	1.8162E+01	6.2350E-01
Accumulated dose (rem)	6.9838E-02	1.8276E+01	6.2740E-01

LPZ Doses:

Time (h) = 170.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.8705E-02	1.0129E+01	3.4772E-01
Accumulated dose (rem)	3.8948E-02	1.0192E+01	3.4989E-01

Control Room Doses:

Time (h) = 170.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.3553E-02	1.3299E+02	4.0797E+00
Accumulated dose (rem)	2.3553E-02	1.3299E+02	4.0798E+00

primary Compartment Nuclide Inventory:

Time (h) = 170.0000	Ci	kg	Atoms	Decay
Br-82	2.4658E-05	2.2776E-14	1.6727E+11	8.2118E+11
Kr-85	5.6422E-01	1.4381E-06	1.0189E+19	1.8170E+16
Kr-85m	1.9842E-11	2.4110E-21	1.7082E+04	8.3315E+05
I-130	2.9603E-07	1.5178E-16	7.0313E+08	1.0493E+10
I-131	9.2758E-02	7.4820E-10	3.4395E+15	3.0054E+15
I-132	1.9138E-02	1.8541E-12	8.4589E+12	1.0352E+15
I-133	7.5328E-04	6.6497E-13	3.0109E+12	2.5681E+13
I-135	3.6057E-09	1.0267E-18	4.5800E+06	1.3897E+08
Xe-129m	8.6054E-05	6.8013E-13	3.1751E+12	2.7883E+12
Xe-131m	2.4701E-01	2.9490E-09	1.3557E+16	7.9873E+15
Xe-133	1.9515E+01	1.0426E-07	4.7208E+17	6.3432E+17
Xe-133m	2.1401E-01	4.7695E-10	2.1596E+15	7.0490E+15
Xe-135	2.8307E-04	1.1085E-13	4.9447E+11	1.0387E+13
Xe-135m	1.3130E-09	1.4414E-20	6.4297E+04	2.7863E+09

primary Transport Group Inventory:

Time (h) = 170.0000	Atmosphere	Sump
Noble gases (atoms)	1.0677E+19	0.0000E+00
Elemental I (atoms)	1.6738E+14	0.0000E+00
Organic I (atoms)	5.1767E+12	0.0000E+00
Aerosols (kg)	7.1321E-10	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid) 4.1310E-12

Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid) 4.1600E-12
Total I (Ci) 1.1265E-01

primary to Environment Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0592E+22
Elemental I (atoms)	0.0000E+00	1.6732E+17
Organic I (atoms)	0.0000E+00	5.1750E+15
Aerosols (kg)	0.0000E+00	7.1297E-07

Environment Integral Nuclide Release:

Time (h) = 170.0000	Ci	kg	Atoms	Bq
Br-82	2.5276E-02	2.3347E-11	1.7146E+14	9.3523E+08
Kr-85	5.5983E+02	1.4269E-03	1.0110E+22	2.0714E+13
Kr-85m	2.5468E-08	3.0947E-18	2.1926E+07	9.4232E+02
I-130	3.2239E-04	1.6530E-13	7.6573E+11	1.1928E+07
I-131	9.2586E+01	7.4681E-07	3.4331E+18	3.4257E+12
I-132	3.1406E+01	3.0426E-09	1.3881E+16	1.1620E+12
I-133	7.8992E-01	6.9731E-10	3.1573E+15	2.9227E+10
I-135	4.2588E-06	1.2127E-15	5.4097E+09	1.5758E+05
Xe-129m	8.5897E-02	6.7888E-10	3.1693E+15	3.1782E+09
Xe-131m	2.4607E+02	2.9378E-06	1.3505E+19	9.1047E+12
Xe-133	1.9539E+04	1.0439E-04	4.7265E+20	7.2295E+14
Xe-133m	2.1705E+02	4.8371E-07	2.1902E+18	8.0307E+12
Xe-135	3.1879E-01	1.2483E-10	5.5687E+14	1.1795E+10
Xe-135m	7.4699E-05	8.2004E-16	3.6581E+09	2.7639E+06

Environment Transport Group Inventory:

Time (h) = 170.0000	Total Release	Release Rate/s
Noble gases (atoms)	1.0598E+22	1.4719E+18
Elemental I (atoms)	1.6734E+17	2.3242E+13
Organic I (atoms)	5.1755E+15	7.1882E+11
Aerosols (kg)	7.1305E-07	9.9034E-11

Dose Effective (Ci) I-131 (Thyroid) 9.2904E+01
Dose Effective (Ci) I-131 (ICRP2 Thyroid) 9.3929E+01
Total I (Ci) 1.2478E+02

primary to Environment Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0592E+22
Elemental I (atoms)	0.0000E+00	1.6732E+17
Organic I (atoms)	0.0000E+00	5.1750E+15
Aerosols (kg)	0.0000E+00	7.1297E-07

Environment to Control Room Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7150E+19
Elemental I (atoms)	0.0000E+00	1.0608E+15
Organic I (atoms)	0.0000E+00	3.2808E+13
Aerosols (kg)	0.0000E+00	4.5200E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3030E+18
Elemental I (atoms)	0.0000E+00	1.3116E+14
Organic I (atoms)	0.0000E+00	4.0566E+12
Aerosols (kg)	0.0000E+00	5.5889E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	6.9304E+19	0.0000E+00
Elemental I (atoms)	1.0924E+15	0.0000E+00
Organic I (atoms)	3.3786E+13	0.0000E+00
Aerosols (kg)	4.6547E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 170.0000	Ci	kg	Atoms	Decay
Br-82	1.4242E-05	1.3154E-14	9.6607E+10	1.4223E+10
Kr-85	3.2587E-01	8.3058E-07	5.8846E+18	3.1754E+14
I-130	1.7097E-07	8.7663E-17	4.0609E+08	1.7877E+08
I-131	5.3573E-02	4.3213E-10	1.9865E+15	5.2438E+13
I-132	1.1053E-02	1.0709E-12	4.8855E+12	1.5862E+13
I-133	4.3506E-04	3.8406E-13	1.7390E+12	4.4203E+11
I-135	2.0825E-09	5.9298E-19	2.6452E+06	2.3164E+06
Xe-129m	4.9701E-05	3.9281E-13	1.8338E+12	4.8649E+10
Xe-131m	1.4266E-01	1.7032E-09	7.8297E+15	1.3943E+14
Xe-133	1.1271E+01	6.0215E-08	2.7265E+17	1.1058E+16
Xe-133m	1.2360E-01	2.7547E-10	1.2473E+15	1.2245E+14
Xe-135	1.6349E-04	6.4020E-14	2.8558E+11	1.7536E+11
Xe-135m	7.5831E-10	8.3246E-21	3.7135E+04	2.1722E+07

Control Room Transport Group Inventory:

Time (h) = 170.0000	Atmosphere	Sump	
Noble gases (atoms)	6.1663E+18	0.0000E+00	
Elemental I (atoms)	9.6672E+13	0.0000E+00	
Organic I (atoms)	2.9898E+12	0.0000E+00	
Aerosols (kg)	4.1191E-10	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.3371E-11
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.3465E-11
Total I (Ci)			6.5061E-02

Environment to Control Room Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7150E+19
Elemental I (atoms)	0.0000E+00	1.0608E+15
Organic I (atoms)	0.0000E+00	3.2808E+13
Aerosols (kg)	0.0000E+00	4.5200E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3030E+18
Elemental I (atoms)	0.0000E+00	1.3116E+14

Organic I (atoms)	0.0000E+00	4.0566E+12
Aerosols (kg)	0.0000E+00	5.5889E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 170.0000	Pathway Filtered	Transported
Noble gases (atoms)	6.9304E+19	0.0000E+00
Elemental I (atoms)	1.0924E+15	0.0000E+00
Organic I (atoms)	3.3786E+13	0.0000E+00
Aerosols (kg)	4.6547E-09	0.0000E+00

EAB Doses:

Time (h) = 176.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	6.9838E-02	1.8276E+01	6.2740E-01

LPZ Doses:

Time (h) = 176.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.7098E-05	1.0188E-02	3.4765E-04
Accumulated dose (rem)	3.8985E-02	1.0202E+01	3.5024E-01

Control Room Doses:

Time (h) = 176.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.0324E-03	1.1946E+01	3.6613E-01
Accumulated dose (rem)	2.5585E-02	1.4494E+02	4.4459E+00

primary Compartment Nuclide Inventory:

Time (h) = 176.0000	Ci	kg	Atoms	Decay
Kr-85	5.6519E-10	1.4406E-15	1.0206E+10	1.8188E+16
I-131	9.0940E-11	7.3353E-19	3.3721E+06	3.0084E+15
Xe-131m	2.4388E-10	2.9116E-18	1.3385E+07	7.9953E+15
Xe-133	1.8921E-08	1.0108E-16	4.5770E+08	6.3495E+17
Xe-133m	1.9807E-10	4.4141E-19	1.9987E+06	7.0559E+15

primary Transport Group Inventory:

Time (h) = 176.0000	Atmosphere	Sump	
Noble gases (atoms)	1.0679E+10	0.0000E+00	
Elemental I (atoms)	1.6374E+05	0.0000E+00	
Organic I (atoms)	5.0642E+03	0.0000E+00	
Aerosols (kg)	6.9768E-19	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		4.0450E-21
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		4.0520E-21
Total I (Ci)			9.4701E-11

primary to Environment Transport Group Inventory:

Time (h) = 176.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment Integral Nuclide Release:

Time (h) = 176.0000	Ci	kg	Atoms	Bq
Br-82	2.5301E-02	2.3370E-11	1.7163E+14	9.3613E+08
Kr-85	5.6040E+02	1.4284E-03	1.0120E+22	2.0735E+13
Kr-85m	2.5487E-08	3.0970E-18	2.1942E+07	9.4302E+02
I-130	3.2268E-04	1.6545E-13	7.6642E+11	1.1939E+07
I-131	9.2678E+01	7.4756E-07	3.4366E+18	3.4291E+12
I-132	3.1424E+01	3.0443E-09	1.3889E+16	1.1627E+12
I-133	7.9066E-01	6.9796E-10	3.1603E+15	2.9254E+10
I-135	4.2623E-06	1.2137E-15	5.4141E+09	1.5771E+05
Xe-129m	8.5983E-02	6.7956E-10	3.1724E+15	3.1814E+09
Xe-131m	2.4632E+02	2.9407E-06	1.3519E+19	9.1138E+12
Xe-133	1.9559E+04	1.0449E-04	4.7312E+20	7.2367E+14
Xe-133m	2.1726E+02	4.8419E-07	2.1924E+18	8.0386E+12
Xe-135	3.1907E-01	1.2494E-10	5.5735E+14	1.1806E+10
Xe-135m	7.4700E-05	8.2005E-16	3.6581E+09	2.7639E+06

Environment Transport Group Inventory:

Time (h) = 176.0000	Total Release	Release Rate/s
Noble gases (atoms)	1.0609E+22	3.6835E+17
Elemental I (atoms)	1.6751E+17	5.8163E+12
Organic I (atoms)	5.1807E+15	1.7988E+11
Aerosols (kg)	7.1376E-07	2.4783E-11
Dose Effective (Ci) I-131 (Thyroid)		9.2997E+01
Dose Effective (Ci) I-131 (ICRP2 Thyroid)		9.4023E+01
Total I (Ci)		1.2489E+02

primary to Environment Transport Group Inventory:

Time (h) = 176.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment to Control Room Transport Group Inventory:

Time (h) = 176.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 176.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 176.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5528E+19	0.0000E+00

Elemental I (atoms)	1.1897E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 176.0000	Ci	kg	Atoms	Decay
Br-82	1.2696E-09	1.1727E-18	8.6124E+06	1.5361E+10
Kr-85	3.2681E-05	8.3300E-11	5.9017E+14	3.4392E+14
I-130	1.2248E-11	6.2801E-21	2.9092E+04	1.9212E+08
I-131	5.2585E-06	4.2416E-14	1.9499E+11	5.6765E+13
I-132	1.8175E-07	1.7608E-17	8.0333E+07	1.6609E+13
I-133	3.5727E-08	3.1538E-17	1.4280E+08	4.7651E+11
Xe-129m	4.8779E-09	3.8553E-17	1.7998E+08	5.2664E+10
Xe-131m	1.4102E-05	1.6836E-13	7.7398E+11	1.5097E+14
Xe-133	1.0941E-03	5.8451E-12	2.6466E+13	1.1967E+16
Xe-133m	1.1453E-05	2.5524E-14	1.1557E+11	1.3237E+14
Xe-135	1.0377E-08	4.0635E-18	1.8127E+07	1.8797E+11

Control Room Transport Group Inventory:

Time (h) = 176.0000	Atmosphere	Sump	
Noble gases (atoms)	6.1753E+14	0.0000E+00	
Elemental I (atoms)	9.4682E+09	0.0000E+00	
Organic I (atoms)	2.9283E+08	0.0000E+00	
Aerosols (kg)	4.0343E-14	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.3108E-15
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.3131E-15
Total I (Ci)			5.4760E-06

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 176.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 176.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 176.0000	Filtered	Transported
Noble gases (atoms)	7.5528E+19	0.0000E+00
Elemental I (atoms)	1.1897E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

EAB Doses:

Time (h) = 192.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00

Accumulated dose (rem)	6.9838E-02	1.8276E+01	6.2740E-01

LPZ Doses:

Time (h) = 192.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	8.6205E-15	1.2916E-12	4.7954E-14
Accumulated dose (rem)	3.8985E-02	1.0202E+01	3.5024E-01

Control Room Doses:

Time (h) = 192.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.8689E-07	1.1605E-03	3.5527E-05
Accumulated dose (rem)	2.5586E-02	1.4494E+02	4.4460E+00

primary Compartment Nuclide Inventory:

Time (h) = 192.0000	Ci	kg	Atoms	Decay

primary Transport Group Inventory:

Time (h) = 192.0000	Atmosphere	Sump	
Noble gases (atoms)	1.0689E-14	0.0000E+00	
Elemental I (atoms)	1.5521E-19	0.0000E+00	
Organic I (atoms)	4.8004E-21	0.0000E+00	
Aerosols (kg)	6.6134E-43	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		3.8346E-45
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		3.8363E-45
Total I (Ci)			8.6653E-35

primary to Environment Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment Integral Nuclide Release:

Time (h) = 192.0000	Ci	kg	Atoms	Bq
Br-82	2.5301E-02	2.3370E-11	1.7163E+14	9.3613E+08
Kr-85	5.6040E+02	1.4284E-03	1.0120E+22	2.0735E+13
Kr-85m	2.5487E-08	3.0970E-18	2.1942E+07	9.4302E+02
I-130	3.2268E-04	1.6545E-13	7.6642E+11	1.1939E+07
I-131	9.2678E+01	7.4756E-07	3.4366E+18	3.4291E+12
I-132	3.1424E+01	3.0443E-09	1.3889E+16	1.1627E+12
I-133	7.9066E-01	6.9796E-10	3.1603E+15	2.9254E+10
I-135	4.2623E-06	1.2137E-15	5.4141E+09	1.5771E+05
Xe-129m	8.5983E-02	6.7956E-10	3.1724E+15	3.1814E+09
Xe-131m	2.4632E+02	2.9407E-06	1.3519E+19	9.1138E+12
Xe-133	1.9559E+04	1.0449E-04	4.7312E+20	7.2367E+14
Xe-133m	2.1726E+02	4.8419E-07	2.1924E+18	8.0386E+12
Xe-135	3.1907E-01	1.2494E-10	5.5735E+14	1.1806E+10
Xe-135m	7.4700E-05	8.2005E-16	3.6581E+09	2.7639E+06

Environment Transport Group Inventory:

Time (h) = 192.0000	Total Release	Release Rate/s
Noble gases (atoms)	1.0609E+22	1.2278E+17

Elemental I (atoms)	1.6751E+17	1.9388E+12	
Organic I (atoms)	5.1807E+15	5.9962E+10	
Aerosols (kg)	7.1376E-07	8.2611E-12	
Dose Effective (Ci) I-131 (Thyroid)			9.2997E+01
Dose Effective (Ci) I-131 (ICRP2 Thyroid)			9.4023E+01
Total I (Ci)			1.2489E+02

primary to Environment Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment to Control Room Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 192.0000	Ci	kg	Atoms	Decay
Kr-85	6.7777E-16	1.7275E-21	1.2239E+04	3.4392E+14

Control Room Transport Group Inventory:

Time (h) = 192.0000	Atmosphere	Sump	
Noble gases (atoms)	1.2760E+04	0.0000E+00	
Elemental I (atoms)	1.8528E-01	0.0000E+00	
Organic I (atoms)	5.7304E-03	0.0000E+00	
Aerosols (kg)	7.8948E-25	0.0000E+00	
Dose Effective (Ci/cc) I-131 (Thyroid)			2.5653E-26
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)			2.5664E-26
Total I (Ci)			1.0344E-16

