7.1 CONFINEMENT BOUNDARY

The primary confinement boundary against the release of radionuclides is the cladding of the individual fuel rods. The spent fuel rods are protected from degradation by maintaining an inert gas atmosphere (helium) inside the MPC and keeping the fuel cladding temperatures below the design basis values specified in Chapter 2.

The HI-STORM 100 confinement boundary consists of any one of the *seven*~~two~~ fully-welded MPC designs described in Chapter 1. Each MPC is identical from a confinement perspective so the following discussion applies to all MPCs. The confinement boundary of the MPC consists of:

- MPC shell
- bottom baseplate
- MPC lid (including the vent and drain port cover plates)
- MPC closure ring
- associated welds

The above items form a totally seal-welded vessel for the storage of design basis spent fuel assemblies.

The MPC requires no valves, gaskets or mechanical seals for confinement. Figure 7.1.1 shows an elevation cross-section of the MPC confinement boundary. All components of the confinement boundary are Important to Safety, Category A, as specified in Table 2.2.6. The MPC confinement boundary is designed and fabricated in accordance with the ASME Code, Section III, Subsection NB [7.1.1] to the maximum extent practicable. Chapter 2 provides design criteria for the confinement design. Section 2.2.4 provides applicable Code requirements. Exceptions to specific Code requirements with complete justifications are presented in Table 2.2.15.

7.1.1 Confinement Vessel

The HI-STORM 100 confinement vessel is the MPC. The MPC is designed to provide confinement of all radionuclides under normal, off-normal and accident conditions. The MPC is designed, fabricated, and tested in accordance with the applicable requirements of ASME, Section III, Subsection NB [7.1.1] to the maximum extent practicable. The MPC shell and baseplate assembly and basket structure are delivered to the loading facility as one complete component. The MPC lid, vent and drain port cover plates, and closure ring are supplied separately and are installed following fuel loading. The MPC lid and closure ring are welded to the upper part of the MPC shell at the loading site to provide redundant sealing of the confinement boundary. The vent and drain port cover plates are welded to the MPC lid after the lid is welded to the MPC. The welds forming the

The MPC is designed to allow for the storage of specified damaged fuel assemblies and fuel debris in a specially designed damaged fuel container (DFC). Fuel assemblies classified as damaged fuel or fuel debris ~~(assembly *array/class 6x6A, 6x6B, 6x6C, 7x7A, and 8x8A*~~ as specified in *the* ~~Technical Specifications in Chapter 12)~~ *Approved Contents Section of Appendix B to the CoC* have been evaluated.

To aid in loading and unloading, damaged fuel assemblies and fuel debris will be loaded into stainless steel DFCs prior to placement in the HI-STORM 100 System. The DFC*s that may be loaded into the MPCs are* ~~is~~ shown in Figures 2.1.1 *through Figure 2.1.2c.* The DFC is designed to provide SNF loose component retention and handling capabilities. The DFC consists of a smooth-walled, welded stainless steel square container with a removable lid. The container lid provides the means of DFC closure and handling. The DFC is provided with stainless steel wire mesh screens in the top and bottom for draining, vacuum drying and helium backfill operations. The screens are specified as a 250-by-250-mesh with an effective opening of 0.0024 inches. There are no other openings in the DFC. The ~~Technical Specifications~~ *CoC* specif*ies*~~y~~ the fuel assembly characteristics for damaged fuel acceptable for loading in the *MPC-24E, MPC-24EF,* MPC-68, *MPC-68F* or MPC-68F*F* and for fuel debris acceptable for loading in the *MPC-24EF, MPC-68F or* MPC-68F*F*. ~~Up to four (4) DFCs containing specified fuel debris may be placed in a MPC-68F. Up to 68 damaged fuel assemblies in DFCs may be stored in an MPC-68 or MPC-68F.~~

Since the DFC has screens on the top and bottom, the DFC provides no pressure retention function. The confinement function of the DFC is limited to minimizing the release of loose particulates within the sealed MPC. The storage design basis leakage rates are not altered by the presence of the DFCs. The radioactive material available for release from the specified fuel assemblies are bounded by the design basis fuel assemblies analyzed herein.

Table 7.1.1

SUMMARY OF CONFINEMENT BOUNDARY DESIGN SPECIFICATIONS

Design Condition	Design Pressure (psig)	Design Temperature (°F)
Normal	100	MPC Lid: 550
		MPC Shell: 450
		MPC Baseplate: 400
Off-Normal	100	MPC Lid: 775
		MPC Shell: 775
		MPC Baseplate: 775
Accident	*200*~~125~~	MPC Lid: 775
		MPC Shell: 775
		MPC Baseplate: 775

7.2 REQUIREMENTS FOR NORMAL AND OFF-NORMAL CONDITIONS OF STORAGE

The MPC uses multiple confinement barriers provided by the fuel cladding and the MPC enclosure vessel to assure that there is no release of radioactive material to the environment. Chapter 3 shows that all confinement boundary components are maintained within their Code-allowable stress limits during normal storage conditions. Chapter 4 shows that the peak confinement boundary component temperatures and pressures are within the design basis limits for all normal conditions of storage. Since the MPC confinement vessel remains intact, and the design bases temperatures and pressure are not exceeded, the design basis leakage rate is not exceeded during normal conditions of storage.

7.2.1 Release of Radioactive Material

The MPC is closed by the MPC lid, the vent and drain port cover plates, and the MPC closure ring. Weld examinations, including multiple surface examinations, volumetric examination, hydrostatic testing, and leakage rate testing on the MPC lid weld, and multiple surface examinations and leakage rate testing of the vent and drain port cover plate welds, assure the integrity of the MPC closure. The MPC is a strength-welded pressure vessel designed to meet the stress criteria of the ASME Code, Section III, Subsection NB [7.1.1]. The all-welded construction of the MPC with redundant closure provided by the fully welded MPC closure ring and extensive inspections and testing ensures that no release of fission gas or crud for normal storage and transfer conditions will occur. The above discussion notwithstanding, an analysis is performed in Section 7.2.7 to calculate the annual dose at 100 meters based on an assumed leakage rate of 5×10^{-6} atm-cm^3/sec under ~~*normal and off-normal conditions of storage.*~~ *reference test conditions.*

7.2.2 Pressurization of the Confinement Vessel

The loaded and sealed MPC is drained, vacuum dried, and backfilled with helium gas. This process provides a chemically non-reactive environment for storage of spent fuel assemblies. First, air in the MPC is displaced with water and then the water is displaced by helium or nitrogen gas during MPC blowdown. The MPC is then vacuum dried, and backfilled with a predetermined mass of helium as specified in the Technical Specifications. Chapter 8 describes the steps of these processes and the Technical Specifications provide the acceptance criteria. This drying and backfilling process ensures that the resulting inventory of oxidizing gases in the MPC remains below 0.25% by volume, and that the MPC pressure is maintained within the design limitations. In addition, the MPC basket fluid contact areas are stainless steel alloy material or aluminum of extremely high corrosion and erosion resistance. The aluminum oxide layer on the aluminum components (e.g., heat conduction elements and Boral neutron absorption plates) ensures that there is no reaction during the short duration of exposure to the fuel pool water. Carbon steels are not employed in the construction of the MPCs. Therefore, no protective coatings which could interact with borated spent fuel pool water are used.

The only means of pressure increase in the MPC is from the temperature rise due to normal heat-up to normal operating temperatures and the release of backfill and fission gas contents from fuel rods into the MPC cavity. Under the most adverse conditions of normal ambient temperature, full

insolation, and design basis decay heat, the calculated pressure increase assuming 1% fuel rod failure is well below the system design pressure as shown in Chapter 4. For off-normal conditions of storage, failure of up to 10% of the fuel rods has been analyzed and would result in an MPC internal pressure below the value specified as the normal design pressure.

7.2.3 Confinement Integrity During Dry Storage

There is no credible mechanism or event that results in a release of radioactive material from the MPC under normal conditions. Since the MPC remains structurally intact and provides redundant welded closures as discussed above, the postulated leakage of radioactive material from the MPC will be limited to a leakage rate equivalent to the acceptance test criteria specified for the MPC helium leak tests. Leakage from the MPC during normal conditions of storage could result in the release of gaseous fission products, fines, volatiles and airborne crud particulates as discussed in Section 7.3.1. The conservative assumption is made that *2.5*~~1~~% of the fuel inventory is available for release *under*~~for~~ normal conditions of storage and *11.5*~~10~~% of the fuel inventory is available for release under off-normal conditions of storage. The maximum cavity internal operating pressure with 10% fuel rod failure reported in Table 4.4.14 is bounded by the use of an internal cavity pressure of *1108*~~0~~ psia (*7.485*~~.44~~ ATM), which is assumed as an initial condition for this evaluation.

The *annual dose equivalent for the whole body, thyroid and other critical organs* ~~following doses~~ to an individual at the site boundary (100 meters) as a result of an assumed effluent release under normal and off-normal conditions of storage were determined.~~; the inhaled committed dose equivalent for critical organs and tissues (gonad, breast, lung, red marrow, bone surface, thyroid, skin, lens of the eye), the effective dose from external submersion in the plume, and the resulting Total Effective Dose Equivalent (TEDE).~~ These doses were determined for each type of MPC. The ISFSI controlled area boundary must be at least 100 meters from the nearest loaded HI-STORM 100 System in accordance with 10CFR72.106(b) [7.0.1]. The doses are compared to the regulatory limits specified in 10CFR72.104*(a)* [7.0.1].

Confinement boundary welds performed at the fabricator's facility are inspected by volumetric and liquid penetrant examination methods as detailed in Section 9.1. Field welds are performed on the MPC lid, the MPC vent and drain port covers, and MPC closure ring. The weld of the MPC lid-to-shell is liquid penetrant examined on the root and final pass, volumetrically (or multilayer liquid penetrant) examined, hydrostatically tested, and leak rate tested. The vent and drain port cover plates are liquid penetrant examined on the root and final pass and leak rate tested. The MPC closure ring welds are inspected by the liquid penetrant examination method.~~ on the root and final pass.~~ In Chapter 11, the MPC lid-to-shell weld is postulated to fail to confirm the safety of the HI-STORM 100 confinement boundary. The failure of the MPC lid weld is equivalent to the MPC drain or vent port cover weld failing. The MPC lid weld failure affects the MPC confinement boundary; however, no leakage will occur due to redundant sealing provided by the MPC closure ring.

7.2.4 Control of Radioactive Material During Fuel Loading Operations

The procedures for closure of the MPC, described in Section 8.1, are intended to assure that there is

no unintended release of gas, liquid, or solid materials from the MPC during dry storage. During MPC closure operations, the lines used for venting or draining are routed to the plant's spent fuel pool or radioactive waste processing systems. MPC closure operations are performed inside the plant's fuel building in a controlled and monitored environment.

Radioactive effluent handling during fuel loading and MPC draining, vacuum drying, helium backfilling, and sealing operations is in accordance with the plant's 10CFR50 license and radioactive waste management system.

7.2.5 External Contamination Control

The external surface of the MPC is protected from contamination by preventing it from coming in contact with the spent fuel pool water. Prior to submergence in the spent fuel pool, an inflatable seal is installed at the top of the annulus formed between the MPC shell and the HI-TRAC transfer cask cavity. This annulus is filled with clean demineralized water and the seal is inflated. The inflated seal, backed by the demineralized water maintained at a slight positive pressure, is sufficient to preclude the entry of contaminated water into the annulus. These steps assure that the MPC surface is free of contamination that could become airborne during storage.

Additionally, following fuel loading operations and removal from the spent fuel pool, the upper end of the MPC shell is surveyed for loose surface contamination in accordance with the Technical Specifications contained in Chapter 12 of this TSAR.

7.2.6 Confinement Vessel Releasable Source Term

As discussed in Section 7.3.1, the source term used to evaluate the annual dose at the minimum controlled area boundary of 100 meters due to leakage from the MPC confinement boundary consists of gaseous fission products, fines, volatiles and airborne crud particulates. *For storage of spent fuel assemblies with burnups in excess of 45 GWD/MTU the source term from the assumed rod breakage fractions of ISG-5 [7.2.2] must be augmented by the source term from 50% of the rods having peak cladding thicknesses greater than 70 micrometers. ISG-11 [7.2.1] recommends that for high burnup fuel assemblies to be classified as intact, no more than 3% of the rods may have peak cladding oxide thickness' greater than 70 micrometers and no more than 1% of the rods may have peak cladding oxide thickness' greater than 80 micrometers. Using Equation 7-0 below the fraction of the source term available for release may be determined:*

Equation 7-0

$$F_R = F_B * (100\%) + F_{70} * P_S$$

where:

F_R *is the percentage of the source term available for release,*
F_B *is the rod breakage fraction from ISG-5,*
F_{70} *is the percentage of rods that have peak cladding oxide thicknesses greater than 70 microns*

P_s *percentage of the source term for rods having peak cladding oxide thickness' greater than 70 microns that must be included in the total source term available for release.*

Table 7.2.1 contains a summary of the values required for Equation 7-0 and the results for normal and off-normal conditions of storage. ~~For this evaluation, it is conservatively assumed that 1% of the fuel inventory is available for release under normal conditions of storage and 10% of the fuel inventory is available for release under off-normal conditions of storage.~~ *Additionally, a* summary of the isotopes available for release is provided in Table 7.3.1.

7.2.7 Release of Contents Under Normal and Off-Normal Storage Conditions

7.2.7.1 *Confinement Boundary*~~Seal~~ Leakage Rate

The methodology presented in Section 7.3.3.1 was used to determine the leakage rate at the upstream conditions. Using the capillary diameter determined in Section 7.3.3.1, and the parameters for normal and off-normal conditions provided in Table 7.3.4, -Equation 7-3 was solved for the leakage rate at the upstream conditions. The resultant normal and off-normal condition leakage rate, *1.129*~~9.5~~x10^{-65} cm^3/s (at ~~510~~*600* K, *7.485*~~.44~~ ATM) was calculated.

7.2.7.2 Percentage of Nuclides that Remain Airborne

In addition to the small fraction of fines that are released in the event of a cladding breach, only 10% of the fines released to the MPC cavity remain airborne long enough to be available for release from the MPC [7.3.11]. It is conservatively assumed that 100% of the volatiles, crud and gases remain airborne and available for release.

7.2.7.*3*~~2~~ Fraction of Volume Released

The minimum free volume of *each MPC design* ~~the confinement vessel~~ is presented in Tables *4.4.12, 4.4.13, 4.4.24, and 4.4.25.*~~14 (6.53 x 106 cm3 for the MPC-24 and 5.99 x 106 cm3 for MPC-68 and MPC-68F)~~. Using these volumes and the upstream normal and off-normal condition leakage rate of ~~9.5~~*1.12*x10^{-56} cm^3/s, the fraction of the volume released per second is calculated. *For calculation of the doses from the MPC-24, MPC-24E and MPC-24EF the minimum free volume from the MPC-24E is used as it conservatively bounds the MPC-24 and MPC-24EF.*

7.2.7.*4*~~3~~ Release Fraction

The release fraction is that portion of the total radionuclide inventory that is released from the *inside of the fuel rods* ~~confinement boundary~~ to the *MPC cavity* ~~atmosphere (i.e., outside the MPC)~~. The release fractions provided in NUREG/CR-6487 [7.3.2] are used. A summary of the release fractions is provided in Table 7.3.1.

7.2.7.*5*~~4~~ Radionuclide Release Rate

The radionuclide release rate is the product of the quantity of isotopes available for release, the number of assemblies, *the percentage of nuclides that remain airborne,* the fraction of volume released, and the release fraction.

7.2.7.~~6~~5 Atmospheric Dispersion Factor

For the evaluation of the dose at the controlled area boundary, the instantaneous χ/Q calculated for accident conditions (8.0×10^{-3} sec/m^3) was reduced to 1.6×10^{-4} sec/m^3 based on the long term nature of the release (1 year); the height of the release being essentially a ground level release ($h_e = 0$); all 16 compass directions (22.5 degree sectors) will be similarly affected due to the long term nature of the continuous release (over one year); the increase in average wind speeds (>1 m/s); and the additional effects of a reduction in atmospheric stability. Therefore, the χ/Q reduction factor of 50 used to correct the short term accident release χ/Q is conservative.

7.2.7.~~7~~6 Dose Conversion Factors

Dose Conversion Factors (DCF) from EPA Federal Guidance Report No. 11, Table 2.1 [7.3.5] and EPA Federal Guidance Report No. 12, Table III.1 [7.3.6] were used for the analysis. The DCFs are provided on the spread sheets included as Appendix 7.A.

7.2.7.~~8~~7 Occupancy Time

An occupancy time of 8,760 hours is used for the analysis [7.0.2]. This conservatively assumes that the individual is exposed 24 hours per day for 365 days at the minimum controlled area boundary of 100 meters.

7.2.7.~~9~~8 Breathing Rate

A breathing rate of 3.3×10^{-4} m^3/sec for a worker is used for the analysis [7.0.2]. This assumption is in accordance with the guidance provided in NUREG-1536 [7.0.2] for a worker.

7.2.8 Postulated Doses Under Normal and Off-Normal Conditions of Storage

The *annual dose equivalent for the whole body, thyroid and other critical organs* ~~following doses~~ to an individual at the site boundary (100 meters) as a result of an assumed effluent release under normal and off-normal conditions of storage were determined~~; the inhaled committed dose equivalent for critical organs and tissues (gonad, breast, lung, red marrow, bone surface, thyroid, skin, lens of the eye), the effective dose from external submersion in the plume, and the resulting Total Effective Dose Equivalent (TEDE).~~. These doses are determined for each type of MPC and for each condition of storage (i.e., normal and off-normal). The postulated doses as a result of exposure to soil with ground surface contamination and soil contaminated to a depth of 15 cm were also determined. The resultant doses were negligible compared to ~~the~~ those resulting from submersion in the plume and are therefore not reported.

The doses were determined using spreadsheet software. The resultant doses are summarized for each MPC type in Tables 7.3.2~~, 7.3.3, and 7.3.4~~ *through Table 7.3.5* of the HI-STORM TSAR. Example spread sheets used for the dose estimates are presented in Appendix 7.A. *Table 7.3.9 compares the doses to the regulatory limits of 10CFR72.104(a).*

7.2.8.1 Whole Body Dose ~~(Total Effective Dose Equivalent)~~

The *annual dose equivalent to the whole body (ADE)* ~~whole body dose~~ is the sum of the inhaled committed effective dose equivalent (CEDE) and the ~~external exposure~~*deep dose equivalent to the whole body* from submersion in the plume. The postulated doses were determined using spreadsheet software. Example spread sheets are provided in Appendix 7.A.

The CEDE is the product of radionuclide release rate, the atmospheric dispersion factor, the occupancy time, the breathing rate, and the effective dose conversion factor.

The Deep Dose Equivalent ~~External exposure from submersion~~ is the product of the nuclide release rate, the atmospheric dispersion factor, the occupancy time, and the effective dose conversion factor.

7.2.8.2 Critical Organ Dose

The *Annual D*~~d~~ose *Equivalent (ADE)* to the critical organ (or tissue) is the sum of the committed dose equivalent *(CDE)* to the critical organ or tissue from inhalation and the *deep* dose equivalent *(DDE)* to the organ or tissue from submersion in the plume. The postulated doses as a result of exposure to soil with ground surface contamination and soil contaminated to a depth of 15 cm were also determined. The resultant doses were negligible compared to the those resulting from submersion in the plume and are therefore not reported.

The committed dose equivalent to the organ or tissue from inhalation is the product of *the* radionuclide release rate, the atmospheric dispersion factor, the occupancy time, the breathing rate, and the organ/tissue dose conversion factor. The *deep* dose equivalent to the organ or tissue from submersion in the plume is the product of the *radio*nuclide release rate, the atmospheric dispersion factor, the occupancy time, and the organ/tissue dose conversion factor.

~~The doses for tissues and organs other than lens of the eye were determined using spreadsheet software. The dose to the lens of the eye as a result of submersion in the plume was estimated using guidance from Dr. James Turner in his book, Atoms, Radiation, and Radiation Protection [7.3.10]]. Dr. Turner states that alpha particles and low-energy beta particles, such as those from tritium, cannot penetrate to the lens of the eye (at a depth of 3 mm). The discussion continues that many noble gases emit photons and energetic beta particles, which in turn must be considered in the dose estimate. Dr. Turner states that the dose-equivalent rate to tissues near the surface of the body (e.g., lens of the eye) is more than 130 times the dose-equivalent rate in the lung from gases contained in the lung. The estimated dose to the lens of the eye is greatest using the accident condition of storage for the MPC-68. Section 7.3.4.2 presents the detailed discussion of the dose to the lens of the eye.~~

7.2.8.3 *Site Boundary*

The estimated annual dose equivalent for critical organs and the whole body at the minimum site boundary of 100 meters are presented in Tables 7.3.2 through 7.3.5. Since doses from any one MPC does not bound the doses from all other MPCs, bounding doses have been presented in Table 7.3.8 for BWR fuel (MPC-68, MPC-68F and MPC-68FF) and PWR fuel (MPC-24, MPC-24E, MPC-24EF and MPC-32) separately. The doses from the MPC-68 bound the doses from all casks containing BWR fuel and the doses from the MPC-32 bounds the doses from all casks containing PWR fuel. Additionally, Table 7.3.8 compares these bounding doses to the regulatory limits of 10CFR72.104(a).

7.2.9 Assumptions

The following presents a summary of assumptions for the normal condition confinement analysis of the HI-STORM 100 System.

- The distance from the cask to the site boundary is 100 meters.

- ~~Under normal conditions of storage, 1% of the fuel rods have ruptured. This assumption is in accordance with NUREG-1536 for normal storage conditions.~~

- *Under normal conditions of storage, 2.5~~1~~% of the source term is available for release.* Under off-normal conditions of storage, 1*1.5*~~0~~% of the *source terms are available for release* ~~fuel rods have ruptured~~. This assumption is in accordance with ISG-5 *[7.2.2], ISG-11 [7.2.1]* and NUREG-1536 *[7.0.2]* for *normal and* off-normal storage conditions.

- Unchoked flow correlations were used as the unchoked flow correlations better approximate the true measured flow rate for the leakage rates.

- For conservatism, the upstream pressure at *reference* test conditions (inside of the MPC) is assumed to be 2 ATM and the down stream pressure (outside of the MPC) is assumed to be 1 ATM.

- *The leak hole diameter is determined using reference test conditions rather than actual test conditions from Table 7.3.7. This is conservative, as it yields a larger leak hole diameter.*

- The temperature at test conditions is assumed to be equal to a temperature, 212° F based on the maximum temperature achievable by the water in the MPC during performance of the leak test. This is conservative because the leak hole diameter computed from test conditions is larger.

- *Off-*~~N~~*n*ormal storage conditions (i.e., MPC cavity at a pressure of *11*~~8~~0 psia (*7.84*~~5.44~~ ATM) at MPC cavity average temperature of ~~51~~*60*0 K) are postulated for this analysis as these

conditions bound the ~~off-~~normal conditions of storage.

- The capillary length required for Equation 7-3 was conservatively chosen to be the MPC lid closure weld which is 1.9 cm.

- The majority of the activity associated with crud is due to ^{60}Co. This assumption follows from the discussion provided in NUREG/CR-6487 [7.3.2].

- The normal and off-normal condition leakage rate persists for one year without a decrease in the rate or nuclide concentration.

- The individual at the site boundary is exposed for 8,760 hours [7.0.2]. This conservatively assumes that the individual is exposed 24 hours per day for 365 days.

- A breathing rate of 3.3×10^{-4} m^3/sec for a worker is used for the analysis [7.0.2]. This assumption is in accordance with the guidance provided in NUREG-1536 for a worker.

- All fuel stored in the MPC is of the design basis type with a bounding burnup and cooling time.

- Exposure to dose conversion factors for inhalation reported in EPA Federal Guidance Report No. 11, Table 2.1 [7.3.5] were selected by lung clearance class which reports the most conservative values.

- For conservat~~iv~~ism, the maximum possible leakage rate *under reference test conditions* is assumed to be 7.5×10^{-6} atm-cm^3/s, which is 150% of the *reference* test leak rate of 5.0×10^{-6} atm-cm^3/s.

Table 7.2.1
Parameters for Determining the Percentage of the Source Term Available for Release

MPC-24, MPC-24E, MPC-24EF, MPC-32, MPC-68 and MPC-68FF

Parameter	Normal	Off-Normal
F_B	.01	.10
F_{70}	3.0%	3.0%
P_S	50%	50%
F_R	**2.5%**	**11.5%**

MPC-68F

Parameter	Normal	Off-Normal
F_R	**1.0%**	**10.0%**

7.3 CONFINEMENT REQUIREMENTS FOR HYPOTHETICAL ACCIDENT CONDITIONS

The MPC uses redundant confinement closures to assure that there is no release of radioactive materials, including fission gases, volatiles, fuel fines or crud, for postulated storage accident conditions. The analyses presented in Chapters 3 and 11 demonstrate that the MPC remains intact during all normal, off-normal and postulated accident conditions, including the associated increased internal pressure due to decay heat generated by the stored fuel. The MPC is designed, fabricated, and tested in accordance with the applicable requirements of ASME, Section III, Subsection NB [7.1.1] to the maximum extent practicable. In summary, there is no mechanistic failure that results in a breach of the MPC confinement boundary.

The above discussion notwithstanding, this section evaluates the consequences of a non-mechanistic postulated ground level breach of the MPC confinement boundary. This breach could result in the release of gaseous fission products, fines, volatiles and airborne crud particulates. The internal *design* accident pressure of *200*~~125~~ psig, as specified in Table 7.1.1, is *conservatively increased in the analysis to 225 psig* ~~assumed as an initial condition~~ for this evaluation. The following doses to an individual at the site boundary (100 meters) as a result of an assumed effluent release under accident conditions of storage were determined.~~; the inhaled committed dose equivalent for critical organs and tissues (gonad, breast, lung, red marrow, bone surface, thyroid, skin, lens of the eye), the effective dose from external submersion in the plume, and the resulting Total Effective Dose Equivalent (TEDE).~~ *the committed dose equivalent (CDE) from inhalation and the deep dose equivalent (DDE) from submersion for critical organs and tissues (gonad, breast, lung, red marrow, bone surface, thyroid); the committed effective dose equivalent (CEDE) from inhalation and the deep dose equivalent (DDE) from submersion for the whole body; the lens dose equivalent (LDE) for the lens of the eye; the shallow dose equivalent (SDE) from submersion for the skin; and the resulting Total Effective Dose Equivalent (TEDE) and Total Organ Dose Equivalent (TODE).*

These doses were determined for each type of MPC. The ISFSI controlled area boundary must be at least 100 meters from the nearest loaded HI-STORM 100 System in accordance with 10CFR72.106(b) [7.0.1]. The doses are compared to the regulatory limits specified in 10CFR72.106(b) [7.0.1].

7.3.1 Confinement Vessel Releasable Source Term

In accordance with NUREG/CR-6487 [7.3.2], the following contributions are considered in determining the releasable source term for packages designed to transport irradiated fuel rods: (1) the radionuclides in the fuel rods, (2) the radionuclides on the surface of the fuel rods, and (3) the residual contamination on the inside surfaces of the vessel. NUREG/CR-6487 goes on to state that a radioactive aerosol can be generated inside a vessel when radioactive material from the fuel rods or from the inside surfaces of the container become airborne. The sources for the airborne material are (1) residual activity on the cask interior, (2) fission and activation-product activity associated with corrosion-deposited material (crud) on the fuel assembly surface, and (3) the radionuclides within the

individual fuel rods. In accordance with NUREG/CR-6487, contamination due to residual activity on the cask interior surfaces is negligible as compared to crud deposits on the fuel rods themselves and therefore may be neglected. The source term considered for this calculation results from the spallation of crud from the fuel rods and from the fines, gases and volatiles which result from cladding breaches. The methodology of NUREG/CR-6487 is conservatively applied to the storage confinement accident analysis as dry storage conditions are less severe than transport conditions.

The inventory for isotopes other than ^{60}Co is calculated with the SAS2H and ORIGEN-S modules of the SCALE 4.3 system as described in Section 5.2. The inventory for the MPC-24, *MPC-24E, MPC-24EF and MPC-32* was conservatively based on the B&W 15x15 fuel assembly with a burnup of *704*~~0~~,000 MWD/MTU, 5 years of cooling time, and an enrichment of *4.8*~~3.4~~%. The inventory for the MPC-68 *and MPC-68FF* was based *on* the GE 7x7 fuel assembly with a burnup of *604*~~0~~*,000* MWD/MTU, 5 years of cooling time, and *4.4*~~3.0~~% enrichment. The ~~Technical Specifications in Chapter 12~~ *CoC* limit*s* the fuel assembly burnup ~~well~~ below *604*~~0~~,000 MWD/MTU for both BWR and PWR fuel at 5 years of cooling time. This ensures that the inventory used in this calculation exceeds that of the fuel authorized for storage ~~in accordance with the Technical Specifications~~. The inventory for the MPC-68F was based on the GE 6x6 fuel assembly with a burnup of 30,000 MWD/MTU, 18 years of cooling time, and 1.8% enrichment. The ~~Technical Specifications~~ *CoC* limit*s* the burnup and cooling time of fuel *(intact, damaged or debris)*~~debris~~ in an MPC-68F to a maximum of 30,000 MWD/MTU at a minimum of 18 years cooling time. *Additionally, the MPC-68F was analyzed containing 67 GE 6x6 assemblies and a DFC containing 18 thorium rods. Finally, an Sb-Be source stored in one fuel rod in one assembly with 67 GE 6x6 assemblies was analyzed.* The isotopes which contribute greater than 0.1% to the total curie inventory for the fuel assembly are considered in the evaluation as fines. The analysis also includes actinides as the dose conversion factors for these isotopes are in general, orders of magnitude greater than other isotopes (e.g., isotopes of plutonium, americium, curium, and neptunium were included regardless of their contribution to the inventory). A summary of the isotopes available for release is provided in Table 7.3.1.

7.3.2 Crud Radionuclides

The majority of the activity associated with crud is due to ^{60}Co [7.3.2]. The inventory for ^{60}Co was determined by using the crud surface activity for PWR rods (140×10^{-6} Ci/cm^2) and for BWR rods (1254×10^{-6} Ci/cm^2) provided in NUREG/CR-6487 [7.3.2] multiplied by the surface area per assembly (3×10^5 cm^2 and 1×10^5 cm^2 for PWR and BWR, respectively, also provided in NUREG/CR-6487). The source terms were then decay corrected (5 years for the MPC-24, *MPC-24E, MPC-24EF, MPC-32, MPC-68* and MPC-68*FF*; 18 years for the MPC-68F) using the basic radioactive decay equation:

Equation 7-1:

$$A(t) = A_0 e^{-\lambda t}$$

where:

A(t)	is activity at time t [Ci]
A_0	is the initial activity [Ci]
λ	is the $\ln 2/t_{1/2}$ (where $t_{1/2}$ = 5.272 years for ^{60}Co)
t	is the time in years (5 years for the MPC-24, *MPC-24E, MPC-24EF, MPC-32, MPC-68* and MPC-68*FF*; 18 years for the MPC-68F)

Total ^{60}Co crud is 140 μCi/cm² for PWR and 1254 μCi/cm² for BWR [7.3.2].

PWR
Surface area per Assy = 3.0E+05 cm²
140 μCi/cm² x 3.0E+05 cm² = 42.0 Ci

BWR
Surface area per Assy = 1.0E+05 cm²
1254 μCi/cm² x 1.0E+05 cm² = 125.4 Ci

$^{60}Co(t) = {}^{60}Co_0\, e^{-(\lambda t)}$, where $\lambda = \ln 2/t_{1/2}$, t = 5 years (for the MPC-24, *MPC-24E, MPC-24EF, MPC-32* and MPC-68), t = 18 years (MPC-68F), $t_{1/2}$ = 5.272 years for ^{60}Co [7.3.3]

MPC-24, *MPC-24E, MPC-24EF and MPC-32*

$^{60}Co(5) = 42.0\ Ci\ e^{-(\ln 2/5.272)(5)}$
$^{60}Co(5) = 21.77\ Ci$

MPC-68 *and MPC-68FF*

$^{60}Co(5) = 125.4\ Ci\ e^{-(\ln 2/5.272)(5)}$
$^{60}Co(5) = 64.98\ Ci$

MPC-68F

$^{60}Co(18) = 125.4\ Ci\ e^{-(\ln 2/5.272)(18)}$
$^{60}Co(18) = 11.76\ Ci$

A summary of the ^{60}Co inventory available for release is provided in Table 7.3.1.

