

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

CHAPTER 7

ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS INVOLVING RADIOACTIVE  
MATERIALS

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**ACRONYMS AND ABBREVIATIONS**

| <u>Acronyms</u>     | <u>Definitions</u>                |
|---------------------|-----------------------------------|
| ABWR                | Advanced Boiling Water Reactor    |
| AP1000              | Advanced Passive 1000             |
| AST                 | Alternative Source Term           |
| BWR                 | boiling water reactor             |
| CDF                 | Core Damage Frequency             |
| Ci                  | curie                             |
| Ci/yr               | curies per year                   |
| COL                 | combined license                  |
| DBA                 | design basis accident             |
| DCD                 | Design Certification Document     |
| DOE                 | U. S. Department of Energy        |
| ESP                 | early site permit                 |
| ESPA                | early site permit application     |
| ft.                 | feet                              |
| ft <sup>3</sup>     | cubic feet                        |
| ft <sup>3</sup> /yr | cubic feet per year               |
| gpd                 | gallons per day                   |
| HCGS                | Hope Creek Generating Station     |
| HIC                 | high integrity container          |
| hr.                 | hour                              |
| HRCQ                | highway route controlled quantity |
| km                  | kilometer                         |
| lb.                 | pound                             |
| LOCA                | Loss of Coolant Accident          |
| LPGS                | Liquid Pathway Generic Study      |
| LPZ                 | Low Population Zone               |
| LWR                 | light water reactor               |
| m                   | meter                             |
| m <sup>3</sup>      | cubic meter                       |
| MBq                 | megabecquerel                     |
| mi.                 | Miles                             |

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**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

| <u>Acronyms</u> | <u>Definitions</u>                      |
|-----------------|-----------------------------------------|
| MTU             | metric ton of uranium                   |
| MW              | megawatt                                |
| MWd/MTU         | megawattdays per metric ton of uranium  |
| MWe             | megawatts electric                      |
| MWt             | megawatts thermal                       |
| NRC             | U.S. Nuclear Regulatory Commission      |
| PPE             | plant parameter envelope                |
| PSEG            | PSEG Power, LLC and PSEG Nuclear, LLC   |
| PWR             | pressurized water reactor               |
| sec.            | second(s)                               |
| SSAR            | Site Safety Analysis Report             |
| Sv              | sievert                                 |
| TEDE            | Total Effective Dose Equivalent         |
| U.S. EPR        | U.S. Evolutionary Power Reactor         |
| U-235           | uranium-235                             |
| US-APWR         | U.S. Advanced Pressurized Water Reactor |
| yr              | year                                    |



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## **CHAPTER 7**

### **ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS INVOLVING RADIOACTIVE MATERIALS**

This chapter evaluates the environmental impacts of postulated accidents involving radioactive materials. Section 7.1 discusses design basis accidents (DBAs). Section 7.2 discusses the impacts of severe accidents. Section 7.3 discusses severe accident mitigation alternatives. Section 7.4 discusses transportation accidents.

#### **7.1 DESIGN BASIS ACCIDENTS**

PSEG is considering constructing a new plant at the PSEG Site. The designs under consideration include an Advanced Boiling Water Reactor (ABWR), an Advanced Passive 1000 Reactor (AP1000) (dual unit), a U.S. Evolutionary Power Reactor (U.S. EPR), or a U.S. Advanced Pressurized Water Reactor (US-APWR). All of these designs are light water reactors (LWR). This section evaluates the radiological consequences of DBAs for the four reactor technologies.

##### **7.1.1 SELECTION OF DESIGN BASIS ACCIDENTS**

NUREG-1555, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan*, Section 7.1 Appendix A states that all DBAs having the potential to release activity to the environment must be identified. Due to differences in reactor technologies, not all accidents identified in NUREG-1555 apply to each reactor design. Tables 7.1-1 through 7.1-4 provide lists of applicable accidents corresponding to the different reactor technologies.

##### **7.1.2 EVALUATION METHODOLOGY**

Doses for selected accidents involving possible fission product release are evaluated at the exclusion area boundary (EAB) and at the outer boundary of the low population zone (LPZ) to demonstrate the new plant's capabilities to mitigate the radiological consequences of an accident. Although the emergency safeguard features are expected to prevent core damage and mitigate the radioactivity release, the bounding Loss of Coolant Accident (LOCA) analysis presumes substantial core damage with fission product release. Other DBAs of lesser magnitude, but greater frequencies of occurrence, are not expected to approach the 10 CFR 50.34, *Contents of Applications; Technical Information*, or 10 CFR 100, *Reactor Site Criteria*, limits as closely as a LOCA. For these accidents, the more restrictive dose limits in Regulatory Guide (RG) 1.183, *Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes*, Revision 0, 2000, and NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition*, are invoked to determine if the accidents are acceptable from an overall risk perspective. Accident doses to an individual are evaluated at any point on the EAB and at any point on the outer boundary of the LPZ to meet limits specified in 10 CFR 50.34 and 10 CFR 100. Radiological consequences related to control room personnel are evaluated as part of the combined license (COL) review.

The dose to an individual located on the EAB or the outer boundary of the LPZ is calculated based on the amount of activity released to the environment through multiple pathways, the

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atmospheric dispersion of the activity during transport from the release point to the dose point, the breathing rate of the individual at the dose point location and the activity-to-dose conversion factors. The atmospheric dispersion factor ( $\chi/Q$ ) is the only site-specific parameter required for determining the dose to an individual. The Design Certification Documents (DCDs) have developed  $\chi/Q$  values that are not expected to be exceeded at most reactor sites. For this evaluation, the accident doses at the EAB and the outer boundary of the LPZ are calculated using the ratio of the site-specific and design certified  $\chi/Q$  values for each respective reactor technology and then compared to the acceptance criteria in RG 1.183 and NUREG-0800. Site-specific  $\chi/Q$  values are based on on-site meteorology and described in Site Safety Analysis Report (SSAR) Section 2.3. Site-specific short-term directional dependent  $\chi/Q$  values are calculated for the PSEG Site using on-site meteorological data and the RG 1.145, *Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants*, Revision 1, 1983, methodology.

The accident dose evaluations are performed using  $\chi/Q$ s and activity releases for the following intervals.

| <u>EAB</u> | <u>LPZ</u>    |
|------------|---------------|
| 0 to 2 hr. | 0 to 8 hr.    |
|            | 8 to 24 hr.   |
|            | 24 to 96 hr.  |
|            | 96 to 720 hr. |

The zero to two hour  $\chi/Q$  value is used for the two hour release duration with the greatest dose consequence at the EAB. Accident doses for the ABWR are expressed as whole body and thyroid doses consistent with 10 CFR 100. Accident doses for the other reactor technologies evaluated are expressed in total effective dose equivalent (TEDE) consistent with 10 CFR 50.34.

Note that SSAR Chapter 15 uses conservative assumptions to perform bounding safety analyses. One such assumption is the use of the 95<sup>th</sup> percentile  $\chi/Q$  values. These analyses overstate the environmental impact of the DBAs. Consistent with NUREG-1555, this section uses 50<sup>th</sup> percentile  $\chi/Q$  values that correspond to the annual average meteorology, and better reflect probable accident conditions.

#### 7.1.3 SOURCE TERMS

Dose estimates are calculated using time-dependent activities released to the environment for each DBA. The activities are based on the analyses used to support the reactor standard safety analysis reports submitted with the DCD. Each reactor technology uses different source terms and approaches in defining the activity releases.

The US-APWR source terms are calculated using the guidance in NUREG-0800 and RG 1.183. US-APWR source terms are listed in Tables 7.1-5 through 7.1-13, and are obtained from the US-APWR DCD (Reference 7.1-3). LOCA activity releases are calculated for a reactor power level of 4555 megawatts thermal (MWt) (102 percent of rated NSSS power of 4466 MWt). Activity releases for other accidents are calculated for a reactor power level equal to or less than that of the LOCA.

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The ABWR source terms are calculated using the guidance in RG 1.3, *Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors*, Revision 2, 1974; RG 1.25, *Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors*, Revision 0, 1972; and TID-14844, *Calculation of Distance Factors for Power and Test Reactor Sites*, 1962. The ABWR DCD source terms are given for a reactor power level of 4005 MWt. An uprated, 4300 MWt version of the ABWR is being considered for the PSEG Site. Source terms are calculated for a reactor power level of 4386 MWt (102 percent of the uprated 4300 MWt) by multiplying the source terms in the ABWR DCD (Reference 7.1-2) by a factor of 1.095 (4386/4005), because activity releases scale directly with power. This approach is used for accidents that involve postulated fuel damage (LOCA and fuel handling accidents). The source terms for the ABWR are listed in Tables 7.1-14 through 7.1-18, and are obtained from the ABWR DCD (Reference 7.1-2).

The AP1000 source terms and approaches to assessing accidents are based on the Alternative Source Term (AST) methods as described in NUREG-1465, *Accident Source Terms for Light-Water Nuclear Power Plants*, 1995, and are in accordance with RG 1.183. Activity releases are calculated at a power level of 3468 MWt (102 percent of rated core power of 3400 MWt). The source terms for the AP1000 are listed in Tables 7.1-19 through 7.1-27.

The U.S. EPR source terms and approaches to assessing accidents are calculated in accordance with NUREG-0800 and RG 1.183. Activity releases are calculated for a reactor power level of 4612 MWt (4590 MWt rated core power + 22 MWt heat balance measurement uncertainty). The source terms for the U.S. EPR are listed in Tables 7.1-28 through 7.1-37.

#### 7.1.4 DOSE CONSEQUENCES

PSEG Site-specific radiation doses at EAB and LPZ are calculated for the applicable postulated DBAs for the four reactor technologies. These PSEG Site-specific doses are calculated by multiplying the reactor DCD dose by the ratio of the site annual average  $\chi/Q$  value to the DCD  $\chi/Q$  value. All PSEG Site-specific annual average  $\chi/Q$  values are bounded by the DCD  $\chi/Q$  values, therefore all site-specific doses are bounded by DCD doses. The site-specific analysis results demonstrate that all US-APWR, AP1000, and U.S. EPR accident doses meet the site acceptance criteria of 10 CFR 50.34. The results also demonstrate that all ABWR accident doses meet the site acceptance criteria of 10 CFR 100.

The ABWR DCD doses are calculated for a reactor power level of 4005 MWt. An uprated, 4300 MWt version of the ABWR is being considered at the PSEG Site. The power uprate only affects doses of accidents that involve fuel damage (LOCA and fuel handling accidents). Doses for these two accidents are calculated for a reactor power level of 4386 MWt (102 percent of the uprated 4300 MWt) by multiplying the site-specific doses by a factor of 1.095 (4386/4005), since activity releases and thus doses are proportional to power. Reactor technology data table locations are listed below:

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| <b><u>Reactor Technology</u></b> | <b><u><math>\gamma</math>/Q Data Table</u></b> | <b><u>Dose Data Table</u></b> |
|----------------------------------|------------------------------------------------|-------------------------------|
| US-APWR                          | Table 7.1-38                                   | Table 7.1-39                  |
| ABWR                             | Table 7.1-40                                   | Tables 7.1-41 through 45      |
| AP1000                           | Table 7.1-46                                   | Tables 7.1-48 through 7.1-54  |
| U.S. EPR                         | Table 7.1-55                                   | Table 7.1-56                  |

7.1.5 REFERENCES

- 7.1-1 AREVA, Design Certification Document for the U.S. Evolutionary Power Reactor (U.S. EPR), Revision 0.
- 7.1-2 GE, Design Certification Document for the Advanced Boiling Water Reactor (ABWR), Revision 4.
- 7.1-3 Mitsubishi, Design Certification Document for the U.S. Advanced Pressurized Water Reactor (US-APWR), Revision 1.
- 7.1-4 Westinghouse, Design Certification Document (DCD) for the Advanced Passive 1000 (AP1000) Reactor, Revision 17.

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**Table 7.1-1  
US-APWR Design Basis Accident List**

| <b>NUREG-1555 DBA Descriptions</b>                                                                                              | <b>Consequences<br/>Tabulated</b> | <b>Remarks</b>                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 15.1.5A - Main Steam Line Failures<br>Outside Containment of a PWR                                                              | Yes                               |                                                                                                                            |
| 15.2.8 - Feedwater System Pipe<br>Breaks Inside and Outside<br>Containment (PWR)                                                | No                                | Bounded by the main steam line<br>break accident, as discussed in<br>US-APWR DCD Subsection<br>15.2.8.5 (Reference 7.1-3). |
| 15.3.3 - Reactor Coolant Pump Rotor<br>Seizure                                                                                  | Yes                               |                                                                                                                            |
| 15.3.4 - Reactor Coolant Pump Shaft<br>Break                                                                                    | No                                | Bounded by the RCP rotor seizure<br>accident, as discussed in<br>US-APWR DCD Subsection 15.3.4<br>(Reference 7.1-3).       |
| 15.4.9A - Control Rod Drop Accident<br>(BWR)                                                                                    | No                                | N/A                                                                                                                        |
| 15.6.2 - Failure of Small Lines<br>Carrying Primary Coolant Outside<br>Containment                                              | Yes                               |                                                                                                                            |
| 15.6.3 - Steam Generator Tube<br>Failure (PWR)                                                                                  | Yes                               |                                                                                                                            |
| 15.6.5A - Design Basis Loss of<br>Coolant Accident Including<br>Containment Leakage Contribution                                | Yes                               | Included in LOCA analysis                                                                                                  |
| 15.6.5B - Design Basis Loss of<br>Coolant Accident: Leakage From<br>Engineered Safety Feature<br>Components Outside Containment | Yes                               | Included in LOCA analysis                                                                                                  |
| 15.6.5D - Design Basis Loss of<br>Coolant Accident: Leakage From Main<br>Steam Isolation Valve Leakage<br>Control System (BWR)  | No                                | N/A                                                                                                                        |
| 15.7.4 - Fuel Handling Accidents                                                                                                | Yes                               |                                                                                                                            |
| <b>Other Accident Descriptions</b>                                                                                              | <b>Consequences<br/>Tabulated</b> | <b>Remarks</b>                                                                                                             |
| Spectrum of Rod Ejection Accidents<br>(PWR)                                                                                     | Yes                               |                                                                                                                            |

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**Table 7.1-2  
ABWR Design Basis Accident List**

| <b>NUREG-1555 DBA Descriptions</b>                                                                                     | <b>Consequences<br/>Tabulated</b> |     | <b>Remarks</b>                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15.1.5A - Main Steam Line Failures Outside Containment of a PWR                                                        | No                                | N/A |                                                                                                                                                      |
| 15.2.8 - Feedwater System Pipe Breaks Inside and Outside Containment (PWR)                                             | No                                | N/A |                                                                                                                                                      |
| 15.3.3 - Reactor Coolant Pump Rotor Seizure                                                                            | No                                |     | Accident does not result in any fuel failures, thus has no radiological consequences as discussed in ABWR DCD Subsection 15.3.4.5 (Reference 7.1-2). |
| 15.3.4 - Reactor Coolant Pump Shaft Break                                                                              | No                                |     | Accident does not result in any fuel failures, thus has no radiological consequences as discussed in ABWR DCD Subsection 15.3.4.5 (Reference 7.1-2). |
| 15.4.9A - Control Rod Drop Accident (BWR)                                                                              | No                                |     | There is no basis for this accident to occur, as discussed in ABWR DCD 15.4.10.3 (Reference 7.1-2).                                                  |
| 15.6.2 - Failure of Small Lines Carrying Primary Coolant Outside Containment                                           | Yes                               |     |                                                                                                                                                      |
| 15.6.3 - Steam Generator Tube Failure (PWR)                                                                            | No                                | N/A |                                                                                                                                                      |
| 15.6.5A - Design Basis Loss of Coolant Accident Including Containment Leakage Contribution                             | Yes                               |     | Included in LOCA analysis                                                                                                                            |
| 15.6.5B - Design Basis Loss of Coolant Accident: Leakage From Engineered Safety Feature Components Outside Containment | Yes                               |     | Included in LOCA analysis                                                                                                                            |
| 15.6.5D - Design Basis Loss of Coolant Accident: Leakage From Main Steam Isolation Valve Leakage Control System (BWR)  | Yes                               |     | Included in LOCA analysis                                                                                                                            |
| 15.7.4 - Fuel Handling Accidents                                                                                       | Yes                               |     |                                                                                                                                                      |
| <b>Other Accident Descriptions</b>                                                                                     | <b>Consequences<br/>Tabulated</b> |     | <b>Remarks</b>                                                                                                                                       |
| Main Steam Line Break                                                                                                  | Yes                               |     |                                                                                                                                                      |

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**Table 7.1-3  
AP1000 Design Basis Accident List**

| <b>NUREG-1555 DBA Descriptions</b>                                                                                     | <b>Consequences<br/>Tabulated</b> | <b>Remarks</b>                                                                                           |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------|
| 15.1.5A - Main Steam Line Failures Outside Containment of a PWR                                                        | Yes                               |                                                                                                          |
| 15.2.8 - Feedwater System Pipe Breaks Inside and Outside Containment (PWR)                                             | No                                | Bounded by steam system piping failures, as discussed in AP1000 DCD Subsection 15.1.5 (Reference 7.1-4). |
| 15.3.3 - Reactor Coolant Pump Rotor Seizure                                                                            | Yes                               |                                                                                                          |
| 15.3.4 - Reactor Coolant Pump Shaft Break                                                                              | No                                | Bounded by RCP rotor seizure accident, as discussed in AP1000 DCD Subsection 15.3.3 (Reference 7.1-4).   |
| 15.4.9A - Control Rod Drop Accident (BWR)                                                                              | No                                | N/A                                                                                                      |
| 15.6.2 - Failure of Small Lines Carrying Primary Coolant Outside Containment                                           | Yes                               |                                                                                                          |
| 15.6.3 - Steam Generator Tube Failure (PWR)                                                                            | Yes                               |                                                                                                          |
| 15.6.5A - Design Basis Loss of Coolant Accident Including Containment Leakage Contribution                             | Yes                               | Included in LOCA analysis                                                                                |
| 15.6.5B - Design Basis Loss of Coolant Accident: Leakage From Engineered Safety Feature Components Outside Containment | Yes                               | Included in LOCA analysis                                                                                |
| 15.6.5D - Design Basis Loss of Coolant Accident: Leakage From Main Steam Isolation Valve Leakage Control System (BWR)  | No                                | N/A                                                                                                      |
| 15.7.4 - Fuel Handling Accidents                                                                                       | Yes                               |                                                                                                          |
| <br>                                                                                                                   |                                   |                                                                                                          |
| <b>Other Accident Descriptions</b>                                                                                     | <b>Consequences<br/>Tabulated</b> | <b>Remarks</b>                                                                                           |
| Spectrum of Rod Cluster Control Assembly Ejection Accidents                                                            | Yes                               |                                                                                                          |

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**Table 7.1-4  
U.S. EPR Design Basis Accident List**

| <b>NUREG-1555 DBA Descriptions</b>                                                                                              | <b>Consequences<br/>Tabulated</b> | <b>Remarks</b>                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 15.1.5A - Main Steam Line Failures<br>Outside Containment of a PWR                                                              | Yes                               |                                                                                                                     |
| 15.2.8 - Feedwater System Pipe<br>Breaks Inside and Outside<br>Containment (PWR)                                                | No                                | Bounded by steam system piping<br>failures, as discussed in U.S. EPR<br>DCD Subsection 15.1.5 (Reference<br>7.1-1). |
| 15.3.3 - Reactor Coolant Pump Rotor<br>Seizure                                                                                  | Yes                               |                                                                                                                     |
| 15.3.4 - Reactor Coolant Pump Shaft<br>Break                                                                                    | No                                | Bounded by RCP rotor seizure<br>accident, as discussed in U.S. EPR<br>DCD Subsection 15.3.4 (Reference<br>7.1-1).   |
| 15.4.9A - Control Rod Drop Accident<br>(BWR)                                                                                    | No                                | N/A                                                                                                                 |
| 15.6.2 - Failure of Small Lines<br>Carrying Primary Coolant Outside<br>Containment                                              | Yes                               |                                                                                                                     |
| 15.6.3 - Steam Generator Tube<br>Failure (PWR)                                                                                  | Yes                               |                                                                                                                     |
| 15.6.5A - Design Basis Loss of<br>Coolant Accident Including<br>Containment Leakage Contribution                                | Yes                               | Included in LOCA analysis                                                                                           |
| 15.6.5B - Design Basis Loss of<br>Coolant Accident: Leakage From<br>Engineered Safety Feature<br>Components Outside Containment | Yes                               | Included in LOCA analysis                                                                                           |
| 15.6.5D - Design Basis Loss of<br>Coolant Accident: Leakage From Main<br>Steam Isolation Valve Leakage<br>Control System (BWR)  | No                                | N/A                                                                                                                 |
| 15.7.4 - Fuel Handling Accidents                                                                                                | Yes                               |                                                                                                                     |
| <b>Other Accident Descriptions</b>                                                                                              | <b>Consequences<br/>Tabulated</b> | <b>Remarks</b>                                                                                                      |
| Rod Ejection Accident                                                                                                           | Yes                               |                                                                                                                     |



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**Table 7.1-5 (Sheet 1 of 2)  
US-APWR Source Terms  
Time Dependent Released Activity during LOCA (Ci)**

| <b>Nuclide</b>              | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|-----------------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| <b>Noble Gases</b>          |                   |                    |                     |                      |              |
| Kr-85                       | 7.75E+02          | 1.74E+03           | 3.92E+03            | 3.35E+04             | 3.99E+04     |
| Kr-85m                      | 9.16E+03          | 4.37E+03           | 1.99E+02            | 0.00E+00             | 1.37E+04     |
| Kr-87                       | 3.54E+03          | 7.83E+01           | 0.00E+00            | 0.00E+00             | 3.62E+03     |
| Kr-88                       | 1.68E+04          | 3.68E+03           | 3.70E+01            | 0.00E+00             | 2.05E+04     |
| Xe-133                      | 1.26E+05          | 2.76E+05           | 4.93E+05            | 9.77E+05             | 1.87E+06     |
| Xe-135                      | 3.79E+04          | 4.05E+04           | 9.60E+03            | 4.41E+01             | 8.80E+04     |
| <b>Iodines</b>              |                   |                    |                     |                      |              |
| I-131                       | 1.42E+03          | 5.61E+02           | 1.85E+03            | 5.60E+03             | 9.43E+03     |
| I-132                       | 1.50E+03          | 1.01E+02           | 2.22E+02            | 2.48E+02             | 2.07E+03     |
| I-133                       | 2.67E+03          | 7.37E+02           | 8.09E+02            | 8.07E+01             | 4.30E+03     |
| I-134                       | 4.22E+02          | 1.84E-01           | 0.00E+00            | 0.00E+00             | 4.22E+02     |
| I-135                       | 1.95E+03          | 2.44E+02           | 4.67E+01            | 1.20E-01             | 2.24E+03     |
| <b>Alkali Metals</b>        |                   |                    |                     |                      |              |
| Rb-86                       | 1.44E+00          | 1.60E-02           | 0.00E+00            | 0.00E+00             | 1.45E+00     |
| Cs-134                      | 1.44E+02          | 1.62E+00           | 0.00E+00            | 0.00E+00             | 1.46E+02     |
| Cs-136                      | 3.90E+01          | 4.31E-01           | 0.00E+00            | 0.00E+00             | 3.94E+01     |
| Cs-137                      | 8.19E+01          | 9.21E-01           | 1.00E-03            | 0.00E+00             | 8.28E+01     |
| <b>Tellurium Group</b>      |                   |                    |                     |                      |              |
| Sb-127                      | 1.04E+01          | 1.26E-01           | 1.00E-05            | 0.00E+00             | 1.05E+01     |
| Sb-129                      | 1.99E+01          | 6.87E-02           | 0.00E+00            | 0.00E+00             | 2.00E+01     |
| Te-127                      | 1.04E+01          | 1.30E-01           | 0.00E+00            | 0.00E+00             | 1.05E+01     |
| Te-127m                     | 1.39E+00          | 1.80E-02           | 0.00E+00            | 0.00E+00             | 1.40E+00     |
| Te-129                      | 2.30E+01          | 1.12E-01           | 0.00E+00            | 0.00E+00             | 2.31E+01     |
| Te-129m                     | 4.75E+00          | 6.13E-02           | 0.00E+00            | 0.00E+00             | 4.81E+00     |
| Te-131m                     | 1.36E+01          | 1.44E-01           | 0.00E+00            | 0.00E+00             | 1.37E+01     |
| Te-132                      | 1.41E+02          | 1.71E+00           | 1.00E-04            | 0.00E+00             | 1.43E+02     |
| <b>Strontium and Barium</b> |                   |                    |                     |                      |              |
| Sr-89                       | 4.74E+01          | 6.12E-01           | 0.00E+00            | 0.00E+00             | 4.80E+01     |
| Sr-90                       | 3.93E+00          | 5.10E-02           | 0.00E+00            | 0.00E+00             | 3.98E+00     |
| Sr-91                       | 5.01E+01          | 3.54E-01           | 1.00E-03            | 0.00E+00             | 5.05E+01     |
| Sr-92                       | 3.11E+01          | 4.95E-02           | 0.00E+00            | 0.00E+00             | 3.11E+01     |
| Ba-139                      | 1.96E+01          | 5.04E-03           | 0.00E+00            | 0.00E+00             | 1.96E+01     |
| Ba-140                      | 7.49E+01          | 9.53E-01           | 0.00E+00            | 0.00E+00             | 7.59E+1      |

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**Table 7.1-5 (Sheet 2 of 2)  
US-APWR Source Terms  
Time Dependent Released Activity during LOCA (Ci)<sup>(a)</sup>**

| <b>Nuclide</b>      | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|---------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Metals</b> |                   |                    |                     |                      |                 |
| Co-58               | 3.36E-03          | 4.50E-08           | 0.00E+00            | 0.00E+00             | 3.36E-03        |
| Co-60               | 1.59E-02          | 2.00E-04           | 1.01E-06            | 0.00E+00             | 1.61E-02        |
| Mo-99               | 9.57E+00          | 1.11E-01           | 1.00E-04            | 0.00E+00             | 9.68E+00        |
| Tc-99m              | 8.50E+00          | 1.04E-01           | 1.00E-04            | 0.00E+00             | 8.60E+00        |
| Ru-103              | 7.62E+00          | 9.83E-02           | 1.01E-04            | 0.00E+00             | 7.72E+00        |
| Ru-105              | 3.14E+00          | 1.12E-02           | 0.00E+00            | 0.00E+00             | 3.15E+00        |
| Ru-106              | 2.67E+00          | 3.46E-02           | 0.00E+00            | 0.00E+00             | 2.70E+00        |
| Rh-105              | 4.61E+00          | 5.41E-02           | 0.00E+00            | 0.00E+00             | 4.67E+00        |
| <b>Lanthanides</b>  |                   |                    |                     |                      |                 |
| Y-90                | 7.44E-02          | 5.12E-03           | 6.06E-06            | 0.00E+00             | 7.96E-02        |
| Y-91                | 6.00E-01          | 8.54E-03           | 0.00E+00            | 0.00E+00             | 6.09E-01        |
| Y-92                | 4.13E+00          | 1.04E-01           | 0.00E+00            | 0.00E+00             | 4.24E+00        |
| Y-93                | 5.90E-01          | 4.32E-03           | 0.00E+00            | 0.00E+00             | 5.94E-01        |
| Zr-95               | 7.55E-01          | 9.76E-03           | 0.00E+00            | 0.00E+00             | 7.65E-01        |
| Zr-97               | 6.65E-01          | 6.12E-03           | 0.00E+00            | 0.00E+00             | 6.71E-01        |
| Nb-95               | 7.60E-01          | 9.85E-03           | 1.01E-05            | 0.00E+00             | 7.69E-01        |
| La-140              | 1.76E+00          | 1.43E-01           | 2.02E-04            | 0.00E+00             | 1.90E+00        |
| La-141              | 4.25E-01          | 1.29E-03           | 0.00E+00            | 0.00E+00             | 4.27E-01        |
| La-142              | 2.01E-01          | 7.07E-05           | 0.00E+00            | 0.00E+00             | 2.01E-01        |
| Pr-143              | 6.74E-01          | 8.91E-03           | 1.00E-05            | 0.00E+00             | 6.83E-01        |
| Nd-147              | 2.80E-01          | 3.55E-03           | 0.00E+00            | 0.00E+00             | 2.83E-01        |
| Am-241              | 7.51E-05          | 9.77E-07           | 0.00E+00            | 0.00E+00             | 7.60E-05        |
| Cm-242              | 1.86E-02          | 2.41E-04           | 0.00E+00            | 0.00E+00             | 1.88E-02        |
| Cm-244              | 2.26E-03          | 2.93E-05           | 0.00E+00            | 0.00E+00             | 2.29E-03        |
| <b>Cerium Group</b> |                   |                    |                     |                      |                 |
| Ce-141              | 1.78E+00          | 2.29E-02           | 0.00E+00            | 0.00E+00             | 1.80E+00        |
| Ce-143              | 1.63E+00          | 1.78E-02           | 0.00E+00            | 0.00E+00             | 1.65E+00        |
| Ce-144              | 1.35E+00          | 1.75E-02           | 0.00E+00            | 0.00E+00             | 1.36E+00        |
| Np-239              | 1.85E+01          | 2.16E-01           | 1.00E-05            | 0.00E+00             | 1.87E+01        |
| Pu-238              | 5.30E-03          | 6.88E-05           | 0.00E+00            | 0.00E+00             | 5.37E-03        |
| Pu-239              | 4.00E-04          | 5.19E-06           | 0.00E+00            | 0.00E+00             | 4.05E-04        |
| Pu-240              | 6.28E-04          | 8.14E-06           | 1.01E-08            | 0.00E+00             | 6.36E-04        |
| Pu-241              | 1.39E-01          | 1.81E-03           | 0.00E+00            | 0.00E+00             | 1.41E-01        |
| <b>Total</b>        | <b>2.03E+05</b>   | <b>3.28E+05</b>    | <b>5.09E+05</b>     | <b>1.02E+06</b>      | <b>2.06E+06</b> |

a) LOCA is calculated at a reactor power level of 4555 MWt (102% of 4466 MWt NSSS).

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**Table 7.1-6  
US-APWR Source Terms  
Time Dependent Released Activity during Steam System Piping Failure (Ci)  
(Transient-Initiated Iodine Spike)<sup>(a)</sup>**

| <b>Nuclide</b>       | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b>   |                   |                    |                     |                      |                 |
| Kr-85                | 3.21E+01          | 2.40E+01           | 0.00E+00            | 0.00E+00             | 5.61E+01        |
| Kr-85m               | 3.56E-01          | 8.77E-02           | 0.00E+00            | 0.00E+00             | 4.43E-01        |
| Kr-87                | 9.12E-02          | 1.13E-03           | 0.00E+00            | 0.00E+00             | 9.23E-02        |
| Kr-88                | 5.10E-01          | 6.46E-02           | 0.00E+00            | 0.00E+00             | 5.74E-01        |
| Xe-133               | 1.08E+02          | 8.03E+01           | 0.00E+00            | 0.00E+00             | 1.88E+02        |
| Xe-135               | 7.61E+00          | 1.33E+01           | 0.00E+00            | 0.00E+00             | 2.09E+01        |
| <b>Iodines</b>       |                   |                    |                     |                      |                 |
| I-131                | 5.05E+01          | 6.50E+01           | 0.00E+00            | 0.00E+00             | 1.16E+02        |
| I-132                | 9.89E+00          | 1.49E+00           | 0.00E+00            | 0.00E+00             | 1.14E+01        |
| I-133                | 7.65E+01          | 8.09E+01           | 0.00E+00            | 0.00E+00             | 1.57E+02        |
| I-134                | 3.77E+00          | 9.11E-03           | 0.00E+00            | 0.00E+00             | 3.78E+00        |
| I-135                | 3.77E+01          | 2.45E+01           | 0.00E+00            | 0.00E+00             | 6.21E+01        |
| <b>Alkali Metals</b> |                   |                    |                     |                      |                 |
| Rb-86                | 8.64E-02          | 1.62E-03           | 0.00E+00            | 0.00E+00             | 8.80E-02        |
| Cs-134               | 8.80E+00          | 1.68E-01           | 0.00E+00            | 0.00E+00             | 8.97E+00        |
| Cs-136               | 2.32E+00          | 4.33E-02           | 0.00E+00            | 0.00E+00             | 2.37E+00        |
| Cs-137               | 5.01E+00          | 9.56E-02           | 0.00E+00            | 0.00E+00             | 5.11E+00        |
| <b>Total</b>         | <b>3.43E+02</b>   | <b>2.90E+02</b>    | <b>0.00E+00</b>     | <b>0.00E+00</b>      | <b>6.33E+02</b> |

a) Steam system piping failure is calculated at a reactor power level of 4540 MWt (102 percent of 4451 MWt core thermal power).

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**Table 7.1-7  
US-APWR Source Terms  
Time Dependent Released Activity during Steam System Piping Failure (Ci)  
(Pre-Transient Iodine Spike)<sup>(a)</sup>**

| <b>Nuclide</b>       | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b>   |                   |                    |                     |                      |                 |
| Kr-85                | 3.21E+01          | 2.40E+01           | 0.00E+00            | 0.00E+00             | 5.61E+01        |
| Kr-85m               | 3.56E-01          | 8.77E-02           | 0.00E+00            | 0.00E+00             | 4.43E-01        |
| Kr-87                | 9.12E-02          | 1.13E-03           | 0.00E+00            | 0.00E+00             | 9.23E-02        |
| Kr-88                | 5.10E-01          | 6.46E-02           | 0.00E+00            | 0.00E+00             | 5.74E-01        |
| Xe-133               | 1.07E+02          | 7.75E+01           | 0.00E+00            | 0.00E+00             | 1.85E+02        |
| Xe-135               | 4.38E+00          | 3.39E+00           | 0.00E+00            | 0.00E+00             | 7.78E+00        |
| <b>Iodines</b>       |                   |                    |                     |                      |                 |
| I-131                | 1.72E+01          | 7.25E+00           | 0.00E+00            | 0.00E+00             | 2.44E+01        |
| I-132                | 6.18E+00          | 1.66E-01           | 0.00E+00            | 0.00E+00             | 6.35E+00        |
| I-133                | 2.79E+01          | 9.03E+00           | 0.00E+00            | 0.00E+00             | 3.69E+01        |
| I-134                | 3.49E+00          | 1.01E-03           | 0.00E+00            | 0.00E+00             | 3.49E+00        |
| I-135                | 1.62E+01          | 2.73E+00           | 0.00E+00            | 0.00E+00             | 1.89E+01        |
| <b>Alkali Metals</b> |                   |                    |                     |                      |                 |
| Rb-86                | 8.64E-02          | 1.62E-03           | 0.00E+00            | 0.00E+00             | 8.80E-02        |
| Cs-134               | 8.80E+00          | 1.68E-01           | 0.00E+00            | 0.00E+00             | 8.97E+00        |
| Cs-136               | 2.32E+00          | 4.33E-02           | 0.00E+00            | 0.00E+00             | 2.37E+00        |
| Cs-137               | 5.01E+00          | 9.56E-02           | 0.00E+00            | 0.00E+00             | 5.11E+00        |
| <b>Total</b>         | <b>2.32E+02</b>   | <b>1.25E+02</b>    | <b>0.00E+00</b>     | <b>0.00E+00</b>      | <b>3.56E+02</b> |

a) Steam system piping failure is calculated at a reactor power level of 4540 MWt (102 percent of 4451 MWt core thermal power).

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**Table 7.1-8  
US-APWR Source Terms  
Time Dependent Released Activity during Steam Generator Tube Rupture (Ci)  
(Transient-Initiated Iodine Spike)<sup>(a)</sup>**

| <b>Nuclide</b>       | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b>   |                   |                    |                     |                      |                 |
| Kr-85                | 3.43E+03          | 4.64E+01           | 2.06E+02            | 1.59E+03             | 5.27E+03        |
| Kr-85m               | 6.17E+01          | 9.70E-02           | 8.00E-03            | 0.00E+00             | 6.18E+01        |
| Kr-87                | 3.40E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 3.40E+01        |
| Kr-88                | 1.11E+02          | 6.00E-02           | 1.00E-02            | 0.00E+00             | 1.11E+02        |
| Xe-133               | 1.16E+04          | 1.45E+02           | 5.06E+02            | 9.44E+02             | 1.32E+04        |
| Xe-135               | 3.70E+02          | 3.82E+00           | 6.70E-01            | 0.00E+00             | 3.74E+02        |
| <b>Iodines</b>       |                   |                    |                     |                      |                 |
| I-131                | 1.10E+02          | 1.03E+01           | 0.00E+00            | 0.00E+00             | 1.20E+02        |
| I-132                | 5.24E+01          | 2.12E-01           | 0.00E+00            | 0.00E+00             | 5.26E+01        |
| I-133                | 1.87E+02          | 1.27E+01           | 0.00E+00            | 0.00E+00             | 2.00E+02        |
| I-134                | 3.05E+01          | 1.06E-03           | 0.00E+00            | 0.00E+00             | 3.05E+01        |
| I-135                | 1.19E+02          | 3.74E+00           | 0.00E+00            | 0.00E+00             | 1.23E+02        |
| <b>Alkali Metals</b> |                   |                    |                     |                      |                 |
| Rb-86                | 4.54E-03          | 5.44E-04           | 0.00E+00            | 0.00E+00             | 5.09E-03        |
| Cs-134               | 4.63E-01          | 5.63E-02           | 0.00E+00            | 0.00E+00             | 5.19E-01        |
| Cs-136               | 1.22E-01          | 1.45E-02           | 0.00E+00            | 0.00E+00             | 1.37E-01        |
| Cs-137               | 2.64E-01          | 3.21E-02           | 0.00E+00            | 0.00E+00             | 2.96E-01        |
| <b>Total</b>         | <b>1.61E+04</b>   | <b>2.22E+02</b>    | <b>7.12 E+02</b>    | <b>2.53E+03</b>      | <b>1.96E+04</b> |

a) SGTR is calculated at a reactor power level of 4555 MWt (102 percent of 4466 MWt NSSS)

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**Table 7.1-9  
US-APWR Source Terms  
Time Dependent Released Activity during Steam Generator Tube Rupture (Ci)  
(Pre-Transient Iodine Spike)<sup>(a)</sup>**

| <b>Nuclide</b>       | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b>   |                   |                    |                     |                      |                 |
| Kr-85                | 3.43E+03          | 4.64E+01           | 2.06E+02            | 1.59E+03             | 5.27E+03        |
| Kr-85m               | 6.17E+01          | 9.70E-02           | 8.00E-03            | 0.00E+00             | 6.18E+01        |
| Kr-87                | 3.40E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 3.40E+01        |
| Kr-88                | 1.11E+02          | 6.00E-02           | 1.00E-02            | 0.00E+00             | 1.11E+02        |
| Xe-133               | 1.16E+04          | 1.44E+02           | 5.06E+02            | 9.44E+02             | 1.32E+04        |
| Xe-135               | 3.75E+02          | 2.18E+00           | 6.70E-01            | 0.00E+00             | 3.78E+02        |
| <b>Iodines</b>       |                   |                    |                     |                      |                 |
| I-131                | 4.18E+02          | 1.81E+00           | 0.00E+00            | 0.00E+00             | 4.20E+02        |
| I-132                | 2.09E+02          | 3.92E-02           | 0.00E+00            | 0.00E+00             | 2.09E+02        |
| I-133                | 7.16E+02          | 2.24E+00           | 0.00E+00            | 0.00E+00             | 7.18E+02        |
| I-134                | 1.28E+02          | 6.00E-05           | 0.00E+00            | 0.00E+00             | 1.28E+02        |
| I-135                | 4.61E+02          | 6.70E-01           | 0.00E+00            | 0.00E+00             | 4.62E+02        |
| <b>Alkali Metals</b> |                   |                    |                     |                      |                 |
| Rb-86                | 4.54E-03          | 5.44E-04           | 0.00E+00            | 0.00E+00             | 5.09E-03        |
| Cs-134               | 4.63E-01          | 5.63E-02           | 0.00E+00            | 0.00E+00             | 5.19E-01        |
| Cs-136               | 1.22E-01          | 1.45E-02           | 0.00E+00            | 0.00E+00             | 1.37E-01        |
| Cs-137               | 2.64E-01          | 3.21E-02           | 0.00E+00            | 0.00E+00             | 2.96E-01        |
| <b>Total</b>         | <b>1.76E+04</b>   | <b>1.98E+02</b>    | <b>7.12E+02</b>     | <b>2.53E+03</b>      | <b>2.10E+04</b> |

a) SGTR is calculated at a reactor power level of 4555 MWt (102 percent of 4466 MWt NSSS)

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**Table 7.1-10  
US-APWR Source Terms  
Time Dependent Released Activity during RCP Rotor Seizure (Ci)<sup>(a)</sup>**

| <b>Nuclide</b>       | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b>   |                   |                    |                     |                      |                 |
| Kr-85                | 1.12E+02          | 8.40E+01           | 0.00E+00            | 0.00E+00             | 1.96E+02        |
| Kr-85m               | 6.40E+02          | 1.58E+02           | 0.00E+00            | 0.00E+00             | 7.98E+02        |
| Kr-87                | 5.02E+02          | 6.21E+00           | 0.00E+00            | 0.00E+00             | 5.08E+02        |
| Kr-88                | 1.37E+03          | 1.74E+02           | 0.00E+00            | 0.00E+00             | 1.55E+03        |
| Xe-133               | 6.87E+03          | 4.96E+03           | 0.00E+00            | 0.00E+00             | 1.18E+04        |
| Xe-135               | 1.61E+03          | 7.67E+02           | 0.00E+00            | 0.00E+00             | 2.37E+03        |
| <b>Iodines</b>       |                   |                    |                     |                      |                 |
| I-131                | 8.81E+01          | 2.32E+02           | 0.00E+00            | 0.00E+00             | 3.20E+02        |
| I-132                | 1.94E+01          | 8.35E+00           | 0.00E+00            | 0.00E+00             | 2.77E+01        |
| I-133                | 9.85E+01          | 2.17E+02           | 0.00E+00            | 0.00E+00             | 3.15E+02        |
| I-134                | 6.46E+00          | 1.10E-01           | 0.00E+00            | 0.00E+00             | 6.57E+00        |
| I-135                | 6.38E+01          | 9.16E+01           | 0.00E+00            | 0.00E+00             | 1.55E+02        |
| <b>Alkali Metals</b> |                   |                    |                     |                      |                 |
| Rb-86                | 3.23E-02          | 8.66E-02           | 0.00E+00            | 0.00E+00             | 1.19E-01        |
| Cs-134               | 3.24E+00          | 8.78E+00           | 0.00E+00            | 0.00E+00             | 1.20E+01        |
| Cs-136               | 8.72E-01          | 2.33E+00           | 0.00E+00            | 0.00E+00             | 3.21E+00        |
| Cs-137               | 1.84E+00          | 5.00E+00           | 0.00E+00            | 0.00E+00             | 6.84E+00        |
| <b>Total</b>         | <b>1.14E+04</b>   | <b>6.71E+03</b>    | <b>0.00E+00</b>     | <b>0.00E+00</b>      | <b>1.81E+04</b> |

- a) RCP rotor seizure is calculated at a reactor power level of 4555 MWt (102 percent of 4466 MWt NSSS).

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**Table 7.1-11  
US-APWR Source Terms  
Time Dependent Released Activity during Rod Ejection Accident (Ci)<sup>(a)</sup>**

| <b>Nuclide</b>       | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b>   |                   |                    |                     |                      |                 |
| Kr-85                | 2.63E+02          | 2.50E+02           | 1.90E+02            | 1.63E+03             | 2.33E+03        |
| Kr-85m               | 3.59E+03          | 9.58E+02           | 9.86E+00            | 0.00E+00             | 4.56E+03        |
| Kr-87                | 2.81E+03          | 3.50E+01           | 0.00E+00            | 0.00E+00             | 2.85E+03        |
| Kr-88                | 7.70E+03          | 1.02E+03           | 2.05E+00            | 0.00E+00             | 8.72E+03        |
| Xe-133               | 3.81E+04          | 3.46E+04           | 2.11E+04            | 4.22E+04             | 1.36E+05        |
| Xe-135               | 9.31E+03          | 5.32E+03           | 5.40E+02            | 2.81E+00             | 1.52E+04        |
| <b>Iodines</b>       |                   |                    |                     |                      |                 |
| I-131                | 5.82E+02          | 7.17E+02           | 2.58E+02            | 7.79E+02             | 2.34E+03        |
| I-132                | 4.62E+02          | 3.93E+01           | 1.40E-02            | 0.00E+00             | 5.01E+02        |
| I-133                | 1.12E+03          | 1.06E+03           | 1.13E+02            | 1.13E+01             | 2.30E+03        |
| I-134                | 4.95E+02          | 5.15E-01           | 0.00E+00            | 0.00E+00             | 4.95E+02        |
| I-135                | 8.75E+02          | 4.39E+02           | 6.60E+00            | 4.00E-03             | 1.32E+03        |
| <b>Alkali Metals</b> |                   |                    |                     |                      |                 |
| Rb-86                | 4.16E-01          | 9.65E-02           | 0.00E+00            | 0.00E+00             | 5.13E-01        |
| Cs-134               | 4.15E+01          | 9.79E+00           | 1.01E-03            | 0.00E+00             | 5.13E+01        |
| Cs-136               | 1.13E+01          | 2.60E+00           | 1.00E-06            | 0.00E+00             | 1.39E+01        |
| Cs-137               | 2.36E+01          | 5.57E+00           | 0.00E+00            | 0.00E+00             | 2.92E+01        |
| <b>Total</b>         | <b>6.53E+04</b>   | <b>4.45E+04</b>    | <b>2.22E+04</b>     | <b>4.46E+04</b>      | <b>1.77E+05</b> |

- a) Rod ejection accident is calculated at a reactor power level of 4540 MWt (102 percent of 4451 MWt core thermal power).



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**Table 7.1-12  
US-APWR Source Terms  
Time Dependent Released Activity during Fuel Handling Accident (Ci)**

| <b>Nuclide</b>     | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|--------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| <b>Noble Gases</b> |                   |                    |                     |                      |              |
| Kr-85              | 1.20E+03          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 1.20E+03     |
| Kr-85m             | 3.90E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 3.90E+02     |
| Kr-87              | 5.98E-02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 5.98E-02     |
| Kr-88              | 1.25E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 1.25E+02     |
| Xe-133             | 9.90E+04          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 9.90E+04     |
| Xe-135             | 2.21E+04          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.21E+04     |
| <b>Iodines</b>     |                   |                    |                     |                      |              |
| I-131              | 3.67E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 3.67E+02     |
| I-132              | 2.75E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.75E+02     |
| I-133              | 2.31E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.31E+02     |
| I-134              | 2.71E-06          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.71E-06     |
| I-135              | 3.80E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 3.80E+01     |
| Total              | 1.24E+05          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 1.24E+05     |

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**Table 7.1-13  
US-APWR Source Terms  
Time Dependent Released Activity during Failure of Small Lines Carrying Primary  
Coolant Outside Containment (Ci)<sup>(a)</sup>**

| <b>Nuclide</b>     | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|--------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| <b>Noble Gases</b> |                   |                    |                     |                      |                 |
| Kr-85              | 6.84E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 6.84E+02        |
| Kr-85m             | 1.25E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 1.25E+01        |
| Kr-87              | 7.05E+00          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 7.05E+00        |
| Kr-88              | 2.26E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.26E+01        |
| Xe-133             | 2.32E+03          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.32E+03        |
| Xe-135             | 7.70E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 7.70E+01        |
| <b>Iodines</b>     |                   |                    |                     |                      |                 |
| I-131              | 1.72E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 1.72E+02        |
| I-132              | 7.98E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 7.98E+01        |
| I-133              | 2.93E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 2.93E+02        |
| I-134              | 4.33E+01          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 4.33E+01        |
| I-135              | 1.85E+02          | 0.00E+00           | 0.00E+00            | 0.00E+00             | 1.85E+02        |
| <b>Total</b>       | <b>3.90E+03</b>   | <b>0.00E+00</b>    | <b>0.00E+00</b>     | <b>0.00E+00</b>      | <b>3.90E+03</b> |

a) Source terms are calculated for 4540 MWt (102 percent of core thermal power 4451 MWt)

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**Table 7.1-14 (Sheet 1 of 2)  
ABWR Source Terms  
Iodine Activity Release to the Environment during a LOCA**

| Isotope                                                                   | 1 min   | 10 min  | 1 hr.   | 2 hr.   | 4 hr.   |
|---------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| <b>A. Release from Reactor Building to Environment (MBq)</b>              |         |         |         |         |         |
| I-131                                                                     | 3.2E+04 | 2.9E+06 | 1.1E+07 | 1.1E+07 | 1.1E+07 |
| I-132                                                                     | 4.5E+04 | 4.1E+06 | 1.4E+07 | 1.4E+07 | 1.5E+07 |
| I-133                                                                     | 6.5E+04 | 6.1E+06 | 2.2E+07 | 2.2E+07 | 2.3E+07 |
| I-134                                                                     | 7.3E+04 | 6.1E+06 | 2.1E+07 | 2.1E+07 | 2.1E+07 |
| I-135                                                                     | 6.1E+04 | 5.7E+06 | 2.1E+07 | 2.1E+07 | 2.2E+07 |
| Total                                                                     | 2.8E+05 | 2.5E+07 | 8.9E+07 | 8.9E+07 | 9.2E+07 |
| <b>B.1 MSIV Pathway Release to Environment—Elemental (MBq)</b>            |         |         |         |         |         |
| I-131                                                                     | 0.0E+00 | 0.0E+00 | 6.1E+01 | 1.0E+03 | 1.0E+04 |
| I-132                                                                     | 0.0E+00 | 0.0E+00 | 6.9E+01 | 9.3E+02 | 6.1E+03 |
| I-133                                                                     | 0.0E+00 | 0.0E+00 | 1.2E+02 | 2.1E+03 | 1.9E+04 |
| I-134                                                                     | 0.0E+00 | 0.0E+00 | 6.9E+01 | 6.9E+02 | 2.5E+03 |
| I-135                                                                     | 0.0E+00 | 0.0E+00 | 1.1E+02 | 1.8E+03 | 1.4E+04 |
| Total                                                                     | 0.0E+00 | 0.0E+00 | 4.3E+02 | 6.5E+03 | 5.2E+04 |
| <b>B.2 MSIV Pathway Release to Environment—Organic (MBq)</b>              |         |         |         |         |         |
| I-131                                                                     | 0.0E+00 | 0.0E+00 | 7.3E+02 | 1.2E+04 | 1.2E+05 |
| I-132                                                                     | 0.0E+00 | 0.0E+00 | 8.1E+02 | 1.1E+04 | 7.3E+04 |
| I-133                                                                     | 0.0E+00 | 0.0E+00 | 1.4E+03 | 2.5E+04 | 2.3E+05 |
| I-134                                                                     | 0.0E+00 | 0.0E+00 | 8.5E+02 | 8.5E+03 | 3.1E+04 |
| I-135                                                                     | 0.0E+00 | 0.0E+00 | 1.3E+03 | 2.1E+04 | 1.8E+05 |
| Total                                                                     | 0.0E+00 | 0.0E+00 | 5.1E+03 | 7.8E+04 | 6.3E+05 |
| <b>B.3 MSIV Pathway Release to Environment—Resuspended Organic (MBq)</b>  |         |         |         |         |         |
| I-131                                                                     | 0.0E+00 | 0.0E+00 | 7.3E+00 | 3.0E+01 | 2.4E+02 |
| I-132                                                                     | 0.0E+00 | 0.0E+00 | 6.1E+00 | 2.3E+01 | 8.9E+01 |
| I-133                                                                     | 0.0E+00 | 0.0E+00 | 1.4E+01 | 5.7E+01 | 4.5E+02 |
| I-134                                                                     | 0.0E+00 | 0.0E+00 | 4.5E+00 | 1.4E+01 | 3.1E+01 |
| I-135                                                                     | 0.0E+00 | 0.0E+00 | 1.2E+01 | 4.5E+01 | 2.9E+02 |
| Total                                                                     | 0.0E+00 | 0.0E+00 | 4.4E+01 | 1.7E+02 | 1.1E+03 |
| <b>B.4 Release from Condenser to Environment—Sum of B.1+B.2+B.3 (MBq)</b> |         |         |         |         |         |
| I-131                                                                     | 0.0E+00 | 0.0E+00 | 7.7E+02 | 1.3E+04 | 1.3E+05 |
| I-132                                                                     | 0.0E+00 | 0.0E+00 | 8.9E+02 | 1.2E+04 | 7.7E+04 |
| I-133                                                                     | 0.0E+00 | 0.0E+00 | 1.6E+03 | 2.6E+04 | 2.5E+05 |
| I-134                                                                     | 0.0E+00 | 0.0E+00 | 9.3E+02 | 9.3E+03 | 3.3E+04 |
| I-135                                                                     | 0.0E+00 | 0.0E+00 | 1.4E+03 | 2.3E+04 | 1.9E+05 |
| Total                                                                     | 0.0E+00 | 0.0E+00 | 5.6E+03 | 8.3E+04 | 6.8E+05 |

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**Table 7.1-14 (Sheet 2 of 2)  
ABWR Source Terms  
Iodine Activity Release to the Environment during a LOCA**

| Isotope                                                                   | 8 hr.   | 12 hr.  | 1 day   | 4 days  | 30 days |
|---------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| <b>A. Release from Reactor Building to Environment (MBq)</b>              |         |         |         |         |         |
| I-131                                                                     | 1.4E+07 | 1.9E+07 | 3.9E+07 | 2.1E+08 | 7.3E+08 |
| I-132                                                                     | 1.5E+07 | 1.6E+07 | 1.6E+07 | 1.6E+07 | 1.6E+07 |
| I-133                                                                     | 2.9E+07 | 3.6E+07 | 6.1E+07 | 1.3E+08 | 1.4E+08 |
| I-134                                                                     | 2.1E+07 | 2.1E+07 | 2.1E+07 | 2.1E+07 | 2.1E+07 |
| I-135                                                                     | 2.5E+07 | 2.9E+07 | 3.4E+07 | 3.8E+07 | 3.8E+07 |
| Total                                                                     | 1.0E+08 | 1.2E+08 | 1.7E+08 | 7.7E+08 | 9.5E+08 |
| <b>B.1 MSIV Pathway Release to Environment—Elemental (MBq)</b>            |         |         |         |         |         |
| I-131                                                                     | 6.9E+04 | 2.0E+05 | 9.8E+05 | 1.1E+07 | 3.3E+07 |
| I-132                                                                     | 2.0E+04 | 3.0E+04 | 3.6E+04 | 3.7E+04 | 3.7E+04 |
| I-133                                                                     | 1.2E+05 | 3.3E+05 | 1.2E+06 | 5.3E+06 | 6.1E+06 |
| I-134                                                                     | 3.9E+03 | 4.1E+03 | 4.1E+03 | 1.4E+02 | 4.1E+03 |
| I-135                                                                     | 7.7E+04 | 1.8E+05 | 4.1E+05 | 6.1E+05 | 6.1E+05 |
| Total                                                                     | 2.9E+05 | 7.4E+05 | 2.6E+06 | 1.7E+07 | 4.0E+07 |
| <b>B.2 MSIV Pathway Release to Environment—Organic (MBq)</b>              |         |         |         |         |         |
| I-131                                                                     | 8.5E+05 | 2.4E+06 | 1.2E+07 | 1.8E+08 | 1.5E+09 |
| I-132                                                                     | 2.4E+05 | 3.6E+05 | 4.5E+05 | 4.5E+05 | 4.5E+05 |
| I-133                                                                     | 1.5E+06 | 3.9E+06 | 1.5E+07 | 7.7E+07 | 8.9E+07 |
| I-134                                                                     | 4.8E+04 | 4.8E+04 | 4.8E+04 | 4.8E+04 | 4.8E+04 |
| I-135                                                                     | 9.3E+05 | 2.1E+06 | 4.8E+06 | 7.7E+06 | 7.7E+06 |
| Total                                                                     | 3.6E+06 | 8.8E+06 | 3.2E+07 | 2.7E+08 | 1.6E+09 |
| <b>B.3 MSIV Pathway Release to Environment—Resuspended Organic (MBq)</b>  |         |         |         |         |         |
| I-131                                                                     | 1.5E+03 | 5.3E+03 | 4.1E+04 | 6.9E+06 | 5.7E+08 |
| I-132                                                                     | 3.2E+02 | 4.8E+02 | 7.3E+02 | 7.7E+02 | 7.7E+02 |
| I-133                                                                     | 2.6E+03 | 8.1E+03 | 4.8E+04 | 1.5E+06 | 3.6E+06 |
| I-134                                                                     | 5.3E+01 | 6.1E+01 | 6.1E+01 | 6.1E+01 | 6.1E+01 |
| I-135                                                                     | 1.5E+03 | 3.5E+03 | 1.2E+04 | 3.7E+04 | 3.8E+04 |
| Total                                                                     | 6.0E+03 | 1.7E+04 | 1.0E+05 | 8.4E+06 | 5.7E+08 |
| <b>B.4 Release from Condenser to Environment—Sum of B.1+B.2+B.3 (MBq)</b> |         |         |         |         |         |
| I-131                                                                     | 9.3E+05 | 2.6E+06 | 1.3E+07 | 2.0E+08 | 2.2E+09 |
| I-132                                                                     | 2.6E+05 | 3.8E+05 | 4.8E+05 | 4.8E+05 | 4.8E+05 |
| I-133                                                                     | 1.6E+06 | 4.1E+06 | 1.6E+07 | 8.1E+07 | 9.8E+07 |
| I-134                                                                     | 5.3E+04 | 5.3E+04 | 5.3E+04 | 5.3E+04 | 5.3E+04 |
| I-135                                                                     | 1.0E+06 | 2.2E+06 | 5.7E+06 | 8.1E+06 | 8.1E+06 |
| Total                                                                     | 3.8E+06 | 9.3E+06 | 3.5E+07 | 2.9E+08 | 2.3E+09 |

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**Table 7.1-15 (Sheet 1 of 2)  
ABWR Source Terms  
Noble Gas Activity Release to the Environment during a LOCA**

| <b>Isotope</b>                                          | <b>1 min</b> | <b>10 min</b> | <b>1 hr.</b> | <b>2 hr.</b> | <b>4 hr.</b> |
|---------------------------------------------------------|--------------|---------------|--------------|--------------|--------------|
| <b>A. Reactor Building Release to Environment (MBq)</b> |              |               |              |              |              |
| Kr-83m                                                  | 3.0E+04      | 2.5E+06       | 1.0E+07      | 1.3E+07      | 2.1E+07      |
| Kr-85                                                   | 2.8E+03      | 2.5E+05       | 1.1E+06      | 1.6E+06      | 3.9E+06      |
| Kr-85m                                                  | 6.1E+04      | 5.7E+06       | 2.3E+07      | 3.4E+07      | 6.5E+07      |
| Kr-87                                                   | 1.2E+05      | 1.0E+07       | 3.9E+07      | 4.8E+07      | 6.9E+07      |
| Kr-88                                                   | 1.8E+05      | 1.5E+07       | 6.1E+07      | 8.5E+07      | 1.5E+08      |
| Kr-89                                                   | 1.9E+05      | 5.3E+06       | 7.3E+06      | 7.3E+06      | 7.3E+06      |
| Xe-131m                                                 | 1.4E+03      | 1.3E+05       | 5.7E+05      | 8.5E+05      | 2.1E+06      |
| Xe-133                                                  | 5.3E+05      | 4.5E+07       | 2.0E+08      | 3.1E+08      | 7.3E+08      |
| Xe-133m                                                 | 2.2E+04      | 2.0E+06       | 8.1E+06      | 1.2E+07      | 3.0E+07      |
| Xe-135                                                  | 6.5E+04      | 6.1E+06       | 2.5E+07      | 3.7E+07      | 8.1E+07      |
| Xe-135m                                                 | 9.3E+04      | 6.5E+06       | 1.9E+07      | 2.0E+07      | 2.0E+07      |
| Xe-137                                                  | 4.1E+05      | 1.4E+07       | 2.1E+07      | 2.1E+07      | 2.1E+07      |
| Xe-138                                                  | 4.1E+05      | 2.8E+07       | 8.1E+07      | 8.1E+07      | 8.1E+07      |
| Total                                                   | 2.1E+06      | 1.4E+08       | 4.7E+08      | 6.2E+08      | 1.3E+09      |
| <b>B. Condenser Release to Environment (MBq)</b>        |              |               |              |              |              |
| Kr-83m                                                  | 0.0E+00      | 0.0E+00       | 6.5E+03      | 8.5E+04      | 4.8E+05      |
| Kr-85                                                   | 0.0E+00      | 0.0E+00       | 8.1E+02      | 1.4E+04      | 1.4E+05      |
| Kr-85m                                                  | 0.0E+00      | 0.0E+00       | 1.6E+04      | 2.5E+05      | 2.0E+06      |
| Kr-87                                                   | 0.0E+00      | 0.0E+00       | 2.2E+04      | 2.6E+05      | 1.2E+06      |
| Kr-88                                                   | 0.0E+00      | 0.0E+00       | 4.1E+04      | 6.1E+05      | 4.1E+06      |
| Kr-89                                                   | 0.0E+00      | 0.0E+00       | 4.5E+00      | 4.5E+00      | 4.5E+00      |
| Xe-131m                                                 | 0.0E+00      | 0.0E+00       | 4.5E+02      | 7.3E+03      | 7.3E+04      |
| Xe-133                                                  | 0.0E+00      | 0.0E+00       | 1.5E+05      | 2.6E+06      | 2.5E+07      |
| Xe-133m                                                 | 0.0E+00      | 0.0E+00       | 6.1E+03      | 1.1E+05      | 1.0E+06      |
| Xe-135                                                  | 0.0E+00      | 0.0E+00       | 1.9E+04      | 3.0E+05      | 2.6E+06      |
| Xe-135m                                                 | 0.0E+00      | 0.0E+00       | 3.2E+03      | 1.1E+04      | 1.4E+04      |
| Xe-137                                                  | 0.0E+00      | 0.0E+00       | 3.7E+01      | 3.8E+01      | 3.8E+01      |
| Xe-138                                                  | 0.0E+00      | 0.0E+00       | 1.1E+04      | 3.5E+04      | 4.1E+04      |
| Total                                                   | 0.0E+00      | 0.0E+00       | 2.7E+05      | 4.3E+06      | 3.7E+07      |

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**Table 7.1-15 (Sheet 2 of 2)  
ABWR Source Terms  
Noble Gas Activity Release to the Environment during a LOCA**

| <b>Isotope</b>                                          | <b>8 hr.</b> | <b>12 hr.</b> | <b>1 day</b> | <b>4 days</b> | <b>30 days</b> |
|---------------------------------------------------------|--------------|---------------|--------------|---------------|----------------|
| <b>A. Reactor Building Release to Environment (MBq)</b> |              |               |              |               |                |
| Kr-83m                                                  | 3.1E+07      | 3.5E+07       | 3.6E+07      | 3.6E+07       | 3.6E+07        |
| Kr-85                                                   | 1.3E+07      | 2.6E+07       | 8.9E+07      | 7.3E+08       | 6.1E+09        |
| Kr-85m                                                  | 1.4E+08      | 2.1E+08       | 3.0E+08      | 3.2E+08       | 3.2E+08        |
| Kr-87                                                   | 8.5E+07      | 8.9E+07       | 8.9E+07      | 8.9E+07       | 8.9E+07        |
| Kr-88                                                   | 2.7E+08      | 3.4E+08       | 3.9E+08      | 4.1E+08       | 4.1E+08        |
| Kr-89                                                   | 7.3E+06      | 7.3E+06       | 7.3E+06      | 7.3E+06       | 7.3E+06        |
| Xe-131m                                                 | 6.5E+06      | 1.4E+07       | 4.5E+07      | 3.3E+08       | 1.5E+09        |
| Xe-133                                                  | 2.3E+09      | 4.8E+09       | 1.5E+10      | 9.7E+10       | 2.7E+11        |
| Xe-133m                                                 | 9.3E+07      | 1.9E+08       | 5.7E+08      | 2.8E+09       | 4.5E+09        |
| Xe-135                                                  | 2.1E+08      | 3.6E+08       | 7.3E+08      | 1.1E+09       | 1.1E+09        |
| Xe-135m                                                 | 2.0E+07      | 2.0E+07       | 2.0E+07      | 2.0E+07       | 2.0E+07        |
| Xe-137                                                  | 2.1E+07      | 2.1E+07       | 2.1E+07      | 2.1E+07       | 2.1E+07        |
| Xe-138                                                  | 8.1E+07      | 8.1E+07       | 8.1E+07      | 8.1E+07       | 8.1E+07        |
| Total                                                   | 3.3E+09      | 6.2E+09       | 1.8E+10      | 1.0E+11       | 2.8E+11        |
| <b>B. Condenser Release to Environment (MBq)</b>        |              |               |              |               |                |
| Kr-83m                                                  | 1.4E+06      | 1.9E+06       | 2.1E+06      | 2.1E+06       | 2.1E+06        |
| Kr-85                                                   | 1.0E+06      | 2.8E+06       | 1.4E+07      | 2.5E+08       | 6.5E+09        |
| Kr-85m                                                  | 9.3E+06      | 1.8E+07       | 3.3E+07      | 3.9E+07       | 3.9E+07        |
| Kr-87                                                   | 2.6E+06      | 3.0E+06       | 3.1E+06      | 3.1E+06       | 3.1E+06        |
| Kr-88                                                   | 1.5E+07      | 2.5E+07       | 3.4E+07      | 3.5E+07       | 3.5E+07        |
| Kr-89                                                   | 4.5E+00      | 4.5E+00       | 4.5E+00      | 4.5E+00       | 4.5E+00        |
| Xe-131m                                                 | 5.3E+05      | 1.4E+06       | 7.3E+06      | 1.1E+08       | 1.4E+09        |
| Xe-133                                                  | 1.8E+08      | 4.8E+08       | 2.4E+09      | 3.3E+10       | 2.0E+11        |
| Xe-133m                                                 | 7.3E+06      | 2.0E+07       | 8.9E+07      | 8.9E+08       | 2.2E+09        |
| Xe-135                                                  | 1.5E+07      | 3.6E+07       | 1.1E+08      | 2.2E+08       | 2.2E+08        |
| Xe-135m                                                 | 1.4E+04      | 1.4E+04       | 1.4E+04      | 1.4E+04       | 1.4E+04        |
| Xe-137                                                  | 3.8E+01      | 3.8E+01       | 3.8E+01      | 3.8E+01       | 3.8E+01        |
| Xe-138                                                  | 4.1E+04      | 4.1E+04       | 4.1E+04      | 4.1E+04       | 4.1E+04        |
| Total                                                   | 2.3E+08      | 5.9E+08       | 2.7E+09      | 3.5E+10       | 2.1E+11        |

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**Table 7.1-16  
ABWR Source Terms  
Activity Released to Environment during a Main Steamline Break Accident (MBq)**

| <b>Isotope</b>    | <b>Case 1<sup>(a)</sup></b> | <b>Case 2<sup>(a)</sup></b> |
|-------------------|-----------------------------|-----------------------------|
| I-131             | 7.29E+04                    | 1.46E+06                    |
| I-132             | 7.10E+05                    | 1.42E+07                    |
| I-133             | 5.00E+05                    | 9.99E+06                    |
| I-134             | 1.40E+06                    | 2.79E+07                    |
| I-135             | 7.29E+05                    | 1.46E+07                    |
| Total Halogens    | 3.41E+06                    | 6.81E+07                    |
| Kr-83m            | 4.07E+02                    | 2.44E+03                    |
| Kr-85m            | 7.18E+02                    | 4.29E+03                    |
| Kr-85             | 2.26E+00                    | 1.36E+01                    |
| Kr-87             | 2.44E+03                    | 1.47E+04                    |
| Kr-88             | 2.46E+03                    | 1.48E+04                    |
| Kr-89             | 9.88E+03                    | 5.92E+04                    |
| Kr-90             | 2.55E+03                    | 1.55E+04                    |
| Xe-131m           | 1.76E+00                    | 1.06E+01                    |
| Xe-133m           | 3.39E+01                    | 2.04E+02                    |
| Xe-133            | 9.47E+02                    | 5.70E+03                    |
| Xe-135m           | 2.89E+03                    | 1.74E+04                    |
| Xe-135            | 2.70E+03                    | 1.62E+04                    |
| Xe-137            | 1.23E+04                    | 7.40E+04                    |
| Xe-138            | 9.44E+03                    | 5.66E+04                    |
| Xe-139            | 4.33E+03                    | 2.59E+04                    |
| Total Noble Gases | 5.11E+04                    | 3.07E+05                    |

- a) The level of activity is consistent with an offgas release rate of 3.7 GBq/s for Case 1 and 14.8 GBq/s for Case 2 referenced to a 30 minute decay. The iodine concentrations in the reactor coolant are tabulated below for each case.

| <b>Isotope</b> | <b>MBq/g</b>  |               |
|----------------|---------------|---------------|
|                | <b>Case 1</b> | <b>Case 2</b> |
| I-131          | 0.001739      | 0.03515       |
| I-132          | 0.01536       | 0.30747       |
| I-133          | 0.01206       | 0.24161       |
| I-134          | 0.02634       | 0.52688       |
| I-135          | 0.01647       | 0.3293        |

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**Table 7.1-17  
ABWR Source Terms  
Isotopic Releases during an Instrument Line Break Accident (MBq)**

| <b>Isotope</b>                          | <b>1 min</b> | <b>10 min</b> | <b>1 hr.</b> | <b>2 hr.</b> | <b>4 hr.</b> | <b>8 hr.</b> |
|-----------------------------------------|--------------|---------------|--------------|--------------|--------------|--------------|
| <b>Reactor Building Inventory</b>       |              |               |              |              |              |              |
| I-131                                   | 3.77E+01     | 3.27E+02      | 2.60E+04     | 1.73E+04     | 1.38E+04     | 4.59E+00     |
| I-132                                   | 3.68E+02     | 3.11E+03      | 2.31E+05     | 1.44E+05     | 1.17E+05     | 1.17E+01     |
| I-133                                   | 2.59E+02     | 2.24E+03      | 1.75E+05     | 1.16E+05     | 9.29E+04     | 2.72E+01     |
| I-134                                   | 7.22E+02     | 5.92E+03      | 3.89E+05     | 2.26E+05     | 1.86E+05     | 2.65E+00     |
| I-135                                   | 3.77E+02     | 3.25E+03      | 2.52E+05     | 1.64E+05     | 1.32E+05     | 2.90E+01     |
| Total                                   | 1.76E+03     | 1.48E+04      | 1.07E+06     | 6.68E+05     | 5.41E+05     | 7.52E+01     |
| <b>Isotopic Releases to Environment</b> |              |               |              |              |              |              |
| I-131                                   | 6.36E-01     | 5.77E+01      | 2.77E+04     | 6.81E+04     | 1.27E+05     | 1.41E+05     |
| I-132                                   | 6.18E+00     | 5.51E+02      | 2.52E+05     | 5.96E+05     | 1.09E+06     | 1.19E+06     |
| I-133                                   | 4.37E+00     | 3.96E+02      | 1.87E+05     | 4.59E+05     | 8.51E+05     | 9.44E+05     |
| I-134                                   | 1.21E+01     | 1.06E+03      | 4.44E+05     | 9.92E+05     | 1.76E+06     | 1.90E+06     |
| I-135                                   | 6.36E+00     | 5.74E+02      | 2.71E+05     | 6.59E+05     | 1.21E+06     | 1.34E+06     |
| Total                                   | 2.97E+01     | 2.64E+03      | 1.18E+06     | 2.77E+06     | 5.04E+06     | 5.51E+06     |



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**Table 7.1-18  
ABWR Source Terms  
Isotopic Release to Environment during a Fuel Handling Accident (MBq)**

| <b>Isotope</b> | <b>1 min</b> | <b>10 min</b> | <b>1 hr.</b> | <b>2 hr.</b> |
|----------------|--------------|---------------|--------------|--------------|
| I-131          | 3.12E+05     | 2.80E+06      | 4.98E+06     | 4.98E+06     |
| I-132          | 4.02E+05     | 3.53E+06      | 6.15E+06     | 6.15E+06     |
| I-133          | 3.23E+05     | 2.89E+06      | 5.15E+06     | 5.15E+06     |
| I-134          | 1.75E-02     | 1.49E-01      | 2.50E-01     | 2.50E-01     |
| I-135          | 5.31E+04     | 4.70E+05      | 8.34E+05     | 8.34E+05     |
| Total          | 1.09E+06     | 9.69E+06      | 1.71E+07     | 1.71E+07     |
| Kr-83m         | 1.66E+04     | 1.45E+05      | 2.55E+05     | 2.61E+05     |
| Kr-85m         | 2.12E+05     | 1.88E+06      | 3.37E+06     | 3.46E+06     |
| Kr-85          | 1.15E+06     | 1.04E+07      | 1.88E+07     | 1.94E+07     |
| Kr-87          | 3.29E+01     | 2.84E+02      | 4.94E+02     | 4.98E+02     |
| Kr-88          | 6.15E+04     | 5.39E+05      | 9.65E+05     | 9.85E+05     |
| Kr-89          | 7.17E-07     | 3.03E-06      | 3.30E-06     | 3.30E-06     |
| Xe-131m        | 2.02E+05     | 1.81E+06      | 3.29E+06     | 3.38E+06     |
| Xe-133m        | 2.67E+06     | 2.39E+07      | 4.34E+07     | 4.46E+07     |
| Xe-133         | 6.81E+07     | 6.12E+08      | 1.11E+09     | 1.14E+09     |
| Xe-135m        | 7.94E+05     | 5.96E+06      | 8.96E+06     | 8.96E+06     |
| Xe-135         | 1.56E+07     | 1.39E+08      | 2.51E+08     | 2.58E+08     |
| Xe-137         | 1.59E-06     | 7.41E-06      | 8.39E-06     | 8.39E-06     |
| Xe-138         | 1.60E-06     | 1.17E-05      | 1.74E-05     | 1.74E-05     |
| Total          | 8.88E+07     | 7.95E+08      | 1.45E+09     | 1.48E+09     |