Environment to Control Room Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 192.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

EAB Doses:

Time (h) = 264.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	6.9838E-02	1.8276E+01	6.2740E-01

LPZ Doses:

Time (h) = 264.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.6954E-39	5.3621E-37	1.9021E-38
Accumulated dose (rem)	3.8985E-02	1.0202E+01	3.5024E-01

Control Room Doses:

Time (h) = 264.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.5131E-18	1.6197E-14	4.9566E-16
Accumulated dose (rem)	2.5586E-02	1.4494E+02	4.4460E+00

primary Compartment Nuclide Inventory:

Time (h) = 264.0000	Ci	kg	Atoms	Decay

primary Transport Group Inventory:

Time (h) = 264.0000	Atmosphere	Sump
Noble gases (atoms)	1.0768-122	0.0000E+00
Elemental I (atoms)	1.2234-127	0.0000E+00
Organic I (atoms)	3.7836-129	0.0000E+00
Aerosols (kg)	5.2127-151	0.0000E+00
Dose Effective (Ci/cc)	I-131 (Thyroid)	3.0218-153
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)	3.0220-153
Total I (Ci)		6.8055-143

primary to Environment Transport Group Inventory:

Pathway

Time (h) = 264.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment Integral Nuclide Release:

Time (h) = 264.0000	Ci	kg	Atoms	Bq
Br-82	2.5301E-02	2.3370E-11	1.7163E+14	9.3613E+08
Kr-85	5.6040E+02	1.4284E-03	1.0120E+22	2.0735E+13
Kr-85m	2.5487E-08	3.0970E-18	2.1942E+07	9.4302E+02
I-130	3.2268E-04	1.6545E-13	7.6642E+11	1.1939E+07
I-131	9.2678E+01	7.4756E-07	3.4366E+18	3.4291E+12
I-132	3.1424E+01	3.0443E-09	1.3889E+16	1.1627E+12
I-133	7.9066E-01	6.9796E-10	3.1603E+15	2.9254E+10
I-135	4.2623E-06	1.2137E-15	5.4141E+09	1.5771E+05
Xe-129m	8.5983E-02	6.7956E-10	3.1724E+15	3.1814E+09
Xe-131m	2.4632E+02	2.9407E-06	1.3519E+19	9.1138E+12
Xe-133	1.9559E+04	1.0449E-04	4.7312E+20	7.2367E+14
Xe-133m	2.1726E+02	4.8419E-07	2.1924E+18	8.0386E+12
Xe-135	3.1907E-01	1.2494E-10	5.5735E+14	1.1806E+10
Xe-135m	7.4700E-05	8.2005E-16	3.6581E+09	2.7639E+06

Environment Transport Group Inventory:

Time (h) = 264.0000	Total Release	Release Rate/s
Noble gases (atoms)	1.0609E+22	3.0696E+16
Elemental I (atoms)	1.6751E+17	4.8469E+11
Organic I (atoms)	5.1807E+15	1.4990E+10
Aerosols (kg)	7.1376E-07	2.0653E-12
Dose Effective (Ci) I-131 (Thyroid)		9.2997E+01
Dose Effective (Ci) I-131 (ICRP2 Thyroid)		9.4023E+01
Total I (Ci)		1.2489E+02

primary to Environment Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment to Control Room Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14

Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 264.0000	Ci	kg	Atoms	Decay

Control Room Transport Group Inventory:

Time (h) = 264.0000	Atmosphere	Sump	
Noble gases (atoms)	1.0608E-44	0.0000E+00	
Elemental I (atoms)	1.2053E-49	0.0000E+00	
Organic I (atoms)	3.7276E-51	0.0000E+00	
Aerosols (kg)	5.1355E-73	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.6684E-74
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.6685E-74
Total I (Ci)			6.7047E-65

Environment to Control Room Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 264.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

EAB Doses:

Time (h) = 888.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	6.9838E-02	1.8276E+01	6.2740E-01

LPZ Doses:

Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 264.0000	Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 264.0000	Ci	kg	Atoms	Decay

Control Room Transport Group Inventory:

Time (h) = 264.0000	Atmosphere	Sump	
Noble gases (atoms)	1.0608E-44	0.0000E+00	
Elemental I (atoms)	1.2053E-49	0.0000E+00	
Organic I (atoms)	3.7276E-51	0.0000E+00	
Aerosols (kg)	5.1355E-73	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		1.6684E-74
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		1.6685E-74
Total I (Ci)			6.7047E-65

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 264.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

	Pathway	
Time (h) = 264.0000	Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

	Pathway	
Time (h) = 264.0000	Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

EAB Doses:

Time (h) = 888.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	6.9838E-02	1.8276E+01	6.2740E-01

LPZ Doses:

Time (h) = 888.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.8856-148	8.7891-146	3.0644-147
Accumulated dose (rem)	3.8985E-02	1.0202E+01	3.5024E-01

Control Room Doses:

Time (h) = 888.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	9.5828E-67	7.0226E-63	2.1476E-64
Accumulated dose (rem)	2.5586E-02	1.4494E+02	4.4460E+00

primary Compartment Nuclide Inventory:

Time (h) = 888.0000	Ci	kg	Atoms	Decay

primary Transport Group Inventory:

Time (h) = 888.0000	Atmosphere	Sump	
Noble gases (atoms)	0.0000E+00	0.0000E+00	
Elemental I (atoms)	0.0000E+00	0.0000E+00	
Organic I (atoms)	0.0000E+00	0.0000E+00	
Aerosols (kg)	0.0000E+00	0.0000E+00	
Dose Effective (Ci/cc)	I-131 (Thyroid)		0.0000E+00
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)		0.0000E+00
Total I (Ci)			0.0000E+00

primary to Environment Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment Integral Nuclide Release:

Time (h) = 888.0000	Ci	kg	Atoms	Bq
Br-82	2.5301E-02	2.3370E-11	1.7163E+14	9.3613E+08
Kr-85	5.6040E+02	1.4284E-03	1.0120E+22	2.0735E+13
Kr-85m	2.5487E-08	3.0970E-18	2.1942E+07	9.4302E+02
I-130	3.2268E-04	1.6545E-13	7.6642E+11	1.1939E+07
I-131	9.2678E+01	7.4756E-07	3.4366E+18	3.4291E+12
I-132	3.1424E+01	3.0443E-09	1.3889E+16	1.1627E+12
I-133	7.9066E-01	6.9796E-10	3.1603E+15	2.9254E+10
I-135	4.2623E-06	1.2137E-15	5.4141E+09	1.5771E+05
Xe-129m	8.5983E-02	6.7956E-10	3.1724E+15	3.1814E+09
Xe-131m	2.4632E+02	2.9407E-06	1.3519E+19	9.1138E+12
Xe-133	1.9559E+04	1.0449E-04	4.7312E+20	7.2367E+14
Xe-133m	2.1726E+02	4.8419E-07	2.1924E+18	8.0386E+12
Xe-135	3.1907E-01	1.2494E-10	5.5735E+14	1.1806E+10
Xe-135m	7.4700E-05	8.2005E-16	3.6581E+09	2.7639E+06

Environment Transport Group Inventory:

Time (h) = 888.0000	Total Release	Release Rate/s
Noble gases (atoms)	1.0609E+22	4.0928E+15
Elemental I (atoms)	1.6751E+17	6.4625E+10
Organic I (atoms)	5.1807E+15	1.9987E+09
Aerosols (kg)	7.1376E-07	2.7537E-13

Dose Effective (Ci) I-131 (Thyroid)	9.2997E+01
Dose Effective (Ci) I-131 (ICRP2 Thyroid)	9.4023E+01
Total I (Ci)	1.2489E+02

primary to Environment Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	1.0603E+22
Elemental I (atoms)	0.0000E+00	1.6749E+17
Organic I (atoms)	0.0000E+00	5.1801E+15
Aerosols (kg)	0.0000E+00	7.1368E-07

Environment to Control Room Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15
Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

Control Room Compartment Nuclide Inventory:

Time (h) = 888.0000	Ci	kg	Atoms	Decay

Control Room Transport Group Inventory:

Time (h) = 888.0000	Atmosphere	Sump
Noble gases (atoms)	0.0000E+00	0.0000E+00
Elemental I (atoms)	0.0000E+00	0.0000E+00
Organic I (atoms)	0.0000E+00	0.0000E+00
Aerosols (kg)	0.0000E+00	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	0.0000E+00
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	0.0000E+00
Total I (Ci)	0.0000E+00

Environment to Control Room Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	6.7203E+19
Elemental I (atoms)	0.0000E+00	1.0616E+15

Organic I (atoms)	0.0000E+00	3.2833E+13
Aerosols (kg)	0.0000E+00	4.5236E-09

Environment to Control Room Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	0.0000E+00	8.3095E+18
Elemental I (atoms)	0.0000E+00	1.3127E+14
Organic I (atoms)	0.0000E+00	4.0598E+12
Aerosols (kg)	0.0000E+00	5.5933E-10

Control Room to Environment Transport Group Inventory:

Time (h) = 888.0000	Pathway Filtered	Transported
Noble gases (atoms)	7.5529E+19	0.0000E+00
Elemental I (atoms)	1.1898E+15	0.0000E+00
Organic I (atoms)	3.6796E+13	0.0000E+00
Aerosols (kg)	5.0695E-09	0.0000E+00

838

##
I-131 Summary
##

Time (hr)	primary I-131 (Curies)	Environment I-131 (Curies)	Control Room I-131 (Curies)
168.000	1.4306E+01	1.3729E-02	9.7713E-05
168.004	9.2217E+01	5.7445E-01	4.0822E-03
168.404	2.3133E+01	6.9573E+01	3.4421E-01
168.704	8.1999E+00	8.4489E+01	2.9853E-01
169.004	2.9066E+00	8.9775E+01	2.1700E-01
169.304	1.0303E+00	9.1649E+01	1.4694E-01
169.604	3.6519E-01	9.2314E+01	9.6188E-02
169.904	1.2945E-01	9.2549E+01	6.1873E-02
170.000	9.2758E-02	9.2586E+01	5.3573E-02
170.300	3.2879E-02	9.2646E+01	3.3998E-02
170.600	1.1654E-02	9.2667E+01	2.1503E-02
170.900	4.1311E-03	9.2674E+01	1.3576E-02
171.200	1.4643E-03	9.2677E+01	8.5617E-03
171.500	5.1904E-04	9.2678E+01	5.3964E-03
171.800	1.8398E-04	9.2678E+01	3.4003E-03
172.100	6.5214E-05	9.2678E+01	2.1421E-03
172.400	2.3116E-05	9.2678E+01	1.3493E-03
172.700	8.1937E-06	9.2678E+01	8.4991E-04
173.000	2.9044E-06	9.2678E+01	5.3532E-04
173.300	1.0295E-06	9.2678E+01	3.3717E-04
173.600	3.6492E-07	9.2678E+01	2.1236E-04
173.900	1.2935E-07	9.2678E+01	1.3375E-04
174.200	4.5849E-08	9.2678E+01	8.4242E-05
174.500	1.6252E-08	9.2678E+01	5.3058E-05
174.800	5.7607E-09	9.2678E+01	3.3417E-05
175.100	2.0419E-09	9.2678E+01	2.1047E-05
175.400	7.2379E-10	9.2678E+01	1.3256E-05
175.700	2.5656E-10	9.2678E+01	8.3491E-06
176.000	9.0940E-11	9.2678E+01	5.2585E-06
176.300	3.2235E-11	9.2678E+01	3.3120E-06
176.600	1.1426E-11	9.2678E+01	2.0860E-06

176.900	4.0501E-12	9.2678E+01	1.3138E-06
177.200	1.4356E-12	9.2678E+01	8.2747E-07
177.500	5.0887E-13	9.2678E+01	5.2117E-07
177.800	1.8037E-13	9.2678E+01	3.2825E-07
178.100	6.3936E-14	9.2678E+01	2.0674E-07
178.400	2.2663E-14	9.2678E+01	1.3021E-07
192.000	8.6263E-35	9.2678E+01	1.0298E-16
264.000	6.8021-143	9.2678E+01	6.7013E-65
888.000	0.0000E+00	9.2678E+01	0.0000E+00

```
#######################################################################
                        Cumulative Dose Summary
#######################################################################
```

	EAB		LPZ		Control Room	
Time (hr)	Thyroid (rem)	TEDE (rem)	Thyroid (rem)	TEDE (rem)	Thyroid (rem)	TEDE (rem)
168.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
168.004	1.1337E-01	3.8956E-03	6.3226E-02	2.1726E-03	1.9485E-03	5.9807E-05
168.404	1.3734E+01	4.7173E-01	7.6596E+00	2.6308E-01	3.2749E+01	1.0050E+00
168.704	1.6678E+01	5.7268E-01	9.3012E+00	3.1938E-01	6.6183E+01	2.0308E+00
169.004	1.7721E+01	6.0843E-01	9.8830E+00	3.3932E-01	9.2477E+01	2.8374E+00
169.304	1.8091E+01	6.2108E-01	1.0089E+01	3.4637E-01	1.1089E+02	3.4022E+00
169.604	1.8222E+01	6.2556E-01	1.0162E+01	3.4887E-01	1.2315E+02	3.7781E+00
169.904	1.8269E+01	6.2715E-01	1.0188E+01	3.4976E-01	1.3110E+02	4.0218E+00
170.000	1.8276E+01	6.2740E-01	1.0192E+01	3.4989E-01	1.3299E+02	4.0798E+00
170.300	1.8276E+01	6.2740E-01	1.0199E+01	3.5012E-01	1.3739E+02	4.2146E+00
170.600	1.8276E+01	6.2740E-01	1.0201E+01	3.5020E-01	1.4018E+02	4.3000E+00
170.900	1.8276E+01	6.2740E-01	1.0202E+01	3.5023E-01	1.4194E+02	4.3540E+00
171.200	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4305E+02	4.3880E+00
171.500	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4375E+02	4.4095E+00
171.800	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4419E+02	4.4230E+00
172.100	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4447E+02	4.4315E+00
172.400	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4464E+02	4.4368E+00
172.700	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4475E+02	4.4402E+00
173.000	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4482E+02	4.4424E+00
173.300	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4486E+02	4.4437E+00
173.600	1.8276E+01	6.2740E-01	1.0202E+01	3.5024E-01	1.4489E+02	4.4445E+00

```
  173.900 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4491E+02
4.4451E+00
  174.200 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4492E+02
4.4454E+00
  174.500 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4493E+02
4.4456E+00
  174.800 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4493E+02
4.4457E+00
  175.100 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4493E+02
4.4458E+00
  175.400 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4459E+00
  175.700 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4459E+00
  176.000 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4459E+00
  176.300 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  176.600 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  176.900 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  177.200 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  177.500 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  177.800 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  178.100 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  178.400 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  192.000 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  264.000 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00
  888.000 1.8276E+01 6.2740E-01 1.0202E+01 3.5024E-01 1.4494E+02
4.4460E+00

 ##################################################################
                        Worst Two-Hour Doses
 ##################################################################

 EAB
    Time    Whole Body    Thyroid        TEDE
    (hr)      (rem)        (rem)         (rem)
   168.0    6.9838E-02   1.8276E+01   6.2740E-01
```