7.3.3 Release of Contents Under Non-Mechanistic Accident Conditions of Storage

7.3.3.1 *Confinement Boundary*~~Seal~~ Leakage Rate

The helium leak rate testing performed on the MPC confinement boundary verifies the helium leak rate *under reference test conditions* to be less than or equal to 5×10^{-6} atm-cm³/s [1] as required by the Technical Specifications. As demonstrated by analysis, the MPC confinement boundary is not

[1] According to ANSI N14.5 (1997), the mass-like leakage rate specified herein is often used in leakage testing. This is defined as the rate of change of the pressure-volume product of the leaking fluid at test conditions.

compromised as a result of normal, off-normal, and accident conditions. Based on the robust nature of the MPC confinement boundary, the NDE inspection of the welds, and the measurement of the helium leakage rate, there is essentially no leakage. However, it is conservatively assumed that the maximum possible leakage rate *under reference test conditions* from the confinement vessel is 7.5×10^{-6} atm-cm^3/s. *The actual leakage test is performed at an elevated pressure (90 +10/-0 psig) to magnify the leakage rate. For purposes of determining the leak hole diameter, reference test condition parameters from Table 7.3.7 are used in Equation 7-2 and Equation 7-3 as it results in a larger leak hole diameter.*

Equation B-1 of ANSI N14.5 (1997) [7.3.8] is used to express this mass-like helium flow rate (Q_u) measured in atm-cm^3/s as a function of the upstream volumetric leakage rate (L_u) as follows:

Equation 7-2

$$Q_u = L_u * P_u \quad \text{atm-cm}^3/\text{sec (Equation B-1 from ANSI N14.5(1997))}$$

$$L_u = Q_u/P_u \quad \text{cm}^3/\text{sec}$$

where:

L_u is the upstream volumetric leakage rate [cm^3/s],
Q_u is the mass-like helium leak rate [atm cm^3/s], and
P_u is the upstream pressure [ATM]

The corresponding leakage rate at accident conditions is determined using the following methodology. For conservatism, unchoked flow correlations were used as the unchoked flow correlations better approximate the true measured flowrate for the leakage rates. Using the equations for molecular and continuum flow, Equation B-5 provided in ANSI N14.5-1997 [7.3.8], the corresponding capillary diameter, D, was calculated. For conservatism, the upstream pressure at *reference* test conditions (inside of the MPC) is assumed to be 2 ATM (minimum) and the down stream pressure (outside of the MPC) is assumed to be 1 ATM (at 298 K), therefore, the average pressure is 1.5 ATM. The evaluation was performed using the helium gas temperature at *reference* test conditions of both 70°F and 212°F. These temperatures are representative of the possible temperature of the helium gas in the confinement vessel during the helium leak test. The 212°F helium temperature is the upper bound because the water inside the MPC is shown not to boil in Chapter 4 as long as the "time-to-boil" time limit is not exceeded. From the two calculations using the two temperatures, it was determined that the higher temperature (212°F) results in a greater capillary diameter. The capillary length required for Equation 7-3 was conservatively chosen to be the minimum MPC lid closure weld which is 1.9 cm. Table 7.3.6 provides a summary of the parameters used in the calculation.

Equation 7-3

$$L_u = [\frac{2.49x10^6 D^4}{a u} + \frac{3.81x10^3 D^3 \sqrt{\frac{T}{M}}}{a P_a}][P_u - P_d][\frac{P_a}{P_u}]$$

where:

L_u	is the allowable leakage rate at the upstream pressure [cm^3/s],
a	is the capillary length [cm],
T	is the temperature [°K],
M	is the gas molecular weight [g/mole] from ANSI N14.5, Table B1 [7.3.8],
u	is the fluid viscosity for helium [cP] from Rosenhow and Hartnett [7.3.9]
P_u	is the upstream pressure [ATM],
P_d	is the downstream pressure [ATM], and
P_a	is the average pressure; $P_a = (P_u + P_d)/2$ [ATM].
D	is the capillary diameter [cm].

The capillary diameter (D) computed from the above equation is equal to $4.96x10^{-4}$ cm.

Using the capillary diameter determined above, and the parameters for accident conditions provided in Table 7.3.6, Equation 7-3 was solved for the leakage rate at the upstream conditions. The resultant hypothetical accident leakage rate, $1.9\cancel{2}5x10^{-5}$ cm^3/s (at 843 K, *16.31~~9.5~~* ATM) was calculated.

7.3.3.2 *Percentage of Nuclides that Remain Airborne*

In addition to the small fraction of fines that are released in the event of a cladding breach, only about 10% of the fines released to the MPC cavity remain airborne long enough to be available for release from the cask MPC [7.3.11]. It is conservatively assumed that 100% of the volatiles, crud and gases remain airborne and available for release.

7.3.3.3 Fraction of Volume Released

The minimum free volume of *each MPC design* the confinement vessel is presented in Table 4.4.14, *4.4.13, 4.4.24, and 4.4.25.* ~~(6.53 x 106 cm3 for the MPC-24 and 5.99 x 106 cm3 for MPC-68 and~~

~~MPC-68F).~~ Using these volumes and the upstream hypothetical accident leakage rate of 1.25×10^{-5} cm^3/s, the fraction of the volume released per second is calculated. *For the analysis of the MPC-24 and MPC-24E, the smaller of the two minimum free volumes was conservatively chosen.*

7.3.3.~~43~~ Release Fraction

The release fraction is that portion of the total radionuclide inventory that is released from the ~~confinement boundary~~ *cladding* to the *MPC cavity.* ~~atmosphere (i.e., outside the MPC).~~ The release fractions provided in NUREG/CR-6487 [7.3.2] are used. A summary of the release fractions is provided in Table 7.3.1.

7.3.3.~~54~~ Radionuclide Release Rate

The radionuclide release rate is the product of the quantity of isotopes available for release, the number of assemblies, *the percentage of nuclides that remain airborne,* the fraction of volume released, and the release fraction.

7.3.3.~~65~~ Atmospheric Dispersion Factor

The short-term accident condition atmospheric dispersion factor at 100 meters was determined using Regulatory Guide 1.145 [7.3.4]. In accordance with NUREG-1536 [7.0.2], the dispersion factor was determined on the basis of F-stability diffusion, a wind speed of 1 m/s, and plume meandering.

Reg Guide 1.145 [7.3.4] specifies that χ/Q be calculated using the following three equations. The values determined using Equations 7-4 and 7-5 should be compared and the higher value selected. This value should be compared with the value determined using Equation 7-6, and the lower value of these two should be selected as the appropriate χ/Q value. This methodology was used to determine the value for χ/Q.

Equation 7-4

$$\frac{\chi}{Q} = \frac{1}{U(\pi \sigma_y \sigma_z + A/2)}$$

Equation 7-5

$$\frac{\chi}{Q} = \frac{1}{U(3\pi \sigma_y \sigma_z)}$$

Equation 7-6

$$\frac{\chi}{Q} = \frac{1}{U \pi \Sigma_y \sigma_z}$$

where:

χ/Q is relative concentration, in sec/m^3,
π is 3.14159,
U is windspeed at 10 meters above plant grade, in m/sec,
σ_y is lateral plume spread, in meters, a function of atmospheric stability and distance (Figure 1, Reg Guide 1.145 [7.3.4]),
σ_z is vertical plume spread, in meters, a function of atmospheric stability and distance (Figure 2, Reg Guide 1.145 [7.3.4]),
Σ_y is lateral plume spread with meander and building wake effects, in m, = M σ_y, where M is determined from Figure 3, Reg Guide 1.145 [7.3.4], and
A is the smallest vertical-plane cross-sectional area of the structure (cross section of the MPC), m^2.

Equations 7-4 through 7-6 were solved using the parameters presented in Table 7.3.5. The atmospheric dispersion factor, χ/Q, at 100 meters was selected in accordance with the methodology described above. The χ/Q value used to determine the dose is 8.0 x 10^{-3} sec/m^3. This short term accident condition χ/Q is deemed conservative for an accident evaluation period of 30 days.

7.3.3.76 Dose Conversion Factors

Dose Conversion Factors (DCF) from EPA Federal Guidance Report No. 11, Table 2.1 [7.3.5] and EPA Federal Guidance Report No. 12, Table III.1 [7.3.6] were used for the analysis. The DCFs are provided on the spread sheets included as Appendix 7.A.

7.3.3.87 Occupancy Time

An occupancy time of 720 hours (30 days) is used for the analysis [7.0.2]. This conservatively assumes that the individual is exposed 24 hours per day for 30 days at the minimum controlled area boundary of 100 meters. The accident event duration is considered conservative as any accident condition of storage resulting in the failure of 100% of the stored fuel rods would be detected by the routine security and surveillance inspections and corrective actions would be completed prior to the end of this 30-day period.

7.3.3.98 Breathing Rate

A breathing rate of 3.3 x 10^{-4} m^3/sec for a worker is used for the analysis [7.0.2]. This assumption is in accordance with the guidance provided in NUREG-1536 [7.0.2] for a worker.

7.3.4 Postulated Accident Doses

The following doses to an individual at the site boundary (100 meters) as a result of an assumed effluent release under accident conditions of storage were determined;~~ the inhaled committed dose equivalent for critical organs and tissues (gonad, breast, lung, red marrow, bone surface, thyroid, skin, lens of the eye), the effective dose from external submersion in the plume, and the resulting Total Effective Dose Equivalent (TEDE).~~ *the committed dose equivalent (CDE) from inhalation and the deep dose equivalent (DDE) from submersion for critical organs and tissues (gonad, breast, lung, red marrow, bone surface, thyroid); the committed effective dose equivalent (CEDE) from inhalation and the deep dose equivalent (DDE) from submersion for the whole body; the lens dose equivalent (LDE) for the lens of the eye; the shallow dose equivalent (SDE) from submersion for the skin; and the resulting Total Effective Dose Equivalent (TEDE) and Total Organ Dose Equivalent (TODE).* These doses are determined for each type of MPC. The postulated doses as a result of exposure to soil with ground surface contamination and soil contaminated to a depth of 15 cm were also determined. The resultant doses were negligible compared to the those resulting from submersion in the plume and are therefore not reported.

The doses were determined using spreadsheet software. The resultant doses are summarized for each MPC type in Tables 7.3.2~~, 7.3.3, and 7.3.4~~ through Table 7.3.5 of the HI-STORM TSAR. Example spread sheets used for the dose estimates are presented in Appendix 7.A.

7.3.4.1 Whole Body Dose (Total Effective Dose Equivalent)

The *Total Effective Dose Equivalent* ~~whole body dose~~ is the sum of the inhaled committed effective dose equivalent (CEDE) *from inhalation* and the *deep dose equivalent (DDE) to the whole body*~~external exposure~~ from submersion in the plume. The postulated doses were determined using spreadsheet software. Example spread sheets are provided in Appendix 7.A.

The CEDE is the product of radionuclide release rate, the atmospheric dispersion factor, the occupancy time, the breathing rate, and the effective dose conversion factor. *The deep dose equivalent to the whole body* ~~External exposure~~ from submersion is the product of the nuclide release rate, the atmospheric dispersion factor, the occupancy time, and the effective dose conversion factor.

7.3.4.2 Critical Organ Dose

The dose to the critical organ (or tissue) is the sum of the committed dose equivalent to the critical organ or tissue from inhalation and the *deep* dose equivalent to the organ or tissue from submersion in the plume. The postulated doses as a result of exposure to soil with ground surface contamination and soil contaminated to a depth of 15 cm were also determined. The resultant doses were negligible compared to the those resulting from submersion in the plume and are therefore not reported.

The committed dose equivalent to the organ or tissue from inhalation is the product of radionuclide release rate, the atmospheric dispersion factor, the occupancy time, the breathing rate, and the

organ/tissue dose conversion factor. The *deep* dose equivalent to the organ or tissue from submersion in the plume is the product of the nuclide release rate, the atmospheric dispersion factor, the occupancy time, and the organ/tissue dose conversion factor.

The ~~dose to the lens of the eye~~ *lens dose equivalent (LDE)* as a result of submersion in the plume was estimated using guidance from Dr. James Turner in his book, *Atoms, Radiation, and Radiation Protection* [7.3.10]. Dr. Turner states that alpha particles and low-energy beta particles, such as those from tritium, cannot penetrate to the lens of the eye (at a depth of 3 mm). The discussion continues that many noble gases emit photons and energetic beta particles, which in turn must be considered in the dose estimate. Dr. Turner states that the dose-equivalent rate to tissues near the surface of the body (e.g., lens of the eye) is more than 130 times the dose-equivalent rate in the lung from gases contained in the lung. Using the accident condition of storage for the MPC-68 *and the MPC-32* (which *have* ~~is~~ the highest dose to the lung *for BWR and PWR fuel respectively*), the estimated dose to the lung from gases in the lung is *$3.60x10^{-3}$ mrem and $4.88x10^{-3}$ mrem, respectively.* ~~2.62x10-6 mrem.~~ Conservatively multiplying this value by 150, the estimated ~~dose to the lens of the eye~~*LDE* is *0.540 mrem for BWR fuel and 0.732 mrem for PWR fuel. These estimated LDEs for BWR and PWR fuel are a small fraction of the 15 rem limit imposed by 10CFR72.106(b).* ~~3.93x10-4 mrem. This estimated dose to the lens of the eye, 3.93x10-4 mrem, is a small fraction of the 15 rem limit imposed by 10 CFR 72.106(b).~~

7.3.5 Site Boundary

The estimated accident doses at the controlled area boundary are highest for the accident condition of storage for the MPC-68 *for BWR fuel and the MPC-32 for PWR fuel.* The estimated TEDEs (*39.24*~~.0~~ mrem *for BWR fuel and 29.1 mrem for PWR fuel*) are~~is a~~ small fractions of the 5 rem whole body limit imposed by 10 CFR 72.106(b). The *maximum* estimated *Total Organ Dose Equivalents (TODE) to the lung and* bone surface,~~dose~~ which *are*~~is~~ the highest critical organ doses *to BWR and PWR fuel, respectively,* (*205*~~468~~ mrem *and 233 mrem, respectively*) *are*~~is a~~ small fractions of the 50 rem critical organ limit imposed by 10 CFR 72.106(b). Additionally, the shallow dose *equivalents*~~estimate~~ to *the* skin (*0.303*~~11~~ mrem *and 0.202 mrem*) *are*~~is a~~ small fractions of the 50 rem shallow dose equivalent to skin or other extremity limit imposed by 10 CFR 72.106(b).

~~The estimated annual dose at the controlled area boundary is highest due to anticipated occurrences (off-normal) using the MPC-68. The estimated TEDE (0.94 mrem/yr) is a small fraction of the annual 25 mrem whole body limit imposed by 10 CFR 72.104(a). The estimated thyroid dose (0.11 mrem/yr) is a small fraction of the annual 75 mrem thyroid limit imposed by 10 CFR 72.104(a). Additionally, the dose estimates to other critical organs are small fractions of the annual 25 mrem critical organ limit imposed by 10 CFR 72.104(a). The highest of the "other critical organs" is 8.65 mrem to the bone surface.~~

7.3.6 Assumptions

The following presents a summary of assumptions for the accident condition confinement analysis of

the HI-STORM 100 System.

- The distance from the cask to the site boundary is 100 meters.

- 100% of the fuel rods have ruptured. This assumption is conservative because it results in the greatest potential release of radioactive material.

- Unchoked flow correlations were used as the unchoked flow correlations better approximate the true measured flowrate for the leakage rates associated with transportation packages.

- For conservatism, the upstream pressure at *reference* test conditions (inside of the MPC) is assumed to be *2 ATM* and the down stream pressure (outside of the MPC) is assumed to be 1 *ATM.*

- *The leak hole diameter is determined using reference test conditions rather than actual test conditions from Table 7.3.7. This is conservative, as it yields a larger leak hole diameter.*

- The temperature at test conditions is assumed to be equal to an ambient reference temperature, 212° F based on the maximum temperature achievable by the water in the MPC during performance of the leak test. This is conservative because the leak hole diameter computed from test conditions is larger.

- Bounding accident conditions (i.e., MPC cavity at design pressure (~~1~~225 psig) at peak cladding temperature limit (570° C)) are postulated for this analysis.

- The capillary length required for Equation 7-3 was conservatively chosen to be the MPC lid closure weld which is 1.9 cm.

- The majority of the activity associated with crud is due to ^{60}Co. This assumption follows from the discussion provided in NUREG/CR-6487 [7.3.2].

- The accident condition leakage rate persists for 30 days without a decrease in the rate or nuclide concentration.

- The individual at the site boundary is exposed for 720 hours (30 days). This conservatively assumes that the individual is exposed 24 hours per day for 30 days.

- A breathing rate of 3.3×10^{-4} m^3/sec for a worker is used for the analysis [7.0.2]. This assumption is in accordance with the guidance provided in NUREG-1536 for a worker.

- All fuel stored in the MPC is of the design basis type with a bounding burnup and cooling time.

- Exposure to dose conversion factors for inhalation reported in EPA Federal Guidance Report

No. 11, Table 2.1 [7.3.5] were selected by lung clearance class which reports the most conservative values.

- For conservativism, the maximum possible leakage rate *at reference test conditions* is assumed to be 7.5×10^{-6} atm-cm^3/s, which is 150% of the test leak rate of 5.0×10^{-6} atm-cm^3/s.

Table 7.3.1
Isotope Inventory and Release Fraction

Nuclide	MPC-24 *MPC-24E MPC-24EF MPC-32* Ci/Assembly	MPC-68 *MPC-68FF* Ci/Assembly	MPC-68F Ci/Assembly	Release Fraction [7.3.2]
Gases				
^{3}H	*3.68~~2.21~~*E+02	*1.24~~8.72~~*E+02~~1~~	1.78E+01	0.30
^{129}I	*3.31~~1.93~~*E-02	*1.12~~7.72~~*E-02~~3~~	3.49E-03	0.30
^{85}Kr	*5.86~~3.75~~*E+03	*2.04~~1.43~~*E+03	2.37E+02	0.30
Crud				
^{60}Co	2.18E+01	6.50E+01	1.18E+01	0.15 normal/off-normal 1.0 accident
Volatiles				
^{90}Sr	*6.32~~3.91~~*E+04	*2.24~~1.52~~*E+04	4.29E+03	2.0E-04
^{106}Ru	*1.59~~1.18~~*E+04	*4.71~~4.16~~*E+03	2.30E-01	2.0E-04
^{134}Cs	*4.04~~1.90~~*E+04	*1.18~~7.20~~*E+03	3.16E+01	2.0E-04
^{137}Cs	*9.82~~5.77~~*E+04	*3.35~~2.29~~*E+04	7.21E+03	2.0E-04
Fines				
^{241}Pu	*8.53~~6.33~~*E+04	*2.58~~2.10~~*E+04	5.16E+03	3.0 E-05
^{90}Y	*6.32~~3.91~~*E+04	*2.24~~1.52~~*E+04	4.29E+03	3.0 E-05
^{147}Pm	*2.63~~2.48~~*E+04	*9.63~~8.88~~*E+03	1.18E+02	3.0 E-05
^{144}Ce	*8.14~~7.97~~*E+03	*2.48~~2.46~~*E+03	--	3.0 E-05
^{144}Pr	*8.14~~7.97~~*E+03	*2.48~~2.46~~*E+03	--	3.0 E-05
^{154}Eu	*5.90~~2.89~~*E+03	*1.74~~1.07~~*E+03	1.44E+02	3.0 E-05
^{244}Cm	*1.01~~2.06~~*+04~~3~~	*2.38~~9.30~~*E+03~~2~~	2.17E+02	3.0 E-05
^{238}Pu	*5.81~~1.98~~*E+03	*1.58~~7.49~~*E+03~~2~~	2.50E+02	3.0 E-05
^{125}Sb	*2.30~~1.57~~*E+03	*7.91~~6.40~~*E+02	--	3.0 E-05
^{155}Eu	*1.65~~8.53~~*E+03~~2~~	*5.41~~3.51~~*E+02	--	3.0 E-05

Table 7.3.1
(continued)

Isotope Inventory and Release Fractions

Nuclide	MPC-24 *MPC-24E* *MPC-24EF* *MPC-32* Ci/Assembly	MPC-68 *MPC-68FF* Ci/Assembly	MPC-68F Ci/Assembly	Release Fraction [7.3.2]
^{241}Am	*9.00~~6.46~~*E+02	*2.78~~2.20~~*E+02	2.52E+02	3.0 E-05
^{125m}Te	*5.61~~3.84~~*E+02	*1.93~~1.56~~*E+02	--	3.0 E-05
^{240}Pu	*4.05~~3.06~~*E+02	*1.50~~1.26~~*E+02	6.81E+01	3.0 E-05
^{151}Sm	*3.38~~2.37~~*E+02	*9.76E+01~~--~~*		3.0 E-05
^{239}Pu	*2.04~~1.86~~*E+02	*6.70~~6.16~~*E+01	2.95E+01	3.0 E-05
^{137m}Ba	*9.27~~5.44~~*E+04	*3.17~~2.16~~*E+04	6.81E+03	3.0 E-05
^{106}Rh	*1.59~~1.18~~*E+04	*4.71~~4.16~~*E+03	--	3.0 E-05
^{144m}Pr	*1.14~~1.12~~*E+02	*3.48E+01~~--~~*	--	3.0 E-05
^{243}Am	*4.87~~1.73~~*E+01	*1.36~~7.39~~*E+01~~0~~	3.30E+00	3.0 E-05
^{242}Cm	*3.23~~1.54~~*E+01	*9.82~~6.10~~*E+00	7.71E-01	3.0 E-05
^{243}Cm	*3.63~~1.14~~*E+01	*9.79~~4.81~~*E+00	1.54E+00	3.0 E-05
^{239}Np	*4.87~~1.73~~*E+01	*1.36~~7.39~~*E+01~~0~~	3.30E+00	3.0 E-05
^{237}Np	*3.88E-01*	*1.18E-01*	*2.72E-02*	*3.0 E-05*
^{242}Pu	*2.85E+00*	*9.04E-01*	*3.06E-01*	*3.0 E-05*
^{242}Am	*8.72E+00*	*2.71E+00*	*9.31E-01*	*3.0 E-05*
^{242m}Am	*8.76E+00*	*2.72E+00*	*9.35E-01*	*3.0 E-05*

Note: The isotopes which contribute greater than 0.1% to the total curie inventory for the fuel assembly are considered in the evaluation as fines. The analysis also includes actinides as the dose conversion factors for these isotopes are in general, orders of magnitude greater than other isotopes (e.g., isotopes of plutonium, americium, curium, and neptunium were included regardless of their contribution to the inventory).

Table 7.3.2

MPC-24, MPC-24E and MPC-24EF
Postulated Doses
To An Individual at the Controlled Area Boundary (100 meters)
As a Result of an Assumed Effluent Release
Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	1.41E-02	1.69E-02	5.46E-01	6.44E-02	5.89E-01	1.52E-02
DDE	3.26E-04	3.68E-04	3.28E-04	3.25E-04	4.75E-04	3.36E-04
ADE	1.44E-02	1.73E-02	5.46E-01	6.47E-02	5.89E-01	1.55E-02

	Skin/Extremity
SDE	8.34E-04

	Whole Body
CEDE	1.14E-01
DDE	3.34E-04
ADE	1.14E-01

Off-Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	5.04E-02	2.27E-02	1.48E+00	2.45E-01	2.67E+00	2.14E-02
DDE	3.82E-04	4.33E-04	3.84E-04	3.80E-04	5.71E-04	3.94E-04
ADE	5.08E-02	2.31E-02	1.48E+00	2.45E-01	2.67E+00	2.18E-02

	Skin/Extremity
SDE	2.52E-03

	Whole Body
CEDE	3.46E-01
DDE	3.91E-04
ADE	3.46E-01

Accident Conditions [mrem/30 days]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	3.09E+00	1.19E+00	8.82E+01	1.50E+01	1.66E+02	1.14E+00
DDE	1.93E-02	2.19E-02	1.94E-02	1.91E-02	2.90E-02	1.99E-02
ADE	3.11E+00	1.21E+00	8.82E+01	1.50E+01	1.66E+02	1.16E+00

	Skin/Extremity
SDE	1.52E-01

	Whole Body
CEDE	2.09E+01
DDE	1.98E-02
ADE	2.09E+01

Table 7.3.3

MPC-32
Postulated Doses
To An Individual at the Controlled Area Boundary (100 meters)
As a Result of an Assumed Effluent Release

Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	1.97E-02	2.37E-02	7.65E-01	9.01E-02	8.25E-01	2.13E-02
DDE	4.56E-04	5.16E-04	4.59E-04	4.55E-04	6.65E-04	4.71E-04
ADE	2.02E-02	2.42E-02	7.65E-01	9.06E-02	8.26E-01	2.18E-02

	Skin/Extremity
SDE	1.17E-03

	Whole Body
CEDE	1.59E-01
DDE	4.67E-04
ADE	1.59E-01

Off-Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	7.05E-02	3.18E-02	2.07E+00	3.42E-01	3.74E+00	3.00E-02
DDE	5.35E-04	6.06E-04	5.38E-04	5.31E-04	7.99E-04	5.51E-04
ADE	7.10E-02	3.24E-02	2.07E+00	3.43E-01	3.74E+00	3.06E-02

	Skin/Extremity
SDE	3.53E-03

	Whole Body
CEDE	4.85E-01
DDE	5.48E-04
ADE	4.86E-01

Accident Conditions [mrem/30 days]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	4.31E+00	1.67E+00	1.23E+02	2.10E+01	2.33E+02	1.60E+00
DDE	2.70E-02	3.06E-02	2.71E-02	2.68E-02	4.06E-02	2.78E-02
ADE	4.34E+00	1.70E+00	1.23E+02	2.10E+01	2.33E+02	1.63E+00

	Skin/Extremity
SDE	2.12E-01

	Whole Body
CEDE	2.91E+01
DDE	2.76E-02
ADE	2.91E+01

Table 7.3.4
MPC-68 and MPC-68FF
Postulated Doses
To An Individual at the Controlled Area Boundary (100 meters)
As a Result of an Assumed Effluent Release

Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	4.50E-02	1.42E-01	2.91E+00	1.73E-01	5.79E-01	1.25E-01
DDE	2.86E-03	3.23E-03	2.88E-03	2.86E-03	4.14E-03	2.95E-03
ADE	4.79E-02	1.45E-01	2.91E+00	1.76E-01	5.83E-01	1.28E-01

	Skin/Extremity
SDE	3.85E-03

	Whole Body
CEDE	5.12E-01
DDE	2.93E-03
ADE	5.15E-01

Off-Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	7.61E-02	1.48E-01	3.90E+00	3.25E-01	2.29E+00	1.32E-01
DDE	2.91E-03	3.29E-03	2.93E-03	2.91E-03	4.23E-03	3.01E-03
ADE	7.90E-02	1.51E-01	3.90E+00	3.28E-01	2.29E+00	1.35E-01

	Skin/Extremity
SDE	5.65E-03

	Whole Body
CEDE	7.32E-01
DDE	2.98E-03
ADE	7.35E-01

Accident Conditions [mrem/30 days]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	4.21E+00	7.17E+00	2.05E+02	1.83E+01	1.42E+02	6.40E+00
DDE	1.40E-01	1.58E-01	1.41E-01	1.40E-01	2.04E-01	1.45E-01
ADE	4.35E+00	7.33E+00	2.05E+02	1.84E+01	1.42E+02	6.55E+00

	Skin/Extremity
SDE	3.03E-01

	Whole Body
CEDE	3.91E+01
DDE	1.44E-01
ADE	3.92E+01

Table 7.3.5

MPC-68F
Postulated Doses
To An Individual at the Controlled Area Boundary (100 meters)
As a Result of an Assumed Effluent Release

Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	7.29E-03	2.56E-02	4.97E-01	2.74E-02	5.94E-01	2.25E-02
DDE	5.16E-04	5.84E-04	5.21E-04	5.16E-04	7.47E-04	5.33E-04
ADE	7.81E-03	2.62E-02	4.98E-01	2.79E-02	5.95E-01	2.30E-02

	Skin/Extremity
SDE	6.31E-04

	Whole Body
CEDE	8.65E-02
DDE	5.29E-04
ADE	8.70E-02

Off-Normal Conditions [mrem/yr]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	1.36E-02	2.64E-02	6.74E-01	5.91E-02	4.26E-01	2.34E-02
DDE	5.18E-04	5.86E-04	5.23E-04	5.18E-04	7.51E-04	5.35E-04
ADE	1.41E-02	2.70E-02	6.75E-01	5.96E-02	4.27E-01	2.39E-02

	Skin/Extremity
SDE	8.36E-04

	Whole Body
CEDE	1.29E-01
DDE	5.31E-04
ADE	1.30E-01

Accident Conditions [mrem/30 days]

	Gonad	Breast	Lung	Red Marrow	Bone Surface	Thyroid
CDE	8.15E-01	1.28E+00	3.69E+01	3.66E+00	3.00E+01	1.14E+00
DDE	2.48E-02	2.80E-02	2.50E-02	2.48E-02	3.59E-02	2.56E-02
ADE	8.40E-01	1.31E+00	3.69E+01	3.68E+00	3.00E+01	1.17E+00

	Skin/Extremity
SDE	4.53E-02

	Whole Body
CEDE	7.26E+00
DDE	2.54E-02
ADE	7.29E+00

Table 7.3.6
χ/Q Parameters

Parameter	Value	Reference
U	1 m/s	NUREG-1536 [7.0.2]
σ_y	4.0 m	Figure 1, Reg Guide 1.145 [7.3.4]
σ_z	2.5 m	Figure 2, Reg Guide 1.145 [7.3.4]
$\Sigma_y = M\,\sigma_y$	16	M is determined from Figure 3, Reg Guide 1.145 [7.3.4]
A	8.41 m^2	Chapter 1, Section 1.5

Table 7.3.7

Parameters for Test, *Normal/Off-Normal and* Hypothetical Accident Conditions

Parameter	Reference Test	*Actual Test*	Normal/Off-Normal[1]	Hypothetical Accident
P_u	2 ATM (min)	*6.78 ATM (min)*	*7.48~~5.44~~* ATM	*16.31~~9.5~~* ATM
P_d	1 ATM	*1 ATM*	1 ATM	1 ATM
T	373 K	*373 K*	*600~~510~~* K	843 K
M	4 g/mol	*4 g/mol*	4 g/mol	4 g/mol
u (helium)	0.0231 cP	*0.0231 cP*	0.0~~287~~*316* cP	0.0397 cP
a	1.9 cm	*1.9 cm*	1.9 cm	1.9 cm

[1]*The values in this column are for the off-normal condition. They uniformly bound the normal condition values.*

Table 7.3.8

Postulated Bounding Doses Compared to Regulatory Limits
To An Individual at the Controlled Area Boundary (100 meters)
As a Result of an Assumed Effluent Release

	BWR	PWR	Regulatory Limit
10CFR72.104(a) - Normal			
Whole body ADE	0.515 mrem	0.159 mrem	25 mrem
Thyroid ADE	0.128 mrem	0.022 mrem	75 mrem
Critical Organ ADE (Max)	2.91 mrem	0.826 mrem	25mrem
10CFR72.104(a) - Off-normal			
Whole body ADE	0.735 mrem	0.486 mrem	25 mrem
Thyroid ADE	0.135 mrem	0.031 mrem	75 mrem
Critical Organ ADE (Max)	3.90 mrem	3.74 mrem	25mrem
10CFR72.106(b) - Accident			
TEDE	39.2 mrem	29.1 mrem	5 rem
TODE=DDE+CDE (Max)	205 mrem	233 mrem	50 rem
LDE	0.540 mrem	0.732 mrem	15 rem
SDE	0.303 mrem	0.212 mrem	50 rem

ADE: Annual Dose Equivalent
TEDE: Total Effective Dose Equivalent
TODE: Total Organ Dose Equivalent
DDE: Deep Dose Equivalent
CDE: Committed Dose Equivalent
LDE: Lens Dose Equivalent
SDE: Shallow Dose Equivalent

7.4

REFERENCES

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[7.0.2] NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems", January, 1997.

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[7.2.1] Interim Staff Guidance-11, Revision 1, "Transportation and Storage of Spent Fuel Having Burnups in Excess of 45GWD/MTU", May 16, 2000.

[7.2.2] Interim Staff Guidance-5, Revision 1, "Normal, Off-Normal, and Hypothetical Dose Estimate Calculations", June 18, 1999.

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[7.3.4] U.S. Nuclear Regulatory Commission, "Atmospheric Dispersement Models for Potential Accident Consequence Assessments at Nuclear Power Plants," Regulatory Guide 1.145, February 1989.

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[7.3.7] International Commission on Radiological Protection, Limits for Intakes of Radionuclides by Workers, ICRP Publication 30, Part 1; Pergamon Press; Oxford; 1978.

[7.3.8] ANSI N14.5-1997. "American National Standard for Radioactive Material Leakage Tests on Packages for Shipment."

[7.3.9] Rosenhow, W.M.. and Hartnett, J.P., *Handbook of Heat Transfer*, McGraw Hill Book Company, New York, 1973.

[7.3.10] Turner, James E. *Atoms, Radiation , and Radiation Protection*, McGraw Hill Book Company, New York, 1992.