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**Table 7.1-19  
AP1000 Source Terms  
Activity Releases for Steam System Piping Failure with Pre-Existing Iodine Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 72 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|---------------------|--------------|
| Kr-85m         | 6.86E-02          | 1.14E-01          | 6.80E-02           | 6.18E-03            | 2.57E-01     |
| Kr-85          | 2.82E-01          | 8.46E-01          | 2.25E+00           | 6.69E+00            | 1.01E+01     |
| Kr-87          | 2.76E-02          | 1.34E-02          | 5.29E-04           | 8.60E-08            | 4.15E-02     |
| Kr-88          | 1.12E-01          | 1.37E-01          | 4.04E-02           | 8.27E-04            | 2.91E-01     |
| Xe-131m        | 1.28E-01          | 3.79E-01          | 9.81E-01           | 2.70E+00            | 4.19E+00     |
| Xe-133m        | 1.59E-01          | 4.51E-01          | 1.04E+00           | 2.05E+00            | 3.70E+00     |
| Xe-133         | 1.18E+01          | 3.45E+01          | 8.64E+01           | 2.16E+02            | 3.49E+02     |
| Xe-135m        | 3.04E-03          | 1.33E-05          | 0.00E+00           | 0.00E+00            | 3.06E-03     |
| Xe-135         | 3.10E-01          | 6.90E-01          | 8.35E-01           | 3.38E-01            | 2.17E+00     |
| Xe-138         | 3.99E-03          | 1.14E-05          | 0.00E+00           | 0.00E+00            | 4.00E-03     |
| I-130          | 3.59E-01          | 1.42E-01          | 2.09E-01           | 1.33E-01            | 8.44E-01     |
| I-131          | 2.40E+01          | 1.21E+01          | 3.10E+01           | 8.22E+01            | 1.49E+02     |
| I-132          | 3.05E+01          | 4.14E+00          | 8.06E-01           | 6.55E-03            | 3.55E+01     |
| I-133          | 4.34E+01          | 1.90E+01          | 3.53E+01           | 3.98E+01            | 1.37E+02     |
| I-134          | 6.74E+00          | 1.63E-01          | 1.43E-03           | 4.54E-09            | 6.91E+00     |
| I-135          | 2.60E+01          | 8.16E+00          | 7.54E+00           | 1.71E+00            | 4.34E+01     |
| Cs-134         | 1.90E+01          | 1.95E-01          | 5.19E-01           | 1.54E+00            | 2.12E+01     |
| Cs-136         | 2.82E+01          | 2.86E-01          | 7.43E-01           | 2.06E+00            | 3.13E+01     |
| Cs-137         | 1.37E+01          | 1.41E-01          | 3.74E-01           | 1.11E+00            | 1.53E+01     |
| Cs-138         | 1.01E+01          | 1.02E-03          | 4.42E-07           | 0.00E+00            | 1.01E+01     |
| Total          | 2.15E+02          | 8.15E+01          | 1.68E+02           | 3.56E+02            | 8.21E+02     |

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**Table 7.1-20  
AP1000 Source Terms  
Activity Releases for Steam System Piping Failure with Accident-Initiated  
Iodine Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 72 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|---------------------|--------------|
| Kr-85m         | 6.86E-02          | 1.14E-01          | 6.80E-02           | 6.18E-03            | 2.57E-01     |
| Kr-85          | 2.82E-01          | 8.46E-01          | 2.25E+00           | 6.69E+00            | 1.01E+01     |
| Kr-87          | 2.76E-02          | 1.34E-02          | 5.29E-04           | 8.60E-08            | 4.15E-02     |
| Kr-88          | 1.12E-01          | 1.37E-01          | 4.04E-02           | 8.27E-04            | 2.91E-01     |
| Xe-131m        | 1.28E-01          | 3.79E-01          | 9.81E-01           | 2.70E+00            | 4.19E+00     |
| Xe-133m        | 1.59E-01          | 4.51E-01          | 1.04E+00           | 2.05E+00            | 3.70E+00     |
| Xe-133         | 1.18E+01          | 3.45E+01          | 8.64E+01           | 2.16E+02            | 3.49E+02     |
| Xe-135m        | 3.04E-03          | 1.33E-05          | 0.00E+00           | 0.00E+00            | 3.06E-03     |
| Xe-135         | 3.10E-01          | 6.90E-01          | 8.35E-01           | 3.38E-01            | 2.17E+00     |
| Xe-138         | 3.99E-03          | 1.14E-05          | 0.00E+00           | 0.00E+00            | 4.00E-03     |
| I-130          | 4.20E-01          | 9.95E-01          | 1.58E+00           | 1.01E+00            | 4.01E+00     |
| I-131          | 2.60E+01          | 5.73E+01          | 1.56E+02           | 4.13E+02            | 6.53E+02     |
| I-132          | 4.62E+01          | 9.74E+01          | 2.24E+01           | 1.82E-01            | 1.66E+02     |
| I-133          | 4.91E+01          | 1.14E+02          | 2.27E+02           | 2.55E+02            | 6.45E+02     |
| I-134          | 1.34E+01          | 1.86E+01          | 2.65E-01           | 8.42E-07            | 3.23E+01     |
| I-135          | 3.24E+01          | 7.74E+01          | 7.83E+01           | 1.77E+01            | 2.06E+02     |
| Cs-134         | 1.90E+01          | 1.95E-01          | 5.19E-01           | 1.54E+00            | 2.12E+01     |
| Cs-136         | 2.82E+01          | 2.86E-01          | 7.43E-01           | 2.06E+00            | 3.13E+01     |
| Cs-137         | 1.37E+01          | 1.41E-01          | 3.74E-01           | 1.11E+00            | 1.53E+01     |
| Cs-138         | 1.01E+01          | 1.02E-03          | 4.42E-07           | 0.00E+00            | 1.01E+01     |
| Total          | 2.51E+02          | 4.03E+02          | 5.78E+02           | 9.20E+02            | 2.15E+03     |

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**Table 7.1-21  
AP1000 Source Terms  
Activity Releases for Reactor Coolant Pump Shaft Seizure (Ci)**

| <b>Isotope</b> | <b>No</b>           | <b>Feedwater Available</b> |                   |                   |              |
|----------------|---------------------|----------------------------|-------------------|-------------------|--------------|
|                | <b>Feedwater</b>    |                            |                   |                   |              |
|                | <b>0 to 1.5 hr.</b> | <b>0 to 2 hr.</b>          | <b>2 to 8 hr.</b> | <b>6 to 8 hr.</b> | <b>Total</b> |
| Kr-85m         | 8.16E+01            | 1.05E+02                   | 1.74E+02          | 4.13E+01          | 2.79E+02     |
| Kr-85          | 7.58E+00            | 1.01E+01                   | 3.03E+01          | 1.01E+01          | 4.04E+01     |
| Kr-87          | 1.20E+02            | 1.43E+02                   | 6.97E+01          | 5.43E+00          | 2.13E+02     |
| Kr-88          | 2.08E+02            | 2.62E+02                   | 3.20E+02          | 6.05E+01          | 5.82E+02     |
| Xe-131m        | 3.77E+00            | 5.03E+00                   | 1.49E+01          | 4.95E+00          | 1.99E+01     |
| Xe-133m        | 2.02E+01            | 2.69E+01                   | 7.64E+01          | 2.48E+01          | 1.03E+02     |
| Xe-133         | 6.66E+02            | 8.87E+02                   | 2.60E+03          | 8.57E+02          | 3.49E+03     |
| Xe-135m        | 3.24E+01            | 3.28E+01                   | 1.43E-01          | 2.68E-06          | 3.30E+01     |
| Xe-135         | 1.59E+02            | 2.08E+02                   | 4.64E+02          | 1.32E+02          | 6.72E+02     |
| Xe-138         | 1.29E+02            | 1.30E+02                   | 3.72E-01          | 3.01E-06          | 1.30E+02     |
| I-130          | 8.45E-01            | 1.17E-01                   | 1.33E+00          | 5.65E-01          | 1.45E+00     |
| I-131          | 3.77E+01            | 5.39E+00                   | 7.51E+01          | 3.46E+01          | 8.05E+01     |
| I-132          | 2.79E+01            | 3.45E+00                   | 1.48E+01          | 3.95E+00          | 1.83E+01     |
| I-133          | 4.86E+01            | 6.86E+00                   | 8.29E+01          | 3.64E+01          | 8.98E+01     |
| I-134          | 2.88E+01            | 2.76E+00                   | 2.98E+00          | 2.09E-01          | 5.74E+00     |
| I-135          | 4.19E+01            | 5.68E+00                   | 5.22E+01          | 2.05E+01          | 5.79E+01     |
| Cs-134         | 1.29E+00            | 1.82E-01                   | 2.40E+00          | 1.11E+00          | 2.59E+00     |
| Cs-136         | 5.63E-01            | 8.45E-02                   | 7.79E-01          | 3.47E-01          | 8.63E-01     |
| Cs-137         | 7.74E-01            | 1.10E-01                   | 1.41E+00          | 6.51E-01          | 1.52E+00     |
| Cs-138         | 6.08E+00            | 7.29E-01                   | 3.35E+00          | 1.13E+00          | 4.08E+00     |
| Rb-86          | 1.33E-02            | 1.83E-03                   | 2.73E-02          | 1.27E-02          | 2.91E-02     |
| Total          | 1.62E+03            | 1.84E+03                   | 3.99E+03          | 1.23E+03          | 5.82E+03     |

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**Table 7.1-22  
AP1000 Source Terms  
Activity Releases for Spectrum of Rod Cluster Control Assembly Ejection Accidents (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b>    |
|----------------|-------------------|-------------------|--------------------|---------------------|----------------------|-----------------|
| Kr-85m         | 1.12E+02          | 6.48E+01          | 3.87E+01           | 1.77E+00            | 2.51E-05             | 2.18E+02        |
| Kr-85          | 5.01E+00          | 5.60E+00          | 1.49E+01           | 3.35E+01            | 2.88E+02             | 3.47E+02        |
| Kr-87          | 1.82E+02          | 2.60E+01          | 1.03E+00           | 8.37E-05            | 0.00E+00             | 2.09E+02        |
| Kr-88          | 2.91E+02          | 1.18E+02          | 3.49E+01           | 3.59E-01            | 8.41E-09             | 4.45E+02        |
| Xe-131m        | 4.94E+00          | 5.46E+00          | 1.42E+01           | 2.86E+01            | 1.16E+02             | 1.69E+02        |
| Xe-133m        | 2.67E+01          | 2.81E+01          | 6.49E+01           | 8.45E+01            | 5.31E+01             | 2.57E+02        |
| Xe-133         | 8.79E+02          | 9.58E+02          | 2.40E+03           | 4.27E+03            | 8.45E+03             | 1.70E+04        |
| Xe-135m        | 7.34E+01          | 5.30E-02          | 4.33E-09           | 0.00E+00            | 0.00E+00             | 7.35E+01        |
| Xe-135         | 2.15E+02          | 1.72E+02          | 2.09E+02           | 4.35E+01            | 1.79E-01             | 6.39E+02        |
| Xe-138         | 2.99E+02          | 1.38E-01          | 3.19E-09           | 0.00E+00            | 0.00E+00             | 2.99E+02        |
| I-130          | 4.90E+00          | 7.28E+00          | 4.32E+00           | 2.03E-01            | 2.95E-04             | 1.67E+01        |
| I-131          | 1.36E+02          | 2.45E+02          | 2.31E+02           | 3.10E+01            | 1.68E+01             | 6.60E+02        |
| I-132          | 1.53E+02          | 9.94E+01          | 9.85E+00           | 8.24E-03            | 0.00E+00             | 2.62E+02        |
| I-133          | 2.72E+02          | 4.40E+02          | 3.18E+02           | 2.28E+01            | 2.41E-01             | 1.05E+03        |
| I-134          | 1.66E+02          | 2.85E+01          | 1.37E-01           | 4.48E-08            | 0.00E+00             | 1.95E+02        |
| I-135          | 2.39E+02          | 2.97E+02          | 1.19E+02           | 2.39E+00            | 7.32E-05             | 6.57E+02        |
| Cs-134         | 3.08E+01          | 6.22E+01          | 6.03E+01           | 7.76E+00            | 5.16E+00             | 1.66E+02        |
| Cs-136         | 8.79E+00          | 1.75E+01          | 1.67E+01           | 2.05E+00            | 6.58E-01             | 4.57E+01        |
| Cs-137         | 1.79E+01          | 3.62E+01          | 3.51E+01           | 4.52E+00            | 3.05E+00             | 9.68E+01        |
| Cs-138         | 1.09E+02          | 7.05E+00          | 1.68E-03           | 0.00E+00            | 0.00E+00             | 1.16E+02        |
| Rb-86          | 3.62E-01          | 7.27E-01          | 6.96E-01           | 8.67E-02            | 3.42E-02             | 1.91E+00        |
| <b>Total</b>   | <b>3.23E+03</b>   | <b>2.62E+03</b>   | <b>3.58E+03</b>    | <b>4.53E+03</b>     | <b>8.93E+03</b>      | <b>2.29E+04</b> |

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**Table 7.1-23  
AP1000 Source Terms  
Activity Releases for Failure of Small Lines Carrying Primary Coolant Outside  
Containment (Ci)**

| <b>Isotope</b> | <b>0-2 hr.</b> |
|----------------|----------------|
| Kr-85m         | 1.24E+01       |
| Kr-85          | 4.40E+01       |
| Kr-87          | 7.05E+00       |
| Kr-88          | 2.21E+01       |
| Xe-131m        | 1.99E+01       |
| Xe-133m        | 2.50E+01       |
| Xe-133         | 1.84E+03       |
| Xe-135m        | 2.59E+00       |
| Xe-135         | 5.20E+01       |
| Xe-138         | 3.65E+00       |
| I-130          | 1.89E+00       |
| I-131          | 9.26E+01       |
| I-132          | 3.49E+02       |
| I-133          | 2.01E+02       |
| I-134          | 1.58E+02       |
| I-135          | 1.68E+02       |
| Cs-134         | 4.16E+00       |
| Cs-136         | 6.16E+00       |
| Cs-137         | 3.00E+00       |
| Cs-138         | 2.21E+00       |
| Total          | 3.02E+03       |

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**Table 7.1-24  
AP1000 Source Terms  
Activity Releases for Steam Generator Tube Rupture with Pre-Existing Iodine Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|--------------|
| Kr-85m         | 5.53E+01          | 1.93E+01          | 7.53E-03           | 7.46E+01     |
| Kr-85          | 2.20E+02          | 1.09E+02          | 1.34E-01           | 3.29E+02     |
| Kr-87          | 2.39E+01          | 3.61E+00          | 9.12E-05           | 2.75E+01     |
| Kr-88          | 9.22E+01          | 2.65E+01          | 5.43E-03           | 1.19E+02     |
| Xe-131m        | 9.96E+01          | 4.88E+01          | 5.91E-02           | 1.48E+02     |
| Xe-133m        | 1.24E+02          | 5.91E+01          | 6.61E-02           | 1.83E+02     |
| Xe-133         | 9.19E+03          | 4.47E+03          | 5.29E+00           | 1.37E+04     |
| Xe-135m        | 3.44E+00          | 5.86E-03          | 0.00E+00           | 3.45E+00     |
| Xe-135         | 2.46E+02          | 1.02E+02          | 7.10E-02           | 3.47E+02     |
| Xe-138         | 4.56E+00          | 5.07E-03          | 0.00E+00           | 4.57E+00     |
| I-130          | 1.79E+00          | 5.39E-02          | 2.68E-01           | 2.12E+00     |
| I-131          | 1.21E+02          | 5.27E+00          | 3.06E+01           | 1.56E+02     |
| I-132          | 1.42E+02          | 7.43E-01          | 1.92E+00           | 1.44E+02     |
| I-133          | 2.16E+02          | 7.63E+00          | 4.06E+01           | 2.64E+02     |
| I-134          | 2.74E+01          | 4.40E-03          | 4.23E-03           | 2.74E+01     |
| I-135          | 1.27E+02          | 2.70E+00          | 1.17E+01           | 1.42E+02     |
| Cs-134         | 1.63E+00          | 6.05E-02          | 2.16E-01           | 1.90E+00     |
| Cs-136         | 2.42E+00          | 8.86E-02          | 3.14E-01           | 2.82E+00     |
| Cs-137         | 1.17E+00          | 4.37E-02          | 1.56E-01           | 1.37E+00     |
| Cs-138         | 5.64E-01          | 2.91E-06          | 5.73E-07           | 5.64E-01     |
| Total          | 1.07E+04          | 4.85E+03          | 9.14E+01           | 1.56E+04     |

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**Table 7.1-25  
AP1000 Source Terms  
Activity Releases for Steam Generator Tube Rupture with Accident-Initiated  
Iodine Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|--------------|
| Kr-85m         | 5.53E+01          | 1.93E+01          | 7.53E-03           | 7.46E+01     |
| Kr-85          | 2.20E+02          | 1.09E+02          | 1.34E-01           | 3.29E+02     |
| Kr-87          | 2.39E+01          | 3.61E+00          | 9.12E-05           | 2.75E+01     |
| Kr-88          | 9.22E+01          | 2.65E+01          | 5.43E-03           | 1.19E+02     |
| Xe-131m        | 9.96E+01          | 4.88E+01          | 5.91E-02           | 1.48E+02     |
| Xe-133m        | 1.24E+02          | 5.91E+01          | 6.61E-02           | 1.83E+02     |
| Xe-133         | 9.19E+03          | 4.47E+03          | 5.29E+00           | 1.37E+04     |
| Xe-135m        | 3.44E+00          | 5.86E-03          | 0.00E+00           | 3.45E+00     |
| Xe-135         | 2.46E+02          | 1.02E+02          | 7.10E-02           | 3.47E+02     |
| Xe-138         | 4.56E+00          | 5.07E-03          | 0.00E+00           | 4.57E+00     |
| I-130          | 8.87E-01          | 1.62E-01          | 8.24E-01           | 1.87E+00     |
| I-131          | 4.36E+01          | 1.14E+01          | 6.76E+01           | 1.23E+02     |
| I-132          | 1.47E+02          | 4.86E+00          | 1.29E+01           | 1.65E+02     |
| I-133          | 9.33E+01          | 2.00E+01          | 1.08E+02           | 2.22E+02     |
| I-134          | 5.59E+01          | 6.04E-02          | 5.94E-02           | 5.60E+01     |
| I-135          | 7.61E+01          | 9.88E+00          | 4.38E+01           | 1.30E+02     |
| Cs-134         | 1.63E+00          | 6.05E-02          | 2.16E-01           | 1.90E+00     |
| Cs-136         | 2.42E+00          | 8.86E-02          | 3.14E-01           | 2.82E+00     |
| Cs-137         | 1.17E+00          | 4.37E-02          | 1.56E-01           | 1.37E+00     |
| Cs-138         | 5.64E-01          | 2.91E-06          | 5.73E-07           | 5.64E-01     |
| Total          | 1.05E+04          | 4.88E+03          | 2.40E+02           | 1.56E+04     |



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**Table 7.1-26 (Sheet 1 of 2)  
AP1000 Source Terms  
Activity Releases for LOCA Resulting from a Spectrum of Postulated Piping Breaks  
Within the Reactor Coolant Pressure Boundary (Ci)**

| <b>Isotope</b> | <b>1.4 to 3.4 hr.</b> | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|-----------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| I-130          | 5.64E+01              | 1.12E+02          | 5.37E+00           | 7.10E-01            | 1.27E-02             | 1.18E+02     |
| I-131          | 1.68E+03              | 3.49E+03          | 2.66E+02           | 2.39E+02            | 7.19E+02             | 4.71E+03     |
| I-132          | 1.23E+03              | 2.14E+03          | 1.64E+01           | 1.46E-02            | 0.00E+00             | 2.15E+03     |
| I-133          | 3.23E+03              | 6.54E+03          | 3.83E+02           | 1.04E+02            | 1.04E+01             | 7.04E+03     |
| I-134          | 6.60E+02              | 1.14E+03          | 2.96E-01           | 6.79E-08            | 0.00E+00             | 1.14E+03     |
| I-135          | 2.56E+03              | 4.89E+03          | 1.58E+02           | 6.09E+00            | 3.16E-03             | 5.06E+03     |
| Kr-85m         | 1.42E+03              | 3.77E+03          | 1.87E+03           | 8.56E+01            | 1.22E-03             | 5.73E+03     |
| Kr-85          | 8.31E+01              | 2.97E+02          | 7.06E+02           | 1.59E+03            | 1.36E+04             | 1.62E+04     |
| Kr-87          | 1.10E+03              | 1.95E+03          | 4.97E+01           | 4.05E-03            | 0.00E+00             | 1.99E+03     |
| Kr-88          | 3.11E+03              | 7.26E+03          | 1.70E+03           | 1.75E+01            | 4.09E-07             | 8.97E+03     |
| Xe-131m        | 8.26E+01              | 2.94E+02          | 6.79E+02           | 1.37E+03            | 5.57E+03             | 7.91E+03     |
| Xe-133m        | 4.43E+02              | 1.54E+03          | 3.15E+03           | 4.11E+03            | 2.58E+03             | 1.14E+04     |
| Xe-133         | 1.47E+04              | 5.19E+04          | 1.16E+05           | 2.06E+05            | 4.07E+05             | 7.80E+05     |
| Xe-135m        | 1.06E+01              | 3.59E+01          | 2.14E-07           | 0.00E+00            | 0.00E+00             | 3.59E+01     |
| Xe-135         | 3.15E+03              | 9.64E+03          | 1.01E+04           | 2.11E+03            | 8.68E+00             | 2.19E+04     |
| Xe-138         | 3.11E+01              | 1.20E+02          | 1.58E-07           | 0.00E+00            | 0.00E+00             | 1.20E+02     |
| Rb-86          | 3.04E+00              | 6.32E+00          | 2.99E-01           | 9.83E-02            | 5.13E-01             | 7.23E+00     |
| Cs-134         | 2.58E+02              | 5.38E+02          | 2.57E+01           | 9.11E+00            | 7.74E+01             | 6.50E+02     |
| Cs-136         | 7.33E+01              | 1.52E+02          | 7.16E+00           | 2.28E+00            | 9.88E+00             | 1.72E+02     |
| Cs-137         | 1.51E+02              | 3.13E+02          | 1.50E+01           | 5.32E+00            | 4.57E+01             | 3.79E+02     |
| Cs-138         | 1.50E+02              | 3.30E+02          | 2.18E-03           | 0.00E+00            | 0.00E+00             | 3.30E+02     |
| Sb-127         | 2.42E+01              | 4.80E+01          | 2.29E+00           | 5.67E-01            | 7.82E-01             | 5.16E+01     |
| Sb-129         | 5.10E+01              | 8.94E+01          | 1.51E+00           | 4.95E-03            | 4.90E-08             | 9.09E+01     |
| Te-127m        | 3.15E+00              | 6.30E+00          | 3.16E-01           | 1.11E-01            | 8.71E-01             | 7.60E+00     |
| Te-127         | 2.05E+01              | 3.83E+01          | 1.15E+00           | 2.75E-02            | 1.33E-04             | 3.94E+01     |
| Te-129m        | 1.07E+01              | 2.15E+01          | 1.07E+00           | 3.65E-01            | 2.36E+00             | 2.52E+01     |
| Te-129         | 1.88E+01              | 2.83E+01          | 2.69E-02           | 3.54E-08            | 0.00E+00             | 2.84E+01     |
| Te-131m        | 3.17E+01              | 6.20E+01          | 2.64E+00           | 3.35E-01            | 7.81E-02             | 6.50E+01     |
| Te-132         | 3.23E+02              | 6.40E+02          | 3.02E+01           | 7.04E+00            | 7.83E+00             | 6.85E+02     |
| Sr-89          | 9.23E+01              | 1.85E+02          | 9.24E+00           | 3.19E+00            | 2.26E+01             | 2.20E+02     |
| Sr-90          | 7.95E+00              | 1.59E+01          | 7.99E-01           | 2.84E-01            | 2.44E+00             | 1.94E+01     |
| Sr-91          | 9.68E+01              | 1.81E+02          | 5.46E+00           | 1.35E-01            | 7.06E-04             | 1.87E+02     |
| Sr-92          | 6.83E+01              | 1.13E+02          | 1.01E+00           | 5.15E-04            | 0.00E+00             | 1.14E+02     |
| Ba-139         | 5.44E+01              | 8.30E+01          | 1.49E-01           | 9.91E-07            | 0.00E+00             | 8.32E+01     |
| Ba-140         | 1.63E+02              | 3.25E+02          | 1.61E+01           | 5.11E+00            | 2.17E+01             | 3.68E+02     |

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**Table 7.1-26 (Sheet 2 of 2)  
AP1000 Source Terms  
Activity Releases for LOCA Resulting from a Spectrum of Postulated Piping Breaks  
Within the Reactor Coolant Pressure Boundary (Ci)**

| <b>Isotope</b> | <b>1.4 to 3.4 hr.</b> | <b>0 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|-----------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| Mo-99          | 2.15E+01              | 4.25E+01          | 1.98E+00           | 4.29E-01            | 3.78E-01             | 4.53E+01     |
| Tc-99m         | 1.47E+01              | 2.66E+01          | 6.05E-01           | 5.27E-03            | 1.33E-06             | 2.72E+01     |
| Ru-103         | 1.73E+01              | 3.46E+01          | 1.73E+00           | 5.93E-01            | 3.99E+00             | 4.09E+01     |
| Ru-105         | 8.18E+00              | 1.44E+01          | 2.48E-01           | 8.86E-04            | 1.17E-08             | 1.46E+01     |
| Ru-106         | 5.70E+00              | 1.14E+01          | 5.73E-01           | 2.03E-01            | 1.70E+00             | 1.39E+01     |
| Rh-105         | 1.03E+01              | 2.02E+01          | 8.81E-01           | 1.29E-01            | 4.14E-02             | 2.12E+01     |
| Ce-141         | 3.89E+00              | 7.78E+00          | 3.88E-01           | 1.32E-01            | 8.45E-01             | 9.15E+00     |
| Ce-143         | 3.46E+00              | 6.78E+00          | 2.93E-01           | 4.05E-02            | 1.14E-02             | 7.13E+00     |
| Ce-144         | 2.94E+00              | 5.89E+00          | 2.96E-01           | 1.05E-01            | 8.68E-01             | 7.15E+00     |
| Pu-238         | 9.16E-03              | 1.83E-02          | 9.21E-04           | 3.27E-04            | 2.82E-03             | 2.24E-02     |
| Pu-239         | 8.06E-04              | 1.61E-03          | 8.10E-05           | 2.88E-05            | 2.48E-04             | 1.97E-03     |
| Pu-240         | 1.18E-03              | 2.37E-03          | 1.19E-04           | 4.22E-05            | 3.63E-04             | 2.89E-03     |
| Pu-241         | 2.66E-01              | 5.31E-01          | 2.67E-02           | 9.48E-03            | 8.14E-02             | 6.49E-01     |
| Np-239         | 4.48E+01              | 8.87E+01          | 4.08E+00           | 8.15E-01            | 5.70E-01             | 9.41E+01     |
| Y-90           | 8.08E-02              | 1.60E-01          | 7.44E-03           | 1.59E-03            | 1.35E-03             | 1.70E-01     |
| Y-91           | 1.19E+00              | 2.37E+00          | 1.19E-01           | 4.12E-02            | 3.00E-01             | 2.83E+00     |
| Y-92           | 7.89E-01              | 1.35E+00          | 1.80E-02           | 2.86E-05            | 0.00E+00             | 1.37E+00     |
| Y-93           | 1.21E+00              | 2.28E+00          | 7.08E-02           | 1.98E-03            | 1.42E-05             | 2.35E+00     |
| Nb-95          | 1.60E+00              | 3.19E+00          | 1.59E-01           | 5.44E-02            | 3.55E-01             | 3.76E+00     |
| Zr-95          | 1.59E+00              | 3.18E+00          | 1.59E-01           | 5.52E-02            | 4.08E-01             | 3.80E+00     |
| Zr-97          | 1.43E+00              | 2.74E+00          | 1.03E-01           | 6.73E-03            | 3.71E-04             | 2.85E+00     |
| La-140         | 1.67E+00              | 3.29E+00          | 1.46E-01           | 2.36E-02            | 9.62E-03             | 3.47E+00     |
| La-141         | 1.03E+00              | 1.79E+00          | 2.71E-02           | 6.41E-05            | 2.01E-10             | 1.81E+00     |
| La-142         | 5.38E-01              | 8.31E-01          | 2.09E-03           | 3.39E-08            | 0.00E+00             | 8.33E-01     |
| Nd-147         | 6.16E-01              | 1.23E+00          | 6.06E-02           | 1.90E-02            | 7.29E-02             | 1.38E+00     |
| Pr-143         | 1.39E+00              | 2.78E+00          | 1.37E-01           | 4.40E-02            | 1.94E-01             | 3.15E+00     |
| Am-241         | 1.20E-04              | 2.39E-04          | 1.20E-05           | 4.27E-06            | 3.68E-05             | 2.92E-04     |
| Cm-242         | 2.82E-02              | 5.65E-02          | 2.83E-03           | 9.98E-04            | 8.08E-03             | 6.84E-02     |
| Cm-244         | 3.46E-03              | 6.93E-03          | 3.48E-04           | 1.24E-04            | 1.06E-03             | 8.47E-03     |
| Total          | 3.53E+04              | 9.85E+04          | 1.35E+05           | 2.15E+05            | 4.30E+05             | 8.79E+05     |

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**Table 7.1-27  
AP1000 Source Terms  
Activity Releases for Fuel Handling Accident (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> |
|----------------|-------------------|
| Kr-85m         | 3.42E+02          |
| Kr-85          | 1.11E+03          |
| Kr-87          | 6.00E-02          |
| Kr-88          | 1.07E+02          |
| Xe-131m        | 5.54E+02          |
| Xe-133m        | 2.80E+03          |
| Xe-133         | 9.66E+04          |
| Xe-135m        | 1.26E+03          |
| Xe-135         | 2.49E+04          |
| I-130          | 2.51E+00          |
| I-131          | 3.76E+02          |
| I-132          | 3.01E+02          |
| I-133          | 2.40E+02          |
| I-135          | 3.94E+01          |
| Total          | 1.29E+05          |

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**Table 7.1-28  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Main Steamline Break with Pre-Accident Iodine  
Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|--------------|
| Kr-83m         | 2.167E-02         | 2.145E-02         | 3.182E-04          | 4.344E-02    |
| Kr-85m         | 1.115E-01         | 1.858E-01         | 4.350E-03          | 3.016E-01    |
| Kr-85          | 1.205E+00         | 3.613E+00         | 1.505E-01          | 4.969E+00    |
| Kr-87          | 4.505E-02         | 2.194E-02         | 9.099E-05          | 6.709E-02    |
| Kr-88          | 1.849E-01         | 2.258E-01         | 3.674E-03          | 4.144E-01    |
| Kr-89          | 2.093E-04         | 8.419E-16         | 1.370E-50          | 2.093E-04    |
| Xe-131m        | 2.446E-01         | 7.271E-01         | 3.027E-02          | 1.002E+00    |
| Xe-133m        | 3.042E-01         | 8.850E-01         | 3.985E-02          | 1.229E+00    |
| Xe-133         | 2.140E+01         | 6.307E+01         | 2.646E+00          | 8.711E+01    |
| Xe-135m        | 3.843E-01         | 8.821E-01         | 8.834E-02          | 1.355E+00    |
| Xe-135         | 9.137E-01         | 3.733E+00         | 4.540E-01          | 5.100E+00    |
| Xe-137         | 4.777E-04         | 1.767E-13         | 2.237E-42          | 4.777E-04    |
| Xe-138         | 6.324E-03         | 1.790E-05         | 9.525E-14          | 6.341E-03    |
| Br-83          | 2.522E-01         | 4.130E-03         | 7.641E-05          | 2.564E-01    |
| Br-84          | 4.771E-02         | 4.524E-05         | 7.550E-09          | 4.775E-02    |
| Br-85          | 6.133E-04         | 1.092E-18         | 1.546E-56          | 6.133E-04    |
| I-129          | 7.539E-07         | 3.757E-08         | 1.301E-09          | 7.928E-07    |
| I-130          | 6.787E-01         | 2.685E-02         | 8.749E-04          | 7.064E-01    |
| I-131          | 1.516E+01         | 8.621E+00         | 1.226E+00          | 2.501E+01    |
| I-132          | 4.788E+00         | 1.069E+00         | 4.889E-02          | 5.906E+00    |
| I-133          | 2.350E+01         | 1.244E+01         | 1.602E+00          | 3.754E+01    |
| I-134          | 1.620E+00         | 1.135E-01         | 5.052E-04          | 1.734E+00    |
| I-135          | 1.246E+01         | 5.510E+00         | 5.515E-01          | 1.852E+01    |
| Rb-86m         | 1.353E-09         | 1.255E-45         | 0.000E+00          | 1.353E-09    |
| Rb-86          | 1.398E-03         | 7.207E-04         | 1.024E-04          | 2.221E-03    |
| Rb-88          | 1.915E-01         | 2.517E-01         | 4.103E-03          | 4.474E-01    |
| Rb-89          | 1.838E-03         | 3.266E-06         | 1.619E-13          | 1.841E-03    |
| Cs-134         | 1.609E-01         | 8.300E-02         | 1.185E-02          | 2.557E-01    |
| Cs-136         | 3.808E-02         | 1.963E-02         | 2.782E-03          | 6.048E-02    |
| Cs-137         | 6.160E-02         | 3.177E-02         | 4.536E-03          | 9.791E-02    |
| Cs-138         | 2.051E-02         | 1.254E-03         | 1.886E-07          | 2.177E-02    |
| Sr-89          | 7.189E-07         | 2.557E-06         | 3.082E-07          | 3.584E-06    |
| Ba-137m        | 5.786E-02         | 3.006E-02         | 4.291E-03          | 9.220E-02    |
| Total          | 8.386E+01         | 1.016E+02         | 6.875E+00          | 1.923E+02    |

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**Table 7.1-29  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Main Steamline Break with Accident-Induced  
(Coincident) Iodine Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|--------------|
| Kr-83m         | 2.167E-02         | 2.145E-02         | 3.182E-04          | 4.344E-02    |
| Kr-85m         | 1.115E-01         | 1.858E-01         | 4.350E-03          | 3.016E-01    |
| Kr-85          | 1.205E+00         | 3.613E+00         | 1.505E-01          | 4.969E+00    |
| Kr-87          | 4.505E-02         | 2.194E-02         | 9.099E-05          | 6.709E-02    |
| Kr-88          | 1.849E-01         | 2.258E-01         | 3.674E-03          | 4.144E-01    |
| Kr-89          | 2.093E-04         | 8.419E-16         | 1.370E-50          | 2.093E-04    |
| Xe-131m        | 2.446E-01         | 7.308E-01         | 3.188E-02          | 1.007E+00    |
| Xe-133m        | 3.045E-01         | 9.837E-01         | 8.092E-02          | 1.369E+00    |
| Xe-133         | 2.140E+01         | 6.448E+01         | 3.237E+00          | 8.912E+01    |
| Xe-135m        | 7.205E-01         | 1.136E+01         | 2.616E+00          | 1.470E+01    |
| Xe-135         | 1.023E+00         | 1.721E+01         | 5.434E+00          | 2.367E+01    |
| Xe-137         | 4.777E-04         | 1.767E-13         | 2.237E-42          | 4.777E-04    |
| Xe-138         | 6.324E-03         | 1.790E-05         | 9.525E-14          | 6.341E-03    |
| Br-83          | 2.522E-01         | 4.130E-03         | 7.641E-05          | 2.564E-01    |
| Br-84          | 4.771E-02         | 4.524E-05         | 7.550E-09          | 4.775E-02    |
| Br-85          | 6.133E-04         | 1.092E-18         | 1.546E-56          | 6.133E-04    |
| I-129          | 7.539E-07         | 3.757E-08         | 1.301E-09          | 7.928E-07    |
| I-130          | 6.787E-01         | 2.685E-02         | 8.749E-04          | 7.064E-01    |
| I-131          | 1.627E+01         | 6.254E+01         | 1.557E+01          | 9.438E+01    |
| I-132          | 8.145E+00         | 3.962E+01         | 6.683E+00          | 5.445E+01    |
| I-133          | 2.653E+01         | 1.129E+02         | 2.685E+01          | 1.663E+02    |
| I-134          | 5.642E+00         | 2.468E+01         | 2.899E+00          | 3.322E+01    |
| I-135          | 1.595E+01         | 7.814E+01         | 1.675E+01          | 1.108E+02    |
| Rb-86m         | 1.353E-09         | 1.255E-45         | 0.000E+00          | 1.353E-09    |
| Rb-86          | 1.398E-03         | 7.207E-04         | 1.024E-04          | 2.221E-03    |
| Rb-88          | 1.915E-01         | 2.517E-01         | 4.103E-03          | 4.474E-01    |
| Rb-89          | 1.838E-03         | 3.266E-06         | 1.619E-13          | 1.841E-03    |
| Cs-134         | 1.609E-01         | 8.300E-02         | 1.185E-02          | 2.557E-01    |
| Cs-136         | 3.808E-02         | 1.963E-02         | 2.782E-03          | 6.048E-02    |
| Cs-137         | 6.160E-02         | 3.177E-02         | 4.536E-03          | 9.791E-02    |
| Cs-138         | 2.051E-02         | 1.254E-03         | 1.886E-07          | 2.177E-02    |
| Sr-89          | 7.189E-07         | 2.557E-06         | 3.082E-07          | 3.584E-06    |
| Ba-137m        | 5.786E-02         | 3.006E-02         | 4.291E-03          | 9.220E-02    |
| Total          | 9.932E+01         | 4.172E+02         | 8.034E+01          | 5.968E+02    |

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**Table 7.1-30A  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Main Steamline Break with Accident-Induced  
3.3% Clad Failure (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|--------------|
| Kr-83m         | 3.280E+01         | 3.559E+01         | 1.238E+00          | 6.963E+01    |
| Kr-85m         | 8.444E+01         | 1.407E+02         | 3.320E+00          | 2.285E+02    |
| Kr-85          | 1.031E+01         | 3.093E+01         | 1.288E+00          | 4.253E+01    |
| Kr-87          | 1.192E+02         | 5.806E+01         | 2.408E-01          | 1.775E+02    |
| Kr-88          | 2.202E+02         | 2.688E+02         | 4.376E+00          | 4.934E+02    |
| Kr-89          | 1.332E+01         | 5.359E-11         | 8.719E-46          | 1.332E+01    |
| Xe-131m        | 3.583E+00         | 1.068E+01         | 4.523E-01          | 1.472E+01    |
| Xe-133m        | 1.946E+01         | 5.604E+01         | 2.403E+00          | 7.790E+01    |
| Xe-133         | 6.466E+02         | 1.908E+03         | 8.055E+01          | 2.635E+03    |
| Xe-135m        | 4.150E+01         | 4.615E+01         | 4.800E+00          | 9.245E+01    |
| Xe-135         | 1.998E+02         | 5.351E+02         | 3.532E+01          | 7.702E+02    |
| Xe-137         | 2.515E+01         | 9.302E-09         | 1.178E-37          | 2.515E+01    |
| Xe-138         | 9.017E+01         | 2.552E-01         | 1.358E-09          | 9.042E+01    |
| Br-83          | 1.094E+01         | 9.155E+00         | 4.542E-01          | 2.055E+01    |
| Br-84          | 1.069E+01         | 5.777E-01         | 1.566E-04          | 1.126E+01    |
| Br-85          | 1.663E+00         | 2.161E-13         | 3.269E-51          | 1.663E+00    |
| I-129          | 6.476E-06         | 1.488E-05         | 2.258E-06          | 2.362E-05    |
| I-130          | 9.312E+00         | 1.780E+01         | 2.217E+00          | 2.933E+01    |
| I-131          | 1.643E+02         | 3.897E+02         | 5.846E+01          | 6.125E+02    |
| I-132          | 1.121E+02         | 8.941E+01         | 4.225E+00          | 2.057E+02    |
| I-133          | 2.124E+02         | 4.391E+02         | 5.933E+01          | 7.109E+02    |
| I-134          | 1.242E+02         | 2.356E+01         | 1.065E-01          | 1.479E+02    |
| I-135          | 1.789E+02         | 2.877E+02         | 2.996E+01          | 4.966E+02    |
| Rb-86m         | 1.764E-03         | 2.996E-39         | 0.000E+00          | 1.764E-03    |
| Rb-86          | 9.539E-01         | 2.456E+00         | 3.714E-01          | 3.781E+00    |
| Rb-88          | 2.406E+02         | 2.999E+02         | 4.885E+00          | 5.454E+02    |
| Rb-89          | 8.269E+01         | 2.451E-01         | 1.281E-08          | 8.293E+01    |
| Cs-134         | 1.069E+02         | 2.768E+02         | 4.209E+01          | 4.258E+02    |
| Cs-136         | 2.650E+01         | 6.805E+01         | 1.026E+01          | 1.048E+02    |
| Cs-137         | 4.081E+01         | 1.057E+02         | 1.607E+01          | 1.626E+02    |
| Cs-138         | 2.696E+02         | 2.276E+01         | 4.151E-03          | 2.923E+02    |
| Sr-89          | 5.497E-02         | 1.946E-01         | 2.451E-02          | 2.741E-01    |
| Ba-137m        | 3.860E+01         | 1.000E+02         | 1.520E+01          | 1.538E+02    |
| Total          | 3.138E+03         | 5.224E+03         | 3.776E+02          | 8.739E+03    |

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**Table 7.1-30B  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Main Steam Line Break with  
Accident-Induced 0.58% Fuel Overheat (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr</b> | <b>2 to 8 hr</b> | <b>8 to 24 hr</b> | <b>Total</b> |
|----------------|------------------|------------------|-------------------|--------------|
| Kr-83m         | 1.098E+02        | 1.038E+02        | 2.549E+00         | 2.162E+02    |
| Kr-85m         | 2.957E+02        | 4.928E+02        | 1.158E+01         | 8.001E+02    |
| Kr-85          | 1.721E+01        | 5.163E+01        | 2.150E+00         | 7.099E+01    |
| Kr-87          | 4.179E+02        | 2.035E+02        | 8.440E-01         | 6.223E+02    |
| Kr-88          | 7.737E+02        | 9.445E+02        | 1.537E+01         | 1.733E+03    |
| Kr-89          | 4.684E+01        | 1.884E-10        | 3.065E-45         | 4.684E+01    |
| Xe-131m        | 1.197E+01        | 3.560E+01        | 1.483E+00         | 4.905E+01    |
| Xe-133m        | 6.769E+01        | 1.938E+02        | 8.011E+00         | 2.695E+02    |
| Xe-133         | 2.213E+03        | 6.514E+03        | 2.708E+02         | 8.997E+03    |
| Xe-135m        | 1.112E+02        | 8.124E+01        | 8.435E+00         | 2.008E+02    |
| Xe-135         | 6.807E+02        | 1.677E+03        | 8.537E+01         | 2.443E+03    |
| Xe-137         | 8.839E+01        | 3.271E-08        | 4.140E-37         | 8.839E+01    |
| Xe-138         | 3.178E+02        | 8.992E-01        | 4.786E-09         | 3.187E+02    |
| Br-83          | 1.904E+01        | 1.609E+01        | 7.982E-01         | 3.592E+01    |
| Br-84          | 1.875E+01        | 1.015E+00        | 2.752E-04         | 1.976E+01    |
| Br-85          | 2.922E+00        | 3.798E-13        | 5.745E-51         | 2.922E+00    |
| I-129          | 1.081E-05        | 2.613E-05        | 3.967E-06         | 4.091E-05    |
| I-130          | 1.585E+01        | 3.127E+01        | 3.897E+00         | 5.102E+01    |
| I-131          | 1.792E+02        | 4.277E+02        | 6.411E+01         | 6.709E+02    |
| I-132          | 1.943E+02        | 1.571E+02        | 7.425E+00         | 3.588E+02    |
| I-133          | 3.595E+02        | 7.712E+02        | 1.043E+02         | 1.235E+03    |
| I-134          | 2.175E+02        | 4.141E+01        | 1.872E-01         | 2.591E+02    |
| I-135          | 3.073E+02        | 5.054E+02        | 5.265E+01         | 8.654E+02    |
| Rb-86m         | 1.290E-03        | 2.191E-39        | 0.000E+00         | 1.290E-03    |
| Rb-86          | 7.010E-01        | 1.804E+00        | 2.727E-01         | 2.777E+00    |
| Rb-88          | 6.770E+02        | 1.053E+03        | 1.716E+01         | 1.747E+03    |
| Rb-89          | 9.740E+01        | 3.763E-01        | 1.278E-08         | 9.778E+01    |
| Cs-134         | 7.845E+01        | 2.031E+02        | 3.087E+01         | 3.124E+02    |
| Cs-136         | 1.947E+01        | 4.995E+01        | 7.537E+00         | 7.696E+01    |
| Cs-137         | 2.990E+01        | 7.740E+01        | 1.177E+01         | 1.191E+02    |
| Cs-138         | 4.164E+02        | 5.014E+01        | 5.701E-03         | 4.666E+02    |
| Sr-89          | 7.331E-02        | 2.692E-01        | 2.321E-02         | 3.657E-01    |
| Ba-137m        | 2.829E+01        | 7.327E+01        | 1.113E+01         | 1.127E+02    |
| Total          | 7.814E+03        | 1.376E+04        | 7.187E+02         | 2.229E+04    |

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**Table 7.1-31  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Pump Locked Rotor Accident (LRA) with  
Accident-Induced 9.5% Clad Failure (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------|
| Kr-83m         | 6.864E+01         | 5.405E+01         | 1.227E+02    |
| Kr-85m         | 1.905E+02         | 3.030E+02         | 4.935E+02    |
| Kr-85          | 2.146E+01         | 6.173E+01         | 8.319E+01    |
| Kr-87          | 2.742E+02         | 1.254E+02         | 3.996E+02    |
| Kr-88          | 5.001E+02         | 5.806E+02         | 1.081E+03    |
| Kr-89          | 3.803E+01         | 1.158E-10         | 3.803E+01    |
| Xe-131m        | 7.701E+00         | 2.195E+01         | 2.966E+01    |
| Xe-133m        | 4.324E+01         | 1.182E+02         | 1.615E+02    |
| Xe-133         | 1.423E+03         | 4.010E+03         | 5.433E+03    |
| Xe-135m        | 5.836E+01         | 1.167E+01         | 7.003E+01    |
| Xe-135         | 4.279E+02         | 9.442E+02         | 1.372E+03    |
| Xe-137         | 7.127E+01         | 2.011E-08         | 7.127E+01    |
| Xe-138         | 2.288E+02         | 5.516E-01         | 2.293E+02    |
| Br-83          | 4.263E+00         | 2.041E+00         | 6.304E+00    |
| Br-84          | 6.306E+00         | 8.774E-02         | 6.394E+00    |
| Br-85          | 2.332E+00         | 2.497E-14         | 2.332E+00    |
| I-129          | 2.293E-06         | 3.969E-06         | 6.262E-06    |
| I-130          | 3.307E+00         | 4.570E+00         | 7.877E+00    |
| I-131          | 5.682E+01         | 1.029E+02         | 1.597E+02    |
| I-132          | 4.404E+01         | 1.982E+01         | 6.386E+01    |
| I-133          | 7.514E+01         | 1.144E+02         | 1.896E+02    |
| I-134          | 6.060E+01         | 4.122E+00         | 6.472E+01    |
| I-135          | 6.439E+01         | 7.163E+01         | 1.360E+02    |
| Rb-86m         | 2.540E-03         | 3.391E-40         | 2.540E-03    |
| Rb-86          | 3.151E-01         | 6.410E-01         | 9.561E-01    |
| Rb-88          | 4.415E+02         | 6.471E+02         | 1.089E+03    |
| Rb-89          | 8.974E+01         | 1.757E-01         | 8.992E+01    |
| Cs-134         | 3.527E+01         | 7.231E+01         | 1.076E+02    |
| Cs-136         | 8.757E+00         | 1.775E+01         | 2.651E+01    |
| Cs-137         | 1.347E+01         | 2.761E+01         | 4.108E+01    |
| Cs-138         | 2.872E+02         | 2.755E+01         | 3.147E+02    |
| Sr-89          | 3.289E-02         | 1.374E-01         | 1.702E-01    |
| Ba-137m        | 1.008E+01         | 2.612E+01         | 3.620E+01    |
| Total          | 4.557E+03         | 7.371E+03         | 1.193E+04    |



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**Table 7.1-32  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis Small Line Break (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> |
|----------------|-------------------|
| Kr-83m         | 1.653E+00         |
| Kr-85m         | 7.066E+00         |
| Kr-85          | 6.827E+01         |
| Kr-87          | 3.672E+00         |
| Kr-88          | 1.247E+01         |
| Kr-89          | 4.810E-02         |
| Xe-131m        | 1.389E+01         |
| Xe-133m        | 1.750E+01         |
| Xe-133         | 1.219E+03         |
| Xe-135m        | 1.652E+02         |
| Xe-135         | 6.941E+01         |
| Xe-137         | 1.093E-01         |
| Xe-138         | 1.111E+00         |
| Br-83          | 1.514E-01         |
| Br-84          | 6.319E-02         |
| Br-85          | 1.447E-03         |
| I-129          | 2.360E-07         |
| I-130          | 2.521E-01         |
| I-131          | 9.400E+01         |
| I-132          | 1.132E+02         |
| I-133          | 1.828E+02         |
| I-134          | 1.347E+02         |
| I-135          | 1.502E+02         |
| Rb-86          | 1.881E-02         |
| Rb-88          | 5.174E+00         |
| Rb-89          | 1.458E-01         |
| Cs-134         | 2.150E+00         |
| Cs-136         | 5.140E-01         |
| Cs-137         | 8.228E-01         |
| Cs-138         | 1.032E+00         |
| Sr-89          | 2.485E-05         |
| Ba-137m        | 7.775E-01         |
| Total          | 2.27E+03          |

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**Table 7.1-33  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Steam Generator Tube Rupture  
with Pre-Accident Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| Kr-83m         | 5.579E+01         | 5.208E+01         | 1.113E+01          | 1.110E-01           | 1.024E-10            | 1.191E+02    |
| Kr-85m         | 2.745E+01         | 9.737E-02         | 5.647E-02          | 5.168E-03           | 7.391E-08            | 2.761E+01    |
| Kr-85          | 2.693E+02         | 1.875E+00         | 4.878E+00          | 2.172E+01           | 1.734E+02            | 4.711E+02    |
| Kr-87          | 1.365E+01         | 1.170E-02         | 4.390E-04          | 7.132E-08           | 6.326E-25            | 1.366E+01    |
| Kr-88          | 4.786E+01         | 1.186E-01         | 3.368E-02          | 6.881E-04           | 1.565E-11            | 4.801E+01    |
| Kr-89          | 1.260E-01         | 4.744E-16         | 2.768E-50          | 0.000E+00           | 0.000E+00            | 1.260E-01    |
| Xe-131m        | 5.483E+01         | 7.018E-01         | 1.810E+00          | 7.458E+00           | 3.116E+01            | 9.596E+01    |
| Xe-133m        | 7.072E+01         | 7.102E+00         | 1.379E+01          | 2.108E+01           | 4.983E+00            | 1.177E+02    |
| Xe-133         | 4.829E+03         | 1.262E+02         | 2.600E+02          | 5.499E+02           | 6.459E+02            | 6.411E+03    |
| Xe-135m        | 1.530E+03         | 3.263E+03         | 3.062E+03          | 7.187E+02           | 4.064E-01            | 8.574E+03    |
| Xe-135         | 4.299E+02         | 5.069E+02         | 4.845E+02          | 1.206E+02           | 1.232E-01            | 1.542E+03    |
| Xe-137         | 2.887E-01         | 9.932E-14         | 4.492E-42          | 0.000E+00           | 0.000E+00            | 2.887E-01    |
| Xe-138         | 3.434E+00         | 9.959E-06         | 2.041E-13          | 8.199E-34           | 0.000E+00            | 3.434E+00    |
| Br-83          | 2.004E+00         | 2.840E-03         | 7.849E-04          | 1.620E-05           | 4.395E-14            | 2.008E+00    |
| Br-84          | 5.904E-01         | 4.270E-05         | 1.939E-08          | 4.027E-17           | 1.788E-57            | 5.904E-01    |
| Br-85          | 6.852E-04         | 1.190E-18         | 2.448E-56          | 0.000E+00           | 0.000E+00            | 6.852E-04    |
| I-129          | 3.454E-06         | 1.964E-08         | 8.140E-08          | 1.077E-06           | 4.192E-05            | 4.655E-05    |
| I-130          | 3.616E+00         | 1.503E-02         | 3.374E-02          | 5.191E-02           | 2.304E-03            | 3.719E+00    |
| I-131          | 5.578E+01         | 3.103E-01         | 1.236E+00          | 1.376E+01           | 1.542E+02            | 2.253E+02    |
| I-132          | 2.339E+01         | 3.417E-02         | 8.312E-03          | 1.407E-04           | 1.667E-13            | 2.343E+01    |
| I-133          | 9.220E+01         | 4.337E-01         | 1.242E+00          | 3.997E+00           | 9.448E-01            | 9.882E+01    |
| I-134          | 1.140E+01         | 3.079E-03         | 3.155E-05          | 2.442E-10           | 1.584E-34            | 1.140E+01    |
| I-135          | 5.584E+01         | 1.805E-01         | 2.463E-01          | 1.167E-01           | 1.685E-04            | 5.639E+01    |
| Rb-86          | 4.589E-03         | 2.766E-05         | 1.086E-04          | 1.305E-03           | 2.814E-02            | 3.417E-02    |
| Rb-88          | 1.105E+00         | 1.286E-03         | 6.410E-04          | 2.976E-05           | 2.261E-12            | 1.107E+00    |
| Rb-89          | 1.257E-02         | 4.677E-08         | 4.331E-15          | 1.140E-33           | 0.000E+00            | 1.257E-02    |
| Cs-134         | 5.246E-01         | 3.196E-03         | 1.275E-02          | 1.648E-01           | 6.259E+00            | 6.964E+00    |
| Cs-136         | 1.253E-01         | 7.520E-04         | 2.931E-03          | 3.415E-02           | 5.875E-01            | 7.507E-01    |
| Cs-137         | 2.008E-01         | 1.224E-03         | 4.884E-03          | 6.322E-02           | 2.436E+00            | 2.706E+00    |
| Cs-138         | 1.397E-01         | 9.813E-06         | 5.129E-09          | 1.405E-17           | 2.046E-57            | 1.397E-01    |
| Ba-137m        | 1.883E-01         | 1.148E-03         | 4.579E-03          | 5.927E-02           | 2.284E+00            | 2.537E+00    |
| Total          | 7.580E+03         | 3.959E+03         | 3.841E+03          | 1.458E+03           | 1.023E+03            | 1.786E+04    |

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**Table 7.1-34  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Steam Generator Tube Rupture with Accident-  
Induced (Coincident) Iodine Spike (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| Kr-83m         | 5.286E+01         | 6.506E+01         | 2.614E+01          | 5.395E-01           | 1.229E-09            | 1.446E+02    |
| Kr-85m         | 2.938E+01         | 2.475E-01         | 2.560E-01          | 2.342E-02           | 3.350E-07            | 2.990E+01    |
| Kr-85          | 2.693E+02         | 1.875E+00         | 4.878E+00          | 2.172E+01           | 1.734E+02            | 4.711E+02    |
| Kr-87          | 1.365E+01         | 1.170E-02         | 4.390E-04          | 7.132E-08           | 6.326E-25            | 1.366E+01    |
| Kr-88          | 4.786E+01         | 1.186E-01         | 3.368E-02          | 6.881E-04           | 1.565E-11            | 4.801E+01    |
| Kr-89          | 1.260E-01         | 4.744E-16         | 2.768E-50          | 0.000E+00           | 0.000E+00            | 1.260E-01    |
| Xe-131m        | 5.476E+01         | 5.269E-01         | 1.550E+00          | 9.473E+00           | 8.667E+01            | 1.530E+02    |
| Xe-133m        | 6.924E+01         | 4.025E+00         | 1.188E+01          | 4.107E+01           | 2.417E+01            | 1.504E+02    |
| Xe-133         | 4.808E+03         | 8.294E+01         | 2.349E+02          | 9.134E+02           | 1.558E+03            | 7.597E+03    |
| Xe-135m        | 9.009E+02         | 2.273E+03         | 2.859E+03          | 1.054E+03           | 1.262E+00            | 7.088E+03    |
| Xe-135         | 3.154E+02         | 3.712E+02         | 6.204E+02          | 3.471E+02           | 1.427E+00            | 1.655E+03    |
| Xe-137         | 2.887E-01         | 9.932E-14         | 4.492E-42          | 0.000E+00           | 0.000E+00            | 2.887E-01    |
| Xe-138         | 3.434E+00         | 9.959E-06         | 2.041E-13          | 8.199E-34           | 0.000E+00            | 3.434E+00    |
| Br-83          | 3.105E+00         | 2.064E-02         | 3.304E-02          | 1.187E-03           | 4.062E-12            | 3.159E+00    |
| Br-84          | 3.844E+00         | 4.306E-03         | 7.921E-04          | 7.298E-12           | 4.404E-52            | 3.849E+00    |
| Br-85          | 7.119E-01         | 4.381E-05         | 6.904E-07          | 0.000E+00           | 0.000E+00            | 7.120E-01    |
| I-129          | 1.942E-06         | 3.838E-08         | 4.662E-07          | 9.049E-06           | 3.973E-04            | 4.088E-04    |
| I-130          | 2.679E+00         | 3.998E-02         | 3.041E-01          | 6.765E-01           | 3.436E-02            | 3.734E+00    |
| I-131          | 3.199E+01         | 6.194E-01         | 7.305E+00          | 1.192E+02           | 1.500E+03            | 1.659E+03    |
| I-132          | 3.721E+01         | 2.421E-01         | 3.626E-01          | 1.103E-02           | 1.671E-11            | 3.782E+01    |
| I-133          | 6.155E+01         | 1.022E+00         | 9.383E+00          | 4.389E+01           | 1.163E+01            | 1.275E+02    |
| I-134          | 4.170E+01         | 9.438E-02         | 3.336E-02          | 7.756E-07           | 6.711E-31            | 4.183E+01    |
| I-135          | 5.032E+01         | 6.126E-01         | 3.161E+00          | 2.185E+00           | 3.747E-03            | 5.629E+01    |
| Rb-86          | 4.589E-03         | 2.766E-05         | 1.086E-04          | 1.305E-03           | 2.814E-02            | 3.417E-02    |
| Rb-88          | 1.105E+00         | 1.286E-03         | 6.410E-04          | 2.976E-05           | 2.261E-12            | 1.107E+00    |
| Rb-89          | 1.257E-02         | 4.677E-08         | 4.331E-15          | 1.140E-33           | 0.000E+00            | 1.257E-02    |
| Cs-134         | 5.246E-01         | 3.196E-03         | 1.275E-02          | 1.648E-01           | 6.259E+00            | 6.964E+00    |
| Cs-136         | 1.253E-01         | 7.520E-04         | 2.931E-03          | 3.415E-02           | 5.875E-01            | 7.507E-01    |
| Cs-137         | 2.008E-01         | 1.224E-03         | 4.884E-03          | 6.322E-02           | 2.436E+00            | 2.706E+00    |
| Cs-138         | 1.397E-01         | 9.813E-06         | 5.129E-09          | 1.405E-17           | 2.046E-57            | 1.397E-01    |
| Ba-137m        | 1.883E-01         | 1.148E-03         | 4.579E-03          | 5.927E-02           | 2.284E+00            | 2.537E+00    |
| Total          | 6.801E+03         | 2.802E+03         | 3.780E+03          | 2.554E+03           | 3.368E+03            | 1.930E+04    |

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**Table 7.1-35 (Sheet 1 of 6)  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

| <b>Isotope</b> | <b>0 to 1.5 hr.</b> | <b>1.5 to 3.5 hr.</b> | <b>3.5 to 8 hr.</b> |
|----------------|---------------------|-----------------------|---------------------|
| Kr-83m         | 7.297E+02           | 2.751E+03             | 4.641E+03           |
| Kr-85m         | 1.709E+03           | 6.303E+03             | 8.876E+03           |
| Kr-85          | 1.126E+02           | 4.307E+02             | 9.847E+02           |
| Kr-87          | 2.224E+03           | 4.925E+03             | 2.337E+03           |
| Kr-88          | 4.382E+03           | 1.434E+04             | 1.548E+04           |
| Kr-89          | 9.523E+00           | 3.044E-06             | 1.461E-17           |
| Xe-131m        | 7.277E+01           | 3.151E+02             | 7.225E+02           |
| Xe-133m        | 4.023E+02           | 1.806E+03             | 4.148E+03           |
| Xe-133         | 1.326E+04           | 5.898E+04             | 1.353E+05           |
| Xe-135m        | 1.676E+03           | 1.283E+04             | 5.187E+04           |
| Xe-135         | 4.390E+03           | 2.130E+04             | 5.958E+04           |
| Xe-137         | 2.238E+01           | 1.730E-04             | 7.545E-14           |
| Xe-138         | 6.229E+02           | 9.854E+01             | 3.005E-01           |
| Br-83          | 3.714E+00           | 7.476E+00             | 5.922E+00           |
| Br-84          | 3.206E+00           | 1.399E+00             | 1.010E-01           |
| Br-85          | 7.005E-01           | 3.783E-10             | 1.011E-22           |
| I-129          | 2.143E-06           | 6.460E-06             | 1.204E-05           |
| I-130          | 3.160E+00           | 8.910E+00             | 1.395E+01           |
| I-131          | 3.558E+01           | 1.070E+02             | 1.971E+02           |
| I-132          | 3.928E+01           | 8.453E+01             | 8.515E+01           |
| I-133          | 7.134E+01           | 2.071E+02             | 3.479E+02           |
| I-134          | 4.192E+01           | 4.308E+01             | 1.043E+01           |
| I-135          | 6.120E+01           | 1.615E+02             | 2.183E+02           |
| Rb-86m         | 2.457E-04           | 8.331E-31             | 2.805E-66           |
| Rb-86          | 1.268E-01           | 3.249E-01             | 5.175E-01           |
| Rb-88          | 6.288E+01           | 1.545E+02             | 1.636E+02           |
| Rb-89          | 1.126E+01           | 5.235E-01             | 1.960E-03           |
| Cs-134         | 1.418E+01           | 3.636E+01             | 5.818E+01           |
| Cs-136         | 3.511E+00           | 9.004E+00             | 1.431E+01           |
| Cs-137         | 5.419E+00           | 1.389E+01             | 2.223E+01           |
| Cs-138         | 4.511E+01           | 2.603E+01             | 1.839E+00           |
| Sb-125         | 7.674E-02           | 3.605E-01             | 5.787E-01           |

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**Table 7.1-35 (Sheet 2 of 6)  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

| <b>Isotope</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|--------------------|---------------------|----------------------|--------------|
| Kr-83m         | 4.187E+03          | 1.072E+02           | 3.150E-07            | 1.242E+04    |
| Kr-85m         | 8.074E+03          | 3.703E+02           | 5.366E-03            | 2.533E+04    |
| Kr-85          | 3.497E+03          | 7.845E+03           | 6.661E+04            | 7.948E+04    |
| Kr-87          | 2.199E+02          | 1.791E-02           | 1.613E-19            | 9.706E+03    |
| Kr-88          | 7.580E+03          | 7.766E+01           | 1.794E-06            | 4.186E+04    |
| Kr-89          | 3.346E-43          | 0.000E+00           | 0.000E+00            | 9.523E+00    |
| Xe-131m        | 2.650E+03          | 8.448E+03           | 8.304E+04            | 9.525E+04    |
| Xe-133m        | 1.551E+04          | 3.840E+04           | 2.689E+04            | 8.716E+04    |
| Xe-133         | 4.923E+05          | 1.172E+06           | 2.331E+06            | 4.202E+06    |
| Xe-135m        | 1.495E+05          | 6.371E+04           | 8.257E+01            | 2.797E+05    |
| Xe-135         | 2.402E+05          | 1.708E+05           | 9.095E+02            | 4.971E+05    |
| Xe-137         | 4.529E-35          | 0.000E+00           | 0.000E+00            | 2.238E+01    |
| Xe-138         | 5.518E-07          | 1.111E-27           | 0.000E+00            | 7.217E+02    |
| Br-83          | 1.578E+00          | 9.943E-03           | 7.939E-12            | 1.870E+01    |
| Br-84          | 2.106E-04          | 1.010E-13           | 1.200E-54            | 4.706E+00    |
| Br-85          | 3.330E-51          | 0.000E+00           | 0.000E+00            | 7.005E-01    |
| I-129          | 2.778E-05          | 8.971E-05           | 6.739E-04            | 8.120E-04    |
| I-130          | 1.919E+01          | 9.181E+00           | 1.557E-01            | 5.455E+01    |
| I-131          | 4.395E+02          | 1.216E+03           | 3.310E+03            | 5.305E+03    |
| I-132          | 8.672E+01          | 1.646E+02           | 1.700E+02            | 6.303E+02    |
| I-133          | 5.859E+02          | 5.389E+02           | 5.089E+01            | 1.802E+03    |
| I-134          | 2.466E-01          | 4.949E-07           | 8.736E-32            | 9.568E+01    |
| I-135          | 2.005E+02          | 3.195E+01           | 1.584E-02            | 6.735E+02    |
| Rb-86m         | 0.000E+00          | 0.000E+00           | 0.000E+00            | 2.457E-04    |
| Rb-86          | 6.158E-01          | 1.784E-01           | 3.473E-02            | 1.798E+00    |
| Rb-88          | 8.009E+01          | 8.460E-01           | 1.980E-08            | 4.619E+02    |
| Rb-89          | 4.966E-09          | 5.198E-29           | 0.000E+00            | 1.178E+01    |
| Cs-134         | 7.012E+01          | 2.128E+01           | 5.202E+00            | 2.053E+02    |
| Cs-136         | 1.694E+01          | 4.810E+00           | 8.548E-01            | 4.943E+01    |
| Cs-137         | 2.679E+01          | 8.142E+00           | 2.002E+00            | 7.848E+01    |
| Cs-138         | 3.106E-03          | 3.645E-13           | 3.186E-55            | 7.298E+01    |
| Sb-125         | 6.973E-01          | 2.117E-01           | 5.185E-02            | 1.977E+00    |

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**Table 7.1-35 (Sheet 3 of 6)  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

| <b>Isotope</b> | <b>0 to 1.5 hr.</b> | <b>1.5 to 3.5 hr.</b> | <b>3.5 to 8 hr.</b> |
|----------------|---------------------|-----------------------|---------------------|
| Sb-127         | 3.566E-01           | 1.658E+00             | 2.602E+00           |
| Sb-129         | 8.062E-01           | 3.074E+00             | 3.076E+00           |
| Te-127m        | 5.087E-02           | 2.290E-01             | 3.677E-01           |
| Te-127         | 3.679E-01           | 1.678E+00             | 2.678E+00           |
| Te-129m        | 1.475E-01           | 6.643E-01             | 1.065E+00           |
| Te-129         | 9.137E-01           | 3.758E+00             | 4.244E+00           |
| Te-131m        | 4.117E-01           | 1.808E+00             | 2.706E+00           |
| Te-131         | 4.731E-01           | 6.764E-01             | 6.180E-01           |
| Te-132         | 4.076E+00           | 1.819E+01             | 2.841E+01           |
| Te-134         | 1.637E+00           | 2.306E+00             | 2.992E-01           |
| Sr-89          | 1.295E+00           | 6.070E+00             | 9.727E+00           |
| Sr-90          | 1.352E-01           | 6.346E-01             | 1.019E+00           |
| Sr-91          | 1.523E+00           | 6.489E+00             | 8.369E+00           |
| Sr-92          | 1.273E+00           | 4.299E+00             | 3.300E+00           |
| Ba-137m        | 4.246E+00           | 1.310E+01             | 2.103E+01           |
| Ba-139         | 1.252E+00           | 2.933E+00             | 1.185E+00           |
| Ba-140         | 2.011E+00           | 9.409E+00             | 1.500E+01           |
| Mo-99          | 6.680E-01           | 1.185E+00             | 1.843E+00           |
| Tc-99m         | 4.054E-01           | 1.062E+00             | 1.685E+00           |
| Ru-103         | 2.419E-01           | 1.134E+00             | 1.816E+00           |
| Ru-105         | 1.639E-01           | 6.263E-01             | 6.347E-01           |
| Ru-106         | 1.433E-01           | 6.720E-01             | 1.079E+00           |
| Rh-103m        | 2.180E-01           | 1.022E+00             | 1.637E+00           |
| Rh-105         | 1.753E-01           | 8.191E-01             | 1.284E+00           |
| Rh-106         | 1.433E-01           | 6.720E-01             | 1.079E+00           |
| Ce-141         | 4.504E-02           | 2.100E-01             | 3.363E-01           |
| Ce-143         | 4.473E-02           | 2.032E-01             | 3.060E-01           |
| Ce-144         | 3.421E-02           | 1.595E-01             | 2.560E-01           |
| Np-239         | 7.573E-01           | 3.479E+00             | 5.379E+00           |
| Pu-238         | 2.937E-04           | 1.371E-03             | 2.200E-03           |
| Pu-239         | 1.236E-05           | 5.767E-05             | 9.263E-05           |
| Pu-240         | 2.817E-05           | 1.315E-04             | 2.110E-04           |

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**Table 7.1-35 (Sheet 4 of 6)  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

| <b>Isotope</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|--------------------|---------------------|----------------------|--------------|
| Sb-127         | 2.947E+00          | 7.152E-01           | 6.814E-02            | 8.347E+00    |
| Sb-129         | 1.172E+00          | 1.262E-02           | 9.903E-09            | 8.142E+00    |
| Te-127m        | 4.432E-01          | 1.345E-01           | 3.221E-02            | 1.257E+00    |
| Te-127         | 3.139E+00          | 8.103E-01           | 9.679E-02            | 8.769E+00    |
| Te-129m        | 1.276E+00          | 3.779E-01           | 8.132E-02            | 3.612E+00    |
| Te-129         | 2.219E+00          | 2.610E-01           | 5.294E-02            | 1.145E+01    |
| Te-131m        | 2.700E+00          | 4.296E-01           | 9.844E-03            | 8.066E+00    |
| Te-131         | 6.079E-01          | 9.670E-02           | 2.216E-03            | 2.474E+00    |
| Te-132         | 3.181E+01          | 7.423E+00           | 6.147E-01            | 9.053E+01    |
| Te-134         | 1.926E-03          | 2.642E-11           | 1.491E-43            | 4.244E+00    |
| Sr-89          | 1.167E+01          | 3.484E+00           | 7.831E-01            | 3.303E+01    |
| Sr-90          | 1.228E+00          | 3.731E-01           | 9.176E-02            | 3.481E+00    |
| Sr-91          | 5.720E+00          | 3.029E-01           | 1.462E-04            | 2.240E+01    |
| Sr-92          | 7.207E-01          | 1.556E-03           | 1.220E-12            | 9.594E+00    |
| Ba-137m        | 2.535E+01          | 7.702E+00           | 1.894E+00            | 7.332E+01    |
| Ba-139         | 7.377E-02          | 2.809E-06           | 3.953E-23            | 5.444E+00    |
| Ba-140         | 1.775E+01          | 5.031E+00           | 8.876E-01            | 5.008E+01    |
| Mo-99          | 2.036E+00          | 4.535E-01           | 3.193E-02            | 6.218E+00    |
| Tc-99m         | 1.916E+00          | 4.358E-01           | 3.075E-02            | 5.535E+00    |
| Ru-103         | 2.175E+00          | 6.463E-01           | 1.417E-01            | 6.155E+00    |
| Ru-105         | 2.485E-01          | 2.881E-03           | 3.096E-09            | 1.676E+00    |
| Ru-106         | 1.299E+00          | 3.939E-01           | 9.568E-02            | 3.683E+00    |
| Rh-103m        | 1.961E+00          | 5.827E-01           | 1.277E-01            | 5.549E+00    |
| Rh-105         | 1.375E+00          | 2.453E-01           | 7.574E-03            | 3.907E+00    |
| Rh-106         | 1.299E+00          | 3.939E-01           | 9.568E-02            | 3.683E+00    |
| Ce-141         | 4.027E-01          | 1.191E-01           | 2.551E-02            | 1.139E+00    |
| Ce-143         | 3.105E-01          | 5.212E-02           | 1.426E-03            | 9.179E-01    |
| Ce-144         | 3.085E-01          | 9.342E-02           | 2.261E-02            | 8.743E-01    |
| Np-239         | 5.860E+00          | 1.242E+00           | 7.389E-02            | 1.679E+01    |
| Pu-238         | 2.652E-03          | 8.060E-04           | 1.984E-04            | 7.522E-03    |
| Pu-239         | 1.118E-04          | 3.413E-05           | 8.458E-06            | 3.171E-04    |
| Pu-240         | 2.543E-04          | 7.729E-05           | 1.901E-05            | 7.212E-04    |

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**Table 7.1-35 (Sheet 5 of 6)  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

| <b>Isotope</b> | <b>0 to 1.5 hr.</b> | <b>1.5 to 3.5 hr.</b> | <b>3.5 to 8 hr.</b> |
|----------------|---------------------|-----------------------|---------------------|
| Pu-241         | 5.110E-03           | 2.385E-02             | 3.828E-02           |
| Y-90           | 3.140E-03           | 2.339E-02             | 6.936E-02           |
| Y-91m          | 5.663E-01           | 3.441E+00             | 5.191E+00           |
| Y-91           | 1.652E-02           | 8.019E-02             | 1.426E-01           |
| Y-92           | 3.112E-01           | 2.236E+00             | 3.968E+00           |
| Y-93           | 1.749E-02           | 7.414E-02             | 9.685E-02           |
| Zr-95          | 1.861E-02           | 8.589E-02             | 1.377E-01           |
| Zr-97          | 1.877E-02           | 8.243E-02             | 1.169E-01           |
| Nb-95          | 1.862E-02           | 8.599E-02             | 1.380E-01           |
| La-140         | 6.044E-02           | 4.868E-01             | 1.509E+00           |
| La-141         | 1.590E-02           | 5.866E-02             | 5.613E-02           |
| La-142         | 1.132E-02           | 2.986E-02             | 1.382E-02           |
| Pr-143         | 1.844E-02           | 8.551E-02             | 1.384E-01           |
| Pr-144         | 3.272E-02           | 1.590E-01             | 2.560E-01           |
| Nd-147         | 7.658E-03           | 3.525E-02             | 5.615E-02           |
| Am-241         | 2.343E-06           | 1.083E-05             | 1.740E-05           |
| Cm-242         | 1.065E-03           | 4.917E-03             | 7.889E-03           |
| Cm-244         | 5.651E-04           | 2.610E-03             | 4.190E-03           |
| Total          | 3.005E+04           | 1.250E+05             | 2.852E+05           |



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**Table 7.1-35 (Sheet 6 of 6)  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

| <b>Isotope</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|--------------------|---------------------|----------------------|--------------|
| Pu-241         | 4.613E-02          | 1.402E-02           | 3.446E-03            | 1.308E-01    |
| Y-90           | 1.818E-01          | 1.423E-01           | 7.603E-02            | 4.961E-01    |
| Y-91m          | 3.634E+00          | 1.924E-01           | 9.288E-05            | 1.302E+01    |
| Y-91           | 2.021E-01          | 7.064E-02           | 1.656E-02            | 5.286E-01    |
| Y-92           | 2.181E+00          | 2.160E-02           | 1.599E-09            | 8.719E+00    |
| Y-93           | 6.832E-02          | 3.943E-03           | 2.631E-06            | 2.607E-01    |
| Zr-95          | 1.654E-01          | 4.955E-02           | 1.135E-02            | 4.685E-01    |
| Zr-97          | 1.014E-01          | 1.051E-02           | 5.726E-05            | 3.300E-01    |
| Nb-95          | 1.664E-01          | 5.053E-02           | 1.232E-02            | 4.719E-01    |
| La-140         | 3.941E+00          | 2.736E+00           | 9.057E-01            | 9.639E+00    |
| La-141         | 1.940E-02          | 1.590E-04           | 3.935E-11            | 1.502E-01    |
| La-142         | 1.118E-03          | 1.026E-07           | 7.220E-23            | 5.612E-02    |
| Pr-143         | 1.698E-01          | 5.241E-02           | 1.030E-02            | 4.748E-01    |
| Pr-144         | 3.085E-01          | 9.343E-02           | 2.261E-02            | 8.722E-01    |
| Nd-147         | 6.621E-02          | 1.857E-02           | 3.127E-03            | 1.870E-01    |
| Am-241         | 2.105E-05          | 6.475E-06           | 1.695E-06            | 5.978E-05    |
| Cm-242         | 9.495E-03          | 2.870E-03           | 6.862E-04            | 2.692E-02    |
| Cm-244         | 5.049E-03          | 1.534E-03           | 3.772E-04            | 1.432E-02    |
| Total          | 9.254E+05          | 1.463E+06           | 2.512E+06            | 5.341E+06    |

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**Table 7.1-36  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Fuel Handling Accident (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>8 to 24 hr.</b> | <b>24 to 96 hr.</b> | <b>96 to 720 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------------|---------------------|----------------------|--------------|
| Kr-83m         | 1.437E+00         | 2.129E-01         | 4.404E-02          | 4.294E-04           | 3.665E-13            | 1.694E+00    |
| Kr-85m         | 7.810E+01         | 3.881E-01         | 4.693E-08          | 1.678E-26           | 0.000E+00            | 7.849E+01    |
| Kr-85          | 1.471E+03         | 9.977E+00         | 3.052E-06          | 1.296E-23           | 0.000E+00            | 1.481E+03    |
| Kr-87          | 2.330E-04         | 5.290E-07         | 6.148E-15          | 4.260E-36           | 0.000E+00            | 2.335E-04    |
| Kr-88          | 1.016E+01         | 4.220E-02         | 2.983E-09          | 2.549E-28           | 0.000E+00            | 1.020E+01    |
| Xe-131m        | 5.637E+02         | 1.475E+01         | 2.813E+01          | 1.084E+02           | 3.282E+02            | 1.043E+03    |
| Xe-133m        | 2.609E+03         | 8.098E+01         | 1.193E+02          | 1.540E+02           | 1.538E+01            | 2.979E+03    |
| Xe-133         | 9.442E+04         | 1.533E+03         | 1.684E+03          | 2.174E+03           | 2.171E+02            | 1.000E+05    |
| Xe-135m        | 1.089E+03         | 1.975E+03         | 1.834E+03          | 4.211E+02           | 2.219E-01            | 5.319E+03    |
| Xe-135         | 1.407E+04         | 7.705E+02         | 6.412E+02          | 1.472E+02           | 7.759E-02            | 1.563E+04    |
| Xe-138         | 1.825E-39         | 3.471E-44         | 2.388E-58          | 4.092E-96           | 0.000E+00            | 1.825E-39    |
| Br-83          | 1.610E-03         | 6.097E-06         | 3.273E-13          | 1.343E-32           | 0.000E+00            | 1.616E-03    |
| Br-84          | 2.046E-18         | 1.009E-21         | 1.206E-31          | 4.188E-58           | 0.000E+00            | 2.047E-18    |
| I-129          | 1.459E-05         | 9.898E-08         | 3.028E-14          | 1.286E-31           | 0.000E+00            | 1.469E-05    |
| I-130          | 3.363E+00         | 2.038E-02         | 4.453E-09          | 7.713E-27           | 0.000E+00            | 3.383E+00    |
| I-131          | 3.443E+02         | 2.319E+00         | 6.942E-07          | 2.784E-24           | 0.000E+00            | 3.466E+02    |
| I-132          | 1.118E-02         | 4.139E-05         | 2.076E-12          | 7.100E-32           | 0.000E+00            | 1.122E-02    |
| I-133          | 1.615E+02         | 1.025E+00         | 2.567E-07          | 6.398E-25           | 0.000E+00            | 1.625E+02    |
| I-134          | 8.997E-10         | 1.249E-12         | 3.325E-21          | 4.528E-44           | 0.000E+00            | 9.009E-10    |
| I-135          | 1.282E+01         | 7.041E-02         | 1.148E-08          | 9.113E-27           | 0.000E+00            | 1.289E+01    |
| Rb-88          | 4.884E+00         | 4.672E-02         | 3.332E-09          | 2.846E-28           | 0.000E+00            | 4.931E+00    |
| Cs-138         | 6.206E-40         | 1.019E-42         | 1.379E-52          | 6.210E-79           | 0.000E+00            | 6.216E-40    |
| Total          | 1.148E+05         | 4.388E+03         | 4.307E+03          | 3.005E+03           | 5.610E+02            | 1.271E+05    |

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**Table 7.1-37  
U.S. EPR Source Terms  
Radionuclide Releases to Atmosphere for Rod Ejection Accident (REA) with Accident-  
Induced 36.7% Clad Failure (Ci)**

| <b>Isotope</b> | <b>0 to 2 hr.</b> | <b>2 to 8 hr.</b> | <b>Total</b> |
|----------------|-------------------|-------------------|--------------|
| Kr-83m         | 6.655E+02         | 5.477E+02         | 1.213E+03    |
| Kr-85m         | 1.872E+03         | 3.118E+03         | 4.990E+03    |
| Kr-85          | 1.026E+02         | 3.074E+02         | 4.100E+02    |
| Kr-87          | 2.651E+03         | 1.290E+03         | 3.941E+03    |
| Kr-88          | 4.894E+03         | 5.970E+03         | 1.086E+04    |
| Kr-89          | 2.967E+02         | 1.193E-09         | 2.967E+02    |
| Xe-131m        | 7.443E+01         | 2.209E+02         | 2.953E+02    |
| Xe-133m        | 4.246E+02         | 1.209E+03         | 1.633E+03    |
| Xe-133         | 1.390E+04         | 4.078E+04         | 5.467E+04    |
| Xe-135m        | 4.932E+02         | 8.973E+01         | 5.829E+02    |
| Xe-135         | 4.202E+03         | 9.607E+03         | 1.381E+04    |
| Xe-137         | 5.606E+02         | 2.073E-07         | 5.606E+02    |
| Xe-138         | 2.009E+03         | 5.684E+00         | 2.015E+03    |
| Br-83          | 3.270E+00         | 1.566E+01         | 1.893E+01    |
| Br-84          | 1.892E+00         | 6.754E-01         | 2.567E+00    |
| Br-85          | 2.564E-02         | 1.917E-13         | 2.564E-02    |
| I-129          | 2.042E-06         | 3.009E-05         | 3.213E-05    |
| I-130          | 2.985E+00         | 3.487E+01         | 3.786E+01    |
| I-131          | 3.385E+01         | 4.915E+02         | 5.254E+02    |
| I-132          | 3.305E+01         | 1.520E+02         | 1.851E+02    |
| I-133          | 6.775E+01         | 8.692E+02         | 9.369E+02    |
| I-134          | 2.896E+01         | 3.175E+01         | 6.071E+01    |
| I-135          | 5.703E+01         | 5.471E+02         | 6.042E+02    |
| Rb-86m         | 4.849E-06         | 1.306E-39         | 4.849E-06    |
| Rb-86          | 1.683E-01         | 2.480E+00         | 2.648E+00    |
| Rb-88          | 4.004E+03         | 6.652E+03         | 1.066E+04    |
| Rb-89          | 2.983E+02         | 1.662E+00         | 2.999E+02    |
| Cs-134         | 1.887E+01         | 2.796E+02         | 2.985E+02    |
| Cs-136         | 4.672E+00         | 6.863E+01         | 7.330E+01    |
| Cs-137         | 7.195E+00         | 1.067E+02         | 1.139E+02    |
| Cs-138         | 1.765E+03         | 2.733E+02         | 2.038E+03    |
| Sr-89          | 2.739E-01         | 1.163E+00         | 1.437E+00    |
| Ba-137m        | 6.794E+00         | 1.009E+02         | 1.077E+02    |
| Total          | 3.848E+04         | 7.277E+04         | 1.113E+05    |

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**Table 7.1-38  
US-APWR Radiological Consequences  
Atmospheric Dispersion Factors**

| <b>Location</b> | <b>Time (hr.)</b> | <b>DCD <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b>Site <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> |
|-----------------|-------------------|--------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
| EAB             | 0 to 2            | 5.00E-04                                               | 6.71E-06                                                | 0.013                                           |
| LPZ             | 0 to 8            | 2.10E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 | 8 to 24           | 1.30E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 | 24 to 96          | 6.90E-05                                               | 1.08E-07                                                | 0.002                                           |
|                 | 96 to 720         | 2.80E-05                                               | 1.08E-07                                                | 0.004                                           |

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**Table 7.1-39  
US-APWR Radiological Consequences  
Dose Summary**

| <b>Accident</b>                                                           | <b>DCD Dose<br/>(rem TEDE)</b> |            | <b><math>\chi</math>/Q ratio<br/>(Site/DCD)</b> |                          | <b>Site Dose<br/>(rem TEDE)</b> |            | <b>Limit</b> |
|---------------------------------------------------------------------------|--------------------------------|------------|-------------------------------------------------|--------------------------|---------------------------------|------------|--------------|
|                                                                           | <b>EAB</b>                     | <b>LPZ</b> | <b>EAB</b>                                      | <b>LPZ<sup>(a)</sup></b> | <b>EAB</b>                      | <b>LPZ</b> |              |
| Steam System Piping Failure -<br>Pre-Existing Iodine Spike                | 0.19                           | 0.11       | 0.013                                           | 0.004                    | 0.00                            | 0.00       | 25           |
| Steam System Piping Failure -<br>Accident-Initiated Iodine Spike          | 0.32                           | 0.28       | 0.013                                           | 0.004                    | 0.00                            | 0.00       | 2.5          |
| Reactor Coolant Pump Rotor<br>Seizure                                     | 0.49                           | 0.7        | 0.013                                           | 0.004                    | 0.01                            | 0.00       | 2.5          |
| Spectrum of Rod Cluster Control<br>Assembly Ejection Accidents            | 5.1                            | 4.5        | 0.013                                           | 0.004                    | 0.07                            | 0.02       | 6.3          |
| Failure of Small Lines Carrying<br>Primary Coolant Outside<br>Containment | 1.5                            | 0.6        | 0.013                                           | 0.004                    | 0.02                            | 0.00       | 2.5          |
| Steam Generator Tube Rupture -<br>Pre-Existing Iodine Spike               | 3.6                            | 1.5        | 0.013                                           | 0.004                    | 0.05                            | 0.01       | 25           |
| Steam Generator Tube Rupture -<br>Accident-Initiated Iodine Spike         | 0.96                           | 0.43       | 0.013                                           | 0.004                    | 0.01                            | 0.00       | 2.5          |
| LOCA                                                                      | 13                             | 13         | 0.013                                           | 0.004                    | 0.17                            | 0.05       | 25           |
| Fuel Handling Accident                                                    | 3.3                            | 1.4        | 0.013                                           | 0.004                    | 0.04                            | 0.01       | 6.3          |

a) As LPZ doses are not given in time-dependent form, the most conservative Site/DCD  $\chi$ /Q ratio (from the 96 to 720 hour interval) is used.