ALION
SCIENCE AND TECHNOLOGY

ATTACHMENT G
RADTRAD v 3.10 Detailed Output File (oO)
Qualitative CREFS Shine Analysis

```
#######################################################################
ALION RADTRAD Version 3.10 (Summer 2005) run on  9/22/2005  at 14:58:33
#######################################################################


#######################################################################
                    File information
#######################################################################

 Input File Name      = C:\Documents and Settings\Jan Bostelman\My
Documents\FHAcooper 9-21-05.psf
 Output File Name     = C:\Documents and Settings\Jan Bostelman\My
Documents\FHAcooper 9-21-05.o5

 Inventory file       = c:\radtrad\nuclides_103\defaults\cooper29fha.nif
 Release file         =  c:\radtrad\radtrad_310\defaults\rg1_183.rft
 Dose Conversion file =  C:\RADTRAD\Nuclides_103\Defaults
\cooper29fha.inp


    #####    ####   #####    #  #     #  #####   #    #  #####
    #    #  #       #        #  ##    #  #    #  #    #    #
    #    #  #       #        #  # #   #  #    #  #    #    #
    #####    ####   ####     #  #  #  #  #####   #    #    #
    #            #  #        #  #   # #  #       #    #    #
    #            #  #        #  #    ##  #       #    #    #
    #        ####   #        #  #     #  #        ####     #

 Radtrad 3.10 9/13/2004

 Dose Conversion Factor File:
 C:\RADTRAD\Nuclides_103\Defaults\cooper29fha.inp
 Release Fraction & Timing Files:
   1
 c:\radtrad\radtrad_310\defaults\rg1_183.rft
 Nuclide Inventory Files:
   1
 1 c:\radtrad\nuclides_103\defaults\cooper29fha.nif
 Plant Power Level:
  1.5329E+01
 Number of Compartments:
   3
 Compartment 1:
 containment
   3
  7.9500E+05
   0
   0
   0
   0
   0
 Compartment 2:
 environment
   2
  0.0000E+00
```

```
  0
  0
  0
  0
  0
Compartment 3:
control room
  1
 1.4186E+05
  0
  0
  0
  0
  0
Number of Pathways:
  4
Pathway 1:
containment to environment
  1
  2
  2
Pathway 2:
environment to control room
  2
  3
  2
Pathway 3:
environment to control room
  2
  3
  2
Pathway 4:
control room to environment
  3
  2
  2
End of Plant Model
Source Term Input:
  1
1  1  1  1
 2.4000E+01
  2.4000E+01  7.4400E+02
  1
1  5.0000E-02  9.1000E-01  4.0000E-02
Overlying Pool:
  0
 0.0000E+00
  0
  0
  0
  0
Compartments:
  3
Compartment 1:
  1
  1
  0
  0
  0
  0
```

```
  0
  0
  0
Compartment 2:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Compartment 3:
  1
  1
  0
  0
  0
  0
  0
  0
  0
Pathways:
  4
Pathway 1:
  2
  1
  0
  0
  0
  1
  1
 2.4000E+01  4.5760E+04  0.0000E+00  0.0000E+00  0.0000E+00
  0
 7.4400E+02  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
 7.4400E+02
  0
  0
  0
  0
  0
  0
Pathway 2:
  2
  1
  0
  0
  0
  1
  2
 2.4000E+01  3.2350E+03  0.0000E+00  0.0000E+00  0.0000E+00
 2.4017E+01  8.1000E+02  8.9000E+01  8.9000E+01  8.9000E+01
  0
 7.4400E+02  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
 7.4400E+02
  0
  0
  0
  0
```

```
  0
  0
Pathway 3:
  2
  1
  0
  0
  0
  1
  1
 2.4000E+01  4.0000E+02  0.0000E+00  0.0000E+00  0.0000E+00
  0
 7.4400E+02  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
 7.4400E+02
  0
  0
  0
  0
  0
  0
Pathway 4:
  2
  1
  0
  0
  0
  1
  2
 2.4000E+01  3.6350E+03  0.0000E+00  0.0000E+00  0.0000E+00
 2.4017E+01  1.2100E+03  0.0000E+00  0.0000E+00  0.0000E+00
  0
 7.4400E+02  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
 7.4400E+02
  0
  0
  0
  0
  0
  0
Dose Locations:
  3
Location 1:
Exclusion Area Boundary
  2
  1
  3
 2.4000E+01  3.5000E-04
 3.2000E+01  1.8000E-04
 4.8000E+01  2.3000E-04
  0
Location 2:
Low Population Zone
  2
  1
  3
 2.4000E+01  3.5000E-04
 3.2000E+01  1.8000E-04
 4.8000E+01  2.3000E-04
  0
Location 3:
```

```
control room
  3
  1
  2
 2.4000E+01  3.5000E-04
 7.4400E+02  0.0000E+00
  1
  4
 2.4000E+01  1.0000E+00
 4.8000E+01  6.0000E-01
 1.2000E+02  4.0000E-01
 7.4400E+02  0.0000E+00
X/Q Tables:
  3
Exclusion Area Boundary
  3
 2.4000E+01  5.2000E-04
 2.6000E+01  0.0000E+00
 7.4400E+02  0.0000E+00
Low Population Zone
  5
 2.4000E+01  2.9000E-04
 3.2000E+01  7.3000E-05
 4.8000E+01  2.5000E-05
 1.2000E+02  5.2000E-06
 7.4400E+02  0.0000E+00
cr
  6
 2.4000E+01  4.1500E-03
 2.6000E+01  3.2400E-03
 3.2000E+01  1.3200E-03
 4.8000E+01  9.0100E-04
 1.2000E+02  7.2200E-04
 7.4400E+02  0.0000E+00
Inflow Pathways:
  2  2 3
Exhaust Pathways:
  2  1 4
X/Q table ID for Exhaust-Inflow paths:
  3 3
  0 0
Simulation Parameters:
  1
 2.4000E+01  0.0000E+00
Output Filename:
C:\Documents and Settings\Jan Bostelman\My Documents\FHAcooper 9-21-
05.o4
  1
  1
  0
  1
  1
End of Scenario File
```

```
 control room
   3
   1
   2
  2.4000E+01  3.5000E-04
  7.4400E+02  0.0000E+00
   1
   4
  2.4000E+01  1.0000E+00
  4.8000E+01  6.0000E-01
  1.2000E+02  4.0000E-01
  7.4400E+02  0.0000E+00
 X/Q Tables:
   3
 Exclusion Area Boundary
   3
  2.4000E+01  5.2000E-04
  2.6000E+01  0.0000E+00
  7.4400E+02  0.0000E+00
 Low Population Zone
   5
  2.4000E+01  2.9000E-04
  3.2000E+01  7.3000E-05
  4.8000E+01  2.5000E-05
  1.2000E+02  5.2000E-06
  7.4400E+02  0.0000E+00
 cr
   6
  2.4000E+01  4.1500E-03
  2.6000E+01  3.2400E-03
  3.2000E+01  1.3200E-03
  4.8000E+01  9.0100E-04
  1.2000E+02  7.2200E-04
  7.4400E+02  0.0000E+00
 Inflow Pathways:
   2  2 3
 Exhaust Pathways:
   2  1 4
 X/Q table ID for Exhaust-Inflow paths:
   3 3
   0 0
 Simulation Parameters:
   1
  2.4000E+01  0.0000E+00
 Output Filename:
 C:\Documents and Settings\Jan Bostelman\My Documents\FHAcooper 9-21-
05.o4
   1
   1
   0
   1
   1
 End of Scenario File
```

This page intentionally left blank.

```
#######################################################################
ALION RADTRAD Version 3.10 (Summer 2005) run on  9/22/2005  at 14:58:33
#######################################################################


#######################################################################
                    Plant Description
#######################################################################

Number of Nuclides =  29

Inventory Power =   1.0000E+00 MWth
Plant Power Level =   1.5329E+01 MWth

Number of compartments    =   3

Compartment information

Compartment number  1
Name:  containment
Compartment volume =   7.9500E+05 (Cubic feet)
Compartment type is Normal
Pathways into and out of compartment  1
   Exit Pathway Number    1:  containment to environment

Compartment number  2
Name:  environment
Compartment type is Environment
Pathways into and out of compartment  2
   Inlet Pathway Number   1:  containment to environment
   Inlet Pathway Number   4:  control room to environment
   Exit Pathway Number    2:  environment to control room
   Exit Pathway Number    3:  environment to control room

Compartment number  3
Name:  control room
Compartment volume =   1.4186E+05 (Cubic feet)
Compartment type is Control Room
Pathways into and out of compartment  3
   Inlet Pathway Number   2:  environment to control room
   Inlet Pathway Number   3:  environment to control room
   Exit Pathway Number    4:  control room to environment

Total number of pathways =   4
```

```
#######################################################################
ALION RADTRAD Version 3.10 (Summer 2005) run on  9/22/2005  at 14:58:33
#######################################################################


#######################################################################
                    Scenario Description
#######################################################################

Inventory Power =        15. MWt

Time between shutdown and accident start =   2.4000E+01 (Hours)

Time between shutdown and first release  =   2.4000E+01 (Hours)

End Time                                 =   7.4400E+02 (Hours)

Radioactive Decay is enabled
Calculation of Daughters is enabled

Inventory  1 from file c:\radtrad\nuclides_103\defaults\cooper29fha.nif

Release Table 1 from file  c:\radtrad\radtrad_310\defaults\rg1_183.rft
Dose Conversion file =  C:\RADTRAD\Nuclides_103\Defaults
\cooper29fha.inp
```

Nuclide Name	Group	Specific Inventory (Ci/MWt)	half life (s)	Whole Body DCF (Sv-m3/Bq-s)	Inhaled Thyroid (Sv/Bq)	Inhaled Effective (Sv/Bq)
Br-82	2	1.800E+02	1.271E+05	1.300E-13	2.380E-10	3.310E-10
Br-83	2	3.260E+03	8.604E+03	3.820E-16	3.290E-12	2.330E-11
Br-84	2	5.610E+03	1.908E+03	9.410E-14	3.120E-12	2.610E-11
Kr-83m	1	3.270E+03	6.588E+03	1.500E-18	0.000E+00	0.000E+00
Kr-85	1	7.320E+02	3.383E+08	1.190E-16	0.000E+00	0.000E+00
Kr-85m	1	6.810E+03	1.613E+04	7.480E-15	0.000E+00	0.000E+00
Kr-87	1	1.300E+04	4.578E+03	4.120E-14	0.000E+00	0.000E+00
Kr-88	1	1.830E+04	1.022E+04	1.020E-13	0.000E+00	0.000E+00
I-128	2	4.190E+02	1.499E+03	4.160E-15	5.340E-11	1.280E-11
I-130	2	1.060E+03	4.450E+04	1.040E-13	1.990E-08	7.140E-10
I-131	2	4.352E+04	6.947E+05	1.820E-14	2.920E-07	8.890E-09
I-132	2	3.930E+04	8.280E+03	1.120E-13	1.740E-09	1.030E-10
I-133	2	5.510E+04	7.488E+04	2.940E-14	4.860E-08	1.580E-09
I-134	2	6.040E+04	3.156E+03	1.300E-13	2.880E-10	3.550E-11
I-135	2	5.160E+04	2.380E+04	8.294E-14	8.460E-09	3.320E-10
Te-129	4	8.790E+03	4.176E+03	2.750E-15	5.090E-13	2.090E-11
Te-131	4	2.420E+04	1.500E+03	2.040E-14	2.660E-09	1.240E-10
Te-131m	4	3.960E+03	1.080E+05	7.463E-14	3.669E-08	1.758E-09
Te-132	4	3.850E+04	2.815E+05	1.030E-14	6.280E-08	2.550E-09
Te-133	4	3.240E+04	7.470E+02	4.600E-14	5.910E-10	2.390E-11
Te-133m	4	1.980E+04	3.324E+03	1.140E-13	2.630E-09	1.100E-10
Te-134	4	4.500E+04	2.508E+03	4.240E-14	5.560E-10	3.230E-11
Xe-129m	1	2.060E-01	6.912E+05	1.060E-15	0.000E+00	0.000E+00
Xe-131m	1	3.040E+02	1.028E+06	3.890E-16	0.000E+00	0.000E+00
Xe-133	1	5.260E+04	4.532E+05	1.560E-15	0.000E+00	0.000E+00

Xe-133m	1	1.580E+03	1.890E+05	1.370E-15	0.000E+00	0.000E+00
Xe-135	1	1.860E+04	3.272E+04	1.190E-14	0.000E+00	0.000E+00
Xe-135m	1	1.090E+04	9.174E+02	2.040E-14	0.000E+00	0.000E+00
Xe-138	1	4.500E+04	8.502E+02	5.770E-14	0.000E+00	0.000E+00

Nuclide	Daughter	Fraction	Daughter	Fraction	Daughter	Fraction
Br-83	Kr-83m	1.00	none	0.00	none	0.00
Kr-85m	Kr-85	0.21	none	0.00	none	0.00
Kr-87	Rb-87	1.00	none	0.00	none	0.00
Kr-88	Rb-88	1.00	none	0.00	none	0.00
I-131	Xe-131m	0.01	none	0.00	none	0.00
I-133	Xe-133m	0.03	Xe-133	0.97	none	0.00
I-135	Xe-135m	0.15	Xe-135	0.85	none	0.00
Te-129	I-129	1.00	none	0.00	none	0.00
Te-131	I-131	1.00	none	0.00	none	0.00
Te-131m	I-131	0.78	Te-131	0.22	none	0.00
Te-132	I-132	1.00	none	0.00	none	0.00
Te-133	I-133	1.00	none	0.00	none	0.00
Te-133m	I-133	0.87	Te-133	0.13	none	0.00
Te-134	I-134	1.00	none	0.00	none	0.00
Xe-133m	Xe-133	1.00	none	0.00	none	0.00
Xe-135	Cs-135	1.00	none	0.00	none	0.00
Xe-135m	Cs-135	0.00	Xe-135	1.00	none	0.00
Xe-138	Cs-138	1.00	none	0.00	none	0.00

Release Fractions and Timings
RG 1.183, Tables 3 with DF iodine=200
Duration (h): NON-LOCA Accident chk i

	GAP	EARLY IN-VESSEL	LATE RELEASE	RELEASE MASS
	0.003600 hr	0.0000 hrs	0.0000 hrs	(Ci)
NOBLES	5.0000E-02	0.0000E+00	0.0000E+00	1.311E+05
IODINE	2.5000E-04	0.0000E+00	0.0000E+00	9.981E+02
CESIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
TELLURIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
STRONTIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
BARIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
RUTHENIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
CERIUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
LANTHANUM	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
AEROSOL	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00

Source Number 1 is used in Compartment 1
Nuclide Distribution from Inventory File 1
Nuclide Distribution given in Ci/MWt
Release File Number 1
Fraction of Nuclide Distribution in this Compartment 1.00000

Iodine fractions
Aerosol = 5.0000E-02
Elemental = 9.1000E-01
Organic = 4.0000E-02

COMPARTMENT DATA

Compartment number 1: containment

Compartment number 2: environment

Compartment number 3: control room

PATHWAY DATA

Pathway number 1: containment to environment
Radioactive decay is enabled for this pathway.

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	4.5760E+04	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 2: environment to control room
Radioactive decay is enabled for this pathway.

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	3.2350E+03	0.0000E+00	0.0000E+00	0.0000E+00
2.4017E+01	8.1000E+02	8.9000E+01	8.9000E+01	8.9000E+01

Pathway number 3: environment to control room
Radioactive decay is enabled for this pathway.

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	4.0000E+02	0.0000E+00	0.0000E+00	0.0000E+00

Pathway number 4: control room to environment
Radioactive decay is enabled for this pathway.

Pathway Filter: Removal Data

Time (hr)	Flow Rate (cfm)	Filter Efficiencies (%) Aerosol	Elemental	Organic
2.4000E+01	3.6350E+03	0.0000E+00	0.0000E+00	0.0000E+00
2.4017E+01	1.2100E+03	0.0000E+00	0.0000E+00	0.0000E+00

DOSE INFORMATION
Number_Dose_Locations = 3

Dose Location Name = Exclusion Area Boundary
Located in compartment 2 the environment

Exclusion Area Boundary Breathing Rate Data

Time (hr)	Breathing Rate (m^3 * sec^-1)
2.4000E+01	3.5000E-04
3.2000E+01	1.8000E-04
4.8000E+01	2.3000E-04

Dose Location Name = Low Population Zone
Located in compartment 2 the environment

Low Population Zone Breathing Rate Data

Time (hr)	Breathing Rate (m^3 * sec^-1)
2.4000E+01	3.5000E-04
3.2000E+01	1.8000E-04
4.8000E+01	2.3000E-04

Dose Location Name = control room
Located in compartment 3 the control room

control room Breathing Rate Data

Time (hr)	Breathing Rate (m^3 * sec^-1)
2.4000E+01	3.5000E-04
7.4400E+02	0.0000E+00

control room Occupancy Factor Data

Time (hr)	Occupancy Factor
2.4000E+01	1.0000E+00
4.8000E+01	6.0000E-01
1.2000E+02	4.0000E-01
7.4400E+02	0.0000E+00

X/Q, ATMOSPHERIC DISPERSION INFORMATION

X/Q Table Name = Exclusion Area Boundary

Location X/Q Data

Time (hr)	X/Q (s * m^-3)
2.4000E+01	5.2000E-04
2.6000E+01	0.0000E+00
7.4400E+02	0.0000E+00

X/Q Table Name = Low Population Zone

Location X/Q Data

Time (hr)	X/Q (s * m^-3)
2.4000E+01	2.9000E-04
3.2000E+01	7.3000E-05
4.8000E+01	2.5000E-05
1.2000E+02	5.2000E-06
7.4400E+02	0.0000E+00

X/Q Table Name = cr

Location X/Q Data

Time (hr)	X/Q (s * m^-3)
2.4000E+01	4.1500E-03
2.6000E+01	3.2400E-03
3.2000E+01	1.3200E-03
4.8000E+01	9.0100E-04
1.2000E+02	7.2200E-04
7.4400E+02	0.0000E+00

This X/Q Table is used for these connected pathways
Path 1 containment to environment and Path 2 environment to control room
Path 1 containment to environment and Path 3 environment to control room