[7.3.11] Rashid, Y.R., et al, "An Estimate of the Contribution of Spent Fuel Products to the Releaseable Source Term in Spent Fuel Transportation Casks," SAND88-2778C, Sandia National Laboratories, 1988

APPENDIX 7.A

EXAMPLE DOSE CALCULATIONS FOR NORMAL, OFF-NORMAL, AND ACCIDENT CONDITIONS OF STORAGE

MPC-32, Normal Conditions of Storage, Dose from Inhalation: 7 pages
MPC-32, Off-Normal Conditions of Storage, Dose from Inhalation: 7 pages
MPC-32, Accident Conditions of Storage, Dose from Inhalation: 7 pages

MPC-32, Normal Conditions of Storage, Dose from Submersion: 8 pages
MPC-32, Off-Normal Conditions of Storage, Dose from Submersion: 8 pages
MPC-32, Accident Conditions of Storage, Dose from Submersion: 8 pages

MPC-68, Normal Conditions of Storage, Dose from Inhalation: 7 pages
MPC-68, Off-Normal Conditions of Storage, Dose from Inhalation: 7 pages
MPC-68, Accident Conditions of Storage, Dose from Inhalation: 7 pages

MPC-68, Normal Conditions of Storage, Dose from Submersion: 8 pages
MPC-68, Off-Normal Conditions of Storage, Dose from Submersion: 8 pages
MPC-68, Accident Conditions of Storage, Dose from Submersion: 8 pages

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	8.69E-11	3.22E-01	3.15E+07	7.69E-09
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	4.76E-09	1.76E+01	3.15E+07	5.54E-03
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	3.03E-05
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.30E-09	4.81E+00	3.15E+07	3.69E-05
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.30E-08	4.81E+01	3.15E+07	9.36E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	8.76E-09	3.24E+01	3.15E+07	1.53E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	6.82E-07	2.52E+03	3.15E+07	1.56E-03
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	1.61E-08
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	8.25E-15	3.05E-05	3.15E+07	5.80E-12
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.93E-09	7.14E+00	3.15E+07	4.20E-07
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	2.41E-15	8.92E-06	3.15E+07	5.25E-13
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	1.17E-08	4.33E+01	3.15E+07	1.85E-06
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	1.59E-05	5.88E+04	3.15E+07	4.29E-03
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	2.80E-05	1.04E+05	3.15E+07	4.35E-03
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	3.60E-10	1.33E+00	3.15E+07	2.21E-08
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	3.56E-10	1.32E+00	3.15E+07	1.57E-08
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	3.25E-05	1.20E+05	3.15E+07	7.82E-04
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	1.24E-10	4.59E-01	3.15E+07	1.86E-09
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	3.44E-04
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	4.03E-14	1.49E-04	3.15E+07	3.64E-13
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	1.73E-04
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	3.26E-05	1.21E+05	3.15E+07	4.25E-05
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	5.70E-07	2.11E+03	3.15E+07	4.92E-07
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	2.07E-05	7.66E+04	3.15E+07	2.01E-05
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	7.45E-11	2.76E-01	3.15E+07	9.70E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	2.96E-05	1.10E+05	3.15E+07	3.07E-07
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	3.02E-05	1.12E+05	3.15E+07	2.30E-06
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	1.94E-09	7.18E+00	3.15E+07	4.52E-10
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	3.21E-05	1.19E+05	3.15E+07	7.52E-06
														Total	1.97E-02

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	2.09E-10	7.73E-01	3.15E+07	1.85E-08
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.84E-08	6.81E+01	3.15E+07	2.14E-02
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	3.03E-05
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.78E-09	6.59E+00	3.15E+07	5.05E-05
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.08E-08	4.00E+01	3.15E+07	7.78E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	7.84E-09	2.90E+01	3.15E+07	1.37E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	3.06E-11	1.13E-01	3.15E+07	6.98E-08
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	1.61E-08
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	3.60E-14	1.33E-04	3.15E+07	2.53E-11
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.97E-09	7.29E+00	3.15E+07	4.29E-07
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.05E-14	3.89E-05	3.15E+07	2.29E-12
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	1.55E-08	5.74E+01	3.15E+07	2.45E-06
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	1.04E-09	3.85E+00	3.15E+07	2.81E-07
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	1.00E-09	3.70E+00	3.15E+07	1.55E-07
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	4.16E-10	1.54E+00	3.15E+07	2.56E-08
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	6.14E-10	2.27E+00	3.15E+07	2.71E-08
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	2.67E-09	9.88E+00	3.15E+07	6.43E-08
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	1.07E-10	3.96E-01	3.15E+07	1.60E-09
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	9.51E-10	3.52E+00	3.15E+07	1.03E-08
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	1.49E-13	5.51E-04	3.15E+07	1.35E-12
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	9.22E-10	3.41E+00	3.15E+07	5.03E-09
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	1.52E-08	5.62E+01	3.15E+07	1.98E-08
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	9.44E-10	3.49E+00	3.15E+07	8.15E-10
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	6.29E-09	2.33E+01	3.15E+07	6.11E-09
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	1.63E-11	6.03E-02	3.15E+07	2.12E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	1.69E-08	6.25E+01	3.15E+07	1.75E-10
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	9.45E-10	3.50E+00	3.15E+07	7.20E-11
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	2.94E-12	1.09E-02	3.15E+07	6.86E-13
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	1.38E-09	5.11E+00	3.15E+07	3.23E-10
														Total	2.37E-02

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	3.14E-10	1.16E+00	3.15E+07	2.78E-08
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	3.45E-07	1.28E+03	3.15E+07	4.02E-01
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	2.86E-06	1.06E+04	3.15E+07	3.22E-01
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.04E-06	3.85E+03	3.15E+07	2.95E-02
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	8.50E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	8.82E-09	3.26E+01	3.15E+07	1.54E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	7.42E-09	2.75E+01	3.15E+07	1.69E-05
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	8.89E-09	3.29E+01	3.15E+07	1.50E-05
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	7.74E-08	2.86E+02	3.15E+07	5.44E-05
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.83E-07	6.77E+02	3.15E+07	3.98E-05
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	9.40E-11	3.48E-01	3.15E+07	2.05E-08
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	7.92E-08	2.93E+02	3.15E+07	1.25E-05
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	1.93E-05	7.14E+04	3.15E+07	5.21E-03
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	2.86E-03
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	2.17E-08	8.03E+01	3.15E+07	1.33E-06
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	1.19E-08	4.40E+01	3.15E+07	5.25E-07
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	4.43E-04
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	4.66E-10	1.72E+00	3.15E+07	6.99E-09
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	1.87E-04
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	3.26E-09	1.21E+01	3.15E+07	2.95E-08
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	9.44E-05
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	1.78E-05	6.59E+04	3.15E+07	2.32E-05
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	1.55E-05	5.74E+04	3.15E+07	1.34E-05
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	1.94E-05	7.18E+04	3.15E+07	1.88E-05
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	2.36E-09	8.73E+00	3.15E+07	3.07E-09
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	1.61E-05	5.96E+04	3.15E+07	1.67E-07
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	1.64E-05	6.07E+04	3.15E+07	1.25E-06
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	5.20E-08	1.92E+02	3.15E+07	1.21E-08
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	4.20E-06	1.55E+04	3.15E+07	9.84E-07
														Total	7.65E-01

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	1.40E-10	5.18E-01	3.15E+07	1.24E-08
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.72E-08	6.36E+01	3.15E+07	2.00E-02
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	3.28E-08	1.21E+02	3.15E+07	3.70E-03
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.76E-09	6.51E+00	3.15E+07	4.99E-05
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	8.50E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	8.30E-09	3.07E+01	3.15E+07	1.45E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	3.36E-06	1.24E+04	3.15E+07	7.66E-03
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	2.79E-10	1.03E+00	3.15E+07	4.72E-07
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	1.13E-06
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	2.67E-08	9.88E+01	3.15E+07	5.81E-06
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.38E-14	5.11E-05	3.15E+07	3.00E-12
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	1.06E-07	3.92E+02	3.15E+07	1.67E-05
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	9.38E-05	3.47E+05	3.15E+07	2.53E-02
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	1.52E-04	5.62E+05	3.15E+07	2.36E-02
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	5.35E-10	1.98E+00	3.15E+07	3.29E-08
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	1.43E-08	5.29E+01	3.15E+07	6.31E-07
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	1.74E-04	6.44E+05	3.15E+07	4.19E-03
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	3.01E-09	1.11E+01	3.15E+07	4.51E-08
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	1.83E-03
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	9.94E-08
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	9.22E-04
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	1.73E-04	6.40E+05	3.15E+07	2.25E-04
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	3.90E-06	1.44E+04	3.15E+07	3.37E-06
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	1.18E-04	4.37E+05	3.15E+07	1.15E-04
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	2.08E-10	7.70E-01	3.15E+07	2.71E-10
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	2.62E-04	9.69E+05	3.15E+07	2.72E-06
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	1.61E-04	5.96E+05	3.15E+07	1.23E-05
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	1.32E-08	4.88E+01	3.15E+07	3.08E-09
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	3.96E-05
														Total	9.01E-02

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	1.38E-10	5.11E-01	3.15E+07	1.22E-08
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.35E-08	5.00E+01	3.15E+07	1.57E-02
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	7.09E-08	2.62E+02	3.15E+07	7.99E-03
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	4.56E-05
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	7.92E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	7.94E-09	2.94E+01	3.15E+07	1.39E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	4.20E-05	1.55E+05	3.15E+07	9.58E-02
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	2.78E-10	1.03E+00	3.15E+07	4.70E-07
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	2.01E-08	7.44E+01	3.15E+07	1.41E-05
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	4.54E-08	1.68E+02	3.15E+07	9.88E-06
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.47E-14	5.44E-05	3.15E+07	3.20E-12
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	5.23E-07	1.94E+03	3.15E+07	8.25E-05
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	1.17E-03	4.33E+06	3.15E+07	3.16E-01
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	1.90E-03	7.03E+06	3.15E+07	2.95E-01
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	9.78E-10	3.62E+00	3.15E+07	6.01E-08
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	1.52E-07	5.62E+02	3.15E+07	6.71E-06
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	5.22E-02
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	3.21E-08	1.19E+02	3.15E+07	4.81E-07
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	2.29E-02
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	1.38E-07	5.11E+02	3.15E+07	1.25E-06
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	1.15E-02
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	2.83E-03
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	4.87E-05	1.80E+05	3.15E+07	4.21E-05
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	1.47E-03	5.44E+06	3.15E+07	1.43E-03
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	2.03E-09	7.51E+00	3.15E+07	2.64E-09
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	3.27E-03	1.21E+07	3.15E+07	3.39E-05
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	2.01E-03	7.44E+06	3.15E+07	1.53E-04
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	1.65E-07	6.11E+02	3.15E+07	3.85E-08
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	2.12E-03	7.84E+06	3.15E+07	4.97E-04
														Total	8.25E-01

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	1.56E-06	5.77E+03	3.15E+07	1.38E-04
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.62E-08	5.99E+01	3.15E+07	1.89E-02
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	3.03E-05
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.72E-09	6.36E+00	3.15E+07	4.88E-05
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.11E-08	4.11E+01	3.15E+07	7.99E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	7.93E-09	2.93E+01	3.15E+07	1.39E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	1.24E-11	4.59E-02	3.15E+07	2.83E-08
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	1.61E-08
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	1.98E-14	7.33E-05	3.15E+07	1.39E-11
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.88E-09	6.96E+00	3.15E+07	4.09E-07
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	8.47E-15	3.13E-05	3.15E+07	1.84E-12
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	7.14E-09	2.64E+01	3.15E+07	1.13E-06
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	1.01E-09	3.74E+00	3.15E+07	2.73E-07
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	9.62E-10	3.56E+00	3.15E+07	1.49E-07
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	3.24E-10	1.20E+00	3.15E+07	1.99E-08
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	2.40E-10	8.88E-01	3.15E+07	1.06E-08
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	1.60E-09	5.92E+00	3.15E+07	3.85E-08
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	9.93E-11	3.67E-01	3.15E+07	1.49E-09
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	9.05E-10	3.35E+00	3.15E+07	9.80E-09
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	1.32E-14	4.88E-05	3.15E+07	1.19E-13
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	9.03E-10	3.34E+00	3.15E+07	4.93E-09
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	8.29E-09	3.07E+01	3.15E+07	1.08E-08
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	9.41E-10	3.48E+00	3.15E+07	8.13E-10
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	3.83E-09	1.42E+01	3.15E+07	3.72E-09
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	7.62E-12	2.82E-02	3.15E+07	9.92E-12
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	1.34E-08	4.96E+01	3.15E+07	1.39E-10
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	8.79E-10	3.25E+00	3.15E+07	6.70E-11
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	2.52E-12	9.32E-03	3.15E+07	5.88E-13
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	5.64E-10	2.09E+00	3.15E+07	1.32E-10
														Total	2.13E-02

MPC-32															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CEDE (mRem)
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.70E-05
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.30E-04	4.69E-08	1.74E+02	3.15E+07	4.15E-06
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	5.91E-08	2.19E+02	3.15E+07	6.88E-02
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	3.30E-04	3.51E-07	1.30E+03	3.15E+07	3.95E-02
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	3.30E-04	1.29E-07	4.77E+02	3.15E+07	3.66E-03
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	3.30E-04	1.25E-08	4.63E+01	3.15E+07	9.00E-04
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	3.30E-04	8.63E-09	3.19E+01	3.15E+07	1.51E-03
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	3.30E-04	2.23E-06	8.25E+03	3.15E+07	5.09E-03
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	3.30E-04	2.13E-09	7.88E+00	3.15E+07	3.60E-06
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	3.30E-04	1.06E-08	3.92E+01	3.15E+07	7.46E-06
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	5.84E-08	2.16E+02	3.15E+07	1.27E-05
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	3.30E-04	1.17E-11	4.33E-02	3.15E+07	2.55E-09
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	3.30E-04	7.73E-08	2.86E+02	3.15E+07	1.22E-05
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.30E-04	6.70E-05	2.48E+05	3.15E+07	1.81E-02
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	3.30E-04	1.06E-04	3.92E+05	3.15E+07	1.65E-02
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.30E-04	3.30E-09	1.22E+01	3.15E+07	2.03E-07
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.30E-04	1.12E-08	4.14E+01	3.15E+07	4.94E-07
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	3.30E-04	1.20E-04	4.44E+05	3.15E+07	2.89E-03
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	3.30E-04	1.52E-09	5.62E+00	3.15E+07	2.28E-08
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	1.26E-03
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.30E-04	8.10E-09	3.00E+01	3.15E+07	7.32E-08
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	6.33E-04
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	1.19E-04	4.40E+05	3.15E+07	1.55E-04
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	3.30E-04	4.67E-06	1.73E+04	3.15E+07	4.03E-06
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	3.30E-04	8.30E-05	3.07E+05	3.15E+07	8.06E-05
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	3.30E-04	6.78E-10	2.51E+00	3.15E+07	8.83E-10
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.30E-04	1.46E-04	5.40E+05	3.15E+07	1.51E-06
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.30E-04	1.11E-04	4.11E+05	3.15E+07	8.46E-06
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	3.30E-04	1.58E-08	5.85E+01	3.15E+07	3.68E-09
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.30E-04	1.15E-04	4.26E+05	3.15E+07	2.69E-05
														Total	1.59E-01

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	8.69E-11	3.22E-01	3.15E+07	3.54E-08
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	4.76E-09	1.76E+01	3.15E+07	5.54E-03
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	1.39E-04
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.30E-09	4.81E+00	3.15E+07	1.70E-04
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.30E-08	4.81E+01	3.15E+07	4.31E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	8.76E-09	3.24E+01	3.15E+07	7.05E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	6.82E-07	2.52E+03	3.15E+07	7.16E-03
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	7.40E-08
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	8.25E-15	3.05E-05	3.15E+07	2.67E-11
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.93E-09	7.14E+00	3.15E+07	1.93E-06
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	2.41E-15	8.92E-06	3.15E+07	2.41E-12
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	1.17E-08	4.33E+01	3.15E+07	8.49E-06
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	1.59E-05	5.88E+04	3.15E+07	1.98E-02
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	2.80E-05	1.04E+05	3.15E+07	2.00E-02
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	3.60E-10	1.33E+00	3.15E+07	1.02E-07
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	3.56E-10	1.32E+00	3.15E+07	7.23E-08
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	3.25E-05	1.20E+05	3.15E+07	3.60E-03
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	1.24E-10	4.59E-01	3.15E+07	8.56E-09
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	1.58E-03
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	4.03E-14	1.49E-04	3.15E+07	1.68E-12
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	7.98E-04
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	3.26E-05	1.21E+05	3.15E+07	1.95E-04
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	5.70E-07	2.11E+03	3.15E+07	2.26E-06
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	2.07E-05	7.66E+04	3.15E+07	9.24E-05
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	7.45E-11	2.76E-01	3.15E+07	4.46E-10
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	2.96E-05	1.10E+05	3.15E+07	1.41E-06
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	3.02E-05	1.12E+05	3.15E+07	1.06E-05
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	1.94E-09	7.18E+00	3.15E+07	2.08E-09
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	3.21E-05	1.19E+05	3.15E+07	3.46E-05
														Total	7.05E-02

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	2.09E-10	7.73E-01	3.15E+07	8.51E-08
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.84E-08	6.81E+01	3.15E+07	2.14E-02
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	1.39E-04
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.78E-09	6.59E+00	3.15E+07	2.32E-04
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.08E-08	4.00E+01	3.15E+07	3.58E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	7.84E-09	2.90E+01	3.15E+07	6.31E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	3.06E-11	1.13E-01	3.15E+07	3.21E-07
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	7.40E-08
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	3.60E-14	1.33E-04	3.15E+07	1.16E-10
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.97E-09	7.29E+00	3.15E+07	1.97E-06
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.05E-14	3.89E-05	3.15E+07	1.05E-11
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	1.55E-08	5.74E+01	3.15E+07	1.12E-05
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	1.04E-09	3.85E+00	3.15E+07	1.29E-06
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	1.00E-09	3.70E+00	3.15E+07	7.15E-07
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	4.16E-10	1.54E+00	3.15E+07	1.18E-07
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	6.14E-10	2.27E+00	3.15E+07	1.25E-07
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	2.67E-09	9.88E+00	3.15E+07	2.96E-07
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	1.07E-10	3.96E-01	3.15E+07	7.38E-09
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	9.51E-10	3.52E+00	3.15E+07	4.74E-08
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	1.49E-13	5.51E-04	3.15E+07	6.20E-12
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	9.22E-10	3.41E+00	3.15E+07	2.31E-08
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	1.52E-08	5.62E+01	3.15E+07	9.11E-08
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	9.44E-10	3.49E+00	3.15E+07	3.75E-09
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	6.29E-09	2.33E+01	3.15E+07	2.81E-08
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	1.63E-11	6.03E-02	3.15E+07	9.77E-11
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	1.69E-08	6.25E+01	3.15E+07	8.07E-10
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	9.45E-10	3.50E+00	3.15E+07	3.31E-10
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	2.94E-12	1.09E-02	3.15E+07	3.15E-12
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	1.38E-09	5.11E+00	3.15E+07	1.49E-09
														Total	3.18E-02

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	3.14E-10	1.16E+00	3.15E+07	1.28E-07
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	3.45E-07	1.28E+03	3.15E+07	4.02E-01
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	2.86E-06	1.06E+04	3.15E+07	1.48E+00
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.04E-06	3.85E+03	3.15E+07	1.36E-01
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	3.91E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	8.82E-09	3.26E+01	3.15E+07	7.10E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	7.42E-09	2.75E+01	3.15E+07	7.79E-05
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	8.89E-09	3.29E+01	3.15E+07	6.91E-05
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	7.74E-08	2.86E+02	3.15E+07	2.50E-04
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.83E-07	6.77E+02	3.15E+07	1.83E-04
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	9.40E-11	3.48E-01	3.15E+07	9.41E-08
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	7.92E-08	2.93E+02	3.15E+07	5.75E-05
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	1.93E-05	7.14E+04	3.15E+07	2.40E-02
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	1.32E-02
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	2.17E-08	8.03E+01	3.15E+07	6.14E-06
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	1.19E-08	4.40E+01	3.15E+07	2.42E-06
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	2.04E-03
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	4.66E-10	1.72E+00	3.15E+07	3.22E-08
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	8.62E-04
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	3.26E-09	1.21E+01	3.15E+07	1.36E-07
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	4.34E-04
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	1.78E-05	6.59E+04	3.15E+07	1.07E-04
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	1.55E-05	5.74E+04	3.15E+07	6.16E-05
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	1.94E-05	7.18E+04	3.15E+07	8.66E-05
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	2.36E-09	8.73E+00	3.15E+07	1.41E-08
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	1.61E-05	5.96E+04	3.15E+07	7.68E-07
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	1.64E-05	6.07E+04	3.15E+07	5.75E-06
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	5.20E-08	1.92E+02	3.15E+07	5.58E-08
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	4.20E-06	1.55E+04	3.15E+07	4.53E-06
														Total	2.07E+00

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	1.40E-10	5.18E-01	3.15E+07	5.70E-08
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.72E-08	6.36E+01	3.15E+07	2.00E-02
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	3.28E-08	1.21E+02	3.15E+07	1.70E-02
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.76E-09	6.51E+00	3.15E+07	2.29E-04
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	3.91E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	8.30E-09	3.07E+01	3.15E+07	6.68E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	3.36E-06	1.24E+04	3.15E+07	3.53E-02
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	2.79E-10	1.03E+00	3.15E+07	2.17E-06
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	5.21E-06
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	2.67E-08	9.88E+01	3.15E+07	2.67E-05
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.38E-14	5.11E-05	3.15E+07	1.38E-11
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	1.06E-07	3.92E+02	3.15E+07	7.69E-05
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	9.38E-05	3.47E+05	3.15E+07	1.17E-01
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	1.52E-04	5.62E+05	3.15E+07	1.09E-01
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	5.35E-10	1.98E+00	3.15E+07	1.51E-07
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	1.43E-08	5.29E+01	3.15E+07	2.90E-06
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	1.74E-04	6.44E+05	3.15E+07	1.93E-02
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	3.01E-09	1.11E+01	3.15E+07	2.08E-07
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	8.42E-03
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	4.57E-07
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	4.24E-03
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	1.73E-04	6.40E+05	3.15E+07	1.04E-03
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	3.90E-06	1.44E+04	3.15E+07	1.55E-05
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	1.18E-04	4.37E+05	3.15E+07	5.27E-04
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	2.08E-10	7.70E-01	3.15E+07	1.25E-09
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	2.62E-04	9.69E+05	3.15E+07	1.25E-05
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	1.61E-04	5.96E+05	3.15E+07	5.64E-05
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	1.32E-08	4.88E+01	3.15E+07	1.42E-08
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	1.82E-04
														Total	3.42E-01

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	1.38E-10	5.11E-01	3.15E+07	5.62E-08
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.35E-08	5.00E+01	3.15E+07	1.57E-02
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	7.09E-08	2.62E+02	3.15E+07	3.67E-02
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	2.10E-04
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	3.64E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	7.94E-09	2.94E+01	3.15E+07	6.39E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	4.20E-05	1.55E+05	3.15E+07	4.41E-01
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	2.78E-10	1.03E+00	3.15E+07	2.16E-06
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	2.01E-08	7.44E+01	3.15E+07	6.50E-05
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	4.54E-08	1.68E+02	3.15E+07	4.55E-05
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.47E-14	5.44E-05	3.15E+07	1.47E-11
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	5.23E-07	1.94E+03	3.15E+07	3.80E-04
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	1.17E-03	4.33E+06	3.15E+07	1.45E+00
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	1.90E-03	7.03E+06	3.15E+07	1.36E+00
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	9.78E-10	3.62E+00	3.15E+07	2.77E-07
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	1.52E-07	5.62E+02	3.15E+07	3.09E-05
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	2.40E-01
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	3.21E-08	1.19E+02	3.15E+07	2.21E-06
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	1.05E-01
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	1.38E-07	5.11E+02	3.15E+07	5.74E-06
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	5.30E-02
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	1.30E-02
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	4.87E-05	1.80E+05	3.15E+07	1.94E-04
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	1.47E-03	5.44E+06	3.15E+07	6.56E-03
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	2.03E-09	7.51E+00	3.15E+07	1.22E-08
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	3.27E-03	1.21E+07	3.15E+07	1.56E-04
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	2.01E-03	7.44E+06	3.15E+07	7.05E-04
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	1.65E-07	6.11E+02	3.15E+07	1.77E-07
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	2.12E-03	7.84E+06	3.15E+07	2.28E-03
														Total	3.74E+00

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	1.56E-06	5.77E+03	3.15E+07	6.35E-04
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	1.62E-08	5.99E+01	3.15E+07	1.89E-02
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	1.39E-04
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.72E-09	6.36E+00	3.15E+07	2.24E-04
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.11E-08	4.11E+01	3.15E+07	3.68E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	7.93E-09	2.93E+01	3.15E+07	6.39E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	1.24E-11	4.59E-02	3.15E+07	1.30E-07
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	7.40E-08
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	1.98E-14	7.33E-05	3.15E+07	6.41E-11
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.88E-09	6.96E+00	3.15E+07	1.88E-06
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	8.47E-15	3.13E-05	3.15E+07	8.48E-12
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	7.14E-09	2.64E+01	3.15E+07	5.18E-06
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	1.01E-09	3.74E+00	3.15E+07	1.25E-06
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	9.62E-10	3.56E+00	3.15E+07	6.88E-07
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	3.24E-10	1.20E+00	3.15E+07	9.16E-08
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	2.40E-10	8.88E-01	3.15E+07	4.87E-08
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	1.60E-09	5.92E+00	3.15E+07	1.77E-07
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	9.93E-11	3.67E-01	3.15E+07	6.85E-09
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	9.05E-10	3.35E+00	3.15E+07	4.51E-08
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	1.32E-14	4.88E-05	3.15E+07	5.49E-13
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	9.03E-10	3.34E+00	3.15E+07	2.27E-08
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	8.29E-09	3.07E+01	3.15E+07	4.97E-08
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	9.41E-10	3.48E+00	3.15E+07	3.74E-09
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	3.83E-09	1.42E+01	3.15E+07	1.71E-08
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	7.62E-12	2.82E-02	3.15E+07	4.57E-11
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	1.34E-08	4.96E+01	3.15E+07	6.40E-10
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	8.79E-10	3.25E+00	3.15E+07	3.08E-10
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	2.52E-12	9.32E-03	3.15E+07	2.70E-12
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	5.64E-10	2.09E+00	3.15E+07	6.08E-10
														Total	3.00E-02

MPC-32															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CEDE (mRem)
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	7.83E-05
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.30E-04	4.69E-08	1.74E+02	3.15E+07	1.91E-05
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	3.30E-04	5.91E-08	2.19E+02	3.15E+07	6.88E-02
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	3.30E-04	3.51E-07	1.30E+03	3.15E+07	1.82E-01
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	3.30E-04	1.29E-07	4.77E+02	3.15E+07	1.68E-02
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	3.30E-04	1.25E-08	4.63E+01	3.15E+07	4.14E-03
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	3.30E-04	8.63E-09	3.19E+01	3.15E+07	6.95E-03
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	3.30E-04	2.23E-06	8.25E+03	3.15E+07	2.34E-02
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	3.30E-04	2.13E-09	7.88E+00	3.15E+07	1.66E-05
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	3.30E-04	1.06E-08	3.92E+01	3.15E+07	3.43E-05
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	5.84E-08	2.16E+02	3.15E+07	5.85E-05
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	3.30E-04	1.17E-11	4.33E-02	3.15E+07	1.17E-08
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	3.30E-04	7.73E-08	2.86E+02	3.15E+07	5.61E-05
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.30E-04	6.70E-05	2.48E+05	3.15E+07	8.32E-02
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	3.30E-04	1.06E-04	3.92E+05	3.15E+07	7.58E-02
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.30E-04	3.30E-09	1.22E+01	3.15E+07	9.33E-07
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.30E-04	1.12E-08	4.14E+01	3.15E+07	2.27E-06
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	3.30E-04	1.20E-04	4.44E+05	3.15E+07	1.33E-02
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	3.30E-04	1.52E-09	5.62E+00	3.15E+07	1.05E-07
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	5.78E-03
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.30E-04	8.10E-09	3.00E+01	3.15E+07	3.37E-07
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	2.91E-03
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	1.19E-04	4.40E+05	3.15E+07	7.13E-04
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	3.30E-04	4.67E-06	1.73E+04	3.15E+07	1.86E-05
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	3.30E-04	8.30E-05	3.07E+05	3.15E+07	3.71E-04
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	3.30E-04	6.78E-10	2.51E+00	3.15E+07	4.06E-09
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.30E-04	1.46E-04	5.40E+05	3.15E+07	6.97E-06
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.30E-04	1.11E-04	4.11E+05	3.15E+07	3.89E-05
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	3.30E-04	1.58E-08	5.85E+01	3.15E+07	1.69E-08
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.30E-04	1.15E-04	4.26E+05	3.15E+07	1.24E-04
														Total	4.85E-01

MPC-32														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.88E-03
I129	3.31E-02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.30E-04	8.69E-11	3.22E-01	2.59E+06	2.20E-06
KR 85	5.86E+03	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	3.30E-04	4.76E-09	1.76E+01	2.59E+06	2.65E-01
Volatiles														
SR 90	6.32E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	3.30E-04	2.69E-10	9.95E-01	2.59E+06	8.68E-03
RU106	1.59E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	3.30E-04	1.30E-09	4.81E+00	2.59E+06	1.06E-02
CS134	4.04E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	3.30E-04	1.30E-08	4.81E+01	2.59E+06	2.68E-01
CS137	9.82E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	8.76E-09	3.24E+01	2.59E+06	4.39E-01
Fines														
PU241	8.53E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	3.30E-04	6.82E-07	2.52E+03	2.59E+06	4.46E-01
Y 90	6.32E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	3.30E-04	9.52E-12	3.52E-02	2.59E+06	4.61E-06
PM147	2.63E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	3.30E-04	8.25E-15	3.05E-05	2.59E+06	1.66E-09
CE144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.93E-09	7.14E+00	2.59E+06	1.20E-04
PR144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	2.41E-15	8.92E-06	2.59E+06	1.50E-10
EU154	5.90E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	3.30E-04	1.17E-08	4.33E+01	2.59E+06	5.29E-04
CM244	1.01E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	3.30E-04	1.59E-05	5.88E+04	2.59E+06	1.23E+00
PU238	5.81E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	2.80E-05	1.04E+05	2.59E+06	1.25E+00
SB125	2.30E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	3.30E-04	3.60E-10	1.33E+00	2.59E+06	6.34E-06
EU155	1.65E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.30E-04	3.56E-10	1.32E+00	2.59E+06	4.50E-06
AM241	9.00E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	3.30E-04	3.25E-05	1.20E+05	2.59E+06	2.24E-01
TE125M	5.61E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	3.30E-04	1.24E-10	4.59E-01	2.59E+06	5.33E-07
PU240	4.05E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.30E-04	3.18E-05	1.18E+05	2.59E+06	9.87E-02
SM151	3.38E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	4.03E-14	1.49E-04	2.59E+06	1.04E-10
PU239	2.04E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	3.30E-04	3.18E-05	1.18E+05	2.59E+06	4.97E-02
BA137M	9.27E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	3.26E-05	1.21E+05	2.59E+06	1.22E-02
CM242	3.23E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	3.30E-04	5.70E-07	2.11E+03	2.59E+06	1.41E-04
CM243	3.63E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	2.07E-05	7.66E+04	2.59E+06	5.76E-03
NP239	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	7.45E-11	2.76E-01	2.59E+06	2.78E-08
NP237	3.88E-01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.30E-04	2.96E-05	1.10E+05	2.59E+06	8.80E-05
PU242	2.85E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.30E-04	3.02E-05	1.12E+05	2.59E+06	6.60E-04
AM242	8.72E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	3.30E-04	1.94E-09	7.18E+00	2.59E+06	1.30E-07
AM242M	8.76E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.30E-04	3.21E-05	1.19E+05	2.59E+06	2.15E-03
													Total	4.31E+00

MPC-32														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.88E-03
I129	3.31E-02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.30E-04	2.09E-10	7.73E-01	2.59E+06	5.30E-06
KR 85	5.86E+03	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	3.30E-04	1.84E-08	6.81E+01	2.59E+06	1.02E+00
Volatiles														
SR 90	6.32E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	3.30E-04	2.69E-10	9.95E-01	2.59E+06	8.68E-03
RU106	1.59E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	3.30E-04	1.78E-09	6.59E+00	2.59E+06	1.45E-02
CS134	4.04E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	3.30E-04	1.08E-08	4.00E+01	2.59E+06	2.23E-01
CS137	9.82E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	7.84E-09	2.90E+01	2.59E+06	3.93E-01
Fines														
PU241	8.53E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	3.30E-04	3.06E-11	1.13E-01	2.59E+06	2.00E-05
Y 90	6.32E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	3.30E-04	9.52E-12	3.52E-02	2.59E+06	4.61E-06
PM147	2.63E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	3.30E-04	3.60E-14	1.33E-04	2.59E+06	7.25E-09
CE144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.97E-09	7.29E+00	2.59E+06	1.23E-04
PR144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.05E-14	3.89E-05	2.59E+06	6.55E-10
EU154	5.90E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	3.30E-04	1.55E-08	5.74E+01	2.59E+06	7.01E-04
CM244	1.01E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	3.30E-04	1.04E-09	3.85E+00	2.59E+06	8.05E-05
PU238	5.81E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	1.00E-09	3.70E+00	2.59E+06	4.45E-05
SB125	2.30E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	3.30E-04	4.16E-10	1.54E+00	2.59E+06	7.33E-06
EU155	1.65E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.30E-04	6.14E-10	2.27E+00	2.59E+06	7.76E-06
AM241	9.00E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	3.30E-04	2.67E-09	9.88E+00	2.59E+06	1.84E-05
TE125M	5.61E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	3.30E-04	1.07E-10	3.96E-01	2.59E+06	4.60E-07
PU240	4.05E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.30E-04	9.51E-10	3.52E+00	2.59E+06	2.95E-06
SM151	3.38E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	1.49E-13	5.51E-04	2.59E+06	3.86E-10
PU239	2.04E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	3.30E-04	9.22E-10	3.41E+00	2.59E+06	1.44E-06
BA137M	9.27E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	1.52E-08	5.62E+01	2.59E+06	5.67E-06
CM242	3.23E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	3.30E-04	9.44E-10	3.49E+00	2.59E+06	2.34E-07
CM243	3.63E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	6.29E-09	2.33E+01	2.59E+06	1.75E-06
NP239	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	1.63E-11	6.03E-02	2.59E+06	6.08E-09
NP237	3.88E-01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.30E-04	1.69E-08	6.25E+01	2.59E+06	5.02E-08
PU242	2.85E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.30E-04	9.45E-10	3.50E+00	2.59E+06	2.06E-08
AM242	8.72E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	3.30E-04	2.94E-12	1.09E-02	2.59E+06	1.96E-10
AM242M	8.76E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.30E-04	1.38E-09	5.11E+00	2.59E+06	9.26E-08
													Total	1.67E+00