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**Table 7.1-40  
ABWR Radiological Consequences  
Atmospheric Dispersion Factors**

| <b>Accident</b>  | <b>Location</b> | <b>Time (hr.)</b> | <b>DCD <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b>Site <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> |
|------------------|-----------------|-------------------|--------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
| All<br>Accidents | EAB             | 0 to 2            | 1.37E-03                                               | 6.71E-06                                                | 0.005                                           |
|                  | LPZ             | 0 to 2            | 4.11E-04                                               | 1.08E-07                                                | 0.000                                           |
| LOCA<br>Only     |                 | 0 to 8            | 1.56E-04                                               | 1.08E-07                                                | 0.001                                           |
|                  |                 | 8 to 24           | 9.61E-05                                               | 1.08E-07                                                | 0.001                                           |
|                  |                 | 24 to 96          | 3.36E-05                                               | 1.08E-07                                                | 0.003                                           |
|                  |                 | 96 to 720         | 7.42E-06                                               | 1.08E-07                                                | 0.015                                           |

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**Table 7.1-41  
ABWR Radiological Consequences  
PSEG Site-Specific Dose Summary**

| <b>Accident</b>                                                                          | <b>Thyroid<br/>Dose (Sv)</b> | <b>Whole Body<br/>Dose (Sv)</b> | <b>Thyroid<br/>Limit (Sv)</b> | <b>Whole<br/>Body<br/>Limit (Sv)</b> |
|------------------------------------------------------------------------------------------|------------------------------|---------------------------------|-------------------------------|--------------------------------------|
| Failure of Small Lines Carrying<br>Primary Coolant Outside<br>Containment <sup>(a)</sup> | 2.35E-04                     | 4.60E-06                        | 3.00E-01                      | 2.50E-02                             |
| LOCA - EAB                                                                               | 1.02E-02                     | 2.20E-04                        | 3.00E+00                      | 2.50E-01                             |
| LOCA - LPZ                                                                               | 2.08E-02                     | 2.00E-04                        | 3.00E+00                      | 2.50E-01                             |
| Fuel Handling Accident <sup>(a)</sup>                                                    | 4.02E-03                     | 6.44E-05                        | 7.50E-01                      | 6.25E-02                             |
| Main Steamline Break Case 1 <sup>(a)(b)</sup>                                            | 1.27E-04                     | 3.04E-06                        | 3.00E-01                      | 2.50E-02                             |
| Main Steamline Break Case 2 <sup>(a)(b)</sup>                                            | 2.50E-03                     | 6.37E-05                        | 3.00E+00                      | 2.50E-01                             |

a) The dose is calculated for the maximum two hour EAB meteorology, only, based on the DCD.

b) The level of activity is consistent with an offgas release rate of 3.7 GBq/s for Case 1 and 14.8 GBq/s for Case 2 referenced to a 30 minute decay. The iodine concentrations in the reactor coolant are tabulated below for each case.

| <b>Isotope</b> | <b>MBq/g</b>  |               |
|----------------|---------------|---------------|
|                | <b>Case 1</b> | <b>Case 2</b> |
| I-131          | 0.001739      | 0.03515       |
| I-132          | 0.01536       | 0.30747       |
| I-133          | 0.01206       | 0.24161       |
| I-134          | 0.02634       | 0.52688       |
| I-135          | 0.01647       | 0.3293        |

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**Table 7.1-42  
ABWR Radiological Consequences  
Doses for an Instrument Line Break Accident**

| DCD                     |                            |                              | Site                    |                            |
|-------------------------|----------------------------|------------------------------|-------------------------|----------------------------|
| Thyroid<br>Dose<br>(Sv) | Whole<br>Body<br>Dose (Sv) | $\chi/Q$ Ratio<br>(Site/DCD) | Thyroid<br>Dose<br>(Sv) | Whole<br>Body<br>Dose (Sv) |
| 4.80E-02                | 9.40E-04                   | 0.005                        | 2.35E-04                | 4.60E-06                   |



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**Table 7.1-43  
ABWR Radiological Consequences  
Doses for a Fuel Handling Accident**

| <b>DCD</b>                       |                                     | $\chi/Q$ Ratio<br>(Site/DCD) | <b>Uprate<br/>Ratio</b> | <b>Site</b>                      |                                     |
|----------------------------------|-------------------------------------|------------------------------|-------------------------|----------------------------------|-------------------------------------|
| <b>Thyroid<br/>Dose<br/>(Sv)</b> | <b>Whole<br/>Body<br/>Dose (Sv)</b> |                              |                         | <b>Thyroid<br/>Dose<br/>(Sv)</b> | <b>Whole<br/>Body<br/>Dose (Sv)</b> |
| 7.50E-01                         | 1.20E-02                            | 0.005                        | 1.095                   | 4.02E-03                         | 6.44E-05                            |

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**Table 7.1-44  
ABWR Radiological Consequences  
Doses for a LOCA**

| Location | Time<br>(hr.) | DCD                     |                               |                               | Uprate<br>Ratio | Site                 |                               |
|----------|---------------|-------------------------|-------------------------------|-------------------------------|-----------------|----------------------|-------------------------------|
|          |               | Thyroid<br>Dose<br>(Sv) | Whole<br>Body<br>Dose<br>(Sv) | $\chi$ /Q Ratio<br>(Site/DCD) |                 | Thyroid<br>Dose (Sv) | Whole<br>Body<br>Dose<br>(Sv) |
| EAB      | 0 to 2        | 1.90E+00                | 4.10E-02                      | 0.005                         | 1.095           | 1.02E-02             | 2.20E-04                      |
| LPZ      | 0 to 8        | 3.10E-01                | 1.00E-02                      | 0.001                         | 1.095           | 2.35E-04             | 7.58E-06                      |
|          | 0 to 24       | 5.10E-01                | 1.80E-02                      | 0.001                         | 1.095           | 4.81E-04             | 1.74E-05                      |
|          | 0 to 96       | 1.30E+00                | 2.90E-02                      | 0.003                         | 1.095           | 3.26E-03             | 5.61E-05                      |
|          | 0 to 720      | 2.40E+00                | 3.80E-02                      | 0.015                         | 1.095           | 2.08E-02             | 2.00E-04                      |

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**Table 7.1-45  
ABWR Radiological Consequences  
Doses for a Main Steamline Break**

|        | <b>DCD</b>                       |                                 |                                                 | <b>Site</b>                      |                                     |
|--------|----------------------------------|---------------------------------|-------------------------------------------------|----------------------------------|-------------------------------------|
|        | <b>Thyroid<br/>Dose<br/>(Sv)</b> | <b>Whole Body<br/>Dose (Sv)</b> | <b><math>\chi</math>/Q Ratio<br/>(Site/DCD)</b> | <b>Thyroid<br/>Dose<br/>(Sv)</b> | <b>Whole<br/>Body<br/>Dose (Sv)</b> |
| Case 1 | 2.60E-02                         | 6.20E-04                        | 0.005                                           | 1.27E-04                         | 3.04E-06                            |
| Case 2 | 5.10E-01                         | 1.30E-02                        | 0.005                                           | 2.50E-03                         | 6.37E-05                            |

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**Table 7.1-46  
AP1000 Radiological Consequences  
Atmospheric Dispersion Factors**

| <b>Accident</b> | <b>Location</b> | <b>Time (hr.)</b> | <b>DCD <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b>Site <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> |
|-----------------|-----------------|-------------------|--------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
| LOCA            | EAB             | 0 to 2            | 5.10E-04                                               | 6.71E-06                                                | 0.013                                           |
|                 | LPZ             | 0 to 8            | 2.20E-04                                               | 1.08E-07                                                | 0.000                                           |
|                 |                 | 8 to 24           | 1.60E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 |                 | 24 to 96          | 1.00E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 |                 | 96 to 720         | 8.00E-05                                               | 1.08E-07                                                | 0.001                                           |
| Other Accidents | EAB             | 0 to 2            | 8.00E-04                                               | 6.71E-06                                                | 0.008                                           |
|                 | LPZ             | 0 to 8            | 5.00E-04                                               | 1.08E-07                                                | 0.000                                           |
|                 |                 | 8 to 24           | 3.00E-04                                               | 1.08E-07                                                | 0.000                                           |
|                 |                 | 24 to 96          | 1.50E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 |                 | 96 to 720         | 8.00E-05                                               | 1.08E-07                                                | 0.001                                           |

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**Table 7.1-47  
AP1000 Radiological Consequences  
PSEG Site-Specific Dose Summary**

| <b>Accident</b>                                                        | <b>Site Dose (rem TEDE)</b> |            |              |
|------------------------------------------------------------------------|-----------------------------|------------|--------------|
|                                                                        | <b>EAB</b>                  | <b>LPZ</b> | <b>Limit</b> |
| Steam System Piping Failure –<br>Pre-Existing Iodine Spike             | 0.01                        | 0.00       | 25           |
| Steam System Piping Failure –<br>Accident-Initiated Iodine Spike       | 0.01                        | 0.00       | 2.5          |
| Reactor Coolant Pump Shaft Seizure –<br>No Feedwater                   | 0.01                        | 0.00       | 2.5          |
| Reactor Coolant Pump Shaft Seizure –<br>Feedwater Available            | 0.01                        | 0.00       | 2.5          |
| Spectrum of Rod Cluster Control<br>Assembly Ejection Accidents         | 0.03                        | 0.00       | 6.3          |
| Failure of Small Lines Carrying<br>Primary Coolant Outside Containment | 0.02                        | 0.00       | 2.5          |
| Steam Generator Tube Rupture –<br>Pre-Existing Iodine Spike            | 0.02                        | 0.00       | 25           |
| Steam Generator Tube Rupture –<br>Accident-Initiated Iodine Spike      | 0.01                        | 0.00       | 2.5          |
| LOCA                                                                   | 0.32                        | 0.01       | 25           |
| Fuel Handling Accident                                                 | 0.04                        | 0.00       | 6.3          |

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**Table 7.1-48  
AP1000 Radiological Consequences  
Doses for a Steam System Piping Failure**

| <b>Doses for Steam System Piping Failure with Pre-Existing Iodine Spike</b> |                            |            |                                                 |                             |            |
|-----------------------------------------------------------------------------|----------------------------|------------|-------------------------------------------------|-----------------------------|------------|
| <b>Time (hr.)</b>                                                           | <b>DCD Dose (rem TEDE)</b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b>Site Dose (rem TEDE)</b> |            |
|                                                                             | <b>EAB</b>                 | <b>LPZ</b> |                                                 | <b>EAB</b>                  | <b>LPZ</b> |
| 0 to 2                                                                      | 1.00E+00                   |            | 0.008                                           | 8.39E-03                    |            |
| 0 to 8                                                                      |                            | 5.81E-01   | 0.000                                           |                             | 1.25E-04   |
| 8 to 24                                                                     |                            | 7.18E-02   | 0.000                                           |                             | 2.58E-05   |
| 24 to 96                                                                    |                            | 1.08E-01   | 0.001                                           |                             | 7.78E-05   |
| 96 to 720                                                                   |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| Total                                                                       | 1.00E+00                   | 7.61E-01   |                                                 | 8.39E-03                    | 2.29E-04   |
| Limit                                                                       |                            |            |                                                 | 25                          | 25         |

| <b>Doses for Steam System Piping Failure with Accident-Initiated Iodine Spike</b> |                            |            |                                                 |                             |            |
|-----------------------------------------------------------------------------------|----------------------------|------------|-------------------------------------------------|-----------------------------|------------|
| <b>Time (hr.)</b>                                                                 | <b>DCD Dose (rem TEDE)</b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b>Site Dose (rem TEDE)</b> |            |
|                                                                                   | <b>EAB</b>                 | <b>LPZ</b> |                                                 | <b>EAB</b>                  | <b>LPZ</b> |
| 0 to 2                                                                            | 1.10E+00                   |            | 0.008                                           | 9.23E-03                    |            |
| 0 to 8                                                                            |                            | 1.02E+00   | 0.000                                           |                             | 2.20E-04   |
| 8 to 24                                                                           |                            | 3.77E-01   | 0.000                                           |                             | 1.36E-04   |
| 24 to 96                                                                          |                            | 5.36E-01   | 0.001                                           |                             | 3.86E-04   |
| 96 to 720                                                                         |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| Total                                                                             | 1.10E+00                   | 1.93E+00   |                                                 | 9.23E-03                    | 7.42E-04   |
| Limit                                                                             |                            |            |                                                 | 2.5                         | 2.5        |

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**Table 7.1-49  
AP1000 Radiological Consequences  
Doses for a Reactor Coolant Pump Shaft Seizure Accident**

| <b>Doses for Reactor Coolant Pump Shaft Seizure with No Feedwater</b> |                            |            |                                                 |                             |            |
|-----------------------------------------------------------------------|----------------------------|------------|-------------------------------------------------|-----------------------------|------------|
| <b>Time<br/>(hr.)</b>                                                 | <b>DCD Dose (rem TEDE)</b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b>Site Dose (rem TEDE)</b> |            |
|                                                                       | <b>EAB</b>                 | <b>LPZ</b> |                                                 | <b>EAB</b>                  | <b>LPZ</b> |
| 0 to 2                                                                | 8.00E-01                   |            | 0.008                                           | 6.71E-03                    |            |
| 0 to 8                                                                |                            | 3.89E-01   | 0.000                                           |                             | 8.40E-05   |
| 8 to 24                                                               |                            | 0.00E+00   | 0.000                                           |                             | 0.00E+00   |
| 24 to 96                                                              |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| 96 to 720                                                             |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| Total                                                                 | 8.00E-01                   | 3.89E-01   |                                                 | 6.71E-03                    | 8.40E-05   |
| Limit                                                                 |                            |            |                                                 | 2.5                         | 2.5        |

| <b>Doses for Reactor Coolant Pump Shaft Seizure with Feedwater Available</b> |                            |            |                                                 |                             |            |
|------------------------------------------------------------------------------|----------------------------|------------|-------------------------------------------------|-----------------------------|------------|
| <b>Time<br/>(hr.)</b>                                                        | <b>DCD Dose (rem TEDE)</b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b>Site Dose (rem TEDE)</b> |            |
|                                                                              | <b>EAB</b>                 | <b>LPZ</b> |                                                 | <b>EAB</b>                  | <b>LPZ</b> |
| 0 to 2                                                                       | 6.00E-01                   |            | 0.008                                           | 5.03E-03                    |            |
| 0 to 8                                                                       |                            | 7.94E-01   | 0.000                                           |                             | 1.72E-04   |
| 8 to 24                                                                      |                            | 0.00E+00   | 0.000                                           |                             | 0.00E+00   |
| 24 to 96                                                                     |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| 96 to 720                                                                    |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| Total                                                                        | 6.00E-01                   | 7.94E-01   |                                                 | 5.03E-03                    | 1.72E-04   |
| Limit                                                                        |                            |            |                                                 | 2.5                         | 2.5        |

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**Table 7.1-50  
AP1000 Radiological Consequences  
Doses for Spectrum of Rod Cluster Control Assembly Ejection Accidents**

| Time<br>(hr.) | DCD Dose (rem TEDE) |          | $\chi/Q$ Ratio<br>(Site/DCD) | Site Dose (rem TEDE) |          |
|---------------|---------------------|----------|------------------------------|----------------------|----------|
|               | EAB                 | LPZ      |                              | EAB                  | LPZ      |
| 0 to 2        | 3.60E+00            |          | 0.008                        | 3.02E-02             |          |
| 0 to 8        |                     | 4.58E+00 | 0.000                        |                      | 9.89E-04 |
| 8 to 24       |                     | 7.84E-01 | 0.000                        |                      | 2.82E-04 |
| 24 to 96      |                     | 6.32E-02 | 0.001                        |                      | 4.55E-05 |
| 96 to 720     |                     | 2.06E-02 | 0.001                        |                      | 2.78E-05 |
| Total         | 3.60E+00            | 5.45E+00 |                              | 3.02E-02             | 1.34E-03 |
| Limit         |                     |          |                              | 6.3                  | 6.3      |



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**Table 7.1-51  
AP1000 Radiological Consequences  
Doses for Failure of Small Lines Carrying Primary Coolant Outside Containment**

| <b>Time<br/>(hr.)</b> | <u><b>DCD Dose (rem TEDE)</b></u> |            | <b><math>\chi</math>/Q Ratio<br/>(Site/DCD)</b> | <u><b>Site Dose (rem TEDE)</b></u> |            |
|-----------------------|-----------------------------------|------------|-------------------------------------------------|------------------------------------|------------|
|                       | <b>EAB</b>                        | <b>LPZ</b> |                                                 | <b>EAB</b>                         | <b>LPZ</b> |
| 0 to 2                | 2.10E+00                          |            | 0.008                                           | 1.76E-02                           |            |
| 0 to 8                |                                   | 1.02E+00   | 0.000                                           |                                    | 2.20E-04   |
| 8 to 24               |                                   | 0.00E+00   | 0.000                                           |                                    | 0.00E+00   |
| 24 to 96              |                                   | 0.00E+00   | 0.001                                           |                                    | 0.00E+00   |
| 96 to 720             |                                   | 0.00E+00   | 0.001                                           |                                    | 0.00E+00   |
| Total                 | 2.10E+00                          | 1.02E+00   |                                                 | 1.76E-02                           | 2.20E-04   |
| Limit                 |                                   |            |                                                 | 2.5                                | 2.5        |

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**Table 7.1-52  
AP1000 Radiological Consequences  
Doses for Steam Generator Tube Rupture**

| <b>Doses for Steam Generator Tube Rupture with Pre-Existing Iodine Spike</b> |                            |            |                                                 |                             |            |
|------------------------------------------------------------------------------|----------------------------|------------|-------------------------------------------------|-----------------------------|------------|
| <b>Time<br/>(hr.)</b>                                                        | <b>DCD Dose (rem TEDE)</b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b>Site Dose (rem TEDE)</b> |            |
|                                                                              | <b>EAB</b>                 | <b>LPZ</b> |                                                 | <b>EAB</b>                  | <b>LPZ</b> |
| 0 to 2                                                                       | 2.20E+00                   |            | 0.008                                           | 1.85E-02                    |            |
| 0 to 8                                                                       |                            | 1.16E+00   | 0.000                                           |                             | 2.51E-04   |
| 8 to 24                                                                      |                            | 7.24E-02   | 0.000                                           |                             | 2.61E-05   |
| 24 to 96                                                                     |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| 96 to 720                                                                    |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| Total                                                                        | 2.20E+00                   | 1.23E+00   |                                                 | 1.85E-02                    | 2.77E-04   |
| Limit                                                                        |                            |            |                                                 | 25                          | 25         |

| <b>Doses for Steam Generator Tube Rupture with Accident-Initiated Iodine Spike</b> |                            |            |                                                 |                             |            |
|------------------------------------------------------------------------------------|----------------------------|------------|-------------------------------------------------|-----------------------------|------------|
| <b>Time<br/>(hr.)</b>                                                              | <b>DCD Dose (rem TEDE)</b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b>Site Dose (rem TEDE)</b> |            |
|                                                                                    | <b>EAB</b>                 | <b>LPZ</b> |                                                 | <b>EAB</b>                  | <b>LPZ</b> |
| 0 to 2                                                                             | 1.10E+00                   |            | 0.008                                           | 9.23E-03                    |            |
| 0 to 8                                                                             |                            | 6.27E-01   | 0.000                                           |                             | 1.35E-04   |
| 8 to 24                                                                            |                            | 1.69E-01   | 0.000                                           |                             | 6.08E-05   |
| 24 to 96                                                                           |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| 96 to 720                                                                          |                            | 0.00E+00   | 0.001                                           |                             | 0.00E+00   |
| Total                                                                              | 1.10E+00                   | 7.96E-01   |                                                 | 9.23E-03                    | 1.96E-04   |
| Limit                                                                              |                            |            |                                                 | 2.5                         | 2.5        |

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**Table 7.1-53  
AP1000 Radiological Consequences  
Doses for LOCA**

| <b>Time (hr.)</b> | <b><u>DCD Dose (rem TEDE)</u></b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b><u>Site Dose (rem TEDE)</u></b> |            |
|-------------------|-----------------------------------|------------|-------------------------------------------------|------------------------------------|------------|
|                   | <b>EAB</b>                        | <b>LPZ</b> |                                                 | <b>EAB</b>                         | <b>LPZ</b> |
| 0 to 2            | 2.43E+01                          |            | 0.013                                           | 3.20E-01                           |            |
| 0 to 8            |                                   | 2.17E+01   | 0.000                                           |                                    | 1.07E-02   |
| 8 to 24           |                                   | 7.69E-01   | 0.001                                           |                                    | 5.19E-04   |
| 24 to 96          |                                   | 3.71E-01   | 0.001                                           |                                    | 4.01E-04   |
| 96 to 720         |                                   | 8.70E-01   | 0.001                                           |                                    | 1.17E-03   |
| Total             | 2.43E+01                          | 2.37E+01   |                                                 | 3.20E-01                           | 1.27E-02   |
| Limit             |                                   |            |                                                 | 25                                 | 25         |

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**Table 7.1-54  
AP1000 Radiological Consequences  
Doses for a Fuel Handling Accident**

| <b>Time (hr.)</b> | <b><u>DCD Dose (rem TEDE)</u></b> |            | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> | <b><u>Site Dose (rem TEDE)</u></b> |            |
|-------------------|-----------------------------------|------------|-------------------------------------------------|------------------------------------|------------|
|                   | <b>EAB</b>                        | <b>LPZ</b> |                                                 | <b>EAB</b>                         | <b>LPZ</b> |
| 0 to 2            | 5.20E+00                          |            | 0.008                                           | 4.36E-02                           |            |
| 0 to 8            |                                   | 3.44E+00   | 0.000                                           |                                    | 7.43E-04   |
| 8 to 24           |                                   | 0.00E+00   | 0.000                                           |                                    | 0.00E+00   |
| 24 to 96          |                                   | 0.00E+00   | 0.001                                           |                                    | 0.00E+00   |
| 96 to 720         |                                   | 0.00E+00   | 0.001                                           |                                    | 0.00E+00   |
| Total             | 5.20E+00                          | 3.44E+00   |                                                 | 4.36E-02                           | 7.43E-04   |
| Limit             |                                   |            |                                                 | 25                                 | 25         |

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**Table 7.1-55  
U.S. EPR Radiological Consequences  
Atmospheric Dispersion Factors**

| <b>Location</b> | <b>Time (hr.)</b> | <b>DCD <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b>Site <math>\chi/Q</math><br/>(sec/m<sup>3</sup>)</b> | <b><math>\chi/Q</math> Ratio<br/>(Site/DCD)</b> |
|-----------------|-------------------|--------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
| EAB             | 0 to 2            | 1.00E-03                                               | 6.71E-06                                                | 0.007                                           |
| LPZ             | 0 to 8            | 1.35E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 | 8 to 24           | 1.00E-04                                               | 1.08E-07                                                | 0.001                                           |
|                 | 24 to 96          | 5.40E-05                                               | 1.08E-07                                                | 0.002                                           |
|                 | 96 to 720         | 2.20E-05                                               | 1.08E-07                                                | 0.005                                           |

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**Table 7.1-56  
U.S. EPR Radiological Consequences  
Dose Summary**

| <b>Accident</b>                                                           | <b>DCD Dose<br/>(rem TEDE)</b> |            | <b><math>\chi</math>/Q ratio<br/>(Site/DCD)</b> |                          | <b>Site Dose<br/>(rem TEDE)</b> |            | <b>Max</b> |
|---------------------------------------------------------------------------|--------------------------------|------------|-------------------------------------------------|--------------------------|---------------------------------|------------|------------|
|                                                                           | <b>EAB</b>                     | <b>LPZ</b> | <b>EAB</b>                                      | <b>LPZ<sup>(a)</sup></b> | <b>EAB</b>                      | <b>LPZ</b> |            |
| Main Steam Line Break -<br>Pre-Existing Iodine Spike                      | 0.2                            | 0.1        | 0.007                                           | 0.005                    | 1.40E-03                        | 5.00E-04   | 25         |
| Main Steam Line Break -<br>Accident-Initiated<br>Iodine Spike             | 0.3                            | 0.2        | 0.007                                           | 0.005                    | 2.10E-03                        | 1.00E-03   | 2.5        |
| Main Steam Line Break -<br>Fuel Rod Clad Failure                          | 5.3                            | 2.6        | 0.007                                           | 0.005                    | 3.71E-02                        | 1.30E-02   | 25         |
| Main Steam Line Break -<br>Fuel Overheat                                  | 5.8                            | 2.8        | 0.007                                           | 0.005                    | 4.06E-02                        | 1.40E-02   | 25         |
| Reactor Coolant Pump<br>Shaft Seizure                                     | 2.3                            | 0.9        | 0.007                                           | 0.005                    | 1.61E-02                        | 4.50E-03   | 2.5        |
| Spectrum of Rod Cluster<br>Control Assembly Ejection<br>Accidents         | 5.7                            | 3.5        | 0.007                                           | 0.005                    | 3.99E-02                        | 1.75E-02   | 6.3        |
| Failure of Small Lines<br>Carrying Primary Coolant<br>Outside Containment | 1.8                            | 0.3        | 0.007                                           | 0.005                    | 1.26E-02                        | 1.50E-03   | 2.5        |
| Steam Generator Tube<br>Rupture -<br>Pre-Existing Iodine Spike            | 1.1                            | 0.3        | 0.007                                           | 0.005                    | 7.70E-03                        | 1.50E-03   | 25         |
| Steam Generator Tube<br>Rupture -<br>Accident-Initiated<br>Iodine Spike   | 0.7                            | 0.5        | 0.007                                           | 0.005                    | 4.90E-03                        | 2.50E-03   | 2.5        |
| LOCA                                                                      | 12.2                           | 11.1       | 0.007                                           | 0.005                    | 8.54E-02                        | 5.55E-02   | 25         |
| Fuel Handling Accident                                                    | 5.6                            | 1          | 0.007                                           | 0.005                    | 3.92E-02                        | 5.00E-03   | 6.3        |

a) As LPZ doses are not given in time-dependent form, the most conservative Site/DCD  $\chi$ /Q ratio (from the 96 to 720 hour interval) was used.

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## 7.2 SEVERE ACCIDENTS

This section evaluates the potential environmental impacts of severe accidents at the PSEG Site from four different reactor technologies. The four reactor technologies are: ABWR (4300 MWt), AP1000, US-APWR, and U.S. EPR. These reactor technologies are for a single-unit plant except for the AP1000 case, which is based on two units. The environmental impacts from postulated severe accidents are calculated using site-specific data to demonstrate acceptability.

Severe accidents are defined as accidents with substantial reactor core damage and degradation of containment systems. Because the severe accident probability is low for the considered reactor technologies, these accidents are not part of the new plant design basis. However, the U. S. Nuclear Regulatory Commission (NRC) requires, in *Severe Reactor Accidents Regarding Future Designs and Existing Plants* (Reference 7.2-1), the completion of a probabilistic risk assessment (PRA) for severe accidents for the new reactor designs. This requirement is specified in regulation 10 CFR 52.47, *Contents of Applications; Technical Information*.

A PRA is completed for each of the four reactor technologies as part of the associated application for design certification. This section uses the applicable results of the PRA for severe accidents, along with site-specific characteristics, to determine impacts of severe accidents over an entire new plant life cycle. The purpose of this analysis is to identify potential off-site radiological impacts of severe accidents and demonstrate that the impacts are acceptable.

### 7.2.1 METHODOLOGY

#### 7.2.1.1 Off-Site Consequences

The NRC computer code MACCS2 (Reference 7.2-2) is used to model the environmental consequences of the severe accidents. Each of the four reactor technologies has a reactor-specific set of severe accidents that correspond to unique accident sequences. The PRA for the four reactor technologies established event trees that define the end states of each accident sequence. Each end state has a corresponding release category source term. The source terms are based on core inventory data and release fractions for specific chemical groups. This data is used as input to the MACCS2 code. Table 7.2-1 contains the list of release categories and their brief descriptions. Table 7.2-4 contains the list of chemical groups and the associated nuclides. Table 7.2-5 contains the release fractions for all chemical groups.

The exposure pathways modeled include external exposure from the passing plume, external exposure from material deposited on the ground, inhalation of material in the passing plume or resuspended from the ground, and ingestion of contaminated food and surface water.

The MACCS2 code primarily addresses dose from the air pathway, but also calculates dose from surface runoff and deposition on surface water. The code evaluates the extent of contamination. The meteorology data used in the analysis is hourly data for one year that includes wind velocity (speed and direction), stability class, and rainfall.

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To assess human health impacts, the analysis determined the risk of early fatalities, the risk of latent cancer fatalities, and collective whole body dose-risk from a severe accident for the year 2081 estimated population within a 50-mile (mi.) radius of the new plant. The population data for the year 2081 is selected considering a new plant operating life (40 yr) and the potential license extension (20 yr). If the new plant has a start-up date within the next decade (2010 to 2020), the population data corresponds to the end-point of the plant operating period. This is the most conservative estimate for population because it increases with time.

The economic risk associated with severe accidents is determined. The economic risk is based on costs associated with short-term relocation of people, decontamination of property and equipment, and interdiction of food supplies. Risk calculation is further discussed in Subsection 7.2.1.2.

MACCS2 requires five input files: ATMOS, EARLY, CHRONC, METEOROLOGICAL, and SITE. ATMOS provides data to calculate the amount of material released to the atmosphere that is dispersed and deposited. The calculation uses a Gaussian plume model. Important reactor-specific inputs in this file include the core inventory, release fractions, and geometry of the reactor and associated buildings. EARLY provides inputs to calculations regarding exposure in the time period immediately following the release. Important site-specific information includes emergency response information such as evacuation time. CHRONC provides data for calculating long-term impacts and economic costs and includes region-specific data on agriculture and economic factors. These files access a meteorological file, (METEOROLOGICAL) which uses actual PSEG Site meteorological monitoring data for the year 2004, and a site characteristics file (SITE) which uses site-specific population data, land usage, watershed index, and regions. The meteorological data for year 2004 was selected due to its completeness (hourly data for each day of the year) and it is representative of the overall long-term regional climate (i.e., there are no outliers in the data set compared to the long-term regional climate).

#### 7.2.1.2 Risk Calculation

The results of the MACCS2 calculations and the accident frequency information are used to determine risk. The accident frequencies (the same as the release category frequencies) are listed in Table 7.2-2. Risk is the product of accident frequency and the consequences of the accident. The consequence is either a radiation dose, economic cost, or the area of land contaminated due to the accident. The total risk is determined by summing all the corresponding accident risks.

#### 7.2.2 CONSEQUENCES TO POPULATION GROUPS

This section evaluates impacts of severe accidents from air, surface water, and groundwater pathways. The MACCS2 code is used to evaluate the doses from the air pathway and from water ingestion with PSEG Site-specific data. MACCS2 does not model other surface water and groundwater dose pathways. These are analyzed qualitatively based on a comparison of the new plant atmospheric doses to those of the existing U.S. nuclear fleet.

The four reactor technologies considered here belong to a new generation of reactors that are based on improved design parameters with respect to the associated core damage frequencies (CDFs). The CDF is a measure of the impacts of potential accidents. A CDF is calculated using



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PRA modeling to evaluate how changes to the reactor or auxiliary systems change the severity of the accident. The CDFs for the ABWR, AP1000, US-APWR, and U.S. EPR are typically one to three orders of magnitude lower than the CDFs for the current nuclear fleet.

#### 7.2.2.1 Air Pathways

For each reactor technology, the potential severe accidents are grouped into release categories based on their similarity. The number of release categories is reactor-specific. Each release category has a set of characteristics representative of that categories chemical elements. Radionuclides that may be released are organized into groups having similar chemical characteristics. Table 7.2-4 provides the groupings. Release categories for each reactor technology are analyzed with MACCS2 to calculate population dose, number of early and latent fatalities, cost, and farm land requiring decontamination. The analysis assumes that 95 percent of the population is evacuated following declaration of a general emergency.

For each release category, risk is calculated by multiplying each consequence (population dose, fatalities, cost, and area of contaminated land) with its corresponding frequency. A summary of the results is provided in Table 7.2-3. The total cost calculation considers other consequences, such as evacuation costs, value of crops contaminated and condemned, value of milk contaminated and condemned, cost of property decontamination, and indirect costs resulting from loss of property use and incomes as a result of the accident.

#### 7.2.2.2 Surface Water Pathways

A population is exposed to radiation when airborne radioactivity is deposited onto surface water. The exposure pathway is from drinking the water, external radiation from submersion in the water, external radiation from activities near the shoreline, or ingestion of fish or shellfish. MACCS2 only calculates the dose from drinking water. The MACCS2 severe accident dose risk to the 50-mi. population from drinking water is  $8.74\text{E-}03$  person-rem/reactor-year ( $8.74\text{E-}05$  person-Sv/reactor-year) (Table 7.2-3) for the US-APWR, which is bounding for the four reactor technologies. This value is the sum of all water ingestion doses for the associated US-APWR release categories.

Surface water pathways involving swimming, fishing, and boating are not modeled by MACCS2. Surface water bodies within the 50-mi. region of PSEG Site include the Chesapeake Bay, Delaware Bay, Delaware River, Susquehanna River, Smyrna River, Schuylkill River, Cooper River and the reservoirs listed on Table 2.3-3. The tributary streams in the vicinity of the PSEG Site are listed in Table 2.3-4. The NRC evaluated doses from the aquatic food pathway (fishing) for the current nuclear fleet discharging to various bodies of water in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. The NRC evaluation concluded that with interdiction, the risk associated with the aquatic food pathway is SMALL relative to the atmospheric pathway for most sites and essentially the same as the atmospheric pathway for the few sites with large annual aquatic food harvests. The new plant atmospheric pathway doses are lower than those of the current U.S. nuclear fleet, therefore, the doses from surface water sources are consistently lower for the new plant as well.

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**7.2.2.3 Groundwater Pathways**

People also receive a dose from groundwater pathways. Radioactivity released during an accident enters groundwater or moves through an aquifer that eventually discharges to surface water. The consequences of a radioactive spill not associated with an accident are evaluated in SSAR Subsection 2.4.13, which determined that if the radioactive liquids are released directly to the groundwater, all radionuclides are below the environmental concentration limits before they reach any local aquifers containing drinking water. NUREG-1437 also evaluated the groundwater pathway dose, based on the analysis in NUREG-0440, *Liquid Pathway Generic Study* (LPGS). NUREG-0440 analyzed a core meltdown that contaminated groundwater and subsequently contaminated surface water. However, NUREG-0440 did not analyze direct groundwater drinking because of the limited number of potable groundwater wells.

The LPGS results provide conservative, uninterdicted population dose estimates for six generic categories of plants. These dose estimates are one or more orders of magnitude less than those attributed to the atmospheric pathway. NUREG-1437 compared potential contamination at the existing Hope Creek Generating Station (HCGS) and found that its estimated uninterdicted total population dose is less than one percent of the LPGS generic dose for estuaries. The new plant proposed location has the same groundwater characteristics as the existing HCGS and the CDFs for the new reactor technologies are lower than that for the HCGS reactor. Therefore, the dose risk from the new reactor technologies via groundwater pathway is smaller than the dose risk from the existing HCGS reactor.

**7.2.3 CONCLUSIONS**

The total calculated dose risk to the 50-mi., year 2081 population from US-APWR airborne releases at the PSEG Site is  $1.15\text{E}+00$  person-rem/reactor-year ( $1.15\text{E}-02$  person-Sv/reactor-year) (Table 7.2-3). The US-APWR bounds the ABWR, AP1000 and U.S.EPR with respect to airborne releases. Similarly, the risks of persons exposed to doses greater than 25 rem (0.25 Sv) and 200 rem (2 Sv) for US-APWR are  $3.07\text{E}-03$  and  $9.23\text{E}-05$  person/reactor-year, respectively (Table 7.2-3).

The US-APWR population dose risk at the PSEG Site is less than that for all five reactors analyzed in NUREG-1150, *Severe Accident Risks; An Assessment for Five U.S. Nuclear Power Plants*. It is however greater than the minimum population risk of the current reactors that have undergone license renewal. Per NUREG-1811, *Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site*, and NUREG-1437, the lowest dose risk reported for reactors currently undergoing license renewal (e.g., Arkansas Nuclear One) is  $5.5\text{E}-01$  person-rem/reactor-year ( $5.5\text{E}-03$  person-Sv/reactor-year). The reason the US-APWR population dose risk is greater than the minimum dose risk in NUREG-1437 (Arkansas Nuclear One) is due to the significantly larger population within the 50-mi. radius of the PSEG Site (approximately three orders of magnitude).

As discussed in Subsection 7.2.2.2, the risk from surface water contamination resulting from an accident at the PSEG Site is less than the risk from the atmospheric pathway. The risk from the atmospheric pathway for a US-APWR severe accident is bounding. Therefore, the risk from surface water contamination is minor compared to the surface water pathway of the current U.S. nuclear fleet.

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As discussed in Subsection 7.2.2.3, the risk of groundwater contamination from a US-APWR severe accident is negligible, and is smaller than the associated risk from the currently licensed reactors.

To gauge the relative magnitude of the severe accident dose risk, the bounding severe accident population dose risk is compared to the population dose risk associated with normal operation of the new plant. As reported in Section 5.4, the total collective doses for the bounding reactor technology at the PSEG Site from normal operation due to liquid and gaseous effluents are  $4.56\text{E}+01$  person-rem/year ( $4.56\text{E}-01$  person-Sv/year) and  $1.45\text{E}+01$  person-rem/year ( $1.45\text{E}-01$  person-Sv/year), respectively. The sum of these two components is the total collective dose and is equal to  $6.00\text{E}+01$  person-rem/year ( $6.00\text{E}-01$  person-Sv/year). As previously described, dose risk is dose times frequency. Normal operation has a frequency of one. Therefore, the dose risk for normal operation is  $6.00\text{E}+01$  person-rem/reactor-year ( $6.00\text{E}-01$  person-Sv/reactor-year). Comparing this value to the bounding severe accident dose risk of  $1.15\text{E}+00$  person-rem/reactor-year ( $1.15\text{E}-02$  person-Sv/reactor-year) indicates that the bounding dose risk from severe accidents is 1.9 percent of dose risk from normal operation.

Per Table 7.2-3, the US-APWR severe accident produces a bounding economic risk of  $5.03\text{E}+03$  dollars/reactor-year for the new plant. Similarly, the bounding value for risk of farm land requiring decontamination is for the US-APWR severe reactor accident and is calculated to be  $7.34\text{E}-03$  hectares/reactor-year. The probability-weighted risks of early and latent cancer fatalities from a US-APWR severe accident at the PSEG Site are indicated in Table 7.2-3 as  $1.24\text{E}-09$  persons/reactor-year and  $7.36\text{E}-04$  persons/reactor-year, respectively. Note that because no member of the public resides within a mile of the PSEG Site, the prompt fatality risk for this area is zero and complies with the guideline established in Reference 7.2-3.

#### 7.2.4 REFERENCES

- 7.2-1. 50 FR 32138, Severe Reactor Accidents Regarding Future Designs and Existing Plants, Nuclear Regulatory Commission, August 8, 1985.
- 7.2-2. Chanin, D. I. and M. L. Young. Code Manual for MACCS2: Volume 1, User's Guide, SAND97-0594, Sandia National Laboratories, Albuquerque, New Mexico, March 1997.
- 7.2-3. Nuclear Regulatory Commission (NRC), "Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication", 51 FR 30028, August 1986.

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**Table 7.2-1 (Sheet 1 of 2)  
Severe Accident Release Categories for ABWR, AP1000, US-APWR, and U.S. EPR**

| <b>Release Category</b> | <b>Accident Scenario Description</b>                                                                                                                                          |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ABWR</b>             |                                                                                                                                                                               |
| NCL                     | No loss of containment.                                                                                                                                                       |
| Case 1                  | Transients followed by failure of high pressure coolant makeup and failure to depressurize in timely fashion.                                                                 |
| Case 2                  | Short-term station blackout with reactor core isolation cooling (RCIC) failure, onsite power recovery in 8 hr.                                                                |
| Case 3                  | Station blackout with RCIC available for about 8 hr.                                                                                                                          |
| Case 4                  | Station blackout (more than 8 hr) with RCIC failure.                                                                                                                          |
| Case 5                  | Transients followed by failure of high pressure coolant makeup, successful depressurization of reactor, failure of low-pressure coolant makeup.                               |
| Case 6                  | Transient, loss-of-coolant accident (LOCA), and anticipated transient without scram (ATWS) events with successful coolant makeup, but potential prior failure of containment. |
| Case 7                  | Small/medium LOCA followed by failure of high-pressure coolant makeup and failure to depressurize.                                                                            |
| Case 8                  | LOCA followed by failure of high pressure coolant makeup.                                                                                                                     |
| Case 9                  | ATWS followed by boron injection failure and successful high-pressure coolant makeup.                                                                                         |
| <b>AP1000</b>           |                                                                                                                                                                               |
| IC                      | Intact containment.                                                                                                                                                           |
| CFE                     | Early containment failure.                                                                                                                                                    |
| CFI                     | Intermediate containment failure.                                                                                                                                             |
| CFL                     | Late containment failure.                                                                                                                                                     |
| CI                      | Containment isolation failure.                                                                                                                                                |
| BP                      | Containment bypass.                                                                                                                                                           |
| <b>US-APWR</b>          |                                                                                                                                                                               |
| RC1                     | Containment bypass.                                                                                                                                                           |
| RC2                     | Containment isolation failure.                                                                                                                                                |
| RC3                     | Containment failure before core damage.                                                                                                                                       |
| RC4                     | Early containment failure.                                                                                                                                                    |
| RC5                     | Late containment failure.                                                                                                                                                     |
| RC6                     | Intact containment.                                                                                                                                                           |
| <b>U.S. EPR</b>         |                                                                                                                                                                               |
| RC101                   | No containment failure.                                                                                                                                                       |
| RC201                   | Containment fails before vessel breach due to isolation failure, melt retained in vessel.                                                                                     |
| RC202                   | Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex-vessel, with containment sprays.                   |
| RC203                   | Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex-vessel, without containment sprays.                |

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**Table 7.2-1 (Sheet 2 of 2)  
Severe Accident Release Categories for ABWR, AP1000, US-APWR, and U.S. EPR**

| <b>Release Category</b> | <b>Accident Scenario Description</b>                                                                                                                            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RC204                   | Containment fails before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex-vessel with containment sprays.       |
| RC205                   | Containment failures before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex-vessel without containment sprays. |
| RC206                   | Small containment failure due to failure to isolate 2" or smaller lines.                                                                                        |
| RC301                   | Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex-vessel, with containment sprays.                              |
| RC302                   | Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex-vessel, without containment sprays.                           |
| RC303                   | Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex-vessel, with containment sprays.                               |
| RC304                   | Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex-vessel, without containment sprays.                            |
| RC401                   | Containment failures after breach and up to melt transfer to the spreading area, with MCCI, without debris flooding, with containment spray.                    |
| RC402                   | Containment failures after breach and up to melt transfer to the spreading area, with MCCI, without debris flooding, without containment spray.                 |
| RC403                   | Containment failures after breach and up to melt transfer to the spreading area, without MCCI, with debris flooding, with containment spray.                    |
| RC404                   | Containment failures after breach and up to melt transfer to the spreading area, without MCCI, with debris flooding, without containment spray.                 |
| RC501                   | Long term containment failure during and after debris quench, due to rupture, with MCCI, without debris flooding, with containment sprays.                      |
| RC502                   | Long term containment failure during and after debris quench, due to rupture, with MCCI, without debris flooding, without containment sprays.                   |
| RC503                   | Long term containment failure during and after debris quench, due to rupture, without MCCI, with debris flooding, with containment sprays.                      |
| RC504                   | Long term containment failure during and after debris quench, due to rupture, without MCCI, with debris flooding, without containment sprays.                   |
| RC602                   | Long term containment failure due to basemat failure, without debris flooding, without containment sprays.                                                      |
| RC701                   | Steam Generator Tube Rupture with fission product scrubbing.                                                                                                    |
| RC702                   | Steam Generator Tube Rupture without fission product scrubbing.                                                                                                 |
| RC802                   | Interfacing System LOCA without fission product scrubbing.                                                                                                      |

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**Table 7.2-2  
Severe Accident Release Categories and Frequencies for ABWR, AP1000, US-APWR, and U.S. EPR**

| <b>ABWR</b>             |                                 | <b>AP1000</b>           |                                 | <b>US-APWR</b>          |                                 | <b>U.S. EPR</b>         |                                 |
|-------------------------|---------------------------------|-------------------------|---------------------------------|-------------------------|---------------------------------|-------------------------|---------------------------------|
| <b>Release Category</b> | <b>Frequency (Reactor Year)</b> | <b>Release Category</b> | <b>Frequency (Reactor Year)</b> | <b>Release Category</b> | <b>Frequency (Reactor Year)</b> | <b>Release Category</b> | <b>Frequency (Reactor Year)</b> |
| NCL                     | 1.34E-07                        | IC                      | 2.21E-07                        | RC1                     | 7.5E-09                         | RC101                   | 3.43E-07                        |
| Case 1                  | 2.08E-08                        | CFE                     | 7.47E-09                        | RC2                     | 2.1E-09                         | RC201                   | 4.98E-10                        |
| Case 2                  | 1.00E-10                        | CFI                     | 1.89E-10                        | RC3                     | 2.0E-08                         | RC202                   | 3.97E-14                        |
| Case 3                  | 1.00E-10                        | CFL                     | 3.45E-13                        | RC4                     | 1.1E-08                         | RC203                   | 1.92E-12                        |
| Case 4                  | 1.00E-10                        | CI                      | 1.33E-09                        | RC5                     | 6.5E-08                         | RC204                   | 2.78E-11                        |
| Case 5                  | 1.00E-10                        | BP                      | 1.05E-08                        | RC6                     | 1.1E-06                         | RC205                   | 4.08E-10                        |
| Case 6                  | 1.00E-10                        |                         |                                 |                         |                                 | RC206                   | 1.65E-08                        |
| Case 7                  | 3.91E-10                        |                         |                                 |                         |                                 | RC301                   | 1.67E-12                        |
| Case 8                  | 4.05E-10                        |                         |                                 |                         |                                 | RC302                   | 2.18E-11                        |
| Case 9                  | 1.70E-10                        |                         |                                 |                         |                                 | RC303                   | 2.30E-09                        |
|                         |                                 |                         |                                 |                         |                                 | RC304                   | 1.75E-08                        |
|                         |                                 |                         |                                 |                         |                                 | RC401                   | 1.38E-11                        |
|                         |                                 |                         |                                 |                         |                                 | RC402                   | 2.75E-10                        |
|                         |                                 |                         |                                 |                         |                                 | RC403                   | 6.82E-10                        |
|                         |                                 |                         |                                 |                         |                                 | RC404                   | 1.34E-08                        |
|                         |                                 |                         |                                 |                         |                                 | RC501                   | 5.92E-13                        |
|                         |                                 |                         |                                 |                         |                                 | RC502                   | 2.87E-10                        |
|                         |                                 |                         |                                 |                         |                                 | RC503                   | 6.01E-10                        |
|                         |                                 |                         |                                 |                         |                                 | RC504                   | 1.19E-07                        |
|                         |                                 |                         |                                 |                         |                                 | RC602                   | 6.50E-10                        |
|                         |                                 |                         |                                 |                         |                                 | RC701                   | 1.02E-08                        |
|                         |                                 |                         |                                 |                         |                                 | RC702                   | 5.38E-09                        |
|                         |                                 |                         |                                 |                         |                                 | RC802                   | 2.64E-10                        |

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**Table 7.2-3 (Sheet 1 of 3)  
Environmental Consequence Risk Results**

| Release<br>Category | Population Dose Risk                              |          | Risk of Fatalities                   |                                     | Risk of Exceeding<br>Threshold Doses    |                                          | Economic Risk                | Risk of Farm Land<br>Requiring<br>Decontamination |
|---------------------|---------------------------------------------------|----------|--------------------------------------|-------------------------------------|-----------------------------------------|------------------------------------------|------------------------------|---------------------------------------------------|
|                     | Water Ingestion<br>(Person-Sv)/<br>(Reactor-Year) | Total    | Early<br>(Person)/<br>(Reactor-Year) | Late<br>(Person)/<br>(Reactor-Year) | 25 (rem)<br>(Person)/<br>(Reactor-Year) | 200 (rem)<br>(Person)/<br>(Reactor-Year) | (Dollars)/<br>(Reactor-Year) | Hectares/<br>(Reactor-Year)                       |
| <b>ABWR</b>         |                                                   |          |                                      |                                     |                                         |                                          |                              |                                                   |
| NCL                 | 1.37E-08                                          | 2.16E-05 | 0.00E+00                             | 9.63E-07                            | 0.00E+00                                | 0.00E+00                                 | 3.43E-01                     | 1.04E-06                                          |
| Case 1              | 1.37E-11                                          | 1.78E-06 | 0.00E+00                             | 7.40E-08                            | 0.00E+00                                | 0.00E+00                                 | 1.52E-02                     | 0.00E+00                                          |
| Case 2              | 2.19E-12                                          | 1.18E-08 | 0.00E+00                             | 5.01E-10                            | 0.00E+00                                | 0.00E+00                                 | 1.14E-04                     | 2.44E-11                                          |
| Case 3              | 1.24E-10                                          | 2.03E-07 | 0.00E+00                             | 9.01E-09                            | 0.00E+00                                | 0.00E+00                                 | 6.97E-03                     | 3.14E-08                                          |
| Case 4              | 7.01E-10                                          | 7.32E-07 | 0.00E+00                             | 3.24E-08                            | 3.49E-15                                | 0.00E+00                                 | 8.62E-02                     | 3.35E-07                                          |
| Case 5              | 2.63E-09                                          | 1.54E-06 | 0.00E+00                             | 6.81E-08                            | 2.04E-13                                | 0.00E+00                                 | 4.17E-01                     | 1.18E-06                                          |
| Case 6              | 1.38E-08                                          | 3.66E-06 | 0.00E+00                             | 1.63E-07                            | 2.54E-10                                | 0.00E+00                                 | 1.89E+00                     | 3.95E-06                                          |
| Case 7              | 1.55E-07                                          | 2.10E-05 | 0.00E+00                             | 9.34E-07                            | 3.49E-09                                | 5.83E-13                                 | 1.37E+01                     | 2.13E-05                                          |
| Case 8              | 3.37E-07                                          | 3.14E-05 | 1.56E-14                             | 1.42E-06                            | 3.58E-07                                | 5.55E-11                                 | 2.27E+01                     | 2.80E-05                                          |
| Case 9              | 2.81E-07                                          | 1.64E-05 | 9.98E-14                             | 7.48E-07                            | 3.77E-07                                | 1.77E-10                                 | 1.45E+01                     | 1.37E-05                                          |
| Total (1 Unit)      | 8.04E-07                                          | 9.83E-05 | 1.15E-13                             | 4.41E-06                            | 7.39E-07                                | 2.33E-10                                 | 5.37E+01                     | 6.95E-05                                          |

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**Table 7.2-3 (Sheet 2 of 3)  
Environmental Consequence Risk Results**

| Release Category | Population Dose Risk                              |                                         | Risk of Fatalities                   |                                     | Risk of Exceeding Threshold Doses       |                                          | Economic Risk                | Risk of Farm Land Requiring Decontamination |
|------------------|---------------------------------------------------|-----------------------------------------|--------------------------------------|-------------------------------------|-----------------------------------------|------------------------------------------|------------------------------|---------------------------------------------|
|                  | Water Ingestion<br>(Person-Sv)/<br>(Reactor-Year) | Total<br>(Person-Sv)/<br>(Reactor-Year) | Early<br>(Person)/<br>(Reactor-Year) | Late<br>(Person)/<br>(Reactor-Year) | 25 (rem)<br>(Person)/<br>(Reactor-Year) | 200 (rem)<br>(Person)/<br>(Reactor-Year) | (Dollars)/<br>(Reactor-Year) | Hectares/<br>(Reactor-Year)                 |
| <b>AP1000</b>    |                                                   |                                         |                                      |                                     |                                         |                                          |                              |                                             |
| IC               | 2.32E-08                                          | 2.32E-05                                | 0.00E+00                             | 1.04E-06                            | 0.00E+00                                | 0.00E+00                                 | 2.61E-01                     | 2.39E-06                                    |
| CFE              | 1.58E-06                                          | 2.99E-04                                | 1.11E-14                             | 1.42E-05                            | 3.55E-07                                | 8.89E-10                                 | 1.71E+02                     | 3.25E-04                                    |
| CFI              | 2.68E-08                                          | 1.01E-05                                | 0.00E+00                             | 3.95E-07                            | 5.37E-08                                | 4.23E-11                                 | 6.10E+00                     | 1.50E-05                                    |
| CFL              | 5.97E-12                                          | 2.04E-08                                | 0.00E+00                             | 7.62E-10                            | 0.00E+00                                | 0.00E+00                                 | 2.12E-02                     | 3.83E-08                                    |
| CI               | 2.62E-07                                          | 5.40E-05                                | 0.00E+00                             | 3.13E-06                            | 1.72E-06                                | 6.54E-10                                 | 2.65E+01                     | 5.49E-05                                    |
| BP               | 1.05E-05                                          | 1.40E-03                                | 8.36E-13                             | 6.90E-05                            | 8.23E-05                                | 5.27E-08                                 | 8.26E+02                     | 1.26E-03                                    |
| Total (1 Unit)   | 1.24E-05                                          | 1.79E-03                                | 8.47E-13                             | 8.78E-05                            | 8.44E-05                                | 5.43E-08                                 | 1.03E+03                     | 1.66E-03                                    |
| Total (2 Units)  | 2.48E-05                                          | 3.57E-03                                | 1.69E-12                             | 1.76E-04                            | 1.69E-04                                | 1.09E-07                                 | 2.06E+03                     | 3.31E-03                                    |
| <b>US-APWR</b>   |                                                   |                                         |                                      |                                     |                                         |                                          |                              |                                             |
| RC1              | 9.98E-06                                          | 9.98E-04                                | 2.57E-12                             | 4.62E-05                            | 6.05E-05                                | 5.93E-08                                 | 6.62E+02                     | 9.08E-04                                    |
| RC2              | 7.12E-07                                          | 2.23E-04                                | 1.93E-15                             | 1.10E-05                            | 2.31E-05                                | 1.21E-08                                 | 1.00E+02                     | 2.09E-04                                    |
| RC3              | 6.46E-05                                          | 5.18E-03                                | 1.24E-09                             | 4.48E-04                            | 2.96E-03                                | 9.22E-05                                 | 2.56E+03                     | 2.08E-03                                    |
| RC4              | 3.69E-06                                          | 8.67E-04                                | 1.06E-13                             | 4.53E-05                            | 2.88E-05                                | 1.40E-08                                 | 4.13E+02                     | 7.93E-04                                    |
| RC5              | 8.39E-06                                          | 4.25E-03                                | 0.00E+00                             | 1.85E-04                            | 8.91E-09                                | 0.00E+00                                 | 1.29E+03                     | 3.35E-03                                    |
| RC6              | 1.25E-08                                          | 1.86E-05                                | 0.00E+00                             | 8.37E-07                            | 0.00E+00                                | 0.00E+00                                 | 1.78E-01                     | 3.81E-07                                    |
| Total (1 Unit)   | 8.74E-05                                          | 1.15E-02                                | 1.24E-09                             | 7.36E-04                            | 3.07E-03                                | 9.23E-05                                 | 5.03E+03                     | 7.34E-03                                    |



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**Table 7.2-3 (Sheet 3 of 3)  
Environmental Consequence Risk Results**

| Release Category | Population Dose Risk                              |                                         | Risk of Fatalities                   |                                     | Risk of Exceeding Threshold Doses       |                                          | Economic Risk                | Risk of Farm Land Requiring Decontamination |
|------------------|---------------------------------------------------|-----------------------------------------|--------------------------------------|-------------------------------------|-----------------------------------------|------------------------------------------|------------------------------|---------------------------------------------|
|                  | Water Ingestion<br>(Person-Sv)/<br>(Reactor-Year) | Total<br>(Person-Sv)/<br>(Reactor-Year) | Early<br>(Person)/<br>(Reactor-Year) | Late<br>(Person)/<br>(Reactor-Year) | 25 (rem)<br>(Person)/<br>(Reactor-Year) | 200 (rem)<br>(Person)/<br>(Reactor-Year) | (Dollars)/<br>(Reactor-Year) | Hectares/<br>(Reactor-Year)                 |
| <b>U.S. EPR</b>  |                                                   |                                         |                                      |                                     |                                         |                                          |                              |                                             |
| RC101            | 1.11E-07                                          | 2.02E-04                                | 0.00E+00                             | 9.71E-06                            | 0.00E+00                                | 0.00E+00                                 | 3.77E+00                     | 2.83E-05                                    |
| RC201            | 2.73E-07                                          | 1.88E-05                                | 5.48E-14                             | 8.37E-07                            | 1.31E-06                                | 2.47E-12                                 | 1.73E+01                     | 1.41E-05                                    |
| RC202            | 4.53E-12                                          | 1.22E-09                                | 0.00E+00                             | 5.72E-11                            | 2.75E-14                                | 0.00E+00                                 | 7.27E-04                     | 1.35E-09                                    |
| RC203            | 4.01E-10                                          | 9.22E-08                                | 5.91E-19                             | 4.63E-09                            | 3.82E-09                                | 5.55E-15                                 | 4.99E-02                     | 8.26E-08                                    |
| RC204            | 3.28E-09                                          | 9.01E-07                                | 0.00E+00                             | 4.42E-08                            | 6.59E-09                                | 2.81E-16                                 | 5.25E-01                     | 9.62E-07                                    |
| RC205            | 1.17E-07                                          | 2.33E-05                                | 0.00E+00                             | 1.20E-06                            | 2.24E-06                                | 3.99E-12                                 | 1.24E+01                     | 1.93E-05                                    |
| RC206            | 1.08E-06                                          | 4.37E-04                                | 0.00E+00                             | 2.41E-05                            | 3.53E-06                                | 3.20E-09                                 | 2.44E+02                     | 5.59E-04                                    |
| RC301            | 1.90E-10                                          | 5.13E-08                                | 0.00E+00                             | 2.40E-09                            | 1.16E-12                                | 0.00E+00                                 | 3.06E-02                     | 5.69E-08                                    |
| RC302            | 4.56E-09                                          | 1.05E-06                                | 6.71E-18                             | 5.25E-08                            | 4.34E-08                                | 6.30E-14                                 | 5.67E-01                     | 9.37E-07                                    |
| RC303            | 2.71E-07                                          | 7.45E-05                                | 0.00E+00                             | 3.66E-06                            | 5.45E-07                                | 2.32E-14                                 | 4.35E+01                     | 7.96E-05                                    |
| RC304            | 5.02E-06                                          | 9.99E-04                                | 0.00E+00                             | 5.15E-05                            | 9.59E-05                                | 1.71E-10                                 | 5.30E+02                     | 8.26E-04                                    |
| RC401            | 4.20E-10                                          | 1.99E-07                                | 0.00E+00                             | 8.90E-09                            | 1.12E-12                                | 0.00E+00                                 | 1.01E-01                     | 2.54E-07                                    |
| RC402            | 2.63E-08                                          | 8.00E-06                                | 0.00E+00                             | 3.60E-07                            | 6.66E-09                                | 0.00E+00                                 | 4.40E+00                     | 8.36E-06                                    |
| RC403            | 2.07E-08                                          | 9.82E-06                                | 0.00E+00                             | 4.40E-07                            | 5.52E-11                                | 0.00E+00                                 | 4.99E+00                     | 1.25E-05                                    |
| RC404            | 1.28E-06                                          | 3.90E-04                                | 0.00E+00                             | 1.76E-05                            | 3.24E-07                                | 0.00E+00                                 | 2.14E+02                     | 4.07E-04                                    |
| RC501            | 1.57E-12                                          | 3.30E-09                                | 0.00E+00                             | 1.47E-10                            | 0.00E+00                                | 0.00E+00                                 | 1.46E-04                     | 3.13E-10                                    |
| RC502            | 7.63E-10                                          | 1.60E-06                                | 0.00E+00                             | 7.15E-08                            | 0.00E+00                                | 0.00E+00                                 | 7.06E-02                     | 1.52E-07                                    |
| RC503            | 2.13E-10                                          | 3.92E-07                                | 0.00E+00                             | 1.76E-08                            | 0.00E+00                                | 0.00E+00                                 | 1.10E-02                     | 8.95E-09                                    |
| RC504            | 4.21E-08                                          | 7.77E-05                                | 0.00E+00                             | 3.49E-06                            | 0.00E+00                                | 0.00E+00                                 | 2.18E+00                     | 1.77E-06                                    |
| RC602            | 1.73E-09                                          | 3.62E-06                                | 0.00E+00                             | 1.62E-07                            | 0.00E+00                                | 0.00E+00                                 | 1.60E-01                     | 3.43E-07                                    |
| RC701            | 5.01E-07                                          | 2.26E-04                                | 0.00E+00                             | 1.18E-05                            | 5.75E-07                                | 3.55E-11                                 | 1.22E+02                     | 2.89E-04                                    |
| RC702            | 5.23E-06                                          | 8.55E-04                                | 1.39E-11                             | 7.59E-05                            | 4.87E-04                                | 1.19E-05                                 | 3.37E+02                     | 3.79E-04                                    |
| RC802            | 1.38E-06                                          | 1.48E-04                                | 3.99E-11                             | 1.67E-05                            | 8.03E-05                                | 1.76E-05                                 | 3.14E+01                     | 1.24E-05                                    |
| Total (1 Unit)   | 1.54E-05                                          | 3.48E-03                                | 5.39E-11                             | 2.18E-04                            | 6.72E-04                                | 2.95E-05                                 | 1.57E+03                     | 2.64E-03                                    |

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**Table 7.2-4  
Chemical Group Assignment<sup>(a)</sup>**

| <b>Group</b> | <b>Nuclides</b>                                                                                             |
|--------------|-------------------------------------------------------------------------------------------------------------|
| 1            | Kr-85, Kr-85m, Kr-87, Kr-88, Xe-133, Xe-135                                                                 |
| 2            | I-131, I-132, I-133, I-134, I-135                                                                           |
| 3            | Rb-86, Cs-134, Cs-136, Cs-137                                                                               |
| 4            | Sb-127, Sb-129, Te-127, Te-127m, Te-129, Te-129m, Te-131m, Te-132                                           |
| 5            | Sr-89, Sr-90, Sr-91, Sr-92                                                                                  |
| 6            | Co-58, Co-60, Mo-99, Tc-99m, Ru-103, Ru-105, Ru-106, Rh-105                                                 |
| 7            | Y-90, Y-91, Y-92, Y-93, Zr-95, Zr-97, Nb-95, La-140, La-141, La-142, Pr-143, Nd-147, Am-241, Cm-242, Cm-244 |
| 8            | Ce-141, Ce-143, Ce-144, Np-239, Pu-238, Pu-239, Pu-240, Pu-241                                              |
| 9            | Ba-139, Ba-140                                                                                              |

- a) For the ABWR there are 7 groups. Groups 9 and 5 are combined into one (Group 5), and Groups 7 and 8 are combined into one (Group 7).