USER SPECIFIED TIME STEP DATA - SUPPLEMENTAL TIME STEPS

Time (hr)	Time step (hr)
0.0000E+00	0.0000E+00

EDIT EACH MAJOR TIME STEP
EDIT SUPPLEMENTAL TIME STEPS
DO NOT EDIT MODEL DECONTAMINATION

Masses in Curies in detailed output

```
#######################################################################
ALION RADTRAD Version 3.10 (Summer 2005) run on  9/22/2005  at 14:58:33
#######################################################################

 ####   #    #  #####  #####   #    #  #####
#    #  #    #    #    #    #  #    #    #
#    #  #    #    #    #    #  #    #    #
#    #  #    #    #    #####   #    #    #
#    #  #    #    #    #       #    #    #
#    #  #    #    #    #       #    #    #
 ####    ####     #    #        ####     #

#######################################################################
            Dose, Detailed model and Detailed Inventory Output
#######################################################################

*******************************************************

 Exclusion Area Boundary Doses:

Time (h) =  24.0006     Whole Body   Thyroid       TEDE
Delta dose (rem)         6.4970E-05  4.9913E-03  2.1867E-04
Accumulated dose (rem)   6.4970E-05  4.9913E-03  2.1867E-04

 Low Population Zone Doses:

Time (h) =  24.0006     Whole Body   Thyroid       TEDE
Delta dose (rem)         3.6233E-05  2.7836E-03  1.2195E-04
Accumulated dose (rem)   3.6233E-05  2.7836E-03  1.2195E-04

 control room Doses:

Time (h) =  24.0006     Whole Body   Thyroid       TEDE        Skin
Delta dose (rem)         1.0403E-08  1.7007E-05  5.3410E-07  5.8867E-07
Accumulated dose (rem)   1.0403E-08  1.7007E-05  5.3410E-07  5.8867E-07

*******************************************************

 containment COMPARTMENT NUCLIDE INVENTORY (Ci)  at Time (h) =  24.0006

 Nuclide     COMPARTMENT   EXPOSURE
             Atomsphere     (Ci-hr)
  Br-82      6.6384E-02   3.6880E-05
  Br-83      1.8269E-03   1.0149E-06
  Br-84      7.7368E-14   4.2982E-17
  Kr-83m     1.4394E+00   7.9969E-04
  Kr-85      8.6490E+01   4.8050E-02
  Kr-85m     1.9631E+01   1.0906E-02
  Kr-87      3.1989E-03   1.7772E-06
  Kr-88      6.1797E+00   3.4332E-03
  I-130      1.6302E-01   9.0564E-05
  I-131      2.3765E+01   1.3203E-02
```

I-132	1.9181E+01	1.0656E-02
I-133	1.4962E+01	8.3124E-03
I-134	8.1049E-07	4.5027E-10
I-135	2.4609E+00	1.3671E-03
Xe-129m	2.2322E-02	1.2401E-05
Xe-131m	3.6969E+01	2.0539E-02
Xe-133	6.0135E+03	3.3408E+00
Xe-133m	1.7132E+02	9.5179E-02
Xe-135	1.6612E+03	9.2288E-01
Xe-135m	8.5707E+01	4.7615E-02
Total	8.1430E+03	0.0000E+00

Dose Effective (Ci/cc)	I-131 (Thyroid)	1.1745E-09
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)	1.2731E-09
Total I (Ci)		6.0368E+01

containment Compartment Group Inventory Distribution:

Time (h) = 24.0006	Atmosphere	Sump
Noble gases (Ci)	8.0824E+03	0.0000E+00
Elemental I (Ci)	5.5146E+01	0.0000E+00
Organic I (Ci)	2.4240E+00	0.0000E+00
Aerosol I (Ci)	3.0300E+00	0.0000E+00
Aerosols (Ci)	3.0300E+00	0.0000E+00
Aerosols (kg)	1.0380E-08	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 24.0006	Ci	kg	Atoms	Bq
Br-82	6.3705E-05	5.8842E-14	4.3214E+11	2.3571E+06
Br-83	1.7532E-06	1.1098E-16	8.0519E+08	6.4867E+04
Kr-83m	1.3813E-03	6.6951E-14	4.8577E+11	5.1110E+07
Kr-85	8.2999E-02	2.1155E-07	1.4988E+18	3.0710E+09
Kr-85m	1.8839E-02	2.2891E-12	1.6218E+13	6.9703E+08
Kr-87	3.0698E-06	1.0838E-16	7.5018E+08	1.1358E+05
Kr-88	5.9303E-03	4.7294E-13	3.2365E+12	2.1942E+08
I-130	1.5644E-04	8.0210E-14	3.7156E+11	5.7881E+06
I-131	2.2805E-02	1.8395E-10	8.4563E+14	8.4380E+08
I-132	1.8406E-02	1.7832E-12	8.1353E+12	6.8104E+08
I-133	1.4358E-02	1.2675E-11	5.7392E+13	5.3126E+08
I-134	7.7778E-10	2.9156E-20	1.3103E+05	2.8778E+01
I-135	2.3615E-03	6.7245E-13	2.9997E+12	8.7377E+07
Xe-129m	2.1421E-05	1.6930E-13	7.9034E+11	7.9257E+05
Xe-131m	3.5477E-02	4.2355E-10	1.9471E+15	1.3127E+09
Xe-133	5.7707E+00	3.0830E-08	1.3959E+17	2.1352E+11
Xe-133m	1.6441E-01	3.6640E-10	1.6590E+15	6.0831E+09
Xe-135	1.5941E+00	6.2424E-10	2.7846E+15	5.8983E+10
Xe-135m	8.2248E-02	9.0291E-13	4.0277E+12	3.0432E+09

environment Compartment Group Inventory Distribution:

Time (h) = 24.0006	Total Release	Release Rate/s
Noble gases (Ci)	7.7562E+00	3.8781E+00
Elemental I (Ci)	5.2920E-02	2.6460E-02
Organic I (Ci)	2.3261E-03	1.1631E-03
Aerosol I (Ci)	2.9077E-03	1.4538E-03
Aerosols (Ci)	2.9077E-03	1.4538E-03

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 24.0006

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Br-82	4.5341E-07	2.5190E-10
Br-83	1.2478E-08	6.9322E-12
Kr-83m	9.8316E-06	5.4620E-09
Kr-85	5.9074E-04	3.2819E-07
Kr-85m	1.3408E-04	7.4490E-08
Kr-87	2.1849E-08	1.2138E-11
Kr-88	4.2208E-05	2.3449E-08
I-130	1.1134E-06	6.1857E-10
I-131	1.6231E-04	9.0175E-08
I-132	1.3101E-04	7.2781E-08
I-133	1.0220E-04	5.6775E-08
I-134	5.5358E-12	3.0754E-15
I-135	1.6808E-05	9.3378E-09
Xe-129m	1.5246E-07	8.4701E-11
Xe-131m	2.5251E-04	1.4028E-07
Xe-133	4.1073E-02	2.2818E-05
Xe-133m	1.1702E-03	6.5009E-07
Xe-135	1.1346E-02	6.3034E-06
Xe-135m	5.8539E-04	3.2522E-07
Total	5.5618E-02	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid) 4.4956E-14
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid) 4.8731E-14
Total I (Ci) 4.1232E-04

control room Compartment Group Inventory Distribution:

Time (h) = 24.0006	Atmosphere	Sump
Noble gases (Ci)	5.5204E-02	0.0000E+00
Elemental I (Ci)	3.7665E-04	0.0000E+00
Organic I (Ci)	1.6556E-05	0.0000E+00
Aerosol I (Ci)	2.0695E-05	0.0000E+00
Aerosols (Ci)	2.0695E-05	0.0000E+00
Aerosols (kg)	7.0897E-14	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0006

Nuclide Filter

containment to environment Transport Group Inventory:

Time (h) = 24.0006	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	7.7539E+00
Elemental I (Ci)	0.0000E+00	5.2906E-02
Organic I (Ci)	0.0000E+00	2.3255E-03
Aerosol I (Ci)	0.0000E+00	2.9069E-03
Aerosols (Ci)	0.0000E+00	2.9069E-03
Aerosols (kg)	0.0000E+00	9.9611E-12

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0006

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 24.0006	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	9.8258E-02
Elemental I (Ci)	0.0000E+00	6.7043E-04
Organic I (Ci)	0.0000E+00	2.9469E-05
Aerosol I (Ci)	0.0000E+00	3.6837E-05
Aerosols (Ci)	0.0000E+00	3.6837E-05
Aerosols (kg)	0.0000E+00	6.3093E-14

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0006

Nuclide	Filter

environment to control room Transport Group Inventory:

Time (h) = 24.0006	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	1.2149E-02
Elemental I (Ci)	0.0000E+00	8.2897E-05
Organic I (Ci)	0.0000E+00	3.6438E-06
Aerosol I (Ci)	0.0000E+00	4.5548E-06
Aerosols (Ci)	0.0000E+00	4.5548E-06
Aerosols (kg)	0.0000E+00	7.8013E-15

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0006

Nuclide	Filter
Br-82	1.9364E-10
Kr-83m	4.1987E-09
Kr-85	2.5228E-07
Kr-85m	5.7262E-08
Kr-88	1.8026E-08
I-130	4.7550E-10
I-131	6.9319E-08
I-132	5.5948E-08
I-133	4.3644E-08
I-135	7.1781E-09
Xe-129m	6.5111E-11
Xe-131m	1.0784E-07
Xe-133	1.7541E-05
Xe-133m	4.9973E-07
Xe-135	4.8455E-06
Xe-135m	2.5000E-07

control room to environment Transport Group Inventory:

Time (h) = 24.0006	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	0.0000E+00
Elemental I (Ci)	0.0000E+00	0.0000E+00
Organic I (Ci)	0.0000E+00	0.0000E+00
Aerosol I (Ci)	0.0000E+00	0.0000E+00
Aerosols (Ci)	0.0000E+00	0.0000E+00
Aerosols (kg)	2.0185E-17	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 24.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.6531E-03	2.0386E-01	8.9306E-03
Accumulated dose (rem)	2.7181E-03	2.0885E-01	9.1492E-03

Low Population Zone Doses:

Time (h) = 24.0036	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.4796E-03	1.1369E-01	4.9805E-03
Accumulated dose (rem)	1.5159E-03	1.1648E-01	5.1025E-03

control room Doses:

Time (h) = 24.0036	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	2.0964E-06	3.4281E-03	1.0766E-04	1.1864E-04
Accumulated dose (rem)	2.1068E-06	3.4451E-03	1.0819E-04	1.1923E-04

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 24.0036

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Br-82	4.2789E-01	1.1055E-03
Br-83	1.1766E-02	3.0403E-05
Br-84	4.9674E-13	1.2842E-15
Kr-83m	9.2690E+00	2.3951E-02
Kr-85	5.5752E+02	1.4404E+00
Kr-85m	1.2648E+02	3.2681E-01
Kr-87	2.0586E-02	5.3201E-05
Kr-88	3.9805E+01	1.0285E-01
I-130	1.0506E+00	2.7145E-03
I-131	1.5319E+02	3.9577E-01
I-132	1.2356E+02	3.1926E-01
I-133	9.6439E+01	2.4916E-01
I-134	5.2119E-06	1.3471E-08
I-135	1.5858E+01	4.0973E-02
Xe-129m	1.4389E-01	3.7175E-04
Xe-131m	2.3831E+02	6.1569E-01
Xe-133	3.8763E+04	1.0015E+02
Xe-133m	1.1043E+03	2.8532E+00
Xe-135	1.0706E+04	2.7661E+01
Xe-135m	5.4924E+02	1.4201E+00
Total	5.2484E+04	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	7.5708E-09
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	8.2063E-09
Total I (Ci)	3.8904E+02

containment Compartment Group Inventory Distribution:

Time (h) = 24.0036	Atmosphere	Sump
Noble gases (Ci)	5.2094E+04	0.0000E+00
Elemental I (Ci)	3.5539E+02	0.0000E+00
Organic I (Ci)	1.5621E+01	0.0000E+00
Aerosol I (Ci)	1.9527E+01	0.0000E+00
Aerosols (Ci)	1.9527E+01	0.0000E+00
Aerosols (kg)	6.6909E-08	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 24.0036	Ci	kg	Atoms	Bq
Br-82	2.6655E-03	2.4620E-12	1.8081E+13	9.8623E+07
Br-83	7.3303E-05	4.6401E-15	3.3667E+10	2.7122E+06
Kr-83m	5.7748E-02	2.7989E-12	2.0308E+13	2.1367E+09
Kr-85	3.4730E+00	8.8521E-06	6.2716E+19	1.2850E+11
Kr-85m	7.8796E-01	9.5748E-11	6.7836E+14	2.9154E+10
Kr-87	1.2827E-04	4.5284E-15	3.1346E+10	4.7460E+06
Kr-88	2.4799E-01	1.9777E-11	1.3534E+14	9.1756E+09
I-130	6.5449E-03	3.3558E-12	1.5545E+13	2.4216E+08
I-131	9.5425E-01	7.6971E-09	3.5384E+16	3.5307E+10
I-132	7.6974E-01	7.4572E-11	3.4021E+14	2.8480E+10
I-133	6.0076E-01	5.3033E-10	2.4013E+15	2.2228E+10
I-134	3.2478E-08	1.2175E-18	5.4715E+06	1.2017E+03
I-135	9.8789E-02	2.8130E-11	1.2548E+14	3.6552E+09
Xe-129m	8.9632E-04	7.0840E-12	3.3071E+13	3.3164E+07
Xe-131m	1.4845E+00	1.7723E-08	8.1473E+16	5.4926E+10
Xe-133	2.4147E+02	1.2900E-06	5.8410E+18	8.9342E+12
Xe-133m	6.8792E+00	1.5331E-08	6.9419E+16	2.5453E+11
Xe-135	6.6693E+01	2.6116E-08	1.1650E+17	2.4676E+12
Xe-135m	3.4229E+00	3.7576E-11	1.6762E+14	1.2665E+11

environment Compartment Group Inventory Distribution:

Time (h) = 24.0036	Total Release	Release Rate/s
Noble gases (Ci)	3.2451E+02	2.5040E+01
Elemental I (Ci)	2.2139E+00	1.7082E-01
Organic I (Ci)	9.7313E-02	7.5087E-03
Aerosol I (Ci)	1.2164E-01	9.3859E-03
Aerosols (Ci)	1.2164E-01	9.3859E-03

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 24.0036

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 4 Filter
Br-82	1.8942E-05	4.2413E-08	3.9223E-08
Br-83	5.2085E-07	1.1664E-09	1.0785E-09
Kr-83m	4.1030E-04	9.1883E-07	8.4961E-07
Kr-85	2.4680E-02	5.5262E-05	5.1105E-05
Kr-85m	5.5991E-03	1.2538E-05	1.1594E-05
Kr-87	9.1131E-07	2.0409E-09	1.8871E-09
Kr-88	1.7621E-03	3.9459E-06	3.6488E-06
I-130	4.6509E-05	1.0414E-07	9.6307E-08
I-131	6.7812E-03	1.5184E-05	1.4042E-05
I-132	5.4693E-03	1.2247E-05	1.1325E-05
I-133	4.2691E-03	9.5593E-06	8.8401E-06
I-134	2.3072E-10	5.1674E-13	4.7775E-13
I-135	7.0199E-04	1.5719E-06	1.4536E-06
Xe-129m	6.3695E-06	1.4262E-08	1.3189E-08
Xe-131m	1.0549E-02	2.3621E-05	2.1844E-05
Xe-133	1.7159E+00	3.8422E-03	3.5532E-03
Xe-133m	4.8886E-02	1.0946E-04	1.0123E-04
Xe-135	4.7392E-01	1.0612E-03	9.8135E-04
Xe-135m	2.4294E-02	5.4436E-05	5.0294E-05
Total	2.3233E+00	0.0000E+00	4.8109E-03

Dose Effective (Ci/cc) I-131 (Thyroid)	1.8782E-12
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	2.0358E-12
Total I (Ci)	1.7222E-02

control room Compartment Group Inventory Distribution:

Time (h) = 24.0036	Atmosphere	Sump
Noble gases (Ci)	2.3060E+00	0.0000E+00
Elemental I (Ci)	1.5732E-02	0.0000E+00
Organic I (Ci)	6.9150E-04	0.0000E+00
Aerosol I (Ci)	8.6438E-04	0.0000E+00
Aerosols (Ci)	8.6438E-04	0.0000E+00
Aerosols (kg)	2.9619E-12	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0036

Nuclide Filter

containment to environment Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.2438E+02
Elemental I (Ci)	0.0000E+00	2.2132E+00
Organic I (Ci)	0.0000E+00	9.7283E-02
Aerosol I (Ci)	0.0000E+00	1.2160E-01
Aerosols (Ci)	0.0000E+00	1.2160E-01
Aerosols (kg)	0.0000E+00	4.1680E-10