MPC-32														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.88E-03
I129	3.31E-02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.30E-04	3.14E-10	1.16E+00	2.59E+06	7.96E-06
KR 85	5.86E+03	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	3.30E-04	3.45E-07	1.28E+03	2.59E+06	1.92E+01
Volatiles														
SR 90	6.32E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	3.30E-04	2.86E-06	1.06E+04	2.59E+06	9.23E+01
RU106	1.59E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	3.30E-04	1.04E-06	3.85E+03	2.59E+06	8.45E+00
CS134	4.04E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	3.30E-04	1.18E-08	4.37E+01	2.59E+06	2.44E-01
CS137	9.82E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	8.82E-09	3.26E+01	2.59E+06	4.42E-01
Fines														
PU241	8.53E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	3.30E-04	7.42E-09	2.75E+01	2.59E+06	4.85E-03
Y 90	6.32E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	3.30E-04	8.89E-09	3.29E+01	2.59E+06	4.31E-03
PM147	2.63E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	3.30E-04	7.74E-08	2.86E+02	2.59E+06	1.56E-02
CE144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.83E-07	6.77E+02	2.59E+06	1.14E-02
PR144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	9.40E-11	3.48E-01	2.59E+06	5.86E-06
EU154	5.90E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	3.30E-04	7.92E-08	2.93E+02	2.59E+06	3.58E-03
CM244	1.01E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	3.30E-04	1.93E-05	7.14E+04	2.59E+06	1.49E+00
PU238	5.81E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	1.84E-05	6.81E+04	2.59E+06	8.19E-01
SB125	2.30E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	3.30E-04	2.17E-08	8.03E+01	2.59E+06	3.82E-04
EU155	1.65E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.30E-04	1.19E-08	4.40E+01	2.59E+06	1.50E-04
AM241	9.00E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	3.30E-04	1.84E-05	6.81E+04	2.59E+06	1.27E-01
TE125M	5.61E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	3.30E-04	4.66E-10	1.72E+00	2.59E+06	2.00E-06
PU240	4.05E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.30E-04	1.73E-05	6.40E+04	2.59E+06	5.37E-02
SM151	3.38E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	3.26E-09	1.21E+01	2.59E+06	8.44E-06
PU239	2.04E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	3.30E-04	1.73E-05	6.40E+04	2.59E+06	2.70E-02
BA137M	9.27E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	1.78E-05	6.59E+04	2.59E+06	6.64E-03
CM242	3.23E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	3.30E-04	1.55E-05	5.74E+04	2.59E+06	3.84E-03
CM243	3.63E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	1.94E-05	7.18E+04	2.59E+06	5.40E-03
NP239	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	2.36E-09	8.73E+00	2.59E+06	8.81E-07
NP237	3.88E-01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.30E-04	1.61E-05	5.96E+04	2.59E+06	4.79E-05
PU242	2.85E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.30E-04	1.64E-05	6.07E+04	2.59E+06	3.58E-04
AM242	8.72E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	3.30E-04	5.20E-08	1.92E+02	2.59E+06	3.47E-06
AM242M	8.76E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.30E-04	4.20E-06	1.55E+04	2.59E+06	2.82E-04
													Total	1.23E+02

MPC-32														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.88E-03
I129	3.31E-02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.30E-04	1.40E-10	5.18E-01	2.59E+06	3.55E-06
KR 85	5.86E+03	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	3.30E-04	1.72E-08	6.36E+01	2.59E+06	9.56E-01
Volatiles														
SR 90	6.32E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	3.30E-04	3.28E-08	1.21E+02	2.59E+06	1.06E+00
RU106	1.59E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	3.30E-04	1.76E-09	6.51E+00	2.59E+06	1.43E-02
CS134	4.04E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	3.30E-04	1.18E-08	4.37E+01	2.59E+06	2.44E-01
CS137	9.82E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	8.30E-09	3.07E+01	2.59E+06	4.16E-01
Fines														
PU241	8.53E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	3.30E-04	3.36E-06	1.24E+04	2.59E+06	2.20E+00
Y 90	6.32E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	3.30E-04	2.79E-10	1.03E+00	2.59E+06	1.35E-04
PM147	2.63E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	3.30E-04	1.61E-09	5.96E+00	2.59E+06	3.24E-04
CE144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	2.67E-08	9.88E+01	2.59E+06	1.67E-03
PR144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.38E-14	5.11E-05	2.59E+06	8.61E-10
EU154	5.90E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	3.30E-04	1.06E-07	3.92E+02	2.59E+06	4.79E-03
CM244	1.01E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	3.30E-04	9.38E-05	3.47E+05	2.59E+06	7.26E+00
PU238	5.81E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	1.52E-04	5.62E+05	2.59E+06	6.77E+00
SB125	2.30E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	3.30E-04	5.35E-10	1.98E+00	2.59E+06	9.42E-06
EU155	1.65E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.30E-04	1.43E-08	5.29E+01	2.59E+06	1.81E-04
AM241	9.00E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	3.30E-04	1.74E-04	6.44E+05	2.59E+06	1.20E+00
TE125M	5.61E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	3.30E-04	3.01E-09	1.11E+01	2.59E+06	1.29E-05
PU240	4.05E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.30E-04	1.69E-04	6.25E+05	2.59E+06	5.24E-01
SM151	3.38E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	1.10E-08	4.07E+01	2.59E+06	2.85E-05
PU239	2.04E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	3.30E-04	1.69E-04	6.25E+05	2.59E+06	2.64E-01
BA137M	9.27E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	1.73E-04	6.40E+05	2.59E+06	6.46E-02
CM242	3.23E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	3.30E-04	3.90E-06	1.44E+04	2.59E+06	9.65E-04
CM243	3.63E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	1.18E-04	4.37E+05	2.59E+06	3.28E-02
NP239	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	2.08E-10	7.70E-01	2.59E+06	7.76E-08
NP237	3.88E-01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.30E-04	2.62E-04	9.69E+05	2.59E+06	7.79E-04
PU242	2.85E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.30E-04	1.61E-04	5.96E+05	2.59E+06	3.52E-03
AM242	8.72E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	3.30E-04	1.32E-08	4.88E+01	2.59E+06	8.82E-07
AM242M	8.76E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.30E-04	1.69E-04	6.25E+05	2.59E+06	1.13E-02
													Total	2.10E+01

MPC-32														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.19E+06	1.95E-05	3.16E-12	0.30	1.12E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.89E-03
I129	3.31E-02	100%	32	6.19E+06	1.95E-05	3.16E-12	0.30	1.00E-12	8.00E-03	3.30E-04	1.38E-10	5.11E-01	2.59E+06	3.51E-06
KR 85	5.86E+03	100%	32	6.19E+06	1.95E-05	3.16E-12	0.30	1.78E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.19E+06	1.95E-05	3.16E-12	1.00	2.20E-09	8.00E-03	3.30E-04	1.35E-08	5.00E+01	2.59E+06	7.52E-01
Volatiles														
SR 90	6.32E+04	100%	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	1.28E-09	8.00E-03	3.30E-04	7.09E-08	2.62E+02	2.59E+06	2.29E+00
RU106	1.59E+04	100%	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	3.21E-10	8.00E-03	3.30E-04	1.61E-09	5.96E+00	2.59E+06	1.31E-02
CS134	4.04E+04	100%	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	8.16E-10	8.00E-03	3.30E-04	1.10E-08	4.07E+01	2.59E+06	2.27E-01
CS137	9.82E+04	100%	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	7.94E-09	2.94E+01	2.59E+06	3.99E-01
Fines														
PU241	8.53E+04	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.59E-11	8.00E-03	3.30E-04	4.20E-05	1.55E+05	2.59E+06	2.75E+01
Y 90	6.32E+04	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.92E-11	8.00E-03	3.30E-04	2.78E-10	1.03E+00	2.59E+06	1.35E-04
PM147	2.63E+04	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	7.97E-12	8.00E-03	3.30E-04	2.01E-08	7.44E+01	2.59E+06	4.06E-03
CE144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.47E-12	8.00E-03	3.30E-04	4.54E-08	1.68E+02	2.59E+06	2.84E-03
PR144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.47E-12	8.00E-03	3.30E-04	1.47E-14	5.44E-05	2.59E+06	9.18E-10
EU154	5.90E+03	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.79E-12	8.00E-03	3.30E-04	5.23E-07	1.94E+03	2.59E+06	2.37E-02
CM244	1.01E+04	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	3.06E-12	8.00E-03	3.30E-04	1.17E-03	4.33E+06	2.59E+06	9.07E+01
PU238	5.81E+03	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	1.90E-03	7.03E+06	2.59E+06	8.47E+01
SB125	2.30E+03	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	6.97E-13	8.00E-03	3.30E-04	9.78E-10	3.62E+00	2.59E+06	1.73E-05
EU155	1.65E+03	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	5.00E-13	8.00E-03	3.30E-04	1.52E-07	5.62E+02	2.59E+06	1.92E-03
AM241	9.00E+02	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.73E-13	8.00E-03	3.30E-04	2.17E-03	8.03E+06	2.59E+06	1.50E+01
TE125M	5.61E+02	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.70E-13	8.00E-03	3.30E-04	3.21E-08	1.19E+02	2.59E+06	1.38E-04
PU240	4.05E+02	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.23E-13	8.00E-03	3.30E-04	2.11E-03	7.81E+06	2.59E+06	6.56E+00
SM151	3.38E+02	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	1.38E-07	5.11E+02	2.59E+06	3.58E-04
PU239	2.04E+02	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	6.18E-14	8.00E-03	3.30E-04	2.11E-03	7.81E+06	2.59E+06	3.30E+00
BA137M	9.27E+04	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.81E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	4.82E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	3.46E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.48E-14	8.00E-03	3.30E-04	2.17E-03	8.03E+06	2.59E+06	8.11E-01
CM242	3.23E+01	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	9.79E-15	8.00E-03	3.30E-04	4.87E-05	1.80E+05	2.59E+06	1.21E-02
CM243	3.63E+01	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	1.47E-03	5.44E+06	2.59E+06	4.10E-01
NP239	4.87E+01	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.48E-14	8.00E-03	3.30E-04	2.03E-09	7.51E+00	2.59E+06	7.59E-07
NP237	3.88E-01	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.18E-16	8.00E-03	3.30E-04	3.27E-03	1.21E+07	2.59E+06	9.74E-03
PU242	2.85E+00	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	8.64E-16	8.00E-03	3.30E-04	2.01E-03	7.44E+06	2.59E+06	4.40E-02
AM242	8.72E+00	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.64E-15	8.00E-03	3.30E-04	1.65E-07	6.11E+02	2.59E+06	1.10E-05
AM242M	8.76E+00	10%	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.66E-15	8.00E-03	3.30E-04	2.12E-03	7.84E+06	2.59E+06	1.43E-01
													Total	2.33E+02

MPC-32														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.88E-03
I129	3.31E-02	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.30E-04	1.56E-06	5.77E+03	2.59E+06	3.96E-02
KR 85	5.86E+03	100%	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	3.30E-04	1.62E-08	5.99E+01	2.59E+06	9.01E-01
Volatiles														
SR 90	6.32E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	3.30E-04	2.69E-10	9.95E-01	2.59E+06	8.68E-03
RU106	1.59E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	3.30E-04	1.72E-09	6.36E+00	2.59E+06	1.40E-02
CS134	4.04E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	3.30E-04	1.11E-08	4.11E+01	2.59E+06	2.29E-01
CS137	9.82E+04	100%	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	7.93E-09	2.93E+01	2.59E+06	3.98E-01
Fines														
PU241	8.53E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	3.30E-04	1.24E-11	4.59E-02	2.59E+06	8.10E-06
Y 90	6.32E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	3.30E-04	9.52E-12	3.52E-02	2.59E+06	4.61E-06
PM147	2.63E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	3.30E-04	1.98E-14	7.33E-05	2.59E+06	3.99E-09
CE144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.88E-09	6.96E+00	2.59E+06	1.17E-04
PR144	8.14E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	8.47E-15	3.13E-05	2.59E+06	5.28E-10
EU154	5.90E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	3.30E-04	7.14E-09	2.64E+01	2.59E+06	3.23E-04
CM244	1.01E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	3.30E-04	1.01E-09	3.74E+00	2.59E+06	7.82E-05
PU238	5.81E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	9.62E-10	3.56E+00	2.59E+06	4.28E-05
SB125	2.30E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	3.30E-04	3.24E-10	1.20E+00	2.59E+06	5.71E-06
EU155	1.65E+03	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.30E-04	2.40E-10	8.88E-01	2.59E+06	3.03E-06
AM241	9.00E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	3.30E-04	1.60E-09	5.92E+00	2.59E+06	1.10E-05
TE125M	5.61E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	3.30E-04	9.93E-11	3.67E-01	2.59E+06	4.27E-07
PU240	4.05E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.30E-04	9.05E-10	3.35E+00	2.59E+06	2.81E-06
SM151	3.38E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	1.32E-14	4.88E-05	2.59E+06	3.42E-11
PU239	2.04E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	3.30E-04	9.03E-10	3.34E+00	2.59E+06	1.41E-06
BA137M	9.27E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	8.29E-09	3.07E+01	2.59E+06	3.09E-06
CM242	3.23E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	3.30E-04	9.41E-10	3.48E+00	2.59E+06	2.33E-07
CM243	3.63E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	3.83E-09	1.42E+01	2.59E+06	1.07E-06
NP239	4.87E+01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	7.62E-12	2.82E-02	2.59E+06	2.84E-09
NP237	3.88E-01	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.30E-04	1.34E-08	4.96E+01	2.59E+06	3.98E-08
PU242	2.85E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.30E-04	8.79E-10	3.25E+00	2.59E+06	1.92E-08
AM242	8.72E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	3.30E-04	2.52E-12	9.32E-03	2.59E+06	1.68E-10
AM242M	8.76E+00	10%	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.30E-04	5.64E-10	2.09E+00	2.59E+06	3.79E-08
													Total	1.60E+00

MPC-32														
Accident Conditions														
Committed Effective Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occupancy Time (sec)	CEDE (mRem)
Gases														
H 3	3.68E+02	100%	32	6.20E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	4.87E-03
I129	3.31E-02	100%	32	6.20E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.30E-04	4.69E-08	1.74E+02	2.59E+06	1.19E-03
KR 85	5.86E+03	100%	32	6.20E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
Crud														
Co-60	2.18E+01	100%	32	6.20E+06	1.95E-05	3.15E-12	1.00	2.19E-09	8.00E-03	3.30E-04	5.91E-08	2.19E+02	2.59E+06	3.28E+00
Volatiles														
SR 90	6.32E+04	100%	32	6.20E+06	1.95E-05	3.15E-12	2.00E-04	1.27E-09	8.00E-03	3.30E-04	3.51E-07	1.30E+03	2.59E+06	1.13E+01
RU106	1.59E+04	100%	32	6.20E+06	1.95E-05	3.15E-12	2.00E-04	3.20E-10	8.00E-03	3.30E-04	1.29E-07	4.77E+02	2.59E+06	1.05E+00
CS134	4.04E+04	100%	32	6.20E+06	1.95E-05	3.15E-12	2.00E-04	8.14E-10	8.00E-03	3.30E-04	1.25E-08	4.63E+01	2.59E+06	2.58E-01
CS137	9.82E+04	100%	32	6.20E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	3.30E-04	8.63E-09	3.19E+01	2.59E+06	4.32E-01
Fines														
PU241	8.53E+04	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	3.30E-04	2.23E-06	8.25E+03	2.59E+06	1.46E+00
Y 90	6.32E+04	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	3.30E-04	2.13E-09	7.88E+00	2.59E+06	1.03E-03
PM147	2.63E+04	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	7.95E-12	8.00E-03	3.30E-04	1.06E-08	3.92E+01	2.59E+06	2.13E-03
CE144	8.14E+03	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	5.84E-08	2.16E+02	2.59E+06	3.64E-03
PR144	8.14E+03	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	3.30E-04	1.17E-11	4.33E-02	2.59E+06	7.29E-07
EU154	5.90E+03	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.78E-12	8.00E-03	3.30E-04	7.73E-08	2.86E+02	2.59E+06	3.49E-03
CM244	1.01E+04	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	3.05E-12	8.00E-03	3.30E-04	6.70E-05	2.48E+05	2.59E+06	5.18E+00
PU238	5.81E+03	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	3.30E-04	1.06E-04	3.92E+05	2.59E+06	4.71E+00
SB125	2.30E+03	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	6.95E-13	8.00E-03	3.30E-04	3.30E-09	1.22E+01	2.59E+06	5.80E-05
EU155	1.65E+03	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.30E-04	1.12E-08	4.14E+01	2.59E+06	1.41E-04
AM241	9.00E+02	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	3.30E-04	1.20E-04	4.44E+05	2.59E+06	8.26E-01
TE125M	5.61E+02	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.69E-13	8.00E-03	3.30E-04	1.52E-09	5.62E+00	2.59E+06	6.52E-06
PU240	4.05E+02	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.22E-13	8.00E-03	3.30E-04	1.16E-04	4.29E+05	2.59E+06	3.59E-01
SM151	3.38E+02	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.30E-04	8.10E-09	3.00E+01	2.59E+06	2.09E-05
PU239	2.04E+02	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	6.16E-14	8.00E-03	3.30E-04	1.16E-04	4.29E+05	2.59E+06	1.81E-01
BA137M	9.27E+04	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.80E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	1.59E+04	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	4.80E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	1.14E+02	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	3.44E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	4.87E+01	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	1.19E-04	4.40E+05	2.59E+06	4.43E-02
CM242	3.23E+01	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	9.76E-15	8.00E-03	3.30E-04	4.67E-06	1.73E+04	2.59E+06	1.15E-03
CM243	3.63E+01	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	3.30E-04	8.30E-05	3.07E+05	2.59E+06	2.30E-02
NP239	4.87E+01	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	3.30E-04	6.78E-10	2.51E+00	2.59E+06	2.53E-07
NP237	3.88E-01	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.30E-04	1.46E-04	5.40E+05	2.59E+06	4.33E-04
PU242	2.85E+00	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	8.61E-16	8.00E-03	3.30E-04	1.11E-04	4.11E+05	2.59E+06	2.42E-03
AM242	8.72E+00	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.63E-15	8.00E-03	3.30E-04	1.58E-08	5.85E+01	2.59E+06	1.05E-06
AM242M	8.76E+00	10%	32	6.20E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.30E-04	1.15E-04	4.26E+05	2.59E+06	7.71E-03
													Total	2.91E+01

MPC-32														
Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	4.83E-16	1.79E-06	3.15E+07	1.30E-10
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.17E-16	4.33E-07	3.15E+07	5.56E-06
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.23E-13	4.55E-04	3.15E+07	4.34E-04
Volatiles														
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	7.78E-18	2.88E-08	3.15E+07	2.66E-09
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	7.40E-14	2.74E-04	3.15E+07	1.62E-05
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	7.96E-18	2.95E-08	3.15E+07	4.22E-09
Fines														
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	7.19E-20	2.66E-10	3.15E+07	4.97E-13
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	1.89E-16	6.99E-07	3.15E+07	9.68E-10
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	7.48E-19	2.77E-09	3.15E+07	1.59E-12
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	8.53E-16	3.16E-06	3.15E+07	5.63E-10
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	1.90E-15	7.03E-06	3.15E+07	1.25E-09
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	6.00E-14	2.22E-04	3.15E+07	2.87E-08
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	6.90E-18	2.55E-08	3.15E+07	5.65E-12
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	6.56E-18	2.43E-08	3.15E+07	3.09E-12
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	1.98E-14	7.33E-05	3.15E+07	3.69E-09
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	2.49E-15	9.21E-06	3.15E+07	3.33E-10
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	8.58E-16	3.17E-06	3.15E+07	6.26E-11
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	5.96E-16	2.21E-06	3.15E+07	2.71E-11
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	6.36E-18	2.35E-08	3.15E+07	2.09E-13
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	5.20E-20	1.92E-10	3.15E+07	1.42E-15
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	4.84E-18	1.79E-08	3.15E+07	8.00E-14
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	2.82E-14	1.04E-04	3.15E+07	2.12E-07
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.01E-14	3.74E-05	3.15E+07	1.30E-08
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	3.25E-16	1.20E-06	3.15E+07	3.00E-12
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	2.19E-15	8.10E-06	3.15E+07	8.64E-12
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	7.83E-18	2.90E-08	3.15E+07	2.05E-14
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	5.77E-15	2.13E-05	3.15E+07	1.70E-11
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	7.53E-15	2.79E-05	3.15E+07	2.97E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	1.04E-15	3.85E-06	3.15E+07	3.27E-14
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	5.34E-18	1.98E-08	3.15E+07	1.23E-15
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	6.09E-16	2.25E-06	3.15E+07	4.30E-13
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.80E-17	1.41E-07	3.15E+07	2.70E-14
													Total	4.56E-04

MPC-32														
Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	6.66E-16	2.46E-06	3.15E+07	1.79E-10
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.34E-16	4.96E-07	3.15E+07	6.36E-06
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.39E-13	5.14E-04	3.15E+07	4.90E-04
Volatiles														
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	9.49E-18	3.51E-08	3.15E+07	3.24E-09
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	8.43E-14	3.12E-04	3.15E+07	1.84E-05
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	9.67E-18	3.58E-08	3.15E+07	5.13E-09
Fines														
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	8.67E-20	3.21E-10	3.15E+07	5.99E-13
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	2.20E-16	8.14E-07	3.15E+07	1.13E-09
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	9.56E-19	3.54E-09	3.15E+07	2.04E-12
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	1.01E-15	3.74E-06	3.15E+07	6.66E-10
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	2.15E-15	7.96E-06	3.15E+07	1.42E-09
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	6.81E-14	2.52E-04	3.15E+07	3.26E-08
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	1.33E-17	4.92E-08	3.15E+07	1.09E-11
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	1.27E-17	4.70E-08	3.15E+07	5.98E-12
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	2.27E-14	8.40E-05	3.15E+07	4.23E-09
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	2.95E-15	1.09E-05	3.15E+07	3.94E-10
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	1.07E-15	3.96E-06	3.15E+07	7.80E-11
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	8.48E-16	3.14E-06	3.15E+07	3.85E-11
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	1.23E-17	4.55E-08	3.15E+07	4.04E-13
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	8.80E-20	3.26E-10	3.15E+07	2.41E-15
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	7.55E-18	2.79E-08	3.15E+07	1.25E-13
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.22E-14	1.19E-04	3.15E+07	2.42E-07
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.16E-14	4.29E-05	3.15E+07	1.49E-08
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	4.20E-16	1.55E-06	3.15E+07	3.88E-12
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	2.61E-15	9.66E-06	3.15E+07	1.03E-11
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	1.48E-17	5.48E-08	3.15E+07	3.87E-14
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	6.68E-15	2.47E-05	3.15E+07	1.97E-11
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	8.73E-15	3.23E-05	3.15E+07	3.45E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	1.26E-15	4.66E-06	3.15E+07	3.96E-14
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	1.03E-17	3.81E-08	3.15E+07	2.38E-15
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	7.30E-16	2.70E-06	3.15E+07	5.16E-13
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	6.01E-17	2.22E-07	3.15E+07	4.27E-14
													Total	5.16E-04

MPC-32														
Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	2.75E-18	1.02E-08	3.15E+07	8.20E-09
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	2.14E-16	7.92E-07	3.15E+07	5.74E-11
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.14E-16	4.22E-07	3.15E+07	5.41E-06
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.24E-13	4.59E-04	3.15E+07	4.38E-04
Volatiles														
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	6.44E-18	2.38E-08	3.15E+07	2.20E-09
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	7.37E-14	2.73E-04	3.15E+07	1.61E-05
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	6.68E-18	2.47E-08	3.15E+07	3.54E-09
Fines														
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	6.48E-20	2.40E-10	3.15E+07	4.48E-13
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	1.77E-16	6.55E-07	3.15E+07	9.07E-10
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	5.45E-19	2.02E-09	3.15E+07	1.16E-12
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	7.69E-16	2.85E-06	3.15E+07	5.07E-10
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	1.90E-15	7.03E-06	3.15E+07	1.25E-09
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	5.99E-14	2.22E-04	3.15E+07	2.86E-08
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	7.08E-19	2.62E-09	3.15E+07	5.79E-13
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	1.06E-18	3.92E-09	3.15E+07	4.99E-13
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	1.95E-14	7.22E-05	3.15E+07	3.63E-09
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	2.22E-15	8.21E-06	3.15E+07	2.97E-10
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	6.74E-16	2.49E-06	3.15E+07	4.92E-11
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	2.23E-16	8.25E-07	3.15E+07	1.01E-11
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	1.09E-18	4.03E-09	3.15E+07	3.58E-14
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	7.08E-21	2.62E-11	3.15E+07	1.94E-16
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	2.65E-18	9.81E-09	3.15E+07	4.38E-14
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	2.80E-14	1.04E-04	3.15E+07	2.10E-07
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.01E-14	3.74E-05	3.15E+07	1.30E-08
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	2.00E-16	7.40E-07	3.15E+07	1.85E-12
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	1.92E-15	7.10E-06	3.15E+07	7.58E-12
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	1.13E-18	4.18E-09	3.15E+07	2.96E-15
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	5.50E-15	2.04E-05	3.15E+07	1.62E-11
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	7.18E-15	2.66E-05	3.15E+07	2.83E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	9.02E-16	3.34E-06	3.15E+07	2.84E-14
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	9.69E-19	3.59E-09	3.15E+07	2.24E-16
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	5.51E-16	2.04E-06	3.15E+07	3.89E-13
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	1.72E-17	6.36E-08	3.15E+07	1.22E-14
													Total	4.59E-04

MPC-32															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	1.64E-16	6.07E-07	3.15E+07	4.40E-11	
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.09E-16	4.03E-07	3.15E+07	5.18E-06	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.23E-13	4.55E-04	3.15E+07	4.34E-04	
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	5.44E-18	2.01E-08	3.15E+07	1.86E-09	
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	7.19E-14	2.66E-04	3.15E+07	1.57E-05	
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	5.70E-18	2.11E-08	3.15E+07	3.02E-09	
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	5.63E-20	2.08E-10	3.15E+07	3.89E-13	
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	1.62E-16	5.99E-07	3.15E+07	8.30E-10	
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	4.46E-19	1.65E-09	3.15E+07	9.51E-13	
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	6.68E-16	2.47E-06	3.15E+07	4.41E-10	
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	1.87E-15	6.92E-06	3.15E+07	1.23E-09	
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	5.87E-14	2.17E-04	3.15E+07	2.81E-08	
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	1.46E-18	5.40E-09	3.15E+07	1.19E-12	
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	1.68E-18	6.22E-09	3.15E+07	7.91E-13	
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	1.87E-14	6.92E-05	3.15E+07	3.48E-09	
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	1.85E-15	6.85E-06	3.15E+07	2.47E-10	
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	5.21E-16	1.93E-06	3.15E+07	3.80E-11	
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	1.86E-16	6.88E-07	3.15E+07	8.45E-12	
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	1.65E-18	6.11E-09	3.15E+07	5.42E-14	
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	1.13E-20	4.18E-11	3.15E+07	3.10E-16	
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	2.67E-18	9.88E-09	3.15E+07	4.41E-14	
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	2.73E-14	1.01E-04	3.15E+07	2.05E-07	
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	9.75E-15	3.61E-05	3.15E+07	1.26E-08	
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	1.56E-16	5.77E-07	3.15E+07	1.44E-12	
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	1.55E-15	5.74E-06	3.15E+07	6.12E-12	
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	1.89E-18	6.99E-09	3.15E+07	4.95E-15	
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	5.00E-15	1.85E-05	3.15E+07	1.47E-11	
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	6.50E-15	2.41E-05	3.15E+07	2.57E-11	
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	7.69E-16	2.85E-06	3.15E+07	2.42E-14	
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	1.43E-18	5.29E-09	3.15E+07	3.30E-16	
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	4.77E-16	1.76E-06	3.15E+07	3.37E-13	
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	1.72E-17	6.36E-08	3.15E+07	1.22E-14	
													Total	4.55E-04	

MPC-32														
Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	2.95E-10
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	2.20E-16	8.14E-07	3.15E+07	1.04E-05
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.78E-13	6.59E-04	3.15E+07	6.28E-04
Volatiles														
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	2.28E-17	8.44E-08	3.15E+07	7.78E-09
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	1.20E-13	4.44E-04	3.15E+07	2.62E-05
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	2.29E-17	8.47E-08	3.15E+07	1.21E-08
Fines														
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	2.19E-19	8.10E-10	3.15E+07	1.51E-12
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	4.44E-16	1.64E-06	3.15E+07	2.27E-09
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	2.18E-18	8.07E-09	3.15E+07	4.65E-12
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	2.49E-15	9.21E-06	3.15E+07	1.64E-09
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	2.99E-15	1.11E-05	3.15E+07	1.97E-09
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	9.43E-14	3.49E-04	3.15E+07	4.51E-08
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	8.82E-18	3.26E-08	3.15E+07	7.22E-12
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	9.30E-18	3.44E-08	3.15E+07	4.38E-12
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	3.53E-14	1.31E-04	3.15E+07	6.58E-09
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	8.09E-15	2.99E-05	3.15E+07	1.08E-09
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	2.87E-15	1.06E-05	3.15E+07	2.09E-10
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	1.22E-15	4.51E-06	3.15E+07	5.55E-11
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	9.26E-18	3.43E-08	3.15E+07	3.04E-13
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	7.09E-20	2.62E-10	3.15E+07	1.94E-15
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	9.47E-18	3.50E-08	3.15E+07	1.57E-13
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	4.63E-14	1.71E-04	3.15E+07	3.48E-07
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.72E-14	6.36E-05	3.15E+07	2.22E-08
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	8.16E-16	3.02E-06	3.15E+07	7.54E-12
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	7.47E-15	2.76E-05	3.15E+07	2.95E-11
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	1.06E-17	3.92E-08	3.15E+07	2.77E-14
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	1.50E-14	5.55E-05	3.15E+07	4.41E-11
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	2.00E-14	7.40E-05	3.15E+07	7.89E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	3.20E-15	1.18E-05	3.15E+07	1.01E-13
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	7.90E-18	2.92E-08	3.15E+07	1.82E-15
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	1.88E-15	6.96E-06	3.15E+07	1.33E-12
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	7.94E-17	2.94E-07	3.15E+07	5.64E-14
													Total	6.65E-04

MPC-32														
Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.86E-16	1.43E-06	3.15E+07	1.04E-10
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.18E-16	4.37E-07	3.15E+07	5.60E-06
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.27E-13	4.70E-04	3.15E+07	4.48E-04
Volatiles														
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	7.33E-18	2.71E-08	3.15E+07	2.50E-09
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	7.57E-14	2.80E-04	3.15E+07	1.65E-05
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	7.55E-18	2.79E-08	3.15E+07	4.01E-09
Fines														
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	6.98E-20	2.58E-10	3.15E+07	4.82E-13
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	1.87E-16	6.92E-07	3.15E+07	9.58E-10
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	6.75E-19	2.50E-09	3.15E+07	1.44E-12
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	8.33E-16	3.08E-06	3.15E+07	5.49E-10
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	1.95E-15	7.22E-06	3.15E+07	1.29E-09
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	6.15E-14	2.28E-04	3.15E+07	2.94E-08
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	4.19E-18	1.55E-08	3.15E+07	3.43E-12
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	4.01E-18	1.48E-08	3.15E+07	1.89E-12
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	2.01E-14	7.44E-05	3.15E+07	3.74E-09
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	2.41E-15	8.92E-06	3.15E+07	3.22E-10
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	7.83E-16	2.90E-06	3.15E+07	5.71E-11
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	4.64E-16	1.72E-06	3.15E+07	2.11E-11
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.92E-18	1.45E-08	3.15E+07	1.29E-13
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.58E-20	1.32E-10	3.15E+07	9.81E-16
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	3.88E-18	1.44E-08	3.15E+07	6.41E-14
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	2.88E-14	1.07E-04	3.15E+07	2.16E-07
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.03E-14	3.81E-05	3.15E+07	1.33E-08
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	2.81E-16	1.04E-06	3.15E+07	2.60E-12
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	2.09E-15	7.73E-06	3.15E+07	8.25E-12
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	4.91E-18	1.82E-08	3.15E+07	1.29E-14
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	5.76E-15	2.13E-05	3.15E+07	1.69E-11
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	7.52E-15	2.78E-05	3.15E+07	2.97E-11
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	9.94E-16	3.68E-06	3.15E+07	3.13E-14
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.32E-18	1.23E-08	3.15E+07	7.67E-16
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	5.94E-16	2.20E-06	3.15E+07	4.20E-13
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	2.95E-17	1.09E-07	3.15E+07	2.09E-14
													Total	4.71E-04

MPC-32															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	3.31E-19	1.22E-09	3.15E+07	9.87E-10	
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	3.80E-16	1.41E-06	3.15E+07	1.02E-10	
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.19E-16	4.40E-07	3.15E+07	5.65E-06	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.26E-13	4.66E-04	3.15E+07	4.45E-04	
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	7.53E-18	2.79E-08	3.15E+07	2.57E-09	
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	7.57E-14	2.80E-04	3.15E+07	1.65E-05	
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	7.74E-18	2.86E-08	3.15E+07	4.11E-09	
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	7.25E-20	2.68E-10	3.15E+07	5.01E-13	
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	1.90E-16	7.03E-07	3.15E+07	9.73E-10	
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	6.93E-19	2.56E-09	3.15E+07	1.48E-12	
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	8.53E-16	3.16E-06	3.15E+07	5.63E-10	
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	1.95E-15	7.22E-06	3.15E+07	1.29E-09	
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	6.14E-14	2.27E-04	3.15E+07	2.94E-08	
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	4.91E-18	1.82E-08	3.15E+07	4.02E-12	
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	4.88E-18	1.81E-08	3.15E+07	2.30E-12	
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	2.02E-14	7.47E-05	3.15E+07	3.76E-09	
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	2.49E-15	9.21E-06	3.15E+07	3.33E-10	
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	8.18E-16	3.03E-06	3.15E+07	5.97E-11	
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	4.53E-16	1.68E-06	3.15E+07	2.06E-11	
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	4.75E-18	1.76E-08	3.15E+07	1.56E-13	
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	3.61E-20	1.34E-10	3.15E+07	9.89E-16	
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	4.24E-18	1.57E-08	3.15E+07	7.01E-14	
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	2.88E-14	1.07E-04	3.15E+07	2.16E-07	
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.04E-14	3.85E-05	3.15E+07	1.34E-08	
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	2.79E-16	1.03E-06	3.15E+07	2.58E-12	
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	2.18E-15	8.07E-06	3.15E+07	8.60E-12	
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	5.69E-18	2.11E-08	3.15E+07	1.49E-14	
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	5.88E-15	2.18E-05	3.15E+07	1.73E-11	
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	7.69E-15	2.85E-05	3.15E+07	3.03E-11	
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	1.03E-15	3.81E-06	3.15E+07	3.24E-14	
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	4.01E-18	1.48E-08	3.15E+07	9.26E-16	
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	6.15E-16	2.28E-06	3.15E+07	4.35E-13	
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	3.17E-17	1.17E-07	3.15E+07	2.25E-14	
													Total	4.67E-04	