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**Table 7.2-5 (Sheet 1 of 4)  
Source Release Fractions**

| <b>ABWR</b>             |                  |                    |                    |                    |                    |                    |                    |                    |
|-------------------------|------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>Release Category</b> | <b>Plume No.</b> | <b>Group No. 1</b> | <b>Group No. 2</b> | <b>Group No. 3</b> | <b>Group No. 4</b> | <b>Group No. 5</b> | <b>Group No. 6</b> | <b>Group No. 7</b> |
| NCL                     | 1                | 4.40E-02           | 0.00E+00           | 2.30E-05           | 2.30E-05           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 1                  | 1                | 1.00E+00           | 0.00E+00           | 1.50E-07           | 1.30E-05           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 2                  | 1                | 1.00E+00           | 0.00E+00           | 5.00E-06           | 5.00E-06           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 3                  | 1                | 1.00E+00           | 0.00E+00           | 2.80E-04           | 2.20E-03           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 4                  | 1                | 1.00E+00           | 0.00E+00           | 1.60E-03           | 1.60E-03           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 5                  | 1                | 1.00E+00           | 0.00E+00           | 6.00E-03           | 5.30E-04           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 6                  | 1                | 1.00E+00           | 0.00E+00           | 3.10E-02           | 7.70E-02           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 7                  | 1                | 1.00E+00           | 0.00E+00           | 8.90E-02           | 9.90E-02           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 8                  | 1                | 1.00E+00           | 0.00E+00           | 1.90E-01           | 2.50E-01           | 0.00E+00           | 0.00E+00           | 0.00E+00           |
| Case 9                  | 1                | 1.00E+00           | 0.00E+00           | 3.70E-01           | 3.60E-01           | 0.00E+00           | 0.00E+00           | 0.00E+00           |

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**Table 7.2-5 (Sheet 2 of 4)  
Source Release Fractions**

| AP1000           |           |             |             |             |             |             |             |             |             |             |
|------------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Release Category | Plume No. | Group No. 1 | Group No. 2 | Group No. 3 | Group No. 4 | Group No. 5 | Group No. 6 | Group No. 7 | Group No. 8 | Group No. 9 |
| CFI              | 1         | 5.40E-01    | 3.19E-03    | 3.18E-03    | 4.18E-04    | 2.11E-02    | 9.11E-03    | 3.53E-03    | 2.64E-05    | 1.62E-02    |
|                  | 2         | 2.58E-01    | 1.35E-04    | 1.35E-04    | 1.67E-05    | 6.50E-04    | 1.68E-04    | 4.53E-03    | 1.68E-05    | 3.40E-04    |
|                  | 3         | 8.40E-02    | 0.00E+00    | 0.00E+00    | 4.47E-06    | 0.00E+00    | 0.00E+00    | 6.00E-03    | 2.17E-05    | 0.00E+00    |
|                  | 4         | 3.83E-02    | 0.00E+00    | 0.00E+00    | 1.57E-06    | 0.00E+00    | 0.00E+00    | 5.22E-03    | 1.89E-05    | 0.00E+00    |
| CFE              | 1         | 4.16E-01    | 5.53E-02    | 5.37E-02    | 1.23E-03    | 3.14E-03    | 1.16E-02    | 5.57E-05    | 9.54E-07    | 4.63E-03    |
|                  | 2         | 4.05E-01    | 1.26E-03    | 1.21E-03    | 1.61E-04    | 3.43E-04    | 2.58E-03    | 9.66E-06    | 4.56E-08    | 6.45E-04    |
|                  | 3         | 1.08E-01    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
|                  | 4         | 3.43E-02    | 0.00E+00    | 0.00E+00    | 6.04E-07    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
| IC               | 1         | 9.83E-04    | 1.20E-05    | 1.15E-05    | 8.04E-07    | 1.07E-05    | 1.31E-05    | 1.35E-06    | 5.85E-09    | 1.20E-05    |
|                  | 2         | 4.93E-04    | 0.00E+00    | 0.00E+00    | 4.83E-09    | 0.00E+00    | 0.00E+00    | 6.00E-09    | 3.20E-11    | 0.00E+00    |
|                  | 3         | 3.94E-04    | 0.00E+00    | 0.00E+00    | 1.21E-09    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
|                  | 4         | 7.72E-04    | 0.00E+00    | 0.00E+00    | 6.04E-10    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
| BP               | 1         | 1.00E+00    | 1.69E-01    | 1.62E-01    | 6.27E-03    | 3.57E-03    | 4.48E-02    | 1.30E-04    | 3.19E-06    | 8.93E-03    |
|                  | 2         | 0.00E+00    | 4.64E-02    | 3.38E-02    | 3.12E-03    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 2.00E-06    |
|                  | 3         | 0.00E+00    | 2.31E-01    | 6.60E-02    | 5.32E-03    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
|                  | 4         | 0.00E+00    | 2.80E-03    | 9.96E-03    | 1.57E-03    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 1.00E-06    | 0.00E+00    |
| CI               | 1         | 5.73E-01    | 4.56E-02    | 2.10E-02    | 1.64E-03    | 2.03E-02    | 4.04E-02    | 2.39E-04    | 2.97E-06    | 3.16E-02    |
|                  | 2         | 1.13E-01    | 0.00E+00    | 0.00E+00    | 1.15E-05    | 0.00E+00    | 0.00E+00    | 1.00E-07    | 0.00E+00    | 0.00E+00    |
|                  | 3         | 5.66E-02    | 0.00E+00    | 0.00E+00    | 8.10E-05    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
|                  | 4         | 2.74E-02    | 0.00E+00    | 0.00E+00    | 1.27E-05    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
| CFL              | 1         | 3.36E-04    | 1.20E-05    | 1.15E-05    | 1.00E-06    | 1.57E-05    | 1.68E-05    | 9.96E-07    | 7.41E-09    | 1.61E-05    |
|                  | 2         | 1.19E-03    | 5.00E-08    | 3.23E-08    | 1.75E-08    | 1.04E-06    | 2.90E-07    | 1.07E-05    | 4.05E-08    | 6.60E-07    |
|                  | 3         | 9.79E-01    | 2.13E-05    | 1.16E-05    | 2.47E-05    | 2.39E-03    | 1.26E-03    | 9.75E-02    | 3.68E-04    | 2.25E-03    |
|                  | 4         | 0.00E+00    | 0.00E+00    | 2.56E-07    | 1.20E-05    | 4.42E-04    | 1.55E-04    | 4.39E-02    | 1.66E-04    | 3.46E-04    |

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**Table 7.2-5 (Sheet 3 of 4)  
Source Release Fractions**

| US-APWR          |           |             |             |             |             |             |             |             |             |             |
|------------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Release Category | Plume No. | Group No. 1 | Group No. 2 | Group No. 3 | Group No. 4 | Group No. 5 | Group No. 6 | Group No. 7 | Group No. 8 | Group No. 9 |
| RC1              | 1         | 6.88E-01    | 1.96E-01    | 1.56E-01    | 8.55E-02    | 3.49E-04    | 1.45E-02    | 1.47E-05    | 4.34E-05    | 2.90E-03    |
|                  | 2         | 2.48E-01    | 8.73E-02    | 3.91E-02    | 3.91E-02    | 4.55E-03    | 3.87E-03    | 2.25E-04    | 2.38E-04    | 8.82E-03    |
|                  | 3         | 2.72E-03    | 4.03E-03    | 8.47E-03    | 7.88E-03    | 3.71E-03    | 4.21E-03    | 2.12E-03    | 1.35E-03    | 3.50E-03    |
|                  | 4         | 4.87E-03    | 2.29E-03    | 2.66E-03    | 6.09E-04    | 1.85E-04    | 7.59E-05    | 6.23E-04    | 5.30E-04    | 9.68E-05    |
| RC2              | 1         | 7.31E-01    | 3.61E-02    | 2.13E-02    | 3.56E-02    | 5.14E-03    | 1.50E-02    | 3.62E-03    | 1.95E-03    | 8.12E-03    |
|                  | 2         | 2.38E-01    | 3.22E-02    | 4.19E-03    | 7.24E-03    | 2.61E-04    | 7.07E-04    | 4.01E-04    | 3.65E-04    | 4.38E-04    |
|                  | 3         | 2.20E-02    | 1.65E-01    | 1.16E-02    | 2.86E-02    | 1.23E-03    | 4.00E-05    | 5.18E-05    | 1.58E-04    | 1.50E-03    |
|                  | 4         | 5.37E-03    | 4.70E-02    | 5.46E-03    | 5.88E-03    | 1.11E-03    | 6.12E-05    | 5.64E-05    | 2.47E-04    | 1.11E-03    |
| RC3              | 1         | 9.38E-01    | 4.70E-01    | 4.58E-01    | 4.19E-01    | 4.22E-02    | 2.71E-01    | 1.49E-03    | 6.33E-03    | 1.02E-01    |
|                  | 2         | 4.74E-02    | 8.37E-03    | 6.51E-03    | 6.41E-03    | 1.77E-03    | 4.94E-03    | 6.60E-05    | 8.66E-05    | 3.49E-03    |
|                  | 3         | 1.45E-03    | 1.03E-03    | 1.11E-03    | 2.84E-03    | 4.37E-04    | 1.84E-04    | 6.37E-06    | 6.00E-05    | 2.24E-04    |
|                  | 4         | 5.54E-04    | 2.46E-04    | 1.80E-05    | 1.49E-03    | 5.37E-05    | 0.00E+00    | 2.33E-07    | 2.75E-06    | 2.42E-05    |
| RC4              | 1         | 9.98E-01    | 3.79E-02    | 3.29E-02    | 4.88E-02    | 4.53E-03    | 2.38E-02    | 1.21E-04    | 3.67E-04    | 2.29E-02    |
|                  | 2         | 1.56E-03    | 1.66E-02    | 8.59E-03    | 3.77E-03    | 3.05E-04    | 2.79E-03    | 6.78E-07    | 3.49E-06    | 5.64E-04    |
|                  | 3         | 2.72E-04    | 7.50E-03    | 3.40E-03    | 7.78E-03    | 1.32E-03    | 1.08E-05    | 1.51E-05    | 4.73E-04    | 4.69E-04    |
|                  | 4         | 1.04E-04    | 6.34E-03    | 1.11E-03    | 2.78E-03    | 1.51E-06    | 0.00E+00    | 3.05E-08    | 9.57E-07    | 9.97E-07    |
| RC5              | 1         | 9.28E-01    | 2.72E-03    | 1.06E-03    | 6.42E-03    | 8.05E-05    | 9.95E-05    | 2.99E-05    | 1.87E-05    | 6.61E-05    |
|                  | 2         | 3.53E-02    | 2.23E-02    | 4.21E-03    | 2.53E-03    | 1.45E-06    | 1.92E-06    | 5.29E-07    | 3.42E-07    | 1.60E-06    |
|                  | 3         | 1.83E-02    | 6.02E-02    | 8.03E-03    | 3.11E-03    | 5.15E-07    | 1.70E-06    | 5.69E-08    | 4.62E-08    | 1.30E-06    |
|                  | 4         | 6.47E-03    | 5.72E-02    | 6.42E-03    | 4.56E-03    | 1.64E-06    | 9.22E-07    | 2.10E-09    | 1.29E-08    | 3.67E-06    |
| RC6              | 1         | 1.24E-04    | 1.68E-06    | 1.66E-06    | 1.30E-06    | 1.55E-07    | 6.31E-07    | 3.19E-09    | 5.31E-09    | 2.44E-07    |
|                  | 2         | 6.54E-04    | 1.46E-09    | 0.00E+00    | 6.96E-09    | 1.79E-08    | 6.46E-09    | 2.88E-10    | 2.76E-10    | 2.45E-08    |
|                  | 3         | 6.90E-04    | 1.86E-09    | 0.00E+00    | 5.08E-10    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    | 0.00E+00    |
|                  | 4         | 6.45E-04    | 0.00E+00    | 0.00E+00    | 8.88E-11    | 6.46E-11    | 4.43E-11    | 4.55E-13    | 1.23E-12    | 6.38E-11    |

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Source Release Fractions**

| Release Category | Plume No. | U.S. EPR    |             |             |             |             |             |             |             |             |
|------------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  |           | Group No. 1 | Group No. 2 | Group No. 3 | Group No. 4 | Group No. 5 | Group No. 6 | Group No. 7 | Group No. 8 | Group No. 9 |
| RC101            | 1         | 1.90E-03    | 2.40E-05    | 2.00E-05    | 5.30E-05    | 8.50E-06    | 4.40E-05    | 2.80E-07    | 7.30E-07    | 2.40E-05    |
| RC201            | 1         | 3.60E-01    | 1.00E-01    | 9.50E-02    | 7.60E-03    | 7.80E-05    | 1.10E-03    | 3.40E-06    | 1.70E-05    | 4.10E-04    |
| RC202            | 1         | 7.90E-01    | 2.30E-02    | 1.50E-02    | 2.00E-02    | 2.40E-04    | 3.40E-03    | 1.90E-05    | 6.80E-05    | 2.40E-03    |
| RC203            | 1         | 8.90E-01    | 5.30E-02    | 2.80E-02    | 1.60E-01    | 1.40E-04    | 6.80E-03    | 1.50E-05    | 2.40E-04    | 2.20E-03    |
| RC204            | 1         | 9.50E-01    | 2.80E-02    | 1.60E-02    | 3.60E-02    | 1.70E-04    | 5.30E-03    | 1.40E-05    | 6.20E-05    | 3.20E-03    |
| RC205            | 1         | 9.80E-01    | 5.70E-02    | 3.60E-02    | 9.30E-02    | 4.00E-03    | 9.80E-03    | 3.00E-04    | 5.30E-04    | 6.10E-03    |
| RC206            | 1         | 1.90E-01    | 5.60E-03    | 5.00E-03    | 9.00E-03    | 1.20E-03    | 7.30E-03    | 5.50E-05    | 1.80E-04    | 4.20E-03    |
| RC301            | 1         | 7.90E-01    | 2.30E-02    | 1.50E-02    | 2.00E-02    | 2.40E-04    | 3.40E-03    | 1.90E-05    | 6.80E-05    | 2.40E-03    |
| RC302            | 1         | 8.90E-01    | 5.30E-02    | 2.80E-02    | 1.60E-01    | 1.40E-04    | 6.80E-03    | 1.50E-05    | 2.40E-04    | 2.20E-03    |
| RC303            | 1         | 9.50E-01    | 2.80E-02    | 1.60E-02    | 3.60E-02    | 1.70E-04    | 5.30E-03    | 1.40E-05    | 6.20E-05    | 3.20E-03    |
| RC304            | 1         | 9.80E-01    | 5.70E-02    | 3.60E-02    | 9.30E-02    | 4.00E-03    | 9.80E-03    | 3.00E-04    | 5.30E-04    | 6.10E-03    |
| RC401            | 1         | 8.00E-01    | 4.60E-03    | 2.30E-03    | 3.40E-03    | 2.70E-03    | 1.50E-03    | 8.00E-05    | 3.40E-04    | 5.20E-03    |
| RC402            | 1         | 9.70E-01    | 2.00E-02    | 1.00E-02    | 1.20E-02    | 3.80E-03    | 2.10E-03    | 1.10E-04    | 4.90E-04    | 7.30E-03    |
| RC403            | 1         | 8.00E-01    | 4.60E-03    | 2.30E-03    | 3.40E-03    | 2.70E-03    | 1.50E-03    | 8.00E-05    | 3.40E-04    | 5.20E-03    |
| RC404            | 1         | 9.70E-01    | 2.00E-02    | 1.00E-02    | 1.20E-02    | 3.80E-03    | 2.10E-03    | 1.10E-04    | 4.90E-04    | 7.30E-03    |
| RC501            | 1         | 9.90E-01    | 7.70E-04    | 4.00E-04    | 1.70E-02    | 7.40E-06    | 4.40E-05    | 2.20E-07    | 7.00E-07    | 2.40E-05    |
| RC502            | 1         | 9.90E-01    | 7.70E-04    | 4.00E-04    | 1.70E-02    | 7.40E-06    | 4.40E-05    | 2.20E-07    | 7.00E-07    | 2.40E-05    |
| RC503            | 1         | 1.00E+00    | 4.10E-04    | 6.90E-05    | 5.10E-05    | 8.50E-06    | 4.40E-05    | 2.80E-07    | 7.30E-07    | 2.40E-05    |
| RC504            | 1         | 1.00E+00    | 4.10E-04    | 6.90E-05    | 5.10E-05    | 8.50E-06    | 4.40E-05    | 2.80E-07    | 7.30E-07    | 2.40E-05    |
| RC602            | 1         | 9.90E-01    | 7.70E-04    | 4.00E-04    | 1.70E-02    | 7.40E-06    | 4.40E-05    | 2.20E-07    | 7.00E-07    | 2.40E-05    |
| RC701            | 1         | 1.10E-01    | 4.20E-03    | 4.40E-03    | 6.90E-03    | 6.00E-04    | 4.80E-03    | 2.20E-05    | 1.10E-04    | 2.70E-03    |
| RC702            | 1         | 1.10E-01    | 8.40E-02    | 8.70E-02    | 1.40E-01    | 1.20E-02    | 9.60E-02    | 4.50E-04    | 2.20E-03    | 5.40E-02    |
| RC802            | 1         | 9.80E-01    | 7.10E-01    | 6.90E-01    | 6.40E-01    | 1.30E-01    | 5.70E-01    | 3.90E-03    | 2.20E-02    | 3.80E-01    |

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**7.3 SEVERE ACCIDENT MITIGATION ALTERNATIVES**

This section is not required for an ESPA.

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## 7.4 TRANSPORTATION ACCIDENTS

This section describes the environmental impacts of postulated transportation accidents involving the shipment of radioactive materials including unirradiated fuel, irradiated (spent) fuel and radioactive waste. The evaluations in this section assume that all fuel and radioactive waste shipments are by truck.

The evaluations of transportation accidents for the new plant are based on bounding information from the PPE in Section 1.3 of the SSAR. The reactor technologies considered are the ABWR, AP1000, U.S. EPR, and US-APWR. A description of PPE development and intended use is provided in Section 1.3 of the SSAR.

The NRC evaluated the environmental effects of fuel and waste transportation for light-water-cooled reactors in WASH-1238, *Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Plants* (Reference 7.4-6), and NUREG-75/038, *Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants, Supplement 1*, and found the impacts to be SMALL. These documents provide the basis for Table S-4 in 10 CFR 51.52, *Environmental Effects of Transportations of Fuel and Waste – Table S-4*, which summarizes the environmental impacts of fuel and waste transportation to and from one LWR of 3000 to 5000 MWt (1000 to 1500 megawatt electric [MWe]). Impacts are provided for normal transport conditions and accidents in transport for a reference 1100 MWe LWR at an 80 percent capacity factor.

As stated in 10 CFR 51.52:

“Under § 51.50, every environmental report prepared for the construction permit stage or early site permit stage or combined license stage of a light-water-cooled nuclear power reactor, and submitted after February 4, 1975, shall contain a statement concerning transportation of fuel and radioactive wastes to and from the reactor. That statement shall indicate that the reactor and this transportation either meet all of the conditions in paragraph (a) of this section or all of the conditions of paragraph (b) of this section.”

10 CFR 51.52(a)(1) through (5) delineate specific conditions the reactor licensee must meet to use Table S-4 as part of its ER. For reactors not meeting all of the conditions in 10 CFR 51.52 paragraph (a), paragraph (b) requires a further analysis of the transportation effects.

The technologies under consideration for the PSEG Site differ from some of the conditions of 10 CFR 51.52(a). Therefore, 10 CFR 51.52 (b) requires “... a full description and detailed analysis of the environmental effects of transportation of fuel and wastes to and from the reactor, including values for the environmental impact under normal conditions of transport and for the environmental risk from accidents in transport. The statement shall indicate that the values determined by the analysis represent the contribution of such effects to the environmental costs of licensing the reactor.”

A comparison to the parameters in Table S-4 for each of the reactor technologies being considered, including a discussion of the acceptability of the parameters that differ from Table S-4, is provided in Subsection 5.7.2.1. Table S-4 provides the environmental impact for “... one light-water-cooled nuclear powered reactor.” A dual unit AP1000 is also being considered for the



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PSEG Site. A single unit AP1000 is evaluated for transportation accidents in this section to be consistent with the Table S-4 basis.

These environmental impacts are determined using the TRAGIS (Reference 7.4-3) and RADTRAN (References 7.4-4 and 7.4-5) computer codes. The input and output streams for these codes are contained in Appendix 7A to this report.

#### 7.4.1 RADIOLOGICAL IMPACTS

Accident risks are the product of accident frequency and the consequence of the accident. NUREG-1815, *Environmental Impact Statement for an Early Site Permit (ESP) at the Exelon ESP Site*, Appendix G, 2006, indicates that accident frequencies are likely to be lower than those used in the WASH-1238 analysis, because traffic accident, injury, and fatality rates have fallen over the past 30 years.

##### 7.4.1.1 Transportation of Unirradiated Fuel

Consequences of accidents that are severe enough to result in a release of unirradiated fuel particles are not significantly different for advanced LWRs because the fuel form, cladding, and packaging are similar to those analyzed in WASH-1238. Consequently, the risks of accidents during transport of unirradiated fuel to advanced LWR sites are smaller than the WASH-1238 results that formed the basis for Table S-4.

##### 7.4.1.2 Transportation of Irradiated Fuel

The detailed analyses required by 10 CFR 51.52 are performed using TRAGIS (Reference 7.4-3) and RADTRAN (References 7.4-4 and 7.4-5) computer codes. The US-APWR is the bounding reactor technology with regard to fission product inventory, Ci/MTU. Therefore, US-APWR-specific design information is used for the irradiated fuel accident analysis.

The evaluation model assumes that irradiated fuel is shipped to the proposed Yucca Mountain repository. The impacts of the transportation of spent fuel to a possible repository in Nevada (NV) provide a reasonable estimate of the transportation risks to a monitored retrievable storage facility because of the distances involved. The distance from the PSEG Site to the proposed repository is 2780 mi. (4474 km) as determined by the TRAGIS computer code for a highway route controlled quantity (HRCQ).

State-specific accident data from Table 4 of ANL/ESD/TM-150, *State-Level Accident Rates of Surface Freight Transportation: A Reexamination*, (Reference 7.4-1) is shown in Table 7.4-1. Only the interstate data is used because the HRCQ route is mainly on Interstate roads.

Fuel shipments are summarized in Tables 5.7-5 and 5.7-6. The average annual quantity of irradiated fuel shipped is assumed to equal the average annual reload quantity, which is consistent with NUREG-1815. For the US-APWR, this is 35 MTU of irradiated fuel per year. The initial irradiated fuel activity is decayed 5 years to account for the minimum decay period prior to shipment to the repository at Yucca Mountain, NV. The source term used for the analysis (i.e., with 5 years decay) is provided in Table 7.4-2. This source term bounds spent fuel inventories with a burnup of 55 GWt/MTU.

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The radionuclides chosen are those in Table G-9 of NUREG-1815 with the addition of those in the RADTRAN 5.6 library (Table 7.4-2). In Appendix G of NUREG-1815, the NRC performed a screening analysis showing that these are the dominant nuclides.

In addition to the source term assumed above, Cobalt-60 is used to represent fuel surface contamination. Using Cobalt-60 in the model is consistent with previously performed studies that quantified fuel rod contamination levels and concluded that the maximum contribution from contamination is Cobalt-60 (Reference 7.4-2). NUREG/CR-6672, *Reexamination of Spent Fuel Shipment Risk Estimates*, 2002, estimates the maximum contamination from Cobalt-60 for PWR fuel at zero year decay is approximately 0.2 Ci/rod ( $7.4\text{E}+09$  Bq/rod) (Reference 7.4-2). The Cobalt-60 surface contamination used corresponds to the US-APWR value of approximately 0.3 Ci/rod ( $1.13\text{E}+10$  Bq/rod) prior to decay.

The accident severity categories and associated release fractions from Appendix G of NUREG-1815 are used and shown in Table 7.4-3. The model severity fractions, release fractions, aerosol fractions, and respirable fractions are the conditional probabilities for specific severity categories of a postulated transportation accident. Other RADTRAN parameters used are the default values from the RADCAT 2.3 User Guide (Reference 7.4-5), and from Appendix G of NUREG-1815.

The dose impact from postulated transportation accidents involving irradiated fuel is  $2.88\text{E}-06$  person-rem per MTU shipped ( $2.88\text{E}-08$  person-Sv per MTU shipped). Using the average annual reload requirements for a US-APWR of 35 MTU, the annual population dose impact is  $1.01\text{E}-04$  person-rem/year ( $1.01\text{E}-06$  person-Sv/year) from postulated transportation accidents involving irradiated fuel. These results are summarized in Table 7.4-5.

#### 7.4.1.3 Transportation of Radioactive Waste

The detailed analyses required by 10 CFR 51.52 are performed using TRAGIS (Reference 7.4-3) and RADTRAN (References 7.4-4 and 7.4-5) computer codes.

Radwaste shipments are summarized in Tables 5.7-4 and 5.7-7. The US-APWR is the bounding reactor technology with respect to annual radwaste volume. However, the overall activity is determined, on a radionuclide basis, across the four reactor technologies. The bounding value for each radionuclide in the PPE (SSAR Table 1.3-3) is used for the radwaste accident analysis.

New Jersey is a member of the Atlantic Interstate Low Level Radioactive Waste Management Compact. The PSEG Site repository is Barnwell, South Carolina (SC). The distance from the PSEG Site to the Barnwell repository is 689 mi. (1109 km) as determined by the TRAGIS computer code for a commercial route.

The accident severity categories and associated release fractions from Appendix G of NUREG-1815 are used and shown in Table 7.4-3. The model severity fractions, release fractions, aerosol fractions, and respirable fractions are the conditional probabilities, given an accident occurs, for specific severity categories. Gases are not deposited and have a 0.0 m/s deposition velocity. Other RADTRAN parameters used are the default values from the RADCAT 2.3 User Guide (Reference 7.4-5), and from Appendix G of NUREG-1815.

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State-specific accident data from Table 4 of ANL/ESD/TM-150 (Reference 7.4-1) are shown in Table 7.4-1. Only the interstate data are used because the commercial route is mainly on Interstate roads.

The evaluation determined that the average annual population dose impact is  $1.48\text{E-}05$  person-rem/year ( $1.48\text{E-}07$  person-Sv/year) from postulated transportation accidents involving radwaste. These results are summarized in Tables 7.4-5.

#### 7.4.2 NON-RADIOLOGICAL IMPACTS

Non-radiological impacts associated with the postulated accidents are calculated for:

- Injuries and fatalities during transportation of unirradiated fuel
- Injuries and fatalities during transportation of irradiated fuel
- Injuries and fatalities during transportation of radwaste

The non-radiological impacts from postulated accidents during transportation are evaluated using the TRAGIS code (Reference 7.4-3) to define appropriate routing and population density along the route, and the RADTRAN code (References 7.4-4 and 7.4-5) to calculate the non-radiological impacts (e.g., injuries and fatalities). The injury rate is calculated by substituting the state specific injury rates in Table 7.4-1 for the state specific fatality rates in the RADTRAN "fatalities per accident" array.

The non-radiological impacts are based on round-trip distances because the return of the empty truck is included in the evaluation. Therefore, the frequency (fatalities/reactor-yr and injuries/reactor-yr) is multiplied by two.

##### 7.4.2.1 Transportation of Unirradiated Fuel

It is assumed that all new fuel shipments came from the fuel fabrication facility located in Richland, Washington, which is the furthest fabrication facility from the PSEG Site.

The annual unirradiated fuel shipment requirements are summarized in Table 5.7-5. A review of the unirradiated fuel shipment requirements for the reactor technologies being considered indicates that the bounding case for the number of shipments is the U.S. EPR with 7.5 shipments/yr. The non-radiological fatality rate and injury rate per shipment, per 10 reactor-years (for injuries) and per 100 reactor-years (for fatalities) are provided in Tables 7.4-6 and 7.4-7.

##### 7.4.2.2 Transportation of Irradiated Fuel

The routing and accident parameters are the same as those used to analyze the radiological impacts of transporting irradiated fuel described in Subsection 7.4.1.2 above.

The annual irradiated fuel shipments are summarized in Table 5.7-6. The US-APWR average annual quantity of irradiated fuel shipped is assumed to equal the average annual reload quantity, consistent with NUREG-1815. A review of the annual unirradiated fuel requirements for the reactor technologies being considered indicates that the bounding case for the number of shipments is the ABWR with 44.7 MTU/yr.

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Shipping cask capacity assumptions are based on current shipping cask designs. The irradiated fuel cask capacity is assumed to be 1.8 MTU (4000 lbs U) consistent with NUREG-1815. The irradiated fuel shipments are summarized in Table 5.7-6. As shown in Table 5.7-6, the bounding case for the new plant is the ABWR with 24.8 shipments/yr.

The non-radiological fatality rate and injury rate per shipment, per 10 reactor-years (for injuries) and per 100 reactor-years (for fatalities), are provided in Tables 7.4-6 and 7.4-7.

#### 7.4.2.3 Transportation of Radioactive Waste

The routing and accident parameters are the same as those used to analyze the radiological impacts of transporting radioactive waste described in Subsection 7.4.1.3 above.

For the purposes of this evaluation, each radwaste container is assumed to be shipped separately, (i.e., one container per truck.) The total number of radwaste containers is determined by assuming that dry active waste is shipped in a Sea-Land container with an internal useable volume of 28.32 cubic meters ( $m^3$ ) (1000 cubic feet [ $ft^3$ ]). All other waste (e.g., resins, filters, etc.) are shipped in high integrity containers (HICs) with a useable internal volume of 2.55  $m^3$  (90  $ft^3$ ). The annual radwaste shipment requirements are summarized in Table 5.7-7.

The radioactive waste shipments are summarized in Table 5.7-7. A review of the annual radwaste requirements for the technologies being considered indicates that the bounding case is the U.S. APWR with 21.8 shipments/yr.

The non-radiological injury rate and fatality rate per shipment, per 10 reactor-years (for injuries) and per 100 reactor-years (for fatalities), are provided in Tables 7.4-6 and 7.4-7.

#### 7.4.3 SUMMARY AND CONCLUSION

A detailed accident analysis of the environmental impacts for the transportation of unirradiated fuel, irradiated fuel, and radioactive waste transported to and from the PSEG Site is performed in accordance with 10 CFR 51.52(b).

The results of the radiological accident analysis are summarized in Table 7.4-5, and the results of the non-radiological accident analysis are summarized in Tables 7.4-6 and 7.4-7. The values determined by these analyses represent the contribution of such effects to the environmental costs of licensing the reactor.

These environmental impact results of these accidents are bounded by Table S-4 in 10 CFR 51.52(c), as shown in Table 7.4-8.

Therefore, the corresponding impacts from accidents associated with the transportation of fuel and waste, to and from the proposed new plant, are SMALL and are less than those specified in 10 CFR 51.52.

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**7.4.4 REFERENCES**

- 7.4-1 Argonne National Laboratory, "State-Level Accident Rates of Surface Freight Transportation: A Reexamination," ANL/ESD/TM-150, 1999.
- 7.4-2 Nuclear Regulatory Commission, "Re-Examination of Spent Fuel Shipment Risk Estimates," NUREG/CR-6672, 2000.
- 7.4-3 Oak Ridge National Laboratory, P. Johnson, and R. Michelhaugh, "Transportation Routing Analysis Geographic Information System (TRAGIS) User's Manual," ORNL/NTRC-006, 2003.
- 7.4-4 Sandia National Laboratories, K. S. Neuhauser, F.L. Kanipe, and R. F. Weiner, "RADTRAN 5," SAND2000-1256, 2000.
- 7.4-5 Sandia National Laboratories, R. Weiner, D. Osborn, G. Mills, D. Hinojosa, T. Heames, and D. Orcutt, "RADCAT 2.3 User Guide," SAND2006-6315, 2006. (bundled with RADTRAN 5.6)
- 7.4-6 U.S. Atomic Energy Commission, Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants, WASH-1238, U.S. Atomic Energy Commission, Washington, D.C., December 1972.

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**Table 7.4-1  
PSEG Site Model  
Accident, Fatality and Injury Rates**

| <b>State</b> | <b>Accident Rate<br/>Accident/Truck-mi.<br/>(Accident/Truck-km)</b> | <b>Fatality Rate<br/>Fatality/Truck-mi.<br/>(Fatality/Truck-km)</b> | <b>Fatality Rate<br/>Fatality<br/>/Accident<sup>(a)</sup></b> | <b>Injury Rate<br/>Injury /Truck-mi.<br/>(Injury/Truck-km)</b> | <b>Injury Rate<br/>Injury/Accident<sup>(b)</sup></b> |
|--------------|---------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------|
| AZ           | 2.12E-07<br>(1.32E-07)                                              | 1.51E-08<br>(9.40E-09)                                              | 7.12E-02                                                      | 1.88E-07<br>(1.17E-07)                                         | 8.86E-01                                             |
| DE           | 8.34E-07<br>(5.18E-07)                                              | 9.01E-09<br>(5.60E-09)                                              | 1.08E-02                                                      | 5.5E-07<br>(3.42E-07)                                          | 6.60E-01                                             |
| ID           | 4.75E-07<br>(2.95E-07)                                              | 6.12E-09<br>(3.80E-09)                                              | 1.29E-02                                                      | 4.94E-07<br>(3.07E-07)                                         | 1.04E+00                                             |
| IL           | 3.57E-07<br>(2.22E-07)                                              | 1.34E-08<br>(8.30E-09)                                              | 3.74E-02                                                      | 2.41E-07<br>(1.50E-07)                                         | 6.76E-01                                             |
| IN           | 3.62E-07<br>(2.25E-07)                                              | 1.08E-08<br>(6.70E-09)                                              | 2.98E-02                                                      | 2.25E-07<br>(1.40E-07)                                         | 6.22E-01                                             |
| IA           | 1.80E-07<br>(1.12E-07)                                              | 1.51E-08<br>(9.40E-09)                                              | 8.39E-02                                                      | 1.38E-07<br>(8.60E-08)                                         | 7.68E-01                                             |
| MD           | 8.69E-07<br>(5.40E-07)                                              | 1.05E-08<br>(6.50E-09)                                              | 1.20E-02                                                      | 7.39E-07<br>(4.59E-07)                                         | 8.50E-01                                             |
| NC           | 5.57E-07<br>(3.46E-07)                                              | 2.37E-08<br>(1.49E-08)                                              | 4.25E-02                                                      | 5.10E-07<br>(3.17E-07)                                         | 9.16E-01                                             |
| NE           | 5.13E-07<br>(3.19E-07)                                              | 2.20E-08<br>(1.37E-08)                                              | 4.29E-02                                                      | 3.17E-07<br>(1.97E-07)                                         | 6.18E-01                                             |
| NJ           | 9.09E-07<br>(5.65E-07)                                              | 1.95E-08<br>(1.21E-8)                                               | 2.14E-02                                                      | 6.29E-07<br>(3.91E-07)                                         | 6.92E-01                                             |
| NV           | 3.62E-07<br>(2.25E-07)                                              | 1.06E-08<br>(6.60E-09)                                              | 2.93E-02                                                      | 2.38E-07<br>(1.48E-07)                                         | 6.58E-01                                             |
| OH           | 2.64E-07<br>(1.64E-07)                                              | 6.28E-09<br>(3.90E-09)                                              | 2.38E-02                                                      | 2.25E-07<br>(1.40E-07)                                         | 8.54E-01                                             |
| OR           | 5.07E-07<br>(3.15E-07)                                              | 3.28E-08<br>(2.04E-08)                                              | 6.48E-02                                                      | 3.65E-07<br>(2.27E-07)                                         | 7.21E-01                                             |
| PA           | 8.27E-07<br>(5.14E-07)                                              | 2.17E-08<br>(1.35E-08)                                              | 2.63E-02                                                      | 6.16E-07<br>(3.83E-07)                                         | 7.45E-01                                             |
| SC           | 5.07E-07<br>(3.15E-07)                                              | 1.42E-08<br>(8.8E-09)                                               | 2.79E-02                                                      | 3.65E-07<br>(2.27E-07)                                         | 7.21E-01                                             |
| UT           | 4.67E-07<br>(2.90E-07)                                              | 1.92E-08<br>(1.19E-08)                                              | 4.10E-02                                                      | 4.07E-07<br>(2.53E-07)                                         | 8.72E-01                                             |
| VA           | 6.32E-07<br>(3.93E-07)                                              | 2.59E-08<br>(1.61E-08)                                              | 4.10E-02                                                      | 4.99E-07<br>(3.10E-07)                                         | 7.89E-01                                             |
| WA           | 4.26E-07<br>(2.65E-07)                                              | 2.70E-08<br>(1.68E-08)                                              | 6.34E-02                                                      | 2.90E-07<br>(1.80E-07)                                         | 6.79E-01                                             |
| WV           | 2.77E-07<br>(1.72E-07)                                              | 2.90E-09<br>(1.80E-09)                                              | 1.05E-02                                                      | 1.80E-07<br>(1.12E-07)                                         | 6.51E-01                                             |
| WY           | 1.08E-06<br>(6.74E-07)                                              | 1.74E-08<br>(1.08E-08)                                              | 1.60E-02                                                      | 5.20E-07<br>(3.23E-07)                                         | 4.79E-01                                             |

a) Fatality/Accident = Fatality/Truck-km / Accident/Truck-km

b) Injury/Accident = Injury/Truck-km / Accident/Truck-km

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**Table 7.4-2  
PSEG Site Model  
Irradiated Fuel Source Term**

| <b>Nuclide<sup>(a)</sup></b> | <b>US- APWR<br/>5 Year Decay<br/>Ci/MTU</b> | <b>US- APWR<br/>5 Year Decay<br/>Bq/MTU</b> |
|------------------------------|---------------------------------------------|---------------------------------------------|
| Am-241                       | 1.81E+03                                    | 6.70E+13                                    |
| Am-242m                      | 2.04E+01                                    | 7.54E+11                                    |
| Am-243                       | 7.45E+01                                    | 2.76E+12                                    |
| Ce-144                       | 1.39E+04                                    | 5.13E+14                                    |
| Pr-144 (D)                   |                                             |                                             |
| Pr-144m (D)                  |                                             |                                             |
| Cm-242                       | 6.08E+01                                    | 2.25E+12                                    |
| Cm-243                       | 5.76E+01                                    | 2.13E+12                                    |
| Cm-244                       | 1.25E+04                                    | 4.64E+14                                    |
| Cm-245                       |                                             |                                             |
| Co-60                        | 8.58E+01                                    | 3.17E+12                                    |
| Cs-134                       | 6.41E+04                                    | 2.37E+15                                    |
| Cs-137                       | 1.76E+05                                    | 6.51E+15                                    |
| Ba-137m (D)                  |                                             |                                             |
| Eu-154                       | 1.03E+04                                    | 3.80E+14                                    |
| Eu-155                       | 2.74E+03                                    | 1.01E+14                                    |
| Kr-85                        | 1.09E+04                                    | 4.04E+14                                    |
| Pm-147                       | 5.17E+04                                    | 1.91E+15                                    |
| Pu-238                       | 9.51E+03                                    | 3.52E+14                                    |
| Pu-239                       | 4.08E+02                                    | 1.51E+13                                    |
| Np-239                       | 7.45E+01                                    | 2.76E+12                                    |
| Pu-240                       | 6.97E+02                                    | 2.58E+13                                    |
| Pu-241                       | 1.68E+05                                    | 6.22E+15                                    |
| Ru-106                       | 2.46E+04                                    | 9.12E+14                                    |
| Rh-106 (D)                   |                                             |                                             |
| Sb-125                       | 3.39E+03                                    | 1.25E+14                                    |
| Sr-90                        | 1.20E+05                                    | 4.43E+15                                    |
| Y-90                         | 1.20E+05                                    | 4.43E+15                                    |
| H-3 <sup>(b)</sup>           | 6.49E+02                                    | 2.40E+13                                    |
| Tc-99 <sup>(b)</sup>         | 2.33E+01                                    | 8.64E+11                                    |
| Cd-113m <sup>(b)</sup>       | 4.98E+01                                    | 1.84E+12                                    |
| Te-125m <sup>(b)</sup>       | 8.30E+02                                    | 3.07E+13                                    |
| Sm-151 <sup>(b)</sup>        | 6.47E+02                                    | 2.39E+13                                    |
| Total                        | 7.93E+05                                    | 2.93E+16                                    |

- a) The radionuclides labeled with a (D) are daughter products and are included with the parent in the RADTRAN program (References 7.4-5 and 7.4-6)
- b) These radionuclides are from the US-APWR inventory but are not included in Table G-9 of NUREG-1815. It should be noted that all the nuclides in this table are in the RADTRAN library. Those not marked <sup>(b)</sup> are also in Table G-9 of NUREG-1815.

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**Table 7.4-3  
PSEG Site Model  
Severity and Release Fractions<sup>(a)</sup>**

| Severity<br>Category | Severity<br>Fraction | Gas  | Release Fractions |           |             | Corrosion<br>Product |
|----------------------|----------------------|------|-------------------|-----------|-------------|----------------------|
|                      |                      |      | Cesium            | Ruthenium | Particulate |                      |
| 0                    | 1.53E-08             | 0.8  | 2.40E-08          | 6.00E-07  | 6.00E-07    | 2.00E-03             |
| 1                    | 5.88E-05             | 0.14 | 4.10E-09          | 1.00E-07  | 1.00E-07    | 1.40E-03             |
| 2                    | 1.81E-06             | 0.18 | 5.40E-09          | 1.30E-07  | 1.30E-07    | 1.80E-03             |
| 3                    | 7.49E-08             | 0.84 | 3.60E-05          | 3.80E-06  | 3.80E-06    | 3.20E-03             |
| 4                    | 4.65E-07             | 0.43 | 1.30E-08          | 3.20E-07  | 3.20E-07    | 1.80E-03             |
| 5                    | 3.31E-09             | 0.49 | 1.50E-08          | 3.70E-07  | 3.70E-07    | 2.10E-03             |
| 6                    | 0                    | 0.85 | 2.70E-05          | 2.10E-06  | 2.10E-06    | 3.10E-03             |
| 7                    | 1.13E-08             | 0.82 | 2.40E-08          | 6.10E-07  | 6.10E-07    | 2.00E-02             |
| 8                    | 8.03E-11             | 0.89 | 2.70E-08          | 6.70E-07  | 6.70E-07    | 2.20E-03             |
| 9                    | 0                    | 0.91 | 5.90E-06          | 6.80E-07  | 6.80E-07    | 2.50E-03             |
| 10                   | 1.44E-10             | 0.82 | 2.40E-08          | 6.10E-07  | 6.10E-07    | 2.00E-03             |
| 11                   | 1.02E-12             | 0.89 | 2.70E-08          | 6.70E-07  | 6.70E-07    | 2.20E-03             |
| 12                   | 0                    | 0.91 | 5.90E-06          | 6.80E-07  | 6.80E-07    | 2.50E-03             |
| 13                   | 7.49E-11             | 0.84 | 9.60E-05          | 8.40E-05  | 1.80E-05    | 6.40E-03             |
| 14                   | 0                    | 0.85 | 5.50E-05          | 5.00E-05  | 9.00E-06    | 5.90E-03             |
| 15                   | 0                    | 0.91 | 5.90E-06          | 6.40E-06  | 6.80E-07    | 3.30E-03             |
| 16                   | 0                    | 0.91 | 5.90E-06          | 6.40E-06  | 6.80E-07    | 3.30E-03             |
| 17                   | 5.86E-06             | 0.84 | 1.70E-05          | 6.70E-08  | 6.70E-08    | 2.50E-03             |
| 18                   | 0.99993              | 0    | 0                 | 0         | 0           | 0                    |

a) Aerosol and Respirable Fractions set to 1.0.



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**Table 7.4-4 Not Used.**

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**Table 7.4-5  
PSEG Site Model  
Radiological Accident Analysis Results**

| <b>Environmental Impact</b>                                 | <b>Unirradiated<br/>Fuel</b> | <b>Irradiated Fuel</b> | <b>Radwaste</b>        | <b>Total</b>           |
|-------------------------------------------------------------|------------------------------|------------------------|------------------------|------------------------|
| Person-rem per reactor-year<br>(person-Sv per reactor-year) | See below                    | 1.01E-04<br>(1.01E-06) | 1.48E-05<br>(1.48E-07) | 1.16E-04<br>(1.16E-06) |

The dose from unirradiated fuel accidents is assumed to be negligible compared to the doses from Irradiated Fuel and Radioactive Waste as described in Subsection 7.4.1.1.

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**Table 7.4-6  
PSEG Site Model  
Non-Radiological Accident Analysis Results: Fatalities**

|                            | <b>Fatalities<br/>per<br/>Shipment</b> | <b>Shipments<br/>per<br/>Year</b> | <b>Fatalities<br/>per<br/>Year</b> | <b>Fatalities<br/>per<br/>100 Years</b> |
|----------------------------|----------------------------------------|-----------------------------------|------------------------------------|-----------------------------------------|
| <b>ABWR</b>                |                                        |                                   |                                    |                                         |
| New Fuel                   | 4.67E-05                               | 6.1                               | 5.70E-04                           | 5.70E-02                                |
| Spent Fuel                 | 4.68E-05                               | 24.8                              | 2.32E-03                           | 2.32E-01                                |
| Radwaste                   | 1.33E-05                               | 23.7                              | 6.30E-04                           | 6.30E-02                                |
| Total                      |                                        |                                   |                                    | 3.52E-01                                |
| <b>Single AP 1000 Unit</b> |                                        |                                   |                                    |                                         |
| New Fuel                   | 4.67E-05                               | 3.8                               | 3.55E-04                           | 3.55E-02                                |
| Spent Fuel                 | 4.68E-05                               | 13.6                              | 1.27E-03                           | 1.27E-01                                |
| Radwaste                   | 1.33E-05                               | 7.9                               | 2.09E-04                           | 2.09E-02                                |
| Total                      |                                        |                                   |                                    | 1.83E-01                                |
| <b>U.S. EPR</b>            |                                        |                                   |                                    |                                         |
| New Fuel                   | 4.67E-05                               | 7.5                               | 7.01E-04                           | 7.01E-02                                |
| Spent Fuel                 | 4.68E-05                               | 20.8                              | 1.95E-03                           | 1.95E-01                                |
| Radwaste                   | 1.33E-05                               | 12.1                              | 3.21E-04                           | 3.21E-02                                |
| Total                      |                                        |                                   |                                    | 2.97E-01                                |
| <b>US-APWR</b>             |                                        |                                   |                                    |                                         |
| New Fuel                   | 4.67E-05                               | 2.3                               | 2.15E-04                           | 2.15E-02                                |
| Spent Fuel                 | 4.68E-05                               | 19.4                              | 1.82E-03                           | 1.82E-01                                |
| Radwaste                   | 1.33E-05                               | 21.8                              | 5.81E-04                           | 5.81E-02                                |
| Total                      |                                        |                                   |                                    | 2.62E-01                                |

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**Table 7.4-7  
PSEG Site Model  
Non-Radiological Accident Analysis Results: Injuries**

|                            | <b>Injuries<br/>per<br/>Shipment</b> | <b>Shipments<br/>per<br/>Year</b> | <b>Injuries<br/>per<br/>Year</b> | <b>Injuries<br/>per<br/>10 Years</b> |
|----------------------------|--------------------------------------|-----------------------------------|----------------------------------|--------------------------------------|
| <b>ABWR</b>                |                                      |                                   |                                  |                                      |
| New Fuel                   | 1.02E-03                             | 6.1                               | 1.24E-02                         | 1.24E-01                             |
| Spent Fuel                 | 1.02E-03                             | 24.8                              | 5.07E-02                         | 5.07E-01                             |
| Radwaste                   | 3.54E-04                             | 23.7                              | 1.68E-02                         | 1.68E-01                             |
| Total                      |                                      |                                   |                                  | 7.99E-01                             |
| <b>Single AP 1000 Unit</b> |                                      |                                   |                                  |                                      |
| New Fuel                   | 1.02E-03                             | 3.8                               | 7.75E-03                         | 7.75E-02                             |
| Spent Fuel                 | 1.02E-03                             | 13.6                              | 2.77E-02                         | 2.77E-01                             |
| Radwaste                   | 3.54E-04                             | 7.9                               | 5.56E-03                         | 5.56E-02                             |
| Total                      |                                      |                                   |                                  | 4.10E-01                             |
| <b>U.S. EPR</b>            |                                      |                                   |                                  |                                      |
| New Fuel                   | 1.02E-03                             | 7.5                               | 1.53E-02                         | 1.53E-01                             |
| Spent Fuel                 | 1.02E-03                             | 20.8                              | 4.25E-02                         | 4.25E-01                             |
| Radwaste                   | 3.54E-04                             | 12.1                              | 8.56E-03                         | 8.56E-02                             |
| Total                      |                                      |                                   |                                  | 6.64E-01                             |
| <b>US-APWR</b>             |                                      |                                   |                                  |                                      |
| New Fuel                   | 1.02E-03                             | 2.3                               | 4.69E-03                         | 4.69E-02                             |
| Spent Fuel                 | 1.02E-03                             | 19.4                              | 3.97E-02                         | 3.97E-01                             |
| Radwaste                   | 3.54E-04                             | 21.8                              | 1.55E-02                         | 1.55E-01                             |
| Total                      |                                      |                                   |                                  | 5.98E-01                             |

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**Table 7.4-8  
PSEG Site Model Comparison to  
10 CFR 51.52 Summary Table S-4: "Accidents in Transport"  
Bounding Technology Summary**

| <b>Types of Effects</b>                                     | <b>Environmental Risk<br/>10 CFR 51.52 Table S-4</b>                                                                   | <b>PSEG Site Model<br/>Bounding Reactor</b> |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Radiological effects                                        | Small                                                                                                                  |                                             |
| Person-rem per reactor-year<br>(person-Sv per reactor-year) |                                                                                                                        | 1.16E-04<br>(1.16E-06)                      |
| Common (nonradiological)<br>causes                          | 1 fatal injury in 100 reactor years<br>1 nonfatal injury in 10 reactor years<br>\$475 property damage per reactor year | 3.52E-01<br>7.99E-01<br>(a)                 |

- a) No attempt has been made to update the property damage value to account for inflation or other considerations such as changes in the type and value of property that could be damaged. However, because the quantified environmental risk for the PSEG Site is less than the corresponding quantified risk determined for Table S-4, the property damage per reactor year attributable to the PSEG Site is also less than that which would be shown for a Table S-4 updated for the current year.

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**APPENDIX 7A**

**TRAGIS AND RADTRAN INPUT AND OUTPUT**

This appendix contains TRAGIS and RADCAT/RADTRAN input and output streams corresponding to the Irradiated Fuel Analysis, Radwaste Analysis, and New Fuel Analysis that are the basis for discussion in relevant Sections of 5.7 and 7.4.

Information pertaining to Irradiated Fuel Analysis is in Section 7A.1. This information contains the TRAGIS and RADCAT/RADTRAN input and output for one irradiated fuel shipment from the PSEG Site to Yucca Mt., NV. The nuclide inventories are for 1 MTU of irradiated fuel for the bounding technology, which, for irradiated fuel, is the AREVA U.S. EPR.

Information pertaining to Radwaste Analysis is in Section 7A.2. This information contains the TRAGIS and RADCAT/RADTRAN input and output for one radwaste shipment from the PSEG Site to Barnwell, SC. The nuclide inventories are the total annual production for the bounding technology, which is the GE ABWR.

Information pertaining to New Fuel Analysis is in Section 7A.3. This information contains the TRAGIS and RADCAT/RADTRAN input and output for one new fuel shipment from Richland, WA to the PSEG Site.

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**7A.1 IRRADIATED FUEL ANALYSIS**

This attachment contains the TRAGIS and RADCAT/RADTRAN input and output for one irradiated fuel shipment from the PSEG Site to Yucca Mt., NV. The nuclide inventories are for 1 MTU of irradiated fuel for the bounding technology, which, for irradiated fuel, is the US-APWR.

|   |                                          |       |
|---|------------------------------------------|-------|
| 1 | TRAGIS INPUT .....                       | 7A-3  |
| 2 | TRAGIS Output.....                       | 7A-5  |
| 3 | TRAGIS Generated Input for RADTRAN ..... | 7A-8  |
| 4 | RADTRAN Input.....                       | 7A-11 |
| 5 | RADTRAN Fatalities Case Output .....     | 7A-26 |
| 6 | RADTRAN Injuries Case Output.....        | 7A-41 |

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## 1 TRAGIS INPUT

The TRAGIS input screens are reproduced below.

WebTRAGIS Client Version: 4.6.2

Block Nodes/Links
Route Listings
Route Maps

Select Origin/Destination
Highway Routing Parameters
Rail Routing Parameters
Water Routing Parameters

**Mode**  
☒ Highway   
 ☐ Railroad   
 ☐ Water   
 ☐ InterModal

**Origin**  

| State | Node Name                |
|-------|--------------------------|
| MN    | ROCKAWAY NE I80X37       |
| MO    | ROSS COR U206S15         |
| MS    | RUTHERFORD S S17 S3      |
| MT    | S BRUNSWICK U130S32      |
| NC    | S BRUNSWICK E TNJT X8A   |
| ND    | S TOMS RIVER W TGSPX80   |
| NE    | SADDLE BROOK I80X62      |
| NH    | SADDLE BROOK NW TGSPX159 |
| NJ    | SALEM S45 S49            |
| NM    | SALEM NW S49 LOCL        |
| NV    | SALEM NP                 |
| NY    | SAYREVILLE W TNJT X9     |
| OH    | SEASIDE HTS S35 S37      |
| OK    | SEAVILLE U9 S50          |

**Selected Node Number**  
  
☐ Enter Intermediate Node

**Destination**  

| State | Node Name             |
|-------|-----------------------|
| NM    | STEWART               |
| NV    | TNX AIRPORT           |
| NY    | TONOPAH               |
| OH    | TONOPAH E U6 LOCL     |
| OK    | TONOPAH E U6 S376     |
| OR    | TPH AIRPORT           |
| PA    | VGT AIRPORT           |
| RI    | WARM SPRINGS          |
| SC    | WELLS I80X352         |
| SD    | WENDOVER I80X410      |
| TN    | WINNEMUCCA I80X178    |
| TX    | WINNEMUCCA SW I80X173 |
| UT    | WMC AIRPORT           |
| VA    | YUCCA MOUNTAIN        |

**Selected Node Number**

**Route Type**  

☐ Commercial   
 ☒ HRCQ

☐ Quickest   
 ☐ Other   
 ☐ HRCQ + Nevada

☐ Shortest   
 ☐ WIPP

**Calculate Route**  
  
**Alternative Route Penalty**  
Enter the alternative route penalty to be applied to next alternative routing  
 Link Penalty (1-100)

Calculate Alternative Route

**Preferred Route**  
Enter a penalty factor for the non-preferred links at 100

**Date/Time Options**  
☒ Use Current Date  
  
☒ Use Current Time

**Population Options**  
☐ 400m Buffer Zone  
☒ 800m Buffer Zone  
☐ 2500m Buffer Zone



**PSEG Site  
ESP Application  
Part 3, Environmental Report**

WebTRAGIS Client Version: 4.6.2

| Block Nodes/Links<br>Select Origin/Destination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Route Listings<br><b>Highway Routing Parameters</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Route Maps<br>Rail Routing Parameters  | Water Routing Parameters       |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------|------------------------------------------|--------------------------------|---------------------------------|--------------------------------|-----------------------------------|--------------------------------|---------------------------------|--------------------------------|-------------------------------|--------------------------------|---------------------|--------------------------------|--|--|
| <b>Driver Options</b><br><br><input type="radio"/> One Driver <input checked="" type="radio"/> Two Drivers<br><br><br><br><br><b>Highway Inspection</b><br><br><input checked="" type="checkbox"/> Include time for inspections upon entry into state.<br>Enter est. average time to complete inspection per state. (in minutes) <input type="text" value="30"/><br><br><b>Toll Bias Factor</b><br>Enter the toll bias factor. (0 - 1000) <input type="text" value="0"/><br><br><input type="checkbox"/> Include Nevada County Population Details | <b>Other Constraints</b><br><br><input checked="" type="checkbox"/> Prohibit use of roads that restrict Commercial Trucks.<br><input checked="" type="checkbox"/> Prohibit the use of Ferry Crossings.<br><input type="checkbox"/> Prohibit the use of roads with Hazmat Restrictions.<br><input checked="" type="checkbox"/> Prohibit the use of roads with Radioactive restrictions.<br><input type="checkbox"/> Avoid the use of roads in Urban Areas.<br><input type="checkbox"/> Avoid the use of roads Inside of Beltways.<br><input type="checkbox"/> Prohibit the use of roads with Low Clearance.<br><input type="checkbox"/> Prohibit the use of roads with Narrow Clearance.<br><input type="checkbox"/> Prohibit the use of roads with Tunnels.<br><input checked="" type="checkbox"/> Las Vegas Beltway considered a Preferred Route.<br><br><b>Road Lane Type Penalty</b><br><b>Penalty Factor (0 - 100)</b><br><table style="width: 100%;"><tr><td>Lane Type 1 - Limited Access Multilane</td><td><input type="text" value="0"/></td></tr><tr><td>Lane Type 2 - Limited Access Single Lane</td><td><input type="text" value="0"/></td></tr><tr><td>Lane Type 3 - Multilane Divided</td><td><input type="text" value="0"/></td></tr><tr><td>Lane Type 4 - Multilane Undivided</td><td><input type="text" value="0"/></td></tr><tr><td>Lane Type 5 - Principal Highway</td><td><input type="text" value="0"/></td></tr><tr><td>Lane Type 6 - Through Highway</td><td><input type="text" value="0"/></td></tr><tr><td>Lane Type 7 - Other</td><td><input type="text" value="0"/></td></tr></table> | Lane Type 1 - Limited Access Multilane | <input type="text" value="0"/> | Lane Type 2 - Limited Access Single Lane | <input type="text" value="0"/> | Lane Type 3 - Multilane Divided | <input type="text" value="0"/> | Lane Type 4 - Multilane Undivided | <input type="text" value="0"/> | Lane Type 5 - Principal Highway | <input type="text" value="0"/> | Lane Type 6 - Through Highway | <input type="text" value="0"/> | Lane Type 7 - Other | <input type="text" value="0"/> |  |  |
| Lane Type 1 - Limited Access Multilane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
| Lane Type 2 - Limited Access Single Lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
| Lane Type 3 - Multilane Divided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
| Lane Type 4 - Multilane Undivided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
| Lane Type 5 - Principal Highway                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
| Lane Type 6 - Through Highway                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |
| Lane Type 7 - Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <input type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                |                                          |                                |                                 |                                |                                   |                                |                                 |                                |                               |                                |                     |                                |  |  |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

## 2 TRAGIS OUTPUT

TRAGIS Routing Engine Version 1.5.4                      -- Highway Data Network    4.0

FROM:        SALEM NP                                      NJ                      Leaving : 06/26/09 17:15  
TO :        YUCCA MOUNTAIN                                  NV                      Arriving : 06/28/09 20:50

Routing parameters used to calculate the route-

Routing type: HRCQ Preferred Route with 2 driver(s)  
Preferred roads        Time bias: 1.00    Mile bias: 0.00, Toll bias: 1.00  
Nonpreferred roads    Time bias: 0.00    Mile bias: 1.00, Toll bias: 1.00, Penalty factor:  
30.0

Constraints used on route:

Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit use of roads with Radioactive materials prohibition  
Las Vegas Beltway is considered a preferred route

| Miles | Hwy Sign | City                             | Dir                         | Junction  | State   | Dist  | Time  | Date     | Hour     |       |
|-------|----------|----------------------------------|-----------------------------|-----------|---------|-------|-------|----------|----------|-------|
| 0.0   |          | SALEM NP                         |                             |           | NJ      | 0.0   | 0:00  | 06/26/09 | 17:15    |       |
| 12.3  | LOCAL    | SALEM                            | NW                          | S49 LOCL  | NJ      | 12.3  | 0:24  | 06/26/09 | 17:39    |       |
| 3.0   | S49      | PENNSVILLE                       | S                           | S49 C551  | NJ      | 15.3  | 0:29  | 06/26/09 | 17:44    |       |
| 4.7   | C551     | DEEPWATER                        | SE                          | TNJT I295 | NJ      | 19.9  | 0:36  | 06/26/09 | 17:51    |       |
| 0.4   | I295\$   | DEEPWATER                        | S                           | I295X1    | NJ      | 20.3  | 0:37  | 06/26/09 | 17:52    |       |
| 0.9   | I295#    | crossing state border DE/NJ      |                             |           | BD      | 21.3  | 1:07  | 06/26/09 | 18:22    |       |
|       |          | State Inspection took 30 minutes |                             |           |         |       |       |          |          |       |
| 2.5   | I295#    | NEW CASTLE                       | N                           | I295S9    | DE      | 23.8  | 1:10  | 06/26/09 | 18:25    |       |
| 2.1   | I295     | NEWPORT                          | SE                          | I295I95   | DE      | 25.9  | 1:12  | 06/26/09 | 18:27    |       |
| 0.8   | I95      | NEWPORT                          | SE                          | I495I95   | DE      | 26.6  | 1:13  | 06/26/09 | 18:28    |       |
| 10.8  | I495     | CLAYMONT                         | N                           | I495I95   | DE      | 37.5  | 1:25  | 06/26/09 | 18:40    |       |
| 0.4   | I95      | crossing state border DE/PA      |                             |           | BD      | 37.9  | 1:56  | 06/26/09 | 19:11    |       |
|       |          | State Inspection took 30 minutes |                             |           |         |       |       |          |          |       |
| 6.6   | I95      | EDDYSTONE                        | N                           | I476I95   | PA      | 44.5  | 2:02  | 06/26/09 | 19:17    |       |
| 16.0  | I476     | CONSHOHOCKEN                     | SW                          | I476I76   | PA      | 60.6  | 2:17  | 06/26/09 | 19:32    |       |
| 5.3   | I76      | VALLEY FORGE                     | SE                          | I276I76   | PA      | 65.8  | 2:22  | 06/26/09 | 19:37    |       |
| 78.3  | I76 \$   | HIGHSPIRE                        | N                           | I283I76   | PA      | 144.2 | 3:38  | 06/26/09 | 20:53    |       |
| 3.1   | I283     | HARRISBURG                       | SE                          | I283I83   | PA      | 147.3 | 3:41  | 06/26/09 | 20:56    |       |
| 4.1   | I83      | PENBROOK                         | NE                          | I81 I83   | PA      | 151.3 | 3:45  | 06/26/09 | 21:00    |       |
|       |          | Rest 30 minutes                  |                             |           |         |       |       |          |          |       |
| 81.1  | I81      | DRUMS                            | N                           | I80 I81   | PA      | 232.4 | 5:31  | 06/26/09 | 22:46    |       |
|       |          | Rest 30 minutes                  |                             |           |         |       |       |          |          |       |
| 254.1 | I80      | WEST MIDDLESEX                   | NE                          | I80 X4    | PA      | 486.4 | 9:56  | 06/27/09 | 03:11    |       |
| 4.0   | I80      | crossing state border OH/PA      |                             |           | BD      | 490.5 | 10:30 | 06/27/09 | 03:45    |       |
|       |          | State Inspection took 30 minutes |                             |           |         |       |       |          |          |       |
| 17.9  | I80      | NORTH JACKSON                    | NE                          | I76 I80   | OH      | 508.4 | 10:50 | 06/27/09 | 04:05    |       |
| 76.0  | I80 \$   | ELYRIA                           | NW                          | I80 I90   | OH      | 584.4 | 12:12 | 06/27/09 | 05:27    |       |
|       |          | Rest 30 minutes                  |                             |           |         |       |       |          |          |       |
| 128.7 | I80 \$   | I90 \$                           | WEST JEFFERSON              | N         | I80 X13 | OH    | 713.1 | 15:03    | 06/27/09 | 08:18 |
| 13.1  | I80 \$   | I90 \$                           | crossing state border IN/OH |           | BD      | 726.1 | 15:47 | 06/27/09 | 09:02    |       |
|       |          | State Inspection took 30 minutes |                             |           |         |       |       |          |          |       |
|       |          | Rest 30 minutes                  |                             |           |         |       |       |          |          |       |
| 135.4 | I80 \$   | I90 \$                           | PORTAGE                     | W         | I80 I90 | IN    | 861.5 | 18:33    | 06/27/09 | 10:48 |
| 0.5   | I80      | LAKE STATION                     | NE                          | I80 I94   | IN      | 862.0 | 18:33 | 06/27/09 | 10:48    |       |
| 14.5  | I80      | I94                              | HAMMOND                     | W         | I80 X1  | IN    | 876.5 | 18:49    | 06/27/09 | 11:04 |
| 0.9   | I80      | I94                              | crossing state border IL/IN |           | BD      | 877.4 | 19:20 | 06/27/09 | 11:35    |       |
|       |          | State Inspection took 30 minutes |                             |           |         |       |       |          |          |       |
| 3.0   | I80      | I94                              | LANSING                     | W         | I294I94 | IL    | 880.3 | 19:23    | 06/27/09 | 11:38 |
| 4.9   | I294\$   | I80 \$                           | HOMEWOOD                    | NW        | I294I80 | IL    | 885.3 | 19:28    | 06/27/09 | 11:43 |

Rev. 1

# PSEG Site ESP Application

| Time                             |       | Location |  | Direction |  | Time   |       | Date     |       | Time |  |
|----------------------------------|-------|----------|--|-----------|--|--------|-------|----------|-------|------|--|
| 154.4                            | I80   |          |  |           |  | 1039.7 | 22:47 | 06/27/09 | 15:02 |      |  |
| 0.3                              | I80   |          |  |           |  | 1040.0 | 23:17 | 06/27/09 | 15:32 |      |  |
| State Inspection took 30 minutes |       |          |  |           |  |        |       |          |       |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| 168.0                            | I80   |          |  |           |  | 1207.9 | 26:23 | 06/27/09 | 18:38 |      |  |
| 14.2                             | I35   | I80      |  |           |  | 1222.1 | 26:37 | 06/27/09 | 18:52 |      |  |
| 95.7                             | I80   |          |  |           |  | 1317.8 | 28:05 | 06/27/09 | 20:20 |      |  |
| 16.5                             | I680  |          |  |           |  | 1334.3 | 28:20 | 06/27/09 | 20:35 |      |  |
| 9.7                              | I29   | I680     |  |           |  | 1344.0 | 28:29 | 06/27/09 | 20:44 |      |  |
| 3.0                              | I680  |          |  |           |  | 1347.0 | 29:02 | 06/27/09 | 21:17 |      |  |
| State Inspection took 30 minutes |       |          |  |           |  |        |       |          |       |      |  |
| 13.4                             | I680  |          |  |           |  | 1360.4 | 29:17 | 06/27/09 | 21:32 |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| 422.7                            | I80   |          |  |           |  | 1783.1 | 35:56 | 06/28/09 | 03:11 |      |  |
| 20.6                             | I80   |          |  |           |  | 1803.6 | 36:43 | 06/28/09 | 03:58 |      |  |
| State Inspection took 30 minutes |       |          |  |           |  |        |       |          |       |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| 382.4                            | I80   |          |  |           |  | 2186.0 | 42:19 | 06/28/09 | 09:34 |      |  |
| 18.2                             | I80   |          |  |           |  | 2204.2 | 43:03 | 06/28/09 | 10:18 |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| State Inspection took 30 minutes |       |          |  |           |  |        |       |          |       |      |  |
| 68.4                             | I80   |          |  |           |  | 2272.5 | 44:28 | 06/28/09 | 11:43 |      |  |
| 10.2                             | I215  |          |  |           |  | 2282.8 | 44:37 | 06/28/09 | 11:52 |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| 294.2                            | I15   |          |  |           |  | 2577.0 | 49:06 | 06/28/09 | 16:21 |      |  |
| 6.4                              | I15   |          |  |           |  | 2583.4 | 49:41 | 06/28/09 | 16:56 |      |  |
| State Inspection took 30 minutes |       |          |  |           |  |        |       |          |       |      |  |
| 20.6                             | I15   |          |  |           |  | 2604.0 | 49:58 | 06/28/09 | 16:13 |      |  |
| 8.6                              | I15   |          |  |           |  | 2612.7 | 50:35 | 06/28/09 | 16:50 |      |  |
| State Inspection took 30 minutes |       |          |  |           |  |        |       |          |       |      |  |
| 73.6                             | I15   |          |  |           |  | 2686.2 | 51:35 | 06/28/09 | 17:50 |      |  |
| Rest 30 minutes                  |       |          |  |           |  |        |       |          |       |      |  |
| 14.8                             | C215  |          |  |           |  | 2701.0 | 52:04 | 06/28/09 | 18:19 |      |  |
| 46.1                             | U95   |          |  |           |  | 2747.1 | 53:20 | 06/28/09 | 19:35 |      |  |
| 33.1                             | LOCAL |          |  |           |  | 2780.1 | 54:35 | 06/28/09 | 20:50 |      |  |

Total elapsed time: 54:35      Total trip mileage: 2780.1      Impedance: 5371.4

Mileage by State :

|     |      |     |       |     |       |     |       |     |       |     |       |
|-----|------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| AZ: | 29.2 | DE: | 16.6  | IA: | 307.1 | IL: | 162.6 | IN: | 151.2 | NE: | 456.6 |
| NJ: | 21.3 | NV: | 167.5 | OH: | 235.7 | PA: | 452.5 | UT: | 379.2 | WY: | 400.5 |

## Mileage by Sign Type:

|               |        |       |      |          |     |           |      |
|---------------|--------|-------|------|----------|-----|-----------|------|
| 1-INTERSTATE: | 2666.3 | 2-US: | 46.1 | 3-STATE: | 3.0 | 5-COUNTY: | 19.4 |
| 6-LOCAL:      | 45.3   |       |      |          |     |           |      |

### Mileage by Lane Type:

|                                 |        |                               |      |
|---------------------------------|--------|-------------------------------|------|
| 1-Multi-Lane Controlled Access: | 2666.3 | 3-Multi-Lane Divided Highway: | 60.9 |
| 5-Principle Road:               | 3.0    | 7-Other:                      | 50.0 |

Mileage by Tribal Lands:

|                            |   |        |
|----------------------------|---|--------|
| Total Outside Tribal Lands | : | 2766.2 |
| Total Inside Tribal Lands  | : | 13.9   |

|                         |   |     |                         |   |     |
|-------------------------|---|-----|-------------------------|---|-----|
| Las Vegas Colony        | : | 2.8 | Moapa River Reservation | : | 9.2 |
| Paiute (UT) Reservation | : | 1.9 |                         |   |     |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

POPULATION DENSITY within      800 meter Buffer Zone:

FROM: SALEM NP

NJ

TO : YUCCA MOUNTAIN

NV

|    |       | >0.0   | 22.7   | 59.7   | 139   | 326   | 821   | 1861  | 3326  | 5815  |       |       |
|----|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| ST | MILES | 0      | -22.7  | -59.7  | -139  | -326  | -821  | -1861 | -3326 | -5815 | -9996 | >9996 |
| AZ | 29.2  | 16.37  | 10.91  | 1.52   | 0.26  | 0.13  | 0.07  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| DE | 16.6  | 3.25   | 0.34   | 0.47   | 0.65  | 1.61  | 2.37  | 2.24  | 2.42  | 1.83  | 0.99  | 0.45  |
| IL | 162.6 | 19.10  | 37.80  | 30.07  | 23.86 | 18.01 | 12.57 | 9.39  | 5.42  | 3.67  | 2.24  | 0.40  |
| IN | 151.2 | 1.73   | 19.97  | 37.40  | 25.85 | 28.69 | 17.16 | 8.92  | 5.71  | 3.55  | 1.89  | 0.41  |
| IA | 307.1 | 26.27  | 73.66  | 93.61  | 51.14 | 25.99 | 18.72 | 10.70 | 3.86  | 2.30  | 0.64  | 0.20  |
| NE | 456.6 | 167.07 | 80.87  | 107.72 | 49.64 | 24.69 | 10.77 | 7.27  | 4.24  | 2.75  | 1.02  | 0.59  |
| NV | 167.5 | 108.64 | 21.16  | 17.66  | 9.52  | 3.96  | 3.65  | 1.23  | 0.77  | 0.53  | 0.40  | 0.00  |
| NJ | 21.3  | 4.37   | 3.43   | 2.66   | 2.36  | 1.85  | 3.25  | 1.70  | 0.99  | 0.55  | 0.14  | 0.00  |
| OH | 235.7 | 5.72   | 33.46  | 51.22  | 42.02 | 37.15 | 29.12 | 17.51 | 10.25 | 6.65  | 1.89  | 0.68  |
| PA | 452.5 | 33.02  | 76.68  | 87.18  | 81.49 | 62.74 | 51.70 | 31.14 | 14.78 | 8.20  | 4.10  | 1.47  |
| UT | 379.2 | 118.00 | 70.04  | 66.60  | 38.43 | 23.87 | 17.36 | 14.41 | 10.53 | 10.42 | 8.06  | 1.52  |
| WY | 400.5 | 207.08 | 105.56 | 52.54  | 12.14 | 6.48  | 6.02  | 4.33  | 4.26  | 1.86  | 0.22  | 0.06  |

TOTALS

2780.1    710.62    533.88    548.65    337.36    235.17    172.76    108.84    63.23    42.31    21.59    5.78

PERCENTAGES

25.56    19.20    19.73    12.13    8.46    6.21    3.91    2.27    1.52    0.78    0.21

BASIS:      2000 Census data

|                     |       |          |        |
|---------------------|-------|----------|--------|
| RADTRAN Input Data  | RURAL | SUBURBAN | URBAN  |
| WEIGHTED POPULATION |       |          |        |
| People/sq. mi.      | 29.8  | 799.5    | 6137.2 |
| People/sq. km.      | 11.5  | 308.7    | 2369.6 |

|             |        |       |       |        |
|-------------|--------|-------|-------|--------|
| DISTANCE    |        |       |       | TOTALS |
| Miles       | 2130.5 | 580.0 | 69.7  | 2780.1 |
| Kilometers  | 3428.6 | 933.4 | 112.1 | 4474.1 |
| Percentages | 76.6   | 20.9  | 2.5   |        |

BASIS (people/sq mi.)      <139      139-3326      >3326

Population within      800 meter Buffer Zone by State:

|    |        |    |        |    |        |    |       |    |       |    |       |    |       |    |      |
|----|--------|----|--------|----|--------|----|-------|----|-------|----|-------|----|-------|----|------|
| AZ | 245    | DE | 28510  | IL | 72678  | IN | 79041 | IA | 60053 | NE | 59486 | NV | 12582 | NJ | 8552 |
| OH | 123201 | PA | 189259 | UT | 159594 | WY | 32573 |    |       |    |       |    |       |    |      |

Total Population within      800 meter Buffer Zone:    825774

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

**3 TRAGIS GENERATED INPUT FOR RADTRAN**

```
[TRAGIS]
TRAGIS Version=1.5.4
Mode=H
Network Version=4.0
Census Data=2000
Buffer Zone=800
[ROUTEINFO]
From CITY=SALEM NP
From STATE=NJ
From SUBNET=
To CITY=YUCCA MOUNTAIN
To STATE=NV
To SUBNET=
[AZ]
Rural - KM= 46.8
Suburban - KM= 0.3
Urban - KM= 0.0
Total - KM= 47.1
Rural Pop Density= 3.2
Suburban Pop Density= 135.8
Urban Pop Density= 0.0
[DE]
Rural - KM= 7.6
Suburban - KM= 13.9
Urban - KM= 5.3
Total - KM= 26.8
Rural Pop Density= 7.3
Suburban Pop Density= 492.2
Urban Pop Density=2496.1
[IL]
Rural - KM= 178.4
Suburban - KM= 73.0
Urban - KM= 10.2
Total - KM= 261.7
Rural Pop Density= 14.4
Suburban Pop Density= 323.6
Urban Pop Density=2379.1
[IN]
Rural - KM= 136.7
Suburban - KM= 97.3
Urban - KM= 9.4
Total - KM= 243.4
Rural Pop Density= 19.9
Suburban Pop Density= 276.3
Urban Pop Density=2354.7
[IA]
Rural - KM= 393.8
Suburban - KM= 95.4
Urban - KM= 5.1
Total - KM= 494.1
Rural Pop Density= 15.7
Suburban Pop Density= 268.0
Urban Pop Density=2185.2
[NE]
Rural - KM= 652.2
```

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Suburban - KM= 75.6  
Urban - KM= 7.0  
Total - KM= 734.8  
Rural Pop Density= 10.0  
Suburban Pop Density= 268.5  
Urban Pop Density=2401.8  
[NV]  
Rural - KM= 252.6  
Suburban - KM= 15.5  
Urban - KM= 1.5  
Total - KM= 269.5  
Rural Pop Density= 4.8  
Suburban Pop Density= 267.6  
Urban Pop Density=2318.5  
[NJ]  
Rural - KM= 20.6  
Suburban - KM= 12.5  
Urban - KM= 1.1  
Total - KM= 34.3  
Rural Pop Density= 11.8  
Suburban Pop Density= 353.9  
Urban Pop Density=2025.9  
[OH]  
Rural - KM= 213.1  
Suburban - KM= 151.3  
Urban - KM= 14.8  
Total - KM= 379.3  
Rural Pop Density= 19.7  
Suburban Pop Density= 309.6  
Urban Pop Density=2211.7  
[PA]  
Rural - KM= 448.0  
Suburban - KM= 258.1  
Urban - KM= 22.2  
Total - KM= 728.3  
Rural Pop Density= 17.7  
Suburban Pop Density= 299.3  
Urban Pop Density=2413.1  
[UT]  
Rural - KM= 471.6  
Suburban - KM= 106.5  
Urban - KM= 32.2  
Total - KM= 610.3  
Rural Pop Density= 9.9  
Suburban Pop Density= 362.6  
Urban Pop Density=2472.3  
[WY]  
Rural - KM= 607.2  
Suburban - KM= 33.9  
Urban - KM= 3.4  
Total - KM= 644.6  
Rural Pop Density= 4.9  
Suburban Pop Density= 399.4  
Urban Pop Density=1966.6

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[Total]  
Rural - KM=3428.6  
Suburban - KM= 933.4  
Urban - KM= 112.1  
Total - KM=4474.1  
Rural Pop Density= 11.5  
Suburban Pop Density= 308.7  
Urban Pop Density=2369.6

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4 RADTRAN INPUT

The RADTRAN/RADCAT input screens are reproduced below.