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0036

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	2.9454E+00
Elemental I (Ci)	0.0000E+00	2.0096E-02
Organic I (Ci)	0.0000E+00	8.8336E-04
Aerosol I (Ci)	0.0000E+00	1.1042E-03
Aerosols (Ci)	0.0000E+00	1.1042E-03
Aerosols (kg)	0.0000E+00	2.6396E-12

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0036

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.6419E-01
Elemental I (Ci)	0.0000E+00	2.4849E-03
Organic I (Ci)	0.0000E+00	1.0922E-04
Aerosol I (Ci)	0.0000E+00	1.3653E-04
Aerosols (Ci)	0.0000E+00	1.3653E-04
Aerosols (kg)	0.0000E+00	3.2637E-13

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0036

Nuclide	Filter
Br-82	3.9223E-08
Br-83	1.0785E-09
Kr-83m	8.4961E-07
Kr-85	5.1105E-05
Kr-85m	1.1594E-05
Kr-87	1.8871E-09
Kr-88	3.6488E-06
I-130	9.6307E-08
I-131	1.4042E-05
I-132	1.1325E-05
I-133	8.8401E-06
I-135	1.4536E-06
Xe-129m	1.3189E-08
Xe-131m	2.1844E-05
Xe-133	3.5532E-03
Xe-133m	1.0123E-04
Xe-135	9.8135E-04
Xe-135m	5.0294E-05

control room to environment Transport Group Inventory:

Time (h) = 24.0036	Pathway Filtered	Transported
Noble gases (Ci)	4.7751E-03	0.0000E+00
Elemental I (Ci)	3.2575E-05	0.0000E+00
Organic I (Ci)	1.4319E-06	0.0000E+00
Aerosol I (Ci)	1.7899E-06	0.0000E+00
Aerosols (Ci)	1.7899E-06	0.0000E+00
Aerosols (kg)	5.4715E-15	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 24.0170	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.9711E-02	1.5162E+00	6.6397E-02
Accumulated dose (rem)	2.2429E-02	1.7250E+00	7.5546E-02

Low Population Zone Doses:

Time (h) = 24.0170	Whole Body	Thyroid	TEDE
Delta dose (rem)	1.0993E-02	8.4555E-01	3.7029E-02
Accumulated dose (rem)	1.2509E-02	9.6203E-01	4.2132E-02

control room Doses:

Time (h) = 24.0170	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	9.6701E-05	1.5832E-01	4.9717E-03	5.4751E-03
Accumulated dose (rem)	9.8807E-05	1.6176E-01	5.0799E-03	5.5943E-03

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 24.0170

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Br-82	4.0843E-01	6.6471E-03
Br-83	1.1190E-02	1.8238E-04

Br-84	4.6604E-13	7.6370E-15
Kr-83m	8.8051E+00	1.4357E-01
Kr-85	5.3231E+02	8.6622E+00
Kr-85m	1.2051E+02	1.9627E+00
Kr-87	1.9512E-02	3.1845E-04
Kr-88	3.7881E+01	6.1724E-01
I-130	1.0024E+00	1.6316E-02
I-131	1.4625E+02	2.3800E+00
I-132	1.1750E+02	1.9151E+00
I-133	9.2036E+01	1.4980E+00
I-134	4.9238E-06	8.0463E-08
I-135	1.5119E+01	2.4618E-01
Xe-129m	1.3737E-01	2.2355E-03
Xe-131m	2.2752E+02	3.7025E+00
Xe-133	3.7007E+04	6.0223E+02
Xe-133m	1.0542E+03	1.7156E+01
Xe-135	1.0212E+04	1.6624E+02
Xe-135m	5.0572E+02	8.3493E+00
Total	5.0078E+04	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	7.2276E-09
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	7.8335E-09
Total I (Ci)	3.7091E+02

containment Compartment Group Inventory Distribution:

Time (h) = 24.0170	Atmosphere	Sump
Noble gases (Ci)	4.9706E+04	0.0000E+00
Elemental I (Ci)	3.3882E+02	0.0000E+00
Organic I (Ci)	1.4893E+01	0.0000E+00
Aerosol I (Ci)	1.8616E+01	0.0000E+00
Aerosols (Ci)	1.8616E+01	0.0000E+00
Aerosols (kg)	6.3876E-08	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 24.0170	Ci	kg	Atoms	Bq
Br-82	2.2012E-02	2.0332E-11	1.4932E+14	8.1446E+08
Br-83	6.0389E-04	3.8226E-14	2.7735E+11	2.2344E+07
Kr-83m	4.7538E-01	2.3041E-11	1.6717E+14	1.7589E+10
Kr-85	2.8686E+01	7.3116E-05	5.1802E+20	1.0614E+12
Kr-85m	6.4993E+00	7.8975E-10	5.5953E+15	2.4047E+11
Kr-87	1.0543E-03	3.7221E-14	2.5764E+11	3.9009E+07
Kr-88	2.0438E+00	1.6299E-10	1.1154E+15	7.5622E+10
I-130	5.4032E-02	2.7704E-11	1.2834E+14	1.9992E+09
I-131	7.8816E+00	6.3574E-08	2.9225E+17	2.9162E+11
I-132	6.3412E+00	6.1433E-10	2.8027E+15	2.3462E+11
I-133	4.9606E+00	4.3791E-09	1.9828E+16	1.8354E+11
I-134	2.6636E-07	9.9848E-18	4.4873E+07	9.8554E+03
I-135	8.1520E-01	2.3213E-10	1.0355E+15	3.0162E+10
Xe-129m	7.4031E-03	5.8511E-11	2.7315E+14	2.7392E+08
Xe-131m	1.2261E+01	1.4638E-07	6.7293E+17	4.5367E+11
Xe-133	1.9944E+03	1.0655E-05	4.8244E+19	7.3791E+13
Xe-133m	5.6814E+01	1.2662E-07	5.7332E+17	2.1021E+12
Xe-135	5.5053E+02	2.1558E-07	9.6166E+17	2.0370E+13
Xe-135m	2.7616E+01	3.0316E-10	1.3524E+15	1.0218E+12

environment Compartment Group Inventory Distribution:

Time (h) = 24.0170	Total Release	Release Rate/s

Noble gases (Ci)	2.6793E+03	4.3779E+01
Elemental I (Ci)	1.8269E+01	2.9851E-01
Organic I (Ci)	8.0301E-01	1.3121E-02
Aerosol I (Ci)	1.0038E+00	1.6401E-02
Aerosols (Ci)	1.0038E+00	1.6401E-02

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 24.0170

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 4 Filter
Br-82	1.5486E-04	1.6401E-06	1.8413E-06
Br-83	4.2429E-06	4.4962E-08	5.0448E-08
Kr-83m	3.3385E-03	3.5385E-05	3.9694E-05
Kr-85	2.0183E-01	2.1374E-03	2.3997E-03
Kr-85m	4.5693E-02	4.8407E-04	5.4329E-04
Kr-87	7.3983E-06	7.8442E-08	8.7965E-08
Kr-88	1.4363E-02	1.5219E-04	1.7078E-04
I-130	3.8006E-04	4.0254E-06	4.5189E-06
I-131	5.5452E-02	5.8727E-04	6.5933E-04
I-132	4.4550E-02	4.7211E-04	5.2970E-04
I-133	3.4896E-02	3.6959E-04	4.1492E-04
I-134	1.8669E-09	1.9805E-11	2.2197E-11
I-135	5.7327E-03	6.0725E-05	6.8161E-05
Xe-129m	5.2086E-05	5.5161E-07	6.1930E-07
Xe-131m	8.6267E-02	9.1360E-04	1.0257E-03
Xe-133	1.4032E+01	1.4860E-01	1.6683E-01
Xe-133m	3.9971E-01	4.2332E-03	4.7525E-03
Xe-135	3.8719E+00	4.1012E-02	4.6036E-02
Xe-135m	1.9173E-01	2.0424E-03	2.2792E-03
Total	1.8988E+01	0.0000E+00	2.2576E-01

Dose Effective (Ci/cc) I-131 (Thyroid)	1.5358E-11
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	1.6645E-11
Total I (Ci)	1.4063E-01

control room Compartment Group Inventory Distribution:

Time (h) = 24.0170	Atmosphere	Sump
Noble gases (Ci)	1.8846E+01	0.0000E+00
Elemental I (Ci)	1.2847E-01	0.0000E+00
Organic I (Ci)	5.6468E-03	0.0000E+00
Aerosol I (Ci)	7.0586E-03	0.0000E+00
Aerosols (Ci)	7.0586E-03	0.0000E+00
Aerosols (kg)	2.4219E-11	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0170

Nuclide Filter

containment to environment Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	2.6799E+03
Elemental I (Ci)	0.0000E+00	1.8280E+01
Organic I (Ci)	0.0000E+00	8.0350E-01
Aerosol I (Ci)	0.0000E+00	1.0044E+00
Aerosols (Ci)	0.0000E+00	1.0044E+00
Aerosols (kg)	0.0000E+00	3.4426E-09

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0170

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	1.7709E+01
Elemental I (Ci)	0.0000E+00	1.2079E-01
Organic I (Ci)	0.0000E+00	5.3095E-03
Aerosol I (Ci)	0.0000E+00	6.6368E-03
Aerosols (Ci)	0.0000E+00	6.6368E-03
Aerosols (kg)	0.0000E+00	2.1812E-11

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0170

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	2.1896E+00
Elemental I (Ci)	0.0000E+00	1.4935E-02
Organic I (Ci)	0.0000E+00	6.5650E-04
Aerosol I (Ci)	0.0000E+00	8.2063E-04
Aerosols (Ci)	0.0000E+00	8.2063E-04
Aerosols (kg)	0.0000E+00	2.6970E-12

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 24.0170

Nuclide	Filter
Br-82	1.8413E-06
Br-83	5.0448E-08
Kr-83m	3.9694E-05
Kr-85	2.3997E-03
Kr-85m	5.4329E-04
Kr-87	8.7965E-08
Kr-88	1.7078E-04
I-130	4.5189E-06
I-131	6.5933E-04
I-132	5.2970E-04
I-133	4.1492E-04
I-135	6.8161E-05
Xe-129m	6.1930E-07
Xe-131m	1.0257E-03
Xe-133	1.6683E-01
Xe-133m	4.7525E-03
Xe-135	4.6036E-02
Xe-135m	2.2792E-03

control room to environment Transport Group Inventory:

Time (h) = 24.0170	Pathway Filtered	Transported

Noble gases (Ci)	2.2408E-01	0.0000E+00
Elemental I (Ci)	1.5274E-03	0.0000E+00
Organic I (Ci)	6.7141E-05	0.0000E+00
Aerosol I (Ci)	8.3926E-05	0.0000E+00
Aerosols (Ci)	8.3926E-05	0.0000E+00
Aerosols (kg)	2.8794E-13	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 26.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.9979E-01	3.1907E+01	1.3819E+00
Accumulated dose (rem)	4.2222E-01	3.3632E+01	1.4575E+00

Low Population Zone Doses:

Time (h) = 26.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.2296E-01	1.7794E+01	7.7069E-01
Accumulated dose (rem)	2.3547E-01	1.8756E+01	8.1282E-01

control room Doses:

Time (h) = 26.0000	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	9.0952E-02	8.4757E+01	2.6978E+00	5.4102E+00
Accumulated dose (rem)	9.1051E-02	8.4918E+01	2.7029E+00	5.4158E+00

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 26.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Br-82	4.1683E-04	1.1457E-01
Br-83	6.6807E-06	2.9092E-03
Kr-83m	4.4131E-03	2.2356E+00
Kr-85	5.6482E-01	1.5017E+02
Kr-85m	9.4089E-02	3.2523E+01
Kr-87	7.0249E-06	4.7441E-03
Kr-88	2.4773E-02	9.9724E+00
I-130	9.5166E-04	2.7821E-01
I-131	1.5408E-01	4.1217E+01
I-132	6.8588E-02	3.0453E+01
I-133	9.1414E-02	2.5714E+01
I-134	1.0892E-09	1.1267E-06
I-135	1.3031E-02	4.1382E+00
Xe-129m	1.4472E-04	3.8715E-02
Xe-131m	2.4027E-01	6.4143E+01
Xe-133	3.8854E+01	1.0424E+04
Xe-133m	1.0898E+00	2.9627E+02
Xe-135	9.3304E+00	2.8198E+03
Xe-135m	4.6012E-03	7.9290E+01
Total	5.0536E+01	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	7.5553E-12
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	8.0880E-12
Total I (Ci)	3.2712E-01

containment Compartment Group Inventory Distribution:

Time (h) = 26.0000	Atmosphere	Sump

Noble gases (Ci)	5.0208E+01	0.0000E+00
Elemental I (Ci)	2.9893E-01	0.0000E+00
Organic I (Ci)	1.3140E-02	0.0000E+00
Aerosol I (Ci)	1.6425E-02	0.0000E+00
Aerosols (Ci)	1.6425E-02	0.0000E+00
Aerosols (kg)	6.6740E-11	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 26.0000	Ci	kg	Atoms	Bq
Br-82	4.2752E-01	3.9489E-10	2.9001E+15	1.5818E+10
Br-83	1.0847E-02	6.8664E-13	4.9819E+12	4.0135E+08
Kr-83m	8.3391E+00	4.0418E-10	2.9326E+15	3.0855E+11
Kr-85	5.6043E+02	1.4284E-03	1.0120E+22	2.0736E+13
Kr-85m	1.2131E+02	1.4741E-08	1.0444E+17	4.4886E+12
Kr-87	1.7676E-02	6.2401E-13	4.3194E+12	6.5400E+08
Kr-88	3.7189E+01	2.9658E-09	2.0296E+16	1.3760E+12
I-130	1.0381E+00	5.3225E-10	2.4656E+15	3.8409E+10
I-131	1.5381E+02	1.2407E-06	5.7035E+18	5.6911E+12
I-132	1.1354E+02	1.1000E-08	5.0185E+16	4.2012E+12
I-133	9.5952E+01	8.4702E-08	3.8353E+17	3.5502E+12
I-134	4.1947E-06	1.5724E-16	7.0667E+08	1.5520E+05
I-135	1.5438E+01	4.3961E-09	1.9610E+16	5.7122E+11
Xe-129m	1.4448E-01	1.1419E-09	5.3306E+15	5.3456E+09
Xe-131m	2.3938E+02	2.8579E-06	1.3138E+19	8.8570E+12
Xe-133	3.8912E+04	2.0788E-04	9.4128E+20	1.4397E+15
Xe-133m	1.1056E+03	2.4641E-06	1.1157E+19	4.0909E+13
Xe-135	1.0532E+04	4.1241E-06	1.8397E+19	3.8968E+14
Xe-135m	3.0359E+02	3.3328E-09	1.4867E+16	1.1233E+13

environment Compartment Group Inventory Distribution:

Time (h) = 26.0000	Total Release	Release Rate/s
Noble gases (Ci)	5.1820E+04	7.1972E+00
Elemental I (Ci)	3.4601E+02	4.8056E-02
Organic I (Ci)	1.5209E+01	2.1124E-03
Aerosol I (Ci)	1.9011E+01	2.6405E-03
Aerosols (Ci)	1.9011E+01	2.6405E-03

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 26.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 2 Filter	PATHWAY 4 Filter
Br-82	2.1364E-04	6.2324E-04	5.0925E-04	3.1285E-04
Br-83	3.4242E-06	1.3356E-05	8.1619E-06	5.0142E-06
Kr-83m	4.7545E-03	1.9571E-02	0.0000E+00	6.6812E-03
Kr-85	6.0836E-01	1.6783E+00	0.0000E+00	8.5556E-01
Kr-85m	1.0134E-01	3.2775E-01	0.0000E+00	1.4252E-01
Kr-87	7.5665E-06	3.7631E-05	0.0000E+00	1.0641E-05
Kr-88	2.6683E-02	9.4883E-02	0.0000E+00	3.7525E-02
I-130	4.8777E-04	1.4779E-03	1.1627E-03	7.1427E-04
I-131	7.8975E-02	2.2660E-01	1.8825E-01	1.1565E-01
I-132	3.5154E-02	1.3887E-01	8.3794E-02	5.1478E-02
I-133	4.6854E-02	1.3864E-01	1.1168E-01	6.8611E-02
I-134	5.5829E-10	3.9317E-09	1.3307E-09	8.1754E-10
I-135	6.6790E-03	2.1304E-02	1.5920E-02	9.7804E-03
Xe-129m	1.5588E-04	4.3159E-04	0.0000E+00	2.1922E-04
Xe-131m	2.5880E-01	7.1566E-01	0.0000E+00	3.6394E-01

Xe-133	4.1850E+01	1.1607E+02	0.0000E+00	5.8844E+01
Xe-133m	1.1738E+00	3.2813E+00	0.0000E+00	1.6507E+00
Xe-135	1.0050E+01	2.9948E+01	0.0000E+00	1.4128E+01
Xe-135m	5.9845E-03	2.6855E-01	0.0000E+00	4.3249E-03
Total	5.4248E+01	0.0000E+00	4.0132E-01	7.6280E+01