MPC-32															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	SDE (mRem)	
Gases															
H 3	3.68E+02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.60E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	3.31E-02	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.44E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	2.95E-10	
KR 85	5.86E+03	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	2.55E-09	1.60E-04	1.32E-14	4.88E-05	3.15E+07	6.27E-04	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.45E-13	5.37E-04	3.15E+07	5.12E-04	
Volatiles															
SR 90	6.32E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.83E-11	1.60E-04	9.20E-15	3.40E-05	3.15E+07	3.14E-06	
RU106	1.59E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	4.61E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.17E-11	1.60E-04	9.45E-14	3.50E-04	3.15E+07	2.06E-05	
CS137	9.82E+04	2.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.84E-11	1.60E-04	8.63E-15	3.19E-05	3.15E+07	4.58E-06	
Fines															
PU241	8.53E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.71E-13	1.60E-04	1.17E-19	4.33E-10	3.15E+07	8.09E-13	
Y 90	6.32E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.75E-13	1.60E-04	6.24E-14	2.31E-04	3.15E+07	3.20E-07	
PM147	2.63E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.14E-13	1.60E-04	8.11E-16	3.00E-06	3.15E+07	1.73E-09	
CE144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	2.93E-15	1.08E-05	3.15E+07	1.93E-09	
PR144	8.14E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.54E-14	1.60E-04	8.43E-14	3.12E-04	3.15E+07	5.56E-08	
EU154	5.90E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.56E-14	1.60E-04	8.29E-14	3.07E-04	3.15E+07	3.96E-08	
CM244	1.01E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.39E-14	1.60E-04	3.91E-17	1.45E-07	3.15E+07	3.20E-11	
PU238	5.81E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.52E-14	1.60E-04	4.09E-17	1.51E-07	3.15E+07	1.93E-11	
SB125	2.30E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.99E-15	1.60E-04	2.65E-14	9.81E-05	3.15E+07	4.94E-09	
EU155	1.65E+03	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.17E-15	1.60E-04	3.39E-15	1.25E-05	3.15E+07	4.53E-10	
AM241	9.00E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.91E-15	1.60E-04	1.28E-15	4.74E-06	3.15E+07	9.34E-11	
TE125M	5.61E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.44E-15	1.60E-04	1.94E-15	7.18E-06	3.15E+07	8.82E-11	
PU240	4.05E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.76E-15	1.60E-04	3.92E-17	1.45E-07	3.15E+07	1.29E-12	
SM151	3.38E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.47E-15	1.60E-04	1.90E-19	7.03E-10	3.15E+07	5.20E-15	
PU239	2.04E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.87E-16	1.60E-04	1.86E-17	6.88E-08	3.15E+07	3.07E-13	
BA137M	9.27E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.03E-13	1.60E-04	3.73E-14	1.38E-04	3.15E+07	2.80E-07	
RH106	1.59E+04	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.91E-14	1.60E-04	1.09E-13	4.03E-04	3.15E+07	1.40E-07	
PR144M	1.14E+02	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.95E-16	1.60E-04	5.08E-16	1.88E-06	3.15E+07	4.69E-12	
AM243	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	2.75E-15	1.02E-05	3.15E+07	1.09E-11	
CM242	3.23E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.40E-16	1.60E-04	4.29E-17	1.59E-07	3.15E+07	1.12E-13	
CM243	3.63E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.58E-16	1.60E-04	9.79E-15	3.62E-05	3.15E+07	2.88E-11	
NP239	4.87E+01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.12E-16	1.60E-04	1.60E-14	5.92E-05	3.15E+07	6.31E-11	
NP237	3.88E-01	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.69E-18	1.60E-04	1.54E-15	5.70E-06	3.15E+07	4.84E-14	
PU242	2.85E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.24E-17	1.60E-04	3.27E-17	1.21E-07	3.15E+07	7.55E-15	
AM242	8.72E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.79E-17	1.60E-04	8.20E-15	3.03E-05	3.15E+07	5.79E-12	
AM242M	8.76E+00	2.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.81E-17	1.60E-04	1.36E-16	5.03E-07	3.15E+07	9.65E-14	
													Total	1.17E-03	

MPC-32															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	4.83E-16	1.79E-06	3.15E+07	5.96E-10	
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.17E-16	4.33E-07	3.15E+07	2.56E-05	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.23E-13	4.55E-04	3.15E+07	4.34E-04	
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	7.78E-18	2.88E-08	3.15E+07	1.22E-08	
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	7.40E-14	2.74E-04	3.15E+07	7.43E-05	
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	7.96E-18	2.95E-08	3.15E+07	1.94E-08	
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	7.19E-20	2.66E-10	3.15E+07	2.29E-12	
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	1.89E-16	6.99E-07	3.15E+07	4.45E-09	
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	7.48E-19	2.77E-09	3.15E+07	7.33E-12	
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	8.53E-16	3.16E-06	3.15E+07	2.59E-09	
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	1.90E-15	7.03E-06	3.15E+07	5.77E-09	
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	6.00E-14	2.22E-04	3.15E+07	1.32E-07	
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	6.90E-18	2.55E-08	3.15E+07	2.60E-11	
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	6.56E-18	2.43E-08	3.15E+07	1.42E-11	
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	1.98E-14	7.33E-05	3.15E+07	1.70E-08	
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	2.49E-15	9.21E-06	3.15E+07	1.53E-09	
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	8.58E-16	3.17E-06	3.15E+07	2.88E-10	
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	5.96E-16	2.21E-06	3.15E+07	1.25E-10	
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	6.36E-18	2.35E-08	3.15E+07	9.60E-13	
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	5.20E-20	1.92E-10	3.15E+07	6.55E-15	
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	4.84E-18	1.79E-08	3.15E+07	3.68E-13	
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	2.82E-14	1.04E-04	3.15E+07	9.74E-07	
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.01E-14	3.74E-05	3.15E+07	5.99E-08	
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	3.25E-16	1.20E-06	3.15E+07	1.38E-11	
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	2.19E-15	8.10E-06	3.15E+07	3.98E-11	
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	7.83E-18	2.90E-08	3.15E+07	9.43E-14	
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	5.77E-15	2.13E-05	3.15E+07	7.81E-11	
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	7.53E-15	2.79E-05	3.15E+07	1.37E-10	
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	1.04E-15	3.85E-06	3.15E+07	1.50E-13	
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	5.34E-18	1.98E-08	3.15E+07	5.67E-15	
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	6.09E-16	2.25E-06	3.15E+07	1.98E-12	
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.80E-17	1.41E-07	3.15E+07	1.24E-13	
													Total	5.35E-04	

MPC-32														
Off-Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	6.66E-16	2.46E-06	3.15E+07	8.22E-10
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.34E-16	4.96E-07	3.15E+07	2.93E-05
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.39E-13	5.14E-04	3.15E+07	4.90E-04
Volatiles														
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	9.49E-18	3.51E-08	3.15E+07	1.49E-08
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	8.43E-14	3.12E-04	3.15E+07	8.46E-05
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	9.67E-18	3.58E-08	3.15E+07	2.36E-08
Fines														
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	8.67E-20	3.21E-10	3.15E+07	2.76E-12
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	2.20E-16	8.14E-07	3.15E+07	5.18E-09
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	9.56E-19	3.54E-09	3.15E+07	9.37E-12
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	1.01E-15	3.74E-06	3.15E+07	3.06E-09
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	2.15E-15	7.96E-06	3.15E+07	6.52E-09
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	6.81E-14	2.52E-04	3.15E+07	1.50E-07
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	1.33E-17	4.92E-08	3.15E+07	5.01E-11
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	1.27E-17	4.70E-08	3.15E+07	2.75E-11
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	2.27E-14	8.40E-05	3.15E+07	1.95E-08
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	2.95E-15	1.09E-05	3.15E+07	1.81E-09
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	1.07E-15	3.96E-06	3.15E+07	3.59E-10
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	8.48E-16	3.14E-06	3.15E+07	1.77E-10
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	1.23E-17	4.55E-08	3.15E+07	1.86E-12
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	8.80E-20	3.26E-10	3.15E+07	1.11E-14
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	7.55E-18	2.79E-08	3.15E+07	5.74E-13
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.22E-14	1.19E-04	3.15E+07	1.11E-06
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.16E-14	4.29E-05	3.15E+07	6.88E-08
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	4.20E-16	1.55E-06	3.15E+07	1.78E-11
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	2.61E-15	9.66E-06	3.15E+07	4.74E-11
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	1.48E-17	5.48E-08	3.15E+07	1.78E-13
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	6.68E-15	2.47E-05	3.15E+07	9.04E-11
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	8.73E-15	3.23E-05	3.15E+07	1.58E-10
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	1.26E-15	4.66E-06	3.15E+07	1.82E-13
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	1.03E-17	3.81E-08	3.15E+07	1.09E-14
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	7.30E-16	2.70E-06	3.15E+07	2.37E-12
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	6.01E-17	2.22E-07	3.15E+07	1.96E-13
													Total	6.06E-04

MPC-32															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	2.75E-18	1.02E-08	3.15E+07	3.77E-08	
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	2.14E-16	7.92E-07	3.15E+07	2.64E-10	
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.14E-16	4.22E-07	3.15E+07	2.49E-05	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.24E-13	4.59E-04	3.15E+07	4.38E-04	
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	6.44E-18	2.38E-08	3.15E+07	1.01E-08	
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	7.37E-14	2.73E-04	3.15E+07	7.40E-05	
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	6.68E-18	2.47E-08	3.15E+07	1.63E-08	
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	6.48E-20	2.40E-10	3.15E+07	2.06E-12	
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	1.77E-16	6.55E-07	3.15E+07	4.17E-09	
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	5.45E-19	2.02E-09	3.15E+07	5.34E-12	
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	7.69E-16	2.85E-06	3.15E+07	2.33E-09	
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	1.90E-15	7.03E-06	3.15E+07	5.77E-09	
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	5.99E-14	2.22E-04	3.15E+07	1.32E-07	
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	7.08E-19	2.62E-09	3.15E+07	2.67E-12	
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	1.06E-18	3.92E-09	3.15E+07	2.30E-12	
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	1.95E-14	7.22E-05	3.15E+07	1.67E-08	
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	2.22E-15	8.21E-06	3.15E+07	1.37E-09	
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	6.74E-16	2.49E-06	3.15E+07	2.26E-10	
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	2.23E-16	8.25E-07	3.15E+07	4.66E-11	
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	1.09E-18	4.03E-09	3.15E+07	1.65E-13	
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	7.08E-21	2.62E-11	3.15E+07	8.92E-16	
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	2.65E-18	9.81E-09	3.15E+07	2.02E-13	
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	2.80E-14	1.04E-04	3.15E+07	9.68E-07	
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.01E-14	3.74E-05	3.15E+07	5.99E-08	
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	2.00E-16	7.40E-07	3.15E+07	8.50E-12	
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	1.92E-15	7.10E-06	3.15E+07	3.49E-11	
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	1.13E-18	4.18E-09	3.15E+07	1.36E-14	
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	5.50E-15	2.04E-05	3.15E+07	7.44E-11	
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	7.18E-15	2.66E-05	3.15E+07	1.30E-10	
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	9.02E-16	3.34E-06	3.15E+07	1.30E-13	
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	9.69E-19	3.59E-09	3.15E+07	1.03E-15	
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	5.51E-16	2.04E-06	3.15E+07	1.79E-12	
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	1.72E-17	6.36E-08	3.15E+07	5.62E-14	
													Total	5.38E-04	

MPC-32															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	1.64E-16	6.07E-07	3.15E+07	2.02E-10	
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.09E-16	4.03E-07	3.15E+07	2.38E-05	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.23E-13	4.55E-04	3.15E+07	4.34E-04	
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	5.44E-18	2.01E-08	3.15E+07	8.54E-09	
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	7.19E-14	2.66E-04	3.15E+07	7.22E-05	
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	5.70E-18	2.11E-08	3.15E+07	1.39E-08	
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	5.63E-20	2.08E-10	3.15E+07	1.79E-12	
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	1.62E-16	5.99E-07	3.15E+07	3.82E-09	
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	4.46E-19	1.65E-09	3.15E+07	4.37E-12	
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	6.68E-16	2.47E-06	3.15E+07	2.03E-09	
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	1.87E-15	6.92E-06	3.15E+07	5.67E-09	
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	5.87E-14	2.17E-04	3.15E+07	1.29E-07	
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	1.46E-18	5.40E-09	3.15E+07	5.50E-12	
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	1.68E-18	6.22E-09	3.15E+07	3.64E-12	
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	1.87E-14	6.92E-05	3.15E+07	1.60E-08	
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	1.85E-15	6.85E-06	3.15E+07	1.14E-09	
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	5.21E-16	1.93E-06	3.15E+07	1.75E-10	
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	1.86E-16	6.88E-07	3.15E+07	3.89E-11	
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	1.65E-18	6.11E-09	3.15E+07	2.49E-13	
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	1.13E-20	4.18E-11	3.15E+07	1.42E-15	
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	2.67E-18	9.88E-09	3.15E+07	2.03E-13	
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	2.73E-14	1.01E-04	3.15E+07	9.43E-07	
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	9.75E-15	3.61E-05	3.15E+07	5.78E-08	
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	1.56E-16	5.77E-07	3.15E+07	6.63E-12	
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	1.55E-15	5.74E-06	3.15E+07	2.81E-11	
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	1.89E-18	6.99E-09	3.15E+07	2.28E-14	
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	5.00E-15	1.85E-05	3.15E+07	6.77E-11	
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	6.50E-15	2.41E-05	3.15E+07	1.18E-10	
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	7.69E-16	2.85E-06	3.15E+07	1.11E-13	
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	1.43E-18	5.29E-09	3.15E+07	1.52E-15	
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	4.77E-16	1.76E-06	3.15E+07	1.55E-12	
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	1.72E-17	6.36E-08	3.15E+07	5.62E-14	
													Total	5.31E-04	

MPC-32															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	1.36E-09	
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	2.20E-16	8.14E-07	3.15E+07	4.81E-05	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.78E-13	6.59E-04	3.15E+07	6.28E-04	
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	2.28E-17	8.44E-08	3.15E+07	3.58E-08	
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	1.20E-13	4.44E-04	3.15E+07	1.20E-04	
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	2.29E-17	8.47E-08	3.15E+07	5.59E-08	
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	2.19E-19	8.10E-10	3.15E+07	6.96E-12	
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	4.44E-16	1.64E-06	3.15E+07	1.05E-08	
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	2.18E-18	8.07E-09	3.15E+07	2.14E-11	
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	2.49E-15	9.21E-06	3.15E+07	7.56E-09	
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	2.99E-15	1.11E-05	3.15E+07	9.07E-09	
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	9.43E-14	3.49E-04	3.15E+07	2.07E-07	
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	8.82E-18	3.26E-08	3.15E+07	3.32E-11	
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	9.30E-18	3.44E-08	3.15E+07	2.01E-11	
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	3.53E-14	1.31E-04	3.15E+07	3.03E-08	
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	8.09E-15	2.99E-05	3.15E+07	4.98E-09	
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	2.87E-15	1.06E-05	3.15E+07	9.63E-10	
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	1.22E-15	4.51E-06	3.15E+07	2.55E-10	
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	9.26E-18	3.43E-08	3.15E+07	1.40E-12	
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	7.09E-20	2.62E-10	3.15E+07	8.93E-15	
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	9.47E-18	3.50E-08	3.15E+07	7.20E-13	
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	4.63E-14	1.71E-04	3.15E+07	1.60E-06	
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.72E-14	6.36E-05	3.15E+07	1.02E-07	
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	8.16E-16	3.02E-06	3.15E+07	3.47E-11	
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	7.47E-15	2.76E-05	3.15E+07	1.36E-10	
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	1.06E-17	3.92E-08	3.15E+07	1.28E-13	
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	1.50E-14	5.55E-05	3.15E+07	2.03E-10	
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	2.00E-14	7.40E-05	3.15E+07	3.63E-10	
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	3.20E-15	1.18E-05	3.15E+07	4.63E-13	
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	7.90E-18	2.92E-08	3.15E+07	8.39E-15	
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	1.88E-15	6.96E-06	3.15E+07	6.11E-12	
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	7.94E-17	2.94E-07	3.15E+07	2.59E-13	
													Total	7.99E-04	

MPC-32															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases															
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.86E-16	1.43E-06	3.15E+07	4.76E-10	
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.18E-16	4.37E-07	3.15E+07	2.58E-05	
Crud															
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.27E-13	4.70E-04	3.15E+07	4.48E-04	
Volatiles															
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	7.33E-18	2.71E-08	3.15E+07	1.15E-08	
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	7.57E-14	2.80E-04	3.15E+07	7.60E-05	
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	7.55E-18	2.79E-08	3.15E+07	1.84E-08	
Fines															
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	6.98E-20	2.58E-10	3.15E+07	2.22E-12	
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	1.87E-16	6.92E-07	3.15E+07	4.41E-09	
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	6.75E-19	2.50E-09	3.15E+07	6.62E-12	
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	8.33E-16	3.08E-06	3.15E+07	2.53E-09	
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	1.95E-15	7.22E-06	3.15E+07	5.92E-09	
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	6.15E-14	2.28E-04	3.15E+07	1.35E-07	
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	4.19E-18	1.55E-08	3.15E+07	1.58E-11	
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	4.01E-18	1.48E-08	3.15E+07	8.68E-12	
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	2.01E-14	7.44E-05	3.15E+07	1.72E-08	
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	2.41E-15	8.92E-06	3.15E+07	1.48E-09	
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	7.83E-16	2.90E-06	3.15E+07	2.63E-10	
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	4.64E-16	1.72E-06	3.15E+07	9.70E-11	
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.92E-18	1.45E-08	3.15E+07	5.92E-13	
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.58E-20	1.32E-10	3.15E+07	4.51E-15	
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	3.88E-18	1.44E-08	3.15E+07	2.95E-13	
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	2.88E-14	1.07E-04	3.15E+07	9.95E-07	
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.03E-14	3.81E-05	3.15E+07	6.10E-08	
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	2.81E-16	1.04E-06	3.15E+07	1.19E-11	
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	2.09E-15	7.73E-06	3.15E+07	3.79E-11	
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	4.91E-18	1.82E-08	3.15E+07	5.91E-14	
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	5.76E-15	2.13E-05	3.15E+07	7.79E-11	
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	7.52E-15	2.78E-05	3.15E+07	1.37E-10	
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	9.94E-16	3.68E-06	3.15E+07	1.44E-13	
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.32E-18	1.23E-08	3.15E+07	3.53E-15	
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	5.94E-16	2.20E-06	3.15E+07	1.93E-12	
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	2.95E-17	1.09E-07	3.15E+07	9.63E-14	
													Total	5.51E-04	

MPC-32														
Off-Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)
Gases														
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	3.31E-19	1.22E-09	3.15E+07	4.54E-09
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	3.80E-16	1.41E-06	3.15E+07	4.69E-10
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.19E-16	4.40E-07	3.15E+07	2.60E-05
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.26E-13	4.66E-04	3.15E+07	4.45E-04
Volatiles														
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	7.53E-18	2.79E-08	3.15E+07	1.18E-08
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	7.57E-14	2.80E-04	3.15E+07	7.60E-05
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	7.74E-18	2.86E-08	3.15E+07	1.89E-08
Fines														
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	7.25E-20	2.68E-10	3.15E+07	2.31E-12
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	1.90E-16	7.03E-07	3.15E+07	4.48E-09
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	6.93E-19	2.56E-09	3.15E+07	6.79E-12
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	8.53E-16	3.16E-06	3.15E+07	2.59E-09
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	1.95E-15	7.22E-06	3.15E+07	5.92E-09
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	6.14E-14	2.27E-04	3.15E+07	1.35E-07
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	4.91E-18	1.82E-08	3.15E+07	1.85E-11
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	4.88E-18	1.81E-08	3.15E+07	1.06E-11
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	2.02E-14	7.47E-05	3.15E+07	1.73E-08
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	2.49E-15	9.21E-06	3.15E+07	1.53E-09
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	8.18E-16	3.03E-06	3.15E+07	2.74E-10
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	4.53E-16	1.68E-06	3.15E+07	9.47E-11
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	4.75E-18	1.76E-08	3.15E+07	7.17E-13
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	3.61E-20	1.34E-10	3.15E+07	4.55E-15
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	4.24E-18	1.57E-08	3.15E+07	3.22E-13
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	2.88E-14	1.07E-04	3.15E+07	9.95E-07
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.04E-14	3.85E-05	3.15E+07	6.16E-08
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	2.79E-16	1.03E-06	3.15E+07	1.19E-11
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	2.18E-15	8.07E-06	3.15E+07	3.96E-11
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	5.69E-18	2.11E-08	3.15E+07	6.85E-14
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	5.88E-15	2.18E-05	3.15E+07	7.96E-11
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	7.69E-15	2.85E-05	3.15E+07	1.40E-10
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	1.03E-15	3.81E-06	3.15E+07	1.49E-13
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	4.01E-18	1.48E-08	3.15E+07	4.26E-15
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	6.15E-16	2.28E-06	3.15E+07	2.00E-12
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	3.17E-17	1.17E-07	3.15E+07	1.04E-13
													Total	5.48E-04

MPC-32														
Off-Normal Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	SDE (mRem)
Gases														
H 3	3.68E+02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	7.36E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
I129	3.31E-02	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	6.62E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	1.36E-09
KR 85	5.86E+03	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.30	1.17E-08	1.60E-04	1.32E-14	4.88E-05	3.15E+07	2.88E-03
Crud														
Co-60	2.18E+01	100.0%	100%	32	6.19E+06	1.12E-05	1.81E-12	0.15	1.89E-10	1.60E-04	1.45E-13	5.37E-04	3.15E+07	5.12E-04
Volatiles														
SR 90	6.32E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	8.42E-11	1.60E-04	9.20E-15	3.40E-05	3.15E+07	1.44E-05
RU106	1.59E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	2.12E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
CS134	4.04E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	5.38E-11	1.60E-04	9.45E-14	3.50E-04	3.15E+07	9.49E-05
CS137	9.82E+04	11.5%	100%	32	6.19E+06	1.12E-05	1.81E-12	2.00E-04	1.31E-10	1.60E-04	8.63E-15	3.19E-05	3.15E+07	2.11E-05
Fines														
PU241	8.53E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.71E-12	1.60E-04	1.17E-19	4.33E-10	3.15E+07	3.72E-12
Y 90	6.32E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.26E-12	1.60E-04	6.24E-14	2.31E-04	3.15E+07	1.47E-06
PM147	2.63E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.26E-13	1.60E-04	8.11E-16	3.00E-06	3.15E+07	7.95E-09
CE144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	2.93E-15	1.08E-05	3.15E+07	8.89E-09
PR144	8.14E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.63E-13	1.60E-04	8.43E-14	3.12E-04	3.15E+07	2.56E-07
EU154	5.90E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.18E-13	1.60E-04	8.29E-14	3.07E-04	3.15E+07	1.82E-07
CM244	1.01E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.02E-13	1.60E-04	3.91E-17	1.45E-07	3.15E+07	1.47E-10
PU238	5.81E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.16E-13	1.60E-04	4.09E-17	1.51E-07	3.15E+07	8.86E-11
SB125	2.30E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.60E-14	1.60E-04	2.65E-14	9.81E-05	3.15E+07	2.27E-08
EU155	1.65E+03	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.30E-14	1.60E-04	3.39E-15	1.25E-05	3.15E+07	2.09E-09
AM241	9.00E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.80E-14	1.60E-04	1.28E-15	4.74E-06	3.15E+07	4.29E-10
TE125M	5.61E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.12E-14	1.60E-04	1.94E-15	7.18E-06	3.15E+07	4.06E-10
PU240	4.05E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	8.10E-15	1.60E-04	3.92E-17	1.45E-07	3.15E+07	5.92E-12
SM151	3.38E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.76E-15	1.60E-04	1.90E-19	7.03E-10	3.15E+07	2.39E-14
PU239	2.04E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	4.08E-15	1.60E-04	1.86E-17	6.88E-08	3.15E+07	1.41E-12
BA137M	9.27E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.85E-12	1.60E-04	3.73E-14	1.38E-04	3.15E+07	1.29E-06
RH106	1.59E+04	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	3.18E-13	1.60E-04	1.09E-13	4.03E-04	3.15E+07	6.46E-07
PR144M	1.14E+02	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	2.28E-15	1.60E-04	5.08E-16	1.88E-06	3.15E+07	2.16E-11
AM243	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	2.75E-15	1.02E-05	3.15E+07	4.99E-11
CM242	3.23E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	6.46E-16	1.60E-04	4.29E-17	1.59E-07	3.15E+07	5.17E-13
CM243	3.63E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.26E-16	1.60E-04	9.79E-15	3.62E-05	3.15E+07	1.32E-10
NP239	4.87E+01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	9.74E-16	1.60E-04	1.60E-14	5.92E-05	3.15E+07	2.90E-10
NP237	3.88E-01	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	7.76E-18	1.60E-04	1.54E-15	5.70E-06	3.15E+07	2.23E-13
PU242	2.85E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	5.70E-17	1.60E-04	3.27E-17	1.21E-07	3.15E+07	3.47E-14
AM242	8.72E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.74E-16	1.60E-04	8.20E-15	3.03E-05	3.15E+07	2.67E-11
AM242M	8.76E+00	11.5%	10%	32	6.19E+06	1.12E-05	1.81E-12	3.00E-05	1.75E-16	1.60E-04	1.36E-16	5.03E-07	3.15E+07	4.44E-13
													Total	3.53E-03