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt....

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Title: Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

Remarks

Add Remark Remove Remark

Accident Options

☒ Incident Free

☒ Accident

☒ SI Output

Output Level

☒ 1

☐ 2

☐ 3

☐ 4

Health Effects

☒ Rem/Person-rem

☐ Latent Cancer Fatalities

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt....

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

| Name      | Long Dim (m) | Dose Rate (mrem/h) | Gamma Fraction | Neutron Fraction |
|-----------|--------------|--------------------|----------------|------------------|
| PACKAGE_1 | 5.20E00      | 1.39E01            | 1.00E00        | 0.00E00          |

Add Package Remove Package



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Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package **Radionuclides** Vehicle Link Stop Handling Accident Parameters

| PACKAGE_1 | Radionuclide | Phys/Chem Group | Curies  |
|-----------|--------------|-----------------|---------|
| H3WTR     | AM241        | Part            | 1.81E03 |
| H3GAS     | AM242M       | Part            | 2.04E01 |
| BE10      | CM245        | Part            | 0.00E00 |
| C14ORG    | CM244        | Part            | 1.25E04 |
| C14GAS    | CM243        | Part            | 5.76E01 |
| NA22      | CM242        | Part            | 6.08E01 |
| P32       | CE144        | Part            | 1.39E04 |
| S35       | AM243        | Part            | 7.45E01 |
| CL36      | EU154        | Part            | 1.03E04 |
| CA41      | EU155        | Part            | 2.74E03 |
| CA45      | PM147        | Part            | 5.17E04 |
| SC46      | PU238        | Part            | 9.51E03 |
| CR51      | PU239        | Part            | 4.08E02 |
| MN54      | PU240        | Part            | 6.97E02 |
| FE55      | PU241        | Part            | 1.68E05 |
| CO57      | PU242        | Part            | 0.00E00 |
| CO58      | SB125        | Part            | 3.39E03 |
| FE59      | SR90         | Part            | 1.20E05 |
| NI59      | Y90          | Part            | 1.20E05 |
| CO60      | NP239        | Part            | 7.45E01 |
| NI63      | TC99         | Part            | 2.33E01 |
|           | CD113M       | Part            | 4.98E01 |
|           | TE125M       | Part            | 8.30E02 |
|           | SM151        | Part            | 6.47E02 |
|           | CS134        | Cs              | 6.41E04 |
|           | CS137        | Cs              | 1.76E05 |
|           | I129         | Cs              | 0.00E00 |
|           | RU106        | Ru              | 2.46E04 |
|           | KR85         | Gas             | 1.09E04 |
|           | H3GAS        | Gas             | 6.49E02 |
|           | CO60         | Cor             | 8.58E01 |

Add Library Radionuclide >>

Modify User Defined Radionuclides

Add User Defined Radionuclide >>

<< Remove Radionuclide

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Fatalities

| Link Name  | Vehicle   | Length (km) | Speed (km/h) | Population Density (persons/km <sup>2</sup> ) | Vehicle Density (vehicles/hr) | Persons per Vehicle | Accident Rate (accidents/veh-km) | Fatalities per Accident | Zone     |
|------------|-----------|-------------|--------------|-----------------------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|----------|
| RURAL_AZ   | VEHICLE_1 | 4.68E01     | 8.89E01      | 3.20E00                                       | 5.30E02                       | 1.50E00             | 1.32E-07                         | 7.12E-02                | Rural    |
| SUBURBN_AZ | VEHICLE_1 | 3.00E-01    | 8.89E01      | 1.36E02                                       | 7.60E02                       | 1.50E00             | 1.32E-07                         | 7.12E-02                | Suburban |
| URBAN_AZ   | VEHICLE_1 | 0.00E00     | 8.89E01      | 0.00E00                                       | 2.40E03                       | 1.50E00             | 1.32E-07                         | 7.12E-02                | Urban    |
| RURAL_DE   | VEHICLE_1 | 7.60E00     | 8.89E01      | 7.30E00                                       | 5.30E02                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Rural    |
| SUBURBN_DE | VEHICLE_1 | 1.39E01     | 8.89E01      | 4.92E02                                       | 7.60E02                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Suburban |
| URBAN_DE   | VEHICLE_1 | 5.30E00     | 8.89E01      | 2.50E03                                       | 2.40E03                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Urban    |
| RURAL_IL   | VEHICLE_1 | 1.78E02     | 8.89E01      | 1.44E01                                       | 5.30E02                       | 1.50E00             | 2.22E-07                         | 3.74E-02                | Rural    |
| SUBURBN_IL | VEHICLE_1 | 7.30E01     | 8.89E01      | 3.24E02                                       | 7.60E02                       | 1.50E00             | 2.22E-07                         | 3.74E-02                | Suburban |
| URBAN_IL   | VEHICLE_1 | 1.02E01     | 8.89E01      | 2.38E03                                       | 2.40E03                       | 1.50E00             | 2.22E-07                         | 3.74E-02                | Urban    |
| RURAL_IN   | VEHICLE_1 | 1.37E02     | 8.89E01      | 1.99E01                                       | 5.30E02                       | 1.50E00             | 2.25E-07                         | 2.98E-02                | Rural    |
| SUBURBN_IN | VEHICLE_1 | 9.73E01     | 8.89E01      | 2.76E02                                       | 7.60E02                       | 1.50E00             | 2.25E-07                         | 2.98E-02                | Suburban |
| URBAN_IN   | VEHICLE_1 | 9.40E00     | 8.89E01      | 2.35E03                                       | 2.40E03                       | 1.50E00             | 2.25E-07                         | 2.98E-02                | Urban    |
| RURAL_IA   | VEHICLE_1 | 3.94E02     | 8.89E01      | 1.57E01                                       | 5.30E02                       | 1.50E00             | 1.12E-07                         | 8.39E-02                | Rural    |
| SUBURBN_IA | VEHICLE_1 | 9.54E01     | 8.89E01      | 2.68E02                                       | 7.60E02                       | 1.50E00             | 1.12E-07                         | 8.39E-02                | Suburban |
| URBAN_IA   | VEHICLE_1 | 5.10E00     | 8.89E01      | 2.19E03                                       | 2.40E03                       | 1.50E00             | 1.12E-07                         | 8.39E-02                | Urban    |
| RURAL_NE   | VEHICLE_1 | 6.52E02     | 8.89E01      | 1.00E01                                       | 5.30E02                       | 1.50E00             | 3.19E-07                         | 4.29E-02                | Rural    |
| SUBURBN_NE | VEHICLE_1 | 7.56E01     | 8.89E01      | 2.68E02                                       | 7.60E02                       | 1.50E00             | 3.19E-07                         | 4.29E-02                | Suburban |
| URBAN_NE   | VEHICLE_1 | 7.00E00     | 8.89E01      | 2.40E03                                       | 2.40E03                       | 1.50E00             | 3.19E-07                         | 4.29E-02                | Urban    |
| RURAL_NV   | VEHICLE_1 | 2.53E02     | 8.89E01      | 4.80E00                                       | 5.30E02                       | 1.50E00             | 2.25E-07                         | 2.93E-02                | Rural    |
| SUBURBN_NV | VEHICLE_1 | 1.55E01     | 8.89E01      | 2.68E02                                       | 7.60E02                       | 1.50E00             | 2.25E-07                         | 2.93E-02                | Suburban |
| URBAN_NV   | VEHICLE_1 | 1.50E00     | 8.89E01      | 2.32E03                                       | 2.40E03                       | 1.50E00             | 2.25E-07                         | 2.93E-02                | Urban    |
| RURAL_NJ   | VEHICLE_1 | 2.06E01     | 8.89E01      | 1.18E01                                       | 5.30E02                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Rural    |
| SUBURBN_NJ | VEHICLE_1 | 1.25E01     | 8.89E01      | 3.54E02                                       | 7.60E02                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Suburban |
| URBAN_NJ   | VEHICLE_1 | 1.10E00     | 8.89E01      | 2.03E03                                       | 2.40E03                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Urban    |
| RURAL_OH   | VEHICLE_1 | 2.13E02     | 8.89E01      | 1.97E01                                       | 5.30E02                       | 1.50E00             | 1.64E-07                         | 2.38E-02                | Rural    |
| SUBURBN_OH | VEHICLE_1 | 1.51E02     | 8.89E01      | 3.10E02                                       | 7.60E02                       | 1.50E00             | 1.64E-07                         | 2.38E-02                | Suburban |
| URBAN_OH   | VEHICLE_1 | 1.48E01     | 8.89E01      | 2.21E03                                       | 2.40E03                       | 1.50E00             | 1.64E-07                         | 2.38E-02                | Urban    |
| RURAL_PA   | VEHICLE_1 | 4.48E02     | 8.89E01      | 1.77E01                                       | 5.30E02                       | 1.50E00             | 5.14E-07                         | 2.63E-02                | Rural    |
| SUBURBN_PA | VEHICLE_1 | 2.58E02     | 8.89E01      | 2.99E02                                       | 7.60E02                       | 1.50E00             | 5.14E-07                         | 2.63E-02                | Suburban |
| URBAN_PA   | VEHICLE_1 | 2.22E01     | 8.89E01      | 2.41E03                                       | 2.40E03                       | 1.50E00             | 5.14E-07                         | 2.63E-02                | Urban    |
| RURAL_UT   | VEHICLE_1 | 4.72E02     | 8.89E01      | 9.90E00                                       | 5.30E02                       | 1.50E00             | 2.90E-07                         | 4.10E-02                | Rural    |
| SUBURBN_UT | VEHICLE_1 | 1.06E02     | 8.89E01      | 3.63E02                                       | 7.60E02                       | 1.50E00             | 2.90E-07                         | 4.10E-02                | Suburban |
| URBAN_UT   | VEHICLE_1 | 3.22E01     | 8.89E01      | 2.47E03                                       | 2.40E03                       | 1.50E00             | 2.90E-07                         | 4.10E-02                | Urban    |
| RURAL_WY   | VEHICLE_1 | 6.07E02     | 8.89E01      | 4.90E00                                       | 5.30E02                       | 1.50E00             | 6.74E-07                         | 1.60E-02                | Rural    |
| SUBURBN_WY | VEHICLE_1 | 3.39E01     | 8.89E01      | 3.99E02                                       | 7.60E02                       | 1.50E00             | 6.74E-07                         | 1.60E-02                | Suburban |
| URBAN_WY   | VEHICLE_1 | 3.40E00     | 8.89E01      | 1.97E03                                       | 2.40E03                       | 1.50E00             | 6.74E-07                         | 1.60E-02                | Urban    |

## Injuries per Accident in Column Labeled "Fatalities per Accident"

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries

| Link Name  | Vehicle   | Length (km) | Speed (km/h) | Population Density (persons/km <sup>2</sup> ) | Vehicle Density (vehicles/hr) | Persons per Vehicle | Accident Rate (accidents/veh-km) | Fatalities per Accident | Zone             |
|------------|-----------|-------------|--------------|-----------------------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|------------------|
| RURAL_AZ   | VEHICLE_1 | 4.68E01     | 8.89E01      | 3.20E00                                       | 5.30E02                       | 1.50E00             | 1.32E-07                         | 8.86E-01                | Rural Primary    |
| SUBURBN_AZ | VEHICLE_1 | 3.00E-01    | 8.89E01      | 1.36E02                                       | 7.60E02                       | 1.50E00             | 1.32E-07                         | 8.86E-01                | Suburban Primary |
| URBAN_AZ   | VEHICLE_1 | 0.00E00     | 8.89E01      | 0.00E00                                       | 2.40E03                       | 1.50E00             | 1.32E-07                         | 8.86E-01                | Urban Primary    |
| RURAL_DE   | VEHICLE_1 | 7.60E00     | 8.89E01      | 7.30E00                                       | 5.30E02                       | 1.50E00             | 5.18E-07                         | 6.60E-01                | Rural Primary    |
| SUBURBN_DE | VEHICLE_1 | 1.39E01     | 8.89E01      | 4.92E02                                       | 7.60E02                       | 1.50E00             | 5.18E-07                         | 6.60E-01                | Suburban Primary |
| URBAN_DE   | VEHICLE_1 | 5.30E00     | 8.89E01      | 2.50E03                                       | 2.40E03                       | 1.50E00             | 5.18E-07                         | 6.60E-01                | Urban Primary    |
| RURAL_IL   | VEHICLE_1 | 1.78E02     | 8.89E01      | 1.44E01                                       | 5.30E02                       | 1.50E00             | 2.22E-07                         | 6.76E-01                | Rural Primary    |
| SUBURBN_IL | VEHICLE_1 | 7.30E01     | 8.89E01      | 3.24E02                                       | 7.60E02                       | 1.50E00             | 2.22E-07                         | 6.76E-01                | Suburban Primary |
| URBAN_IL   | VEHICLE_1 | 1.02E01     | 8.89E01      | 2.38E03                                       | 2.40E03                       | 1.50E00             | 2.22E-07                         | 6.76E-01                | Urban Primary    |
| RURAL_IN   | VEHICLE_1 | 1.37E02     | 8.89E01      | 1.99E01                                       | 5.30E02                       | 1.50E00             | 2.25E-07                         | 6.22E-01                | Rural Primary    |
| SUBURBN_IN | VEHICLE_1 | 9.73E01     | 8.89E01      | 2.76E02                                       | 7.60E02                       | 1.50E00             | 2.25E-07                         | 6.22E-01                | Suburban Primary |
| URBAN_IN   | VEHICLE_1 | 9.40E00     | 8.89E01      | 2.35E03                                       | 2.40E03                       | 1.50E00             | 2.25E-07                         | 6.22E-01                | Urban Primary    |
| RURAL_IA   | VEHICLE_1 | 3.94E02     | 8.89E01      | 1.57E01                                       | 5.30E02                       | 1.50E00             | 1.12E-07                         | 7.68E-01                | Rural Primary    |
| SUBURBN_IA | VEHICLE_1 | 9.54E01     | 8.89E01      | 2.68E02                                       | 7.60E02                       | 1.50E00             | 1.12E-07                         | 7.68E-01                | Suburban Primary |
| URBAN_IA   | VEHICLE_1 | 5.10E00     | 8.89E01      | 2.19E03                                       | 2.40E03                       | 1.50E00             | 1.12E-07                         | 7.68E-01                | Urban Primary    |
| RURAL_NE   | VEHICLE_1 | 6.52E02     | 8.89E01      | 1.00E01                                       | 5.30E02                       | 1.50E00             | 3.19E-07                         | 6.18E-01                | Rural Primary    |
| SUBURBN_NE | VEHICLE_1 | 7.56E01     | 8.89E01      | 2.68E02                                       | 7.60E02                       | 1.50E00             | 3.19E-07                         | 6.18E-01                | Suburban Primary |
| URBAN_NE   | VEHICLE_1 | 7.00E00     | 8.89E01      | 2.40E03                                       | 2.40E03                       | 1.50E00             | 3.19E-07                         | 6.18E-01                | Urban Primary    |
| RURAL_NV   | VEHICLE_1 | 2.53E02     | 8.89E01      | 4.80E00                                       | 5.30E02                       | 1.50E00             | 2.25E-07                         | 6.58E-01                | Rural Primary    |
| SUBURBN_NV | VEHICLE_1 | 1.55E01     | 8.89E01      | 2.68E02                                       | 7.60E02                       | 1.50E00             | 2.25E-07                         | 6.58E-01                | Suburban Primary |
| URBAN_NV   | VEHICLE_1 | 1.50E00     | 8.89E01      | 2.32E03                                       | 2.40E03                       | 1.50E00             | 2.25E-07                         | 6.58E-01                | Urban Primary    |
| RURAL_NJ   | VEHICLE_1 | 2.06E01     | 8.89E01      | 1.18E01                                       | 5.30E02                       | 1.50E00             | 5.65E-07                         | 6.92E-01                | Rural Primary    |
| SUBURBN_NJ | VEHICLE_1 | 1.25E01     | 8.89E01      | 3.54E02                                       | 7.60E02                       | 1.50E00             | 5.65E-07                         | 6.92E-01                | Suburban Primary |
| URBAN_NJ   | VEHICLE_1 | 1.10E00     | 8.89E01      | 2.03E03                                       | 2.40E03                       | 1.50E00             | 5.65E-07                         | 6.92E-01                | Urban Primary    |
| RURAL_OH   | VEHICLE_1 | 2.13E02     | 8.89E01      | 1.97E01                                       | 5.30E02                       | 1.50E00             | 1.64E-07                         | 8.54E-01                | Rural Primary    |
| SUBURBN_OH | VEHICLE_1 | 1.51E02     | 8.89E01      | 3.10E02                                       | 7.60E02                       | 1.50E00             | 1.64E-07                         | 8.54E-01                | Suburban Primary |
| URBAN_OH   | VEHICLE_1 | 1.48E01     | 8.89E01      | 2.21E03                                       | 2.40E03                       | 1.50E00             | 1.64E-07                         | 8.54E-01                | Urban Primary    |
| RURAL_PA   | VEHICLE_1 | 4.48E02     | 8.89E01      | 1.77E01                                       | 5.30E02                       | 1.50E00             | 5.14E-07                         | 7.45E-01                | Rural Primary    |
| SUBURBN_PA | VEHICLE_1 | 2.58E02     | 8.89E01      | 2.99E02                                       | 7.60E02                       | 1.50E00             | 5.14E-07                         | 7.45E-01                | Suburban Primary |
| URBAN_PA   | VEHICLE_1 | 2.22E01     | 8.89E01      | 2.41E03                                       | 2.40E03                       | 1.50E00             | 5.14E-07                         | 7.45E-01                | Urban Primary    |
| RURAL_UT   | VEHICLE_1 | 4.72E02     | 8.89E01      | 9.90E00                                       | 5.30E02                       | 1.50E00             | 2.90E-07                         | 8.72E-01                | Rural Primary    |
| SUBURBN_UT | VEHICLE_1 | 1.06E02     | 8.89E01      | 3.63E02                                       | 7.60E02                       | 1.50E00             | 2.90E-07                         | 8.72E-01                | Suburban Primary |
| URBAN_UT   | VEHICLE_1 | 3.22E01     | 8.89E01      | 2.47E03                                       | 2.40E03                       | 1.50E00             | 2.90E-07                         | 8.72E-01                | Urban Primary    |
| RURAL_WY   | VEHICLE_1 | 6.07E02     | 8.89E01      | 4.90E00                                       | 5.30E02                       | 1.50E00             | 6.74E-07                         | 4.79E-01                | Rural Primary    |
| SUBURBN_WY | VEHICLE_1 | 3.39E01     | 8.89E01      | 3.99E02                                       | 7.60E02                       | 1.50E00             | 6.74E-07                         | 4.79E-01                | Suburban Primary |
| URBAN_WY   | VEHICLE_1 | 3.40E00     | 8.89E01      | 1.97E03                                       | 2.40E03                       | 1.50E00             | 6.74E-07                         | 4.79E-01                | Urban Primary    |

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Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link **Stop** Handling Accident Parameters

| Name   | Vehicle   | Min Distance (m) | Max Distance (m) | People or People/km <sup>2</sup> | Shielding Factor | Time (h) |
|--------|-----------|------------------|------------------|----------------------------------|------------------|----------|
| STOP_1 | VEHICLE_1 | 1.00E00          | 1.00E01          | 3.00E04                          | 1.00E00          | 6.00E00  |
| STOP_2 | VEHICLE_1 | 1.00E01          | 8.00E02          | 3.40E02                          | 2.00E-01         | 6.00E00  |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop **Handling** Accident Parameters

| Name     | Vehicle   | Number of Handlers | Distance (m) | Time (h) |
|----------|-----------|--------------------|--------------|----------|
| HANDLE_1 | VEHICLE_1 | 5.00E00            | 1.00E00      | 5.00E-01 |

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File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

| Index | Probability Fraction |
|-------|----------------------|
| 0     | 1.53E-08             |
| 1     | 5.88E-05             |
| 2     | 1.81E-06             |
| 3     | 7.49E-08             |
| 4     | 4.65E-07             |
| 5     | 3.31E-09             |
| 6     | 0.00E00              |
| 7     | 1.13E-08             |
| 8     | 8.03E-11             |
| 9     | 0.00E00              |
| 10    | 1.44E-10             |
| 11    | 1.02E-12             |
| 12    | 0.00E00              |
| 13    | 7.49E-11             |
| 14    | 0.00E00              |
| 15    | 0.00E00              |
| 16    | 0.00E00              |
| 17    | 5.86E-06             |
| 18    | 1.00E00              |

Add severity fraction Remove severity fraction

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca M...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

| Group | Deposition Velocity (m/s) |
|-------|---------------------------|
| Part  | 1.00E-02                  |
| Cs    | 1.00E-02                  |
| Ru    | 1.00E-02                  |
| Gas   | 0.00E00                   |
| Cor   | 1.00E-02                  |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca M...

File Edit

... \* [Icons] ...

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Part

| Index | Release Fraction |
|-------|------------------|
| 0     | 6.00E-07         |
| 1     | 1.00E-07         |
| 2     | 1.30E-07         |
| 3     | 3.80E-06         |
| 4     | 3.20E-07         |
| 5     | 3.70E-07         |
| 6     | 2.10E-06         |
| 7     | 6.10E-07         |
| 8     | 6.70E-07         |
| 9     | 6.80E-07         |
| 10    | 6.10E-07         |
| 11    | 6.70E-07         |
| 12    | 6.80E-07         |
| 13    | 1.80E-05         |
| 14    | 9.00E-06         |
| 15    | 6.80E-07         |
| 16    | 6.80E-07         |
| 17    | 6.70E-08         |
| 18    | 0.00E00          |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cs

| Index | Release Fraction |
|-------|------------------|
| 0     | 2.40E-08         |
| 1     | 4.10E-09         |
| 2     | 5.40E-09         |
| 3     | 3.60E-05         |
| 4     | 1.30E-08         |
| 5     | 1.50E-08         |
| 6     | 2.70E-05         |
| 7     | 2.40E-08         |
| 8     | 2.70E-08         |
| 9     | 5.90E-06         |
| 10    | 2.40E-08         |
| 11    | 2.70E-08         |
| 12    | 5.90E-06         |
| 13    | 9.60E-05         |
| 14    | 5.50E-05         |
| 15    | 5.90E-06         |
| 16    | 5.90E-06         |
| 17    | 1.70E-05         |
| 18    | 0.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Ru

| Index | Release Fraction |
|-------|------------------|
| 0     | 6.00E-07         |
| 1     | 1.00E-07         |
| 2     | 1.30E-07         |
| 3     | 3.80E-06         |
| 4     | 3.20E-07         |
| 5     | 3.70E-07         |
| 6     | 2.10E-06         |
| 7     | 6.10E-07         |
| 8     | 6.70E-07         |
| 9     | 6.80E-07         |
| 10    | 6.10E-07         |
| 11    | 6.70E-07         |
| 12    | 6.80E-07         |
| 13    | 8.40E-05         |
| 14    | 5.00E-05         |
| 15    | 6.40E-06         |
| 16    | 6.40E-06         |
| 17    | 6.70E-08         |
| 18    | 0.00E00          |

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Gas

| Index | Release Fraction |
|-------|------------------|
| 0     | 8.00E-01         |
| 1     | 1.40E-01         |
| 2     | 1.80E-01         |
| 3     | 8.40E-01         |
| 4     | 4.30E-01         |
| 5     | 4.90E-01         |
| 6     | 8.50E-01         |
| 7     | 8.20E-01         |
| 8     | 8.90E-01         |
| 9     | 9.10E-01         |
| 10    | 8.20E-01         |
| 11    | 8.90E-01         |
| 12    | 9.10E-01         |
| 13    | 8.40E-01         |
| 14    | 8.50E-01         |
| 15    | 9.10E-01         |
| 16    | 9.10E-01         |
| 17    | 8.40E-01         |
| 18    | 0.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Release Fraction |
|-------|------------------|
| 0     | 2.00E-03         |
| 1     | 1.40E-03         |
| 2     | 1.80E-03         |
| 3     | 3.20E-03         |
| 4     | 1.80E-03         |
| 5     | 2.10E-03         |
| 6     | 3.10E-03         |
| 7     | 2.00E-02         |
| 8     | 2.20E-03         |
| 9     | 2.50E-03         |
| 10    | 2.00E-03         |
| 11    | 2.20E-03         |
| 12    | 2.50E-03         |
| 13    | 6.40E-03         |
| 14    | 5.90E-03         |
| 15    | 3.30E-03         |
| 16    | 3.30E-03         |
| 17    | 2.50E-03         |
| 18    | 0.00E00          |

# **PSEG Site ESP Application Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Part

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cs

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |



**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

...

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Ru

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

...

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Gas

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Part

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

**PSEG Site  
ESP Application  
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Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cs

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Ru

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Gas

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

# **PSEG Site ESP Application Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

☒ Use the default population densities  
☐ Specify your own population densities

people/km<sup>2</sup>

Add Isopleth P Remove Isopleth P

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

☐ Pasquill ☒ Average ☐ User-Defined

| Isopleth Area Size (m <sup>2</sup> ) | Time Integrated Concentration | Center-Line Distance (m) |
|--------------------------------------|-------------------------------|--------------------------|
| 4.59E02                              | 3.42E-03                      | 3.30E01                  |
| 1.53E03                              | 1.72E-03                      | 6.80E01                  |
| 3.94E03                              | 8.58E-04                      | 1.05E02                  |
| 1.25E04                              | 3.42E-04                      | 2.44E02                  |
| 3.04E04                              | 1.72E-04                      | 3.69E02                  |
| 6.85E04                              | 8.58E-05                      | 5.61E02                  |
| 1.76E05                              | 3.42E-05                      | 1.02E03                  |
| 4.45E05                              | 1.72E-05                      | 1.63E03                  |
| 8.59E05                              | 8.58E-06                      | 2.31E03                  |
| 2.55E06                              | 3.42E-06                      | 4.27E03                  |
| 4.45E06                              | 1.72E-06                      | 5.47E03                  |
| 1.03E07                              | 8.58E-07                      | 1.11E04                  |
| 2.16E07                              | 3.42E-07                      | 1.31E04                  |
| 5.52E07                              | 1.72E-07                      | 2.13E04                  |
| 1.77E08                              | 8.58E-08                      | 4.05E04                  |
| 4.89E08                              | 5.42E-08                      | 7.00E04                  |
| 8.12E08                              | 4.30E-08                      | 8.99E04                  |
| 1.35E09                              | 3.42E-08                      | 1.21E05                  |

Add Average Area Remove Average Area

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries & Fatalities

File Edit



Title Package Radionuclides Vehicle Link Stop Handling Accident **Parameters**

| Parameter                                                                      | Value    |
|--------------------------------------------------------------------------------|----------|
| Shielding factor for rural residents                                           | 1.00E00  |
| Shielding factor for suburban residents                                        | 8.70E-01 |
| Shielding factor for urban residents                                           | 1.80E-02 |
| Fraction of outside air in urban buildings                                     | 5.00E-02 |
| Fraction of urban population occupying the sidewalk                            | 4.80E-01 |
| Fraction of urban population inside buildings                                  | 5.20E-01 |
| Ratio of pedestrians/km <sup>2</sup> to residential population/km <sup>2</sup> | 6.00E00  |
| Minimum small package dimension for handling (m)                               | 5.00E-01 |
| Distance from shipment for maximum exposure (m)                                | 3.00E01  |
| Vehicle speed for maximum exposure (km/hr)                                     | 2.40E01  |
| Imposed regulatory limit on vehicle external dose                              | Yes      |
| Average breathing rate (m <sup>3</sup> /sec)                                   | 3.30E-04 |
| Cleanup Level (microcuries/m <sup>2</sup> )                                    | 2.00E-01 |
| Interdiction Threshold                                                         | 4.00E01  |
| Evacuation time for groundshine (days)                                         | 1.00E00  |
| Survey interval for groundshine (days)                                         | 1.00E01  |
| Occupational latent cancer fatalities per person-rem                           | 4.00E-04 |
| Public latent cancer fatalities per person-rem                                 | 5.00E-04 |
| Genetic effects per person-rem (public)                                        | 1.00E-04 |
| Campaign (year)                                                                | 8.33E-02 |
| Iodine                                                                         | I129     |
| Rem per curie thyroid via inhalation (Rem/Ci)                                  | 5.77E06  |
| Distance of freeway vehicle carrying radioactive cargo to pede...              | 3.00E01  |
| Distance of freeway vehicle carrying radioactive cargo to right-...            | 3.00E01  |
| Distance of freeway vehicle carrying radioactive cargo to maxi...              | 8.00E02  |
| Distance of non-freeway vehicle carrying radioactive cargo to p...             | 2.70E01  |
| Distance of non-freeway vehicle carrying radioactive cargo to ri...            | 3.00E01  |
| Distance of non-freeway vehicle carrying radioactive cargo to ...              | 8.00E02  |
| Distance of city street vehicle carrying radioactive cargo to ped...           | 5.00E00  |
| Distance of city street vehicle carrying radioactive cargo to righ...          | 8.00E00  |
| Distance of city street vehicle carrying radioactive cargo to ma...            | 8.00E02  |
| Perpendicular distance to freeway vehicle going in opposite dire...            | 1.50E01  |
| Perpendicular distance to non-freeway vehicle going in opposit...              | 3.00E00  |
| Perpendicular distance to city vehicle going in opposite direction...          | 3.00E00  |
| Perpendicular distance to all vehicles going in same direction (m)             | 4.00E00  |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

**5 RADTRAN FATALITIES CASE OUTPUT**

RUN DATE: [ 29-JUL-09 AT 20:38:42 ]

PAGE 1

|                 |     |               |       |      |     |   |   |       |   |
|-----------------|-----|---------------|-------|------|-----|---|---|-------|---|
| RRRR            | AAA | DDDD          | TTTTT | RRRR | AAA | N | N | 55555 | 6 |
| R R A A D D     | T   | R R A A NN    | N     | 5    | 6   |   |   |       |   |
| R R A A D D     | T   | R R A A N N N | 5     | 6    |     |   |   |       |   |
| RRRR A A D D    | T   | RRRR A A N NN | 5555  | 6666 |     |   |   |       |   |
| R R A A A A A   | D D | T R R A A A A | N N   | 5    | 6   | 6 |   |       |   |
| R R A A D D     | T   | R R A A N N   | 5 5   | 6    | 6   |   |   |       |   |
| R R A A D D D D | T   | R R A A N N   | 5555  | *    | 666 |   |   |       |   |

RADTRAN 5.6 February 20, 2006

INPUT ECHO

-----

TITLE Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Fatalities

INPUT STANDARD

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| STD: 0 10 18                                                                 | && DIMEN=NSEV NRAD NAREAS               |
| STD: 1 3 3 0                                                                 | && PARM=IRNKC IANA ISEN IPSQSB          |
| STD: .TRUE. .FALSE.                                                          | && FORM = UNIT, SI-UNITS?               |
| STD: 2.3E12                                                                  | && NEVAL FOR CF252                      |
| STD: 9.25E5 5.77E6 1.27E6                                                    | && RPCTHY FOR I125, I129, I131          |
| STD: 0.0 0.0 0.0 0.0 0.0                                                     | && TRANSFER GAMMA                       |
| STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0                                     | && TRANSFER NEUTRON                     |
| STD: 30 24                                                                   | && MITDDIST MITDVEL                     |
| STD: 1 2 .0018                                                               | && ITRAIN FMINCL DDRWEF                 |
| STD: 33 68 105 244 369                                                       | && CENTER LINE                          |
| STD: 561 1018 1628 2308 4269                                                 | && DISTANCES                            |
| STD: 5468 11136 13097 21334 40502                                            | && FOR AVERAGE                          |
| STD: 69986 89860 120878 0 0 0 0 0 0 0 0 0 0                                  | && US CLOUD                             |
| STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05 |                                         |
| STD: 8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08 |                                         |
| STD: 8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0                                   | && AREADA                               |
| STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05 |                                         |
| STD: 8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08 |                                         |
| STD: 4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0                                   | && DFLEV                                |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  | && RADIST                               |
| STD: 0.5                                                                     | && SMLPKG                               |
| STD: 1.0 0.87 0.018                                                          | && SHIELDING FACTORS RR RS RU           |
| STD: 30 30 800                                                               | && OFFLINK {FREEWAY}                    |
| STD: 27 30 800                                                               | && OFFLINK {NON-FREEWAY}                |
| STD: 5 8 800                                                                 | && OFFLINK {CITY STREETS}               |
| STD: 30 30 800                                                               | && OFFLINK {RAILWAY}                    |
| STD: 200 200 1000                                                            | && OFFLINK {WATERWAY}                   |
| STD: 15 3 3 3 4                                                              | && ONLINK {FWAY NONFWY STREET RAIL ADJ} |
| STD: 6.0 4 40.0                                                              | && RPD FNOATT INTERDICT                 |
| STD: 0.05 0.2 3.3E-4                                                         | && BDF CULVL BRATE                      |
| STD: 0.9 0.1                                                                 | && UBF USWF                             |
| STD: 1.0 10.0 1.0                                                            | && EVACUATION SURVEY CAMPAIGN           |

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```
STD: 0.0 0.0 1.5E-8 5.3E-8 && HIGHWAY - RURAL - NONRAD
STD: 0.0 0.0 3.7E-9 1.3E-8 && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0 0.0 2.1E-9 7.5E-9 && HIGHWAY - URBAN - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - R - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - S - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - U - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - R - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - S - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0 && PSPROB
STD: 0.67 0.67 0.42 && TIMENDE NON-DISPERSAL EVAC TIME
(LCF&EARLY)
STD: 2 2 1 && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.0E-4 && LCFCON(1), LCFCON(2), GECON
STD: R5INGEST.BIN && INGESTION FILE
OUTPUT BQ_SV
FORM UNIT
DIMEN 19 10 18
PARM 1 3 1 0
SEVERITY
  NPOP=1
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=2
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=3
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
RELEASE
  GROUP=Part
    RFRAC
      6.0E-7
    1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7
    2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7
    6.7E-7 6.8E-7 1.8E-5 9.0E-6 6.8E-7
    6.8E-7 6.7E-8 0.0
    AERSOL
      1.0
```



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```
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  RESP
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  LOS
    0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
  DEPVEL 0.01
  GROUP=Cs
  RFRAC
    2.4E-8
4.1E-9 5.4E-9 3.6E-5 1.3E-8 1.5E-8
2.7E-5 2.4E-8 2.7E-8 5.9E-6 2.4E-8
2.7E-8 5.9E-6 9.6E-5 5.5E-5 5.9E-6
5.9E-6 1.7E-5 0.0
  AERSOL
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  RESP
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  LOS
    0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
  DEPVEL 0.01
  GROUP=Ru
  RFRAC
    6.0E-7
1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7
2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7
6.7E-7 6.8E-7 8.4E-5 5.0E-5 6.4E-6
6.4E-6 6.7E-8 0.0
  AERSOL
    1.0
1.0 1.0 1.0 1.0 1.0
```

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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Gas

RFRAC

0.8

0.14 0.18 0.84 0.43 0.49  
0.85 0.82 0.89 0.91 0.82  
0.89 0.91 0.84 0.85 0.91  
0.91 0.84 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.0

GROUP=Cor

RFRAC

0.0020

0.0014 0.0018 0.0032 0.0018 0.0021  
0.0031 0.02 0.0022 0.0025 0.0020  
0.0022 0.0025 0.0064 0.0059 0.0033  
0.0033 0.0025 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0

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```
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  RESP
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  LOS
    0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
  DEPVEL 0.01
PACKAGE PACKAGE_1 13.9 1.0 0.0 5.2
  AM241 1810.0 Part
  AM242M 20.4 Part
  CM245 0.0 Part
  CM244 12500.0 Part
  CM243 57.6 Part
  CM242 60.8 Part
  CE144 13900.0 Part
  AM243 74.5 Part
  EU154 10300.0 Part
  EU155 2740.0 Part
  PM147 51700.0 Part
  PU238 9510.0 Part
  PU239 408.0 Part
  PU240 697.0 Part
  PU241 168000.0 Part
  PU242 0.0 Part
  SB125 3390.0 Part
  SR90 120000.0 Part
  Y90 120000.0 Part
  NP239 74.5 Part
  TC99 23.3 Part
  CD113M 49.8 Part
  TE125M 830.0 Part
  SM151 647.0 Part
  CS134 64100.0 Cs
  CS137 176000.0 Cs
  I129 0.0 Cs
  RU106 24600.0 Ru
  KR85 10900.0 Gas
  H3GAS 649.0 Gas
  CO60 85.8 Cor
END
VEHICLE -1 VEHICLE_1 1.39E01 1.0 0.0 5.2 1.0 2.0 4.0 1.0 1.0
  PACKAGE_1 1.0
FLAGS
  IACC 2
  IUOPT 2
```

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```
REGCHECK 1
MODSTD
  DISTOFF FREEWAY 3.00E01 3.00E01 8.00E02
  DISTOFF SECONDARY 2.70E01 3.00E01 8.00E02
  DISTOFF STREET 5.00E00 8.00E00 8.00E02
  DISTON
    FREEWAY 1.50E01
    SECONDARY 3.00E00
    STREET 3.00E00
    ADJACENT 4.00E00
  BDF 5.00E-02
  BRATE 3.30E-04
  CULVL 2.00E-01
  EVACUATION 1.00E00
  GECON 1.00E-04
  INTERDICT 4.00E01
  LCFCON 5.00E-04 4.00E-04
  SURVEY 1.00E01
  UBF 5.20E-01
  USWF 4.80E-01
  CAMPAIGN 8.33E-02
  MITDDIST 3.00E01
  MITDVEL 2.40E01
  RPD 6.00E00
  RR 1.00E00
  RU 1.80E-02
  RS 8.70E-01
  SMALLPKG 5.00E-01
  RPCTHYROID
    I129 5.77E06
EOF
LINK RURAL_AZ VEHICLE_1 46.8 88.9 1.5 3.2 530.0 1.32E-7 0.0712 R 1 1.0
LINK SUBURBN_AZ VEHICLE_1 0.3 88.9 1.5 135.8 760.0 1.32E-7 0.0712 S 1 1.0
LINK URBAN_AZ VEHICLE_1 0.0 88.9 1.5 0.0 2400.0 1.32E-7 0.0712 U 1 1.0
LINK RURAL_DE VEHICLE_1 7.6 88.9 1.5 7.3 530.0 5.18E-7 0.0108 R 1 1.0
LINK SUBURBN_DE VEHICLE_1 13.9 88.9 1.5 492.2 760.0 5.18E-7 0.0108 S 1 1.0
LINK URBAN_DE VEHICLE_1 5.3 88.9 1.5 2496.1 2400.0 5.18E-7 0.0108 U 1 1.0
LINK RURAL_IL VEHICLE_1 178.4 88.9 1.5 14.4 530.0 2.22E-7 0.0374 R 1 1.0
LINK SUBURBN_IL VEHICLE_1 73.0 88.9 1.5 323.6 760.0 2.22E-7 0.0374 S 1 1.0
LINK URBAN_IL VEHICLE_1 10.2 88.9 1.5 2379.1 2400.0 2.22E-7 0.0374 U 1 1.0
LINK RURAL_IN VEHICLE_1 136.7 88.9 1.5 19.9 530.0 2.25E-7 0.0298 R 1 1.0
LINK SUBURBN_IN VEHICLE_1 97.3 88.9 1.5 276.3 760.0 2.25E-7 0.0298 S 1 1.0
LINK URBAN_IN VEHICLE_1 9.4 88.9 1.5 2354.7 2400.0 2.25E-7 0.0298 U 1 1.0
LINK RURAL_IA VEHICLE_1 393.8 88.9 1.5 15.7 530.0 1.12E-7 0.0839 R 1 1.0
LINK SUBURBN_IA VEHICLE_1 95.4 88.9 1.5 268.0 760.0 1.12E-7 0.0839 S 1 1.0
LINK URBAN_IA VEHICLE_1 5.1 88.9 1.5 2185.2 2400.0 1.12E-7 0.0839 U 1 1.0
LINK RURAL_NE VEHICLE_1 652.2 88.9 1.5 10.0 530.0 3.19E-7 0.0429 R 1 1.0
LINK SUBURBN_NE VEHICLE_1 75.6 88.9 1.5 268.5 760.0 3.19E-7 0.0429 S 1 1.0
LINK URBAN_NE VEHICLE_1 7.0 88.9 1.5 2401.8 2400.0 3.19E-7 0.0429 U 1 1.0
LINK RURAL_NV VEHICLE_1 252.6 88.9 1.5 4.8 530.0 2.25E-7 0.0293 R 1 1.0
LINK SUBURBN_NV VEHICLE_1 15.5 88.9 1.5 267.6 760.0 2.25E-7 0.0293 S 1 1.0
LINK URBAN_NV VEHICLE_1 1.5 88.9 1.5 2318.5 2400.0 2.25E-7 0.0293 U 1 1.0
LINK RURAL_NJ VEHICLE_1 20.6 88.9 1.5 11.8 530.0 5.65E-7 0.0214 R 1 1.0
```

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LINK SUBURBN\_NJ VEHICLE\_1 12.5 88.9 1.5 353.9 760.0 5.65E-7 0.0214 S 1 1.0  
LINK URBAN\_NJ VEHICLE\_1 1.1 88.9 1.5 2025.9 2400.0 5.65E-7 0.0214 U 1 1.0  
LINK RURAL\_OH VEHICLE\_1 213.1 88.9 1.5 19.7 530.0 1.64E-7 0.0238 R 1 1.0  
LINK SUBURBN\_OH VEHICLE\_1 151.3 88.9 1.5 309.6 760.0 1.64E-7 0.0238 S 1 1.0  
LINK URBAN\_OH VEHICLE\_1 14.8 88.9 1.5 2211.7 2400.0 1.64E-7 0.0238 U 1 1.0  
LINK RURAL\_PA VEHICLE\_1 448.0 88.9 1.5 17.7 530.0 5.14E-7 0.0263 R 1 1.0  
LINK SUBURBN\_PA VEHICLE\_1 258.1 88.9 1.5 299.3 760.0 5.14E-7 0.0263 S 1 1.0  
LINK URBAN\_PA VEHICLE\_1 22.2 88.9 1.5 2413.1 2400.0 5.14E-7 0.0263 U 1 1.0  
LINK RURAL\_UT VEHICLE\_1 471.6 88.9 1.5 9.9 530.0 2.9E-7 0.041 R 1 1.0  
LINK SUBURBN\_UT VEHICLE\_1 106.5 88.9 1.5 362.6 760.0 2.9E-7 0.041 S 1 1.0  
LINK URBAN\_UT VEHICLE\_1 32.2 88.9 1.5 2472.3 2400.0 2.9E-7 0.041 U 1 1.0  
LINK RURAL\_WY VEHICLE\_1 607.2 88.9 1.5 4.9 530.0 6.74E-7 0.016 R 1 1.0  
LINK SUBURBN\_WY VEHICLE\_1 33.9 88.9 1.5 399.4 760.0 6.74E-7 0.016 S 1 1.0  
LINK URBAN\_WY VEHICLE\_1 3.4 88.9 1.5 1966.6 2400.0 6.74E-7 0.016 U 1 1.0

STOP STOP\_1 VEHICLE\_1 30000.0 1.0 10.0 1.0 6.0  
STOP STOP\_2 VEHICLE\_1 340.0 10.0 800.0 0.2 6.0

HANDLING HANDLE\_1 VEHICLE\_1 5.0 1.0 0.5

EOF

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NON-RADIOLOGICAL DATA (ACCIDENTS and FATALITIES)  
\*\*\*\*\*

|            | ACCIDENT RATE | ACCIDENTS | FATALITIES |
|------------|---------------|-----------|------------|
| RURAL_AZ   | 1.32E-07      | 6.18E-06  | 4.40E-07   |
| SUBURBN_AZ | 1.32E-07      | 3.96E-08  | 2.82E-09   |
| URBAN_AZ   | 1.32E-07      | 0.00E+00  | 0.00E+00   |
| RURAL_DE   | 5.18E-07      | 3.94E-06  | 4.25E-08   |
| SUBURBN_DE | 5.18E-07      | 7.20E-06  | 7.78E-08   |
| URBAN_DE   | 5.18E-07      | 2.75E-06  | 2.97E-08   |
| RURAL_IL   | 2.22E-07      | 3.96E-05  | 1.48E-06   |
| SUBURBN_IL | 2.22E-07      | 1.62E-05  | 6.06E-07   |
| URBAN_IL   | 2.22E-07      | 2.26E-06  | 8.47E-08   |
| RURAL_IN   | 2.25E-07      | 3.08E-05  | 9.17E-07   |
| SUBURBN_IN | 2.25E-07      | 2.19E-05  | 6.52E-07   |
| URBAN_IN   | 2.25E-07      | 2.12E-06  | 6.30E-08   |
| RURAL_IA   | 1.12E-07      | 4.41E-05  | 3.70E-06   |
| SUBURBN_IA | 1.12E-07      | 1.07E-05  | 8.96E-07   |
| URBAN_IA   | 1.12E-07      | 5.71E-07  | 4.79E-08   |
| RURAL_NE   | 3.19E-07      | 2.08E-04  | 8.93E-06   |
| SUBURBN_NE | 3.19E-07      | 2.41E-05  | 1.03E-06   |
| URBAN_NE   | 3.19E-07      | 2.23E-06  | 9.58E-08   |
| RURAL_NV   | 2.25E-07      | 5.68E-05  | 1.67E-06   |
| SUBURBN_NV | 2.25E-07      | 3.49E-06  | 1.02E-07   |
| URBAN_NV   | 2.25E-07      | 3.38E-07  | 9.89E-09   |
| RURAL_NJ   | 5.65E-07      | 1.16E-05  | 2.49E-07   |
| SUBURBN_NJ | 5.65E-07      | 7.06E-06  | 1.51E-07   |
| URBAN_NJ   | 5.65E-07      | 6.22E-07  | 1.33E-08   |
| RURAL_OH   | 1.64E-07      | 3.49E-05  | 8.32E-07   |
| SUBURBN_OH | 1.64E-07      | 2.48E-05  | 5.91E-07   |
| URBAN_OH   | 1.64E-07      | 2.43E-06  | 5.78E-08   |
| RURAL_PA   | 5.14E-07      | 2.30E-04  | 6.06E-06   |
| SUBURBN_PA | 5.14E-07      | 1.33E-04  | 3.49E-06   |
| URBAN_PA   | 5.14E-07      | 1.14E-05  | 3.00E-07   |
| RURAL_UT   | 2.90E-07      | 1.37E-04  | 5.61E-06   |
| SUBURBN_UT | 2.90E-07      | 3.09E-05  | 1.27E-06   |
| URBAN_UT   | 2.90E-07      | 9.34E-06  | 3.83E-07   |
| RURAL_WY   | 6.74E-07      | 4.09E-04  | 6.55E-06   |
| SUBURBN_WY | 6.74E-07      | 2.28E-05  | 3.66E-07   |
| URBAN_WY   | 6.74E-07      | 2.29E-06  | 3.67E-08   |
| TOTALS:    | 1.19E-05      | 1.55E-03  | 4.68E-05   |

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REGULATORY CHECKS

FOR VEHICLE\_1 THE DOSE RATE AT 2 METERS COULD EXCEED 0.1 MSV/HR  
THE VEHICLE DOSE RATE HAS BEEN RESET TO EQUAL 0.13 MSV/HR

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CALCULATIONAL INFORMATION

FOR VEHICLE\_1 AREAS WITH TOTAL CONTAMINATION RATIO GREATER THAN 40.000  
(THE AREAS MARKED WITH AN 'X' ARE INTERDICTED AND HAVE  
NO 50 YEAR GROUNDSHINE DOSE AND NO INGESTION DOSE.)

| AREA/SEVERITY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| 1             | X | - | - | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 2             | X | - | - | X | - | - | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 3             | - | - | - | X | - | - | X | X | - | X  | -  | -  | X  | X  | X  | X  | X  | X  | -  |
| 4             | - | - | - | X | - | - | X | - | - | -  | -  | -  | -  | X  | X  | -  | -  | X  | -  |
| 5             | - | - | - | X | - | - | X | - | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 6             | - | - | - | X | - | - | - | - | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 7             | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | X  | -  | -  | -  | -  | -  |
| 8             | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 9             | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 10            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 11            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 12            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 13            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 14            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 15            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 16            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 17            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 18            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |



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INCIDENT-FREE SUMMARY

\*\*\*\*\* \*\*\*\*\*

IN-TRANSIT POPULATION EXPOSURE IN PERSON-SV  
\*INPUT DATA WERE ALTERED WITH REGULATORY CHECKS

|            | PASSENGER | CREW     | OFF LINK | ON LINK  | TOTALS   |
|------------|-----------|----------|----------|----------|----------|
| RURAL_AZ   | 0.00E+00  | 2.07E-05 | 5.07E-08 | 3.26E-06 | 2.41E-05 |
| SUBURBN_AZ | 0.00E+00  | 1.33E-07 | 1.20E-08 | 3.00E-08 | 1.75E-07 |
| URBAN_AZ   | 0.00E+00  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RURAL_DE   | 0.00E+00  | 3.37E-06 | 1.88E-08 | 5.30E-07 | 3.92E-06 |
| SUBURBN_DE | 0.00E+00  | 6.16E-06 | 2.02E-06 | 1.39E-06 | 9.57E-06 |
| URBAN_DE   | 0.00E+00  | 2.35E-06 | 8.07E-08 | 1.67E-06 | 4.10E-06 |
| RURAL_IL   | 0.00E+00  | 7.91E-05 | 8.70E-07 | 1.24E-05 | 9.24E-05 |
| SUBURBN_IL | 0.00E+00  | 3.24E-05 | 6.96E-06 | 7.30E-06 | 4.66E-05 |
| URBAN_IL   | 0.00E+00  | 4.52E-06 | 1.48E-07 | 3.22E-06 | 7.89E-06 |
| RURAL_IN   | 0.00E+00  | 6.06E-05 | 9.22E-07 | 9.53E-06 | 7.11E-05 |
| SUBURBN_IN | 0.00E+00  | 4.31E-05 | 7.92E-06 | 9.73E-06 | 6.08E-05 |
| URBAN_IN   | 0.00E+00  | 4.17E-06 | 1.35E-07 | 2.97E-06 | 7.27E-06 |
| RURAL_IA   | 0.00E+00  | 1.75E-04 | 2.09E-06 | 2.75E-05 | 2.04E-04 |
| SUBURBN_IA | 0.00E+00  | 4.23E-05 | 7.54E-06 | 9.54E-06 | 5.94E-05 |
| URBAN_IA   | 0.00E+00  | 2.26E-06 | 6.80E-08 | 1.61E-06 | 3.94E-06 |
| RURAL_NE   | 0.00E+00  | 2.89E-04 | 2.21E-06 | 4.55E-05 | 3.37E-04 |
| SUBURBN_NE | 0.00E+00  | 3.35E-05 | 5.98E-06 | 7.56E-06 | 4.71E-05 |
| URBAN_NE   | 0.00E+00  | 3.10E-06 | 1.03E-07 | 2.21E-06 | 5.42E-06 |
| RURAL_NV   | 0.00E+00  | 1.12E-04 | 4.11E-07 | 1.76E-05 | 1.30E-04 |
| SUBURBN_NV | 0.00E+00  | 6.87E-06 | 1.22E-06 | 1.55E-06 | 9.64E-06 |
| URBAN_NV   | 0.00E+00  | 6.65E-07 | 2.12E-08 | 4.74E-07 | 1.16E-06 |
| RURAL_NJ   | 0.00E+00  | 9.13E-06 | 8.24E-08 | 1.44E-06 | 1.07E-05 |
| SUBURBN_NJ | 0.00E+00  | 5.54E-06 | 1.30E-06 | 1.25E-06 | 8.09E-06 |
| URBAN_NJ   | 0.00E+00  | 4.88E-07 | 1.36E-08 | 3.47E-07 | 8.49E-07 |
| RURAL_OH   | 0.00E+00  | 9.45E-05 | 1.42E-06 | 1.49E-05 | 1.11E-04 |
| SUBURBN_OH | 0.00E+00  | 6.71E-05 | 1.38E-05 | 1.51E-05 | 9.60E-05 |
| URBAN_OH   | 0.00E+00  | 6.56E-06 | 2.00E-07 | 4.67E-06 | 1.14E-05 |
| RURAL_PA   | 0.00E+00  | 1.99E-04 | 2.69E-06 | 3.12E-05 | 2.33E-04 |
| SUBURBN_PA | 0.00E+00  | 1.14E-04 | 2.28E-05 | 2.58E-05 | 1.63E-04 |
| URBAN_PA   | 0.00E+00  | 9.84E-06 | 3.27E-07 | 7.01E-06 | 1.72E-05 |
| RURAL_UT   | 0.00E+00  | 2.09E-04 | 1.58E-06 | 3.29E-05 | 2.44E-04 |
| SUBURBN_UT | 0.00E+00  | 4.72E-05 | 1.14E-05 | 1.07E-05 | 6.92E-05 |
| URBAN_UT   | 0.00E+00  | 1.43E-05 | 4.86E-07 | 1.02E-05 | 2.49E-05 |
| RURAL_WY   | 0.00E+00  | 2.69E-04 | 1.01E-06 | 4.23E-05 | 3.13E-04 |
| SUBURBN_WY | 0.00E+00  | 1.50E-05 | 3.99E-06 | 3.39E-06 | 2.24E-05 |
| URBAN_WY   | 0.00E+00  | 1.51E-06 | 4.08E-08 | 1.07E-06 | 2.62E-06 |
|            |           |          |          |          |          |
| RURAL      | 0.00E+00  | 1.52E-03 | 1.34E-05 | 2.39E-04 | 1.77E-03 |
| SUBURB     | 0.00E+00  | 4.14E-04 | 8.49E-05 | 9.33E-05 | 5.92E-04 |
| URBAN      | 0.00E+00  | 4.97E-05 | 1.62E-06 | 3.54E-05 | 8.68E-05 |
|            |           |          |          |          |          |
| TOTALS:    | 0.00E+00  | 1.98E-03 | 9.99E-05 | 3.68E-04 | 2.45E-03 |

**PSEG Site  
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MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

VEHICLE\_1      5.92E-09 SV

STOP EXPOSURE IN PERSON-SV

|              |        |          |
|--------------|--------|----------|
| ANNULAR AREA | STOP_1 | 3.77E-03 |
| ANNULAR AREA | STOP_2 | 1.63E-05 |
| TOTAL:       |        | 3.79E-03 |

HANDLING EXPOSURE IN PERSON-SV

| HANDLING | VEHICLE   | MATERIAL  | METHOD      | DOSE     |
|----------|-----------|-----------|-------------|----------|
| HANDLE_1 | VEHICLE_1 | PACKAGE_1 | LINE-SOURCE | 1.16E-03 |
| TOTAL:   |           |           |             | 1.16E-03 |

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ACCIDENT SUMMARY

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EXPECTED VALUES OF POPULATION RISK IN PERSON-SV

|            | GROUND   | INHALED  | RESUSPD  | CLOUDSH  | TOTAL    |
|------------|----------|----------|----------|----------|----------|
| RURAL_AZ   | 1.72E-12 | 1.51E-13 | 1.09E-15 | 2.00E-15 | 1.88E-12 |
| SUBURBN_AZ | 4.69E-13 | 4.11E-14 | 2.97E-16 | 5.45E-16 | 5.11E-13 |
| URBAN_AZ   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RURAL_DE   | 2.51E-12 | 2.20E-13 | 1.59E-15 | 2.91E-15 | 2.73E-12 |
| SUBURBN_DE | 3.09E-10 | 2.71E-11 | 1.96E-13 | 3.59E-13 | 3.37E-10 |
| URBAN_DE   | 1.74E-09 | 1.52E-10 | 1.10E-12 | 2.02E-12 | 1.89E-09 |
| RURAL_IL   | 4.97E-11 | 4.36E-12 | 3.15E-14 | 5.78E-14 | 5.42E-11 |
| SUBURBN_IL | 4.57E-10 | 4.01E-11 | 2.90E-13 | 5.32E-13 | 4.98E-10 |
| URBAN_IL   | 1.37E-09 | 1.20E-10 | 8.66E-13 | 1.59E-12 | 1.49E-09 |
| RURAL_IN   | 5.34E-11 | 4.68E-12 | 3.38E-14 | 6.21E-14 | 5.82E-11 |
| SUBURBN_IN | 5.27E-10 | 4.63E-11 | 3.34E-13 | 6.13E-13 | 5.75E-10 |
| URBAN_IN   | 1.26E-09 | 1.11E-10 | 8.00E-13 | 1.47E-12 | 1.37E-09 |
| RURAL_IA   | 6.04E-11 | 5.30E-12 | 3.83E-14 | 7.02E-14 | 6.58E-11 |
| SUBURBN_IA | 2.50E-10 | 2.19E-11 | 1.58E-13 | 2.90E-13 | 2.72E-10 |
| URBAN_IA   | 3.16E-10 | 2.77E-11 | 2.01E-13 | 3.68E-13 | 3.45E-10 |
| RURAL_NE   | 1.81E-10 | 1.59E-11 | 1.15E-13 | 2.11E-13 | 1.98E-10 |
| SUBURBN_NE | 5.65E-10 | 4.95E-11 | 3.58E-13 | 6.57E-13 | 6.15E-10 |
| URBAN_NE   | 1.36E-09 | 1.19E-10 | 8.62E-13 | 1.58E-12 | 1.48E-09 |
| RURAL_NV   | 2.38E-11 | 2.09E-12 | 1.51E-14 | 2.77E-14 | 2.59E-11 |
| SUBURBN_NV | 8.14E-11 | 7.14E-12 | 5.16E-14 | 9.46E-14 | 8.87E-11 |
| URBAN_NV   | 1.98E-10 | 1.74E-11 | 1.26E-13 | 2.31E-13 | 2.16E-10 |
| RURAL_NJ   | 1.20E-11 | 1.05E-12 | 7.59E-15 | 1.39E-14 | 1.30E-11 |
| SUBURBN_NJ | 2.18E-10 | 1.91E-11 | 1.38E-13 | 2.53E-13 | 2.37E-10 |
| URBAN_NJ   | 3.19E-10 | 2.80E-11 | 2.02E-13 | 3.71E-13 | 3.48E-10 |
| RURAL_OH   | 6.00E-11 | 5.26E-12 | 3.81E-14 | 6.98E-14 | 6.54E-11 |
| SUBURBN_OH | 6.70E-10 | 5.87E-11 | 4.25E-13 | 7.79E-13 | 7.30E-10 |
| URBAN_OH   | 1.36E-09 | 1.19E-10 | 8.63E-13 | 1.58E-12 | 1.48E-09 |
| RURAL_PA   | 3.55E-10 | 3.12E-11 | 2.25E-13 | 4.13E-13 | 3.87E-10 |
| SUBURBN_PA | 3.46E-09 | 3.04E-10 | 2.20E-12 | 4.03E-12 | 3.77E-09 |
| URBAN_PA   | 6.98E-09 | 6.12E-10 | 4.42E-12 | 8.11E-12 | 7.60E-09 |
| RURAL_UT   | 1.18E-10 | 1.04E-11 | 7.49E-14 | 1.37E-13 | 1.29E-10 |
| SUBURBN_UT | 9.77E-10 | 8.56E-11 | 6.19E-13 | 1.14E-12 | 1.06E-09 |
| URBAN_UT   | 5.85E-09 | 5.13E-10 | 3.71E-12 | 6.80E-12 | 6.37E-09 |
| RURAL_WY   | 1.75E-10 | 1.53E-11 | 1.11E-13 | 2.03E-13 | 1.91E-10 |
| SUBURBN_WY | 7.96E-10 | 6.98E-11 | 5.05E-13 | 9.25E-13 | 8.67E-10 |
| URBAN_WY   | 1.14E-09 | 1.00E-10 | 7.24E-13 | 1.33E-12 | 1.24E-09 |
|            |          |          |          |          |          |
| RURAL      | 1.09E-09 | 9.59E-11 | 6.93E-13 | 1.27E-12 | 1.19E-09 |
| SUBURB     | 8.31E-09 | 7.29E-10 | 5.27E-12 | 9.67E-12 | 9.06E-09 |
| URBAN      | 2.19E-08 | 1.92E-09 | 1.39E-11 | 2.55E-11 | 2.38E-08 |
|            |          |          |          |          |          |
| TOTALS:    | 3.13E-08 | 2.74E-09 | 1.98E-11 | 3.64E-11 | 3.41E-08 |

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SOCIETAL INGESTION RISK - PERSON-SV

| LINK     | GONADS   | EFFECTIVE |
|----------|----------|-----------|
| RURAL_AZ | 1.33E-11 | 1.35E-11  |
| RURAL_DE | 8.47E-12 | 8.63E-12  |
| RURAL_IL | 8.53E-11 | 8.68E-11  |
| RURAL_IN | 6.62E-11 | 6.74E-11  |
| RURAL_IA | 9.49E-11 | 9.67E-11  |
| RURAL_NE | 4.48E-10 | 4.56E-10  |
| RURAL_NV | 1.22E-10 | 1.25E-10  |
| RURAL_NJ | 2.51E-11 | 2.55E-11  |
| RURAL_OH | 7.52E-11 | 7.66E-11  |
| RURAL_PA | 4.96E-10 | 5.05E-10  |
| RURAL_UT | 2.94E-10 | 3.00E-10  |
| RURAL_WY | 8.81E-10 | 8.97E-10  |
| TOTAL    | 2.61E-09 | 2.66E-09  |

SOCIETAL INGESTION RISK BY ORGAN - PERSON-SV

| LINK     | BREAST   | LUNGS    | RED MARR | BONE SUR | THYROID  | REMAINDER |
|----------|----------|----------|----------|----------|----------|-----------|
| RURAL_AZ | 1.13E-11 | 1.15E-11 | 1.45E-11 | 2.46E-11 | 1.14E-11 | 1.45E-11  |
| RURAL_DE | 7.19E-12 | 7.34E-12 | 9.25E-12 | 1.57E-11 | 7.29E-12 | 9.24E-12  |
| RURAL_IL | 7.23E-11 | 7.38E-11 | 9.30E-11 | 1.58E-10 | 7.33E-11 | 9.29E-11  |
| RURAL_IN | 5.61E-11 | 5.73E-11 | 7.23E-11 | 1.22E-10 | 5.70E-11 | 7.22E-11  |
| RURAL_IA | 8.05E-11 | 8.22E-11 | 1.04E-10 | 1.75E-10 | 8.17E-11 | 1.04E-10  |
| RURAL_NE | 3.80E-10 | 3.88E-10 | 4.89E-10 | 8.28E-10 | 3.85E-10 | 4.88E-10  |
| RURAL_NV | 1.04E-10 | 1.06E-10 | 1.34E-10 | 2.26E-10 | 1.05E-10 | 1.33E-10  |
| RURAL_NJ | 2.12E-11 | 2.17E-11 | 2.73E-11 | 4.63E-11 | 2.16E-11 | 2.73E-11  |
| RURAL_OH | 6.38E-11 | 6.51E-11 | 8.21E-11 | 1.39E-10 | 6.47E-11 | 8.20E-11  |
| RURAL_PA | 4.20E-10 | 4.29E-10 | 5.41E-10 | 9.16E-10 | 4.26E-10 | 5.40E-10  |
| RURAL_UT | 2.50E-10 | 2.55E-10 | 3.21E-10 | 5.44E-10 | 2.53E-10 | 3.21E-10  |
| RURAL_WY | 7.47E-10 | 7.63E-10 | 9.61E-10 | 1.63E-09 | 7.58E-10 | 9.60E-10  |
| TOTAL    | 2.21E-09 | 2.26E-09 | 2.85E-09 | 4.82E-09 | 2.24E-09 | 2.85E-09  |

**PSEG Site  
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Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Fatalities

EXPECTED RISK VALUES - OTHER

| LINK       | EARLY<br>FATALITY | EARLY<br>MORBIDITY |
|------------|-------------------|--------------------|
| RURAL_AZ   | 0.00E+00          | 0.00E+00           |
| SUBURBN_AZ | 0.00E+00          | 0.00E+00           |
| URBAN_AZ   | 0.00E+00          | 0.00E+00           |
| RURAL_DE   | 0.00E+00          | 0.00E+00           |
| SUBURBN_DE | 0.00E+00          | 0.00E+00           |
| URBAN_DE   | 0.00E+00          | 0.00E+00           |
| RURAL_IL   | 0.00E+00          | 0.00E+00           |
| SUBURBN_IL | 0.00E+00          | 0.00E+00           |
| URBAN_IL   | 0.00E+00          | 0.00E+00           |
| RURAL_IN   | 0.00E+00          | 0.00E+00           |
| SUBURBN_IN | 0.00E+00          | 0.00E+00           |
| URBAN_IN   | 0.00E+00          | 0.00E+00           |
| RURAL_IA   | 0.00E+00          | 0.00E+00           |
| SUBURBN_IA | 0.00E+00          | 0.00E+00           |
| URBAN_IA   | 0.00E+00          | 0.00E+00           |
| RURAL_NE   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NE | 0.00E+00          | 0.00E+00           |
| URBAN_NE   | 0.00E+00          | 0.00E+00           |
| RURAL_NV   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NV | 0.00E+00          | 0.00E+00           |
| URBAN_NV   | 0.00E+00          | 0.00E+00           |
| RURAL_NJ   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NJ | 0.00E+00          | 0.00E+00           |
| URBAN_NJ   | 0.00E+00          | 0.00E+00           |
| RURAL_OH   | 0.00E+00          | 0.00E+00           |
| SUBURBN_OH | 0.00E+00          | 0.00E+00           |
| URBAN_OH   | 0.00E+00          | 0.00E+00           |
| RURAL_PA   | 0.00E+00          | 0.00E+00           |
| SUBURBN_PA | 0.00E+00          | 0.00E+00           |
| URBAN_PA   | 0.00E+00          | 0.00E+00           |
| RURAL_UT   | 0.00E+00          | 0.00E+00           |
| SUBURBN_UT | 0.00E+00          | 0.00E+00           |
| URBAN_UT   | 0.00E+00          | 0.00E+00           |
| RURAL_WY   | 0.00E+00          | 0.00E+00           |
| SUBURBN_WY | 0.00E+00          | 0.00E+00           |
| URBAN_WY   | 0.00E+00          | 0.00E+00           |
| TOTAL      | 0.00E+00          | 0.00E+00           |

EOI  
END OF RUN  
SUCCESSFUL COMPLETION

**PSEG Site  
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**6 RADTRAN INJURIES CASE OUTPUT**

RUN DATE: [ 29-JUL-09 AT 19:33:49 ]

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|                 |     |               |       |      |     |   |   |       |   |
|-----------------|-----|---------------|-------|------|-----|---|---|-------|---|
| RRRR            | AAA | DDDD          | TTTTT | RRRR | AAA | N | N | 55555 | 6 |
| R R A A D D     | T   | R R A A NN    | N     | 5    | 6   |   |   |       |   |
| R R A A D D     | T   | R R A A N N N | 5     | 6    |     |   |   |       |   |
| RRRR A A D D    | T   | RRRR A A N NN | 5555  | 6666 |     |   |   |       |   |
| R R A A A A A   | D D | T R R A A A A | N N   | 5    | 6   | 6 |   |       |   |
| R R A A D D     | T   | R R A A N N   | 5 5   | 6    | 6   |   |   |       |   |
| R R A A D D D D | T   | R R A A N N   | 5555  | *    | 666 |   |   |       |   |

RADTRAN 5.6 February 20, 2006

INPUT ECHO

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TITLE Calc. 2009-06944:Irradiated Fuel to Yucca Mt.: Injuries

INPUT STANDARD

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| STD: 0 10 18                                                                 | && DIMEN=NSEV NRAD NAREAS               |
| STD: 1 3 3 0                                                                 | && PARM=IRNKC IANA ISEN IPSQSB          |
| STD: .TRUE. .FALSE.                                                          | && FORM = UNIT, SI-UNITS?               |
| STD: 2.3E12                                                                  | && NEVAL FOR CF252                      |
| STD: 9.25E5 5.77E6 1.27E6                                                    | && RPCTHY FOR I125, I129, I131          |
| STD: 0.0 0.0 0.0 0.0 0.0                                                     | && TRANSFER GAMMA                       |
| STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0                                     | && TRANSFER NEUTRON                     |
| STD: 30 24                                                                   | && MITDDIST MITDVEL                     |
| STD: 1 2 .0018                                                               | && ITRAIN FMINCL DDRWEF                 |
| STD: 33 68 105 244 369                                                       | && CENTER LINE                          |
| STD: 561 1018 1628 2308 4269                                                 | && DISTANCES                            |
| STD: 5468 11136 13097 21334 40502                                            | && FOR AVERAGE                          |
| STD: 69986 89860 120878 0 0 0 0 0 0 0 0 0 0 0 0                              | && US CLOUD                             |
| STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05 |                                         |
| STD: 8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08 |                                         |
| STD: 8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0                                   | && AREADA                               |
| STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05 |                                         |
| STD: 8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08 |                                         |
| STD: 4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0                                   | && DFLEV                                |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0                                    |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0                                    |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0                                    | && RADIST                               |
| STD: 0.5                                                                     | && SMLPKG                               |
| STD: 1.0 0.87 0.018                                                          | && SHIELDING FACTORS RR RS RU           |
| STD: 30 30 800                                                               | && OFFLINK {FREEWAY}                    |
| STD: 27 30 800                                                               | && OFFLINK {NON-FREEWAY}                |
| STD: 5 8 800                                                                 | && OFFLINK {CITY STREETS}               |
| STD: 30 30 800                                                               | && OFFLINK {RAILWAY}                    |
| STD: 200 200 1000                                                            | && OFFLINK {WATERWAY}                   |
| STD: 15 3 3 3 4                                                              | && ONLINK {FWAY NONFWY STREET RAIL ADJ} |
| STD: 6.0 4 40.0                                                              | && RPD FNOATT INTERDICT                 |
| STD: 0.05 0.2 3.3E-4                                                         | && BDF CULVL BRATE                      |
| STD: 0.9 0.1                                                                 | && UBF USWF                             |
| STD: 1.0 10.0 1.0                                                            | && EVACUATION SURVEY CAMPAIGN           |

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```

STD: 0.0 0.0 1.5E-8 5.3E-8 && HIGHWAY - RURAL - NONRAD
STD: 0.0 0.0 3.7E-9 1.3E-8 && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0 0.0 2.1E-9 7.5E-9 && HIGHWAY - URBAN - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - R - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - S - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - U - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - R - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - S - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0 && PSPROB
STD: 0.67 0.67 0.42 && TIMENDE NON-DISPERSAL EVAC TIME
(LCF&EARLY)
STD: 2 2 1 && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.0E-4 && LCFCON(1), LCFCON(2), GECON
STD: R5INGEST.BIN && INGESTION FILE
OUTPUT BQ_SV
FORM UNIT
DIMEN 19 10 18
PARAM 1 3 1 0
SEVERITY
  NPOP=1
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=2
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=3
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
RELEASE
  GROUP=Part
  RFRAC
    6.0E-7
  1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7
  2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7
  6.7E-7 6.8E-7 1.8E-5 9.0E-6 6.8E-7
  6.8E-7 6.7E-8 0.0
  AERSOL
    1.0

```

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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Cs

RFRAC

2.4E-8

4.1E-9 5.4E-9 3.6E-5 1.3E-8 1.5E-8  
2.7E-5 2.4E-8 2.7E-8 5.9E-6 2.4E-8  
2.7E-8 5.9E-6 9.6E-5 5.5E-5 5.9E-6  
5.9E-6 1.7E-5 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Ru

RFRAC

6.0E-7

1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7  
2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7  
6.7E-7 6.8E-7 8.4E-5 5.0E-5 6.4E-6  
6.4E-6 6.7E-8 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0



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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Gas

RFRAC

0.8

0.14 0.18 0.84 0.43 0.49  
0.85 0.82 0.89 0.91 0.82  
0.89 0.91 0.84 0.85 0.91  
0.91 0.84 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.0

GROUP=Cor

RFRAC

0.0020

0.0014 0.0018 0.0032 0.0018 0.0021  
0.0031 0.02 0.0022 0.0025 0.0020  
0.0022 0.0025 0.0064 0.0059 0.0033  
0.0033 0.0025 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0

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```
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  RESP
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  LOS
    0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
  DEPVEL 0.01
PACKAGE PACKAGE_1 13.9 1.0 0.0 5.2
  AM241 1810.0 Part
  AM242M 20.4 Part
  CM245 0.0 Part
  CM244 12500.0 Part
  CM243 57.6 Part
  CM242 60.8 Part
  CE144 13900.0 Part
  AM243 74.5 Part
  EU154 10300.0 Part
  EU155 2740.0 Part
  PM147 51700.0 Part
  PU238 9510.0 Part
  PU239 408.0 Part
  PU240 697.0 Part
  PU241 168000.0 Part
  PU242 0.0 Part
  SB125 3390.0 Part
  SR90 120000.0 Part
  Y90 120000.0 Part
  CS134 64100.0 Cs
  CS137 176000.0 Cs
  I129 0.0 Cs
  RU106 24600.0 Ru
  KR85 10900.0 Gas
  CO60 85.8 Cor
  NP239 74.5 Part
  H3GAS 649.0 Gas
  TC99 23.3 Part
  CD113M 49.8 Part
  TE125M 830.0 Part
  SM151 647.0 Part
END
VEHICLE -1 VEHICLE_1 1.39E01 1.0 0.0 5.2 1.0 2.0 4.0 1.0 1.0
  PACKAGE_1 1.0
FLAGS
  IACC 2
  IUOPT 2
```