Dose Effective (Ci/cc) I-131 (Thyroid) 2.1702E-11
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid) 2.3232E-11
Total I (Ci) 1.6766E-01

control room Compartment Group Inventory Distribution:

Time (h) = 26.0000	Atmosphere	Sump
Noble gases (Ci)	5.4080E+01	0.0000E+00
Elemental I (Ci)	1.5321E-01	0.0000E+00
Organic I (Ci)	6.7346E-03	0.0000E+00
Aerosol I (Ci)	8.4183E-03	0.0000E+00
Aerosols (Ci)	8.4183E-03	0.0000E+00
Aerosols (kg)	3.4207E-11	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 26.0000

Nuclide	Filter

containment to environment Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	5.1986E+04
Elemental I (Ci)	0.0000E+00	3.4843E+02
Organic I (Ci)	0.0000E+00	1.5316E+01
Aerosol I (Ci)	0.0000E+00	1.9145E+01
Aerosols (Ci)	0.0000E+00	1.9145E+01
Aerosols (kg)	0.0000E+00	6.7107E-08

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 26.0000

Nuclide	Filter
Br-82	5.0925E-04
Br-83	8.1619E-06
I-130	1.1627E-03
I-131	1.8825E-01
I-132	8.3794E-02
I-133	1.1168E-01
I-134	1.3307E-09
I-135	1.5920E-02

environment to control room Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	8.9437E+01
Elemental I (Ci)	3.6520E-01	1.7363E-01
Organic I (Ci)	1.6053E-02	7.6319E-03
Aerosol I (Ci)	2.0066E-02	9.5399E-03
Aerosols (Ci)	2.0066E-02	9.5399E-03
Aerosols (kg)	9.0107E-11	3.2948E-11

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time

(h) = 26.0000

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.7611E+01
Elemental I (Ci)	0.0000E+00	2.5213E-01
Organic I (Ci)	0.0000E+00	1.1083E-02
Aerosol I (Ci)	0.0000E+00	1.3853E-02
Aerosols (Ci)	0.0000E+00	1.3853E-02
Aerosols (kg)	0.0000E+00	5.2694E-11

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 26.0000

Nuclide	Filter
Br-82	3.1285E-04
Br-83	5.0142E-06
Kr-83m	6.6812E-03
Kr-85	8.5556E-01
Kr-85m	1.4252E-01
Kr-87	1.0641E-05
Kr-88	3.7525E-02
I-130	7.1427E-04
I-131	1.1565E-01
I-132	5.1478E-02
I-133	6.8611E-02
I-134	8.1754E-10
I-135	9.7804E-03
Xe-129m	2.1922E-04
Xe-131m	3.6394E-01
Xe-133	5.8844E+01
Xe-133m	1.6507E+00
Xe-135	1.4128E+01
Xe-135m	4.3249E-03

control room to environment Transport Group Inventory:

Time (h) = 26.0000	Pathway Filtered	Transported
Noble gases (Ci)	7.6034E+01	0.0000E+00
Elemental I (Ci)	2.2436E-01	0.0000E+00
Organic I (Ci)	9.8620E-03	0.0000E+00
Aerosol I (Ci)	1.2327E-02	0.0000E+00
Aerosols (Ci)	1.2327E-02	0.0000E+00
Aerosols (kg)	5.0523E-11	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 32.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2222E-01	3.3632E+01	1.4575E+00

Low Population Zone Doses:

Time (h) = 32.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	2.0164E-04	1.8624E-02	7.7369E-04
Accumulated dose (rem)	2.3567E-01	1.8775E+01	8.1360E-01

control room Doses:

Time (h) = 32.0000	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	5.2703E-02	5.4537E+01	1.7264E+00	3.2170E+00
Accumulated dose (rem)	1.4375E-01	1.3946E+02	4.4294E+00	8.6328E+00

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 32.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Br-82	3.7116E-13	1.1468E-01
Br-83	1.1745E-15	2.9108E-03
Kr-83m	4.5763E-13	2.2366E+00
Kr-85	5.6579E-10	1.5032E+02
Kr-85m	3.7251E-11	3.2546E+01
Kr-88	5.7381E-12	9.9785E+00
I-130	6.8095E-13	2.7846E-01
I-131	1.5106E-10	4.1258E+01
I-132	1.1265E-11	3.0470E+01
I-133	7.4979E-11	2.5738E+01
I-135	6.9581E-12	4.1416E+00
Xe-129m	1.4187E-13	3.8753E-02
Xe-131m	2.3724E-10	6.4207E+01
Xe-133	3.7694E-08	1.0434E+04
Xe-133m	1.0087E-09	2.9655E+02
Xe-135	5.9186E-09	2.8222E+03
Xe-135m	1.1611E-12	7.9291E+01
Total	4.5715E-08	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	7.2767E-21
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	7.6445E-21
Total I (Ci)	2.4427E-10

containment Compartment Group Inventory Distribution:

Time (h) = 32.0000	Atmosphere	Sump
Noble gases (Ci)	4.5470E-08	0.0000E+00
Elemental I (Ci)	2.2324E-10	0.0000E+00
Organic I (Ci)	9.8127E-12	0.0000E+00
Aerosol I (Ci)	1.2266E-11	0.0000E+00
Aerosols (Ci)	1.2266E-11	0.0000E+00
Aerosols (kg)	6.4423E-20	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 32.0000	Ci	kg	Atoms	Bq
Br-82	4.2794E-01	3.9527E-10	2.9029E+15	1.5834E+10
Br-83	1.0853E-02	6.8702E-13	4.9848E+12	4.0158E+08
Kr-83m	8.3502E+00	4.0472E-10	2.9365E+15	3.0896E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2140E+02	1.4752E-08	1.0452E+17	4.4919E+12
Kr-87	1.7682E-02	6.2422E-13	4.3209E+12	6.5422E+08
Kr-88	3.7212E+01	2.9676E-09	2.0308E+16	1.3768E+12
I-130	1.0390E+00	5.3273E-10	2.4678E+15	3.8443E+10
I-131	1.5397E+02	1.2419E-06	5.7092E+18	5.6968E+12

I-132	1.1361E+02	1.1006E-08	5.0213E+16	4.2035E+12
I-133	9.6042E+01	8.4782E-08	3.8389E+17	3.5536E+12
I-134	4.1956E-06	1.5727E-16	7.0681E+08	1.5524E+05
I-135	1.5451E+01	4.3997E-09	1.9626E+16	5.7169E+11
Xe-129m	1.4462E-01	1.1430E-09	5.3359E+15	5.3509E+09
Xe-131m	2.3964E+02	2.8610E-06	1.3152E+19	8.8667E+12
Xe-133	3.8988E+04	2.0829E-04	9.4311E+20	1.4425E+15
Xe-133m	1.1069E+03	2.4669E-06	1.1170E+19	4.0956E+13
Xe-135	1.0545E+04	4.1295E-06	1.8421E+19	3.9018E+14
Xe-135m	3.2714E+02	3.5913E-09	1.6020E+16	1.2104E+13

environment Compartment Group Inventory Distribution:

Time (h) = 32.0000	Total Release	Release Rate/s
Noble gases (Ci)	5.1935E+04	1.8033E+00
Elemental I (Ci)	3.4630E+02	1.2024E-02
Organic I (Ci)	1.5222E+01	5.2854E-04
Aerosol I (Ci)	1.9027E+01	6.6067E-04
Aerosols (Ci)	1.9027E+01	6.6067E-04

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 32.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 2 Filter	PATHWAY 4 Filter
Br-82	8.8249E-06	1.0042E-03	4.5302E-04	4.5945E-04
Br-83	2.7926E-08	1.7514E-05	1.4336E-06	1.4539E-06
Kr-83m	2.3723E-05	2.4786E-02	0.0000E+00	1.1583E-03
Kr-85	2.8279E-02	2.7993E+00	0.0000E+00	1.4367E+00
Kr-85m	1.8618E-03	4.7479E-01	0.0000E+00	9.4588E-02
Kr-87	1.3363E-08	4.4601E-05	0.0000E+00	6.7886E-07
Kr-88	2.8680E-04	1.2921E-01	0.0000E+00	1.4570E-02
I-130	1.6191E-05	2.2979E-03	8.3115E-04	8.4293E-04
I-131	3.5918E-03	3.7122E-01	1.8438E-01	1.8700E-01
I-132	2.6783E-04	1.8096E-01	1.3749E-02	1.3944E-02
I-133	1.7828E-03	2.2032E-01	9.1517E-02	9.2815E-02
I-134	2.2582E-13	4.3469E-09	1.1592E-11	1.1757E-11
I-135	1.6544E-04	3.1721E-02	8.4929E-03	8.6133E-03
Xe-129m	7.0910E-06	7.1711E-04	0.0000E+00	3.6025E-04
Xe-131m	1.1866E-02	1.1907E+00	0.0000E+00	6.0235E-01
Xe-133	1.8849E+00	1.9251E+02	0.0000E+00	9.5624E+01
Xe-133m	5.0483E-02	5.3975E+00	0.0000E+00	2.5611E+00
Xe-135	2.9700E-01	4.6331E+01	0.0000E+00	1.5020E+01
Xe-135m	1.2278E-03	2.8103E-01	0.0000E+00	2.2336E-04
Total	2.2818E+00	0.0000E+00	2.9943E-01	1.1566E+02

Dose Effective (Ci/cc) I-131 (Thyroid)	9.6960E-13
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	1.0186E-12
Total I (Ci)	5.8078E-03

control room Compartment Group Inventory Distribution:

Time (h) = 32.0000	Atmosphere	Sump
Noble gases (Ci)	2.2760E+00	0.0000E+00
Elemental I (Ci)	5.3079E-03	0.0000E+00
Organic I (Ci)	2.3331E-04	0.0000E+00
Aerosol I (Ci)	2.9164E-04	0.0000E+00
Aerosols (Ci)	2.9164E-04	0.0000E+00
Aerosols (kg)	1.5318E-12	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 32.0000

Nuclide Filter

containment to environment Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	5.2036E+04
Elemental I (Ci)	0.0000E+00	3.4873E+02
Organic I (Ci)	0.0000E+00	1.5329E+01
Aerosol I (Ci)	0.0000E+00	1.9161E+01
Aerosols (Ci)	0.0000E+00	1.9161E+01
Aerosols (kg)	0.0000E+00	6.7174E-08

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 32.0000

Nuclide	Filter
Br-82	4.5302E-04
Br-83	1.4336E-06
I-130	8.3115E-04
I-131	1.8438E-01
I-132	1.3749E-02
I-133	9.1517E-02
I-135	8.4929E-03

environment to control room Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	8.9494E+01
Elemental I (Ci)	2.7248E-01	1.7366E-01
Organic I (Ci)	1.1977E-02	7.6335E-03
Aerosol I (Ci)	1.4971E-02	9.5419E-03
Aerosols (Ci)	1.4971E-02	9.5419E-03
Aerosols (kg)	9.0180E-11	3.2958E-11

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 32.0000

Nuclide Filter

environment to control room Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.7639E+01
Elemental I (Ci)	0.0000E+00	2.5230E-01
Organic I (Ci)	0.0000E+00	1.1090E-02
Aerosol I (Ci)	0.0000E+00	1.3862E-02
Aerosols (Ci)	0.0000E+00	1.3862E-02
Aerosols (kg)	0.0000E+00	5.2735E-11

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 32.0000

Nuclide	Filter
Br-82	4.5945E-04

Br-83	1.4539E-06
Kr-83m	1.1583E-03
Kr-85	1.4367E+00
Kr-85m	9.4588E-02
Kr-87	6.7886E-07
Kr-88	1.4570E-02
I-130	8.4293E-04
I-131	1.8700E-01
I-132	1.3944E-02
I-133	9.2815E-02
I-135	8.6133E-03
Xe-129m	3.6025E-04
Xe-131m	6.0235E-01
Xe-133	9.5624E+01
Xe-133m	2.5611E+00
Xe-135	1.5020E+01
Xe-135m	2.2336E-04

control room to environment Transport Group Inventory:

Time (h) = 32.0000	Pathway Filtered	Transported
Noble gases (Ci)	1.1535E+02	0.0000E+00
Elemental I (Ci)	2.7634E-01	0.0000E+00
Organic I (Ci)	1.2147E-02	0.0000E+00
Aerosol I (Ci)	1.5184E-02	0.0000E+00
Aerosols (Ci)	1.5184E-02	0.0000E+00
Aerosols (kg)	8.2839E-11	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 48.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2222E-01	3.3632E+01	1.4575E+00

Low Population Zone Doses:

Time (h) = 48.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	3.6981E-14	2.3225E-12	1.0811E-13
Accumulated dose (rem)	2.3567E-01	1.8775E+01	8.1360E-01

control room Doses:

Time (h) = 48.0000	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	1.9551E-03	2.5552E+00	8.0185E-02	1.2283E-01
Accumulated dose (rem)	1.4571E-01	1.4201E+02	4.5095E+00	8.7556E+00

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 48.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Total	3.8328E-32	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	6.6938E-45
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	6.8951E-45
Total I (Ci)	1.8889E-34

containment Compartment Group Inventory Distribution:

Time (h) = 48.0000	Atmosphere	Sump
Noble gases (Ci)	3.8139E-32	0.0000E+00
Elemental I (Ci)	1.7239E-34	0.0000E+00
Organic I (Ci)	7.5777E-36	0.0000E+00
Aerosol I (Ci)	9.4721E-36	0.0000E+00
Aerosols (Ci)	9.4721E-36	0.0000E+00
Aerosols (kg)	5.9782E-44	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 48.0000	Ci	kg	Atoms	Bq
Br-82	4.2794E-01	3.9527E-10	2.9029E+15	1.5834E+10
Br-83	1.0853E-02	6.8702E-13	4.9848E+12	4.0158E+08
Kr-83m	8.3517E+00	4.0479E-10	2.9370E+15	3.0901E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2140E+02	1.4752E-08	1.0452E+17	4.4919E+12
Kr-87	1.7682E-02	6.2422E-13	4.3209E+12	6.5422E+08
Kr-88	3.7212E+01	2.9676E-09	2.0308E+16	1.3768E+12
I-130	1.0390E+00	5.3273E-10	2.4678E+15	3.8443E+10
I-131	1.5397E+02	1.2419E-06	5.7092E+18	5.6968E+12
I-132	1.1361E+02	1.1006E-08	5.0213E+16	4.2035E+12
I-133	9.6042E+01	8.4782E-08	3.8389E+17	3.5536E+12
I-134	4.1956E-06	1.5727E-16	7.0681E+08	1.5524E+05
I-135	1.5451E+01	4.3997E-09	1.9626E+16	5.7169E+11
Xe-129m	1.4462E-01	1.1430E-09	5.3359E+15	5.3509E+09
Xe-131m	2.3970E+02	2.8618E-06	1.3156E+19	8.8690E+12
Xe-133	3.9072E+04	2.0874E-04	9.4516E+20	1.4457E+15
Xe-133m	1.1073E+03	2.4677E-06	1.1173E+19	4.0969E+13
Xe-135	1.0550E+04	4.1311E-06	1.8428E+19	3.9034E+14
Xe-135m	3.4239E+02	3.7587E-09	1.6767E+16	1.2669E+13

environment Compartment Group Inventory Distribution:

Time (h) = 48.0000	Total Release	Release Rate/s
Noble gases (Ci)	5.2039E+04	6.0231E-01
Elemental I (Ci)	3.4630E+02	4.0081E-03
Organic I (Ci)	1.5222E+01	1.7618E-04
Aerosol I (Ci)	1.9027E+01	2.2022E-04
Aerosols (Ci)	1.9027E+01	2.2022E-04

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 48.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 2 Filter	PATHWAY 4 Filter
Br-82	1.7911E-09	1.0202E-03	3.3088E-04	3.4203E-04
Br-83	7.4920E-14	1.7548E-05	1.3841E-08	1.4307E-08
Kr-83m	1.1530E-08	2.4814E-02	0.0000E+00	2.7941E-06
Kr-85	7.8569E-06	2.8528E+00	0.0000E+00	1.4648E+00
Kr-85m	4.3519E-08	4.7751E-01	0.0000E+00	8.1135E-03
Kr-87	6.0562E-16	4.4614E-05	0.0000E+00	1.1291E-10
Kr-88	1.6050E-09	1.2958E-01	0.0000E+00	2.9923E-04
I-130	1.8341E-09	2.3255E-03	3.3884E-04	3.5025E-04
I-131	9.4231E-07	3.7796E-01	1.7409E-01	1.7995E-01
I-132	5.9922E-10	1.8128E-01	1.1070E-04	1.1443E-04
I-133	2.9065E-07	2.2349E-01	5.3696E-02	5.5505E-02
I-135	8.5866E-09	3.1981E-02	1.5863E-03	1.6398E-03