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	0.30	1.12E-08	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	0.30	1.00E-12	8.00E-03	4.83E-16	1.79E-06	2.59E+06	3.72E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	0.30	1.78E-07	8.00E-03	1.17E-16	4.33E-07	2.59E+06	1.59E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	1.00	2.20E-09	8.00E-03	1.23E-13	4.55E-04	2.59E+06	2.07E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	1.28E-09	8.00E-03	7.78E-18	2.88E-08	2.59E+06	7.62E-07	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	8.16E-10	8.00E-03	7.40E-14	2.74E-04	2.59E+06	4.63E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.16E-12	2.00E-04	1.98E-09	8.00E-03	7.96E-18	2.95E-08	2.59E+06	1.21E-06	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.59E-11	8.00E-03	7.19E-20	2.66E-10	2.59E+06	1.43E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.92E-11	8.00E-03	1.89E-16	6.99E-07	2.59E+06	2.78E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	7.97E-12	8.00E-03	7.48E-19	2.77E-09	2.59E+06	4.57E-10	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.47E-12	8.00E-03	8.53E-16	3.16E-06	2.59E+06	1.61E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.47E-12	8.00E-03	1.90E-15	7.03E-06	2.59E+06	3.59E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.79E-12	8.00E-03	6.00E-14	2.22E-04	2.59E+06	8.23E-06	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	3.06E-12	8.00E-03	6.90E-18	2.55E-08	2.59E+06	1.62E-09	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.76E-12	8.00E-03	6.56E-18	2.43E-08	2.59E+06	8.86E-10	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	6.97E-13	8.00E-03	1.98E-14	7.33E-05	2.59E+06	1.06E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	5.00E-13	8.00E-03	2.49E-15	9.21E-06	2.59E+06	9.55E-08	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.73E-13	8.00E-03	8.58E-16	3.17E-06	2.59E+06	1.79E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.70E-13	8.00E-03	5.96E-16	2.21E-06	2.59E+06	7.77E-09	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.23E-13	8.00E-03	6.36E-18	2.35E-08	2.59E+06	5.99E-11	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.02E-13	8.00E-03	5.20E-20	1.92E-10	2.59E+06	4.08E-13	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	6.18E-14	8.00E-03	4.84E-18	1.79E-08	2.59E+06	2.29E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.81E-11	8.00E-03	2.82E-14	1.04E-04	2.59E+06	6.07E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	4.82E-12	8.00E-03	1.01E-14	3.74E-05	2.59E+06	3.73E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	3.46E-14	8.00E-03	3.25E-16	1.20E-06	2.59E+06	8.61E-10	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.48E-14	8.00E-03	2.19E-15	8.10E-06	2.59E+06	2.48E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	9.79E-15	8.00E-03	7.83E-18	2.90E-08	2.59E+06	5.88E-12	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.10E-14	8.00E-03	5.77E-15	2.13E-05	2.59E+06	4.87E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.48E-14	8.00E-03	7.53E-15	2.79E-05	2.59E+06	8.52E-09	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	1.18E-16	8.00E-03	1.04E-15	3.85E-06	2.59E+06	9.38E-12	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	8.64E-16	8.00E-03	5.34E-18	1.98E-08	2.59E+06	3.54E-13	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.64E-15	8.00E-03	6.09E-16	2.25E-06	2.59E+06	1.23E-10	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.16E-12	3.00E-05	2.66E-15	8.00E-03	3.80E-17	1.41E-07	2.59E+06	7.74E-12	
												Total	2.70E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	6.66E-16	2.46E-06	2.59E+06	5.11E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	1.34E-16	4.96E-07	2.59E+06	1.82E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.39E-13	5.14E-04	2.59E+06	2.34E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	9.49E-18	3.51E-08	2.59E+06	9.28E-07	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	8.43E-14	3.12E-04	2.59E+06	5.27E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	9.67E-18	3.58E-08	2.59E+06	1.47E-06	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	8.67E-20	3.21E-10	2.59E+06	1.72E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	2.20E-16	8.14E-07	2.59E+06	3.23E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	9.56E-19	3.54E-09	2.59E+06	5.83E-10	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	1.01E-15	3.74E-06	2.59E+06	1.91E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	2.15E-15	7.96E-06	2.59E+06	4.06E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	6.81E-14	2.52E-04	2.59E+06	9.32E-06	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	1.33E-17	4.92E-08	2.59E+06	3.12E-09	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	1.27E-17	4.70E-08	2.59E+06	1.71E-09	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	2.27E-14	8.40E-05	2.59E+06	1.21E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	2.95E-15	1.09E-05	2.59E+06	1.13E-07	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	1.07E-15	3.96E-06	2.59E+06	2.23E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	8.48E-16	3.14E-06	2.59E+06	1.10E-08	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	1.23E-17	4.55E-08	2.59E+06	1.16E-10	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	8.80E-20	3.26E-10	2.59E+06	6.90E-13	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	7.55E-18	2.79E-08	2.59E+06	3.57E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.22E-14	1.19E-04	2.59E+06	6.93E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	1.16E-14	4.29E-05	2.59E+06	4.28E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	4.20E-16	1.55E-06	2.59E+06	1.11E-09	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	2.61E-15	9.66E-06	2.59E+06	2.95E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	1.48E-17	5.48E-08	2.59E+06	1.11E-11	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	6.68E-15	2.47E-05	2.59E+06	5.63E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	8.73E-15	3.23E-05	2.59E+06	9.86E-09	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	1.26E-15	4.66E-06	2.59E+06	1.13E-11	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	1.03E-17	3.81E-08	2.59E+06	6.81E-13	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	7.30E-16	2.70E-06	2.59E+06	1.48E-10	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	6.01E-17	2.22E-07	2.59E+06	1.22E-11	
												Total	3.06E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	2.75E-18	1.02E-08	2.59E+06	2.35E-06	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	2.14E-16	7.92E-07	2.59E+06	1.64E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	1.14E-16	4.22E-07	2.59E+06	1.55E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.24E-13	4.59E-04	2.59E+06	2.09E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	6.44E-18	2.38E-08	2.59E+06	6.30E-07	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	7.37E-14	2.73E-04	2.59E+06	4.61E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	6.68E-18	2.47E-08	2.59E+06	1.01E-06	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	6.48E-20	2.40E-10	2.59E+06	1.28E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	1.77E-16	6.55E-07	2.59E+06	2.60E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	5.45E-19	2.02E-09	2.59E+06	3.33E-10	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	7.69E-16	2.85E-06	2.59E+06	1.45E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	1.90E-15	7.03E-06	2.59E+06	3.59E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	5.99E-14	2.22E-04	2.59E+06	8.20E-06	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	7.08E-19	2.62E-09	2.59E+06	1.66E-10	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	1.06E-18	3.92E-09	2.59E+06	1.43E-10	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	1.95E-14	7.22E-05	2.59E+06	1.04E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	2.22E-15	8.21E-06	2.59E+06	8.50E-08	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	6.74E-16	2.49E-06	2.59E+06	1.41E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	2.23E-16	8.25E-07	2.59E+06	2.90E-09	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	1.09E-18	4.03E-09	2.59E+06	1.02E-11	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	7.08E-21	2.62E-11	2.59E+06	5.55E-14	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	2.65E-18	9.81E-09	2.59E+06	1.25E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	2.80E-14	1.04E-04	2.59E+06	6.02E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	1.01E-14	3.74E-05	2.59E+06	3.73E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	2.00E-16	7.40E-07	2.59E+06	5.29E-10	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	1.92E-15	7.10E-06	2.59E+06	2.17E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	1.13E-18	4.18E-09	2.59E+06	8.47E-13	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	5.50E-15	2.04E-05	2.59E+06	4.63E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	7.18E-15	2.66E-05	2.59E+06	8.11E-09	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	9.02E-16	3.34E-06	2.59E+06	8.12E-12	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	9.69E-19	3.59E-09	2.59E+06	6.41E-14	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	5.51E-16	2.04E-06	2.59E+06	1.11E-10	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	1.72E-17	6.36E-08	2.59E+06	3.50E-12	
												Total	2.71E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	1.64E-16	6.07E-07	2.59E+06	1.26E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	1.09E-16	4.03E-07	2.59E+06	1.48E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.23E-13	4.55E-04	2.59E+06	2.07E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	5.44E-18	2.01E-08	2.59E+06	5.32E-07	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	7.19E-14	2.66E-04	2.59E+06	4.49E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	5.70E-18	2.11E-08	2.59E+06	8.66E-07	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	5.63E-20	2.08E-10	2.59E+06	1.11E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	1.62E-16	5.99E-07	2.59E+06	2.38E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	4.46E-19	1.65E-09	2.59E+06	2.72E-10	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	6.68E-16	2.47E-06	2.59E+06	1.26E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	1.87E-15	6.92E-06	2.59E+06	3.53E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	5.87E-14	2.17E-04	2.59E+06	8.04E-06	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	1.46E-18	5.40E-09	2.59E+06	3.42E-10	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	1.68E-18	6.22E-09	2.59E+06	2.26E-10	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	1.87E-14	6.92E-05	2.59E+06	9.97E-07	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	1.85E-15	6.85E-06	2.59E+06	7.08E-08	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	5.21E-16	1.93E-06	2.59E+06	1.09E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	1.86E-16	6.88E-07	2.59E+06	2.42E-09	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	1.65E-18	6.11E-09	2.59E+06	1.55E-11	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	1.13E-20	4.18E-11	2.59E+06	8.86E-14	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	2.67E-18	9.88E-09	2.59E+06	1.26E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	2.73E-14	1.01E-04	2.59E+06	5.87E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	9.75E-15	3.61E-05	2.59E+06	3.60E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	1.56E-16	5.77E-07	2.59E+06	4.13E-10	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	1.55E-15	5.74E-06	2.59E+06	1.75E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	1.89E-18	6.99E-09	2.59E+06	1.42E-12	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	5.00E-15	1.85E-05	2.59E+06	4.21E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	6.50E-15	2.41E-05	2.59E+06	7.34E-09	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	7.69E-16	2.85E-06	2.59E+06	6.92E-12	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	1.43E-18	5.29E-09	2.59E+06	9.46E-14	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	4.77E-16	1.76E-06	2.59E+06	9.65E-11	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	1.72E-17	6.36E-08	2.59E+06	3.50E-12	
												Total	2.68E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	1.10E-15	4.07E-06	2.59E+06	8.45E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	2.20E-16	8.14E-07	2.59E+06	2.99E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.78E-13	6.59E-04	2.59E+06	3.00E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	2.28E-17	8.44E-08	2.59E+06	2.23E-06	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	1.20E-13	4.44E-04	2.59E+06	7.50E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	2.29E-17	8.47E-08	2.59E+06	3.48E-06	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	2.19E-19	8.10E-10	2.59E+06	4.33E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	4.44E-16	1.64E-06	2.59E+06	6.51E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	2.18E-18	8.07E-09	2.59E+06	1.33E-09	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	2.49E-15	9.21E-06	2.59E+06	4.70E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	2.99E-15	1.11E-05	2.59E+06	5.65E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	9.43E-14	3.49E-04	2.59E+06	1.29E-05	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	8.82E-18	3.26E-08	2.59E+06	2.07E-09	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	9.30E-18	3.44E-08	2.59E+06	1.25E-09	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	3.53E-14	1.31E-04	2.59E+06	1.88E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	8.09E-15	2.99E-05	2.59E+06	3.10E-07	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	2.87E-15	1.06E-05	2.59E+06	5.99E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	1.22E-15	4.51E-06	2.59E+06	1.59E-08	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	9.26E-18	3.43E-08	2.59E+06	8.70E-11	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	7.09E-20	2.62E-10	2.59E+06	5.56E-13	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	9.47E-18	3.50E-08	2.59E+06	4.48E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	4.63E-14	1.71E-04	2.59E+06	9.96E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	1.72E-14	6.36E-05	2.59E+06	6.35E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	8.16E-16	3.02E-06	2.59E+06	2.16E-09	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	7.47E-15	2.76E-05	2.59E+06	8.44E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	1.06E-17	3.92E-08	2.59E+06	7.94E-12	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	1.50E-14	5.55E-05	2.59E+06	1.26E-08	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	2.00E-14	7.40E-05	2.59E+06	2.26E-08	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	3.20E-15	1.18E-05	2.59E+06	2.88E-11	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	7.90E-18	2.92E-08	2.59E+06	5.22E-13	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	1.88E-15	6.96E-06	2.59E+06	3.80E-10	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	7.94E-17	2.94E-07	2.59E+06	1.61E-11	
												Total	4.06E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.86E-16	1.43E-06	2.59E+06	2.96E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	1.18E-16	4.37E-07	2.59E+06	1.60E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.27E-13	4.70E-04	2.59E+06	2.14E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	7.33E-18	2.71E-08	2.59E+06	7.17E-07	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	7.57E-14	2.80E-04	2.59E+06	4.73E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	7.55E-18	2.79E-08	2.59E+06	1.15E-06	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	6.98E-20	2.58E-10	2.59E+06	1.38E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	1.87E-16	6.92E-07	2.59E+06	2.74E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	6.75E-19	2.50E-09	2.59E+06	4.12E-10	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	8.33E-16	3.08E-06	2.59E+06	1.57E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	1.95E-15	7.22E-06	2.59E+06	3.68E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	6.15E-14	2.28E-04	2.59E+06	8.42E-06	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	4.19E-18	1.55E-08	2.59E+06	9.82E-10	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	4.01E-18	1.48E-08	2.59E+06	5.41E-10	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	2.01E-14	7.44E-05	2.59E+06	1.07E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	2.41E-15	8.92E-06	2.59E+06	9.23E-08	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	7.83E-16	2.90E-06	2.59E+06	1.64E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	4.64E-16	1.72E-06	2.59E+06	6.04E-09	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.92E-18	1.45E-08	2.59E+06	3.68E-11	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.58E-20	1.32E-10	2.59E+06	2.81E-13	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	3.88E-18	1.44E-08	2.59E+06	1.84E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	2.88E-14	1.07E-04	2.59E+06	6.19E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	1.03E-14	3.81E-05	2.59E+06	3.80E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	2.81E-16	1.04E-06	2.59E+06	7.43E-10	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	2.09E-15	7.73E-06	2.59E+06	2.36E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	4.91E-18	1.82E-08	2.59E+06	3.68E-12	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	5.76E-15	2.13E-05	2.59E+06	4.85E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	7.52E-15	2.78E-05	2.59E+06	8.50E-09	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	9.94E-16	3.68E-06	2.59E+06	8.95E-12	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.32E-18	1.23E-08	2.59E+06	2.20E-13	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	5.94E-16	2.20E-06	2.59E+06	1.20E-10	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	2.95E-17	1.09E-07	2.59E+06	6.00E-12	
												Total	2.78E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	3.31E-19	1.22E-09	2.59E+06	2.83E-07	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	3.80E-16	1.41E-06	2.59E+06	2.92E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	1.19E-16	4.40E-07	2.59E+06	1.62E-03	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.26E-13	4.66E-04	2.59E+06	2.12E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	7.53E-18	2.79E-08	2.59E+06	7.36E-07	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	7.57E-14	2.80E-04	2.59E+06	4.73E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	7.74E-18	2.86E-08	2.59E+06	1.18E-06	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	7.25E-20	2.68E-10	2.59E+06	1.43E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	1.90E-16	7.03E-07	2.59E+06	2.79E-07	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	6.93E-19	2.56E-09	2.59E+06	4.23E-10	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	8.53E-16	3.16E-06	2.59E+06	1.61E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	1.95E-15	7.22E-06	2.59E+06	3.68E-07	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	6.14E-14	2.27E-04	2.59E+06	8.41E-06	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	4.91E-18	1.82E-08	2.59E+06	1.15E-09	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	4.88E-18	1.81E-08	2.59E+06	6.58E-10	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	2.02E-14	7.47E-05	2.59E+06	1.08E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	2.49E-15	9.21E-06	2.59E+06	9.53E-08	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	8.18E-16	3.03E-06	2.59E+06	1.71E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	4.53E-16	1.68E-06	2.59E+06	5.90E-09	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	4.75E-18	1.76E-08	2.59E+06	4.46E-11	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	3.61E-20	1.34E-10	2.59E+06	2.83E-13	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	4.24E-18	1.57E-08	2.59E+06	2.01E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	2.88E-14	1.07E-04	2.59E+06	6.19E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	1.04E-14	3.85E-05	2.59E+06	3.84E-06	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	2.79E-16	1.03E-06	2.59E+06	7.38E-10	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	2.18E-15	8.07E-06	2.59E+06	2.46E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	5.69E-18	2.11E-08	2.59E+06	4.26E-12	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	5.88E-15	2.18E-05	2.59E+06	4.95E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	7.69E-15	2.85E-05	2.59E+06	8.69E-09	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	1.03E-15	3.81E-06	2.59E+06	9.27E-12	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	4.01E-18	1.48E-08	2.59E+06	2.65E-13	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	6.15E-16	2.28E-06	2.59E+06	1.24E-10	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	3.17E-17	1.17E-07	2.59E+06	6.44E-12	
												Total	2.76E-02	

MPC-32														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	Lacc Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	SDE (mRem)	
Gases														
H 3	3.68E+02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.11E-08	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	3.31E-02	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.00E-12	8.00E-03	1.10E-15	4.07E-06	2.59E+06	8.45E-08	
KR 85	5.86E+03	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	0.30	1.77E-07	8.00E-03	1.32E-14	4.88E-05	2.59E+06	1.79E-01	
Crud														
Co-60	2.18E+01	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	1.00	2.20E-09	8.00E-03	1.45E-13	5.37E-04	2.59E+06	2.44E-02	
Volatiles														
SR 90	6.32E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.28E-09	8.00E-03	9.20E-15	3.40E-05	2.59E+06	8.99E-04	
RU106	1.59E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	3.21E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	4.04E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	8.15E-10	8.00E-03	9.45E-14	3.50E-04	2.59E+06	5.91E-03	
CS137	9.82E+04	1.00E+00	32	6.19E+06	1.95E-05	3.15E-12	2.00E-04	1.98E-09	8.00E-03	8.63E-15	3.19E-05	2.59E+06	1.31E-03	
Fines														
PU241	8.53E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.58E-11	8.00E-03	1.17E-19	4.33E-10	2.59E+06	2.32E-10	
Y 90	6.32E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.91E-11	8.00E-03	6.24E-14	2.31E-04	2.59E+06	9.15E-05	
PM147	2.63E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	7.96E-12	8.00E-03	8.11E-16	3.00E-06	2.59E+06	4.95E-07	
CE144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	2.93E-15	1.08E-05	2.59E+06	5.53E-07	
PR144	8.14E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.46E-12	8.00E-03	8.43E-14	3.12E-04	2.59E+06	1.59E-05	
EU154	5.90E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.79E-12	8.00E-03	8.29E-14	3.07E-04	2.59E+06	1.13E-05	
CM244	1.01E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.06E-12	8.00E-03	3.91E-17	1.45E-07	2.59E+06	9.16E-09	
PU238	5.81E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.76E-12	8.00E-03	4.09E-17	1.51E-07	2.59E+06	5.51E-09	
SB125	2.30E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.96E-13	8.00E-03	2.65E-14	9.81E-05	2.59E+06	1.41E-06	
EU155	1.65E+03	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.99E-13	8.00E-03	3.39E-15	1.25E-05	2.59E+06	1.30E-07	
AM241	9.00E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.72E-13	8.00E-03	1.28E-15	4.74E-06	2.59E+06	2.67E-08	
TE125M	5.61E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.70E-13	8.00E-03	1.94E-15	7.18E-06	2.59E+06	2.52E-08	
PU240	4.05E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.23E-13	8.00E-03	3.92E-17	1.45E-07	2.59E+06	3.68E-10	
SM151	3.38E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.02E-13	8.00E-03	1.90E-19	7.03E-10	2.59E+06	1.49E-12	
PU239	2.04E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	6.17E-14	8.00E-03	1.86E-17	6.88E-08	2.59E+06	8.80E-11	
BA137M	9.27E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.81E-11	8.00E-03	3.73E-14	1.38E-04	2.59E+06	8.02E-05	
RH106	1.59E+04	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	4.81E-12	8.00E-03	1.09E-13	4.03E-04	2.59E+06	4.02E-05	
PR144M	1.14E+02	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	3.45E-14	8.00E-03	5.08E-16	1.88E-06	2.59E+06	1.34E-09	
AM243	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	2.75E-15	1.02E-05	2.59E+06	3.11E-09	
CM242	3.23E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	9.78E-15	8.00E-03	4.29E-17	1.59E-07	2.59E+06	3.22E-11	
CM243	3.63E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.10E-14	8.00E-03	9.79E-15	3.62E-05	2.59E+06	8.25E-09	
NP239	4.87E+01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.47E-14	8.00E-03	1.60E-14	5.92E-05	2.59E+06	1.81E-08	
NP237	3.88E-01	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	1.17E-16	8.00E-03	1.54E-15	5.70E-06	2.59E+06	1.39E-11	
PU242	2.85E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	8.63E-16	8.00E-03	3.27E-17	1.21E-07	2.59E+06	2.16E-12	
AM242	8.72E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.64E-15	8.00E-03	8.20E-15	3.03E-05	2.59E+06	1.66E-09	
AM242M	8.76E+00	1.00E-01	32	6.19E+06	1.95E-05	3.15E-12	3.00E-05	2.65E-15	8.00E-03	1.36E-16	5.03E-07	2.59E+06	2.76E-11	
												Total	2.12E-01	

MPC-68															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	8.69E-11	3.22E-01	3.15E+07	5.71E-09
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	4.76E-09	1.76E+01	3.15E+07	3.63E-02
									Volatiles						
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	2.36E-05
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.30E-09	4.81E+00	3.15E+07	2.40E-05
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.30E-08	4.81E+01	3.15E+07	6.00E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	8.76E-09	3.24E+01	3.15E+07	1.15E-03
									Fines						
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	6.82E-07	2.52E+03	3.15E+07	1.03E-03
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	1.25E-08
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	8.25E-15	3.05E-05	3.15E+07	4.66E-12
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.93E-09	7.14E+00	3.15E+07	2.81E-07
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	2.41E-15	8.92E-06	3.15E+07	3.51E-13
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	1.17E-08	4.33E+01	3.15E+07	1.19E-06
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	1.59E-05	5.88E+04	3.15E+07	2.22E-03
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	2.80E-05	1.04E+05	3.15E+07	2.60E-03
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	3.60E-10	1.33E+00	3.15E+07	1.67E-08
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	3.56E-10	1.32E+00	3.15E+07	1.13E-08
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	3.25E-05	1.20E+05	3.15E+07	5.30E-04
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	1.24E-10	4.59E-01	3.15E+07	1.41E-09
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	2.80E-04
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	4.03E-14	1.49E-04	3.15E+07	2.31E-13
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	1.25E-04
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	3.26E-05	1.21E+05	3.15E+07	2.60E-05
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	5.70E-07	2.11E+03	3.15E+07	3.28E-07
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	2.07E-05	7.66E+04	3.15E+07	1.19E-05
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	7.45E-11	2.76E-01	3.15E+07	5.95E-11
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	2.96E-05	1.10E+05	3.15E+07	2.05E-07
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	3.02E-05	1.12E+05	3.15E+07	1.60E-06
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	1.94E-09	7.18E+00	3.15E+07	3.09E-10
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	3.21E-05	1.19E+05	3.15E+07	5.12E-06
														Total	4.50E-02

MPC-68																
Normal Conditions																
Committed Effective Dose Equivalent From Inhalation																
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	2.09E-10	7.73E-01	3.15E+07	1.37E-08
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.84E-08	6.81E+01	3.15E+07	1.40E-01
									Volatiles						
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	2.36E-05
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.78E-09	6.59E+00	3.15E+07	3.28E-05
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.08E-08	4.00E+01	3.15E+07	4.99E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	7.84E-09	2.90E+01	3.15E+07	1.03E-03
									Fines						
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	3.06E-11	1.13E-01	3.15E+07	4.63E-08
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	1.25E-08
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	3.60E-14	1.33E-04	3.15E+07	2.03E-11
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.97E-09	7.29E+00	3.15E+07	2.87E-07
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.05E-14	3.89E-05	3.15E+07	1.53E-12
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	1.55E-08	5.74E+01	3.15E+07	1.58E-06
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	1.04E-09	3.85E+00	3.15E+07	1.45E-07
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	1.00E-09	3.70E+00	3.15E+07	9.27E-08
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	4.16E-10	1.54E+00	3.15E+07	1.93E-08
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	6.14E-10	2.27E+00	3.15E+07	1.95E-08
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	2.67E-09	9.88E+00	3.15E+07	4.36E-08
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	1.07E-10	3.96E-01	3.15E+07	1.21E-09
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	9.51E-10	3.52E+00	3.15E+07	8.37E-09
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	1.49E-13	5.51E-04	3.15E+07	8.53E-13
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	9.22E-10	3.41E+00	3.15E+07	3.63E-09
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	1.52E-08	5.62E+01	3.15E+07	1.21E-08
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	9.44E-10	3.49E+00	3.15E+07	5.44E-10
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	6.29E-09	2.33E+01	3.15E+07	3.61E-09
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	1.63E-11	6.03E-02	3.15E+07	1.30E-11
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	1.69E-08	6.25E+01	3.15E+07	1.17E-10
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	9.45E-10	3.50E+00	3.15E+07	5.01E-11
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	2.94E-12	1.09E-02	3.15E+07	4.68E-13
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	1.38E-09	5.11E+00	3.15E+07	2.20E-10
														Total	1.42E-01

MPC-68															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	3.14E-10	1.16E+00	3.15E+07	2.06E-08
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	3.45E-07	1.28E+03	3.15E+07	2.63E+00
									Volatiles						
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	2.86E-06	1.06E+04	3.15E+07	2.51E-01
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.04E-06	3.85E+03	3.15E+07	1.92E-02
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	5.45E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	8.82E-09	3.26E+01	3.15E+07	1.16E-03
									Fines						
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	7.42E-09	2.75E+01	3.15E+07	1.12E-05
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	8.89E-09	3.29E+01	3.15E+07	1.17E-05
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	7.74E-08	2.86E+02	3.15E+07	4.37E-05
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.83E-07	6.77E+02	3.15E+07	2.66E-05
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	9.40E-11	3.48E-01	3.15E+07	1.37E-08
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	7.92E-08	2.93E+02	3.15E+07	8.09E-06
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	1.93E-05	7.14E+04	3.15E+07	2.70E-03
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	1.71E-03
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	2.17E-08	8.03E+01	3.15E+07	1.01E-06
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	1.19E-08	4.40E+01	3.15E+07	3.78E-07
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	3.00E-04
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	4.66E-10	1.72E+00	3.15E+07	5.29E-09
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	1.52E-04
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	3.26E-09	1.21E+01	3.15E+07	1.87E-08
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	6.80E-05
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	1.78E-05	6.59E+04	3.15E+07	1.42E-05
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	1.55E-05	5.74E+04	3.15E+07	8.93E-06
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	1.94E-05	7.18E+04	3.15E+07	1.11E-05
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	2.36E-09	8.73E+00	3.15E+07	1.88E-09
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	1.61E-05	5.96E+04	3.15E+07	1.11E-07
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	1.64E-05	6.07E+04	3.15E+07	8.70E-07
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	5.20E-08	1.92E+02	3.15E+07	8.27E-09
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	4.20E-06	1.55E+04	3.15E+07	6.70E-07
														Total	2.91E+00

MPC-68															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	1.40E-10	5.18E-01	3.15E+07	9.20E-09
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.72E-08	6.36E+01	3.15E+07	1.31E-01
									Volatiles						
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	3.28E-08	1.21E+02	3.15E+07	2.87E-03
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.76E-09	6.51E+00	3.15E+07	3.24E-05
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	5.45E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	8.30E-09	3.07E+01	3.15E+07	1.09E-03
									Fines						
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	3.36E-06	1.24E+04	3.15E+07	5.09E-03
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	2.79E-10	1.03E+00	3.15E+07	3.67E-07
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	9.10E-07
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	2.67E-08	9.88E+01	3.15E+07	3.89E-06
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.38E-14	5.11E-05	3.15E+07	2.01E-12
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	1.06E-07	3.92E+02	3.15E+07	1.08E-05
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	9.38E-05	3.47E+05	3.15E+07	1.31E-02
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	1.52E-04	5.62E+05	3.15E+07	1.41E-02
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	5.35E-10	1.98E+00	3.15E+07	2.48E-08
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	1.43E-08	5.29E+01	3.15E+07	4.54E-07
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	1.74E-04	6.44E+05	3.15E+07	2.84E-03
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	3.01E-09	1.11E+01	3.15E+07	3.42E-08
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	1.49E-03
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	6.30E-08
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	6.64E-04
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	1.73E-04	6.40E+05	3.15E+07	1.38E-04
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	3.90E-06	1.44E+04	3.15E+07	2.25E-06
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	1.18E-04	4.37E+05	3.15E+07	6.78E-05
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	2.08E-10	7.70E-01	3.15E+07	1.66E-10
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	2.62E-04	9.69E+05	3.15E+07	1.81E-06
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	1.61E-04	5.96E+05	3.15E+07	8.54E-06
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	1.32E-08	4.88E+01	3.15E+07	2.10E-09
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	2.70E-05
														Total	1.73E-01

MPC-68															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	1.38E-10	5.11E-01	3.15E+07	9.07E-09
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.35E-08	5.00E+01	3.15E+07	1.03E-01
									Volatiles						
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	7.09E-08	2.62E+02	3.15E+07	6.21E-03
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	2.97E-05
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	5.08E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	7.94E-09	2.94E+01	3.15E+07	1.04E-03
									Fines						
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	4.20E-05	1.55E+05	3.15E+07	6.36E-02
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	2.78E-10	1.03E+00	3.15E+07	3.65E-07
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	2.01E-08	7.44E+01	3.15E+07	1.14E-05
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	4.54E-08	1.68E+02	3.15E+07	6.61E-06
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.47E-14	5.44E-05	3.15E+07	2.14E-12
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	5.23E-07	1.94E+03	3.15E+07	5.34E-05
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	1.17E-03	4.33E+06	3.15E+07	1.63E-01
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	1.90E-03	7.03E+06	3.15E+07	1.76E-01
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	9.78E-10	3.62E+00	3.15E+07	4.54E-08
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	1.52E-07	5.62E+02	3.15E+07	4.83E-06
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	3.54E-02
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	3.21E-08	1.19E+02	3.15E+07	3.64E-07
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	1.86E-02
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	1.38E-07	5.11E+02	3.15E+07	7.90E-07
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	8.30E-03
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	1.73E-03
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	4.87E-05	1.80E+05	3.15E+07	2.81E-05
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	1.47E-03	5.44E+06	3.15E+07	8.45E-04
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	2.03E-09	7.51E+00	3.15E+07	1.62E-09
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	3.27E-03	1.21E+07	3.15E+07	2.26E-05
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	2.01E-03	7.44E+06	3.15E+07	1.07E-04
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	1.65E-07	6.11E+02	3.15E+07	2.62E-08
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	2.12E-03	7.84E+06	3.15E+07	3.38E-04
														Total	5.79E-01

MPC-68															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	1.56E-06	5.77E+03	3.15E+07	1.03E-04
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.62E-08	5.99E+01	3.15E+07	1.24E-01
									Volatiles						
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	2.36E-05
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.72E-09	6.36E+00	3.15E+07	3.17E-05
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.11E-08	4.11E+01	3.15E+07	5.12E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	7.93E-09	2.93E+01	3.15E+07	1.04E-03
									Fines						
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	1.24E-11	4.59E-02	3.15E+07	1.88E-08
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	1.25E-08
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	1.98E-14	7.33E-05	3.15E+07	1.12E-11
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.88E-09	6.96E+00	3.15E+07	2.74E-07
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	8.47E-15	3.13E-05	3.15E+07	1.23E-12
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	7.14E-09	2.64E+01	3.15E+07	7.29E-07
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	1.01E-09	3.74E+00	3.15E+07	1.41E-07
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	9.62E-10	3.56E+00	3.15E+07	8.92E-08
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	3.24E-10	1.20E+00	3.15E+07	1.50E-08
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	2.40E-10	8.88E-01	3.15E+07	7.62E-09
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	1.60E-09	5.92E+00	3.15E+07	2.61E-08
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	9.93E-11	3.67E-01	3.15E+07	1.13E-09
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	9.05E-10	3.35E+00	3.15E+07	7.97E-09
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	1.32E-14	4.88E-05	3.15E+07	7.56E-14
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	9.03E-10	3.34E+00	3.15E+07	3.55E-09
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	8.29E-09	3.07E+01	3.15E+07	6.62E-09
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	9.41E-10	3.48E+00	3.15E+07	5.42E-10
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	3.83E-09	1.42E+01	3.15E+07	2.20E-09
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	7.62E-12	2.82E-02	3.15E+07	6.08E-12
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	1.34E-08	4.96E+01	3.15E+07	9.28E-11
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	8.79E-10	3.25E+00	3.15E+07	4.66E-11
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	2.52E-12	9.32E-03	3.15E+07	4.01E-13
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	5.64E-10	2.09E+00	3.15E+07	9.00E-11
														Total	1.25E-01

MPC-68															
Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CEDE (mRem)
									Gases						
H 3	1.24E+02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	1.26E-05
I129	1.12E-02	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.30E-04	4.69E-08	1.74E+02	3.15E+07	3.08E-06
KR 85	2.04E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud		3.30E-04				
Co-60	6.50E+01	100.0%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	5.91E-08	2.19E+02	3.15E+07	4.51E-01
									Volatiles		3.30E-04				
SR 90	2.24E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	3.30E-04	3.51E-07	1.30E+03	3.15E+07	3.08E-02
RU106	4.71E+03	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	3.30E-04	1.29E-07	4.77E+02	3.15E+07	2.38E-03
CS134	1.18E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	3.30E-04	1.25E-08	4.63E+01	3.15E+07	5.77E-04
CS137	3.35E+04	2.5%	1.00E+00	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	3.30E-04	8.63E-09	3.19E+01	3.15E+07	1.13E-03
									Fines		3.30E-04				
PU241	2.58E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	3.30E-04	2.23E-06	8.25E+03	3.15E+07	3.38E-03
Y 90	2.24E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	3.30E-04	2.13E-09	7.88E+00	3.15E+07	2.80E-06
PM147	9.63E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	3.30E-04	1.06E-08	3.92E+01	3.15E+07	5.99E-06
CE144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	5.84E-08	2.16E+02	3.15E+07	8.50E-06
PR144	2.48E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	3.30E-04	1.17E-11	4.33E-02	3.15E+07	1.70E-09
EU154	1.74E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	3.30E-04	7.73E-08	2.86E+02	3.15E+07	7.89E-06
CM244	2.38E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.30E-04	6.70E-05	2.48E+05	3.15E+07	9.36E-03
PU238	1.58E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	3.30E-04	1.06E-04	3.92E+05	3.15E+07	9.83E-03
SB125	7.91E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.30E-04	3.30E-09	1.22E+01	3.15E+07	1.53E-07
EU155	5.41E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.30E-04	1.12E-08	4.14E+01	3.15E+07	3.56E-07
AM241	2.78E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	3.30E-04	1.20E-04	4.44E+05	3.15E+07	1.96E-03
TE125M	1.93E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	3.30E-04	1.52E-09	5.62E+00	3.15E+07	1.73E-08
PU240	1.50E+02	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	1.02E-03
SM151	9.76E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.30E-04	8.10E-09	3.00E+01	3.15E+07	4.64E-08
PU239	6.70E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	4.56E-04
BA137M	3.17E+04	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	1.19E-04	4.40E+05	3.15E+07	9.50E-05
CM242	9.82E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	3.30E-04	4.67E-06	1.73E+04	3.15E+07	2.69E-06
CM243	9.79E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	3.30E-04	8.30E-05	3.07E+05	3.15E+07	4.77E-05
NP239	1.36E+01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	3.30E-04	6.78E-10	2.51E+00	3.15E+07	5.41E-10
NP237	1.18E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.30E-04	1.46E-04	5.40E+05	3.15E+07	1.01E-06
PU242	9.04E-01	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.30E-04	1.11E-04	4.11E+05	3.15E+07	5.89E-06
AM242	2.71E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	3.30E-04	1.58E-08	5.85E+01	3.15E+07	2.51E-09
AM242M	2.72E+00	2.5%	1.00E-01	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.30E-04	1.15E-04	4.26E+05	3.15E+07	1.84E-05
														Total	5.12E-01

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	8.69E-11	3.22E-01	3.15E+07	2.63E-08
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	4.76E-09	1.76E+01	3.15E+07	3.63E-02
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	1.08E-04
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.30E-09	4.81E+00	3.15E+07	1.10E-04
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.30E-08	4.81E+01	3.15E+07	2.76E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	8.76E-09	3.24E+01	3.15E+07	5.28E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	6.82E-07	2.52E+03	3.15E+07	4.75E-03
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	5.76E-08
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	8.25E-15	3.05E-05	3.15E+07	2.14E-11
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.93E-09	7.14E+00	3.15E+07	1.29E-06
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	2.41E-15	8.92E-06	3.15E+07	1.61E-12
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	1.17E-08	4.33E+01	3.15E+07	5.50E-06
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	1.59E-05	5.88E+04	3.15E+07	1.02E-02
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	2.80E-05	1.04E+05	3.15E+07	1.19E-02
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	3.60E-10	1.33E+00	3.15E+07	7.69E-08
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	3.56E-10	1.32E+00	3.15E+07	5.20E-08
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	3.25E-05	1.20E+05	3.15E+07	2.44E-03
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	1.24E-10	4.59E-01	3.15E+07	6.47E-09
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	1.29E-03
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	4.03E-14	1.49E-04	3.15E+07	1.06E-12
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	3.18E-05	1.18E+05	3.15E+07	5.75E-04
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	3.26E-05	1.21E+05	3.15E+07	1.20E-04
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	5.70E-07	2.11E+03	3.15E+07	1.51E-06
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	2.07E-05	7.66E+04	3.15E+07	5.47E-05
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	7.45E-11	2.76E-01	3.15E+07	2.74E-10
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	2.96E-05	1.10E+05	3.15E+07	9.43E-07
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	3.02E-05	1.12E+05	3.15E+07	7.37E-06
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.94E-09	7.18E+00	3.15E+07	1.42E-09
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	3.21E-05	1.19E+05	3.15E+07	2.36E-05
														Total	7.61E-02

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	2.09E-10	7.73E-01	3.15E+07	6.32E-08
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.84E-08	6.81E+01	3.15E+07	1.40E-01
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	1.08E-04
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.78E-09	6.59E+00	3.15E+07	1.51E-04
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.08E-08	4.00E+01	3.15E+07	2.29E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	7.84E-09	2.90E+01	3.15E+07	4.73E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	3.06E-11	1.13E-01	3.15E+07	2.13E-07
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	5.76E-08
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	3.60E-14	1.33E-04	3.15E+07	9.36E-11
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.97E-09	7.29E+00	3.15E+07	1.32E-06
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.05E-14	3.89E-05	3.15E+07	7.03E-12
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	1.55E-08	5.74E+01	3.15E+07	7.28E-06
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	1.04E-09	3.85E+00	3.15E+07	6.68E-07
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	1.00E-09	3.70E+00	3.15E+07	4.27E-07
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	4.16E-10	1.54E+00	3.15E+07	8.88E-08
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	6.14E-10	2.27E+00	3.15E+07	8.97E-08
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	2.67E-09	9.88E+00	3.15E+07	2.00E-07
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	1.07E-10	3.96E-01	3.15E+07	5.59E-09
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	9.51E-10	3.52E+00	3.15E+07	3.85E-08
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	1.49E-13	5.51E-04	3.15E+07	3.93E-12
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	9.22E-10	3.41E+00	3.15E+07	1.67E-08
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	1.52E-08	5.62E+01	3.15E+07	5.58E-08
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	9.44E-10	3.49E+00	3.15E+07	2.50E-09
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	6.29E-09	2.33E+01	3.15E+07	1.66E-08
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	1.63E-11	6.03E-02	3.15E+07	5.98E-11
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	1.69E-08	6.25E+01	3.15E+07	5.38E-10
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	9.45E-10	3.50E+00	3.15E+07	2.31E-10
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	2.94E-12	1.09E-02	3.15E+07	2.15E-12
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.38E-09	5.11E+00	3.15E+07	1.01E-09
														Total	1.48E-01

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	3.14E-10	1.16E+00	3.15E+07	9.49E-08
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	3.45E-07	1.28E+03	3.15E+07	2.63E+00
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	2.86E-06	1.06E+04	3.15E+07	1.15E+00
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.04E-06	3.85E+03	3.15E+07	8.82E-02
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	2.51E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	8.82E-09	3.26E+01	3.15E+07	5.32E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	7.42E-09	2.75E+01	3.15E+07	5.17E-05
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	8.89E-09	3.29E+01	3.15E+07	5.38E-05
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	7.74E-08	2.86E+02	3.15E+07	2.01E-04
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.83E-07	6.77E+02	3.15E+07	1.23E-04
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	9.40E-11	3.48E-01	3.15E+07	6.29E-08
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	7.92E-08	2.93E+02	3.15E+07	3.72E-05
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	1.93E-05	7.14E+04	3.15E+07	1.24E-02
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	7.85E-03
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	2.17E-08	8.03E+01	3.15E+07	4.63E-06
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	1.19E-08	4.40E+01	3.15E+07	1.74E-06
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	1.84E-05	6.81E+04	3.15E+07	1.38E-03
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	4.66E-10	1.72E+00	3.15E+07	2.43E-08
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	7.00E-04
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	3.26E-09	1.21E+01	3.15E+07	8.59E-08
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	1.73E-05	6.40E+04	3.15E+07	3.13E-04
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	1.78E-05	6.59E+04	3.15E+07	6.53E-05
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	1.55E-05	5.74E+04	3.15E+07	4.11E-05
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	1.94E-05	7.18E+04	3.15E+07	5.13E-05
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	2.36E-09	8.73E+00	3.15E+07	8.66E-09
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	1.61E-05	5.96E+04	3.15E+07	5.13E-07
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	1.64E-05	6.07E+04	3.15E+07	4.00E-06
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	5.20E-08	1.92E+02	3.15E+07	3.80E-08
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	4.20E-06	1.55E+04	3.15E+07	3.08E-06
														Total	3.90E+00