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REGCHECK 1  
MODSTD  
DISTOFF FREEWAY 3.00E01 3.00E01 8.00E02  
DISTOFF SECONDARY 2.70E01 3.00E01 8.00E02  
DISTOFF STREET 5.00E00 8.00E00 8.00E02  
DISTON  
    FREEWAY 1.50E01  
    SECONDARY 3.00E00  
    STREET 3.00E00  
    ADJACENT 4.00E00  
BDF 5.00E-02  
BRATE 3.30E-04  
CULVL 2.00E-01  
EVACUATION 1.00E00  
GECON 1.00E-04  
INTERDICT 4.00E01  
LCFCON 5.00E-04 4.00E-04  
SURVEY 1.00E01  
UBF 5.20E-01  
USWF 4.80E-01  
CAMPAIGN 8.33E-02  
MITDDIST 3.00E01  
MITDVEL 2.40E01  
RPD 6.00E00  
RR 1.00E00  
RU 1.80E-02  
RS 8.70E-01  
SMALLPKG 5.00E-01  
RPCTHYROID  
    I129 5.77E06  
EOF  
LINK RURAL\_AZ VEHICLE\_1 46.8 88.9 1.5 3.2 530.0 1.32E-7 0.886 R 1 1.0  
LINK SUBURBN\_AZ VEHICLE\_1 0.3 88.9 1.5 135.8 760.0 1.32E-7 0.886 S 1 1.0  
LINK URBAN\_AZ VEHICLE\_1 0.0 88.9 1.5 0.0 2400.0 1.32E-7 0.886 U 1 1.0  
LINK RURAL\_DE VEHICLE\_1 7.6 88.9 1.5 7.3 530.0 5.18E-7 0.66 R 1 1.0  
LINK SUBURBN\_DE VEHICLE\_1 13.9 88.9 1.5 492.2 760.0 5.18E-7 0.66 S 1 1.0  
LINK URBAN\_DE VEHICLE\_1 5.3 88.9 1.5 2496.1 2400.0 5.18E-7 0.66 U 1 1.0  
LINK RURAL\_IL VEHICLE\_1 178.4 88.9 1.5 14.4 530.0 2.22E-7 0.676 R 1 1.0  
LINK SUBURBN\_IL VEHICLE\_1 73.0 88.9 1.5 323.6 760.0 2.22E-7 0.676 S 1 1.0  
LINK URBAN\_IL VEHICLE\_1 10.2 88.9 1.5 2379.1 2400.0 2.22E-7 0.676 U 1 1.0  
LINK RURAL\_IN VEHICLE\_1 136.7 88.9 1.5 19.9 530.0 2.25E-7 0.622 R 1 1.0  
LINK SUBURBN\_IN VEHICLE\_1 97.3 88.9 1.5 276.3 760.0 2.25E-7 0.622 S 1 1.0  
LINK URBAN\_IN VEHICLE\_1 9.4 88.9 1.5 2354.7 2400.0 2.25E-7 0.622 U 1 1.0  
LINK RURAL\_IA VEHICLE\_1 393.8 88.9 1.5 15.7 530.0 1.12E-7 0.768 R 1 1.0  
LINK SUBURBN\_IA VEHICLE\_1 95.4 88.9 1.5 268.0 760.0 1.12E-7 0.768 S 1 1.0  
LINK URBAN\_IA VEHICLE\_1 5.1 88.9 1.5 2185.2 2400.0 1.12E-7 0.768 U 1 1.0  
LINK RURAL\_NE VEHICLE\_1 652.2 88.9 1.5 10.0 530.0 3.19E-7 0.618 R 1 1.0  
LINK SUBURBN\_NE VEHICLE\_1 75.6 88.9 1.5 268.5 760.0 3.19E-7 0.618 S 1 1.0  
LINK URBAN\_NE VEHICLE\_1 7.0 88.9 1.5 2401.8 2400.0 3.19E-7 0.618 U 1 1.0  
LINK RURAL\_NV VEHICLE\_1 252.6 88.9 1.5 4.8 530.0 2.25E-7 0.658 R 1 1.0  
LINK SUBURBN\_NV VEHICLE\_1 15.5 88.9 1.5 267.6 760.0 2.25E-7 0.658 S 1 1.0  
LINK URBAN\_NV VEHICLE\_1 1.5 88.9 1.5 2318.5 2400.0 2.25E-7 0.658 U 1 1.0  
LINK RURAL\_NJ VEHICLE\_1 20.6 88.9 1.5 11.8 530.0 5.65E-7 0.692 R 1 1.0

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LINK SUBURBN\_NJ VEHICLE\_1 12.5 88.9 1.5 353.9 760.0 5.65E-7 0.692 S 1 1.0  
LINK URBAN\_NJ VEHICLE\_1 1.1 88.9 1.5 2025.9 2400.0 5.65E-7 0.692 U 1 1.0  
LINK RURAL\_OH VEHICLE\_1 213.1 88.9 1.5 19.7 530.0 1.64E-7 0.854 R 1 1.0  
LINK SUBURBN\_OH VEHICLE\_1 151.3 88.9 1.5 309.6 760.0 1.64E-7 0.854 S 1 1.0  
LINK URBAN\_OH VEHICLE\_1 14.8 88.9 1.5 2211.7 2400.0 1.64E-7 0.854 U 1 1.0  
LINK RURAL\_PA VEHICLE\_1 448.0 88.9 1.5 17.7 530.0 5.14E-7 0.745 R 1 1.0  
LINK SUBURBN\_PA VEHICLE\_1 258.1 88.9 1.5 299.3 760.0 5.14E-7 0.745 S 1 1.0  
LINK URBAN\_PA VEHICLE\_1 22.2 88.9 1.5 2413.1 2400.0 5.14E-7 0.745 U 1 1.0  
LINK RURAL\_UT VEHICLE\_1 471.6 88.9 1.5 9.9 530.0 2.9E-7 0.872 R 1 1.0  
LINK SUBURBN\_UT VEHICLE\_1 106.5 88.9 1.5 362.6 760.0 2.9E-7 0.872 S 1 1.0  
LINK URBAN\_UT VEHICLE\_1 32.2 88.9 1.5 2472.3 2400.0 2.9E-7 0.872 U 1 1.0  
LINK RURAL\_WY VEHICLE\_1 607.2 88.9 1.5 4.9 530.0 6.74E-7 0.479 R 1 1.0  
LINK SUBURBN\_WY VEHICLE\_1 33.9 88.9 1.5 399.4 760.0 6.74E-7 0.479 S 1 1.0  
LINK URBAN\_WY VEHICLE\_1 3.4 88.9 1.5 1966.6 2400.0 6.74E-7 0.479 U 1 1.0

STOP STOP\_1 VEHICLE\_1 30000.0 1.0 10.0 1.0 6.0  
STOP STOP\_2 VEHICLE\_1 340.0 10.0 800.0 0.2 6.0

HANDLING HANDLE\_1 VEHICLE\_1 5.0 1.0 0.5

EOF

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NON-RADIOLOGICAL DATA (ACCIDENTS and FATALITIES)

\*\*\*\*\*

HIGHWAY

|            | ACCIDENT RATE | ACCIDENTS | FATALITIES |
|------------|---------------|-----------|------------|
| RURAL_AZ   | 1.32E-07      | 6.18E-06  | 5.47E-06   |
| SUBURBN_AZ | 1.32E-07      | 3.96E-08  | 3.51E-08   |
| URBAN_AZ   | 1.32E-07      | 0.00E+00  | 0.00E+00   |
| RURAL_DE   | 5.18E-07      | 3.94E-06  | 2.60E-06   |
| SUBURBN_DE | 5.18E-07      | 7.20E-06  | 4.75E-06   |
| URBAN_DE   | 5.18E-07      | 2.75E-06  | 1.81E-06   |
| RURAL_IL   | 2.22E-07      | 3.96E-05  | 2.68E-05   |
| SUBURBN_IL | 2.22E-07      | 1.62E-05  | 1.10E-05   |
| URBAN_IL   | 2.22E-07      | 2.26E-06  | 1.53E-06   |
| RURAL_IN   | 2.25E-07      | 3.08E-05  | 1.91E-05   |
| SUBURBN_IN | 2.25E-07      | 2.19E-05  | 1.36E-05   |
| URBAN_IN   | 2.25E-07      | 2.12E-06  | 1.32E-06   |
| RURAL_IA   | 1.12E-07      | 4.41E-05  | 3.39E-05   |
| SUBURBN_IA | 1.12E-07      | 1.07E-05  | 8.21E-06   |
| URBAN_IA   | 1.12E-07      | 5.71E-07  | 4.39E-07   |
| RURAL_NE   | 3.19E-07      | 2.08E-04  | 1.29E-04   |
| SUBURBN_NE | 3.19E-07      | 2.41E-05  | 1.49E-05   |
| URBAN_NE   | 3.19E-07      | 2.23E-06  | 1.38E-06   |
| RURAL_NV   | 2.25E-07      | 5.68E-05  | 3.74E-05   |
| SUBURBN_NV | 2.25E-07      | 3.49E-06  | 2.29E-06   |
| URBAN_NV   | 2.25E-07      | 3.38E-07  | 2.22E-07   |
| RURAL_NJ   | 5.65E-07      | 1.16E-05  | 8.05E-06   |
| SUBURBN_NJ | 5.65E-07      | 7.06E-06  | 4.89E-06   |
| URBAN_NJ   | 5.65E-07      | 6.22E-07  | 4.30E-07   |
| RURAL_OH   | 1.64E-07      | 3.49E-05  | 2.98E-05   |
| SUBURBN_OH | 1.64E-07      | 2.48E-05  | 2.12E-05   |
| URBAN_OH   | 1.64E-07      | 2.43E-06  | 2.07E-06   |
| RURAL_PA   | 5.14E-07      | 2.30E-04  | 1.72E-04   |
| SUBURBN_PA | 5.14E-07      | 1.33E-04  | 9.88E-05   |
| URBAN_PA   | 5.14E-07      | 1.14E-05  | 8.50E-06   |
| RURAL_UT   | 2.90E-07      | 1.37E-04  | 1.19E-04   |
| SUBURBN_UT | 2.90E-07      | 3.09E-05  | 2.69E-05   |
| URBAN_UT   | 2.90E-07      | 9.34E-06  | 8.14E-06   |
| RURAL_WY   | 6.74E-07      | 4.09E-04  | 1.96E-04   |
| SUBURBN_WY | 6.74E-07      | 2.28E-05  | 1.09E-05   |
| URBAN_WY   | 6.74E-07      | 2.29E-06  | 1.10E-06   |
| TOTALS:    | 1.19E-05      | 1.55E-03  | 1.02E-03   |

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REGULATORY CHECKS

FOR VEHICLE\_1 THE DOSE RATE AT 2 METERS COULD EXCEED 0.1 MSV/HR  
THE VEHICLE DOSE RATE HAS BEEN RESET TO EQUAL 0.13 MSV/HR

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CALCULATIONAL INFORMATION

FOR VEHICLE 1 AREAS WITH TOTAL CONTAMINATION RATIO GREATER THAN 40.000  
(THE AREAS MARKED WITH AN 'X' ARE INTERDICTED AND HAVE  
NO 50 YEAR GROUNDSHINE DOSE AND NO INGESTION DOSE.)

| AREA/SEVERITY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| 1             | X | - | - | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 2             | X | - | - | X | - | - | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 3             | - | - | - | X | - | - | X | X | - | X  | -  | -  | X  | X  | X  | X  | X  | X  | -  |
| 4             | - | - | - | X | - | - | X | - | - | -  | -  | -  | -  | X  | X  | -  | -  | X  | -  |
| 5             | - | - | - | X | - | - | X | - | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 6             | - | - | - | X | - | - | - | - | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 7             | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | X  | -  | -  | -  | -  | -  |
| 8             | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 9             | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 10            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 11            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 12            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 13            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 14            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 15            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 16            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 17            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 18            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |

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INCIDENT-FREE SUMMARY

\*\*\*\*\* \*\*\*\*\*

IN-TRANSIT POPULATION EXPOSURE IN PERSON-SV  
\*INPUT DATA WERE ALTERED WITH REGULATORY CHECKS

|            | PASSENGER | CREW     | OFF LINK | ON LINK  | TOTALS   |
|------------|-----------|----------|----------|----------|----------|
| RURAL_AZ   | 0.00E+00  | 2.07E-05 | 5.07E-08 | 3.26E-06 | 2.41E-05 |
| SUBURBN_AZ | 0.00E+00  | 1.33E-07 | 1.20E-08 | 3.00E-08 | 1.75E-07 |
| URBAN_AZ   | 0.00E+00  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RURAL_DE   | 0.00E+00  | 3.37E-06 | 1.88E-08 | 5.30E-07 | 3.92E-06 |
| SUBURBN_DE | 0.00E+00  | 6.16E-06 | 2.02E-06 | 1.39E-06 | 9.57E-06 |
| URBAN_DE   | 0.00E+00  | 2.35E-06 | 8.07E-08 | 1.67E-06 | 4.10E-06 |
| RURAL_IL   | 0.00E+00  | 7.91E-05 | 8.70E-07 | 1.24E-05 | 9.24E-05 |
| SUBURBN_IL | 0.00E+00  | 3.24E-05 | 6.96E-06 | 7.30E-06 | 4.66E-05 |
| URBAN_IL   | 0.00E+00  | 4.52E-06 | 1.48E-07 | 3.22E-06 | 7.89E-06 |
| RURAL_IN   | 0.00E+00  | 6.06E-05 | 9.22E-07 | 9.53E-06 | 7.11E-05 |
| SUBURBN_IN | 0.00E+00  | 4.31E-05 | 7.92E-06 | 9.73E-06 | 6.08E-05 |
| URBAN_IN   | 0.00E+00  | 4.17E-06 | 1.35E-07 | 2.97E-06 | 7.27E-06 |
| RURAL_IA   | 0.00E+00  | 1.75E-04 | 2.09E-06 | 2.75E-05 | 2.04E-04 |
| SUBURBN_IA | 0.00E+00  | 4.23E-05 | 7.54E-06 | 9.54E-06 | 5.94E-05 |
| URBAN_IA   | 0.00E+00  | 2.26E-06 | 6.80E-08 | 1.61E-06 | 3.94E-06 |
| RURAL_NE   | 0.00E+00  | 2.89E-04 | 2.21E-06 | 4.55E-05 | 3.37E-04 |
| SUBURBN_NE | 0.00E+00  | 3.35E-05 | 5.98E-06 | 7.56E-06 | 4.71E-05 |
| URBAN_NE   | 0.00E+00  | 3.10E-06 | 1.03E-07 | 2.21E-06 | 5.42E-06 |
| RURAL_NV   | 0.00E+00  | 1.12E-04 | 4.11E-07 | 1.76E-05 | 1.30E-04 |
| SUBURBN_NV | 0.00E+00  | 6.87E-06 | 1.22E-06 | 1.55E-06 | 9.64E-06 |
| URBAN_NV   | 0.00E+00  | 6.65E-07 | 2.12E-08 | 4.74E-07 | 1.16E-06 |
| RURAL_NJ   | 0.00E+00  | 9.13E-06 | 8.24E-08 | 1.44E-06 | 1.07E-05 |
| SUBURBN_NJ | 0.00E+00  | 5.54E-06 | 1.30E-06 | 1.25E-06 | 8.09E-06 |
| URBAN_NJ   | 0.00E+00  | 4.88E-07 | 1.36E-08 | 3.47E-07 | 8.49E-07 |
| RURAL_OH   | 0.00E+00  | 9.45E-05 | 1.42E-06 | 1.49E-05 | 1.11E-04 |
| SUBURBN_OH | 0.00E+00  | 6.71E-05 | 1.38E-05 | 1.51E-05 | 9.60E-05 |
| URBAN_OH   | 0.00E+00  | 6.56E-06 | 2.00E-07 | 4.67E-06 | 1.14E-05 |
| RURAL_PA   | 0.00E+00  | 1.99E-04 | 2.69E-06 | 3.12E-05 | 2.33E-04 |
| SUBURBN_PA | 0.00E+00  | 1.14E-04 | 2.28E-05 | 2.58E-05 | 1.63E-04 |
| URBAN_PA   | 0.00E+00  | 9.84E-06 | 3.27E-07 | 7.01E-06 | 1.72E-05 |
| RURAL_UT   | 0.00E+00  | 2.09E-04 | 1.58E-06 | 3.29E-05 | 2.44E-04 |
| SUBURBN_UT | 0.00E+00  | 4.72E-05 | 1.14E-05 | 1.07E-05 | 6.92E-05 |
| URBAN_UT   | 0.00E+00  | 1.43E-05 | 4.86E-07 | 1.02E-05 | 2.49E-05 |
| RURAL_WY   | 0.00E+00  | 2.69E-04 | 1.01E-06 | 4.23E-05 | 3.13E-04 |
| SUBURBN_WY | 0.00E+00  | 1.50E-05 | 3.99E-06 | 3.39E-06 | 2.24E-05 |
| URBAN_WY   | 0.00E+00  | 1.51E-06 | 4.08E-08 | 1.07E-06 | 2.62E-06 |
|            |           |          |          |          |          |
| RURAL      | 0.00E+00  | 1.52E-03 | 1.34E-05 | 2.39E-04 | 1.77E-03 |
| SUBURB     | 0.00E+00  | 4.14E-04 | 8.49E-05 | 9.33E-05 | 5.92E-04 |
| URBAN      | 0.00E+00  | 4.97E-05 | 1.62E-06 | 3.54E-05 | 8.68E-05 |
|            |           |          |          |          |          |
| TOTALS:    | 0.00E+00  | 1.98E-03 | 9.99E-05 | 3.68E-04 | 2.45E-03 |



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MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

VEHICLE\_1      5.92E-09 SV

STOP EXPOSURE IN PERSON-SV

|              |        |          |
|--------------|--------|----------|
| ANNULAR AREA | STOP_1 | 3.77E-03 |
| ANNULAR AREA | STOP_2 | 1.63E-05 |
| TOTAL:       |        | 3.79E-03 |

HANDLING EXPOSURE IN PERSON-SV

| HANDLING | VEHICLE   | MATERIAL  | METHOD      | DOSE     |
|----------|-----------|-----------|-------------|----------|
| HANDLE_1 | VEHICLE_1 | PACKAGE_1 | LINE-SOURCE | 1.16E-03 |
| TOTAL:   |           |           |             | 1.16E-03 |

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ACCIDENT SUMMARY

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EXPECTED VALUES OF POPULATION RISK IN PERSON-SV

|            | GROUND   | INHALED  | RESUSPD  | CLOUDSH  | TOTAL    |
|------------|----------|----------|----------|----------|----------|
| RURAL_AZ   | 1.72E-12 | 1.51E-13 | 1.09E-15 | 2.00E-15 | 1.88E-12 |
| SUBURBN_AZ | 4.69E-13 | 4.11E-14 | 2.97E-16 | 5.45E-16 | 5.11E-13 |
| URBAN_AZ   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RURAL_DE   | 2.51E-12 | 2.20E-13 | 1.59E-15 | 2.91E-15 | 2.73E-12 |
| SUBURBN_DE | 3.09E-10 | 2.71E-11 | 1.96E-13 | 3.59E-13 | 3.37E-10 |
| URBAN_DE   | 1.74E-09 | 1.52E-10 | 1.10E-12 | 2.02E-12 | 1.89E-09 |
| RURAL_IL   | 4.97E-11 | 4.36E-12 | 3.15E-14 | 5.78E-14 | 5.42E-11 |
| SUBURBN_IL | 4.57E-10 | 4.01E-11 | 2.90E-13 | 5.32E-13 | 4.98E-10 |
| URBAN_IL   | 1.37E-09 | 1.20E-10 | 8.66E-13 | 1.59E-12 | 1.49E-09 |
| RURAL_IN   | 5.34E-11 | 4.68E-12 | 3.38E-14 | 6.21E-14 | 5.82E-11 |
| SUBURBN_IN | 5.27E-10 | 4.63E-11 | 3.34E-13 | 6.13E-13 | 5.75E-10 |
| URBAN_IN   | 1.26E-09 | 1.11E-10 | 8.00E-13 | 1.47E-12 | 1.37E-09 |
| RURAL_IA   | 6.04E-11 | 5.30E-12 | 3.83E-14 | 7.02E-14 | 6.58E-11 |
| SUBURBN_IA | 2.50E-10 | 2.19E-11 | 1.58E-13 | 2.90E-13 | 2.72E-10 |
| URBAN_IA   | 3.16E-10 | 2.77E-11 | 2.01E-13 | 3.68E-13 | 3.45E-10 |
| RURAL_NE   | 1.81E-10 | 1.59E-11 | 1.15E-13 | 2.11E-13 | 1.98E-10 |
| SUBURBN_NE | 5.65E-10 | 4.95E-11 | 3.58E-13 | 6.57E-13 | 6.15E-10 |
| URBAN_NE   | 1.36E-09 | 1.19E-10 | 8.62E-13 | 1.58E-12 | 1.48E-09 |
| RURAL_NV   | 2.38E-11 | 2.09E-12 | 1.51E-14 | 2.77E-14 | 2.59E-11 |
| SUBURBN_NV | 8.14E-11 | 7.14E-12 | 5.16E-14 | 9.46E-14 | 8.87E-11 |
| URBAN_NV   | 1.98E-10 | 1.74E-11 | 1.26E-13 | 2.31E-13 | 2.16E-10 |
| RURAL_NJ   | 1.20E-11 | 1.05E-12 | 7.59E-15 | 1.39E-14 | 1.30E-11 |
| SUBURBN_NJ | 2.18E-10 | 1.91E-11 | 1.38E-13 | 2.53E-13 | 2.37E-10 |
| URBAN_NJ   | 3.19E-10 | 2.80E-11 | 2.02E-13 | 3.71E-13 | 3.48E-10 |
| RURAL_OH   | 6.00E-11 | 5.26E-12 | 3.81E-14 | 6.98E-14 | 6.54E-11 |
| SUBURBN_OH | 6.70E-10 | 5.87E-11 | 4.25E-13 | 7.79E-13 | 7.30E-10 |
| URBAN_OH   | 1.36E-09 | 1.19E-10 | 8.63E-13 | 1.58E-12 | 1.48E-09 |
| RURAL_PA   | 3.55E-10 | 3.12E-11 | 2.25E-13 | 4.13E-13 | 3.87E-10 |
| SUBURBN_PA | 3.46E-09 | 3.04E-10 | 2.20E-12 | 4.03E-12 | 3.77E-09 |
| URBAN_PA   | 6.98E-09 | 6.12E-10 | 4.42E-12 | 8.11E-12 | 7.60E-09 |
| RURAL_UT   | 1.18E-10 | 1.04E-11 | 7.49E-14 | 1.37E-13 | 1.29E-10 |
| SUBURBN_UT | 9.77E-10 | 8.56E-11 | 6.19E-13 | 1.14E-12 | 1.06E-09 |
| URBAN_UT   | 5.85E-09 | 5.13E-10 | 3.71E-12 | 6.80E-12 | 6.37E-09 |
| RURAL_WY   | 1.75E-10 | 1.53E-11 | 1.11E-13 | 2.03E-13 | 1.91E-10 |
| SUBURBN_WY | 7.96E-10 | 6.98E-11 | 5.05E-13 | 9.25E-13 | 8.67E-10 |
| URBAN_WY   | 1.14E-09 | 1.00E-10 | 7.24E-13 | 1.33E-12 | 1.24E-09 |
|            |          |          |          |          |          |
| RURAL      | 1.09E-09 | 9.59E-11 | 6.93E-13 | 1.27E-12 | 1.19E-09 |
| SUBURB     | 8.31E-09 | 7.29E-10 | 5.27E-12 | 9.67E-12 | 9.06E-09 |
| URBAN      | 2.19E-08 | 1.92E-09 | 1.39E-11 | 2.55E-11 | 2.38E-08 |
|            |          |          |          |          |          |
| TOTALS:    | 3.13E-08 | 2.74E-09 | 1.98E-11 | 3.64E-11 | 3.41E-08 |

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SOCIETAL INGESTION RISK - PERSON-SV

| LINK     | GONADS   | EFFECTIVE |
|----------|----------|-----------|
| RURAL_AZ | 1.33E-11 | 1.35E-11  |
| RURAL_DE | 8.47E-12 | 8.63E-12  |
| RURAL_IL | 8.53E-11 | 8.68E-11  |
| RURAL_IN | 6.62E-11 | 6.74E-11  |
| RURAL_IA | 9.49E-11 | 9.67E-11  |
| RURAL_NE | 4.48E-10 | 4.56E-10  |
| RURAL_NV | 1.22E-10 | 1.25E-10  |
| RURAL_NJ | 2.51E-11 | 2.55E-11  |
| RURAL_OH | 7.52E-11 | 7.66E-11  |
| RURAL_PA | 4.96E-10 | 5.05E-10  |
| RURAL_UT | 2.94E-10 | 3.00E-10  |
| RURAL_WY | 8.81E-10 | 8.97E-10  |
| TOTAL    | 2.61E-09 | 2.66E-09  |

SOCIETAL INGESTION RISK BY ORGAN - PERSON-SV

| LINK     | BREAST   | LUNGS    | RED MARR | BONE SUR | THYROID  | REMAINDER |
|----------|----------|----------|----------|----------|----------|-----------|
| RURAL_AZ | 1.13E-11 | 1.15E-11 | 1.45E-11 | 2.46E-11 | 1.14E-11 | 1.45E-11  |
| RURAL_DE | 7.19E-12 | 7.34E-12 | 9.25E-12 | 1.57E-11 | 7.29E-12 | 9.24E-12  |
| RURAL_IL | 7.23E-11 | 7.38E-11 | 9.30E-11 | 1.58E-10 | 7.33E-11 | 9.29E-11  |
| RURAL_IN | 5.61E-11 | 5.73E-11 | 7.23E-11 | 1.22E-10 | 5.70E-11 | 7.22E-11  |
| RURAL_IA | 8.05E-11 | 8.22E-11 | 1.04E-10 | 1.75E-10 | 8.17E-11 | 1.04E-10  |
| RURAL_NE | 3.80E-10 | 3.88E-10 | 4.89E-10 | 8.28E-10 | 3.85E-10 | 4.88E-10  |
| RURAL_NV | 1.04E-10 | 1.06E-10 | 1.34E-10 | 2.26E-10 | 1.05E-10 | 1.33E-10  |
| RURAL_NJ | 2.12E-11 | 2.17E-11 | 2.73E-11 | 4.63E-11 | 2.16E-11 | 2.73E-11  |
| RURAL_OH | 6.38E-11 | 6.51E-11 | 8.21E-11 | 1.39E-10 | 6.47E-11 | 8.20E-11  |
| RURAL_PA | 4.20E-10 | 4.29E-10 | 5.41E-10 | 9.16E-10 | 4.26E-10 | 5.40E-10  |
| RURAL_UT | 2.50E-10 | 2.55E-10 | 3.21E-10 | 5.44E-10 | 2.53E-10 | 3.21E-10  |
| RURAL_WY | 7.47E-10 | 7.63E-10 | 9.61E-10 | 1.63E-09 | 7.58E-10 | 9.60E-10  |
| TOTAL    | 2.21E-09 | 2.26E-09 | 2.85E-09 | 4.82E-09 | 2.24E-09 | 2.85E-09  |

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EXPECTED RISK VALUES - OTHER

| LINK       | EARLY<br>FATALITY | EARLY<br>MORBIDITY |
|------------|-------------------|--------------------|
| RURAL_AZ   | 0.00E+00          | 0.00E+00           |
| SUBURBN_AZ | 0.00E+00          | 0.00E+00           |
| URBAN_AZ   | 0.00E+00          | 0.00E+00           |
| RURAL_DE   | 0.00E+00          | 0.00E+00           |
| SUBURBN_DE | 0.00E+00          | 0.00E+00           |
| URBAN_DE   | 0.00E+00          | 0.00E+00           |
| RURAL_IL   | 0.00E+00          | 0.00E+00           |
| SUBURBN_IL | 0.00E+00          | 0.00E+00           |
| URBAN_IL   | 0.00E+00          | 0.00E+00           |
| RURAL_IN   | 0.00E+00          | 0.00E+00           |
| SUBURBN_IN | 0.00E+00          | 0.00E+00           |
| URBAN_IN   | 0.00E+00          | 0.00E+00           |
| RURAL_IA   | 0.00E+00          | 0.00E+00           |
| SUBURBN_IA | 0.00E+00          | 0.00E+00           |
| URBAN_IA   | 0.00E+00          | 0.00E+00           |
| RURAL_NE   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NE | 0.00E+00          | 0.00E+00           |
| URBAN_NE   | 0.00E+00          | 0.00E+00           |
| RURAL_NV   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NV | 0.00E+00          | 0.00E+00           |
| URBAN_NV   | 0.00E+00          | 0.00E+00           |
| RURAL_NJ   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NJ | 0.00E+00          | 0.00E+00           |
| URBAN_NJ   | 0.00E+00          | 0.00E+00           |
| RURAL_OH   | 0.00E+00          | 0.00E+00           |
| SUBURBN_OH | 0.00E+00          | 0.00E+00           |
| URBAN_OH   | 0.00E+00          | 0.00E+00           |
| RURAL_PA   | 0.00E+00          | 0.00E+00           |
| SUBURBN_PA | 0.00E+00          | 0.00E+00           |
| URBAN_PA   | 0.00E+00          | 0.00E+00           |
| RURAL_UT   | 0.00E+00          | 0.00E+00           |
| SUBURBN_UT | 0.00E+00          | 0.00E+00           |
| URBAN_UT   | 0.00E+00          | 0.00E+00           |
| RURAL_WY   | 0.00E+00          | 0.00E+00           |
| SUBURBN_WY | 0.00E+00          | 0.00E+00           |
| URBAN_WY   | 0.00E+00          | 0.00E+00           |
| TOTAL      | 0.00E+00          | 0.00E+00           |

EOI  
END OF RUN  
SUCCESSFUL COMPLETION

**PSEG Site  
ESP Application  
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**7A.2 RADWASTE ANALYSIS**

This attachment contains the TRAGIS and RADCAT/RADTRAN input and output for one radwaste shipment from the PSEG Site to Barnwell, SC. The nuclide inventories are the total annual production for the bounding technology, which is the US-APWR.

|   |                                          |       |
|---|------------------------------------------|-------|
| 1 | TRAGIS Input.....                        | 7A-57 |
| 2 | TRAGIS Output.....                       | 7A-59 |
| 3 | TRAGIS Generated Input for RADTRAN ..... | 7A-61 |
| 4 | RADTRAN Input.....                       | 7A-63 |
| 5 | RADTRAN Fatalities Case Output .....     | 7A-79 |
| 6 | RADTRAN Injuries Case Output.....        | 7A-93 |

# PSEG Site ESP Application Part 3, Environmental Report

## 1 TRAGIS INPUT

The TRAGIS input screens are reproduced below.

WebTRAGIS Client Version: 4.6.2

Block Nodes/Links | Route Listings | Route Maps

Select Origin/Destination | Highway Routing Parameters | Rail Routing Parameters | Water Routing Parameters

**Mode**

☒ Highway ☐ Railroad ☐ Water ☐ InterModal

**Origin**

| State     | Node Name                   |
|-----------|-----------------------------|
| MD        | SALEM NW S49 LOCL           |
| ME        | SALEM NP                    |
| MI        | SAYREVILLE W TNJTX9         |
| MN        | SEASIDE HTS S35 S37         |
| MO        | SEAVILLE U9 S50             |
| MS        | SEAVILLE SE TGSPX20         |
| MT        | SECAUCUS E I95EX16E         |
| NC        | SEVEN STARS S U9 S70        |
| ND        | SHARPTOWN NW U40 S48        |
| NE        | SINGAC N I80X53             |
| NH        | SOMERS POINT W TGSPX29      |
| <b>NJ</b> | <b>SOMERVILLE N I287X13</b> |
| NM        | SOMERVILLE NW U202U22       |
| NV        | SOMERVILLE W U202U206       |

**Selected Node Number**

341108491

☐ Enter Intermediate Node

**Calculate Route**

**Alternative Route Penalty**

Enter the alternative route penalty to be applied to next alternative routing

Link Penalty [1-100]

**Calculate Alternative Route**

**Destination**

| State     | Node Name                    |
|-----------|------------------------------|
| NJ        | ASHLEY HEIGHTS I26X209       |
| NM        | BAKERS XROADS W U176S121     |
| NV        | BALDOCK S125S3               |
| NY        | BALLETINE N I26X97           |
| OH        | BAMBERG U301U78              |
| OK        | BAMBERG S U301U601           |
| OR        | BARNWELL S U278S3            |
| PA        | BARNWELL W U278S64           |
| RI        | BATESBURG U1 U178            |
| <b>SC</b> | <b>BEECH ISLAND U278S125</b> |
| SD        | BELVEDERE N I20X5            |
| TN        | BENNETTSVILLE E U15 S9       |
| TX        | BISHOPVILLE SW I20X115       |
| UT        | BLACKSBURG W I85X100         |

**Selected Node Number**

451115493

**Route Type**

☒ Commercial ☐ HRCQ

☐ Quickest ☐ Time ☐ HRCQ + Nevada

☐ Shortest ☐ WIPP

**Date/Time Options**

☒ Use Current Date

☒ Use Current Time

**Population Options**

☐ 400m Buffer Zone

☒ 800m Buffer Zone

☐ 2500m Buffer Zone

**Help** **Client Software Parameters**

# PSEG Site ESP Application Part 3, Environmental Report

WebTRAGIS Client Version: 4.6.2

Block Nodes/Links
Route Listings
Route Maps

Select Origin/Destination

Highway Routing Parameters

Rail Routing Parameters

Water Routing Parameters

**Driver Options**

☐ One Driver
 ☒ Two Drivers

**Other Constraints**

- ☒ Prohibit use of roads that restrict Commercial Trucks
- ☒ Prohibit the use of ferries
- ☒ Prohibit the use of roads with Hazmat Restrictions
- ☒ Prohibit the use of roads with Radioactive Restrictions
- ☐ Avoid the use of roads in Urban Areas
- ☐ Avoid the use of roads inside or between Belways
- ☐ Prohibit the use of roads with Low Clearance
- ☐ Prohibit the use of roads with Tunnels
- ☐ Las Vegas Beltway considered a Preferred Route

**Highway Inspection**

☒ Include time for inspections upon entry into state

Enter est. average time to complete inspection per state. (in minutes)

30

**Toll Bias Factor**

Enter the toll bias factor. (0 - 1000)

0

☐ Include Nevada County Population Details

**Road Lane Type Penalty**

Penalty Factor (0 - 100)

|                                   |   |
|-----------------------------------|---|
| Lane Type 1 - Limited Access      | 0 |
| Lane Type 2 - Limited Access      | 0 |
| Lane Type 3 - Multilane Divided   | 0 |
| Lane Type 4 - Multilane Undivided | 0 |
| Lane Type 5 - Principal Highway   | 0 |
| Lane Type 6 - Through Highway     | 0 |
| Lane Type 7 - Other               | 0 |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

## 2 TRAGIS OUTPUT

TRAGIS Routing Engine Version 1.5.4                      -- Highway Data Network    4.0

FROM:        SALEM NP                                              NJ                      Leaving : 06/25/09 16:12  
TO :        BARNWELL                      S        U278S3        SC                      Arriving : 06/26/09 07:39

Routing parameters used to calculate the route-

Routing type: Commercial with 2 driver(s)  
Time bias: 0.70 Mile bias: 0.30, Toll bias: 1.00

Constraints used on route:  
Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit use of roads with Radioactive materials prohibition

| Miles | Hwy Sign | City                             | Dir | Junction  | State | Dist  | Time  | Date     | Hour           |
|-------|----------|----------------------------------|-----|-----------|-------|-------|-------|----------|----------------|
| 0.0   |          | SALEM NP                         |     |           | NJ    | 0.0   | 0:00  | 06/25/09 | 16:12          |
| 12.3  | LOCAL    | SALEM                            | NW  | S49 LOCL  | NJ    | 12.3  | 0:24  | 06/25/09 | 16:36          |
| 3.0   | S49      | PENNSVILLE                       | S   | S49 C551  | NJ    | 15.3  | 0:29  | 06/25/09 | 16:41          |
| 4.7   | C551     | DEEPWATER                        | SE  | TNJT I295 | NJ    | 19.9  | 0:36  | 06/25/09 | 16:48          |
| 0.4   | I295\$   | DEEPWATER                        | S   | I295X1    | NJ    | 20.3  | 0:37  | 06/25/09 | 16:49          |
| 0.9   | I295#    | crossing state border DE/NJ      |     |           |       | BD    | 21.3  | 1:07     | 06/25/09 17:19 |
|       |          | State Inspection took 30 minutes |     |           |       |       |       |          |                |
| 2.5   | I295#    | NEW CASTLE                       | N   | I295S9    | DE    | 23.8  | 1:10  | 06/25/09 | 17:22          |
| 2.1   | I295     | NEWPORT                          | SE  | I295I95   | DE    | 25.9  | 1:12  | 06/25/09 | 17:24          |
| 0.7   | I95      | NEWPORT                          | S   | I95 X5    | DE    | 26.6  | 1:13  | 06/25/09 | 17:25          |
| 8.7   | I95 \$   | NEWARK                           | S   | I95 X1    | DE    | 35.3  | 1:21  | 06/25/09 | 17:33          |
| 2.3   | I95 \$   | crossing state border DE/MD      |     |           |       | BD    | 37.6  | 1:53     | 06/25/09 18:05 |
|       |          | State Inspection took 30 minutes |     |           |       |       |       |          |                |
| 0.8   | I95 \$   | ELK MILLS                        | SE  | I95 X109  | MD    | 38.3  | 1:54  | 06/25/09 | 18:06          |
| 14.8  | I95      | AIKEN                            | N   | I95 X93   | MD    | 53.2  | 2:08  | 06/25/09 | 18:20          |
| 8.9   | S222     | CONOWINGO                        |     | U1 S222   | MD    | 62.1  | 2:21  | 06/25/09 | 18:33          |
| 30.0  | U1       | FULLERTON                        | SW  | I695X32   | MD    | 92.1  | 3:00  | 06/25/09 | 19:12          |
| 8.2   | I695     | TIMONIUM                         | S   | I695I83   | MD    | 100.3 | 3:09  | 06/25/09 | 19:21          |
| 1.5   | I695     | I83 BALTIMORE                    | N   | I695I83   | MD    | 101.8 | 3:11  | 06/25/09 | 19:23          |
| 10.1  | I695     | BALTIMORE                        | W   | I695I70   | MD    | 112.0 | 3:22  | 06/25/09 | 19:34          |
| 4.6   | I70      | DANIELS                          | S   | I70 X87   | MD    | 116.6 | 3:26  | 06/25/09 | 19:38          |
| 23.1  | U29      | FOUR CORNERS                     | SW  | I495X30   | MD    | 139.7 | 3:53  | 06/25/09 | 20:05          |
|       |          | Rest 30 minutes                  |     |           |       |       |       |          |                |
| 9.5   | I495     | EMERY CORNERS                    | E   | I495X39   | MD    | 149.2 | 4:34  | 06/25/09 | 20:46          |
| 2.3   | I495     | crossing state border MD/VA      |     |           |       | BD    | 151.4 | 5:06     | 06/25/09 21:18 |
|       |          | State Inspection took 30 minutes |     |           |       |       |       |          |                |
| 14.6  | I495     | SPRINGFIELD                      | N   | I495I95   | VA    | 166.1 | 5:22  | 06/25/09 | 21:34          |
| 92.3  | I95      | RICHMOND                         | NW  | I64 I95   | VA    | 258.3 | 6:50  | 06/25/09 | 23:02          |
| 3.4   | I64      | I95 RICHMOND                     | N   | I64 I95   | VA    | 261.7 | 6:53  | 06/25/09 | 23:05          |
| 65.0  | I95      | EMPORIA                          | N   | I95 X11   | VA    | 326.7 | 7:58  | 06/26/09 | 00:10          |
| 11.2  | I95      | crossing state border NC/VA      |     |           |       | BD    | 337.9 | 8:38     | 06/26/09 00:50 |
|       |          | Rest 30 minutes                  |     |           |       |       |       |          |                |
|       |          | State Inspection took 30 minutes |     |           |       |       |       |          |                |
| 182.1 | I95      | ROWLAND                          | SW  | I95 X2    | NC    | 520.0 | 11:45 | 06/26/09 | 03:57          |
| 0.1   | I95      | crossing state border NC/SC      |     |           |       | BD    | 520.1 | 12:15    | 06/26/09 04:27 |
|       |          | State Inspection took 30 minutes |     |           |       |       |       |          |                |
|       |          | Rest 30 minutes                  |     |           |       |       |       |          |                |
| 102.4 | I95      | SANTEE                           | S   | I95 X97   | SC    | 622.4 | 14:12 | 06/26/09 | 06:24          |
| 22.3  | U301     | ORANGEBURG                       |     | U301U601  | SC    | 644.7 | 14:35 | 06/26/09 | 06:47          |
| 18.4  | U301     | U601 BAMBERG                     |     | U301U78   | SC    | 663.1 | 14:53 | 06/26/09 | 07:05          |
| 14.9  | U78      | BLACKVILLE                       |     | U78 S3    | SC    | 678.0 | 15:11 | 06/26/09 | 07:23          |
| 10.8  | S3       | BARNWELL                         | S   | U278S3    | SC    | 688.8 | 15:27 | 06/26/09 | 07:39          |



**PSEG Site  
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Total elapsed time: 15:27      Total trip mileage: 688.8      Impedance: 688.0

Mileage by State :

DE: 16.3    MD: 113.9    NC: 182.1    NJ: 21.3    SC: 168.8    VA: 186.5

Mileage by Sign Type:

1-INTERSTATE: 540.5      2-US: 108.7      3-STATE: 22.7      5-COUNTY: 4.7  
6-LOCAL: 12.3

Mileage by Lane Type:

1-Multi-Lane Controlled Access: 540.5      3-Multi-Lane Divided Highway: 63.8  
5-Principle Road: 56.8      6-Through Road: 10.8  
7-Other: 17.0

Mileage by Tribal Lands:

Total Outside Tribal Lands : 688.8  
Total Inside Tribal Lands : 0.0

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: SALEM NP      NJ  
TO : BARNWELL      S      U278S3      SC

| -----       |       |       |       |        |       |       |        |       |       |       |       |       |
|-------------|-------|-------|-------|--------|-------|-------|--------|-------|-------|-------|-------|-------|
| ST          | MILES | 0     | >0.0  | 22.7   | 59.7  | 139   | 326    | 821   | 1861  | 3326  | 5815  |       |
|             |       |       | -22.7 | -59.7  | -139  | -326  | -821   | -1861 | -3326 | -5815 | -9996 | >9996 |
| -----       |       |       |       |        |       |       |        |       |       |       |       |       |
| DE          | 16.3  | 0.94  | 0.24  | 0.93   | 1.55  | 2.04  | 3.38   | 3.56  | 1.53  | 1.34  | 0.60  | 0.14  |
| MD          | 113.9 | 4.50  | 1.53  | 8.92   | 14.06 | 13.87 | 13.95  | 13.03 | 16.63 | 14.86 | 8.61  | 3.91  |
| NJ          | 21.3  | 4.37  | 3.43  | 2.66   | 2.36  | 1.85  | 3.25   | 1.70  | 0.99  | 0.55  | 0.14  | 0.00  |
| NC          | 182.1 | 9.05  | 27.62 | 42.00  | 30.09 | 27.49 | 26.36  | 13.94 | 4.44  | 1.05  | 0.06  | 0.00  |
| SC          | 168.8 | 22.05 | 42.19 | 30.51  | 15.61 | 20.55 | 20.09  | 11.81 | 4.66  | 1.20  | 0.06  | 0.07  |
| VA          | 186.5 | 9.45  | 14.99 | 20.88  | 25.55 | 25.70 | 33.45  | 27.00 | 14.91 | 9.51  | 3.36  | 1.73  |
| TOTALS      |       |       |       |        |       |       |        |       |       |       |       |       |
|             | 688.8 | 50.36 | 90.00 | 105.90 | 89.22 | 91.50 | 100.48 | 71.04 | 43.16 | 28.51 | 12.83 | 5.85  |
| PERCENTAGES |       |       |       |        |       |       |        |       |       |       |       |       |
|             |       | 7.31  | 13.07 | 15.37  | 12.95 | 13.28 | 14.59  | 10.31 | 6.27  | 4.14  | 1.86  | 0.85  |

BASIS: 2000 Census data

RADTRAN Input Data      RURAL      SUBURBAN      URBAN  
WEIGHTED POPULATION  
People/sq. mi.      43.1      934.4      6274.3  
People/sq. km.      16.7      360.8      2422.5

|             |       |       |      |        |
|-------------|-------|-------|------|--------|
| DISTANCE    |       |       |      | TOTALS |
| Miles       | 335.5 | 306.2 | 47.2 | 688.8  |
| Kilometers  | 539.9 | 492.7 | 75.9 | 1108.5 |
| Percentages | 48.7  | 44.5  | 6.9  |        |

BASIS (people/sq mi.)      <139      139-3326      >3326

Population within 800 meter Buffer Zone by State:

DE 20882    MD 218122    NJ 8552    NC 46512    SC 42498    VA 157765

Total Population within 800 meter Buffer Zone: 494331

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

**3 TRAGIS GENERATED INPUT FOR RADTRAN**

```
[TRAGIS]
TRAGIS Version=1.5.4
Mode=H
Network Version=4.0
Census Data=2000
Buffer Zone=800
[ROUTEINFO]
From CITY=SALEM NP
From STATE=NJ
From SUBNET=
To CITY=BARNWELL      S      U278S3
To STATE=SC
To SUBNET=
[DE]
Rural - KM= 5.9
Suburban - KM= 16.9
Urban - KM= 3.3
Total - KM= 26.2
Rural Pop Density= 20.6
Suburban Pop Density= 409.8
Urban Pop Density=2303.2
[MD]
Rural - KM= 46.7
Suburban - KM= 92.5
Urban - KM= 44.1
Total - KM= 183.3
Rural Pop Density= 23.8
Suburban Pop Density= 482.5
Urban Pop Density=2524.1
[NJ]
Rural - KM= 20.6
Suburban - KM= 12.5
Urban - KM= 1.1
Total - KM= 34.3
Rural Pop Density= 11.8
Suburban Pop Density= 353.9
Urban Pop Density=2025.9
[NC]
Rural - KM= 175.0
Suburban - KM= 116.2
Urban - KM= 1.8
Total - KM= 293.1
Rural Pop Density= 18.1
Suburban Pop Density= 276.5
Urban Pop Density=1834.3
[SC]
Rural - KM= 177.6
Suburban - KM= 91.9
Urban - KM= 2.1
Total - KM= 271.6
Rural Pop Density= 11.9
Suburban Pop Density= 299.0
Urban Pop Density=1953.4
```

**PSEG Site  
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[VA]

Rural - KM= 114.1

Suburban - KM= 162.6

Urban - KM= 23.5

Total - KM= 300.1

Rural Pop Density= 19.6

Suburban Pop Density= 382.2

Urban Pop Density=2355.2

[Total]

Rural - KM= 539.9

Suburban - KM= 492.7

Urban - KM= 75.9

Total - KM=1108.5

Rural Pop Density= 16.7

Suburban Pop Density= 360.8

Urban Pop Density=2422.5

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

**4 RADTRAN INPUT**

The RADCAT input screens are reproduced below.

The screenshot displays the Radcat 2.3 software window titled "Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC [unsaved]". The interface includes a menu bar with "File" and "Edit", a toolbar with icons for file operations, and a tabbed interface with tabs for "Title", "Package", "Radionuclides", "Vehicle", "Link", "Stop", "Handling", "Accident", and "Parameters". The "Accident" tab is currently selected. Below the tabs, there is a "Title:" field containing the text "Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC" and a large "Remarks" text area. At the bottom of the window, there are three sections: "Accident Options" with three checked checkboxes ("Incident Free", "Accident", and "SI Output"), "Output Level" with four radio buttons (1, 2, 3, and 4, with 1 selected), and "Health Effects" with two radio buttons ("Rem/Person-rem" and "Latent Cancer Fatalities", with "Rem/Person-rem" selected). Above these sections are two buttons: "Add Remark" and "Remove Remark".

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

Icons: New, Open, Save, Print, Find, Copy, Paste, Undo, Redo, Help

Buttons: Title, Package, Radionuclides, Vehicle, Link, Stop, Handling, Accident, Parameters

| Name      | Long Dim (m) | Dose Rate (mrem/h) | Gamma Fraction | Neutron Fraction |
|-----------|--------------|--------------------|----------------|------------------|
| PACKAGE_1 | 5.20E00      | 1.39E01            | 1.00E00        | 0.00E00          |

Add Package Remove Package

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

Title Package **Radionuclides** Vehicle Link Stop Handling Accident Parameters

| PACKAGE_1 | Radionuclide | Phys/Chem Group | Curies   |
|-----------|--------------|-----------------|----------|
| H3WTR     | CO60         | Cor             | 1.04E03  |
| H3GAS     | CO58         | Cor             | 1.14E03  |
| BE10      | NI63         | Cor             | 1.09E03  |
| C14ORG    | CR51         | Cor             | 5.24E03  |
| C14GAS    | FE55         | Cor             | 2.60E03  |
| NA22      | FE59         | Cor             | 5.33E-01 |
| P32       | MN54         | Cor             | 1.69E03  |
| S35       | NB95         | Cor             | 9.49E01  |
| CL36      | ZR95         | Cor             | 6.24E01  |
| CA41      | MO99         | Cor             | 3.25E03  |
| CA45      | ZN65         | Cor             | 4.16E02  |
| SC46      | H3WTR        | gas             | 1.61E00  |
| CR51      | C14ORG       | gas             | 2.85E-01 |
| MN54      | BA140        | part            | 3.40E02  |
| FE55      | PU241        | part            | 3.39E-01 |
| CO57      | CE141        | part            | 3.12E01  |
| CO58      | CE144        | part            | 1.69E02  |
| FE59      | EU154        | part            | 3.51E00  |
| NI59      | PM147        | part            | 3.12E01  |
| CO60      | SR89         | part            | 2.60E02  |
| NI63      | SR90         | part            | 1.56E02  |
| ZN65      | Y90          | part            | 1.56E02  |
| GA67      | Y91          | part            | 4.81E01  |
|           | TE125M       | part            | 6.63E01  |
|           | TE127M       | part            | 4.94E02  |
|           | TE129M       | part            | 5.20E02  |
|           | TE132        | part            | 1.43E03  |
|           | CS134        | Cs              | 4.16E05  |
|           | CS137        | Cs              | 3.12E05  |
|           | I131         | Cs              | 3.38E04  |
|           | RB86         | Cs              | 2.21E02  |
|           | RU103        | Ru              | 3.12E01  |
|           | RU106        | Ru              | 7.80E01  |

Add Library Radionuclide >

Modify User Defined Radionuclides

Add User Defined Radionuclide >

< Remove Radionuclide

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

Title Package Radionuclides **Vehicle** Link Stop Handling Accident Parameters

| Vehicle Name | Number of Shipments | Vehicle Size (m) | Vehicle Dose Rate (mrem/h) | Gamma Fraction | Neutron Fraction | Crew Size | Crew Distance (m) | Crew Shielding Factor | Crew View (m) | Exclusive Use |
|--------------|---------------------|------------------|----------------------------|----------------|------------------|-----------|-------------------|-----------------------|---------------|---------------|
| VEHICLE_1    | 1.00E00             | 5.20E00          | 1.39E01                    | 1.00E00        | 0.00E00          | 2.00E00   | 4.00E00           | 1.00E00               | 1.00E00       | Yes           |

Add Vehicle Remove Vehicle

Package Number of Packages

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC: Fatalities

File Edit

Title Package Radionuclides Vehicle **Link** Stop Handling Accident Parameters

| Link Name  | Vehicle   | Length (km) | Speed (km/h) | Population Density (persons/km <sup>2</sup> ) | Vehicle Density (vehicles/hr) | Persons per Vehicle | Accident Rate (accidents/veh-km) | Fatalities per Accident | Zon  |
|------------|-----------|-------------|--------------|-----------------------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|------|
| RURAL_DE   | VEHICLE_1 | 5.90E00     | 8.89E01      | 2.06E01                                       | 5.30E03                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Rura |
| SUBURBN_DE | VEHICLE_1 | 1.69E01     | 8.89E01      | 4.10E02                                       | 7.60E02                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Subu |
| URBAN_DE   | VEHICLE_1 | 3.30E00     | 8.89E01      | 2.30E03                                       | 2.40E03                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Urba |
| RURAL_MD   | VEHICLE_1 | 4.67E01     | 8.89E01      | 2.38E01                                       | 5.30E02                       | 1.50E00             | 5.40E-07                         | 1.20E-02                | Rura |
| SUBURBN_MD | VEHICLE_1 | 9.25E01     | 8.89E01      | 4.82E02                                       | 7.60E02                       | 1.50E00             | 5.40E-07                         | 1.20E-02                | Subu |
| URBAN_MD   | VEHICLE_1 | 4.41E01     | 8.89E01      | 2.52E03                                       | 2.40E03                       | 1.50E00             | 5.40E-07                         | 1.20E-02                | Urba |
| RURAL_NJ   | VEHICLE_1 | 2.06E01     | 8.89E01      | 1.18E01                                       | 5.30E02                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Rura |
| SUBURBN_NJ | VEHICLE_1 | 1.25E01     | 8.89E01      | 3.54E02                                       | 7.60E02                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Subu |
| URBAN_NJ   | VEHICLE_1 | 1.10E00     | 8.89E01      | 2.03E03                                       | 2.40E03                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Urba |
| RURAL_NC   | VEHICLE_1 | 1.75E02     | 8.89E01      | 1.81E01                                       | 5.30E02                       | 1.50E00             | 3.46E-07                         | 4.25E-02                | Rura |
| SUBURBN_NC | VEHICLE_1 | 1.16E02     | 8.89E01      | 2.76E02                                       | 7.60E02                       | 1.50E00             | 3.46E-07                         | 4.25E-02                | Subu |
| URBAN_NC   | VEHICLE_1 | 1.80E00     | 8.89E01      | 1.83E03                                       | 2.40E03                       | 1.50E00             | 3.46E-07                         | 4.25E-02                | Urba |
| RURAL_SC   | VEHICLE_1 | 1.78E02     | 8.89E01      | 1.19E01                                       | 5.30E02                       | 1.50E00             | 3.15E-07                         | 2.79E-02                | Rura |
| SUBURBN_SC | VEHICLE_1 | 9.19E01     | 8.89E01      | 2.99E02                                       | 7.60E02                       | 1.50E00             | 3.15E-07                         | 2.79E-02                | Subu |
| URBAN_SC   | VEHICLE_1 | 2.10E00     | 8.89E01      | 1.95E03                                       | 2.40E03                       | 1.50E00             | 3.15E-07                         | 2.79E-02                | Urba |
| RURAL_VA   | VEHICLE_1 | 1.14E02     | 8.89E01      | 1.96E01                                       | 5.30E02                       | 1.50E00             | 3.93E-07                         | 4.10E-02                | Rura |
| SUBURBN_VA | VEHICLE_1 | 1.63E02     | 8.89E01      | 3.82E02                                       | 7.60E02                       | 1.50E00             | 3.93E-07                         | 4.10E-02                | Subu |
| URBAN_VA   | VEHICLE_1 | 2.35E01     | 8.89E01      | 2.36E03                                       | 2.40E03                       | 1.50E00             | 3.93E-07                         | 4.10E-02                | Urba |

Add Link Remove Link Import Web Trags

Injuries per Accident in Column Labeled “Fatalities per Accident”

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC: Injuries

File Edit

Title Package Radionuclides Vehicle **Link** Stop Handling Accident Parameters

| Link Name  | Vehicle   | Length (km) | Speed (km/h) | Population Density (persons/km <sup>2</sup> ) | Vehicle Density (vehicles/hr) | Persons per Vehicle | Accident Rate (accidents/veh-km) | Fatalities per Accident |
|------------|-----------|-------------|--------------|-----------------------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|
| RURAL_DE   | VEHICLE_1 | 5.90E00     | 8.89E01      | 2.06E01                                       | 5.30E03                       | 1.50E00             | 5.18E-07                         | 6.60E-01                |
| SUBURBN_DE | VEHICLE_1 | 1.69E01     | 8.89E01      | 4.10E02                                       | 7.60E02                       | 1.50E00             | 5.18E-07                         | 6.60E-01                |
| URBAN_DE   | VEHICLE_1 | 3.30E00     | 8.89E01      | 2.30E03                                       | 2.40E03                       | 1.50E00             | 5.18E-07                         | 6.60E-01                |
| RURAL_MD   | VEHICLE_1 | 4.67E01     | 8.89E01      | 2.38E01                                       | 5.30E02                       | 1.50E00             | 5.40E-07                         | 8.50E-01                |
| SUBURBN_MD | VEHICLE_1 | 9.25E01     | 8.89E01      | 4.82E02                                       | 7.60E02                       | 1.50E00             | 5.40E-07                         | 8.50E-01                |
| URBAN_MD   | VEHICLE_1 | 4.41E01     | 8.89E01      | 2.52E03                                       | 2.40E03                       | 1.50E00             | 5.40E-07                         | 8.50E-01                |
| RURAL_NJ   | VEHICLE_1 | 2.06E01     | 8.89E01      | 1.18E01                                       | 5.30E02                       | 1.50E00             | 5.65E-07                         | 6.92E-01                |
| SUBURBN_NJ | VEHICLE_1 | 1.25E01     | 8.89E01      | 3.54E02                                       | 7.60E02                       | 1.50E00             | 5.65E-07                         | 6.92E-01                |
| URBAN_NJ   | VEHICLE_1 | 1.10E00     | 8.89E01      | 2.03E03                                       | 2.40E03                       | 1.50E00             | 5.65E-07                         | 6.92E-01                |
| RURAL_NC   | VEHICLE_1 | 1.75E02     | 8.89E01      | 1.81E01                                       | 5.30E02                       | 1.50E00             | 3.46E-07                         | 9.16E-01                |
| SUBURBN_NC | VEHICLE_1 | 1.16E02     | 8.89E01      | 2.76E02                                       | 7.60E02                       | 1.50E00             | 3.46E-07                         | 9.16E-01                |
| URBAN_NC   | VEHICLE_1 | 1.80E00     | 8.89E01      | 1.83E03                                       | 2.40E03                       | 1.50E00             | 3.46E-07                         | 9.16E-01                |
| RURAL_SC   | VEHICLE_1 | 1.78E02     | 8.89E01      | 1.19E01                                       | 5.30E02                       | 1.50E00             | 3.15E-07                         | 7.21E-01                |
| SUBURBN_SC | VEHICLE_1 | 9.19E01     | 8.89E01      | 2.99E02                                       | 7.60E02                       | 1.50E00             | 3.15E-07                         | 7.21E-01                |
| URBAN_SC   | VEHICLE_1 | 2.10E00     | 8.89E01      | 1.95E03                                       | 2.40E03                       | 1.50E00             | 3.15E-07                         | 7.21E-01                |
| RURAL_VA   | VEHICLE_1 | 1.14E02     | 8.89E01      | 1.96E01                                       | 5.30E02                       | 1.50E00             | 3.93E-07                         | 7.89E-01                |
| SUBURBN_VA | VEHICLE_1 | 1.63E02     | 8.89E01      | 3.82E02                                       | 7.60E02                       | 1.50E00             | 3.93E-07                         | 7.89E-01                |
| URBAN_VA   | VEHICLE_1 | 2.35E01     | 8.89E01      | 2.36E03                                       | 2.40E03                       | 1.50E00             | 3.93E-07                         | 7.89E-01                |

Add Link Remove Link Import Web Trags

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

Icons: New, Open, Save, Print, Find, Copy, Paste, Undo, Redo

Tabbed Interface: Title, Package, Radionuclides, Vehicle, Link, **Stop**, Handling, Accident, Parameters

| Name   | Vehicle   | Min Distance (m) | Max Distance (m) | People or People/km <sup>2</sup> | Shielding Factor | Time (h) |
|--------|-----------|------------------|------------------|----------------------------------|------------------|----------|
| STOP_1 | VEHICLE_1 | 1.00E00          | 1.00E01          | 3.00E04                          | 1.00E00          | 1.50E00  |
| STOP_2 | VEHICLE_1 | 1.00E01          | 8.00E02          | 3.40E02                          | 2.00E-01         | 1.50E00  |

Add Stop Remove Stop

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC [unsaved]

File Edit

Icons: New, Open, Save, Print, Find, Copy, Paste, Undo, Redo

Tabbed Interface: Title, Package, Radionuclides, Vehicle, Link, Stop, **Handling**, Accident, Parameters

| Name     | Vehicle   | Number of Handlers | Distance (m) | Time (h) |
|----------|-----------|--------------------|--------------|----------|
| HANDLE_1 | VEHICLE_1 | 5.00E00            | 1.00E00      | 5.00E-01 |

Add Handling Remove Handling



**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC [unsaved]

File Edit









Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

| Index | Probability Fraction |
|-------|----------------------|
| 0     | 1.53E-08             |
| 1     | 5.88E-05             |
| 2     | 1.81E-06             |
| 3     | 7.49E-08             |
| 4     | 4.65E-07             |
| 5     | 3.31E-09             |
| 6     | 0.00E00              |
| 7     | 1.13E-08             |
| 8     | 8.03E-11             |
| 9     | 0.00E00              |
| 10    | 1.44E-10             |
| 11    | 1.02E-12             |
| 12    | 0.00E00              |
| 13    | 7.49E-11             |
| 14    | 0.00E00              |
| 15    | 0.00E00              |
| 16    | 0.00E00              |
| 17    | 5.86E-06             |
| 18    | 1.00E00              |

Add severity fraction Remove severity fraction

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit









Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

| Group | Deposition Velocity (m/s) |
|-------|---------------------------|
| Cor   | 1.00E-02                  |
| gas   | 0.00E00                   |
| part  | 1.00E-02                  |
| Cs    | 1.00E-02                  |
| Ru    | 1.00E-02                  |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell ...

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Release Fraction |
|-------|------------------|
| 0     | 2.00E-03         |
| 1     | 1.40E-03         |
| 2     | 1.80E-03         |
| 3     | 3.20E-03         |
| 4     | 1.80E-03         |
| 5     | 2.10E-03         |
| 6     | 3.10E-03         |
| 7     | 2.00E-02         |
| 8     | 2.20E-03         |
| 9     | 2.50E-03         |
| 10    | 2.00E-03         |
| 11    | 2.20E-03         |
| 12    | 2.50E-03         |
| 13    | 6.40E-03         |
| 14    | 5.90E-03         |
| 15    | 3.30E-03         |
| 16    | 3.30E-03         |
| 17    | 2.50E-03         |
| 18    | 0.00E00          |

# **PSEG Site ESP Application Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

gas

| Index | Release Fraction |
|-------|------------------|
| 0     | 8.00E-01         |
| 1     | 1.40E-01         |
| 2     | 1.80E-01         |
| 3     | 8.40E-01         |
| 4     | 4.30E-01         |
| 5     | 4.90E-01         |
| 6     | 8.50E-01         |
| 7     | 8.20E-01         |
| 8     | 8.90E-01         |
| 9     | 9.10E-01         |
| 10    | 8.20E-01         |
| 11    | 8.90E-01         |
| 12    | 9.10E-01         |
| 13    | 8.40E-01         |
| 14    | 8.50E-01         |
| 15    | 9.10E-01         |
| 16    | 9.10E-01         |
| 17    | 8.40E-01         |
| 18    | 0.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

part

| Index | Release Fraction |
|-------|------------------|
| 0     | 6.00E-07         |
| 1     | 1.00E-07         |
| 2     | 1.30E-07         |
| 3     | 3.80E-06         |
| 4     | 3.20E-07         |
| 5     | 3.70E-07         |
| 6     | 2.10E-06         |
| 7     | 6.10E-07         |
| 8     | 6.70E-07         |
| 9     | 6.80E-07         |
| 10    | 6.10E-07         |
| 11    | 6.70E-07         |
| 12    | 6.80E-07         |
| 13    | 1.80E-05         |
| 14    | 9.00E-06         |
| 15    | 6.80E-07         |
| 16    | 6.80E-07         |
| 17    | 6.70E-08         |
| 18    | 0.00E00          |

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cs

| Index | Release Fraction |
|-------|------------------|
| 0     | 2.40E-08         |
| 1     | 4.10E-09         |
| 2     | 5.40E-09         |
| 3     | 3.60E-05         |
| 4     | 1.30E-08         |
| 5     | 1.50E-08         |
| 6     | 2.70E-05         |
| 7     | 2.40E-08         |
| 8     | 2.70E-08         |
| 9     | 5.90E-06         |
| 10    | 2.40E-08         |
| 11    | 2.70E-08         |
| 12    | 5.90E-06         |
| 13    | 9.60E-05         |
| 14    | 5.50E-05         |
| 15    | 5.90E-06         |
| 16    | 5.90E-06         |
| 17    | 1.70E-05         |
| 18    | 0.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Ru

| Index | Release Fraction |
|-------|------------------|
| 0     | 6.00E-07         |
| 1     | 1.00E-07         |
| 2     | 1.30E-07         |
| 3     | 3.80E-06         |
| 4     | 3.20E-07         |
| 5     | 3.70E-07         |
| 6     | 2.10E-06         |
| 7     | 6.10E-07         |
| 8     | 6.70E-07         |
| 9     | 6.80E-07         |
| 10    | 6.10E-07         |
| 11    | 6.70E-07         |
| 12    | 6.80E-07         |
| 13    | 1.80E-05         |
| 14    | 9.00E-06         |
| 15    | 6.80E-07         |
| 16    | 6.80E-07         |
| 17    | 6.70E-08         |
| 18    | 0.00E00          |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

gas

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit



Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

part

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit



Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cs

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Ru

| Index | Aerosol Fraction |
|-------|------------------|
| 0     | 1.00E00          |
| 1     | 1.00E00          |
| 2     | 1.00E00          |
| 3     | 1.00E00          |
| 4     | 1.00E00          |
| 5     | 1.00E00          |
| 6     | 1.00E00          |
| 7     | 1.00E00          |
| 8     | 1.00E00          |
| 9     | 1.00E00          |
| 10    | 1.00E00          |
| 11    | 1.00E00          |
| 12    | 1.00E00          |
| 13    | 1.00E00          |
| 14    | 1.00E00          |
| 15    | 1.00E00          |
| 16    | 1.00E00          |
| 17    | 1.00E00          |
| 18    | 1.00E00          |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

# **PSEG Site ESP Application Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cor

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

part

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |



**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Cs

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC...

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

Ru

| Index | Respirable Fraction |
|-------|---------------------|
| 0     | 1.00E00             |
| 1     | 1.00E00             |
| 2     | 1.00E00             |
| 3     | 1.00E00             |
| 4     | 1.00E00             |
| 5     | 1.00E00             |
| 6     | 1.00E00             |
| 7     | 1.00E00             |
| 8     | 1.00E00             |
| 9     | 1.00E00             |
| 10    | 1.00E00             |
| 11    | 1.00E00             |
| 12    | 1.00E00             |
| 13    | 1.00E00             |
| 14    | 1.00E00             |
| 15    | 1.00E00             |
| 16    | 1.00E00             |
| 17    | 1.00E00             |
| 18    | 1.00E00             |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barn...

File Edit

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Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

☒ Use the default population densities  
☐ Specify your own population densities

people/km<sup>2</sup>

Add Isopleth P Remove Isopleth P

Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barn...