Xe-129m	1.8598E-09	7.3042E-04	0.0000E+00	3.4673E-04
Xe-131m	1.4824E-05	1.2132E+00	0.0000E+00	5.9091E-01
Xe-133	1.2410E-03	1.9605E+02	0.0000E+00	8.9294E+01
Xe-133m	6.4977E-05	5.4915E+00	0.0000E+00	2.1148E+00
Xe-135	3.4027E-04	4.6830E+01	0.0000E+00	4.5241E+00
Xe-135m	3.0627E-04	2.9171E-01	0.0000E+00	1.0643E-05
Total	1.9765E-03	0.0000E+00	2.3015E-01	9.8235E+01

Dose Effective (Ci/cc) I-131 (Thyroid)	2.4668E-16
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	2.5410E-16
Total I (Ci)	1.2421E-06

control room Compartment Group Inventory Distribution:

Time (h) = 48.0000	Atmosphere	Sump
Noble gases (Ci)	1.9753E-03	0.0000E+00
Elemental I (Ci)	1.1337E-06	0.0000E+00
Organic I (Ci)	4.9831E-08	0.0000E+00
Aerosol I (Ci)	6.2289E-08	0.0000E+00
Aerosols (Ci)	6.2289E-08	0.0000E+00
Aerosols (kg)	3.9312E-16	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 48.0000

Nuclide	Filter

containment to environment Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	5.2036E+04
Elemental I (Ci)	0.0000E+00	3.4873E+02
Organic I (Ci)	0.0000E+00	1.5329E+01
Aerosol I (Ci)	0.0000E+00	1.9161E+01
Aerosols (Ci)	0.0000E+00	1.9161E+01
Aerosols (kg)	0.0000E+00	6.7174E-08

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 48.0000

Nuclide	Filter
Br-82	3.3088E-04
Br-83	1.3841E-08
I-130	3.3884E-04
I-131	1.7409E-01
I-132	1.1070E-04
I-133	5.3696E-02
I-135	1.5863E-03

environment to control room Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	8.9494E+01
Elemental I (Ci)	2.0943E-01	1.7366E-01
Organic I (Ci)	9.2059E-03	7.6335E-03
Aerosol I (Ci)	1.1507E-02	9.5419E-03
Aerosols (Ci)	1.1507E-02	9.5419E-03
Aerosols (kg)	9.0180E-11	3.2958E-11

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 48.0000

Nuclide	Filter

environment to control room Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.7639E+01
Elemental I (Ci)	0.0000E+00	2.5230E-01
Organic I (Ci)	0.0000E+00	1.1090E-02
Aerosol I (Ci)	0.0000E+00	1.3862E-02
Aerosols (Ci)	0.0000E+00	1.3862E-02
Aerosols (kg)	0.0000E+00	5.2735E-11

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 48.0000

Nuclide	Filter
Br-82	3.4203E-04
Br-83	1.4307E-08
Kr-83m	2.7941E-06
Kr-85	1.4648E+00
Kr-85m	8.1135E-03
Kr-87	1.1291E-10
Kr-88	2.9923E-04
I-130	3.5025E-04
I-131	1.7995E-01
I-132	1.1443E-04
I-133	5.5505E-02
I-135	1.6398E-03
Xe-129m	3.4673E-04
Xe-131m	5.9091E-01
Xe-133	8.9294E+01
Xe-133m	2.1148E+00
Xe-135	4.5241E+00
Xe-135m	1.0643E-05

control room to environment Transport Group Inventory:

Time (h) = 48.0000	Pathway Filtered	Transported
Noble gases (Ci)	9.7997E+01	0.0000E+00
Elemental I (Ci)	2.1649E-01	0.0000E+00
Organic I (Ci)	9.5160E-03	0.0000E+00
Aerosol I (Ci)	1.1895E-02	0.0000E+00
Aerosols (Ci)	1.1895E-02	0.0000E+00
Aerosols (kg)	8.4355E-11	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 120.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2222E-01	3.3632E+01	1.4575E+00

Low Population Zone Doses:

Time (h) = 120.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	7.4459E-39	9.3611E-37	3.6045E-38
Accumulated dose (rem)	2.3567E-01	1.8775E+01	8.1360E-01

control room Doses:

Time (h) = 120.0000	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	1.0265E-05	4.0024E-04	2.2491E-05	5.1089E-04
Accumulated dose (rem)	1.4572E-01	1.4201E+02	4.5096E+00	8.7561E+00

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 120.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Total	2.5040-140	0.0000E+00

Dose Effective (Ci/cc)	I-131 (Thyroid)	0.0000E+00
Dose Effective (Ci/cc)	I-131 (ICRP2 Thyroid)	0.0000E+00
Total I (Ci)		0.0000E+00

containment Compartment Group Inventory Distribution:

Time (h) = 120.0000	Atmosphere	Sump
Noble gases (Ci)	2.5040-140	0.0000E+00
Elemental I (Ci)	0.0000E+00	0.0000E+00
Organic I (Ci)	0.0000E+00	0.0000E+00
Aerosol I (Ci)	0.0000E+00	0.0000E+00
Aerosols (Ci)	0.0000E+00	0.0000E+00
Aerosols (kg)	0.0000E+00	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 120.0000	Ci	kg	Atoms	Bq
Br-82	4.2794E-01	3.9527E-10	2.9029E+15	1.5834E+10
Br-83	1.0853E-02	6.8702E-13	4.9848E+12	4.0158E+08
Kr-83m	8.3517E+00	4.0479E-10	2.9370E+15	3.0901E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2140E+02	1.4752E-08	1.0452E+17	4.4919E+12
Kr-87	1.7682E-02	6.2422E-13	4.3209E+12	6.5422E+08
Kr-88	3.7212E+01	2.9676E-09	2.0308E+16	1.3768E+12
I-130	1.0390E+00	5.3273E-10	2.4678E+15	3.8443E+10
I-131	1.5397E+02	1.2419E-06	5.7092E+18	5.6968E+12
I-132	1.1361E+02	1.1006E-08	5.0213E+16	4.2035E+12
I-133	9.6042E+01	8.4782E-08	3.8389E+17	3.5536E+12
I-134	4.1956E-06	1.5727E-16	7.0681E+08	1.5524E+05
I-135	1.5451E+01	4.3997E-09	1.9626E+16	5.7169E+11
Xe-129m	1.4462E-01	1.1430E-09	5.3359E+15	5.3509E+09
Xe-131m	2.3994E+02	2.8646E-06	1.3169E+19	8.8779E+12
Xe-133	3.9286E+04	2.0988E-04	9.5033E+20	1.4536E+15
Xe-133m	1.1077E+03	2.4687E-06	1.1178E+19	4.0986E+13
Xe-135	1.0551E+04	4.1315E-06	1.8430E+19	3.9037E+14
Xe-135m	3.4443E+02	3.7811E-09	1.6867E+16	1.2744E+13

environment Compartment Group Inventory Distribution:

Time (h) = 120.0000	Total Release	Release Rate/s
Noble gases (Ci)	5.2257E+04	1.5121E-01
Elemental I (Ci)	3.4630E+02	1.0020E-03

Organic I (Ci)	1.5222E+01	4.4045E-05
Aerosol I (Ci)	1.9027E+01	5.5056E-05
Aerosols (Ci)	1.9027E+01	5.5056E-05

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 120.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 2 Filter	PATHWAY 4 Filter
Br-82	4.3291E-26	1.0202E-03	8.0478E-05	8.3190E-05
Kr-85	7.8039E-22	2.8528E+00	0.0000E+00	1.4640E+00
Kr-85m	6.2804E-29	4.7751E-01	0.0000E+00	1.1782E-07
Kr-88	3.7241E-33	1.2958E-01	0.0000E+00	6.9865E-12
I-130	3.2147E-27	2.3255E-03	5.9761E-06	6.1775E-06
I-131	7.2304E-23	3.7796E-01	1.3441E-01	1.3894E-01
I-132	2.2456E-35	1.8128E-01	4.1745E-14	4.3152E-14
I-133	2.6220E-24	2.2349E-01	4.8743E-03	5.0386E-03
I-135	4.4887E-28	3.1981E-02	8.3444E-07	8.6255E-07
Xe-129m	1.4252E-25	7.3043E-04	0.0000E+00	2.6737E-04
Xe-131m	8.8431E-06	1.2139E+00	0.0000E+00	4.9645E-01
Xe-133	6.7922E-05	1.9607E+02	0.0000E+00	6.0074E+01
Xe-133m	4.7879E-06	5.4929E+00	0.0000E+00	8.1789E-01
Xe-135	1.6354E-07	4.6833E+01	0.0000E+00	1.8686E-02
Xe-135m	1.5815E-07	2.9444E-01	0.0000E+00	9.8015E-09
Total	8.1874E-05	0.0000E+00	1.3937E-01	6.3016E+01

Dose Effective (Ci/cc) I-131 (Thyroid)	1.8108E-32
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	1.8174E-32
Total I (Ci)	7.4926E-23

control room Compartment Group Inventory Distribution:

Time (h) = 120.0000	Atmosphere	Sump
Noble gases (Ci)	8.1874E-05	0.0000E+00
Elemental I (Ci)	6.8225E-23	0.0000E+00
Organic I (Ci)	2.9989E-24	0.0000E+00
Aerosol I (Ci)	3.7486E-24	0.0000E+00
Aerosols (Ci)	3.7486E-24	0.0000E+00
Aerosols (kg)	2.9279E-32	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 120.0000

Nuclide	Filter

containment to environment Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	5.2036E+04
Elemental I (Ci)	0.0000E+00	3.4873E+02
Organic I (Ci)	0.0000E+00	1.5329E+01
Aerosol I (Ci)	0.0000E+00	1.9161E+01
Aerosols (Ci)	0.0000E+00	1.9161E+01
Aerosols (kg)	0.0000E+00	6.7174E-08

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 120.0000

Nuclide	Filter
Br-82	8.0478E-05

I-130	5.9761E-06
I-131	1.3441E-01
I-133	4.8743E-03
I-135	8.3444E-07

environment to control room Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	8.9494E+01
Elemental I (Ci)	1.2683E-01	1.7366E-01
Organic I (Ci)	5.5749E-03	7.6335E-03
Aerosol I (Ci)	6.9687E-03	9.5419E-03
Aerosols (Ci)	6.9687E-03	9.5419E-03
Aerosols (kg)	9.0180E-11	3.2958E-11

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 120.0000

Nuclide	Filter

environment to control room Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.7639E+01
Elemental I (Ci)	0.0000E+00	2.5230E-01
Organic I (Ci)	0.0000E+00	1.1090E-02
Aerosol I (Ci)	0.0000E+00	1.3862E-02
Aerosols (Ci)	0.0000E+00	1.3862E-02
Aerosols (kg)	0.0000E+00	5.2735E-11

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 120.0000

Nuclide	Filter
Br-82	8.3190E-05
Kr-85	1.4640E+00
Kr-85m	1.1782E-07
I-130	6.1775E-06
I-131	1.3894E-01
I-133	5.0386E-03
I-135	8.6255E-07
Xe-129m	2.6737E-04
Xe-131m	4.9645E-01
Xe-133	6.0074E+01
Xe-133m	8.1789E-01
Xe-135	1.8686E-02
Xe-135m	9.8015E-09

control room to environment Transport Group Inventory:

Time (h) = 120.0000	Pathway Filtered	Transported
Noble gases (Ci)	6.2872E+01	0.0000E+00
Elemental I (Ci)	1.3110E-01	0.0000E+00
Organic I (Ci)	5.7628E-03	0.0000E+00
Aerosol I (Ci)	7.2035E-03	0.0000E+00
Aerosols (Ci)	7.2035E-03	0.0000E+00
Aerosols (kg)	8.4355E-11	0.0000E+00

****

Exclusion Area Boundary Doses:

Time (h) = 744.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	0.0000E+00	0.0000E+00	0.0000E+00
Accumulated dose (rem)	4.2222E-01	3.3632E+01	1.4575E+00

Low Population Zone Doses:

Time (h) = 744.0000	Whole Body	Thyroid	TEDE
Delta dose (rem)	7.3122-148	0.0000E+00	7.3122-148
Accumulated dose (rem)	2.3567E-01	1.8775E+01	8.1360E-01

control room Doses:

Time (h) = 744.0000	Whole Body	Thyroid	TEDE	Skin
Delta dose (rem)	2.1984E-07	1.9620E-20	2.1984E-07	2.4302E-05
Accumulated dose (rem)	1.4572E-01	1.4201E+02	4.5096E+00	8.7561E+00

****

containment COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 744.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)
Xe-131m	8.8431E-06	6.4207E+01
Xe-133	6.7922E-05	1.0434E+04
Xe-133m	4.7879E-06	2.9655E+02
Xe-135	1.6354E-07	2.8222E+03
Xe-135m	1.5815E-07	7.9291E+01
Total	0.0000E+00	0.0000E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	0.0000E+00
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	0.0000E+00
Total I (Ci)	0.0000E+00

containment Compartment Group Inventory Distribution:

Time (h) = 744.0000	Atmosphere	Sump
Noble gases (Ci)	0.0000E+00	0.0000E+00
Elemental I (Ci)	0.0000E+00	0.0000E+00
Organic I (Ci)	0.0000E+00	0.0000E+00
Aerosol I (Ci)	0.0000E+00	0.0000E+00
Aerosols (Ci)	0.0000E+00	0.0000E+00
Aerosols (kg)	0.0000E+00	0.0000E+00

environment Integral Nuclide Release:

Time (h) = 744.0000	Ci	kg	Atoms	Bq
Br-82	4.2794E-01	3.9527E-10	2.9029E+15	1.5834E+10
Br-83	1.0853E-02	6.8702E-13	4.9848E+12	4.0158E+08
Kr-83m	8.3517E+00	4.0479E-10	2.9370E+15	3.0901E+11
Kr-85	5.6099E+02	1.4299E-03	1.0131E+22	2.0757E+13
Kr-85m	1.2140E+02	1.4752E-08	1.0452E+17	4.4919E+12
Kr-87	1.7682E-02	6.2422E-13	4.3209E+12	6.5422E+08
Kr-88	3.7212E+01	2.9676E-09	2.0308E+16	1.3768E+12
I-130	1.0390E+00	5.3273E-10	2.4678E+15	3.8443E+10
I-131	1.5397E+02	1.2419E-06	5.7092E+18	5.6968E+12
I-132	1.1361E+02	1.1006E-08	5.0213E+16	4.2035E+12

I-133	9.6042E+01	8.4782E-08	3.8389E+17	3.5536E+12
I-134	4.1956E-06	1.5727E-16	7.0681E+08	1.5524E+05
I-135	1.5451E+01	4.3997E-09	1.9626E+16	5.7169E+11
Xe-129m	1.4462E-01	1.1430E-09	5.3359E+15	5.3509E+09
Xe-131m	2.4067E+02	2.8733E-06	1.3209E+19	8.9047E+12
Xe-133	3.9417E+04	2.1058E-04	9.5351E+20	1.4584E+15
Xe-133m	1.1078E+03	2.4688E-06	1.1179E+19	4.0987E+13
Xe-135	1.0551E+04	4.1315E-06	1.8430E+19	3.9037E+14
Xe-135m	3.4443E+02	3.7811E-09	1.6867E+16	1.2744E+13

environment Compartment Group Inventory Distribution:

Time (h) = 744.0000	Total Release	Release Rate/s
Noble gases (Ci)	5.2389E+04	2.0212E-02
Elemental I (Ci)	3.4630E+02	1.3360E-04
Organic I (Ci)	1.5222E+01	5.8726E-06
Aerosol I (Ci)	1.9027E+01	7.3408E-06
Aerosols (Ci)	1.9027E+01	7.3408E-06

control room COMPARTMENT NUCLIDE INVENTORY (Ci) at Time (h) = 744.0000

Nuclide	COMPARTMENT Atomsphere	EXPOSURE (Ci-hr)	PATHWAY 2 Filter	PATHWAY 4 Filter
Br-82	0.0000E+00	1.0202E-03	3.8402E-10	3.9696E-10
Kr-85	1.5856-160	2.8528E+00	0.0000E+00	1.4573E+00
I-131	0.0000E+00	3.7796E-01	1.4288E-02	1.4769E-02
I-133	0.0000E+00	2.2349E-01	4.5396E-12	4.6925E-12
Xe-129m	3.0577-165	7.3043E-04	0.0000E+00	2.8104E-05
Xe-131m	9.4319E-07	1.2162E+00	0.0000E+00	1.0954E-01
Xe-133	6.3472E-14	1.9607E+02	0.0000E+00	1.9340E+00
Xe-133m	4.4745E-15	5.4931E+00	0.0000E+00	2.1657E-04
Total	9.4319E-07	0.0000E+00	1.4288E-02	3.5159E+00