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	1.40E-10	5.18E-01	3.15E+07	4.23E-08
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.72E-08	6.36E+01	3.15E+07	1.31E-01
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	3.28E-08	1.21E+02	3.15E+07	1.32E-02
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.76E-09	6.51E+00	3.15E+07	1.49E-04
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.18E-08	4.37E+01	3.15E+07	2.51E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	8.30E-09	3.07E+01	3.15E+07	5.00E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	3.36E-06	1.24E+04	3.15E+07	2.34E-02
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	2.79E-10	1.03E+00	3.15E+07	1.69E-06
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	4.19E-06
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	2.67E-08	9.88E+01	3.15E+07	1.79E-05
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.38E-14	5.11E-05	3.15E+07	9.24E-12
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	1.06E-07	3.92E+02	3.15E+07	4.98E-05
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	9.38E-05	3.47E+05	3.15E+07	6.03E-02
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	1.52E-04	5.62E+05	3.15E+07	6.48E-02
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	5.35E-10	1.98E+00	3.15E+07	1.14E-07
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	1.43E-08	5.29E+01	3.15E+07	2.09E-06
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	1.74E-04	6.44E+05	3.15E+07	1.31E-02
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	3.01E-09	1.11E+01	3.15E+07	1.57E-07
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	6.84E-03
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	2.90E-07
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	3.06E-03
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	1.73E-04	6.40E+05	3.15E+07	6.35E-04
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	3.90E-06	1.44E+04	3.15E+07	1.03E-05
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	1.18E-04	4.37E+05	3.15E+07	3.12E-04
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	2.08E-10	7.70E-01	3.15E+07	7.64E-10
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	2.62E-04	9.69E+05	3.15E+07	8.35E-06
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	1.61E-04	5.96E+05	3.15E+07	3.93E-05
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.32E-08	4.88E+01	3.15E+07	9.66E-09
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.69E-04	6.25E+05	3.15E+07	1.24E-04
														Total	3.25E-01

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	1.38E-10	5.11E-01	3.15E+07	4.17E-08
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.35E-08	5.00E+01	3.15E+07	1.03E-01
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	7.09E-08	2.62E+02	3.15E+07	2.86E-02
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.61E-09	5.96E+00	3.15E+07	1.36E-04
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.10E-08	4.07E+01	3.15E+07	2.34E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	7.94E-09	2.94E+01	3.15E+07	4.79E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	4.20E-05	1.55E+05	3.15E+07	2.93E-01
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	2.78E-10	1.03E+00	3.15E+07	1.68E-06
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	2.01E-08	7.44E+01	3.15E+07	5.23E-05
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	4.54E-08	1.68E+02	3.15E+07	3.04E-05
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.47E-14	5.44E-05	3.15E+07	9.84E-12
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	5.23E-07	1.94E+03	3.15E+07	2.46E-04
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	1.17E-03	4.33E+06	3.15E+07	7.52E-01
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	1.90E-03	7.03E+06	3.15E+07	8.10E-01
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	9.78E-10	3.62E+00	3.15E+07	2.09E-07
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	1.52E-07	5.62E+02	3.15E+07	2.22E-05
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	1.63E-01
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	3.21E-08	1.19E+02	3.15E+07	1.68E-06
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	8.54E-02
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	1.38E-07	5.11E+02	3.15E+07	3.64E-06
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	2.11E-03	7.81E+06	3.15E+07	3.82E-02
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	2.17E-03	8.03E+06	3.15E+07	7.97E-03
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	4.87E-05	1.80E+05	3.15E+07	1.29E-04
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	1.47E-03	5.44E+06	3.15E+07	3.88E-03
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	2.03E-09	7.51E+00	3.15E+07	7.45E-09
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	3.27E-03	1.21E+07	3.15E+07	1.04E-04
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	2.01E-03	7.44E+06	3.15E+07	4.90E-04
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.65E-07	6.11E+02	3.15E+07	1.21E-07
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	2.12E-03	7.84E+06	3.15E+07	1.56E-03
														Total	2.29E+00

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	1.56E-06	5.77E+03	3.15E+07	4.72E-04
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	1.62E-08	5.99E+01	3.15E+07	1.24E-01
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	2.69E-10	9.95E-01	3.15E+07	1.08E-04
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.72E-09	6.36E+00	3.15E+07	1.46E-04
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.11E-08	4.11E+01	3.15E+07	2.36E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	7.93E-09	2.93E+01	3.15E+07	4.78E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	1.24E-11	4.59E-02	3.15E+07	8.64E-08
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	9.52E-12	3.52E-02	3.15E+07	5.76E-08
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	1.98E-14	7.33E-05	3.15E+07	5.15E-11
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.88E-09	6.96E+00	3.15E+07	1.26E-06
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	8.47E-15	3.13E-05	3.15E+07	5.67E-12
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	7.14E-09	2.64E+01	3.15E+07	3.35E-06
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	1.01E-09	3.74E+00	3.15E+07	6.49E-07
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	9.62E-10	3.56E+00	3.15E+07	4.10E-07
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	3.24E-10	1.20E+00	3.15E+07	6.92E-08
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	2.40E-10	8.88E-01	3.15E+07	3.50E-08
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	1.60E-09	5.92E+00	3.15E+07	1.20E-07
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	9.93E-11	3.67E-01	3.15E+07	5.18E-09
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	9.05E-10	3.35E+00	3.15E+07	3.66E-08
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	1.32E-14	4.88E-05	3.15E+07	3.48E-13
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	9.03E-10	3.34E+00	3.15E+07	1.63E-08
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	8.29E-09	3.07E+01	3.15E+07	3.04E-08
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	9.41E-10	3.48E+00	3.15E+07	2.49E-09
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	3.83E-09	1.42E+01	3.15E+07	1.01E-08
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	7.62E-12	2.82E-02	3.15E+07	2.80E-11
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	1.34E-08	4.96E+01	3.15E+07	4.27E-10
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	8.79E-10	3.25E+00	3.15E+07	2.14E-10
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	2.52E-12	9.32E-03	3.15E+07	1.84E-12
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	5.64E-10	2.09E+00	3.15E+07	4.14E-10
														Total	1.32E-01

MPC-68															
Off-Normal Conditions															
Committed Effective Dose Equivalent From Inhalation															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	$L_{off\ nor}$ Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CEDE (mRem)
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.30E-04	1.73E-11	6.40E-02	3.15E+07	5.78E-05
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.30E-04	4.69E-08	1.74E+02	3.15E+07	1.42E-05
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	3.30E-04	5.91E-08	2.19E+02	3.15E+07	4.51E-01
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	3.30E-04	3.51E-07	1.30E+03	3.15E+07	1.41E-01
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	3.30E-04	1.29E-07	4.77E+02	3.15E+07	1.09E-02
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	3.30E-04	1.25E-08	4.63E+01	3.15E+07	2.65E-03
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	3.30E-04	8.63E-09	3.19E+01	3.15E+07	5.20E-03
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	3.30E-04	2.23E-06	8.25E+03	3.15E+07	1.55E-02
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	3.30E-04	2.13E-09	7.88E+00	3.15E+07	1.29E-05
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	3.30E-04	1.06E-08	3.92E+01	3.15E+07	2.76E-05
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	5.84E-08	2.16E+02	3.15E+07	3.91E-05
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	3.30E-04	1.17E-11	4.33E-02	3.15E+07	7.83E-09
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	3.30E-04	7.73E-08	2.86E+02	3.15E+07	3.63E-05
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.30E-04	6.70E-05	2.48E+05	3.15E+07	4.30E-02
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	3.30E-04	1.06E-04	3.92E+05	3.15E+07	4.52E-02
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.30E-04	3.30E-09	1.22E+01	3.15E+07	7.05E-07
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.30E-04	1.12E-08	4.14E+01	3.15E+07	1.64E-06
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	3.30E-04	1.20E-04	4.44E+05	3.15E+07	9.01E-03
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	3.30E-04	1.52E-09	5.62E+00	3.15E+07	7.94E-08
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	4.70E-03
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.30E-04	8.10E-09	3.00E+01	3.15E+07	2.13E-07
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.30E-04	1.16E-04	4.29E+05	3.15E+07	2.10E-03
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.30E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	1.19E-04	4.40E+05	3.15E+07	4.37E-04
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	3.30E-04	4.67E-06	1.73E+04	3.15E+07	1.24E-05
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	3.30E-04	8.30E-05	3.07E+05	3.15E+07	2.19E-04
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	3.30E-04	6.78E-10	2.51E+00	3.15E+07	2.49E-09
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.30E-04	1.46E-04	5.40E+05	3.15E+07	4.65E-06
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.30E-04	1.11E-04	4.11E+05	3.15E+07	2.71E-05
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.58E-08	5.85E+01	3.15E+07	1.16E-08
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.30E-04	1.15E-04	4.26E+05	3.15E+07	8.44E-05
														Total	7.32E-01

MPC-68														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	8.69E-11	3.22E-01	2.59E+06	1.64E-06
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	4.76E-09	1.76E+01	2.59E+06	1.74E+00
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	2.69E-10	9.95E-01	2.59E+06	6.76E-03
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.30E-09	4.81E+00	2.59E+06	6.87E-03
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.30E-08	4.81E+01	2.59E+06	1.72E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	8.76E-09	3.24E+01	2.59E+06	3.29E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	6.82E-07	2.52E+03	2.59E+06	2.96E-01
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	9.52E-12	3.52E-02	2.59E+06	3.59E-06
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	8.25E-15	3.05E-05	2.59E+06	1.34E-09
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.93E-09	7.14E+00	2.59E+06	8.05E-05
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	2.41E-15	8.92E-06	2.59E+06	1.01E-10
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	1.17E-08	4.33E+01	2.59E+06	3.43E-04
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	1.59E-05	5.88E+04	2.59E+06	6.37E-01
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	2.80E-05	1.04E+05	2.59E+06	7.44E-01
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	3.60E-10	1.33E+00	2.59E+06	4.79E-06
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	3.56E-10	1.32E+00	2.59E+06	3.24E-06
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	3.25E-05	1.20E+05	2.59E+06	1.52E-01
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	1.24E-10	4.59E-01	2.59E+06	4.04E-07
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	3.18E-05	1.18E+05	2.59E+06	8.03E-02
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	4.03E-14	1.49E-04	2.59E+06	6.62E-11
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	3.18E-05	1.18E+05	2.59E+06	3.59E-02
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	3.26E-05	1.21E+05	2.59E+06	7.46E-03
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	5.70E-07	2.11E+03	2.59E+06	9.42E-05
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	2.07E-05	7.66E+04	2.59E+06	3.41E-03
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	7.45E-11	2.76E-01	2.59E+06	1.70E-08
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	2.96E-05	1.10E+05	2.59E+06	5.88E-05
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	3.02E-05	1.12E+05	2.59E+06	4.59E-04
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	1.94E-09	7.18E+00	2.59E+06	8.85E-08
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	3.21E-05	1.19E+05	2.59E+06	1.47E-03
													Total	4.21E+00

MPC-68														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	2.09E-10	7.73E-01	2.59E+06	3.94E-06
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	1.84E-08	6.81E+01	2.59E+06	6.71E+00
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	2.69E-10	9.95E-01	2.59E+06	6.76E-03
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.78E-09	6.59E+00	2.59E+06	9.41E-03
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.08E-08	4.00E+01	2.59E+06	1.43E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	7.84E-09	2.90E+01	2.59E+06	2.95E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	3.06E-11	1.13E-01	2.59E+06	1.33E-05
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	9.52E-12	3.52E-02	2.59E+06	3.59E-06
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	3.60E-14	1.33E-04	2.59E+06	5.83E-09
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.97E-09	7.29E+00	2.59E+06	8.22E-05
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.05E-14	3.89E-05	2.59E+06	4.38E-10
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	1.55E-08	5.74E+01	2.59E+06	4.54E-04
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	1.04E-09	3.85E+00	2.59E+06	4.17E-05
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	1.00E-09	3.70E+00	2.59E+06	2.66E-05
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	4.16E-10	1.54E+00	2.59E+06	5.54E-06
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	6.14E-10	2.27E+00	2.59E+06	5.59E-06
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	2.67E-09	9.88E+00	2.59E+06	1.25E-05
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	1.07E-10	3.96E-01	2.59E+06	3.48E-07
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	9.51E-10	3.52E+00	2.59E+06	2.40E-06
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	1.49E-13	5.51E-04	2.59E+06	2.45E-10
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	9.22E-10	3.41E+00	2.59E+06	1.04E-06
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	1.52E-08	5.62E+01	2.59E+06	3.48E-06
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	9.44E-10	3.49E+00	2.59E+06	1.56E-07
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	6.29E-09	2.33E+01	2.59E+06	1.04E-06
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	1.63E-11	6.03E-02	2.59E+06	3.73E-09
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	1.69E-08	6.25E+01	2.59E+06	3.36E-08
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	9.45E-10	3.50E+00	2.59E+06	1.44E-08
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	2.94E-12	1.09E-02	2.59E+06	1.34E-10
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	1.38E-09	5.11E+00	2.59E+06	6.32E-08
													Total	7.17E+00

MPC-68														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	3.14E-10	1.16E+00	2.59E+06	5.92E-06
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	3.45E-07	1.28E+03	2.59E+06	1.26E+02
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	2.86E-06	1.06E+04	2.59E+06	7.19E+01
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.04E-06	3.85E+03	2.59E+06	5.50E+00
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.18E-08	4.37E+01	2.59E+06	1.56E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	8.82E-09	3.26E+01	2.59E+06	3.31E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	7.42E-09	2.75E+01	2.59E+06	3.22E-03
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	8.89E-09	3.29E+01	2.59E+06	3.35E-03
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	7.74E-08	2.86E+02	2.59E+06	1.25E-02
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.83E-07	6.77E+02	2.59E+06	7.64E-03
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	9.40E-11	3.48E-01	2.59E+06	3.92E-06
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	7.92E-08	2.93E+02	2.59E+06	2.32E-03
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	1.93E-05	7.14E+04	2.59E+06	7.73E-01
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	1.84E-05	6.81E+04	2.59E+06	4.89E-01
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	2.17E-08	8.03E+01	2.59E+06	2.89E-04
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	1.19E-08	4.40E+01	2.59E+06	1.08E-04
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	1.84E-05	6.81E+04	2.59E+06	8.61E-02
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	4.66E-10	1.72E+00	2.59E+06	1.52E-06
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	1.73E-05	6.40E+04	2.59E+06	4.37E-02
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	3.26E-09	1.21E+01	2.59E+06	5.35E-06
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	1.73E-05	6.40E+04	2.59E+06	1.95E-02
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	1.78E-05	6.59E+04	2.59E+06	4.07E-03
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	1.55E-05	5.74E+04	2.59E+06	2.56E-03
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	1.94E-05	7.18E+04	2.59E+06	3.20E-03
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	2.36E-09	8.73E+00	2.59E+06	5.40E-07
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	1.61E-05	5.96E+04	2.59E+06	3.20E-05
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	1.64E-05	6.07E+04	2.59E+06	2.49E-04
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	5.20E-08	1.92E+02	2.59E+06	2.37E-06
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	4.20E-06	1.55E+04	2.59E+06	1.92E-04
													Total	2.05E+02

MPC-68														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	1.40E-10	5.18E-01	2.59E+06	2.64E-06
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	1.72E-08	6.36E+01	2.59E+06	6.27E+00
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	3.28E-08	1.21E+02	2.59E+06	8.24E-01
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.76E-09	6.51E+00	2.59E+06	9.30E-03
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.18E-08	4.37E+01	2.59E+06	1.56E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	8.30E-09	3.07E+01	2.59E+06	3.12E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	3.36E-06	1.24E+04	2.59E+06	1.46E+00
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	2.79E-10	1.03E+00	2.59E+06	1.05E-04
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	1.61E-09	5.96E+00	2.59E+06	2.61E-04
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	2.67E-08	9.88E+01	2.59E+06	1.11E-03
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.38E-14	5.11E-05	2.59E+06	5.76E-10
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	1.06E-07	3.92E+02	2.59E+06	3.10E-03
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	9.38E-05	3.47E+05	2.59E+06	3.76E+00
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	1.52E-04	5.62E+05	2.59E+06	4.04E+00
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	5.35E-10	1.98E+00	2.59E+06	7.12E-06
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	1.43E-08	5.29E+01	2.59E+06	1.30E-04
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	1.74E-04	6.44E+05	2.59E+06	8.14E-01
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	3.01E-09	1.11E+01	2.59E+06	9.80E-06
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	1.69E-04	6.25E+05	2.59E+06	4.27E-01
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	1.10E-08	4.07E+01	2.59E+06	1.81E-05
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	1.69E-04	6.25E+05	2.59E+06	1.91E-01
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	1.73E-04	6.40E+05	2.59E+06	3.96E-02
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	3.90E-06	1.44E+04	2.59E+06	6.44E-04
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	1.18E-04	4.37E+05	2.59E+06	1.94E-02
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	2.08E-10	7.70E-01	2.59E+06	4.76E-08
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	2.62E-04	9.69E+05	2.59E+06	5.20E-04
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	1.61E-04	5.96E+05	2.59E+06	2.45E-03
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	1.32E-08	4.88E+01	2.59E+06	6.02E-07
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	1.69E-04	6.25E+05	2.59E+06	7.74E-03
													Total	1.83E+01

MPC-68														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	1.38E-10	5.11E-01	2.59E+06	2.60E-06
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	1.35E-08	5.00E+01	2.59E+06	4.92E+00
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	7.09E-08	2.62E+02	2.59E+06	1.78E+00
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.61E-09	5.96E+00	2.59E+06	8.51E-03
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.10E-08	4.07E+01	2.59E+06	1.46E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	7.94E-09	2.94E+01	2.59E+06	2.98E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	4.20E-05	1.55E+05	2.59E+06	1.82E+01
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	2.78E-10	1.03E+00	2.59E+06	1.05E-04
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	2.01E-08	7.44E+01	2.59E+06	3.26E-03
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	4.54E-08	1.68E+02	2.59E+06	1.89E-03
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.47E-14	5.44E-05	2.59E+06	6.13E-10
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	5.23E-07	1.94E+03	2.59E+06	1.53E-02
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	1.17E-03	4.33E+06	2.59E+06	4.69E+01
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	1.90E-03	7.03E+06	2.59E+06	5.05E+01
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	9.78E-10	3.62E+00	2.59E+06	1.30E-05
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	1.52E-07	5.62E+02	2.59E+06	1.38E-03
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	2.17E-03	8.03E+06	2.59E+06	1.02E+01
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	3.21E-08	1.19E+02	2.59E+06	1.04E-04
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	2.11E-03	7.81E+06	2.59E+06	5.33E+00
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	1.38E-07	5.11E+02	2.59E+06	2.27E-04
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	2.11E-03	7.81E+06	2.59E+06	2.38E+00
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	2.17E-03	8.03E+06	2.59E+06	4.97E-01
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	4.87E-05	1.80E+05	2.59E+06	8.05E-03
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	1.47E-03	5.44E+06	2.59E+06	2.42E-01
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	2.03E-09	7.51E+00	2.59E+06	4.65E-07
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	3.27E-03	1.21E+07	2.59E+06	6.49E-03
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	2.01E-03	7.44E+06	2.59E+06	3.06E-02
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	1.65E-07	6.11E+02	2.59E+06	7.52E-06
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	2.12E-03	7.84E+06	2.59E+06	9.70E-02
													Total	1.42E+02

MPC-68														
Accident Conditions														
Committed Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	1.56E-06	5.77E+03	2.59E+06	2.94E-02
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	1.62E-08	5.99E+01	2.59E+06	5.91E+00
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	2.69E-10	9.95E-01	2.59E+06	6.76E-03
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.72E-09	6.36E+00	2.59E+06	9.09E-03
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.11E-08	4.11E+01	2.59E+06	1.47E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	7.93E-09	2.93E+01	2.59E+06	2.98E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	1.24E-11	4.59E-02	2.59E+06	5.38E-06
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	9.52E-12	3.52E-02	2.59E+06	3.59E-06
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	1.98E-14	7.33E-05	2.59E+06	3.21E-09
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.88E-09	6.96E+00	2.59E+06	7.85E-05
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	8.47E-15	3.13E-05	2.59E+06	3.53E-10
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	7.14E-09	2.64E+01	2.59E+06	2.09E-04
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	1.01E-09	3.74E+00	2.59E+06	4.04E-05
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	9.62E-10	3.56E+00	2.59E+06	2.56E-05
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	3.24E-10	1.20E+00	2.59E+06	4.31E-06
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	2.40E-10	8.88E-01	2.59E+06	2.18E-06
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	1.60E-09	5.92E+00	2.59E+06	7.48E-06
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	9.93E-11	3.67E-01	2.59E+06	3.23E-07
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	9.05E-10	3.35E+00	2.59E+06	2.28E-06
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	1.32E-14	4.88E-05	2.59E+06	2.17E-11
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	9.03E-10	3.34E+00	2.59E+06	1.02E-06
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	8.29E-09	3.07E+01	2.59E+06	1.90E-06
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	9.41E-10	3.48E+00	2.59E+06	1.55E-07
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	3.83E-09	1.42E+01	2.59E+06	6.31E-07
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	7.62E-12	2.82E-02	2.59E+06	1.74E-09
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	1.34E-08	4.96E+01	2.59E+06	2.66E-08
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	8.79E-10	3.25E+00	2.59E+06	1.34E-08
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	2.52E-12	9.32E-03	2.59E+06	1.15E-10
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	5.64E-10	2.09E+00	2.59E+06	2.58E-08
													Total	6.40E+00

MPC-68														
Accident Conditions														
Committed Effective Dose Equivalent From Inhalation														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	Breathing Rate (m3/sec)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	CEDE (mRem)
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.30E-04	1.73E-11	6.40E-02	2.59E+06	3.60E-03
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.30E-04	4.69E-08	1.74E+02	2.59E+06	8.84E-04
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	3.30E-04	5.91E-08	2.19E+02	2.59E+06	2.15E+01
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	3.30E-04	3.51E-07	1.30E+03	2.59E+06	8.82E+00
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	3.30E-04	1.29E-07	4.77E+02	2.59E+06	6.82E-01
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	3.30E-04	1.25E-08	4.63E+01	2.59E+06	1.65E-01
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	3.30E-04	8.63E-09	3.19E+01	2.59E+06	3.24E-01
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	3.30E-04	2.23E-06	8.25E+03	2.59E+06	9.68E-01
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	3.30E-04	2.13E-09	7.88E+00	2.59E+06	8.03E-04
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	3.30E-04	1.06E-08	3.92E+01	2.59E+06	1.72E-03
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	5.84E-08	2.16E+02	2.59E+06	2.44E-03
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	3.30E-04	1.17E-11	4.33E-02	2.59E+06	4.88E-07
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	3.30E-04	7.73E-08	2.86E+02	2.59E+06	2.26E-03
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.30E-04	6.70E-05	2.48E+05	2.59E+06	2.68E+00
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	3.30E-04	1.06E-04	3.92E+05	2.59E+06	2.82E+00
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.30E-04	3.30E-09	1.22E+01	2.59E+06	4.39E-05
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.30E-04	1.12E-08	4.14E+01	2.59E+06	1.02E-04
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	3.30E-04	1.20E-04	4.44E+05	2.59E+06	5.61E-01
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	3.30E-04	1.52E-09	5.62E+00	2.59E+06	4.95E-06
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.30E-04	1.16E-04	4.29E+05	2.59E+06	2.93E-01
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.30E-04	8.10E-09	3.00E+01	2.59E+06	1.33E-05
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.30E-04	1.16E-04	4.29E+05	2.59E+06	1.31E-01
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.30E-04	0.00E+00	0.00E+00	2.59E+06	0.00E+00
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	1.19E-04	4.40E+05	2.59E+06	2.72E-02
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	3.30E-04	4.67E-06	1.73E+04	2.59E+06	7.72E-04
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	3.30E-04	8.30E-05	3.07E+05	2.59E+06	1.37E-02
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	3.30E-04	6.78E-10	2.51E+00	2.59E+06	1.55E-07
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.30E-04	1.46E-04	5.40E+05	2.59E+06	2.90E-04
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.30E-04	1.11E-04	4.11E+05	2.59E+06	1.69E-03
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	3.30E-04	1.58E-08	5.85E+01	2.59E+06	7.21E-07
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.30E-04	1.15E-04	4.26E+05	2.59E+06	5.26E-03
													Total	3.91E+01

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	4.83E-16	1.79E-06	3.15E+07	9.62E-11	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.17E-16	4.33E-07	3.15E+07	4.24E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.23E-13	4.55E-04	3.15E+07	2.84E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	7.78E-18	2.88E-08	3.15E+07	2.07E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	7.40E-14	2.74E-04	3.15E+07	1.04E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	7.96E-18	2.95E-08	3.15E+07	3.16E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	7.19E-20	2.66E-10	3.15E+07	3.30E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	1.89E-16	6.99E-07	3.15E+07	7.53E-10	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	7.48E-19	2.77E-09	3.15E+07	1.28E-12	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	8.53E-16	3.16E-06	3.15E+07	3.76E-10	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	1.90E-15	7.03E-06	3.15E+07	8.38E-10	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	6.00E-14	2.22E-04	3.15E+07	1.86E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	6.90E-18	2.55E-08	3.15E+07	2.92E-12	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	6.56E-18	2.43E-08	3.15E+07	1.84E-12	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	1.98E-14	7.33E-05	3.15E+07	2.79E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	2.49E-15	9.21E-06	3.15E+07	2.40E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	8.58E-16	3.17E-06	3.15E+07	4.24E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	5.96E-16	2.21E-06	3.15E+07	2.05E-11	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	6.36E-18	2.35E-08	3.15E+07	1.70E-13	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	5.20E-20	1.92E-10	3.15E+07	9.02E-16	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	4.84E-18	1.79E-08	3.15E+07	5.77E-14	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	2.82E-14	1.04E-04	3.15E+07	1.59E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.01E-14	3.74E-05	3.15E+07	8.46E-09	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	3.25E-16	1.20E-06	3.15E+07	2.01E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	2.19E-15	8.10E-06	3.15E+07	5.30E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	7.83E-18	2.90E-08	3.15E+07	1.37E-14	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	5.77E-15	2.13E-05	3.15E+07	1.00E-11	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	7.53E-15	2.79E-05	3.15E+07	1.82E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	1.04E-15	3.85E-06	3.15E+07	2.18E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	5.34E-18	1.98E-08	3.15E+07	8.58E-16	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	6.09E-16	2.25E-06	3.15E+07	2.93E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.80E-17	1.41E-07	3.15E+07	1.84E-14	
													Total	2.86E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	6.66E-16	2.46E-06	3.15E+07	1.33E-10	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.34E-16	4.96E-07	3.15E+07	4.86E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.39E-13	5.14E-04	3.15E+07	3.21E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	9.49E-18	3.51E-08	3.15E+07	2.52E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	8.43E-14	3.12E-04	3.15E+07	1.18E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	9.67E-18	3.58E-08	3.15E+07	3.84E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	8.67E-20	3.21E-10	3.15E+07	3.98E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	2.20E-16	8.14E-07	3.15E+07	8.76E-10	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	9.56E-19	3.54E-09	3.15E+07	1.64E-12	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	1.01E-15	3.74E-06	3.15E+07	4.45E-10	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	2.15E-15	7.96E-06	3.15E+07	9.48E-10	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	6.81E-14	2.52E-04	3.15E+07	2.11E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	1.33E-17	4.92E-08	3.15E+07	5.63E-12	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	1.27E-17	4.70E-08	3.15E+07	3.57E-12	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	2.27E-14	8.40E-05	3.15E+07	3.19E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	2.95E-15	1.09E-05	3.15E+07	2.84E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	1.07E-15	3.96E-06	3.15E+07	5.29E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	8.48E-16	3.14E-06	3.15E+07	2.92E-11	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	1.23E-17	4.55E-08	3.15E+07	3.28E-13	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	8.80E-20	3.26E-10	3.15E+07	1.53E-15	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	7.55E-18	2.79E-08	3.15E+07	9.00E-14	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.22E-14	1.19E-04	3.15E+07	1.82E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.16E-14	4.29E-05	3.15E+07	9.72E-09	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	4.20E-16	1.55E-06	3.15E+07	2.60E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	2.61E-15	9.66E-06	3.15E+07	6.31E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	1.48E-17	5.48E-08	3.15E+07	2.58E-14	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	6.68E-15	2.47E-05	3.15E+07	1.16E-11	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	8.73E-15	3.23E-05	3.15E+07	2.11E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	1.26E-15	4.66E-06	3.15E+07	2.64E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	1.03E-17	3.81E-08	3.15E+07	1.66E-15	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	7.30E-16	2.70E-06	3.15E+07	3.52E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	6.01E-17	2.22E-07	3.15E+07	2.91E-14	
													Total	3.23E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	2.75E-18	1.02E-08	3.15E+07	6.05E-09	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	2.14E-16	7.92E-07	3.15E+07	4.26E-11	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.14E-16	4.22E-07	3.15E+07	4.14E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.24E-13	4.59E-04	3.15E+07	2.87E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	6.44E-18	2.38E-08	3.15E+07	1.71E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	7.37E-14	2.73E-04	3.15E+07	1.03E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	6.68E-18	2.47E-08	3.15E+07	2.65E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	6.48E-20	2.40E-10	3.15E+07	2.97E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	1.77E-16	6.55E-07	3.15E+07	7.05E-10	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	5.45E-19	2.02E-09	3.15E+07	9.33E-13	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	7.69E-16	2.85E-06	3.15E+07	3.39E-10	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	1.90E-15	7.03E-06	3.15E+07	8.38E-10	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	5.99E-14	2.22E-04	3.15E+07	1.85E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	7.08E-19	2.62E-09	3.15E+07	3.00E-13	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	1.06E-18	3.92E-09	3.15E+07	2.98E-13	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	1.95E-14	7.22E-05	3.15E+07	2.74E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	2.22E-15	8.21E-06	3.15E+07	2.14E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	6.74E-16	2.49E-06	3.15E+07	3.33E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	2.23E-16	8.25E-07	3.15E+07	7.67E-12	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	1.09E-18	4.03E-09	3.15E+07	2.91E-14	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	7.08E-21	2.62E-11	3.15E+07	1.23E-16	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	2.65E-18	9.81E-09	3.15E+07	3.16E-14	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	2.80E-14	1.04E-04	3.15E+07	1.58E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.01E-14	3.74E-05	3.15E+07	8.46E-09	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	2.00E-16	7.40E-07	3.15E+07	1.24E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	1.92E-15	7.10E-06	3.15E+07	4.64E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	1.13E-18	4.18E-09	3.15E+07	1.97E-15	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	5.50E-15	2.04E-05	3.15E+07	9.58E-12	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	7.18E-15	2.66E-05	3.15E+07	1.74E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	9.02E-16	3.34E-06	3.15E+07	1.89E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	9.69E-19	3.59E-09	3.15E+07	1.56E-16	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	5.51E-16	2.04E-06	3.15E+07	2.66E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	1.72E-17	6.36E-08	3.15E+07	8.32E-15	
													Total	2.88E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	1.64E-16	6.07E-07	3.15E+07	3.27E-11	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.09E-16	4.03E-07	3.15E+07	3.95E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.23E-13	4.55E-04	3.15E+07	2.84E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	5.44E-18	2.01E-08	3.15E+07	1.44E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	7.19E-14	2.66E-04	3.15E+07	1.01E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	5.70E-18	2.11E-08	3.15E+07	2.26E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	5.63E-20	2.08E-10	3.15E+07	2.58E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	1.62E-16	5.99E-07	3.15E+07	6.45E-10	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	4.46E-19	1.65E-09	3.15E+07	7.64E-13	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	6.68E-16	2.47E-06	3.15E+07	2.95E-10	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	1.87E-15	6.92E-06	3.15E+07	8.25E-10	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	5.87E-14	2.17E-04	3.15E+07	1.82E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	1.46E-18	5.40E-09	3.15E+07	6.18E-13	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	1.68E-18	6.22E-09	3.15E+07	4.72E-13	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	1.87E-14	6.92E-05	3.15E+07	2.63E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	1.85E-15	6.85E-06	3.15E+07	1.78E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	5.21E-16	1.93E-06	3.15E+07	2.58E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	1.86E-16	6.88E-07	3.15E+07	6.40E-12	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	1.65E-18	6.11E-09	3.15E+07	4.40E-14	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	1.13E-20	4.18E-11	3.15E+07	1.96E-16	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	2.67E-18	9.88E-09	3.15E+07	3.18E-14	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	2.73E-14	1.01E-04	3.15E+07	1.54E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	9.75E-15	3.61E-05	3.15E+07	8.17E-09	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	1.56E-16	5.77E-07	3.15E+07	9.65E-13	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	1.55E-15	5.74E-06	3.15E+07	3.75E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	1.89E-18	6.99E-09	3.15E+07	3.30E-15	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	5.00E-15	1.85E-05	3.15E+07	8.70E-12	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	6.50E-15	2.41E-05	3.15E+07	1.57E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	7.69E-16	2.85E-06	3.15E+07	1.61E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	1.43E-18	5.29E-09	3.15E+07	2.30E-16	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	4.77E-16	1.76E-06	3.15E+07	2.30E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	1.72E-17	6.36E-08	3.15E+07	8.32E-15	
													Total	2.86E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	2.19E-10	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	2.20E-16	8.14E-07	3.15E+07	7.98E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.78E-13	6.59E-04	3.15E+07	4.11E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	2.28E-17	8.44E-08	3.15E+07	6.05E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	1.20E-13	4.44E-04	3.15E+07	1.68E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	2.29E-17	8.47E-08	3.15E+07	9.09E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	2.19E-19	8.10E-10	3.15E+07	1.00E-12	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	4.44E-16	1.64E-06	3.15E+07	1.77E-09	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	2.18E-18	8.07E-09	3.15E+07	3.73E-12	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	2.49E-15	9.21E-06	3.15E+07	1.10E-09	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	2.99E-15	1.11E-05	3.15E+07	1.32E-09	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	9.43E-14	3.49E-04	3.15E+07	2.92E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	8.82E-18	3.26E-08	3.15E+07	3.73E-12	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	9.30E-18	3.44E-08	3.15E+07	2.61E-12	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	3.53E-14	1.31E-04	3.15E+07	4.97E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	8.09E-15	2.99E-05	3.15E+07	7.78E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	2.87E-15	1.06E-05	3.15E+07	1.42E-10	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	1.22E-15	4.51E-06	3.15E+07	4.20E-11	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	9.26E-18	3.43E-08	3.15E+07	2.47E-13	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	7.09E-20	2.62E-10	3.15E+07	1.23E-15	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	9.47E-18	3.50E-08	3.15E+07	1.13E-13	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	4.63E-14	1.71E-04	3.15E+07	2.61E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.72E-14	6.36E-05	3.15E+07	1.44E-08	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	8.16E-16	3.02E-06	3.15E+07	5.05E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	7.47E-15	2.76E-05	3.15E+07	1.81E-11	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	1.06E-17	3.92E-08	3.15E+07	1.85E-14	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	1.50E-14	5.55E-05	3.15E+07	2.61E-11	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	2.00E-14	7.40E-05	3.15E+07	4.84E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	3.20E-15	1.18E-05	3.15E+07	6.71E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	7.90E-18	2.92E-08	3.15E+07	1.27E-15	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	1.88E-15	6.96E-06	3.15E+07	9.06E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	7.94E-17	2.94E-07	3.15E+07	3.84E-14	
													Total	4.14E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.86E-16	1.43E-06	3.15E+07	7.69E-11	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.18E-16	4.37E-07	3.15E+07	4.28E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.27E-13	4.70E-04	3.15E+07	2.94E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	7.33E-18	2.71E-08	3.15E+07	1.95E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	7.57E-14	2.80E-04	3.15E+07	1.06E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	7.55E-18	2.79E-08	3.15E+07	3.00E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	6.98E-20	2.58E-10	3.15E+07	3.20E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	1.87E-16	6.92E-07	3.15E+07	7.45E-10	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	6.75E-19	2.50E-09	3.15E+07	1.16E-12	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	8.33E-16	3.08E-06	3.15E+07	3.67E-10	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	1.95E-15	7.22E-06	3.15E+07	8.60E-10	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	6.15E-14	2.28E-04	3.15E+07	1.90E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	4.19E-18	1.55E-08	3.15E+07	1.77E-12	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	4.01E-18	1.48E-08	3.15E+07	1.13E-12	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	2.01E-14	7.44E-05	3.15E+07	2.83E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	2.41E-15	8.92E-06	3.15E+07	2.32E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	7.83E-16	2.90E-06	3.15E+07	3.87E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	4.64E-16	1.72E-06	3.15E+07	1.60E-11	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.92E-18	1.45E-08	3.15E+07	1.05E-13	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.58E-20	1.32E-10	3.15E+07	6.21E-16	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	3.88E-18	1.44E-08	3.15E+07	4.62E-14	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	2.88E-14	1.07E-04	3.15E+07	1.62E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.03E-14	3.81E-05	3.15E+07	8.63E-09	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	2.81E-16	1.04E-06	3.15E+07	1.74E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	2.09E-15	7.73E-06	3.15E+07	5.05E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	4.91E-18	1.82E-08	3.15E+07	8.57E-15	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	5.76E-15	2.13E-05	3.15E+07	1.00E-11	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	7.52E-15	2.78E-05	3.15E+07	1.82E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	9.94E-16	3.68E-06	3.15E+07	2.09E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.32E-18	1.23E-08	3.15E+07	5.34E-16	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	5.94E-16	2.20E-06	3.15E+07	2.86E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	2.95E-17	1.09E-07	3.15E+07	1.43E-14	
													Total	2.95E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	3.31E-19	1.22E-09	3.15E+07	7.28E-10	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	3.80E-16	1.41E-06	3.15E+07	7.57E-11	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.19E-16	4.40E-07	3.15E+07	4.32E-06	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.26E-13	4.66E-04	3.15E+07	2.91E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	7.53E-18	2.79E-08	3.15E+07	2.00E-09	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	7.57E-14	2.80E-04	3.15E+07	1.06E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	7.74E-18	2.86E-08	3.15E+07	3.07E-09	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	7.25E-20	2.68E-10	3.15E+07	3.33E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	1.90E-16	7.03E-07	3.15E+07	7.57E-10	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	6.93E-19	2.56E-09	3.15E+07	1.19E-12	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	8.53E-16	3.16E-06	3.15E+07	3.76E-10	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	1.95E-15	7.22E-06	3.15E+07	8.60E-10	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	6.14E-14	2.27E-04	3.15E+07	1.90E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	4.91E-18	1.82E-08	3.15E+07	2.08E-12	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	4.88E-18	1.81E-08	3.15E+07	1.37E-12	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	2.02E-14	7.47E-05	3.15E+07	2.84E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	2.49E-15	9.21E-06	3.15E+07	2.40E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	8.18E-16	3.03E-06	3.15E+07	4.04E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	4.53E-16	1.68E-06	3.15E+07	1.56E-11	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	4.75E-18	1.76E-08	3.15E+07	1.27E-13	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	3.61E-20	1.34E-10	3.15E+07	6.27E-16	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	4.24E-18	1.57E-08	3.15E+07	5.05E-14	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	2.88E-14	1.07E-04	3.15E+07	1.62E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.04E-14	3.85E-05	3.15E+07	8.71E-09	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	2.79E-16	1.03E-06	3.15E+07	1.73E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	2.18E-15	8.07E-06	3.15E+07	5.27E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	5.69E-18	2.11E-08	3.15E+07	9.94E-15	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	5.88E-15	2.18E-05	3.15E+07	1.02E-11	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	7.69E-15	2.85E-05	3.15E+07	1.86E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	1.03E-15	3.81E-06	3.15E+07	2.16E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	4.01E-18	1.48E-08	3.15E+07	6.45E-16	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	6.15E-16	2.28E-06	3.15E+07	2.96E-13	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	3.17E-17	1.17E-07	3.15E+07	1.53E-14	
													Total	2.93E-03	