File Edit

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

☐ Pasquill ☒ Average ☐ User-Defined

| Isopleth Area Size (m <sup>2</sup> ) | Time Integrated Concentration | Center-Line Distance (m) |
|--------------------------------------|-------------------------------|--------------------------|
| 4.59E02                              | 3.42E-03                      | 3.30E01                  |
| 1.53E03                              | 1.72E-03                      | 6.80E01                  |
| 3.94E03                              | 8.58E-04                      | 1.05E02                  |
| 1.25E04                              | 3.42E-04                      | 2.44E02                  |
| 3.04E04                              | 1.72E-04                      | 3.69E02                  |
| 6.85E04                              | 8.58E-05                      | 5.61E02                  |
| 1.76E05                              | 3.42E-05                      | 1.02E03                  |
| 4.45E05                              | 1.72E-05                      | 1.63E03                  |
| 8.59E05                              | 8.58E-06                      | 2.31E03                  |
| 2.55E06                              | 3.42E-06                      | 4.27E03                  |
| 4.45E06                              | 1.72E-06                      | 5.47E03                  |
| 1.03E07                              | 8.58E-07                      | 1.11E04                  |
| 2.16E07                              | 3.42E-07                      | 1.31E04                  |
| 5.52E07                              | 1.72E-07                      | 2.13E04                  |
| 1.77E08                              | 8.58E-08                      | 4.05E04                  |
| 4.89E08                              | 5.42E-08                      | 7.00E04                  |
| 8.12E08                              | 4.30E-08                      | 8.99E04                  |
| 1.35E09                              | 3.42E-08                      | 1.21E05                  |

Add Average Area Remove Average Area

**PSEG Site  
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Radcat 2.3 Project Panthro - Calc. 2009-06944: Radwaste: PSEG ESP to Barn...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident **Parameters**

| Parameter                                                                      | Value    |
|--------------------------------------------------------------------------------|----------|
| Shielding factor for rural residents                                           | 1.00E00  |
| Shielding factor for suburban residents                                        | 8.70E-01 |
| Shielding factor for urban residents                                           | 1.80E-02 |
| Fraction of outside air in urban buildings                                     | 5.00E-02 |
| Fraction of urban population occupying the sidewalk                            | 4.80E-01 |
| Fraction of urban population inside buildings                                  | 5.20E-01 |
| Ratio of pedestrians/km <sup>2</sup> to residential population/km <sup>2</sup> | 6.00E00  |
| Minimum small package dimension for handling (m)                               | 5.00E-01 |
| Distance from shipment for maximum exposure (m)                                | 3.00E01  |
| Vehicle speed for maximum exposure (km/hr)                                     | 2.40E01  |
| Imposed regulatory limit on vehicle external dose                              | Yes      |
| Average breathing rate (m <sup>3</sup> /sec)                                   | 3.30E-04 |
| Cleanup Level (microcuries/m <sup>2</sup> )                                    | 2.00E-01 |
| Interdiction Threshold                                                         | 4.00E01  |
| Evacuation time for groundshine (days)                                         | 1.00E00  |
| Survey interval for groundshine (days)                                         | 1.00E01  |
| Occupational latent cancer fatalities per person-rem                           | 4.00E-04 |
| Public latent cancer fatalities per person-rem                                 | 5.00E-04 |
| Genetic effects per person-rem (public)                                        | 1.00E-04 |
| Campaign (year)                                                                | 8.33E-02 |
| Iodine                                                                         | I131     |
| Rem per curie thyroid via inhalation (Rem/Ci)                                  | 1.27E06  |
| Distance of freeway vehicle carrying radioactive cargo to pede...              | 3.00E01  |
| Distance of freeway vehicle carrying radioactive cargo to right-...            | 3.00E01  |
| Distance of freeway vehicle carrying radioactive cargo to maxi...              | 8.00E02  |
| Distance of non-freeway vehicle carrying radioactive cargo to p...             | 2.70E01  |
| Distance of non-freeway vehicle carrying radioactive cargo to ri...            | 3.00E01  |
| Distance of non-freeway vehicle carrying radioactive cargo to ...              | 8.00E02  |
| Distance of city street vehicle carrying radioactive cargo to ped...           | 5.00E00  |
| Distance of city street vehicle carrying radioactive cargo to righ...          | 8.00E00  |
| Distance of city street vehicle carrying radioactive cargo to ma...            | 8.00E02  |
| Perpendicular distance to freeway vehicle going in opposite dire...            | 1.50E01  |
| Perpendicular distance to non-freeway vehicle going in opposit...              | 3.00E00  |
| Perpendicular distance to city vehicle going in opposite direction...          | 3.00E00  |
| Perpendicular distance to all vehicles going in same direction (m)             | 4.00E00  |

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**5 RADTRAN FATALITIES CASE OUTPUT**

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AT 20:49:42 ] PAGE 1

|                   |     |                   |       |      |     |   |   |       |   |
|-------------------|-----|-------------------|-------|------|-----|---|---|-------|---|
| RRRR              | AAA | DDDD              | TTTTT | RRRR | AAA | N | N | 55555 | 6 |
| R R A A D D       | T   | R R A A NN        | N     | 5    | 6   |   |   |       |   |
| R R A A D D       | T   | R R A A N N N     | 5     | 6    |     |   |   |       |   |
| RRRR A A D D      | T   | RRRR A A N NN     | 5555  | 6666 |     |   |   |       |   |
| R R A A A A A D D | T   | R R A A A A A N N | 5     | 6    | 6   |   |   |       |   |
| R R A A D D       | T   | R R A A N N       | 5 5   | 6    | 6   |   |   |       |   |
| R R A A D D D D   | T   | R R A A N N       | 5555  | *    | 666 |   |   |       |   |

RADTRAN 5.6 February 20, 2006

INPUT ECHO

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TITLE Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC: Fatalities

INPUT STANDARD

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| STD: 0 10 18                                                                 | && DIMEN=NSEV NRAD NAREAS               |
| STD: 1 3 3 0                                                                 | && PARM=IRNKC IANA ISEN IPSQSB          |
| STD: .TRUE. .FALSE.                                                          | && FORM = UNIT, SI-UNITS?               |
| STD: 2.3E12                                                                  | && NEVAL FOR CF252                      |
| STD: 9.25E5 5.77E6 1.27E6                                                    | && RPCTHY FOR I125, I129, I131          |
| STD: 0.0 0.0 0.0 0.0 0.0                                                     | && TRANSFER GAMMA                       |
| STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0                                     | && TRANSFER NEUTRON                     |
| STD: 30 24                                                                   | && MITDDIST MITDVEL                     |
| STD: 1 2 .0018                                                               | && ITRAIN FMINCL DDRWEF                 |
| STD: 33 68 105 244 369                                                       | && CENTER LINE                          |
| STD: 561 1018 1628 2308 4269                                                 | && DISTANCES                            |
| STD: 5468 11136 13097 21334 40502                                            | && FOR AVERAGE                          |
| STD: 69986 89860 120878 0 0 0 0 0 0 0 0 0 0 0                                | && US CLOUD                             |
| STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05 |                                         |
| STD: 8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08 |                                         |
| STD: 8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0                                   | && AREADA                               |
| STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05 |                                         |
| STD: 8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08 |                                         |
| STD: 4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0 0                                 | && DFLEV                                |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  | && RADIST                               |
| STD: 0.5                                                                     | && SMLPKG                               |
| STD: 1.0 0.87 0.018                                                          | && SHIELDING FACTORS RR RS RU           |
| STD: 30 30 800                                                               | && OFFLINK {FREEWAY}                    |
| STD: 27 30 800                                                               | && OFFLINK {NON-FREEWAY}                |
| STD: 5 8 800                                                                 | && OFFLINK {CITY STREETS}               |
| STD: 30 30 800                                                               | && OFFLINK {RAILWAY}                    |
| STD: 200 200 1000                                                            | && OFFLINK {WATERWAY}                   |
| STD: 15 3 3 3 4                                                              | && ONLINK {FWAY NONFWY STREET RAIL ADJ} |
| STD: 6.0 4 40.0                                                              | && RPD FNOATT INTERDICT                 |
| STD: 0.05 0.2 3.3E-4                                                         | && BDF CULVL BRATE                      |
| STD: 0.9 0.1                                                                 | && UBF USWF                             |
| STD: 1.0 10.0 1.0                                                            | && EVACUATION SURVEY CAMPAIGN           |

**PSEG Site  
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Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC: Fatalities

```
STD: 0.0 0.0 1.5E-8 5.3E-8 && HIGHWAY - RURAL - NONRAD
STD: 0.0 0.0 3.7E-9 1.3E-8 && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0 0.0 2.1E-9 7.5E-9 && HIGHWAY - URBAN - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - R - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - S - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - U - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - R - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - S - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0 && PSPROB
STD: 0.67 0.67 0.42 && TIMENDE NON-DISPERSAL EVAC TIME
(LCF&EARLY)
STD: 2 2 1 && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.0E-4 && LCFCON(1), LCFCON(2), GECON
STD: R5INGEST.BIN && INGESTION FILE
OUTPUT BQ_SV
FORM UNIT
DIMEN 19 10 18
PARM 1 3 1 0
SEVERITY
  NPOP=1
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=2
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=3
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
RELEASE
  GROUP=Cor
    RFRAC
      0.0020
    0.0014 0.0018 0.0032 0.0018 0.0021
    0.0031 0.02 0.0022 0.0025 0.0020
    0.0022 0.0025 0.0064 0.0059 0.0033
    0.0033 0.0025 0.0
    AERSOL
      1.0
```

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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=gas

RFRAC

0.8

0.14 0.18 0.84 0.43 0.49  
0.85 0.82 0.89 0.91 0.82  
0.89 0.91 0.84 0.85 0.91  
0.91 0.84 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.0

GROUP=part

RFRAC

6.0E-7

1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7  
2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7  
6.7E-7 6.8E-7 1.8E-5 9.0E-6 6.8E-7  
6.8E-7 6.7E-8 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0

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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Cs

RFRAC

2.4E-8

4.1E-9 5.4E-9 3.6E-5 1.3E-8 1.5E-8  
2.7E-5 2.4E-8 2.7E-8 5.9E-6 2.4E-8  
2.7E-8 5.9E-6 9.6E-5 5.5E-5 5.9E-6  
5.9E-6 1.7E-5 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Ru

RFRAC

6.0E-7

1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7  
2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7  
6.7E-7 6.8E-7 1.8E-5 9.0E-6 6.8E-7  
6.8E-7 6.7E-8 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0

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```
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  RESP
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  LOS
    0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
  DEPVEL 0.01
PACKAGE PACKAGE_1 13.9 0.5 0.5 5.2
  CO60 1040.0 Cor
  CO58 1140.0 Cor
  NI63 1090.0 Cor
  CR51 5240.0 Cor
  FE55 2600.0 Cor
  FE59 0.533 Cor
  MN54 1690.0 Cor
  NB95 94.9 Cor
  ZR95 62.4 Cor
  MO99 3250.0 Cor
  ZN65 416.0 Cor
  H3WTR 1.61 gas
  C14ORG 0.285 gas
  BA140 340.0 part
  PU241 0.339 part
  CE141 31.2 part
  CE144 169.0 part
  EU154 3.51 part
  PM147 31.2 part
  SR89 260.0 part
  SR90 156.0 part
  Y90 156.0 part
  Y91 48.1 part
  TE125M 66.3 part
  TE127M 494.0 part
  TE129M 520.0 part
  TE132 1430.0 part
  CS134 416000.0 Cs
  CS137 312000.0 Cs
  I131 33800.0 Cs
  RB86 221.0 Cs
  RU103 31.2 Ru
  RU106 78.0 Ru
END
VEHICLE -1 VEHICLE_1 1.39E01 1.0 0.0 5.2 1.0 2.0 4.0 1.0 1.0
  PACKAGE_1 1.0
FLAGS
```



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IACC 2  
IUOPT 2  
REGCHECK 1  
MODSTD  
DISTOFF FREEWAY 3.00E01 3.00E01 8.00E02  
DISTOFF SECONDARY 2.70E01 3.00E01 8.00E02  
DISTOFF STREET 5.00E00 8.00E00 8.00E02  
DISTON  
    FREEWAY 1.50E01  
    SECONDARY 3.00E00  
    STREET 3.00E00  
    ADJACENT 4.00E00  
BDF 5.00E-02  
BRATE 3.30E-04  
CULVL 2.00E-01  
EVACUATION 1.00E00  
GECON 1.00E-04  
INTERDICT 4.00E01  
LCFCON 5.00E-04 4.00E-04  
SURVEY 1.00E01  
UBF 5.20E-01  
USWF 4.80E-01  
CAMPAIGN 8.33E-02  
MITDDIST 3.00E01  
MITDVEL 2.40E01  
RPD 6.00E00  
RR 1.00E00  
RU 1.80E-02  
RS 8.70E-01  
SMALLPKG 5.00E-01  
RPCTHYROID  
    I131 1.27E06  
EOF  
LINK RURAL\_DE VEHICLE\_1 5.9 88.9 1.5 20.6 5301.5 5.18E-7 0.0108 R 1 1.0  
LINK SUBURBN\_DE VEHICLE\_1 16.9 88.9 1.5 409.8 760.0 5.18E-7 0.0108 S 1 1.0  
LINK URBAN\_DE VEHICLE\_1 3.3 88.9 1.5 2303.2 2400.0 5.18E-7 0.0108 U 1 1.0  
LINK RURAL\_MD VEHICLE\_1 46.7 88.9 1.5 23.8 530.0 5.4E-7 0.012 R 1 1.0  
LINK SUBURBN\_MD VEHICLE\_1 92.5 88.9 1.5 482.5 760.0 5.4E-7 0.012 S 1 1.0  
LINK URBAN\_MD VEHICLE\_1 44.1 88.9 1.5 2524.1 2400.0 5.4E-7 0.012 U 1 1.0  
LINK RURAL\_NJ VEHICLE\_1 20.6 88.9 1.5 11.8 530.0 5.65E-7 0.0214 R 1 1.0  
LINK SUBURBN\_NJ VEHICLE\_1 12.5 88.9 1.5 353.9 760.0 5.65E-7 0.0214 S 1 1.0  
LINK URBAN\_NJ VEHICLE\_1 1.1 88.9 1.5 2025.9 2400.0 5.65E-7 0.0214 U 1 1.0  
LINK RURAL\_NC VEHICLE\_1 175.0 88.9 1.5 18.1 530.0 3.46E-7 0.0425 R 1 1.0  
LINK SUBURBN\_NC VEHICLE\_1 116.2 88.9 1.5 276.5 760.0 3.46E-7 0.0425 S 1 1.0  
LINK URBAN\_NC VEHICLE\_1 1.8 88.9 1.5 1834.3 2400.0 3.46E-7 0.0425 U 1 1.0  
LINK RURAL\_SC VEHICLE\_1 177.6 88.9 1.5 11.9 530.0 3.15E-7 0.0279 R 1 1.0  
LINK SUBURBN\_SC VEHICLE\_1 91.9 88.9 1.5 299.0 760.0 3.15E-7 0.0279 S 1 1.0  
LINK URBAN\_SC VEHICLE\_1 2.1 88.9 1.5 1953.4 2400.0 3.15E-7 0.0279 U 1 1.0  
LINK RURAL\_VA VEHICLE\_1 114.1 88.9 1.5 19.6 530.0 3.93E-7 0.041 R 1 1.0  
LINK SUBURBN\_VA VEHICLE\_1 162.6 88.9 1.5 382.2 760.0 3.93E-7 0.041 S 1 1.0  
LINK URBAN\_VA VEHICLE\_1 23.5 88.9 1.5 2355.2 2400.0 3.93E-7 0.041 U 1 1.0  
  
STOP STOP\_1 VEHICLE\_1 30000.0 1.0 10.0 1.0 1.5

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STOP STOP\_2 VEHICLE\_1 340.0 10.0 800.0 0.2 1.5

HANDLING HANDLE\_1 VEHICLE\_1 5.0 1.0 0.5

EOF

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NON-RADIOLOGICAL DATA (ACCIDENTS and FATALITIES)

\*\*\*\*\*

HIGHWAY

|            | ACCIDENT RATE | ACCIDENTS | FATALITIES |
|------------|---------------|-----------|------------|
| RURAL_DE   | 5.18E-07      | 3.06E-06  | 3.30E-08   |
| SUBURBN_DE | 5.18E-07      | 8.75E-06  | 9.45E-08   |
| URBAN_DE   | 5.18E-07      | 1.71E-06  | 1.85E-08   |
| RURAL_MD   | 5.40E-07      | 2.52E-05  | 3.03E-07   |
| SUBURBN_MD | 5.40E-07      | 5.00E-05  | 5.99E-07   |
| URBAN_MD   | 5.40E-07      | 2.38E-05  | 2.86E-07   |
| RURAL_NJ   | 5.65E-07      | 1.16E-05  | 2.49E-07   |
| SUBURBN_NJ | 5.65E-07      | 7.06E-06  | 1.51E-07   |
| URBAN_NJ   | 5.65E-07      | 6.22E-07  | 1.33E-08   |
| RURAL_NC   | 3.46E-07      | 6.06E-05  | 2.57E-06   |
| SUBURBN_NC | 3.46E-07      | 4.02E-05  | 1.71E-06   |
| URBAN_NC   | 3.46E-07      | 6.23E-07  | 2.65E-08   |
| RURAL_SC   | 3.15E-07      | 5.59E-05  | 1.56E-06   |
| SUBURBN_SC | 3.15E-07      | 2.89E-05  | 8.08E-07   |
| URBAN_SC   | 3.15E-07      | 6.62E-07  | 1.85E-08   |
| RURAL_VA   | 3.93E-07      | 4.48E-05  | 1.84E-06   |
| SUBURBN_VA | 3.93E-07      | 6.39E-05  | 2.62E-06   |
| URBAN_VA   | 3.93E-07      | 9.24E-06  | 3.79E-07   |
| TOTALS:    | 8.03E-06      | 4.37E-04  | 1.33E-05   |

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REGULATORY CHECKS

FOR VEHICLE\_1 THE DOSE RATE AT 2 METERS COULD EXCEED 0.1 MSV/HR  
THE VEHICLE DOSE RATE HAS BEEN RESET TO EQUAL 0.13 MSV/HR

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CALCULATIONAL INFORMATION

FOR VEHICLE\_1 AREAS WITH TOTAL CONTAMINATION RATIO GREATER THAN 40.000  
(THE AREAS MARKED WITH AN 'X' ARE INTERDICTED AND HAVE  
NO 50 YEAR GROUND SHINE DOSE AND NO INGESTION DOSE.)

| AREA/SEVERITY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| 1             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 2             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 3             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 4             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 5             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 6             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 7             | X | - | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 8             | - | - | - | X | - | - | X | X | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 9             | - | - | - | - | - | - | - | X | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 10            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 11            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 12            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 13            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 14            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 15            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 16            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 17            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 18            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |

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INCIDENT-FREE SUMMARY

\*\*\*\*\* \*\*\*\*\*

IN-TRANSIT POPULATION EXPOSURE IN PERSON-SV  
\*INPUT DATA WERE ALTERED WITH REGULATORY CHECKS

|            | PASSENGER | CREW     | OFF LINK | ON LINK  | TOTALS   |
|------------|-----------|----------|----------|----------|----------|
| RURAL_DE   | 0.00E+00  | 2.62E-06 | 4.12E-08 | 4.12E-06 | 6.77E-06 |
| SUBURBN_DE | 0.00E+00  | 7.49E-06 | 2.04E-06 | 1.69E-06 | 1.12E-05 |
| URBAN_DE   | 0.00E+00  | 1.46E-06 | 4.64E-08 | 1.04E-06 | 2.55E-06 |
| RURAL_MD   | 0.00E+00  | 2.07E-05 | 3.77E-07 | 3.26E-06 | 2.43E-05 |
| SUBURBN_MD | 0.00E+00  | 4.10E-05 | 1.32E-05 | 9.25E-06 | 6.34E-05 |
| URBAN_MD   | 0.00E+00  | 1.95E-05 | 6.79E-07 | 1.39E-05 | 3.42E-05 |
| RURAL_NJ   | 0.00E+00  | 9.13E-06 | 8.24E-08 | 1.44E-06 | 1.07E-05 |
| SUBURBN_NJ | 0.00E+00  | 5.54E-06 | 1.30E-06 | 1.25E-06 | 8.09E-06 |
| URBAN_NJ   | 0.00E+00  | 4.88E-07 | 1.36E-08 | 3.47E-07 | 8.49E-07 |
| RURAL_NC   | 0.00E+00  | 7.76E-05 | 1.07E-06 | 1.22E-05 | 9.09E-05 |
| SUBURBN_NC | 0.00E+00  | 5.15E-05 | 9.47E-06 | 1.16E-05 | 7.26E-05 |
| URBAN_NC   | 0.00E+00  | 7.98E-07 | 2.01E-08 | 5.68E-07 | 1.39E-06 |
| RURAL_SC   | 0.00E+00  | 7.87E-05 | 7.16E-07 | 1.24E-05 | 9.18E-05 |
| SUBURBN_SC | 0.00E+00  | 4.07E-05 | 8.10E-06 | 9.19E-06 | 5.80E-05 |
| URBAN_SC   | 0.00E+00  | 9.31E-07 | 2.50E-08 | 6.63E-07 | 1.62E-06 |
| RURAL_VA   | 0.00E+00  | 5.06E-05 | 7.58E-07 | 7.96E-06 | 5.93E-05 |
| SUBURBN_VA | 0.00E+00  | 7.21E-05 | 1.83E-05 | 1.63E-05 | 1.07E-04 |
| URBAN_VA   | 0.00E+00  | 1.04E-05 | 3.38E-07 | 7.42E-06 | 1.82E-05 |
|            |           |          |          |          |          |
| RURAL      | 0.00E+00  | 2.39E-04 | 3.05E-06 | 4.14E-05 | 2.84E-04 |
| SUBURB     | 0.00E+00  | 2.18E-04 | 5.24E-05 | 4.93E-05 | 3.20E-04 |
| URBAN      | 0.00E+00  | 3.36E-05 | 1.12E-06 | 2.40E-05 | 5.87E-05 |
|            |           |          |          |          |          |
| TOTALS:    | 0.00E+00  | 4.91E-04 | 5.66E-05 | 1.15E-04 | 6.62E-04 |

MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

VEHICLE\_1 5.92E-09 SV

STOP EXPOSURE IN PERSON-SV

|              |        |          |
|--------------|--------|----------|
| ANNULAR AREA | STOP_1 | 9.43E-04 |
| ANNULAR AREA | STOP_2 | 4.07E-06 |
| TOTAL:       |        | 9.47E-04 |

HANDLING EXPOSURE IN PERSON-SV

| HANDLING | VEHICLE   | MATERIAL  | METHOD      | DOSE     |
|----------|-----------|-----------|-------------|----------|
| HANDLE_1 | VEHICLE_1 | PACKAGE_1 | LINE-SOURCE | 1.17E-03 |
| TOTAL:   |           |           |             | 1.17E-03 |

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ACCIDENT SUMMARY

\*\*\*\*\*

EXPECTED VALUES OF POPULATION RISK IN PERSON-SV

|            | GROUND   | INHALED  | RESUSPD  | CLOUDSH  | TOTAL    |
|------------|----------|----------|----------|----------|----------|
| RURAL_DE   | 2.73E-11 | 1.73E-13 | 8.90E-18 | 6.91E-15 | 2.75E-11 |
| SUBURBN_DE | 1.56E-09 | 9.88E-12 | 5.07E-16 | 3.94E-13 | 1.57E-09 |
| URBAN_DE   | 4.96E-09 | 3.15E-11 | 1.62E-15 | 1.26E-12 | 5.00E-09 |
| RURAL_MD   | 2.60E-10 | 1.65E-12 | 8.48E-17 | 6.58E-14 | 2.62E-10 |
| SUBURBN_MD | 1.05E-08 | 6.64E-11 | 3.41E-15 | 2.64E-12 | 1.05E-08 |
| URBAN_MD   | 7.58E-08 | 4.81E-10 | 2.47E-14 | 1.92E-11 | 7.63E-08 |
| RURAL_NJ   | 5.96E-11 | 3.78E-13 | 1.94E-17 | 1.51E-14 | 6.00E-11 |
| SUBURBN_NJ | 1.08E-09 | 6.88E-12 | 3.53E-16 | 2.74E-13 | 1.09E-09 |
| URBAN_NJ   | 1.59E-09 | 1.01E-11 | 5.17E-16 | 4.01E-13 | 1.60E-09 |
| RURAL_NC   | 4.76E-10 | 3.02E-12 | 1.55E-16 | 1.20E-13 | 4.79E-10 |
| SUBURBN_NC | 4.82E-09 | 3.06E-11 | 1.57E-15 | 1.22E-12 | 4.86E-09 |
| URBAN_NC   | 1.44E-09 | 9.14E-12 | 4.69E-16 | 3.64E-13 | 1.45E-09 |
| RURAL_SC   | 2.89E-10 | 1.83E-12 | 9.41E-17 | 7.30E-14 | 2.91E-10 |
| SUBURBN_SC | 3.76E-09 | 2.38E-11 | 1.22E-15 | 9.50E-13 | 3.78E-09 |
| URBAN_SC   | 1.63E-09 | 1.03E-11 | 5.31E-16 | 4.12E-13 | 1.64E-09 |
| RURAL_VA   | 3.81E-10 | 2.42E-12 | 1.24E-16 | 9.64E-14 | 3.84E-10 |
| SUBURBN_VA | 1.06E-08 | 6.72E-11 | 3.45E-15 | 2.68E-12 | 1.07E-08 |
| URBAN_VA   | 2.74E-08 | 1.74E-10 | 8.93E-15 | 6.93E-12 | 2.76E-08 |
|            |          |          |          |          |          |
| RURAL      | 1.49E-09 | 9.47E-12 | 4.86E-16 | 3.78E-13 | 1.50E-09 |
| SUBURB     | 3.23E-08 | 2.05E-10 | 1.05E-14 | 8.16E-12 | 3.25E-08 |
| URBAN      | 1.13E-07 | 7.16E-10 | 3.67E-14 | 2.85E-11 | 1.14E-07 |
|            |          |          |          |          |          |
| TOTALS:    | 1.47E-07 | 9.30E-10 | 4.77E-14 | 3.71E-11 | 1.48E-07 |

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SOCIETAL INGESTION RISK - PERSON-SV

| LINK     | GONADS   | EFFECTIVE |
|----------|----------|-----------|
| RURAL_DE | 2.13E-11 | 2.09E-11  |
| RURAL_MD | 1.76E-10 | 1.73E-10  |
| RURAL_NJ | 8.12E-11 | 7.97E-11  |
| RURAL_NC | 4.23E-10 | 4.15E-10  |
| RURAL_SC | 3.90E-10 | 3.83E-10  |
| RURAL_VA | 3.13E-10 | 3.07E-10  |
| TOTAL    | 1.40E-09 | 1.38E-09  |

SOCIETAL INGESTION RISK BY ORGAN - PERSON-SV

| LINK     | BREAST   | LUNGS    | RED MARR | BONE SUR | THYROID  | REMAINDER |
|----------|----------|----------|----------|----------|----------|-----------|
| RURAL_DE | 1.71E-11 | 1.71E-11 | 1.95E-11 | 1.84E-11 | 1.89E-11 | 2.51E-11  |
| RURAL_MD | 1.41E-10 | 1.41E-10 | 1.61E-10 | 1.52E-10 | 1.56E-10 | 2.07E-10  |
| RURAL_NJ | 6.53E-11 | 6.52E-11 | 7.41E-11 | 7.00E-11 | 7.21E-11 | 9.56E-11  |
| RURAL_NC | 3.40E-10 | 3.39E-10 | 3.85E-10 | 3.64E-10 | 3.75E-10 | 4.97E-10  |
| RURAL_SC | 3.14E-10 | 3.13E-10 | 3.56E-10 | 3.36E-10 | 3.47E-10 | 4.59E-10  |
| RURAL_VA | 2.52E-10 | 2.51E-10 | 2.85E-10 | 2.70E-10 | 2.78E-10 | 3.68E-10  |
| TOTAL    | 1.13E-09 | 1.13E-09 | 1.28E-09 | 1.21E-09 | 1.25E-09 | 1.65E-09  |



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EXPECTED RISK VALUES - OTHER

| LINK       | EARLY<br>FATALITY | EARLY<br>MORBIDITY |
|------------|-------------------|--------------------|
| RURAL_DE   | 0.00E+00          | 0.00E+00           |
| SUBURBN_DE | 0.00E+00          | 0.00E+00           |
| URBAN_DE   | 0.00E+00          | 0.00E+00           |
| RURAL_MD   | 0.00E+00          | 0.00E+00           |
| SUBURBN_MD | 0.00E+00          | 0.00E+00           |
| URBAN_MD   | 0.00E+00          | 0.00E+00           |
| RURAL_NJ   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NJ | 0.00E+00          | 0.00E+00           |
| URBAN_NJ   | 0.00E+00          | 0.00E+00           |
| RURAL_NC   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NC | 0.00E+00          | 0.00E+00           |
| URBAN_NC   | 0.00E+00          | 0.00E+00           |
| RURAL_SC   | 0.00E+00          | 0.00E+00           |
| SUBURBN_SC | 0.00E+00          | 0.00E+00           |
| URBAN_SC   | 0.00E+00          | 0.00E+00           |
| RURAL_VA   | 0.00E+00          | 0.00E+00           |
| SUBURBN_VA | 0.00E+00          | 0.00E+00           |
| URBAN_VA   | 0.00E+00          | 0.00E+00           |
| TOTAL      | 0.00E+00          | 0.00E+00           |

EOI  
END OF RUN  
SUCCESSFUL COMPLETION

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**6 RADTRAN INJURIES CASE OUTPUT**

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|                 |     |               |       |      |     |   |   |       |   |
|-----------------|-----|---------------|-------|------|-----|---|---|-------|---|
| RRRR            | AAA | DDDD          | TTTTT | RRRR | AAA | N | N | 55555 | 6 |
| R R A A D D     | T   | R R A A NN    | N     | 5    | 6   |   |   |       |   |
| R R A A D D     | T   | R R A A N N N | 5     | 6    |     |   |   |       |   |
| RRRR A A D D    | T   | RRRR A A N NN | 5555  | 6666 |     |   |   |       |   |
| R R A A A A A   | D D | T R R A A A A | N N   | 5    | 6   | 6 |   |       |   |
| R R A A D D     | T   | R R A A N N   | 5 5   | 6    | 6   |   |   |       |   |
| R R A A D D D D | T   | R R A A N N   | 5555  | *    | 666 |   |   |       |   |

RADTRAN 5.6 February 20, 2006

INPUT ECHO

-----

TITLE Calc. 2009-06944: Radwaste: PSEG ESP to Barnwell SC: Injuries

INPUT STANDARD

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| STD: 0 10 18                                                                 | && DIMEN=NSEV NRAD NAREAS               |
| STD: 1 3 3 0                                                                 | && PARM=IRNKC IANA ISEN IPSQSB          |
| STD: .TRUE. .FALSE.                                                          | && FORM = UNIT, SI-UNITS?               |
| STD: 2.3E12                                                                  | && NEVAL FOR CF252                      |
| STD: 9.25E5 5.77E6 1.27E6                                                    | && RPCTHY FOR I125, I129, I131          |
| STD: 0.0 0.0 0.0 0.0 0.0                                                     | && TRANSFER GAMMA                       |
| STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0                                     | && TRANSFER NEUTRON                     |
| STD: 30 24                                                                   | && MITDDIST MITDVEL                     |
| STD: 1 2 .0018                                                               | && ITRAIN FMINCL DDRWEF                 |
| STD: 33 68 105 244 369                                                       | && CENTER LINE                          |
| STD: 561 1018 1628 2308 4269                                                 | && DISTANCES                            |
| STD: 5468 11136 13097 21334 40502                                            | && FOR AVERAGE                          |
| STD: 69986 89860 120878 0 0 0 0 0 0 0 0 0 0 0                                | && US CLOUD                             |
| STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05 |                                         |
| STD: 8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08 |                                         |
| STD: 8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0                                   | && AREADA                               |
| STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05 |                                         |
| STD: 8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08 |                                         |
| STD: 4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0 0                                 | && DFLEV                                |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  | && RADIST                               |
| STD: 0.5                                                                     | && SMLPKG                               |
| STD: 1.0 0.87 0.018                                                          | && SHIELDING FACTORS RR RS RU           |
| STD: 30 30 800                                                               | && OFFLINK {FREEWAY}                    |
| STD: 27 30 800                                                               | && OFFLINK {NON-FREEWAY}                |
| STD: 5 8 800                                                                 | && OFFLINK {CITY STREETS}               |
| STD: 30 30 800                                                               | && OFFLINK {RAILWAY}                    |
| STD: 200 200 1000                                                            | && OFFLINK {WATERWAY}                   |
| STD: 15 3 3 3 4                                                              | && ONLINK {FWAY NONFWY STREET RAIL ADJ} |
| STD: 6.0 4 40.0                                                              | && RPD FNOATT INTERDICT                 |
| STD: 0.05 0.2 3.3E-4                                                         | && BDF CULVL BRATE                      |
| STD: 0.9 0.1                                                                 | && UBF USWF                             |
| STD: 1.0 10.0 1.0                                                            | && EVACUATION SURVEY CAMPAIGN           |

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```
STD: 0.0 0.0 1.5E-8 5.3E-8 && HIGHWAY - RURAL - NONRAD
STD: 0.0 0.0 3.7E-9 1.3E-8 && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0 0.0 2.1E-9 7.5E-9 && HIGHWAY - URBAN - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - R - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - S - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - U - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - R - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - S - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0 && PSPROB
STD: 0.67 0.67 0.42 && TIMENDE NON-DISPERSAL EVAC TIME
(LCF&EARLY)
STD: 2 2 1 && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.0E-4 && LCFCON(1), LCFCON(2), GECON
STD: R5INGEST.BIN && INGESTION FILE
OUTPUT BQ_SV
FORM UNIT
DIMEN 19 10 18
PARAM 1 3 1 0
SEVERITY
  NPOP=1
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=2
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
  NPOP=3
    NMODE=1
      1.53E-8
    5.88E-5 1.81E-6 7.49E-8 4.65E-7 3.31E-9
    0.0 1.13E-8 8.03E-11 0.0 1.44E-10
    1.02E-12 0.0 7.49E-11 0.0 0.0
    0.0 5.86E-6 0.99993
RELEASE
  GROUP=Cor
    RFRAC
      0.0020
    0.0014 0.0018 0.0032 0.0018 0.0021
    0.0031 0.02 0.0022 0.0025 0.0020
    0.0022 0.0025 0.0064 0.0059 0.0033
    0.0033 0.0025 0.0
    AERSOL
      1.0
```

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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=gas

RFRAC

0.8

0.14 0.18 0.84 0.43 0.49  
0.85 0.82 0.89 0.91 0.82  
0.89 0.91 0.84 0.85 0.91  
0.91 0.84 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.0

GROUP=part

RFRAC

6.0E-7

1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7  
2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7  
6.7E-7 6.8E-7 1.8E-5 9.0E-6 6.8E-7  
6.8E-7 6.7E-8 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0

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1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Cs

RFRAC

2.4E-8

4.1E-9 5.4E-9 3.6E-5 1.3E-8 1.5E-8  
2.7E-5 2.4E-8 2.7E-8 5.9E-6 2.4E-8  
2.7E-8 5.9E-6 9.6E-5 5.5E-5 5.9E-6  
5.9E-6 1.7E-5 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

RESP

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0

LOS

0.0

0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0

DEPVEL 0.01

GROUP=Ru

RFRAC

6.0E-7

1.0E-7 1.3E-7 3.8E-6 3.2E-7 3.7E-7  
2.1E-6 6.1E-7 6.7E-7 6.8E-7 6.1E-7  
6.7E-7 6.8E-7 1.8E-5 9.0E-6 6.8E-7  
6.8E-7 6.7E-8 0.0

AERSOL

1.0

1.0 1.0 1.0 1.0 1.0  
1.0 1.0 1.0 1.0 1.0

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```
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  RESP
    1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
  LOS
    0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0
  DEPVEL 0.01
PACKAGE PACKAGE_1 13.9 0.5 0.5 5.2
  CO60 1040.0 Cor
  CO58 1140.0 Cor
  NI63 1090.0 Cor
  CR51 5240.0 Cor
  FE55 2600.0 Cor
  FE59 0.533 Cor
  MN54 1690.0 Cor
  NB95 94.9 Cor
  ZR95 62.4 Cor
  MO99 3250.0 Cor
  ZN65 416.0 Cor
  H3WTR 1.61 gas
  C14ORG 0.285 gas
  BA140 340.0 part
  PU241 0.339 part
  CE141 31.2 part
  CE144 169.0 part
  EU154 3.51 part
  PM147 31.2 part
  SR89 260.0 part
  SR90 156.0 part
  Y90 156.0 part
  Y91 48.1 part
  TE125M 66.3 part
  TE127M 494.0 part
  TE129M 520.0 part
  TE132 1430.0 part
  CS134 416000.0 Cs
  CS137 312000.0 Cs
  I131 33800.0 Cs
  RB86 221.0 Cs
  RU103 31.2 Ru
  RU106 78.0 Ru
END
VEHICLE -1 VEHICLE_1 1.39E01 1.0 0.0 5.2 1.0 2.0 4.0 1.0 1.0
  PACKAGE_1 1.0
FLAGS
```

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IACC 2  
IUOPT 2  
REGCHECK 1  
MODSTD  
DISTOFF FREEWAY 3.00E01 3.00E01 8.00E02  
DISTOFF SECONDARY 2.70E01 3.00E01 8.00E02  
DISTOFF STREET 5.00E00 8.00E00 8.00E02  
DISTON  
    FREEWAY 1.50E01  
    SECONDARY 3.00E00  
    STREET 3.00E00  
    ADJACENT 4.00E00  
BDF 5.00E-02  
BRATE 3.30E-04  
CULVL 2.00E-01  
EVACUATION 1.00E00  
GECON 1.00E-04  
INTERDICT 4.00E01  
LCFCON 5.00E-04 4.00E-04  
SURVEY 1.00E01  
UBF 5.20E-01  
USWF 4.80E-01  
CAMPAIGN 8.33E-02  
MITDDIST 3.00E01  
MITDVEL 2.40E01  
RPD 6.00E00  
RR 1.00E00  
RU 1.80E-02  
RS 8.70E-01  
SMALLPKG 5.00E-01  
RPCTHYROID  
    I131 1.27E06  
EOF  
LINK RURAL\_DE VEHICLE\_1 5.9 88.9 1.5 20.6 5301.5 5.18E-7 0.66 R 1 1.0  
LINK SUBURBN\_DE VEHICLE\_1 16.9 88.9 1.5 409.8 760.0 5.18E-7 0.66 S 1 1.0  
LINK URBAN\_DE VEHICLE\_1 3.3 88.9 1.5 2303.2 2400.0 5.18E-7 0.66 U 1 1.0  
LINK RURAL\_MD VEHICLE\_1 46.7 88.9 1.5 23.8 530.0 5.4E-7 0.85 R 1 1.0  
LINK SUBURBN\_MD VEHICLE\_1 92.5 88.9 1.5 482.5 760.0 5.4E-7 0.85 S 1 1.0  
LINK URBAN\_MD VEHICLE\_1 44.1 88.9 1.5 2524.1 2400.0 5.4E-7 0.85 U 1 1.0  
LINK RURAL\_NJ VEHICLE\_1 20.6 88.9 1.5 11.8 530.0 5.65E-7 0.692 R 1 1.0  
LINK SUBURBN\_NJ VEHICLE\_1 12.5 88.9 1.5 353.9 760.0 5.65E-7 0.692 S 1 1.0  
LINK URBAN\_NJ VEHICLE\_1 1.1 88.9 1.5 2025.9 2400.0 5.65E-7 0.692 U 1 1.0  
LINK RURAL\_NC VEHICLE\_1 175.0 88.9 1.5 18.1 530.0 3.46E-7 0.916 R 1 1.0  
LINK SUBURBN\_NC VEHICLE\_1 116.2 88.9 1.5 276.5 760.0 3.46E-7 0.916 S 1 1.0  
LINK URBAN\_NC VEHICLE\_1 1.8 88.9 1.5 1834.3 2400.0 3.46E-7 0.916 U 1 1.0  
LINK RURAL\_SC VEHICLE\_1 177.6 88.9 1.5 11.9 530.0 3.15E-7 0.721 R 1 1.0  
LINK SUBURBN\_SC VEHICLE\_1 91.9 88.9 1.5 299.0 760.0 3.15E-7 0.721 S 1 1.0  
LINK URBAN\_SC VEHICLE\_1 2.1 88.9 1.5 1953.4 2400.0 3.15E-7 0.721 U 1 1.0  
LINK RURAL\_VA VEHICLE\_1 114.1 88.9 1.5 19.6 530.0 3.93E-7 0.789 R 1 1.0  
LINK SUBURBN\_VA VEHICLE\_1 162.6 88.9 1.5 382.2 760.0 3.93E-7 0.789 S 1 1.0  
LINK URBAN\_VA VEHICLE\_1 23.5 88.9 1.5 2355.2 2400.0 3.93E-7 0.789 U 1 1.0  
  
STOP STOP\_1 VEHICLE\_1 30000.0 1.0 10.0 1.0 1.5

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STOP STOP\_2 VEHICLE\_1 340.0 10.0 800.0 0.2 1.5

HANDLING HANDLE\_1 VEHICLE\_1 5.0 1.0 0.5

EOF



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NON-RADIOLOGICAL DATA (ACCIDENTS and FATALITIES)  
\*\*\*\*\*

|            | ACCIDENT RATE | ACCIDENTS | FATALITIES |
|------------|---------------|-----------|------------|
| RURAL_DE   | 5.18E-07      | 3.06E-06  | 2.02E-06   |
| SUBURBN_DE | 5.18E-07      | 8.75E-06  | 5.78E-06   |
| URBAN_DE   | 5.18E-07      | 1.71E-06  | 1.13E-06   |
| RURAL_MD   | 5.40E-07      | 2.52E-05  | 2.14E-05   |
| SUBURBN_MD | 5.40E-07      | 5.00E-05  | 4.25E-05   |
| URBAN_MD   | 5.40E-07      | 2.38E-05  | 2.02E-05   |
| RURAL_NJ   | 5.65E-07      | 1.16E-05  | 8.05E-06   |
| SUBURBN_NJ | 5.65E-07      | 7.06E-06  | 4.89E-06   |
| URBAN_NJ   | 5.65E-07      | 6.22E-07  | 4.30E-07   |
| RURAL_NC   | 3.46E-07      | 6.06E-05  | 5.55E-05   |
| SUBURBN_NC | 3.46E-07      | 4.02E-05  | 3.68E-05   |
| URBAN_NC   | 3.46E-07      | 6.23E-07  | 5.70E-07   |
| RURAL_SC   | 3.15E-07      | 5.59E-05  | 4.03E-05   |
| SUBURBN_SC | 3.15E-07      | 2.89E-05  | 2.09E-05   |
| URBAN_SC   | 3.15E-07      | 6.62E-07  | 4.77E-07   |
| RURAL_VA   | 3.93E-07      | 4.48E-05  | 3.54E-05   |
| SUBURBN_VA | 3.93E-07      | 6.39E-05  | 5.04E-05   |
| URBAN_VA   | 3.93E-07      | 9.24E-06  | 7.29E-06   |
| TOTALS:    | 8.03E-06      | 4.37E-04  | 3.54E-04   |

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REGULATORY CHECKS

FOR VEHICLE\_1 THE DOSE RATE AT 2 METERS COULD EXCEED 0.1 MSV/HR  
THE VEHICLE DOSE RATE HAS BEEN RESET TO EQUAL 0.13 MSV/HR

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CALCULATIONAL INFORMATION

FOR VEHICLE\_1 AREAS WITH TOTAL CONTAMINATION RATIO GREATER THAN 40.000  
(THE AREAS MARKED WITH AN 'X' ARE INTERDICTED AND HAVE  
NO 50 YEAR GROUND SHINE DOSE AND NO INGESTION DOSE.)

| AREA/SEVERITY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| 1             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 2             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 3             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 4             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 5             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 6             | X | X | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 7             | X | - | X | X | X | X | X | X | X | X  | X  | X  | X  | X  | X  | X  | X  | X  | -  |
| 8             | - | - | - | X | - | - | X | X | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 9             | - | - | - | - | - | - | - | X | - | -  | -  | -  | -  | X  | X  | -  | -  | -  | -  |
| 10            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 11            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 12            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 13            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 14            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 15            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 16            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 17            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 18            | - | - | - | - | - | - | - | - | - | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |

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INCIDENT-FREE SUMMARY

\*\*\*\*\* \*\*\*\*\*

IN-TRANSIT POPULATION EXPOSURE IN PERSON-SV  
\*INPUT DATA WERE ALTERED WITH REGULATORY CHECKS

|            | PASSENGER | CREW     | OFF LINK | ON LINK  | TOTALS   |
|------------|-----------|----------|----------|----------|----------|
| RURAL_DE   | 0.00E+00  | 2.62E-06 | 4.12E-08 | 4.12E-06 | 6.77E-06 |
| SUBURBN_DE | 0.00E+00  | 7.49E-06 | 2.04E-06 | 1.69E-06 | 1.12E-05 |
| URBAN_DE   | 0.00E+00  | 1.46E-06 | 4.64E-08 | 1.04E-06 | 2.55E-06 |
| RURAL_MD   | 0.00E+00  | 2.07E-05 | 3.77E-07 | 3.26E-06 | 2.43E-05 |
| SUBURBN_MD | 0.00E+00  | 4.10E-05 | 1.32E-05 | 9.25E-06 | 6.34E-05 |
| URBAN_MD   | 0.00E+00  | 1.95E-05 | 6.79E-07 | 1.39E-05 | 3.42E-05 |
| RURAL_NJ   | 0.00E+00  | 9.13E-06 | 8.24E-08 | 1.44E-06 | 1.07E-05 |
| SUBURBN_NJ | 0.00E+00  | 5.54E-06 | 1.30E-06 | 1.25E-06 | 8.09E-06 |
| URBAN_NJ   | 0.00E+00  | 4.88E-07 | 1.36E-08 | 3.47E-07 | 8.49E-07 |
| RURAL_NC   | 0.00E+00  | 7.76E-05 | 1.07E-06 | 1.22E-05 | 9.09E-05 |
| SUBURBN_NC | 0.00E+00  | 5.15E-05 | 9.47E-06 | 1.16E-05 | 7.26E-05 |
| URBAN_NC   | 0.00E+00  | 7.98E-07 | 2.01E-08 | 5.68E-07 | 1.39E-06 |
| RURAL_SC   | 0.00E+00  | 7.87E-05 | 7.16E-07 | 1.24E-05 | 9.18E-05 |
| SUBURBN_SC | 0.00E+00  | 4.07E-05 | 8.10E-06 | 9.19E-06 | 5.80E-05 |
| URBAN_SC   | 0.00E+00  | 9.31E-07 | 2.50E-08 | 6.63E-07 | 1.62E-06 |
| RURAL_VA   | 0.00E+00  | 5.06E-05 | 7.58E-07 | 7.96E-06 | 5.93E-05 |
| SUBURBN_VA | 0.00E+00  | 7.21E-05 | 1.83E-05 | 1.63E-05 | 1.07E-04 |
| URBAN_VA   | 0.00E+00  | 1.04E-05 | 3.38E-07 | 7.42E-06 | 1.82E-05 |
|            |           |          |          |          |          |
| RURAL      | 0.00E+00  | 2.39E-04 | 3.05E-06 | 4.14E-05 | 2.84E-04 |
| SUBURB     | 0.00E+00  | 2.18E-04 | 5.24E-05 | 4.93E-05 | 3.20E-04 |
| URBAN      | 0.00E+00  | 3.36E-05 | 1.12E-06 | 2.40E-05 | 5.87E-05 |
|            |           |          |          |          |          |
| TOTALS:    | 0.00E+00  | 4.91E-04 | 5.66E-05 | 1.15E-04 | 6.62E-04 |

MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

VEHICLE\_1 5.92E-09 SV

STOP EXPOSURE IN PERSON-SV

|              |        |          |
|--------------|--------|----------|
| ANNULAR AREA | STOP_1 | 9.43E-04 |
| ANNULAR AREA | STOP_2 | 4.07E-06 |
| TOTAL:       |        | 9.47E-04 |

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HANDLING EXPOSURE IN PERSON-SV

| HANDLING | VEHICLE   | MATERIAL  | METHOD      | DOSE     |
|----------|-----------|-----------|-------------|----------|
| HANDLE_1 | VEHICLE_1 | PACKAGE_1 | LINE-SOURCE |          |
|          |           |           |             | 1.17E-03 |
|          |           |           | TOTAL:      | 1.17E-03 |

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ACCIDENT SUMMARY

\*\*\*\*\*

EXPECTED VALUES OF POPULATION RISK IN PERSON-SV

|            | GROUND   | INHALED  | RESUSPD  | CLOUDSH  | TOTAL    |
|------------|----------|----------|----------|----------|----------|
| RURAL_DE   | 2.73E-11 | 1.73E-13 | 8.90E-18 | 6.91E-15 | 2.75E-11 |
| SUBURBN_DE | 1.56E-09 | 9.88E-12 | 5.07E-16 | 3.94E-13 | 1.57E-09 |
| URBAN_DE   | 4.96E-09 | 3.15E-11 | 1.62E-15 | 1.26E-12 | 5.00E-09 |
| RURAL_MD   | 2.60E-10 | 1.65E-12 | 8.48E-17 | 6.58E-14 | 2.62E-10 |
| SUBURBN_MD | 1.05E-08 | 6.64E-11 | 3.41E-15 | 2.64E-12 | 1.05E-08 |
| URBAN_MD   | 7.58E-08 | 4.81E-10 | 2.47E-14 | 1.92E-11 | 7.63E-08 |
| RURAL_NJ   | 5.96E-11 | 3.78E-13 | 1.94E-17 | 1.51E-14 | 6.00E-11 |
| SUBURBN_NJ | 1.08E-09 | 6.88E-12 | 3.53E-16 | 2.74E-13 | 1.09E-09 |
| URBAN_NJ   | 1.59E-09 | 1.01E-11 | 5.17E-16 | 4.01E-13 | 1.60E-09 |
| RURAL_NC   | 4.76E-10 | 3.02E-12 | 1.55E-16 | 1.20E-13 | 4.79E-10 |
| SUBURBN_NC | 4.82E-09 | 3.06E-11 | 1.57E-15 | 1.22E-12 | 4.86E-09 |
| URBAN_NC   | 1.44E-09 | 9.14E-12 | 4.69E-16 | 3.64E-13 | 1.45E-09 |
| RURAL_SC   | 2.89E-10 | 1.83E-12 | 9.41E-17 | 7.30E-14 | 2.91E-10 |
| SUBURBN_SC | 3.76E-09 | 2.38E-11 | 1.22E-15 | 9.50E-13 | 3.78E-09 |
| URBAN_SC   | 1.63E-09 | 1.03E-11 | 5.31E-16 | 4.12E-13 | 1.64E-09 |
| RURAL_VA   | 3.81E-10 | 2.42E-12 | 1.24E-16 | 9.64E-14 | 3.84E-10 |
| SUBURBN_VA | 1.06E-08 | 6.72E-11 | 3.45E-15 | 2.68E-12 | 1.07E-08 |
| URBAN_VA   | 2.74E-08 | 1.74E-10 | 8.93E-15 | 6.93E-12 | 2.76E-08 |
|            |          |          |          |          |          |
| RURAL      | 1.49E-09 | 9.47E-12 | 4.86E-16 | 3.78E-13 | 1.50E-09 |
| SUBURB     | 3.23E-08 | 2.05E-10 | 1.05E-14 | 8.16E-12 | 3.25E-08 |
| URBAN      | 1.13E-07 | 7.16E-10 | 3.67E-14 | 2.85E-11 | 1.14E-07 |
|            |          |          |          |          |          |
| TOTALS:    | 1.47E-07 | 9.30E-10 | 4.77E-14 | 3.71E-11 | 1.48E-07 |

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SOCIETAL INGESTION RISK - PERSON-SV

| LINK     | GONADS   | EFFECTIVE |
|----------|----------|-----------|
| RURAL_DE | 2.13E-11 | 2.09E-11  |
| RURAL_MD | 1.76E-10 | 1.73E-10  |
| RURAL_NJ | 8.12E-11 | 7.97E-11  |
| RURAL_NC | 4.23E-10 | 4.15E-10  |
| RURAL_SC | 3.90E-10 | 3.83E-10  |
| RURAL_VA | 3.13E-10 | 3.07E-10  |
| TOTAL    | 1.40E-09 | 1.38E-09  |

SOCIETAL INGESTION RISK BY ORGAN - PERSON-SV

| LINK     | BREAST   | LUNGS    | RED MARR | BONE SUR | THYROID  | REMAINDER |
|----------|----------|----------|----------|----------|----------|-----------|
| RURAL_DE | 1.71E-11 | 1.71E-11 | 1.95E-11 | 1.84E-11 | 1.89E-11 | 2.51E-11  |
| RURAL_MD | 1.41E-10 | 1.41E-10 | 1.61E-10 | 1.52E-10 | 1.56E-10 | 2.07E-10  |
| RURAL_NJ | 6.53E-11 | 6.52E-11 | 7.41E-11 | 7.00E-11 | 7.21E-11 | 9.56E-11  |
| RURAL_NC | 3.40E-10 | 3.39E-10 | 3.85E-10 | 3.64E-10 | 3.75E-10 | 4.97E-10  |
| RURAL_SC | 3.14E-10 | 3.13E-10 | 3.56E-10 | 3.36E-10 | 3.47E-10 | 4.59E-10  |
| RURAL_VA | 2.52E-10 | 2.51E-10 | 2.85E-10 | 2.70E-10 | 2.78E-10 | 3.68E-10  |
| TOTAL    | 1.13E-09 | 1.13E-09 | 1.28E-09 | 1.21E-09 | 1.25E-09 | 1.65E-09  |

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EXPECTED RISK VALUES - OTHER

| LINK       | EARLY<br>FATALITY | EARLY<br>MORBIDITY |
|------------|-------------------|--------------------|
| RURAL_DE   | 0.00E+00          | 0.00E+00           |
| SUBURBN_DE | 0.00E+00          | 0.00E+00           |
| URBAN_DE   | 0.00E+00          | 0.00E+00           |
| RURAL_MD   | 0.00E+00          | 0.00E+00           |
| SUBURBN_MD | 0.00E+00          | 0.00E+00           |
| URBAN_MD   | 0.00E+00          | 0.00E+00           |
| RURAL_NJ   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NJ | 0.00E+00          | 0.00E+00           |
| URBAN_NJ   | 0.00E+00          | 0.00E+00           |
| RURAL_NC   | 0.00E+00          | 0.00E+00           |
| SUBURBN_NC | 0.00E+00          | 0.00E+00           |
| URBAN_NC   | 0.00E+00          | 0.00E+00           |
| RURAL_SC   | 0.00E+00          | 0.00E+00           |
| SUBURBN_SC | 0.00E+00          | 0.00E+00           |
| URBAN_SC   | 0.00E+00          | 0.00E+00           |
| RURAL_VA   | 0.00E+00          | 0.00E+00           |
| SUBURBN_VA | 0.00E+00          | 0.00E+00           |
| URBAN_VA   | 0.00E+00          | 0.00E+00           |
| TOTAL      | 0.00E+00          | 0.00E+00           |

EOI  
END OF RUN  
SUCCESSFUL COMPLETION



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**7A.3 NEW FUEL ANALYSIS**

This attachment contains the TRAGIS and RADCAT/RADTRAN input and output for one new fuel shipment from Richland, WA to the PSEG Site.

|   |                                          |        |
|---|------------------------------------------|--------|
| 1 | TRAGIS INPUT .....                       | 7A-109 |
| 2 | TRAGIS Output .....                      | 7A-111 |
| 3 | TRAGIS Generated Input for RADTRAN ..... | 7A-113 |
| 4 | RADTRAN Input.....                       | 7A-116 |
| 5 | RADTRAN Fatalities Case Output .....     | 7A-121 |
| 6 | RADTRAN Injuries Case Output .....       | 7A-129 |

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**1 TRAGIS INPUT**

The TRAGIS input screens are reproduced below.

WebTRAGIS Client Version: 4.6.2

| Block Nodes/Links                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Route Listings           | Route Maps |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------|--|-------|-----------|----|-----------------------|----|------------------------|----|---------------------|----|--------------------------|----|-----------------|----|-------------------|-----------|-----------------|----|---------------------|----|----------------------|----|--------------------|----|---------------------|----|----------------------|----|------------------------|----|----------------------|
| <b>Select Origin/Destination</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| <div style="display: flex; justify-content: space-between;"><div style="width: 45%;"><p><b>Mode</b></p><p><input checked="" type="radio"/> Highway   <input type="radio"/> Railroad   <input type="radio"/> Water   <input type="radio"/> InterModal</p><p><b>Origin</b></p><table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>State</th><th>Node Name</th></tr></thead><tbody><tr><td>OR</td><td>PWT AIRPORT</td></tr><tr><td>PA</td><td>QUINCY S28 S281</td></tr><tr><td>RI</td><td>RAYMOND U101S6</td></tr><tr><td>SC</td><td>REDMOND SE S202S520</td></tr><tr><td>SD</td><td>RENTON S I405X2</td></tr><tr><td>TN</td><td>RENTON W I405I5</td></tr><tr><td>TX</td><td><b>RICHLAND</b></td></tr><tr><td>UT</td><td>RICHLAND N S240LR4S</td></tr><tr><td>VA</td><td>RICHLAND NW S240LR10</td></tr><tr><td>VT</td><td>RICHLAND SE I182X5</td></tr><tr><td>WA</td><td>RITZVILLE I90X221</td></tr><tr><td>WI</td><td>RITZVILLE SW I90X220</td></tr><tr><td>WV</td><td>RIVERTON HGTS S518LOCL</td></tr><tr><td>WY</td><td>RLD AIRPORT</td></tr></tbody></table><p><b>Selected Node Number</b></p><p><input type="text" value="531100871"/></p><p><input type="checkbox"/> Enter Intermediate Node</p></div><div style="width: 50%;"><p><b>Calculate Route</b></p><p><b>Alternative Route Penalty</b><br/>Enter the alternative route penalty to be applied to next alternative routing calculation.</p><p>Link Penalty (1-100) <input type="text" value="10"/></p><p><b>Calculate Alternative Route</b></p></div></div> |                          |            |  | State | Node Name | OR | PWT AIRPORT           | PA | QUINCY S28 S281        | RI | RAYMOND U101S6      | SC | REDMOND SE S202S520      | SD | RENTON S I405X2 | TN | RENTON W I405I5   | TX        | <b>RICHLAND</b> | UT | RICHLAND N S240LR4S | VA | RICHLAND NW S240LR10 | VT | RICHLAND SE I182X5 | WA | RITZVILLE I90X221   | WI | RITZVILLE SW I90X220 | WV | RIVERTON HGTS S518LOCL | WY | RLD AIRPORT          |
| State                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Node Name                |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | PWT AIRPORT              |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| PA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | QUINCY S28 S281          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| RI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RAYMOND U101S6           |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| SC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | REDMOND SE S202S520      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| SD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RENTON S I405X2          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| TN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RENTON W I405I5          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| TX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>RICHLAND</b>          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| UT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RICHLAND N S240LR4S      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| VA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RICHLAND NW S240LR10     |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| VT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RICHLAND SE I182X5       |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| WA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RITZVILLE I90X221        |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| WI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RITZVILLE SW I90X220     |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| WV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RIVERTON HGTS S518LOCL   |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| WY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RLD AIRPORT              |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| <div style="display: flex; justify-content: space-between;"><div style="width: 45%;"><p><b>Destination</b></p><table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>State</th><th>Node Name</th></tr></thead><tbody><tr><td>MS</td><td>S BRUNSWICK E TNJTX8A</td></tr><tr><td>MT</td><td>S TOMS RIVER W TGSPX80</td></tr><tr><td>NC</td><td>SADDLE BROOK I80X62</td></tr><tr><td>ND</td><td>SADDLE BROOK NW TGSPX159</td></tr><tr><td>NE</td><td>SALEM S45 S49</td></tr><tr><td>NH</td><td>SALEM NW S49 LOCL</td></tr><tr><td><b>NJ</b></td><td><b>SALEM NP</b></td></tr><tr><td>NM</td><td>SAYREVILLE W TNJTX9</td></tr><tr><td>NV</td><td>SEASIDE HTS S35 S37</td></tr><tr><td>NY</td><td>SEAVILLE U9 S50</td></tr><tr><td>OH</td><td>SEAVILLE SE TGSPX20</td></tr><tr><td>OK</td><td>SECAUCUS E I95EX16E</td></tr><tr><td>OR</td><td>SEVEN STARS S U9 S70</td></tr><tr><td>PA</td><td>SHARPTOWN NW U40 S48</td></tr></tbody></table><p><b>Selected Node Number</b></p><p><input type="text" value="341108491"/></p></div><div style="width: 50%;"><p><b>Date/Time Options</b></p><p><input checked="" type="checkbox"/> Use Current Date</p><p><input checked="" type="checkbox"/> Use Current Time</p><p><b>Population Options</b></p><p><input type="radio"/> 400m Buffer Zone</p><p><input checked="" type="radio"/> 800m Buffer Zone</p><p><input type="radio"/> 2500m Buffer Zone</p><p><b>Help</b>   <b>Client Software Parameters</b></p></div></div>                                                         |                          |            |  | State | Node Name | MS | S BRUNSWICK E TNJTX8A | MT | S TOMS RIVER W TGSPX80 | NC | SADDLE BROOK I80X62 | ND | SADDLE BROOK NW TGSPX159 | NE | SALEM S45 S49   | NH | SALEM NW S49 LOCL | <b>NJ</b> | <b>SALEM NP</b> | NM | SAYREVILLE W TNJTX9 | NV | SEASIDE HTS S35 S37  | NY | SEAVILLE U9 S50    | OH | SEAVILLE SE TGSPX20 | OK | SECAUCUS E I95EX16E  | OR | SEVEN STARS S U9 S70   | PA | SHARPTOWN NW U40 S48 |
| State                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Node Name                |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| MS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | S BRUNSWICK E TNJTX8A    |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| MT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | S TOMS RIVER W TGSPX80   |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| NC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SADDLE BROOK I80X62      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| ND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SADDLE BROOK NW TGSPX159 |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| NE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SALEM S45 S49            |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| NH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SALEM NW S49 LOCL        |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| <b>NJ</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>SALEM NP</b>          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| NM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SAYREVILLE W TNJTX9      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| NV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SEASIDE HTS S35 S37      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| NY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SEAVILLE U9 S50          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| OH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SEAVILLE SE TGSPX20      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SECAUCUS E I95EX16E      |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SEVEN STARS S U9 S70     |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| PA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SHARPTOWN NW U40 S48     |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |
| <p><b>Route Type</b></p> <div style="display: flex; flex-wrap: wrap;"><div style="width: 50%;"><p><input checked="" type="radio"/> Commercial</p><p><input type="radio"/> Quickest</p><p><input type="radio"/> Shortest</p></div><div style="width: 50%;"><p><input type="radio"/> HRCQ</p><p><input type="radio"/> HRCQ + Nevada</p><p><input type="radio"/> WIPP</p></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |            |  |       |           |    |                       |    |                        |    |                     |    |                          |    |                 |    |                   |           |                 |    |                     |    |                      |    |                    |    |                     |    |                      |    |                        |    |                      |

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ESP Application  
Part 3, Environmental Report**

WebTRAGIS Client Version: 4.6.2

| Block Nodes/Links<br>Select Origin/Destination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Route Listings<br><b>Highway Routing Parameters</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Route Maps<br>Rail Routing Parameters  | Water Routing Parameters                            |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------|------------------------------------------|-----------------------------------------------------|---------------------------------|-----------------------------------------------------|-----------------------------------|-----------------------------------------------------|---------------------------------|-----------------------------------------------------|-------------------------------|-----------------------------------------------------|---------------------|-----------------------------------------------------|--|--|
| <p><b>Driver Options</b></p> <p><input type="radio"/> One Driver    <input checked="" type="radio"/> Two Drivers</p><br><br><p><b>Highway Inspection</b></p> <p><input checked="" type="checkbox"/> Include time for inspections upon entry into state</p> <p>Enter est. average time to complete inspection per state. (in minutes) <input style="width: 50px;" type="text" value="30"/></p><br><p><b>Toll Bias Factor</b></p> <p>Enter the toll bias factor. (0 - 1000) <input style="width: 50px;" type="text" value="0"/></p> <p><input type="checkbox"/> Include Nevada County Population Details</p> | <p><b>Other Constraints</b></p> <ul style="list-style-type: none"><li><input checked="" type="checkbox"/> Prohibit use of roads that restrict Commercial Trucks.</li><li><input checked="" type="checkbox"/> Prohibit the use of Ferry Crossings.</li><li><input type="checkbox"/> Prohibit the use of roads with Hazmat Restrictions.</li><li><input checked="" type="checkbox"/> Prohibit the use of roads with Radioactive restrictions.</li><li><input type="checkbox"/> Avoid the use of roads in Urban Areas.</li><li><input type="checkbox"/> Avoid the use of roads Inside of Beltways.</li><li><input type="checkbox"/> Prohibit the use of roads with Low Clearance.</li><li><input type="checkbox"/> Prohibit the use of roads with Narrow Clearance.</li><li><input type="checkbox"/> Prohibit the use of roads with Tunnels.</li><li><input type="checkbox"/> Las Vegas Beltway considered a Preferred Route.</li></ul><br><p><b>Road Lane Type Penalty</b></p> <p><b>Penalty Factor (0 - 100)</b></p> <table style="width: 100%;"><tbody><tr><td>Lane Type 1 - Limited Access Multilane</td><td><input style="width: 50px;" type="text" value="0"/></td></tr><tr><td>Lane Type 2 - Limited Access Single Lane</td><td><input style="width: 50px;" type="text" value="0"/></td></tr><tr><td>Lane Type 3 - Multilane Divided</td><td><input style="width: 50px;" type="text" value="0"/></td></tr><tr><td>Lane Type 4 - Multilane Undivided</td><td><input style="width: 50px;" type="text" value="0"/></td></tr><tr><td>Lane Type 5 - Principal Highway</td><td><input style="width: 50px;" type="text" value="0"/></td></tr><tr><td>Lane Type 6 - Through Highway</td><td><input style="width: 50px;" type="text" value="0"/></td></tr><tr><td>Lane Type 7 - Other</td><td><input style="width: 50px;" type="text" value="0"/></td></tr></tbody></table> | Lane Type 1 - Limited Access Multilane | <input style="width: 50px;" type="text" value="0"/> | Lane Type 2 - Limited Access Single Lane | <input style="width: 50px;" type="text" value="0"/> | Lane Type 3 - Multilane Divided | <input style="width: 50px;" type="text" value="0"/> | Lane Type 4 - Multilane Undivided | <input style="width: 50px;" type="text" value="0"/> | Lane Type 5 - Principal Highway | <input style="width: 50px;" type="text" value="0"/> | Lane Type 6 - Through Highway | <input style="width: 50px;" type="text" value="0"/> | Lane Type 7 - Other | <input style="width: 50px;" type="text" value="0"/> |  |  |
| Lane Type 1 - Limited Access Multilane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
| Lane Type 2 - Limited Access Single Lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
| Lane Type 3 - Multilane Divided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
| Lane Type 4 - Multilane Undivided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
| Lane Type 5 - Principal Highway                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
| Lane Type 6 - Through Highway                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |
| Lane Type 7 - Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <input style="width: 50px;" type="text" value="0"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                                                     |                                          |                                                     |                                 |                                                     |                                   |                                                     |                                 |                                                     |                               |                                                     |                     |                                                     |  |  |

[Help](#)    [Client Software Parameters](#)

**PSEG Site  
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## 2 TRAGIS OUTPUT

TRAGIS Routing Engine Version 1.5.4                      -- Highway Data Network    4.0

FROM:        RICHLAND                                      WA                      Leaving : 06/26/09 15:33  
TO :        SALEM NP                                        NJ                      Arriving : 06/29/09 01:54

Routing parameters used to calculate the route-

Routing type: Commercial with 2 driver(s)  
Time bias: 0.70 Mile bias: 0.30, Toll bias: 1.00

Constraints used on route:  
Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit use of roads with Radioactive materials prohibition

| Miles | Hwy Sign | City                             | Dir | Junction | State | Dist   | Time  | Date     | Hour  |
|-------|----------|----------------------------------|-----|----------|-------|--------|-------|----------|-------|
| 0.0   |          | RICHLAND                         |     |          | WA    | 0.0    | 0:00  | 06/26/09 | 15:33 |
| 10.1  | S240     | KENNEWICK                        | NW  | U395S240 | WA    | 10.1   | 0:13  | 06/26/09 | 15:46 |
| 5.8   | U395     | KENNEWICK                        | SW  | I82 X113 | WA    | 15.9   | 0:21  | 06/26/09 | 15:54 |
| 19.1  | I82      | PLYMOUTH                         |     | I82 X131 | WA    | 35.0   | 0:40  | 06/26/09 | 16:13 |
| 0.7   | I82      | crossing state border            |     | OR/WA    | BD    | 35.6   | 1:11  | 06/26/09 | 16:44 |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
| 10.6  | I82      | HERMISTON                        | SW  | I82 I84  | OR    | 46.2   | 1:22  | 06/26/09 | 16:55 |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 196.6 | I84      | ONTARIO                          | E   | I84 X376 | OR    | 242.8  | 5:27  | 06/26/09 | 22:00 |
| 1.3   | I84      | crossing state border            |     | ID/OR    | BD    | 244.1  | 5:58  | 06/26/09 | 22:31 |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 221.6 | I84      | RAFT RIVER                       | W   | I84 I86  | ID    | 465.7  | 9:53  | 06/27/09 | 02:26 |
| 54.0  | I84      | crossing state border            |     | ID/UT    | BD    | 519.7  | 11:13 | 06/27/09 | 03:46 |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
| 41.8  | I84      | TREMONTON                        | W   | I15 I84  | UT    | 561.5  | 11:48 | 06/27/09 | 04:21 |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 39.4  | I15      | OGDEN                            | S   | I15 I84  | UT    | 600.9  | 12:52 | 06/27/09 | 05:25 |
| 38.5  | I84      | ECHO                             |     | I80 I84  | UT    | 639.5  | 13:23 | 06/27/09 | 05:56 |
| 29.4  | I80      | crossing state border            |     | UT/WY    | BD    | 668.9  | 14:17 | 06/27/09 | 06:50 |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 360.1 | I80      | CHEYENNE                         | S   | I80 X362 | WY    | 1028.9 | 19:35 | 06/27/09 | 12:08 |
| 40.5  | I80      | crossing state border            |     | NE/WY    | BD    | 1069.4 | 20:37 | 06/27/09 | 13:10 |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 450.5 | I80      | OMAHA                            | S   | I80 X453 | NE    | 1520.0 | 27:41 | 06/27/09 | 21:14 |
| 2.2   | I80      | crossing state border            |     | IA/NE    | BD    | 1522.1 | 28:13 | 06/27/09 | 21:46 |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
| 0.9   | I80      | COUNCIL BLUFFS                   | SW  | I29 I80  | IA    | 1523.0 | 28:14 | 06/27/09 | 21:47 |
| 2.8   | I29      | COUNCIL BLUFFS                   | SE  | I29 I80  | IA    | 1525.8 | 28:17 | 06/27/09 | 21:50 |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 119.5 | I80      | DES MOINES                       | W   | I235I35  | IA    | 1645.3 | 30:38 | 06/28/09 | 00:11 |
| 14.2  | I35      | DES MOINES                       | N   | I235I35  | IA    | 1659.5 | 30:52 | 06/28/09 | 00:25 |
|       |          | Rest 30 minutes                  |     |          |       |        |       |          |       |
| 167.6 | I80      | LE CLAIRE                        | SW  | I80 X306 | IA    | 1827.1 | 33:27 | 06/28/09 | 03:00 |
| 0.4   | I80      | crossing state border            |     | IA/IL    | BD    | 1827.4 | 34:28 | 06/28/09 | 04:01 |
|       |          | State Inspection took 30 minutes |     |          |       |        |       |          |       |
| 154.7 | I80      | HOMEWOOD                         | NW  | I294I80  | IL    | 1982.1 | 37:16 | 06/28/09 | 06:49 |
| 4.9   | I294\$   | LANSING                          | W   | I294I94  | IL    | 1987.1 | 37:22 | 06/28/09 | 06:55 |
| 3.0   | I80      | crossing state border            |     | IL/IN    | BD    | 1990.0 | 37:55 | 06/28/09 | 07:28 |

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|                                  |        |        |                       |       |           |    |        |       |                |
|----------------------------------|--------|--------|-----------------------|-------|-----------|----|--------|-------|----------------|
| Rest 30 minutes                  |        |        |                       |       |           |    |        |       |                |
| State Inspection took 30 minutes |        |        |                       |       |           |    |        |       |                |
| 15.4                             | I80    | I94    | LAKE STATION          | NE    | I80 I94   | IN | 2005.4 | 38:41 | 06/28/09 08:14 |
| 0.5                              | I80    |        | PORTAGE               | W     | I80 I90   | IN | 2005.9 | 38:42 | 06/28/09 08:15 |
| 122.2                            | I80 \$ | I90 \$ | JAMESTOWN             | SE    | I69 I80   | IN | 2128.1 | 40:44 | 06/28/09 10:17 |
| 13.2                             | I80 \$ | I90 \$ | crossing state border | IN/OH | BD        |    | 2141.3 | 41:27 | 06/28/09 11:00 |
| State Inspection took 30 minutes |        |        |                       |       |           |    |        |       |                |
| Rest 30 minutes                  |        |        |                       |       |           |    |        |       |                |
| 141.8                            | I80 \$ | I90 \$ | ELYRIA                | NW    | I80 I90   | OH | 2283.0 | 44:32 | 06/28/09 15:05 |
| 76.0                             | I80 \$ |        | NORTH JACKSON         | NE    | I76 I80   | OH | 2359.0 | 45:55 | 06/28/09 16:28 |
| 15.2                             | I80    |        | HUBBARD               | N     | I80 X234  | OH | 2374.2 | 46:12 | 06/28/09 16:45 |
| 2.7                              | I80    |        | crossing state border | OH/PA | BD        |    | 2376.9 | 46:44 | 06/28/09 17:17 |
| Rest 30 minutes                  |        |        |                       |       |           |    |        |       |                |
| State Inspection took 30 minutes |        |        |                       |       |           |    |        |       |                |
| 121.8                            | I80    |        | NEEDFUL               | S     | I80 X123  | PA | 2498.7 | 49:08 | 06/28/09 19:41 |
| 1.6                              | S970   |        | WOODLAND              | E     | U322S970  | PA | 2500.3 | 49:10 | 06/28/09 19:43 |
| 22.9                             | U322   |        | PORT MATILDA          |       | U220U322  | PA | 2523.2 | 49:38 | 06/28/09 20:11 |
| 2.9                              | U220   | U322   | MARTHA FURNACE        |       | U220U322  | PA | 2526.1 | 49:41 | 06/28/09 20:14 |
| 38.6                             | U322   |        | LEWISTOWN             | NE    | U322U522  | PA | 2564.7 | 50:27 | 06/28/09 21:00 |
| 0.5                              | U322   | U522   | LEWISTOWN             | E     | U322U522  | PA | 2565.2 | 50:27 | 06/28/09 21:00 |
| 1.9                              | U322   |        | LEWISTOWN             | SE    | U22 U322  | PA | 2567.1 | 50:29 | 06/28/09 21:02 |
| Rest 30 minutes                  |        |        |                       |       |           |    |        |       |                |
| 52.1                             | U22    | U322   | ROCKVILLE             | S     | I81 X67   | PA | 2619.1 | 51:23 | 06/28/09 21:56 |
| 2.6                              | I81    |        | PENBROOK              | NE    | I81 I83   | PA | 2621.7 | 51:55 | 06/28/09 22:28 |
| 4.1                              | I83    |        | HARRISBURG            | SE    | I283I83   | PA | 2625.8 | 51:59 | 06/28/09 22:32 |
| 2.8                              | I283   |        | HIGHSPIRE             | N     | I283X1    | PA | 2628.6 | 52:02 | 06/28/09 22:35 |
| 28.4                             | S283   |        | LANCASTER             | NW    | U30 S283  | PA | 2656.9 | 52:30 | 06/28/09 23:03 |
| 1.0                              | U30    |        | LANCASTER             | N     | U222U30   | PA | 2657.9 | 52:31 | 06/28/09 23:04 |
| 1.0                              | U222   | U30    | LANCASTER             | NE    | U222U30   | PA | 2658.9 | 52:32 | 06/28/09 23:05 |
| 15.5                             | U30    |        | GAP                   | NW    | U30 S41   | PA | 2674.4 | 52:51 | 06/28/09 23:24 |
| 21.6                             | S41    |        | KAOLIN                |       | S41 S7    | PA | 2696.1 | 53:23 | 06/28/09 23:56 |
| 0.7                              | S41    |        | crossing state border | DE/PA | BD        |    | 2696.7 | 53:54 | 06/29/09 00:27 |
| State Inspection took 30 minutes |        |        |                       |       |           |    |        |       |                |
| 7.4                              | S41    |        | NEWPORT               |       | S141S41   | DE | 2704.2 | 54:06 | 06/29/09 00:39 |
| 1.7                              | S141   |        | NEWPORT               | S     | I95 X5    | DE | 2705.9 | 54:07 | 06/29/09 00:40 |
| 0.7                              | I95    |        | NEWPORT               | SE    | I295I95   | DE | 2706.6 | 54:08 | 06/29/09 00:41 |
| 2.1                              | I295   |        | NEW CASTLE            | N     | I295S9    | DE | 2708.7 | 54:10 | 06/29/09 00:43 |
| 2.5                              | I295#  |        | crossing state border | DE/NJ | BD        |    | 2711.2 | 54:43 | 06/29/09 01:16 |
| State Inspection took 30 minutes |        |        |                       |       |           |    |        |       |                |
| 0.9                              | I295#  |        | DEEPWATER             | S     | I295X1    | NJ | 2712.2 | 54:44 | 06/29/09 01:17 |
| 0.4                              | I295\$ | TNJT\$ | DEEPWATER             | SE    | TNJT I295 | NJ | 2712.6 | 54:44 | 06/29/09 01:17 |
| 4.7                              | C551   |        | PENNSVILLE            | S     | S49 C551  | NJ | 2717.2 | 54:51 | 06/29/09 01:24 |
| 3.0                              | S49    |        | SALEM                 | NW    | S49 LOCL  | NJ | 2720.2 | 54:56 | 06/29/09 01:29 |
| 12.3                             | LOCAL  |        | SALEM NP              |       |           | NJ | 2732.5 | 55:21 | 06/29/09 01:54 |

Total elapsed time: 55:21      Total trip mileage: 2732.5      Impedance: 2640.8

Mileage by State :

|     |       |     |       |     |       |     |       |     |       |     |       |
|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| DE: | 14.5  | IA: | 305.3 | ID: | 275.6 | IL: | 162.6 | IN: | 151.2 | NE: | 452.7 |
| NJ: | 21.3  | OH: | 235.7 | OR: | 208.5 | PA: | 319.8 | UT: | 149.1 | WA: | 35.6  |
| WY: | 400.5 |     |       |     |       |     |       |     |       |     |       |

Mileage by Sign Type:

|               |        |       |       |          |      |           |     |
|---------------|--------|-------|-------|----------|------|-----------|-----|
| 1-INTERSTATE: | 2498.9 | 2-US: | 142.2 | 3-STATE: | 74.4 | 5-COUNTY: | 4.7 |
| 6-LOCAL:      | 12.3   |       |       |          |      |           |     |

Mileage by Lane Type:

|                                 |        |                               |      |
|---------------------------------|--------|-------------------------------|------|
| 1-Multi-Lane Controlled Access: | 2596.1 | 3-Multi-Lane Divided Highway: | 13.5 |
| 5-Principle Road:               | 104.4  | 7-Other:                      | 18.5 |

Mileage by Tribal Lands:

|                            |   |        |
|----------------------------|---|--------|
| Total Outside Tribal Lands | : | 2705.6 |
| Total Inside Tribal Lands  | : | 26.9   |

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**3 TRAGIS GENERATED INPUT FOR RADTRAN**