Dose Effective (Ci/cc) I-131 (Thyroid)	0.0000E+00
Dose Effective (Ci/cc) I-131 (ICRP2 Thyroid)	0.0000E+00
Total I (Ci)	0.0000E+00

control room Compartment Group Inventory Distribution:

Time (h) = 744.0000	Atmosphere	Sump
Noble gases (Ci)	9.4319E-07	0.0000E+00
Elemental I (Ci)	0.0000E+00	0.0000E+00
Organic I (Ci)	0.0000E+00	0.0000E+00
Aerosol I (Ci)	0.0000E+00	0.0000E+00
Aerosols (Ci)	0.0000E+00	0.0000E+00
Aerosols (kg)	0.0000E+00	0.0000E+00

containment to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 744.0000

Nuclide Filter

containment to environment Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	5.2036E+04
Elemental I (Ci)	0.0000E+00	3.4873E+02
Organic I (Ci)	0.0000E+00	1.5329E+01

Aerosol I (Ci)	0.0000E+00	1.9161E+01
Aerosols (Ci)	0.0000E+00	1.9161E+01
Aerosols (kg)	0.0000E+00	6.7174E-08

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 744.0000

Nuclide	Filter
Br-82	3.8402E-10
I-131	1.4288E-02
I-133	4.5396E-12

environment to control room Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	8.9494E+01
Elemental I (Ci)	1.3002E-02	1.7366E-01
Organic I (Ci)	5.7150E-04	7.6335E-03
Aerosol I (Ci)	7.1438E-04	9.5419E-03
Aerosols (Ci)	7.1438E-04	9.5419E-03
Aerosols (kg)	9.0180E-11	3.2958E-11

environment to control room PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 744.0000

Nuclide	Filter

environment to control room Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (Ci)	0.0000E+00	3.7639E+01
Elemental I (Ci)	0.0000E+00	2.5230E-01
Organic I (Ci)	0.0000E+00	1.1090E-02
Aerosol I (Ci)	0.0000E+00	1.3862E-02
Aerosols (Ci)	0.0000E+00	1.3862E-02
Aerosols (kg)	0.0000E+00	5.2735E-11

control room to environment PATHWAY NUCLIDE INVENTORY (Ci) at Time (h) = 744.0000

Nuclide	Filter
Br-82	3.9696E-10
Kr-85	1.4573E+00
I-131	1.4769E-02
I-133	4.6925E-12
Xe-129m	2.8104E-05
Xe-131m	1.0954E-01
Xe-133	1.9340E+00
Xe-133m	2.1657E-04

control room to environment Transport Group Inventory:

Time (h) = 744.0000	Pathway Filtered	Transported
Noble gases (Ci)	3.5011E+00	0.0000E+00
Elemental I (Ci)	1.3440E-02	0.0000E+00
Organic I (Ci)	5.9076E-04	0.0000E+00
Aerosol I (Ci)	7.3845E-04	0.0000E+00

Aerosols (Ci)	7.3845E-04	0.0000E+00
Aerosols (kg)	8.4355E-11	0.0000E+00

935

##########
I-131 Summary
##########

room Time (hr)	containment I-131 (Curies)	environment I-131 (Curies)	control I-131 (Curies)
24.000	2.3765E+01	2.2805E-02	1.6231E-04
24.004	1.5319E+02	9.5425E-01	6.7812E-03
24.017	1.4625E+02	7.8816E+00	5.5452E-02
24.350	4.6251E+01	1.0777E+02	1.3323E-01
24.600	1.9488E+01	1.3450E+02	1.4093E-01
24.850	8.2112E+00	1.4577E+02	1.3393E-01
25.100	3.4598E+00	1.5051E+02	1.2197E-01
25.350	1.4578E+00	1.5251E+02	1.0900E-01
25.600	6.1423E-01	1.5335E+02	9.6577E-02
25.850	2.5881E-01	1.5371E+02	8.5218E-02
26.000	1.5408E-01	1.5381E+02	7.8975E-02
26.250	6.4923E-02	1.5390E+02	6.9490E-02
26.500	2.7355E-02	1.5394E+02	6.1115E-02
26.750	1.1526E-02	1.5396E+02	5.3738E-02
27.000	4.8565E-03	1.5396E+02	4.7247E-02
27.250	2.0463E-03	1.5397E+02	4.1537E-02
27.500	8.6220E-04	1.5397E+02	3.6517E-02
27.750	3.6329E-04	1.5397E+02	3.2103E-02
28.000	1.5307E-04	1.5397E+02	2.8222E-02
28.250	6.4496E-05	1.5397E+02	2.4811E-02
28.500	2.7175E-05	1.5397E+02	2.1811E-02
28.750	1.1450E-05	1.5397E+02	1.9175E-02
29.000	4.8246E-06	1.5397E+02	1.6857E-02
29.250	2.0328E-06	1.5397E+02	1.4819E-02
29.500	8.5653E-07	1.5397E+02	1.3028E-02
29.750	3.6090E-07	1.5397E+02	1.1453E-02
30.000	1.5206E-07	1.5397E+02	1.0068E-02
30.250	6.4072E-08	1.5397E+02	8.8511E-03
30.500	2.6997E-08	1.5397E+02	7.7811E-03
30.750	1.1375E-08	1.5397E+02	6.8405E-03
31.000	4.7928E-09	1.5397E+02	6.0136E-03
31.250	2.0195E-09	1.5397E+02	5.2866E-03
31.500	8.5090E-10	1.5397E+02	4.6475E-03
31.750	3.5852E-10	1.5397E+02	4.0857E-03
32.000	1.5106E-10	1.5397E+02	3.5918E-03
32.250	6.3651E-11	1.5397E+02	3.1576E-03
32.500	2.6819E-11	1.5397E+02	2.7759E-03
32.750	1.1300E-11	1.5397E+02	2.4403E-03
33.000	4.7613E-12	1.5397E+02	2.1453E-03
33.250	2.0062E-12	1.5397E+02	1.8860E-03
33.500	8.4530E-13	1.5397E+02	1.6580E-03
33.750	3.5617E-13	1.5397E+02	1.4576E-03
34.000	1.5007E-13	1.5397E+02	1.2814E-03
34.250	6.3232E-14	1.5397E+02	1.1265E-03
48.000	1.4330E-34	1.5397E+02	9.4231E-07
120.000	0.0000E+00	1.5397E+02	7.2304E-23
744.000	0.0000E+00	1.5397E+02	0.0000E+00

```
#####################################################################
                        Cumulative Dose Summary
#####################################################################

          Exclusion Area Bound  Low Population Zone       control room
   Time    Thyroid      TEDE     Thyroid      TEDE     Thyroid      TEDE
   (hr)     (rem)       (rem)     (rem)       (rem)     (rem)
(rem)
   24.000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
0.0000E+00
   24.004 2.0885E-01 9.1492E-03 1.1648E-01 5.1025E-03 3.4451E-03
1.0819E-04
   24.017 1.7250E+00 7.5546E-02 9.6203E-01 4.2132E-02 1.6176E-01
5.0799E-03
   24.350 2.3579E+01 1.0268E+00 1.3150E+01 5.7265E-01 1.3240E+01
4.2077E-01
   24.600 2.9420E+01 1.2781E+00 1.6407E+01 7.1280E-01 2.6315E+01
8.3754E-01
   24.850 3.1878E+01 1.3832E+00 1.7778E+01 7.7139E-01 3.9300E+01
1.2514E+00
   25.100 3.2913E+01 1.4271E+00 1.8355E+01 7.9591E-01 5.1337E+01
1.6348E+00
   25.350 3.3349E+01 1.4456E+00 1.8598E+01 8.0618E-01 6.2174E+01
1.9798E+00
   25.600 3.3532E+01 1.4533E+00 1.8701E+01 8.1049E-01 7.1804E+01
2.2861E+00
   25.850 3.3609E+01 1.4565E+00 1.8744E+01 8.1229E-01 8.0310E+01
2.5565E+00
   26.000 3.3632E+01 1.4575E+00 1.8756E+01 8.1282E-01 8.4918E+01
2.7029E+00
   26.250 3.3632E+01 1.4575E+00 1.8767E+01 8.1327E-01 9.1853E+01
2.9231E+00
   26.500 3.3632E+01 1.4575E+00 1.8772E+01 8.1346E-01 9.7947E+01
3.1166E+00
   26.750 3.3632E+01 1.4575E+00 1.8774E+01 8.1354E-01 1.0330E+02
3.2864E+00
   27.000 3.3632E+01 1.4575E+00 1.8774E+01 8.1357E-01 1.0801E+02
3.4355E+00
   27.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1359E-01 1.1214E+02
3.5665E+00
   27.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1359E-01 1.1577E+02
3.6814E+00
   27.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1359E-01 1.1896E+02
3.7823E+00
   28.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.2176E+02
3.8709E+00
   28.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.2422E+02
3.9487E+00
   28.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.2638E+02
4.0170E+00
   28.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.2828E+02
4.0770E+00
   29.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.2995E+02
4.1297E+00
   29.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3141E+02
4.1759E+00
   29.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3270E+02
4.2165E+00
   29.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3383E+02
4.2522E+00
```

```
   30.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3482E+02
4.2835E+00
   30.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3569E+02
4.3110E+00
   30.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3646E+02
4.3351E+00
   30.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3713E+02
4.3563E+00
   31.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3773E+02
4.3749E+00
   31.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3825E+02
4.3913E+00
   31.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3870E+02
4.4057E+00
   31.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3910E+02
4.4183E+00
   32.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3946E+02
4.4294E+00
   32.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.3977E+02
4.4391E+00
   32.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4004E+02
4.4476E+00
   32.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4028E+02
4.4551E+00
   33.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4049E+02
4.4617E+00
   33.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4067E+02
4.4675E+00
   33.500 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4083E+02
4.4726E+00
   33.750 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4098E+02
4.4771E+00
   34.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4110E+02
4.4810E+00
   34.250 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4121E+02
4.4845E+00
   48.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4201E+02
4.5095E+00
  120.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4201E+02
4.5096E+00
  744.000 3.3632E+01 1.4575E+00 1.8775E+01 8.1360E-01 1.4201E+02
4.5096E+00
```

```
#######################################################################
ALION RADTRAD Version 3.10 (Summer 2005) run on  9/22/2005  at 14:58:36
#######################################################################
```

```
#######################################################################
                         Worst Two-Hour Doses
#######################################################################
```

Exclusion Area Boundary

Time (hr)	Whole Body (rem)	Thyroid (rem)	TEDE (rem)
24.0	4.2222E-01	3.3632E+01	1.4575E+00

```
#######################################################################
                         Final Doses
#######################################################################
```

Low Population Zone

Time (hr)	Whole Body (rem)	Thyroid (rem)	TEDE (rem)
744.0	2.3567E-01	1.8775E+01	8.1360E-01

control room

Time (hr)	Whole Body (rem)	Thyroid (rem)	TEDE (rem)
744.0	1.4572E-01	1.4201E+02	4.5096E+00

ATTACHMENT H

Design Calculations and Analysis Review Checklist

ALION SCIENCE AND TECHNOLOGY

ALION SCIENCE AND TECHNOLOGY	Design Calculations and Analysis Review Checklist			
	Form 3.4.2	Revision: 0	Effective: 10/11/04	41

Document No: ALION-CAL-NPPD-3236-001	**Revision No:** 1	**Review Date:** Sections 1-5.2, 6, 7 Att. A-F 9/26/05
Title: Radiological Dose Analysis for a Fuel Handling Accident (FHA) at Cooper Nuclear Station		

Criteria	Comments	Initials
Document was prepared and formatted consistent with governing procedure and is fully legible.		JLB
Title of the document is consistent with contents.		JLB
The objectives of the work are consistent with the project objectives and are clearly described.		JLB
Any acceptance criteria identified are reasonable.		JLB
The technical approach used for the analysis is clearly defined and appropriate for the stated objectives.		JLB
The technical basis for the analysis is either fully described or appropriately referenced.		JLB
Technical inputs are clearly defined, identified, and appropriately referenced.		JLB
Any codes, standards, and regulatory requirements are clearly defined, identified, and appropriately referenced.		JLB
Any assumptions made are clearly defined and adequately justified, or flagged for further verification as appropriate.		JLB
Any computer programs used are clearly identified as to name, version #, and verification status.		JLB

PAGE 03 JANBOSTELMAN 4025453981 09/26/2005 15:05

ALION SCIENCE AND TECHNOLOGY

ALION SCIENCE AND TECHNOLOGY	Design Calculations and Analysis Review Checklist			
	Form 3.4.2	Revision: 0	Effective: 10/11/04	4

Document No: ALION-CAL-NPPD-3236-01	Revision No: 1	Review Date: Attachment G
Title: Radiological Dose Analysis for a Fuel Handling Accident (FHA) at Cooper Nuclear Station		

Criteria	Comments	Initials
Document was prepared and formatted consistent with governing procedure and is fully legible.		[illegible]
Title of the document is consistent with contents.		[illegible]
The objectives of the work are consistent with the project objectives and are clearly described.		[illegible]
Any acceptance criteria identified are reasonable.		[illegible]
The technical approach used for the analysis is clearly defined and appropriate for the stated objectives.		[illegible]
The technical basis for the analysis is either fully described or appropriately referenced.		[illegible]
Technical inputs are clearly defined, identified, and appropriately referenced.		[illegible]
Any codes, standards, and regulatory requirements are clearly defined, identified, and appropriately referenced.		[illegible]
Any assumptions made are clearly defined and adequately justified, or flagged for further verification as appropriate.		[illegible]
Any computer programs used are clearly identified as to name, version #, and verification status.	Verification Not identified	

ALION SCIENCE AND TECHNOLOGY

Any computer programs used are appropriate for their intended use.		JLB
The calculations/analyses are clearly presented and are consistent with the stated technical approach, design inputs, and assumptions.		JLB
Where results rely on computer calculations, the work clearly references the supporting computer runs, and the input and output listings are provided.		JLB
Where computer calculations are used, appropriate analysis parameters are used.		JLB
Analytical steps in the analyses can be verified without recourse to the originator.		JLB
The results presented are reasonable.		JLB
The conclusions presented are reasonable.		JLB
Any acceptance criteria identified have been met.		JLB
Revision history, if applicable, clearly documents revisions.		JLB
Appropriate quality requirements, including choice of governing procedure, have been identified.		JLB
Where appropriate, applicable construction and operating experience has been considered.	NA	JLB
Where appropriate, the specified parts, equipment, and processes are suitable for the required application.		JLB
Where appropriate, specified materials are compatible with each other and the design environmental conditions to which they will be exposed.		JLB
Where appropriate, adequate maintenance features and requirements are specified.		JLB
Where appropriate, accessibility and other design provisions are adequate for performance of routine maintenance and repair.		JLB

ALION SCIENCE AND TECHNOLOGY

Any computer programs used are appropriate for their intended use.		
The calculations/analyses are clearly presented and are consistent with the stated technical approach, design inputs, and assumptions.		
Where results rely on computer calculations, the work clearly references the supporting computer runs, and the input and output listings are provided.		
Where computer calculations are used, appropriate analysis parameters are used.		
Analytical steps in the analyses can be verified without recourse to the originator.		
The results presented are reasonable.		
The conclusions presented are reasonable.		
Any acceptance criteria identified have been met.		
Revision history, if applicable, clearly documents revisions.		
Appropriate quality requirements, including choice of governing procedure, have been identified.		
Where appropriate, applicable construction and operating experience has been considered.	N/A	
Where appropriate, the specified parts, equipment, and processes are suitable for the required application.		
Where appropriate, specified materials are compatible with each other and the design environmental conditions to which they will be exposed.		
Where appropriate, adequate maintenance features and requirements are specified.		
Where appropriate, accessibility and other design provisions are adequate for performance of routine maintenance and repair.	N/A	

09/26/2005 15:05 JANBOSTELMAN PAGE 07
09/26/2005 14:45 ALION SCIENCE AND TE PAGE 03
405-872-0233 4072453981

ALION
SCIENCE AND TECHNOLOGY

Where appropriate, adequate accessibility is provided to perform the in-service inspection required during system life.		JLB
Where appropriate, design considered radiation exposure to the public and plant personnel.		JLB
Where appropriate, adequate handling, storage, cleaning, and shipping requirements have been specified.		JLB
Where appropriate, adequate identification requirements have been specified.		JLB

ALION SCIENCE AND TECHNOLOGY

Where appropriate, adequate accessibility is provided to perform the in-service inspection required during system life.	N/A	
Where appropriate, design considered radiation exposure to the public and plant personnel.		
Where appropriate, adequate handling, storage, cleaning, and shipping requirements have been specified.		
Where appropriate, adequate identification requirements have been specified.	N/A	

PAGE 08
PAGE 04
JANBOSTELMAN
ALION SCIENCE AND TE
09/26/2005 14:41 4072453361 DOC-8/72235