```
[TRAGIS]
TRAGIS Version=1.5.4
Mode=H
Network Version=4.0
Census Data=2000
Buffer Zone=800
[ROUTEINFO]
From CITY=RICHLAND
From STATE=WA
From SUBNET=
To CITY=SALEM NP
To STATE=NJ
To SUBNET=
[DE]
Rural - KM= 3.3
Suburban - KM= 14.0
Urban - KM= 6.0
Total - KM= 23.3
Rural Pop Density= 18.8
Suburban Pop Density= 549.2
Urban Pop Density=2168.9
[ID]
Rural - KM= 357.0
Suburban - KM= 79.3
Urban - KM= 7.3
Total - KM= 443.5
Rural Pop Density= 11.3
Suburban Pop Density= 278.7
Urban Pop Density=2219.6
[IL]
Rural - KM= 178.4
Suburban - KM= 73.0
Urban - KM= 10.2
Total - KM= 261.7
Rural Pop Density= 14.4
Suburban Pop Density= 323.6
Urban Pop Density=2379.1
[IN]
Rural - KM= 136.7
Suburban - KM= 97.3
Urban - KM= 9.4
Total - KM= 243.4
Rural Pop Density= 19.9
Suburban Pop Density= 276.3
Urban Pop Density=2354.7
[IA]
Rural - KM= 377.8
Suburban - KM= 107.7
Urban - KM= 5.8
Total - KM= 491.3
Rural Pop Density= 16.4
Suburban Pop Density= 272.7
Urban Pop Density=2191.1
[NE]
Rural - KM= 649.1
Suburban - KM= 71.5
Urban - KM= 8.0
Total - KM= 728.5
Rural Pop Density= 9.9
Suburban Pop Density= 270.2
Urban Pop Density=2410.2
```

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[NJ]

Rural - KM= 20.6  
Suburban - KM= 12.5  
Urban - KM= 1.1  
Total - KM= 34.3  
Rural Pop Density= 11.8  
Suburban Pop Density= 353.9  
Urban Pop Density=2025.9

[OH]

Rural - KM= 213.1  
Suburban - KM= 151.3  
Urban - KM= 14.8  
Total - KM= 379.3  
Rural Pop Density= 19.7  
Suburban Pop Density= 309.6  
Urban Pop Density=2211.7

[OR]

Rural - KM= 301.0  
Suburban - KM= 32.2  
Urban - KM= 2.3  
Total - KM= 335.5  
Rural Pop Density= 8.2  
Suburban Pop Density= 313.2  
Urban Pop Density=1976.3

[PA]

Rural - KM= 321.7  
Suburban - KM= 172.2  
Urban - KM= 20.7  
Total - KM= 514.7  
Rural Pop Density= 18.4  
Suburban Pop Density= 313.8  
Urban Pop Density=2452.8

[UT]

Rural - KM= 186.8  
Suburban - KM= 51.6  
Urban - KM= 1.5  
Total - KM= 240.0  
Rural Pop Density= 9.7  
Suburban Pop Density= 257.8  
Urban Pop Density=2112.2

[WA]

Rural - KM= 44.1  
Suburban - KM= 8.6  
Urban - KM= 4.7  
Total - KM= 57.4  
Rural Pop Density= 1.5  
Suburban Pop Density= 604.4  
Urban Pop Density=2293.2

[WY]

Rural - KM= 607.2  
Suburban - KM= 33.9  
Urban - KM= 3.4  
Total - KM= 644.6  
Rural Pop Density= 4.9  
Suburban Pop Density= 399.4  
Urban Pop Density=1966.6

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

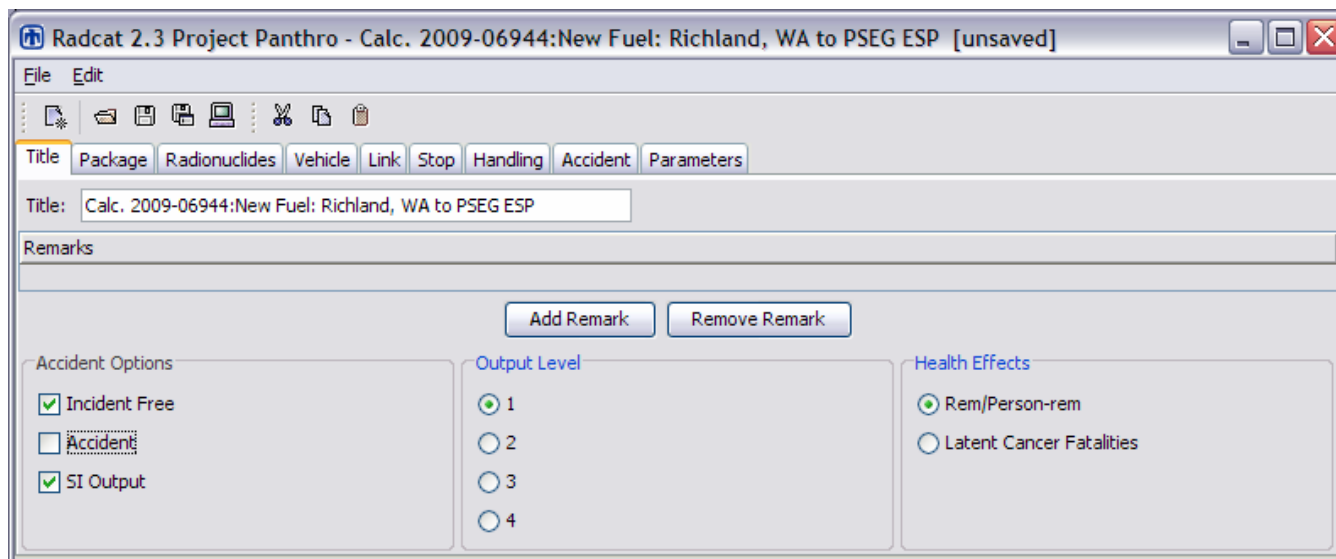
[Total]  
Rural - KM=3396.8  
Suburban - KM= 905.4  
Urban - KM= 95.3  
Total - KM=4397.4  
Rural Pop Density= 11.7  
Suburban Pop Density= 305.4  
Urban Pop Density=2294.9



**PSEG Site  
ESP Application  
Part 3, Environmental Report**

**4 RADTRAN INPUT**

The RADTRAN/RADCAT input screens are reproduced below.



Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP [unsaved]

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Title: Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP

Remarks

Add Remark Remove Remark

Accident Options

☒ Incident Free

☐ Accident

☒ SI Output

Output Level

☒ 1

☐ 2

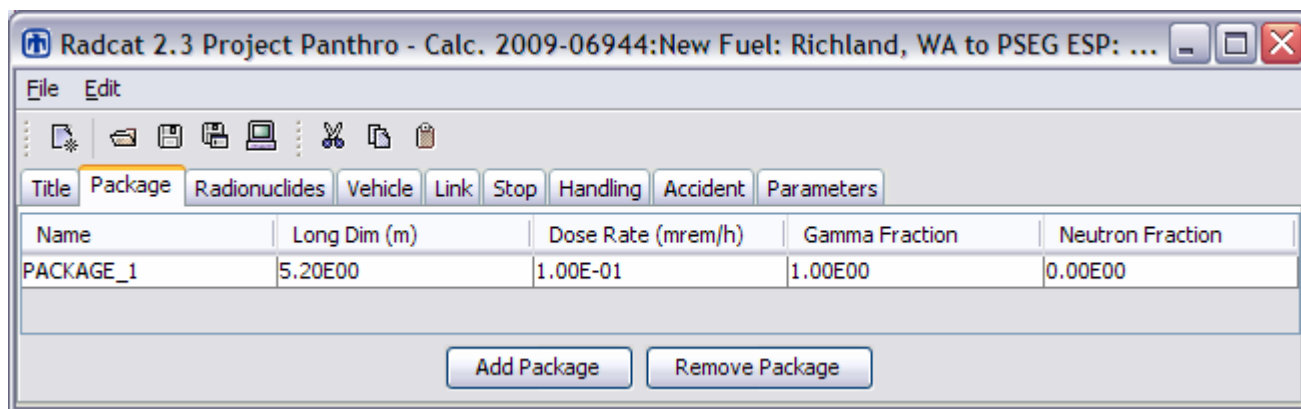
☐ 3

☐ 4

Health Effects

☒ Rem/Person-rem

☐ Latent Cancer Fatalities



Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: ...

File Edit

Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

| Name      | Long Dim (m) | Dose Rate (mrem/h) | Gamma Fraction | Neutron Fraction |
|-----------|--------------|--------------------|----------------|------------------|
| PACKAGE_1 | 5.20E00      | 1.00E-01           | 1.00E00        | 0.00E00          |

Add Package Remove Package

# **PSEG Site ESP Application Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP

File Edit

Radionuclides

PACKAGE\_1

Add Library Radionuclide

Radionuclide Phys/Chem Group Curies

Modify User Defined Radionuclides

Add User Defined Radionuclide

Remove Radionuclide

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Fatalities [unsaved]

File Edit

Vehicle

| Vehicle Name | Number of Shipments | Vehicle Size (m) | Vehicle Dose Rate (mrem/h) | Gamma Fraction | Neutron Fraction | Crew Size | Crew Distance (m) | Crew Shielding Factor | Crew View (m) | Exclusive |
|--------------|---------------------|------------------|----------------------------|----------------|------------------|-----------|-------------------|-----------------------|---------------|-----------|
| VEHICLE_1    | 1.00E00             | 5.20E00          | 1.00E-01                   | 1.00E00        | 0.00E00          | 2.00E00   | 4.00E00           | 1.00E00               | 1.00E00       | Yes       |

Add Vehicle Remove Vehicle

Package Number of Packages

PACKAGE\_1 1.00E00

Note: This screen is the same for both the “fatalities” case and the “injuries” case.

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

File Edit

Vehicle

| Vehicle Name | Number of Shipments | Vehicle Size (m) | Vehicle Dose Rate (mrem/h) | Gamma Fraction | Neutron Fraction | Crew Size | Crew Distance (m) | Crew Shielding Factor | Crew View (m) | Exclusive |
|--------------|---------------------|------------------|----------------------------|----------------|------------------|-----------|-------------------|-----------------------|---------------|-----------|
| VEHICLE_1    | 1.00E00             | 5.20E00          | 1.00E-01                   | 1.00E00        | 0.00E00          | 2.00E00   | 4.00E00           | 1.00E00               | 1.00E00       | Yes       |

Add Vehicle Remove Vehicle

Package Number of Packages

# PSEG Site ESP Application Part 3, Environmental Report

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Fatalities

File Edit

Package Radionuclides Vehicle **Link** Stop Handling Accident Parameters

| Link-Name  | Vehicle   | Length (km) | Speed (km/h) | Population Density (persons/km²) | Vehicle Density (vehicles/hr) | Persons per Vehicle | Accident Rate (accidents/veh-km) | Fatalities per Accident | Zone     |           |
|------------|-----------|-------------|--------------|----------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|----------|-----------|
| RURAL_DE   | VEHICLE_1 | 3.30E00     | 8.89E01      | 1.88E01                          | 5.30E02                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Rural    | Primary H |
| SUBURBN_DE | VEHICLE_1 | 1.40E01     | 8.89E01      | 5.49E02                          | 7.60E02                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Suburban | Primary H |
| URBAN_DE   | VEHICLE_1 | 6.00E00     | 8.89E01      | 2.17E03                          | 2.40E03                       | 1.50E00             | 5.18E-07                         | 1.08E-02                | Urban    | Primary H |
| RURAL_ID   | VEHICLE_1 | 3.57E02     | 8.89E01      | 1.13E01                          | 5.30E02                       | 1.50E00             | 2.95E-07                         | 1.29E-02                | Rural    | Primary H |
| SUBURBN_ID | VEHICLE_1 | 7.93E01     | 8.89E01      | 2.79E02                          | 7.60E02                       | 1.50E00             | 2.95E-07                         | 1.29E-02                | Suburban | Primary H |
| URBAN_ID   | VEHICLE_1 | 7.30E00     | 8.89E01      | 2.22E03                          | 2.40E03                       | 1.50E00             | 2.95E-07                         | 1.29E-02                | Urban    | Primary H |
| RURAL_IL   | VEHICLE_1 | 1.78E02     | 8.89E01      | 1.44E01                          | 5.30E02                       | 1.50E00             | 2.22E-07                         | 3.74E-02                | Rural    | Primary H |
| SUBURBN_IL | VEHICLE_1 | 7.30E01     | 8.89E01      | 3.24E02                          | 7.60E02                       | 1.50E00             | 2.22E-07                         | 3.74E-02                | Suburban | Primary H |
| URBAN_IL   | VEHICLE_1 | 1.02E01     | 8.89E01      | 2.38E03                          | 2.40E03                       | 1.50E00             | 2.22E-07                         | 3.74E-02                | Urban    | Primary H |
| RURAL_IN   | VEHICLE_1 | 1.37E02     | 8.89E01      | 1.99E01                          | 5.30E02                       | 1.50E00             | 2.25E-07                         | 2.98E-02                | Rural    | Primary H |
| SUBURBN_IN | VEHICLE_1 | 9.73E01     | 8.89E01      | 2.76E02                          | 7.60E02                       | 1.50E00             | 2.25E-07                         | 2.98E-02                | Suburban | Primary H |
| URBAN_IN   | VEHICLE_1 | 9.40E00     | 8.89E01      | 2.35E03                          | 2.40E03                       | 1.50E00             | 2.25E-07                         | 2.98E-02                | Urban    | Primary H |
| RURAL_IA   | VEHICLE_1 | 3.78E02     | 8.89E01      | 1.64E01                          | 5.30E02                       | 1.50E00             | 1.12E-07                         | 8.39E-02                | Rural    | Primary H |
| SUBURBN_IA | VEHICLE_1 | 1.08E02     | 8.89E01      | 2.73E02                          | 7.60E02                       | 1.50E00             | 1.12E-07                         | 8.39E-02                | Suburban | Primary H |
| URBAN_IA   | VEHICLE_1 | 5.80E00     | 8.89E01      | 2.19E03                          | 2.40E03                       | 1.50E00             | 1.12E-07                         | 8.39E-02                | Urban    | Primary H |
| RURAL_NE   | VEHICLE_1 | 6.49E02     | 8.89E01      | 9.90E00                          | 5.30E02                       | 1.50E00             | 3.19E-07                         | 4.29E-02                | Rural    | Primary H |
| SUBURBN_NE | VEHICLE_1 | 7.15E01     | 8.89E01      | 2.70E02                          | 7.60E02                       | 1.50E00             | 3.19E-07                         | 4.29E-02                | Suburban | Primary H |
| URBAN_NE   | VEHICLE_1 | 8.00E00     | 8.89E01      | 2.41E03                          | 2.40E03                       | 1.50E00             | 3.19E-07                         | 4.29E-02                | Urban    | Primary H |
| RURAL_NJ   | VEHICLE_1 | 2.06E01     | 8.89E01      | 1.18E01                          | 5.30E02                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Rural    | Primary H |
| SUBURBN_NJ | VEHICLE_1 | 1.25E01     | 8.89E01      | 3.54E02                          | 7.60E02                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Suburban | Primary H |
| URBAN_NJ   | VEHICLE_1 | 1.10E00     | 8.89E01      | 2.03E03                          | 2.40E03                       | 1.50E00             | 5.65E-07                         | 2.14E-02                | Urban    | Primary H |
| RURAL_OH   | VEHICLE_1 | 2.13E02     | 8.89E01      | 1.97E01                          | 5.30E02                       | 1.50E00             | 1.64E-07                         | 2.38E-02                | Rural    | Primary H |
| SUBURBN_OH | VEHICLE_1 | 1.51E02     | 8.89E01      | 3.10E02                          | 7.60E02                       | 1.50E00             | 1.64E-07                         | 2.38E-02                | Suburban | Primary H |
| URBAN_OH   | VEHICLE_1 | 1.48E01     | 8.89E01      | 2.21E03                          | 2.40E03                       | 1.50E00             | 1.64E-07                         | 2.38E-02                | Urban    | Primary H |
| RURAL_OR   | VEHICLE_1 | 3.01E02     | 8.89E01      | 8.20E00                          | 5.30E02                       | 1.50E00             | 3.15E-07                         | 6.48E-02                | Rural    | Primary H |
| SUBURBN_OR | VEHICLE_1 | 3.22E01     | 8.89E01      | 3.13E02                          | 7.60E02                       | 1.50E00             | 3.15E-07                         | 6.48E-02                | Suburban | Primary H |
| URBAN_OR   | VEHICLE_1 | 2.30E00     | 8.89E01      | 1.98E03                          | 2.40E03                       | 1.50E00             | 3.15E-07                         | 6.48E-02                | Urban    | Primary H |
| RURAL_PA   | VEHICLE_1 | 3.22E02     | 8.89E01      | 1.84E01                          | 5.30E02                       | 1.50E00             | 5.14E-07                         | 2.63E-02                | Rural    | Primary H |
| SUBURBN_PA | VEHICLE_1 | 1.72E02     | 8.89E01      | 3.14E02                          | 7.60E02                       | 1.50E00             | 5.14E-07                         | 2.63E-02                | Suburban | Primary H |
| URBAN_PA   | VEHICLE_1 | 2.07E01     | 8.89E01      | 2.45E03                          | 2.40E03                       | 1.50E00             | 5.14E-07                         | 2.63E-02                | Urban    | Primary H |
| RURAL_UT   | VEHICLE_1 | 1.87E02     | 8.89E01      | 9.70E00                          | 5.30E02                       | 1.50E00             | 2.90E-07                         | 4.10E-02                | Rural    | Primary H |
| SUBURBN_UT | VEHICLE_1 | 5.16E01     | 8.89E01      | 2.58E02                          | 7.60E02                       | 1.50E00             | 2.90E-07                         | 4.10E-02                | Suburban | Primary H |
| URBAN_UT   | VEHICLE_1 | 1.50E00     | 8.89E01      | 2.11E03                          | 2.40E03                       | 1.50E00             | 2.90E-07                         | 4.10E-02                | Urban    | Primary H |
| RURAL_WA   | VEHICLE_1 | 4.41E01     | 8.89E01      | 1.50E00                          | 5.30E02                       | 1.50E00             | 2.65E-07                         | 6.34E-02                | Rural    | Primary H |
| SUBURBN_WA | VEHICLE_1 | 8.60E00     | 8.89E01      | 6.04E02                          | 7.60E02                       | 1.50E00             | 2.65E-07                         | 6.34E-02                | Suburban | Primary H |
| URBAN_WA   | VEHICLE_1 | 4.70E00     | 8.89E01      | 2.29E03                          | 2.40E03                       | 1.50E00             | 2.65E-07                         | 6.34E-02                | Urban    | Primary H |
| RURAL_WY   | VEHICLE_1 | 6.07E02     | 8.89E01      | 4.90E00                          | 5.30E02                       | 1.50E00             | 6.74E-07                         | 1.60E-02                | Rural    | Primary H |
| SUBURBN_WY | VEHICLE_1 | 3.39E01     | 8.89E01      | 3.99E02                          | 7.60E02                       | 1.50E00             | 6.74E-07                         | 1.60E-02                | Suburban | Primary H |
| URBAN_WY   | VEHICLE_1 | 3.40E00     | 8.89E01      | 1.97E03                          | 2.40E03                       | 1.50E00             | 6.74E-07                         | 1.60E-02                | Urban    | Primary H |

Add Link Remove Link Import Web Trags

Injuries per Accident in Column Labeled “Fatalities per Accident”

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

File Edit

Package Radionuclides Vehicle **Link** Stop Handling Accident Parameters

| Link-Name  | Vehicle   | Length (km) | Speed (km/h) | Population Density (persons/km²) | Vehicle Density (vehicles/hr) | Persons per Vehicle | Accident Rate (accidents/veh-km) | Fatalities per Accident | Zone   |  |
|------------|-----------|-------------|--------------|----------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|--------|--|
| RURAL_DE   | VEHICLE_1 | 3.30E00     | 8.89E01      | 1.88E01                          | 5.30E02                       | 1.50E00             | 5.18E-07                         | 6.60E-01                | Rural  |  |
| SUBURBN_DE | VEHICLE_1 | 1.40E01     | 8.89E01      | 5.49E02                          | 7.60E02                       | 1.50E00             | 5.18E-07                         | 6.60E-01                | Suburb |  |
| URBAN_DE   | VEHICLE_1 | 6.00E00     | 8.89E01      | 2.17E03                          | 2.40E03                       | 1.50E00             | 5.18E-07                         | 6.60E-01                | Urban  |  |
| RURAL_ID   | VEHICLE_1 | 3.57E02     | 8.89E01      | 1.13E01                          | 5.30E02                       | 1.50E00             | 2.95E-07                         | 1.04E00                 | Rural  |  |
| SUBURBN_ID | VEHICLE_1 | 7.93E01     | 8.89E01      | 2.79E02                          | 7.60E02                       | 1.50E00             | 2.95E-07                         | 1.04E00                 | Suburb |  |
| URBAN_ID   | VEHICLE_1 | 7.30E00     | 8.89E01      | 2.22E03                          | 2.40E03                       | 1.50E00             | 2.95E-07                         | 1.04E00                 | Urban  |  |
| RURAL_IL   | VEHICLE_1 | 1.78E02     | 8.89E01      | 1.44E01                          | 5.30E02                       | 1.50E00             | 2.22E-07                         | 6.76E-01                | Rural  |  |
| SUBURBN_IL | VEHICLE_1 | 7.30E01     | 8.89E01      | 3.24E02                          | 7.60E02                       | 1.50E00             | 2.22E-07                         | 6.76E-01                | Suburb |  |
| URBAN_IL   | VEHICLE_1 | 1.02E01     | 8.89E01      | 2.38E03                          | 2.40E03                       | 1.50E00             | 2.22E-07                         | 6.76E-01                | Urban  |  |
| RURAL_IN   | VEHICLE_1 | 1.37E02     | 8.89E01      | 1.99E01                          | 5.30E02                       | 1.50E00             | 2.25E-07                         | 6.22E-01                | Rural  |  |
| SUBURBN_IN | VEHICLE_1 | 9.73E01     | 8.89E01      | 2.76E02                          | 7.60E02                       | 1.50E00             | 2.25E-07                         | 6.22E-01                | Suburb |  |
| URBAN_IN   | VEHICLE_1 | 9.40E00     | 8.89E01      | 2.35E03                          | 2.40E03                       | 1.50E00             | 2.25E-07                         | 6.22E-01                | Urban  |  |
| RURAL_IA   | VEHICLE_1 | 3.78E02     | 8.89E01      | 1.64E01                          | 5.30E02                       | 1.50E00             | 1.12E-07                         | 7.68E-01                | Rural  |  |
| SUBURBN_IA | VEHICLE_1 | 1.08E02     | 8.89E01      | 2.73E02                          | 7.60E02                       | 1.50E00             | 1.12E-07                         | 7.68E-01                | Suburb |  |
| URBAN_IA   | VEHICLE_1 | 5.80E00     | 8.89E01      | 2.19E03                          | 2.40E03                       | 1.50E00             | 1.12E-07                         | 7.68E-01                | Urban  |  |
| RURAL_NE   | VEHICLE_1 | 6.49E02     | 8.89E01      | 9.90E00                          | 5.30E02                       | 1.50E00             | 3.19E-07                         | 6.18E-01                | Rural  |  |
| SUBURBN_NE | VEHICLE_1 | 7.15E01     | 8.89E01      | 2.70E02                          | 7.60E02                       | 1.50E00             | 3.19E-07                         | 6.18E-01                | Suburb |  |
| URBAN_NE   | VEHICLE_1 | 8.00E00     | 8.89E01      | 2.41E03                          | 2.40E03                       | 1.50E00             | 3.19E-07                         | 6.18E-01                | Urban  |  |
| RURAL_NJ   | VEHICLE_1 | 2.06E01     | 8.89E01      | 1.18E01                          | 5.30E02                       | 1.50E00             | 5.65E-07                         | 6.92E-01                | Rural  |  |
| SUBURBN_NJ | VEHICLE_1 | 1.25E01     | 8.89E01      | 3.54E02                          | 7.60E02                       | 1.50E00             | 5.65E-07                         | 6.92E-01                | Suburb |  |
| URBAN_NJ   | VEHICLE_1 | 1.10E00     | 8.89E01      | 2.03E03                          | 2.40E03                       | 1.50E00             | 5.65E-07                         | 6.92E-01                | Urban  |  |
| RURAL_OH   | VEHICLE_1 | 2.13E02     | 8.89E01      | 1.97E01                          | 5.30E02                       | 1.50E00             | 1.64E-07                         | 8.54E-01                | Rural  |  |
| SUBURBN_OH | VEHICLE_1 | 1.51E02     | 8.89E01      | 3.10E02                          | 7.60E02                       | 1.50E00             | 1.64E-07                         | 8.54E-01                | Suburb |  |
| URBAN_OH   | VEHICLE_1 | 1.48E01     | 8.89E01      | 2.21E03                          | 2.40E03                       | 1.50E00             | 1.64E-07                         | 8.54E-01                | Urban  |  |
| RURAL_OR   | VEHICLE_1 | 3.01E02     | 8.89E01      | 8.20E00                          | 5.30E02                       | 1.50E00             | 3.15E-07                         | 7.21E-01                | Rural  |  |
| SUBURBN_OR | VEHICLE_1 | 3.22E01     | 8.89E01      | 3.13E02                          | 7.60E02                       | 1.50E00             | 3.15E-07                         | 7.21E-01                | Suburb |  |
| URBAN_OR   | VEHICLE_1 | 2.30E00     | 8.89E01      | 1.98E03                          | 2.40E03                       | 1.50E00             | 3.15E-07                         | 7.21E-01                | Urban  |  |
| RURAL_PA   | VEHICLE_1 | 3.22E02     | 8.89E01      | 1.84E01                          | 5.30E02                       | 1.50E00             | 5.14E-07                         | 7.45E-01                | Rural  |  |
| SUBURBN_PA | VEHICLE_1 | 1.72E02     | 8.89E01      | 3.14E02                          | 7.60E02                       | 1.50E00             | 5.14E-07                         | 7.45E-01                | Suburb |  |
| URBAN_PA   | VEHICLE_1 | 2.07E01     | 8.89E01      | 2.45E03                          | 2.40E03                       | 1.50E00             | 5.14E-07                         | 7.45E-01                | Urban  |  |
| RURAL_UT   | VEHICLE_1 | 1.87E02     | 8.89E01      | 9.70E00                          | 5.30E02                       | 1.50E00             | 2.90E-07                         | 8.72E-01                | Rural  |  |
| SUBURBN_UT | VEHICLE_1 | 5.16E01     | 8.89E01      | 2.58E02                          | 7.60E02                       | 1.50E00             | 2.90E-07                         | 8.72E-01                | Suburb |  |
| URBAN_UT   | VEHICLE_1 | 1.50E00     | 8.89E01      | 2.11E03                          | 2.40E03                       | 1.50E00             | 2.90E-07                         | 8.72E-01                | Urban  |  |
| RURAL_WA   | VEHICLE_1 | 4.41E01     | 8.89E01      | 1.50E00                          | 5.30E02                       | 1.50E00             | 2.65E-07                         | 6.79E-01                | Rural  |  |
| SUBURBN_WA | VEHICLE_1 | 8.60E00     | 8.89E01      | 6.04E02                          | 7.60E02                       | 1.50E00             | 2.65E-07                         | 6.79E-01                | Suburb |  |
| URBAN_WA   | VEHICLE_1 | 4.70E00     | 8.89E01      | 2.29E03                          | 2.40E03                       | 1.50E00             | 2.65E-07                         | 6.79E-01                | Urban  |  |
| RURAL_WY   | VEHICLE_1 | 6.07E02     | 8.89E01      | 4.90E00                          | 5.30E02                       | 1.50E00             | 6.74E-07                         | 4.79E-01                | Rural  |  |
| SUBURBN_WY | VEHICLE_1 | 3.39E01     | 8.89E01      | 3.99E02                          | 7.60E02                       | 1.50E00             | 6.74E-07                         | 4.79E-01                | Suburb |  |
| URBAN_WY   | VEHICLE_1 | 3.40E00     | 8.89E01      | 1.97E03                          | 2.40E03                       | 1.50E00             | 6.74E-07                         | 4.79E-01                | Urban  |  |

Add Link Remove Link Import Web Trags

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP

File Edit









Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

| Name   | Vehicle   | Min Distance (m) | Max Distance (m) | People or People/km <sup>2</sup> | Shielding Factor | Time (h) |
|--------|-----------|------------------|------------------|----------------------------------|------------------|----------|
| STOP_1 | VEHICLE_1 | 1.00E00          | 1.00E01          | 3.00E04                          | 1.00E00          | 6.00E00  |
| STOP_2 | VEHICLE_1 | 1.00E01          | 8.00E02          | 3.40E02                          | 2.00E-01         | 6.00E00  |

Add Stop Remove Stop

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP

File Edit









Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

| Name     | Vehicle   | Number of Handlers | Distance (m) | Time (h) |
|----------|-----------|--------------------|--------------|----------|
| HANDLE_1 | VEHICLE_1 | 5.00E00            | 1.00E00      | 5.00E-01 |

Add Handling Remove Handling

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP

File Edit









Title Package Radionuclides Vehicle Link Stop Handling Accident Parameters

Probability Deposition Velocity Release Aerosol Respirable Isopleth P Weather

| Index | Probability Fraction |
|-------|----------------------|
|-------|----------------------|

Add severity fraction Remove severity fraction

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

Radcat 2.3 Project Panthro - Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP

File Edit

Parameters

| Parameter                                                                      | Value    |
|--------------------------------------------------------------------------------|----------|
| Shielding factor for rural residents                                           | 1.00E00  |
| Shielding factor for suburban residents                                        | 8.70E-01 |
| Shielding factor for urban residents                                           | 1.80E-02 |
| Fraction of outside air in urban buildings                                     | 5.00E-02 |
| Fraction of urban population occupying the sidewalk                            | 4.80E-01 |
| Fraction of urban population inside buildings                                  | 5.20E-01 |
| Ratio of pedestrians/km <sup>2</sup> to residential population/km <sup>2</sup> | 6.00E00  |
| Minimum small package dimension for handling (m)                               | 5.00E-01 |
| Distance from shipment for maximum exposure (m)                                | 3.00E01  |
| Vehicle speed for maximum exposure (km/hr)                                     | 2.40E01  |
| Imposed regulatory limit on vehicle external dose                              | Yes      |
| Average breathing rate (m <sup>3</sup> /sec)                                   | 3.30E-04 |
| Cleanup Level (microcuries/m <sup>2</sup> )                                    | 2.00E-01 |
| Interdiction Threshold                                                         | 4.00E01  |
| Evacuation time for groundshine (days)                                         | 1.00E00  |
| Survey interval for groundshine (days)                                         | 1.00E01  |
| Occupational latent cancer fatalities per person-rem                           | 4.00E-04 |
| Public latent cancer fatalities per person-rem                                 | 5.00E-04 |
| Genetic effects per person-rem (public)                                        | 1.00E-04 |
| Campaign (year)                                                                | 8.33E-02 |
| Iodine                                                                         | I129     |
| Rem per curie thyroid via inhalation (Rem/Ci)                                  | 5.77E06  |
| Distance of freeway vehicle carrying radioactive cargo to pede...              | 3.00E01  |
| Distance of freeway vehicle carrying radioactive cargo to right-...            | 3.00E01  |
| Distance of freeway vehicle carrying radioactive cargo to maxi...              | 8.00E02  |
| Distance of non-freeway vehicle carrying radioactive cargo to p...             | 2.70E01  |
| Distance of non-freeway vehicle carrying radioactive cargo to ri...            | 3.00E01  |
| Distance of non-freeway vehicle carrying radioactive cargo to ...              | 8.00E02  |
| Distance of city street vehicle carrying radioactive cargo to ped...           | 5.00E00  |
| Distance of city street vehicle carrying radioactive cargo to righ...          | 8.00E00  |
| Distance of city street vehicle carrying radioactive cargo to ma...            | 8.00E02  |
| Perpendicular distance to freeway vehicle going in opposite dire...            | 1.50E01  |
| Perpendicular distance to non-freeway vehicle going in opposit...              | 3.00E00  |
| Perpendicular distance to city vehicle going in opposite direction...          | 3.00E00  |
| Perpendicular distance to all vehicles going in same direction (m)             | 4.00E00  |

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**5 RADTRAN FATALITIES CASE OUTPUT**

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|                   |     |                   |       |      |     |   |   |       |   |
|-------------------|-----|-------------------|-------|------|-----|---|---|-------|---|
| RRRR              | AAA | DDDD              | TTTTT | RRRR | AAA | N | N | 55555 | 6 |
| R R A A D D       | T   | R R A A NN        | N     | 5    | 6   |   |   |       |   |
| R R A A D D       | T   | R R A A N N N     | 5     | 6    |     |   |   |       |   |
| RRRR A A D D      | T   | RRRR A A N NN     | 5555  | 6666 |     |   |   |       |   |
| R R A A A A A D D | T   | R R A A A A A N N | 5     | 6    | 6   |   |   |       |   |
| R R A A D D       | T   | R R A A N N       | 5 5   | 6    | 6   |   |   |       |   |
| R R A A D D D D   | T   | R R A A N N       | 5555  | *    | 666 |   |   |       |   |

RADTRAN 5.6 February 20, 2006

INPUT ECHO

-----

TITLE Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Fatalities

INPUT STANDARD

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| STD: 0 10 18                                                                 | && DIMEN=NSEV NRAD NAREAS               |
| STD: 1 3 3 0                                                                 | && PARM=IRNKC IANA ISEN IPSQSB          |
| STD: .TRUE. .FALSE.                                                          | && FORM = UNIT, SI-UNITS?               |
| STD: 2.3E12                                                                  | && NEVAL FOR CF252                      |
| STD: 9.25E5 5.77E6 1.27E6                                                    | && RPCTHY FOR I125, I129, I131          |
| STD: 0.0 0.0 0.0 0.0 0.0                                                     | && TRANSFER GAMMA                       |
| STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0                                     | && TRANSFER NEUTRON                     |
| STD: 30 24                                                                   | && MITDDIST MITDVEL                     |
| STD: 1 2 .0018                                                               | && ITRAIN FMINCL DDRWEF                 |
| STD: 33 68 105 244 369                                                       | && CENTER LINE                          |
| STD: 561 1018 1628 2308 4269                                                 | && DISTANCES                            |
| STD: 5468 11136 13097 21334 40502                                            | && FOR AVERAGE                          |
| STD: 69986 89860 120878 0 0 0 0 0 0 0 0 0 0 0                                | && US CLOUD                             |
| STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05 |                                         |
| STD: 8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08 |                                         |
| STD: 8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0                                   | && AREADA                               |
| STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05 |                                         |
| STD: 8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08 |                                         |
| STD: 4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0 0                                 | && DFLEV                                |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  | && RADIST                               |
| STD: 0.5                                                                     | && SMLPKG                               |
| STD: 1.0 0.87 0.018                                                          | && SHIELDING FACTORS RR RS RU           |
| STD: 30 30 800                                                               | && OFFLINK {FREEWAY}                    |
| STD: 27 30 800                                                               | && OFFLINK {NON-FREEWAY}                |
| STD: 5 8 800                                                                 | && OFFLINK {CITY STREETS}               |
| STD: 30 30 800                                                               | && OFFLINK {RAILWAY}                    |
| STD: 200 200 1000                                                            | && OFFLINK {WATERWAY}                   |
| STD: 15 3 3 3 4                                                              | && ONLINK {FWAY NONFWY STREET RAIL ADJ} |
| STD: 6.0 4 40.0                                                              | && RPD FNOATT INTERDICT                 |
| STD: 0.05 0.2 3.3E-4                                                         | && BDF CULVL BRATE                      |
| STD: 0.9 0.1                                                                 | && UBF USWF                             |
| STD: 1.0 10.0 1.0                                                            | && EVACUATION SURVEY CAMPAIGN           |

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```
STD: 0.0 0.0 1.5E-8 5.3E-8 && HIGHWAY - RURAL - NONRAD
STD: 0.0 0.0 3.7E-9 1.3E-8 && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0 0.0 2.1E-9 7.5E-9 && HIGHWAY - URBAN - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - R - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - S - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - U - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - R - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - S - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0 && PSPROB
STD: 0.67 0.67 0.42 && TIMENDE NON-DISPERSAL EVAC TIME
(LCF&EARLY)
STD: 2 2 1 && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.0E-4 && LCFCN(1), LCFCN(2), GECON
STD: R5INGEST.BIN && INGESTION FILE
  OUTPUT BQ_SV
  FORM UNIT
  DIMEN 0 10 18
  PARM 1 1 1 0
  SEVERITY
    NPOP=1
    NMODE=1

    NPOP=2
    NMODE=1

    NPOP=3
    NMODE=1

RELEASE
PACKAGE PACKAGE_1 0.1 1.0 0.0 5.2
END
VEHICLE -1 VEHICLE_1 1.00E-01 1.0 0.0 5.2 1.0 2.0 4.0 1.0 1.0
  PACKAGE_1 1.0
FLAGS
  IACC 2
  IUOPT 2
  REGCHECK 1
MODSTD
  DISTOFF FREEWAY 3.00E01 3.00E01 8.00E02
  DISTOFF SECONDARY 2.70E01 3.00E01 8.00E02
  DISTOFF STREET 5.00E00 8.00E00 8.00E02
  DISTON
    FREEWAY 1.50E01
    SECONDARY 3.00E00
    STREET 3.00E00
    ADJACENT 4.00E00
  BDF 5.00E-02
  BRATE 3.30E-04
  CULVL 2.00E-01
  EVACUATION 1.00E00
```

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GECON 1.00E-04  
INTERDICT 4.00E01  
LCFCON 5.00E-04 4.00E-04  
SURVEY 1.00E01  
UBF 5.20E-01  
USWF 4.80E-01  
CAMPAIGN 8.33E-02  
MITDDIST 3.00E01  
MITDVEL 2.40E01  
RPD 6.00E00  
RR 1.00E00  
RU 1.80E-02  
RS 8.70E-01  
SMALLPKG 5.00E-01  
RPCTHYROID  
I129 5.77E06

EOF

LINK RURAL\_DE VEHICLE\_1 3.3 88.9 1.5 18.8 530.0 5.18E-7 0.0108 R 1 1.0  
LINK SUBURBN\_DE VEHICLE\_1 14.0 88.9 1.5 549.2 760.0 5.18E-7 0.0108 S 1 1.0  
LINK URBAN\_DE VEHICLE\_1 6.0 88.9 1.5 2168.9 2400.0 5.18E-7 0.0108 U 1 1.0  
LINK RURAL\_ID VEHICLE\_1 357.0 88.9 1.5 11.3 530.0 2.95E-7 0.0129 R 1 1.0  
LINK SUBURBN\_ID VEHICLE\_1 79.3 88.9 1.5 278.7 760.0 2.95E-7 0.0129 S 1 1.0  
LINK URBAN\_ID VEHICLE\_1 7.3 88.9 1.5 2219.6 2400.0 2.95E-7 0.0129 U 1 1.0  
LINK RURAL\_IL VEHICLE\_1 178.4 88.9 1.5 14.4 530.0 2.22E-7 0.0374 R 1 1.0  
LINK SUBURBN\_IL VEHICLE\_1 73.0 88.9 1.5 323.6 760.0 2.22E-7 0.0374 S 1 1.0  
LINK URBAN\_IL VEHICLE\_1 10.2 88.9 1.5 2379.1 2400.0 2.22E-7 0.0374 U 1 1.0  
LINK RURAL\_IN VEHICLE\_1 136.7 88.9 1.5 19.9 530.0 2.25E-7 0.0298 R 1 1.0  
LINK SUBURBN\_IN VEHICLE\_1 97.3 88.9 1.5 276.3 760.0 2.25E-7 0.0298 S 1 1.0  
LINK URBAN\_IN VEHICLE\_1 9.4 88.9 1.5 2354.7 2400.0 2.25E-7 0.0298 U 1 1.0  
LINK RURAL\_IA VEHICLE\_1 377.8 88.9 1.5 16.4 530.0 1.12E-7 0.0839 R 1 1.0  
LINK SUBURBN\_IA VEHICLE\_1 107.7 88.9 1.5 272.7 760.0 1.12E-7 0.0839 S 1 1.0  
LINK URBAN\_IA VEHICLE\_1 5.8 88.9 1.5 2191.1 2400.0 1.12E-7 0.0839 U 1 1.0  
LINK RURAL\_NE VEHICLE\_1 649.1 88.9 1.5 9.9 530.0 3.19E-7 0.0429 R 1 1.0  
LINK SUBURBN\_NE VEHICLE\_1 71.5 88.9 1.5 270.2 760.0 3.19E-7 0.0429 S 1 1.0  
LINK URBAN\_NE VEHICLE\_1 8.0 88.9 1.5 2410.2 2400.0 3.19E-7 0.0429 U 1 1.0  
LINK RURAL\_NJ VEHICLE\_1 20.6 88.9 1.5 11.8 530.0 5.65E-7 0.0214 R 1 1.0  
LINK SUBURBN\_NJ VEHICLE\_1 12.5 8.9 1.5 353.9 760.0 5.65E-7 0.0214 S 1 1.0  
LINK URBAN\_NJ VEHICLE\_1 1.1 88.9 1.5 2025.9 2400.0 5.65E-7 0.0214 U 1 1.0  
LINK RURAL\_OH VEHICLE\_1 213.1 88.9 1.5 19.7 530.0 1.64E-7 0.0238 R 1 1.0  
LINK SUBURBN\_OH VEHICLE\_1 151.3 88.9 1.5 309.6 760.0 1.64E-7 0.0238 S 1 1.0  
LINK URBAN\_OH VEHICLE\_1 14.8 88.9 1.5 2211.7 2400.0 1.64E-7 0.0238 U 1 1.0  
LINK RURAL\_OR VEHICLE\_1 301.0 88.9 1.5 8.2 530.0 3.15E-7 0.0648 R 1 1.0  
LINK SUBURBN\_OR VEHICLE\_1 32.2 88.9 1.5 313.2 760.0 3.15E-7 0.0648 S 1 1.0  
LINK URBAN\_OR VEHICLE\_1 2.3 88.9 1.5 1976.3 2400.0 3.15E-7 0.0648 U 1 1.0  
LINK RURAL\_PA VEHICLE\_1 321.7 88.9 1.5 18.4 530.0 5.14E-7 0.0263 R 1 1.0  
LINK SUBURBN\_PA VEHICLE\_1 172.2 88.9 1.5 313.8 760.0 5.14E-7 0.0263 S 1 1.0  
LINK URBAN\_PA VEHICLE\_1 20.7 88.9 1.5 2452.8 2400.0 5.14E-7 0.0263 U 1 1.0  
LINK RURAL\_UT VEHICLE\_1 186.8 88.9 1.5 9.7 530.0 2.9E-7 0.041 R 1 1.0  
LINK SUBURBN\_UT VEHICLE\_1 51.6 88.9 1.5 257.8 760.0 2.9E-7 0.041 S 1 1.0  
LINK URBAN\_UT VEHICLE\_1 1.5 88.9 1.5 2112.2 2400.0 2.9E-7 0.041 U 1 1.0  
LINK RURAL\_WA VEHICLE\_1 44.1 88.9 1.5 1.5 530.0 2.65E-7 0.0634 R 1 1.0  
LINK SUBURBN\_WA VEHICLE\_1 8.6 88.9 1.5 604.4 760.0 2.65E-7 0.0634 S 1 1.0  
LINK URBAN\_WA VEHICLE\_1 4.7 88.9 1.5 2293.2 2400.0 2.65E-7 0.0634 U 1 1.0



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LINK RURAL\_WY VEHICLE\_1 607.2 88.9 1.5 4.9 530.0 6.74E-7 0.016 R 1 1.0  
LINK SUBURBN\_WY VEHICLE\_1 33.9 88.9 1.5 399.4 760.0 6.74E-7 0.016 S 1 1.0  
LINK URBAN\_WY VEHICLE\_1 3.4 88.9 1.5 1966.6 2400.0 6.74E-7 0.016 U 1 1.0

STOP STOP\_1 VEHICLE\_1 30000.0 1.0 10.0 1.0 6.0  
STOP STOP\_2 VEHICLE\_1 340.0 10.0 800.0 0.2 6.0

HANDLING HANDLE\_1 VEHICLE\_1 5.0 1.0 0.5

EOF

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NON-RADIOLOGICAL DATA (ACCIDENTS and FATALITIES)

\*\*\*\*\*

HIGHWAY

|            | ACCIDENT RATE | ACCIDENTS | FATALITIES |
|------------|---------------|-----------|------------|
| RURAL_DE   | 5.18E-07      | 1.71E-06  | 1.85E-08   |
| SUBURBN_DE | 5.18E-07      | 7.25E-06  | 7.83E-08   |
| URBAN_DE   | 5.18E-07      | 3.11E-06  | 3.36E-08   |
| RURAL_ID   | 2.95E-07      | 1.05E-04  | 1.36E-06   |
| SUBURBN_ID | 2.95E-07      | 2.34E-05  | 3.02E-07   |
| URBAN_ID   | 2.95E-07      | 2.15E-06  | 2.78E-08   |
| RURAL_IL   | 2.22E-07      | 3.96E-05  | 1.48E-06   |
| SUBURBN_IL | 2.22E-07      | 1.62E-05  | 6.06E-07   |
| URBAN_IL   | 2.22E-07      | 2.26E-06  | 8.47E-08   |
| RURAL_IN   | 2.25E-07      | 3.08E-05  | 9.17E-07   |
| SUBURBN_IN | 2.25E-07      | 2.19E-05  | 6.52E-07   |
| URBAN_IN   | 2.25E-07      | 2.12E-06  | 6.30E-08   |
| RURAL_IA   | 1.12E-07      | 4.23E-05  | 3.55E-06   |
| SUBURBN_IA | 1.12E-07      | 1.21E-05  | 1.01E-06   |
| URBAN_IA   | 1.12E-07      | 6.50E-07  | 5.45E-08   |
| RURAL_NE   | 3.19E-07      | 2.07E-04  | 8.88E-06   |
| SUBURBN_NE | 3.19E-07      | 2.28E-05  | 9.78E-07   |
| URBAN_NE   | 3.19E-07      | 2.55E-06  | 1.09E-07   |
| RURAL_NJ   | 5.65E-07      | 1.16E-05  | 2.49E-07   |
| SUBURBN_NJ | 5.65E-07      | 7.06E-06  | 1.51E-07   |
| URBAN_NJ   | 5.65E-07      | 6.22E-07  | 1.33E-08   |
| RURAL_OH   | 1.64E-07      | 3.49E-05  | 8.32E-07   |
| SUBURBN_OH | 1.64E-07      | 2.48E-05  | 5.91E-07   |
| URBAN_OH   | 1.64E-07      | 2.43E-06  | 5.78E-08   |
| RURAL_OR   | 3.15E-07      | 9.48E-05  | 6.14E-06   |
| SUBURBN_OR | 3.15E-07      | 1.01E-05  | 6.57E-07   |
| URBAN_OR   | 3.15E-07      | 7.25E-07  | 4.69E-08   |
| RURAL_PA   | 5.14E-07      | 1.65E-04  | 4.35E-06   |
| SUBURBN_PA | 5.14E-07      | 8.85E-05  | 2.33E-06   |
| URBAN_PA   | 5.14E-07      | 1.06E-05  | 2.80E-07   |
| RURAL_UT   | 2.90E-07      | 5.42E-05  | 2.22E-06   |
| SUBURBN_UT | 2.90E-07      | 1.50E-05  | 6.14E-07   |
| URBAN_UT   | 2.90E-07      | 4.35E-07  | 1.78E-08   |
| RURAL_WA   | 2.65E-07      | 1.17E-05  | 7.41E-07   |
| SUBURBN_WA | 2.65E-07      | 2.28E-06  | 1.44E-07   |
| URBAN_WA   | 2.65E-07      | 1.25E-06  | 7.90E-08   |
| RURAL_WY   | 6.74E-07      | 4.09E-04  | 6.55E-06   |
| SUBURBN_WY | 6.74E-07      | 2.28E-05  | 3.66E-07   |
| URBAN_WY   | 6.74E-07      | 2.29E-06  | 3.67E-08   |
| TOTALS:    | 1.34E-05      | 1.51E-03  | 4.67E-05   |

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REGULATORY CHECKS

THE SHIPMENT BY VEHICLE\_1 IS DESIGNATED AS EXCLUSIVE USE  
BUT IS NOT REQUIRED TO BE SO DESIGNATED BY REGULATIONS

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Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Fatalities

INCIDENT-FREE SUMMARY

\*\*\*\*\* \*\*\*\*\*

IN-TRANSIT POPULATION EXPOSURE IN PERSON-SV

|            | PASSENGER | CREW     | OFF LINK | ON LINK  | TOTALS   |
|------------|-----------|----------|----------|----------|----------|
| RURAL_DE   | 0.00E+00  | 1.05E-08 | 1.62E-10 | 1.77E-09 | 1.25E-08 |
| SUBURBN_DE | 0.00E+00  | 4.46E-08 | 1.74E-08 | 1.08E-08 | 7.29E-08 |
| URBAN_DE   | 0.00E+00  | 1.91E-08 | 6.11E-10 | 1.46E-08 | 3.43E-08 |
| RURAL_ID   | 0.00E+00  | 1.14E-06 | 1.05E-08 | 1.92E-07 | 1.34E-06 |
| SUBURBN_ID | 0.00E+00  | 2.53E-07 | 5.01E-08 | 6.10E-08 | 3.64E-07 |
| URBAN_ID   | 0.00E+00  | 2.33E-08 | 7.60E-10 | 1.77E-08 | 4.18E-08 |
| RURAL_IL   | 0.00E+00  | 5.69E-07 | 6.70E-09 | 9.57E-08 | 6.71E-07 |
| SUBURBN_IL | 0.00E+00  | 2.33E-07 | 5.36E-08 | 5.62E-08 | 3.43E-07 |
| URBAN_IL   | 0.00E+00  | 3.25E-08 | 1.14E-09 | 2.48E-08 | 5.85E-08 |
| RURAL_IN   | 0.00E+00  | 4.36E-07 | 7.09E-09 | 7.34E-08 | 5.16E-07 |
| SUBURBN_IN | 0.00E+00  | 3.10E-07 | 6.10E-08 | 7.49E-08 | 4.46E-07 |
| URBAN_IN   | 0.00E+00  | 3.00E-08 | 1.04E-09 | 2.28E-08 | 5.39E-08 |
| RURAL_IA   | 0.00E+00  | 1.20E-06 | 1.62E-08 | 2.03E-07 | 1.42E-06 |
| SUBURBN_IA | 0.00E+00  | 3.43E-07 | 6.66E-08 | 8.29E-08 | 4.93E-07 |
| URBAN_IA   | 0.00E+00  | 1.85E-08 | 5.96E-10 | 1.41E-08 | 3.32E-08 |
| RURAL_NE   | 0.00E+00  | 2.07E-06 | 1.68E-08 | 3.48E-07 | 2.44E-06 |
| SUBURBN_NE | 0.00E+00  | 2.28E-07 | 4.38E-08 | 5.50E-08 | 3.27E-07 |
| URBAN_NE   | 0.00E+00  | 2.55E-08 | 9.05E-10 | 1.94E-08 | 4.59E-08 |
| RURAL_NJ   | 0.00E+00  | 6.57E-08 | 6.34E-10 | 1.11E-08 | 7.74E-08 |
| SUBURBN_NJ | 0.00E+00  | 3.98E-07 | 1.00E-07 | 1.32E-06 | 1.82E-06 |
| URBAN_NJ   | 0.00E+00  | 3.51E-09 | 1.05E-10 | 2.67E-09 | 6.29E-09 |
| RURAL_OH   | 0.00E+00  | 6.80E-07 | 1.09E-08 | 1.14E-07 | 8.05E-07 |
| SUBURBN_OH | 0.00E+00  | 4.82E-07 | 1.06E-07 | 1.16E-07 | 7.05E-07 |
| URBAN_OH   | 0.00E+00  | 4.72E-08 | 1.54E-09 | 3.60E-08 | 8.47E-08 |
| RURAL_OR   | 0.00E+00  | 9.60E-07 | 6.44E-09 | 1.62E-07 | 1.13E-06 |
| SUBURBN_OR | 0.00E+00  | 1.03E-07 | 2.29E-08 | 2.48E-08 | 1.50E-07 |
| URBAN_OR   | 0.00E+00  | 7.33E-09 | 2.13E-10 | 5.59E-09 | 1.31E-08 |
| RURAL_PA   | 0.00E+00  | 1.03E-06 | 1.54E-08 | 1.73E-07 | 1.21E-06 |
| SUBURBN_PA | 0.00E+00  | 5.49E-07 | 1.23E-07 | 1.33E-07 | 8.04E-07 |
| URBAN_PA   | 0.00E+00  | 6.60E-08 | 2.38E-09 | 5.03E-08 | 1.19E-07 |
| RURAL_UT   | 0.00E+00  | 5.96E-07 | 4.72E-09 | 1.00E-07 | 7.01E-07 |
| SUBURBN_UT | 0.00E+00  | 1.65E-07 | 3.02E-08 | 3.97E-08 | 2.34E-07 |
| URBAN_UT   | 0.00E+00  | 4.78E-09 | 1.49E-10 | 3.65E-09 | 8.58E-09 |
| RURAL_WA   | 0.00E+00  | 1.41E-07 | 1.72E-10 | 2.37E-08 | 1.64E-07 |
| SUBURBN_WA | 0.00E+00  | 2.74E-08 | 1.18E-08 | 6.62E-09 | 4.58E-08 |
| URBAN_WA   | 0.00E+00  | 1.50E-08 | 5.06E-10 | 1.14E-08 | 2.69E-08 |
| RURAL_WY   | 0.00E+00  | 1.94E-06 | 7.76E-09 | 3.26E-07 | 2.27E-06 |
| SUBURBN_WY | 0.00E+00  | 1.08E-07 | 3.07E-08 | 2.61E-08 | 1.65E-07 |
| URBAN_WY   | 0.00E+00  | 1.08E-08 | 3.14E-10 | 8.26E-09 | 1.94E-08 |
|            |           |          |          |          |          |
| RURAL      | 0.00E+00  | 1.08E-05 | 1.03E-07 | 1.82E-06 | 1.28E-05 |
| SUBURB     | 0.00E+00  | 3.24E-06 | 7.17E-07 | 2.01E-06 | 5.97E-06 |
| URBAN      | 0.00E+00  | 3.04E-07 | 1.03E-08 | 2.31E-07 | 5.45E-07 |

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TOTALS: 0.00E+00 1.44E-05 8.31E-07 4.07E-06 1.93E-05

MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

VEHICLE\_1 4.26E-11 SV

STOP EXPOSURE IN PERSON-SV

ANNULAR AREA STOP\_1 2.90E-05

ANNULAR AREA STOP\_2 1.25E-07

TOTAL: 2.92E-05

HANDLING EXPOSURE IN PERSON-SV

| HANDLING | VEHICLE   | MATERIAL  | METHOD      | DOSE     |
|----------|-----------|-----------|-------------|----------|
| HANDLE_1 | VEHICLE_1 | PACKAGE_1 | LINE-SOURCE | 8.35E-06 |

TOTAL: 8.35E-06

EOI

END OF RUN

SUCCESSFUL COMPLETION

**PSEG Site  
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**6 RADTRAN INJURIES CASE OUTPUT**

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|                   |     |                   |       |      |     |   |   |       |   |
|-------------------|-----|-------------------|-------|------|-----|---|---|-------|---|
| RRRR              | AAA | DDDD              | TTTTT | RRRR | AAA | N | N | 55555 | 6 |
| R R A A D D       | T   | R R A A NN N      | 5     | 6    |     |   |   |       |   |
| R R A A D D       | T   | R R A A NN N      | 5     | 6    |     |   |   |       |   |
| RRRR A A D D      | T   | RRRR A A N NN     | 5555  | 6666 |     |   |   |       |   |
| R R A A A A A D D | T   | R R A A A A A N N | 5     | 6    | 6   |   |   |       |   |
| R R A A D D       | T   | R R A A N N       | 5 5   | 6    | 6   |   |   |       |   |
| R R A A D D D D   | T   | R R A A N N       | 5555  | *    | 666 |   |   |       |   |

RADTRAN 5.6 February 20, 2006

INPUT ECHO

-----

TITLE Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

INPUT STANDARD

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| STD: 0 10 18                                                                 | && DIMEN=NSEV NRAD NAREAS               |
| STD: 1 3 3 0                                                                 | && PARM=IRNKC IANA ISEN IPSQSB          |
| STD: .TRUE. .FALSE.                                                          | && FORM = UNIT, SI-UNITS?               |
| STD: 2.3E12                                                                  | && NEVAL FOR CF252                      |
| STD: 9.25E5 5.77E6 1.27E6                                                    | && RPCTHY FOR I125, I129, I131          |
| STD: 0.0 0.0 0.0 0.0 0.0                                                     | && TRANSFER GAMMA                       |
| STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0                                     | && TRANSFER NEUTRON                     |
| STD: 30 24                                                                   | && MITDDIST MITDVEL                     |
| STD: 1 2 .0018                                                               | && ITRAIN FMINCL DDRWEF                 |
| STD: 33 68 105 244 369                                                       | && CENTER LINE                          |
| STD: 561 1018 1628 2308 4269                                                 | && DISTANCES                            |
| STD: 5468 11136 13097 21334 40502                                            | && FOR AVERAGE                          |
| STD: 69986 89860 120878 0 0 0 0 0 0 0 0 0 0                                  | && US CLOUD                             |
| STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05 |                                         |
| STD: 8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08 |                                         |
| STD: 8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0                                   | && AREADA                               |
| STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05 |                                         |
| STD: 8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08 |                                         |
| STD: 4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0                                   | && DFLEV                                |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  |                                         |
| STD: 3 6 9 12 15 30 61 91 152 305 0 0 0 0 0                                  | && RADIST                               |
| STD: 0.5                                                                     | && SMLPKG                               |
| STD: 1.0 0.87 0.018                                                          | && SHIELDING FACTORS RR RS RU           |
| STD: 30 30 800                                                               | && OFFLINK {FREEWAY}                    |
| STD: 27 30 800                                                               | && OFFLINK {NON-FREEWAY}                |
| STD: 5 8 800                                                                 | && OFFLINK {CITY STREETS}               |
| STD: 30 30 800                                                               | && OFFLINK {RAILWAY}                    |
| STD: 200 200 1000                                                            | && OFFLINK {WATERWAY}                   |
| STD: 15 3 3 3 4                                                              | && ONLINK {FWAY NONFWY STREET RAIL ADJ} |
| STD: 6.0 4 40.0                                                              | && RPD FNOATT INTERDICT                 |
| STD: 0.05 0.2 3.3E-4                                                         | && BDF CULVL BRATE                      |
| STD: 0.9 0.1                                                                 | && UBF USWF                             |
| STD: 1.0 10.0 1.0                                                            | && EVACUATION SURVEY CAMPAIGN           |

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Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

```
STD: 0.0 0.0 1.5E-8 5.3E-8 && HIGHWAY - RURAL - NONRAD
STD: 0.0 0.0 3.7E-9 1.3E-8 && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0 0.0 2.1E-9 7.5E-9 && HIGHWAY - URBAN - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - R - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - S - NONRAD
STD: 0.0 0.0 1.81E-9 2.64E-8 && GENERAL FREIGHT - U - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - R - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - S - NONRAD
STD: 0.0 0.0 1.27E-7 1.85E-6 && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0 && PSPROB
STD: 0.67 0.67 0.42 && TIMENDE NON-DISPERSAL EVAC TIME
(LCF&EARLY)
STD: 2 2 1 && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.0E-4 && LCFCN(1), LCFCN(2), GECON
STD: R5INGEST.BIN && INGESTION FILE
OUTPUT BQ_SV
FORM UNIT
DIMEN 0 10 18
PARM 1 1 1 0
SEVERITY
  NPOP=1
    NMODE=1

  NPOP=2
    NMODE=1

  NPOP=3
    NMODE=1

RELEASE
PACKAGE PACKAGE_1 0.1 1.0 0.0 5.2
END
VEHICLE -1 VEHICLE_1 1.00E-01 1.0 0.0 5.2 1.0 2.0 4.0 1.0 1.0
  PACKAGE_1 1.0
FLAGS
  IACC 2
  IUOPT 2
  REGCHECK 1
MODSTD
  DISTOFF FREEWAY 3.00E01 3.00E01 8.00E02
  DISTOFF SECONDARY 2.70E01 3.00E01 8.00E02
  DISTOFF STREET 5.00E00 8.00E00 8.00E02
  DISTON
    FREEWAY 1.50E01
    SECONDARY 3.00E00
    STREET 3.00E00
    ADJACENT 4.00E00
  BDF 5.00E-02
  BRATE 3.30E-04
  CULVL 2.00E-01
  EVACUATION 1.00E00
```

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GECON 1.00E-04  
INTERDICT 4.00E01  
LCFCON 5.00E-04 4.00E-04  
SURVEY 1.00E01  
UBF 5.20E-01  
USWF 4.80E-01  
CAMPAIGN 8.33E-02  
MITDDIST 3.00E01  
MITDVEL 2.40E01  
RPD 6.00E00  
RR 1.00E00  
RU 1.80E-02  
RS 8.70E-01  
SMALLPKG 5.00E-01  
RPCTHYROID  
I129 5.77E06

EOF

LINK RURAL\_DE VEHICLE\_1 3.3 88.9 1.5 18.8 530.0 5.18E-7 0.66 R 1 1.0  
LINK SUBURBN\_DE VEHICLE\_1 14.0 88.9 1.5 549.2 760.0 5.18E-7 0.66 S 1 1.0  
LINK URBAN\_DE VEHICLE\_1 6.0 88.9 1.5 2168.9 2400.0 5.18E-7 0.66 U 1 1.0  
LINK RURAL\_ID VEHICLE\_1 357.0 88.9 1.5 11.3 530.0 2.95E-7 1.04 R 1 1.0  
LINK SUBURBN\_ID VEHICLE\_1 79.3 88.9 1.5 278.7 760.0 2.95E-7 1.04 S 1 1.0  
LINK URBAN\_ID VEHICLE\_1 7.3 88.9 1.5 2219.6 2400.0 2.95E-7 1.04 U 1 1.0  
LINK RURAL\_IL VEHICLE\_1 178.4 88.9 1.5 14.4 530.0 2.22E-7 0.676 R 1 1.0  
LINK SUBURBN\_IL VEHICLE\_1 73.0 88.9 1.5 323.6 760.0 2.22E-7 0.676 S 1 1.0  
LINK URBAN\_IL VEHICLE\_1 10.2 88.9 1.5 2379.1 2400.0 2.22E-7 0.676 U 1 1.0  
LINK RURAL\_IN VEHICLE\_1 136.7 88.9 1.5 19.9 530.0 2.25E-7 0.622 R 1 1.0  
LINK SUBURBN\_IN VEHICLE\_1 97.3 88.9 1.5 276.3 760.0 2.25E-7 0.622 S 1 1.0  
LINK URBAN\_IN VEHICLE\_1 9.4 88.9 1.5 2354.7 2400.0 2.25E-7 0.622 U 1 1.0  
LINK RURAL\_IA VEHICLE\_1 377.8 88.9 1.5 16.4 530.0 1.12E-7 0.768 R 1 1.0  
LINK SUBURBN\_IA VEHICLE\_1 107.7 88.9 1.5 272.7 760.0 1.12E-7 0.768 S 1 1.0  
LINK URBAN\_IA VEHICLE\_1 5.8 88.9 1.5 2191.1 2400.0 1.12E-7 0.768 U 1 1.0  
LINK RURAL\_NE VEHICLE\_1 649.1 88.9 1.5 9.9 530.0 3.19E-7 0.618 R 1 1.0  
LINK SUBURBN\_NE VEHICLE\_1 71.5 88.9 1.5 270.2 760.0 3.19E-7 0.618 S 1 1.0  
LINK URBAN\_NE VEHICLE\_1 8.0 88.9 1.5 2410.2 2400.0 3.19E-7 0.618 U 1 1.0  
LINK RURAL\_NJ VEHICLE\_1 20.6 88.9 1.5 11.8 530.0 5.65E-7 0.692 R 1 1.0  
LINK SUBURBN\_NJ VEHICLE\_1 12.5 8.9 1.5 353.9 760.0 5.65E-7 0.692 S 1 1.0  
LINK URBAN\_NJ VEHICLE\_1 1.1 88.9 1.5 2025.9 2400.0 5.65E-7 0.692 U 1 1.0  
LINK RURAL\_OH VEHICLE\_1 213.1 88.9 1.5 19.7 530.0 1.64E-7 0.854 R 1 1.0  
LINK SUBURBN\_OH VEHICLE\_1 151.3 88.9 1.5 309.6 760.0 1.64E-7 0.854 S 1 1.0  
LINK URBAN\_OH VEHICLE\_1 14.8 88.9 1.5 2211.7 2400.0 1.64E-7 0.854 U 1 1.0  
LINK RURAL\_OR VEHICLE\_1 301.0 88.9 1.5 8.2 530.0 3.15E-7 0.721 R 1 1.0  
LINK SUBURBN\_OR VEHICLE\_1 32.2 88.9 1.5 313.2 760.0 3.15E-7 0.721 S 1 1.0  
LINK URBAN\_OR VEHICLE\_1 2.3 88.9 1.5 1976.3 2400.0 3.15E-7 0.721 U 1 1.0  
LINK RURAL\_PA VEHICLE\_1 321.7 88.9 1.5 18.4 530.0 5.14E-7 0.745 R 1 1.0  
LINK SUBURBN\_PA VEHICLE\_1 172.2 88.9 1.5 313.8 760.0 5.14E-7 0.745 S 1 1.0  
LINK URBAN\_PA VEHICLE\_1 20.7 88.9 1.5 2452.8 2400.0 5.14E-7 0.745 U 1 1.0  
LINK RURAL\_UT VEHICLE\_1 186.8 88.9 1.5 9.7 530.0 2.9E-7 0.872 R 1 1.0  
LINK SUBURBN\_UT VEHICLE\_1 51.6 88.9 1.5 257.8 760.0 2.9E-7 0.872 S 1 1.0  
LINK URBAN\_UT VEHICLE\_1 1.5 88.9 1.5 2112.2 2400.0 2.9E-7 0.872 U 1 1.0  
LINK RURAL\_WA VEHICLE\_1 44.1 88.9 1.5 1.5 530.0 2.65E-7 0.679 R 1 1.0  
LINK SUBURBN\_WA VEHICLE\_1 8.6 88.9 1.5 604.4 760.0 2.65E-7 0.679 S 1 1.0  
LINK URBAN\_WA VEHICLE\_1 4.7 88.9 1.5 2293.2 2400.0 2.65E-7 0.679 U 1 1.0



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LINK RURAL\_WY VEHICLE\_1 607.2 88.9 1.5 4.9 530.0 6.74E-7 0.479 R 1 1.0  
LINK SUBURBN\_WY VEHICLE\_1 33.9 88.9 1.5 399.4 760.0 6.74E-7 0.479 S 1 1.0  
LINK URBAN\_WY VEHICLE\_1 3.4 88.9 1.5 1966.6 2400.0 6.74E-7 0.479 U 1 1.0

STOP STOP\_1 VEHICLE\_1 30000.0 1.0 10.0 1.0 6.0  
STOP STOP\_2 VEHICLE\_1 340.0 10.0 800.0 0.2 6.0

HANDLING HANDLE\_1 VEHICLE\_1 5.0 1.0 0.5

EOF

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Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

NON-RADIOLOGICAL DATA (ACCIDENTS and FATALITIES)  
\*\*\*\*\*

HIGHWAY

|            | ACCIDENT RATE | ACCIDENTS | FATALITIES |
|------------|---------------|-----------|------------|
| RURAL_DE   | 5.18E-07      | 1.71E-06  | 1.13E-06   |
| SUBURBN_DE | 5.18E-07      | 7.25E-06  | 4.79E-06   |
| URBAN_DE   | 5.18E-07      | 3.11E-06  | 2.05E-06   |
| RURAL_ID   | 2.95E-07      | 1.05E-04  | 1.10E-04   |
| SUBURBN_ID | 2.95E-07      | 2.34E-05  | 2.43E-05   |
| URBAN_ID   | 2.95E-07      | 2.15E-06  | 2.24E-06   |
| RURAL_IL   | 2.22E-07      | 3.96E-05  | 2.68E-05   |
| SUBURBN_IL | 2.22E-07      | 1.62E-05  | 1.10E-05   |
| URBAN_IL   | 2.22E-07      | 2.26E-06  | 1.53E-06   |
| RURAL_IN   | 2.25E-07      | 3.08E-05  | 1.91E-05   |
| SUBURBN_IN | 2.25E-07      | 2.19E-05  | 1.36E-05   |
| URBAN_IN   | 2.25E-07      | 2.12E-06  | 1.32E-06   |
| RURAL_IA   | 1.12E-07      | 4.23E-05  | 3.25E-05   |
| SUBURBN_IA | 1.12E-07      | 1.21E-05  | 9.26E-06   |
| URBAN_IA   | 1.12E-07      | 6.50E-07  | 4.99E-07   |
| RURAL_NE   | 3.19E-07      | 2.07E-04  | 1.28E-04   |
| SUBURBN_NE | 3.19E-07      | 2.28E-05  | 1.41E-05   |
| URBAN_NE   | 3.19E-07      | 2.55E-06  | 1.58E-06   |
| RURAL_NJ   | 5.65E-07      | 1.16E-05  | 8.05E-06   |
| SUBURBN_NJ | 5.65E-07      | 7.06E-06  | 4.89E-06   |
| URBAN_NJ   | 5.65E-07      | 6.22E-07  | 4.30E-07   |
| RURAL_OH   | 1.64E-07      | 3.49E-05  | 2.98E-05   |
| SUBURBN_OH | 1.64E-07      | 2.48E-05  | 2.12E-05   |
| URBAN_OH   | 1.64E-07      | 2.43E-06  | 2.07E-06   |
| RURAL_OR   | 3.15E-07      | 9.48E-05  | 6.84E-05   |
| SUBURBN_OR | 3.15E-07      | 1.01E-05  | 7.31E-06   |
| URBAN_OR   | 3.15E-07      | 7.25E-07  | 5.22E-07   |
| RURAL_PA   | 5.14E-07      | 1.65E-04  | 1.23E-04   |
| SUBURBN_PA | 5.14E-07      | 8.85E-05  | 6.59E-05   |
| URBAN_PA   | 5.14E-07      | 1.06E-05  | 7.93E-06   |
| RURAL_UT   | 2.90E-07      | 5.42E-05  | 4.72E-05   |
| SUBURBN_UT | 2.90E-07      | 1.50E-05  | 1.30E-05   |
| URBAN_UT   | 2.90E-07      | 4.35E-07  | 3.79E-07   |
| RURAL_WA   | 2.65E-07      | 1.17E-05  | 7.94E-06   |
| SUBURBN_WA | 2.65E-07      | 2.28E-06  | 1.55E-06   |
| URBAN_WA   | 2.65E-07      | 1.25E-06  | 8.46E-07   |
| RURAL_WY   | 6.74E-07      | 4.09E-04  | 1.96E-04   |
| SUBURBN_WY | 6.74E-07      | 2.28E-05  | 1.09E-05   |
| URBAN_WY   | 6.74E-07      | 2.29E-06  | 1.10E-06   |
| TOTALS:    | 1.34E-05      | 1.51E-03  | 1.02E-03   |

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Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

REGULATORY CHECKS

THE SHIPMENT BY VEHICLE\_1 IS DESIGNATED AS EXCLUSIVE USE  
BUT IS NOT REQUIRED TO BE SO DESIGNATED BY REGULATIONS

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Calc. 2009-06944:New Fuel: Richland, WA to PSEG ESP: Injuries

INCIDENT-FREE SUMMARY

\*\*\*\*\* \*\*\*\*\*

IN-TRANSIT POPULATION EXPOSURE IN PERSON-SV

|            | PASSENGER | CREW     | OFF LINK | ON LINK  | TOTALS   |
|------------|-----------|----------|----------|----------|----------|
| RURAL_DE   | 0.00E+00  | 1.05E-08 | 1.62E-10 | 1.77E-09 | 1.25E-08 |
| SUBURBN_DE | 0.00E+00  | 4.46E-08 | 1.74E-08 | 1.08E-08 | 7.29E-08 |
| URBAN_DE   | 0.00E+00  | 1.91E-08 | 6.11E-10 | 1.46E-08 | 3.43E-08 |
| RURAL_ID   | 0.00E+00  | 1.14E-06 | 1.05E-08 | 1.92E-07 | 1.34E-06 |
| SUBURBN_ID | 0.00E+00  | 2.53E-07 | 5.01E-08 | 6.10E-08 | 3.64E-07 |
| URBAN_ID   | 0.00E+00  | 2.33E-08 | 7.60E-10 | 1.77E-08 | 4.18E-08 |
| RURAL_IL   | 0.00E+00  | 5.69E-07 | 6.70E-09 | 9.57E-08 | 6.71E-07 |
| SUBURBN_IL | 0.00E+00  | 2.33E-07 | 5.36E-08 | 5.62E-08 | 3.43E-07 |
| URBAN_IL   | 0.00E+00  | 3.25E-08 | 1.14E-09 | 2.48E-08 | 5.85E-08 |
| RURAL_IN   | 0.00E+00  | 4.36E-07 | 7.09E-09 | 7.34E-08 | 5.16E-07 |
| SUBURBN_IN | 0.00E+00  | 3.10E-07 | 6.10E-08 | 7.49E-08 | 4.46E-07 |
| URBAN_IN   | 0.00E+00  | 3.00E-08 | 1.04E-09 | 2.28E-08 | 5.39E-08 |
| RURAL_IA   | 0.00E+00  | 1.20E-06 | 1.62E-08 | 2.03E-07 | 1.42E-06 |
| SUBURBN_IA | 0.00E+00  | 3.43E-07 | 6.66E-08 | 8.29E-08 | 4.93E-07 |
| URBAN_IA   | 0.00E+00  | 1.85E-08 | 5.96E-10 | 1.41E-08 | 3.32E-08 |
| RURAL_NE   | 0.00E+00  | 2.07E-06 | 1.68E-08 | 3.48E-07 | 2.44E-06 |
| SUBURBN_NE | 0.00E+00  | 2.28E-07 | 4.38E-08 | 5.50E-08 | 3.27E-07 |
| URBAN_NE   | 0.00E+00  | 2.55E-08 | 9.05E-10 | 1.94E-08 | 4.59E-08 |
| RURAL_NJ   | 0.00E+00  | 6.57E-08 | 6.34E-10 | 1.11E-08 | 7.74E-08 |
| SUBURBN_NJ | 0.00E+00  | 3.98E-07 | 1.00E-07 | 1.32E-06 | 1.82E-06 |
| URBAN_NJ   | 0.00E+00  | 3.51E-09 | 1.05E-10 | 2.67E-09 | 6.29E-09 |
| RURAL_OH   | 0.00E+00  | 6.80E-07 | 1.09E-08 | 1.14E-07 | 8.05E-07 |
| SUBURBN_OH | 0.00E+00  | 4.82E-07 | 1.06E-07 | 1.16E-07 | 7.05E-07 |
| URBAN_OH   | 0.00E+00  | 4.72E-08 | 1.54E-09 | 3.60E-08 | 8.47E-08 |
| RURAL_OR   | 0.00E+00  | 9.60E-07 | 6.44E-09 | 1.62E-07 | 1.13E-06 |
| SUBURBN_OR | 0.00E+00  | 1.03E-07 | 2.29E-08 | 2.48E-08 | 1.50E-07 |
| URBAN_OR   | 0.00E+00  | 7.33E-09 | 2.13E-10 | 5.59E-09 | 1.31E-08 |
| RURAL_PA   | 0.00E+00  | 1.03E-06 | 1.54E-08 | 1.73E-07 | 1.21E-06 |
| SUBURBN_PA | 0.00E+00  | 5.49E-07 | 1.23E-07 | 1.33E-07 | 8.04E-07 |
| URBAN_PA   | 0.00E+00  | 6.60E-08 | 2.38E-09 | 5.03E-08 | 1.19E-07 |
| RURAL_UT   | 0.00E+00  | 5.96E-07 | 4.72E-09 | 1.00E-07 | 7.01E-07 |
| SUBURBN_UT | 0.00E+00  | 1.65E-07 | 3.02E-08 | 3.97E-08 | 2.34E-07 |
| URBAN_UT   | 0.00E+00  | 4.78E-09 | 1.49E-10 | 3.65E-09 | 8.58E-09 |
| RURAL_WA   | 0.00E+00  | 1.41E-07 | 1.72E-10 | 2.37E-08 | 1.64E-07 |
| SUBURBN_WA | 0.00E+00  | 2.74E-08 | 1.18E-08 | 6.62E-09 | 4.58E-08 |
| URBAN_WA   | 0.00E+00  | 1.50E-08 | 5.06E-10 | 1.14E-08 | 2.69E-08 |
| RURAL_WY   | 0.00E+00  | 1.94E-06 | 7.76E-09 | 3.26E-07 | 2.27E-06 |
| SUBURBN_WY | 0.00E+00  | 1.08E-07 | 3.07E-08 | 2.61E-08 | 1.65E-07 |
| URBAN_WY   | 0.00E+00  | 1.08E-08 | 3.14E-10 | 8.26E-09 | 1.94E-08 |
|            |           |          |          |          |          |
| RURAL      | 0.00E+00  | 1.08E-05 | 1.03E-07 | 1.82E-06 | 1.28E-05 |
| SUBURB     | 0.00E+00  | 3.24E-06 | 7.17E-07 | 2.01E-06 | 5.97E-06 |
| URBAN      | 0.00E+00  | 3.04E-07 | 1.03E-08 | 2.31E-07 | 5.45E-07 |

**PSEG Site  
ESP Application  
Part 3, Environmental Report**

TOTALS: 0.00E+00 1.44E-05 8.31E-07 4.07E-06 1.93E-05

MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

VEHICLE\_1 4.26E-11 SV

STOP EXPOSURE IN PERSON-SV

|              |        |          |
|--------------|--------|----------|
| ANNULAR AREA | STOP_1 | 2.90E-05 |
| ANNULAR AREA | STOP_2 | 1.25E-07 |
| TOTAL:       |        | 2.92E-05 |

HANDLING EXPOSURE IN PERSON-SV

| HANDLING | VEHICLE   | MATERIAL  | METHOD      | DOSE     |
|----------|-----------|-----------|-------------|----------|
| HANDLE_1 | VEHICLE_1 | PACKAGE_1 | LINE-SOURCE | 8.35E-06 |
| TOTAL:   |           |           |             | 8.35E-06 |

EOI  
END OF RUN  
SUCCESSFUL COMPLETION