MPC-68															
Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{nor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	SDE (mRem)	
									Gases						
H 3	1.24E+02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.18E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.07E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	2.19E-10	
KR 85	2.04E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	1.95E-09	1.60E-04	1.32E-14	4.88E-05	3.15E+07	4.79E-04	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.45E-13	5.37E-04	3.15E+07	3.35E-03	
									Volatiles						
SR 90	2.24E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.42E-11	1.60E-04	9.20E-15	3.40E-05	3.15E+07	2.44E-06	
RU106	4.71E+03	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.99E-12	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	7.50E-12	1.60E-04	9.45E-14	3.50E-04	3.15E+07	1.32E-05	
CS137	3.35E+04	2.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	2.13E-11	1.60E-04	8.63E-15	3.19E-05	3.15E+07	3.43E-06	
									Fines						
PU241	2.58E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.46E-13	1.60E-04	1.17E-19	4.33E-10	3.15E+07	5.37E-13	
Y 90	2.24E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.14E-13	1.60E-04	6.24E-14	2.31E-04	3.15E+07	2.49E-07	
PM147	9.63E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.18E-14	1.60E-04	8.11E-16	3.00E-06	3.15E+07	1.39E-09	
CE144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	2.93E-15	1.08E-05	3.15E+07	1.29E-09	
PR144	2.48E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.36E-14	1.60E-04	8.43E-14	3.12E-04	3.15E+07	3.72E-08	
EU154	1.74E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.66E-14	1.60E-04	8.29E-14	3.07E-04	3.15E+07	2.57E-08	
CM244	2.38E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.27E-14	1.60E-04	3.91E-17	1.45E-07	3.15E+07	1.65E-11	
PU238	1.58E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.51E-14	1.60E-04	4.09E-17	1.51E-07	3.15E+07	1.15E-11	
SB125	7.91E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.54E-15	1.60E-04	2.65E-14	9.81E-05	3.15E+07	3.73E-09	
EU155	5.41E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.16E-15	1.60E-04	3.39E-15	1.25E-05	3.15E+07	3.26E-10	
AM241	2.78E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.65E-15	1.60E-04	1.28E-15	4.74E-06	3.15E+07	6.33E-11	
TE125M	1.93E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.84E-15	1.60E-04	1.94E-15	7.18E-06	3.15E+07	6.67E-11	
PU240	1.50E+02	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.43E-15	1.60E-04	3.92E-17	1.45E-07	3.15E+07	1.05E-12	
SM151	9.76E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.31E-16	1.60E-04	1.90E-19	7.03E-10	3.15E+07	3.30E-15	
PU239	6.70E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.39E-16	1.60E-04	1.86E-17	6.88E-08	3.15E+07	2.22E-13	
BA137M	3.17E+04	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.02E-13	1.60E-04	3.73E-14	1.38E-04	3.15E+07	2.10E-07	
RH106	4.71E+03	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.49E-14	1.60E-04	1.09E-13	4.03E-04	3.15E+07	9.13E-08	
PR144M	3.48E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.32E-16	1.60E-04	5.08E-16	1.88E-06	3.15E+07	3.14E-12	
AM243	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	2.75E-15	1.02E-05	3.15E+07	6.65E-12	
CM242	9.82E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.36E-17	1.60E-04	4.29E-17	1.59E-07	3.15E+07	7.49E-14	
CM243	9.79E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.34E-17	1.60E-04	9.79E-15	3.62E-05	3.15E+07	1.70E-11	
NP239	1.36E+01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.30E-16	1.60E-04	1.60E-14	5.92E-05	3.15E+07	3.87E-11	
NP237	1.18E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-18	1.60E-04	1.54E-15	5.70E-06	3.15E+07	3.23E-14	
PU242	9.04E-01	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.62E-18	1.60E-04	3.27E-17	1.21E-07	3.15E+07	5.26E-15	
AM242	2.71E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.58E-17	1.60E-04	8.20E-15	3.03E-05	3.15E+07	3.95E-12	
AM242M	2.72E+00	2.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.59E-17	1.60E-04	1.36E-16	5.03E-07	3.15E+07	6.58E-14	
													Total	3.85E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	4.83E-16	1.79E-06	3.15E+07	4.43E-10	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.17E-16	4.33E-07	3.15E+07	1.95E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.23E-13	4.55E-04	3.15E+07	2.84E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	7.78E-18	2.88E-08	3.15E+07	9.50E-09	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	7.40E-14	2.74E-04	3.15E+07	4.76E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	7.96E-18	2.95E-08	3.15E+07	1.45E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	7.19E-20	2.66E-10	3.15E+07	1.52E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	1.89E-16	6.99E-07	3.15E+07	3.46E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	7.48E-19	2.77E-09	3.15E+07	5.89E-12	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	8.53E-16	3.16E-06	3.15E+07	1.73E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	1.90E-15	7.03E-06	3.15E+07	3.85E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	6.00E-14	2.22E-04	3.15E+07	8.54E-08	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	6.90E-18	2.55E-08	3.15E+07	1.34E-11	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	6.56E-18	2.43E-08	3.15E+07	8.48E-12	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	1.98E-14	7.33E-05	3.15E+07	1.28E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	2.49E-15	9.21E-06	3.15E+07	1.10E-09	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	8.58E-16	3.17E-06	3.15E+07	1.95E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	5.96E-16	2.21E-06	3.15E+07	9.43E-11	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	6.36E-18	2.35E-08	3.15E+07	7.80E-13	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	5.20E-20	1.92E-10	3.15E+07	4.15E-15	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	4.84E-18	1.79E-08	3.15E+07	2.65E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	2.82E-14	1.04E-04	3.15E+07	7.31E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.01E-14	3.74E-05	3.15E+07	3.89E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	3.25E-16	1.20E-06	3.15E+07	9.25E-12	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	2.19E-15	8.10E-06	3.15E+07	2.44E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	7.83E-18	2.90E-08	3.15E+07	6.29E-14	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	5.77E-15	2.13E-05	3.15E+07	4.62E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	7.53E-15	2.79E-05	3.15E+07	8.38E-11	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	1.04E-15	3.85E-06	3.15E+07	1.00E-13	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	5.34E-18	1.98E-08	3.15E+07	3.95E-15	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	6.09E-16	2.25E-06	3.15E+07	1.35E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.80E-17	1.41E-07	3.15E+07	8.45E-14	
													Total	2.91E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	6.66E-16	2.46E-06	3.15E+07	6.10E-10	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.34E-16	4.96E-07	3.15E+07	2.24E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.39E-13	5.14E-04	3.15E+07	3.21E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	9.49E-18	3.51E-08	3.15E+07	1.16E-08	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	8.43E-14	3.12E-04	3.15E+07	5.42E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	9.67E-18	3.58E-08	3.15E+07	1.77E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	8.67E-20	3.21E-10	3.15E+07	1.83E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	2.20E-16	8.14E-07	3.15E+07	4.03E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	9.56E-19	3.54E-09	3.15E+07	7.53E-12	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	1.01E-15	3.74E-06	3.15E+07	2.05E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	2.15E-15	7.96E-06	3.15E+07	4.36E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	6.81E-14	2.52E-04	3.15E+07	9.69E-08	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	1.33E-17	4.92E-08	3.15E+07	2.59E-11	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	1.27E-17	4.70E-08	3.15E+07	1.64E-11	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	2.27E-14	8.40E-05	3.15E+07	1.47E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	2.95E-15	1.09E-05	3.15E+07	1.31E-09	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	1.07E-15	3.96E-06	3.15E+07	2.43E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	8.48E-16	3.14E-06	3.15E+07	1.34E-10	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	1.23E-17	4.55E-08	3.15E+07	1.51E-12	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	8.80E-20	3.26E-10	3.15E+07	7.03E-15	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	7.55E-18	2.79E-08	3.15E+07	4.14E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.22E-14	1.19E-04	3.15E+07	8.35E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.16E-14	4.29E-05	3.15E+07	4.47E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	4.20E-16	1.55E-06	3.15E+07	1.20E-11	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	2.61E-15	9.66E-06	3.15E+07	2.90E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	1.48E-17	5.48E-08	3.15E+07	1.19E-13	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	6.68E-15	2.47E-05	3.15E+07	5.35E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	8.73E-15	3.23E-05	3.15E+07	9.71E-11	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	1.26E-15	4.66E-06	3.15E+07	1.22E-13	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	1.03E-17	3.81E-08	3.15E+07	7.62E-15	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	7.30E-16	2.70E-06	3.15E+07	1.62E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	6.01E-17	2.22E-07	3.15E+07	1.34E-13	
													Total	3.29E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	2.75E-18	1.02E-08	3.15E+07	2.78E-08	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	2.14E-16	7.92E-07	3.15E+07	1.96E-10	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.14E-16	4.22E-07	3.15E+07	1.90E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.24E-13	4.59E-04	3.15E+07	2.87E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	6.44E-18	2.38E-08	3.15E+07	7.87E-09	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	7.37E-14	2.73E-04	3.15E+07	4.74E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	6.68E-18	2.47E-08	3.15E+07	1.22E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	6.48E-20	2.40E-10	3.15E+07	1.37E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	1.77E-16	6.55E-07	3.15E+07	3.24E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	5.45E-19	2.02E-09	3.15E+07	4.29E-12	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	7.69E-16	2.85E-06	3.15E+07	1.56E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	1.90E-15	7.03E-06	3.15E+07	3.85E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	5.99E-14	2.22E-04	3.15E+07	8.53E-08	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	7.08E-19	2.62E-09	3.15E+07	1.38E-12	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	1.06E-18	3.92E-09	3.15E+07	1.37E-12	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	1.95E-14	7.22E-05	3.15E+07	1.26E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	2.22E-15	8.21E-06	3.15E+07	9.82E-10	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	6.74E-16	2.49E-06	3.15E+07	1.53E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	2.23E-16	8.25E-07	3.15E+07	3.53E-11	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	1.09E-18	4.03E-09	3.15E+07	1.34E-13	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	7.08E-21	2.62E-11	3.15E+07	5.65E-16	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	2.65E-18	9.81E-09	3.15E+07	1.45E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	2.80E-14	1.04E-04	3.15E+07	7.26E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.01E-14	3.74E-05	3.15E+07	3.89E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	2.00E-16	7.40E-07	3.15E+07	5.69E-12	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	1.92E-15	7.10E-06	3.15E+07	2.14E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	1.13E-18	4.18E-09	3.15E+07	9.08E-15	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	5.50E-15	2.04E-05	3.15E+07	4.40E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	7.18E-15	2.66E-05	3.15E+07	7.99E-11	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	9.02E-16	3.34E-06	3.15E+07	8.71E-14	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	9.69E-19	3.59E-09	3.15E+07	7.17E-16	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	5.51E-16	2.04E-06	3.15E+07	1.22E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	1.72E-17	6.36E-08	3.15E+07	3.83E-14	
													Total	2.93E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	1.64E-16	6.07E-07	3.15E+07	1.50E-10	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.09E-16	4.03E-07	3.15E+07	1.82E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.23E-13	4.55E-04	3.15E+07	2.84E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	5.44E-18	2.01E-08	3.15E+07	6.65E-09	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	7.19E-14	2.66E-04	3.15E+07	4.63E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	5.70E-18	2.11E-08	3.15E+07	1.04E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	5.63E-20	2.08E-10	3.15E+07	1.19E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	1.62E-16	5.99E-07	3.15E+07	2.97E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	4.46E-19	1.65E-09	3.15E+07	3.51E-12	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	6.68E-16	2.47E-06	3.15E+07	1.36E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	1.87E-15	6.92E-06	3.15E+07	3.79E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	5.87E-14	2.17E-04	3.15E+07	8.35E-08	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	1.46E-18	5.40E-09	3.15E+07	2.84E-12	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	1.68E-18	6.22E-09	3.15E+07	2.17E-12	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	1.87E-14	6.92E-05	3.15E+07	1.21E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	1.85E-15	6.85E-06	3.15E+07	8.19E-10	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	5.21E-16	1.93E-06	3.15E+07	1.18E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	1.86E-16	6.88E-07	3.15E+07	2.94E-11	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	1.65E-18	6.11E-09	3.15E+07	2.02E-13	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	1.13E-20	4.18E-11	3.15E+07	9.02E-16	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	2.67E-18	9.88E-09	3.15E+07	1.46E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	2.73E-14	1.01E-04	3.15E+07	7.08E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	9.75E-15	3.61E-05	3.15E+07	3.76E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	1.56E-16	5.77E-07	3.15E+07	4.44E-12	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	1.55E-15	5.74E-06	3.15E+07	1.72E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	1.89E-18	6.99E-09	3.15E+07	1.52E-14	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	5.00E-15	1.85E-05	3.15E+07	4.00E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	6.50E-15	2.41E-05	3.15E+07	7.23E-11	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	7.69E-16	2.85E-06	3.15E+07	7.42E-14	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	1.43E-18	5.29E-09	3.15E+07	1.06E-15	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	4.77E-16	1.76E-06	3.15E+07	1.06E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	1.72E-17	6.36E-08	3.15E+07	3.83E-14	
													Total	2.91E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	1.01E-09	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	2.20E-16	8.14E-07	3.15E+07	3.67E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.78E-13	6.59E-04	3.15E+07	4.11E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	2.28E-17	8.44E-08	3.15E+07	2.79E-08	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	1.20E-13	4.44E-04	3.15E+07	7.72E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	2.29E-17	8.47E-08	3.15E+07	4.18E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	2.19E-19	8.10E-10	3.15E+07	4.62E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	4.44E-16	1.64E-06	3.15E+07	8.14E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	2.18E-18	8.07E-09	3.15E+07	1.72E-11	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	2.49E-15	9.21E-06	3.15E+07	5.05E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	2.99E-15	1.11E-05	3.15E+07	6.07E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	9.43E-14	3.49E-04	3.15E+07	1.34E-07	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	8.82E-18	3.26E-08	3.15E+07	1.72E-11	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	9.30E-18	3.44E-08	3.15E+07	1.20E-11	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	3.53E-14	1.31E-04	3.15E+07	2.28E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	8.09E-15	2.99E-05	3.15E+07	3.58E-09	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	2.87E-15	1.06E-05	3.15E+07	6.53E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	1.22E-15	4.51E-06	3.15E+07	1.93E-10	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	9.26E-18	3.43E-08	3.15E+07	1.14E-12	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	7.09E-20	2.62E-10	3.15E+07	5.66E-15	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	9.47E-18	3.50E-08	3.15E+07	5.19E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	4.63E-14	1.71E-04	3.15E+07	1.20E-06	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.72E-14	6.36E-05	3.15E+07	6.63E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	8.16E-16	3.02E-06	3.15E+07	2.32E-11	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	7.47E-15	2.76E-05	3.15E+07	8.31E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	1.06E-17	3.92E-08	3.15E+07	8.51E-14	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	1.50E-14	5.55E-05	3.15E+07	1.20E-10	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	2.00E-14	7.40E-05	3.15E+07	2.22E-10	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	3.20E-15	1.18E-05	3.15E+07	3.09E-13	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	7.90E-18	2.92E-08	3.15E+07	5.84E-15	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	1.88E-15	6.96E-06	3.15E+07	4.17E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	7.94E-17	2.94E-07	3.15E+07	1.77E-13	
													Total	4.23E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.86E-16	1.43E-06	3.15E+07	3.54E-10	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.18E-16	4.37E-07	3.15E+07	1.97E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.27E-13	4.70E-04	3.15E+07	2.94E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	7.33E-18	2.71E-08	3.15E+07	8.95E-09	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	7.57E-14	2.80E-04	3.15E+07	4.87E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	7.55E-18	2.79E-08	3.15E+07	1.38E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	6.98E-20	2.58E-10	3.15E+07	1.47E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	1.87E-16	6.92E-07	3.15E+07	3.43E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	6.75E-19	2.50E-09	3.15E+07	5.32E-12	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	8.33E-16	3.08E-06	3.15E+07	1.69E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	1.95E-15	7.22E-06	3.15E+07	3.96E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	6.15E-14	2.28E-04	3.15E+07	8.75E-08	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	4.19E-18	1.55E-08	3.15E+07	8.16E-12	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	4.01E-18	1.48E-08	3.15E+07	5.18E-12	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	2.01E-14	7.44E-05	3.15E+07	1.30E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	2.41E-15	8.92E-06	3.15E+07	1.07E-09	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	7.83E-16	2.90E-06	3.15E+07	1.78E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	4.64E-16	1.72E-06	3.15E+07	7.34E-11	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.92E-18	1.45E-08	3.15E+07	4.81E-13	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.58E-20	1.32E-10	3.15E+07	2.86E-15	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	3.88E-18	1.44E-08	3.15E+07	2.13E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	2.88E-14	1.07E-04	3.15E+07	7.47E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.03E-14	3.81E-05	3.15E+07	3.97E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	2.81E-16	1.04E-06	3.15E+07	8.00E-12	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	2.09E-15	7.73E-06	3.15E+07	2.33E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	4.91E-18	1.82E-08	3.15E+07	3.94E-14	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	5.76E-15	2.13E-05	3.15E+07	4.61E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	7.52E-15	2.78E-05	3.15E+07	8.37E-11	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	9.94E-16	3.68E-06	3.15E+07	9.59E-14	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.32E-18	1.23E-08	3.15E+07	2.46E-15	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	5.94E-16	2.20E-06	3.15E+07	1.32E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	2.95E-17	1.09E-07	3.15E+07	6.56E-14	
													Total	3.01E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	3.31E-19	1.22E-09	3.15E+07	3.35E-09	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	3.80E-16	1.41E-06	3.15E+07	3.48E-10	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.19E-16	4.40E-07	3.15E+07	1.99E-05	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.26E-13	4.66E-04	3.15E+07	2.91E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	7.53E-18	2.79E-08	3.15E+07	9.20E-09	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	7.57E-14	2.80E-04	3.15E+07	4.87E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	7.74E-18	2.86E-08	3.15E+07	1.41E-08	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	7.25E-20	2.68E-10	3.15E+07	1.53E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	1.90E-16	7.03E-07	3.15E+07	3.48E-09	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	6.93E-19	2.56E-09	3.15E+07	5.46E-12	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	8.53E-16	3.16E-06	3.15E+07	1.73E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	1.95E-15	7.22E-06	3.15E+07	3.96E-09	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	6.14E-14	2.27E-04	3.15E+07	8.74E-08	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	4.91E-18	1.82E-08	3.15E+07	9.56E-12	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	4.88E-18	1.81E-08	3.15E+07	6.31E-12	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	2.02E-14	7.47E-05	3.15E+07	1.31E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	2.49E-15	9.21E-06	3.15E+07	1.10E-09	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	8.18E-16	3.03E-06	3.15E+07	1.86E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	4.53E-16	1.68E-06	3.15E+07	7.17E-11	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	4.75E-18	1.76E-08	3.15E+07	5.83E-13	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	3.61E-20	1.34E-10	3.15E+07	2.88E-15	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	4.24E-18	1.57E-08	3.15E+07	2.32E-13	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	2.88E-14	1.07E-04	3.15E+07	7.47E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.04E-14	3.85E-05	3.15E+07	4.01E-08	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	2.79E-16	1.03E-06	3.15E+07	7.94E-12	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	2.18E-15	8.07E-06	3.15E+07	2.43E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	5.69E-18	2.11E-08	3.15E+07	4.57E-14	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	5.88E-15	2.18E-05	3.15E+07	4.71E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	7.69E-15	2.85E-05	3.15E+07	8.55E-11	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	1.03E-15	3.81E-06	3.15E+07	9.94E-14	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	4.01E-18	1.48E-08	3.15E+07	2.97E-15	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	6.15E-16	2.28E-06	3.15E+07	1.36E-12	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	3.17E-17	1.17E-07	3.15E+07	7.05E-14	
													Total	2.98E-03	

MPC-68															
Off-Normal Conditions															
Effective Dose Equivalent From Submersion															
Nuclide	Inventory (Ci/Assy)	% available for release	% remain airborne	No. Assy	MPC Vol (cm3)	L_{offnor} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	SDE (mRem)	
									Gases						
H 3	1.24E+02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	5.43E-10	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
I129	1.12E-02	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	4.91E-14	1.60E-04	1.10E-15	4.07E-06	3.15E+07	1.01E-09	
KR 85	2.04E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.30	8.95E-09	1.60E-04	1.32E-14	4.88E-05	3.15E+07	2.20E-03	
									Crud						
Co-60	6.50E+01	100.0%	100%	68	5.99E+06	1.12E-05	1.87E-12	0.15	1.24E-09	1.60E-04	1.45E-13	5.37E-04	3.15E+07	3.35E-03	
									Volatiles						
SR 90	2.24E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	6.55E-11	1.60E-04	9.20E-15	3.40E-05	3.15E+07	1.12E-05	
RU106	4.71E+03	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	1.38E-11	1.60E-04	0.00E+00	0.00E+00	3.15E+07	0.00E+00	
CS134	1.18E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	3.45E-11	1.60E-04	9.45E-14	3.50E-04	3.15E+07	6.08E-05	
CS137	3.35E+04	11.5%	100%	68	5.99E+06	1.12E-05	1.87E-12	2.00E-04	9.80E-11	1.60E-04	8.63E-15	3.19E-05	3.15E+07	1.58E-05	
									Fines						
PU241	2.58E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.13E-12	1.60E-04	1.17E-19	4.33E-10	3.15E+07	2.47E-12	
Y 90	2.24E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	9.83E-13	1.60E-04	6.24E-14	2.31E-04	3.15E+07	1.14E-06	
PM147	9.63E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.22E-13	1.60E-04	8.11E-16	3.00E-06	3.15E+07	6.39E-09	
CE144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	2.93E-15	1.08E-05	3.15E+07	5.94E-09	
PR144	2.48E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.09E-13	1.60E-04	8.43E-14	3.12E-04	3.15E+07	1.71E-07	
EU154	1.74E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	7.63E-14	1.60E-04	8.29E-14	3.07E-04	3.15E+07	1.18E-07	
CM244	2.38E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.04E-13	1.60E-04	3.91E-17	1.45E-07	3.15E+07	7.61E-11	
PU238	1.58E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.93E-14	1.60E-04	4.09E-17	1.51E-07	3.15E+07	5.29E-11	
SB125	7.91E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.47E-14	1.60E-04	2.65E-14	9.81E-05	3.15E+07	1.71E-08	
EU155	5.41E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.37E-14	1.60E-04	3.39E-15	1.25E-05	3.15E+07	1.50E-09	
AM241	2.78E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.22E-14	1.60E-04	1.28E-15	4.74E-06	3.15E+07	2.91E-10	
TE125M	1.93E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	8.48E-15	1.60E-04	1.94E-15	7.18E-06	3.15E+07	3.07E-10	
PU240	1.50E+02	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	6.58E-15	1.60E-04	3.92E-17	1.45E-07	3.15E+07	4.81E-12	
SM151	9.76E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.28E-15	1.60E-04	1.90E-19	7.03E-10	3.15E+07	1.52E-14	
PU239	6.70E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.94E-15	1.60E-04	1.86E-17	6.88E-08	3.15E+07	1.02E-12	
BA137M	3.17E+04	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.39E-12	1.60E-04	3.73E-14	1.38E-04	3.15E+07	9.67E-07	
RH106	4.71E+03	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	2.07E-13	1.60E-04	1.09E-13	4.03E-04	3.15E+07	4.20E-07	
PR144M	3.48E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.53E-15	1.60E-04	5.08E-16	1.88E-06	3.15E+07	1.45E-11	
AM243	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	2.75E-15	1.02E-05	3.15E+07	3.06E-11	
CM242	9.82E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.31E-16	1.60E-04	4.29E-17	1.59E-07	3.15E+07	3.45E-13	
CM243	9.79E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	4.29E-16	1.60E-04	9.79E-15	3.62E-05	3.15E+07	7.84E-11	
NP239	1.36E+01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.97E-16	1.60E-04	1.60E-14	5.92E-05	3.15E+07	1.78E-10	
NP237	1.18E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	5.18E-18	1.60E-04	1.54E-15	5.70E-06	3.15E+07	1.49E-13	
PU242	9.04E-01	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	3.97E-17	1.60E-04	3.27E-17	1.21E-07	3.15E+07	2.42E-14	
AM242	2.71E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	8.20E-15	3.03E-05	3.15E+07	1.82E-11	
AM242M	2.72E+00	11.5%	10%	68	5.99E+06	1.12E-05	1.87E-12	3.00E-05	1.19E-16	1.60E-04	1.36E-16	5.03E-07	3.15E+07	3.03E-13	
													Total	5.65E-03	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	4.83E-16	1.79E-06	2.59E+06	2.76E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.17E-16	4.33E-07	2.59E+06	1.22E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.23E-13	4.55E-04	2.59E+06	1.36E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	7.78E-18	2.88E-08	2.59E+06	5.92E-07	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	7.40E-14	2.74E-04	2.59E+06	2.97E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	7.96E-18	2.95E-08	2.59E+06	9.06E-07	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	7.19E-20	2.66E-10	2.59E+06	9.46E-11	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	1.89E-16	6.99E-07	2.59E+06	2.16E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	7.48E-19	2.77E-09	2.59E+06	3.67E-10	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	8.53E-16	3.16E-06	2.59E+06	1.08E-07	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	1.90E-15	7.03E-06	2.59E+06	2.40E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	6.00E-14	2.22E-04	2.59E+06	5.32E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	6.90E-18	2.55E-08	2.59E+06	8.37E-10	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	6.56E-18	2.43E-08	2.59E+06	5.29E-10	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	1.98E-14	7.33E-05	2.59E+06	7.99E-07	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	2.49E-15	9.21E-06	2.59E+06	6.87E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	8.58E-16	3.17E-06	2.59E+06	1.22E-08	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	5.96E-16	2.21E-06	2.59E+06	5.88E-09	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	6.36E-18	2.35E-08	2.59E+06	4.86E-11	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	5.20E-20	1.92E-10	2.59E+06	2.59E-13	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	4.84E-18	1.79E-08	2.59E+06	1.65E-11	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	2.82E-14	1.04E-04	2.59E+06	4.56E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.01E-14	3.74E-05	2.59E+06	2.43E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	3.25E-16	1.20E-06	2.59E+06	5.77E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	2.19E-15	8.10E-06	2.59E+06	1.52E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	7.83E-18	2.90E-08	2.59E+06	3.92E-12	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	5.77E-15	2.13E-05	2.59E+06	2.88E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	7.53E-15	2.79E-05	2.59E+06	5.22E-09	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	1.04E-15	3.85E-06	2.59E+06	6.26E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	5.34E-18	1.98E-08	2.59E+06	2.46E-13	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	6.09E-16	2.25E-06	2.59E+06	8.42E-11	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.80E-17	1.41E-07	2.59E+06	5.27E-12	
												Total	1.40E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	6.66E-16	2.46E-06	2.59E+06	3.80E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.34E-16	4.96E-07	2.59E+06	1.39E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.39E-13	5.14E-04	2.59E+06	1.54E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	9.49E-18	3.51E-08	2.59E+06	7.23E-07	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	8.43E-14	3.12E-04	2.59E+06	3.38E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	9.67E-18	3.58E-08	2.59E+06	1.10E-06	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	8.67E-20	3.21E-10	2.59E+06	1.14E-10	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	2.20E-16	8.14E-07	2.59E+06	2.51E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	9.56E-19	3.54E-09	2.59E+06	4.69E-10	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	1.01E-15	3.74E-06	2.59E+06	1.28E-07	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	2.15E-15	7.96E-06	2.59E+06	2.72E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	6.81E-14	2.52E-04	2.59E+06	6.04E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	1.33E-17	4.92E-08	2.59E+06	1.61E-09	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	1.27E-17	4.70E-08	2.59E+06	1.02E-09	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	2.27E-14	8.40E-05	2.59E+06	9.16E-07	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	2.95E-15	1.09E-05	2.59E+06	8.14E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	1.07E-15	3.96E-06	2.59E+06	1.52E-08	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	8.48E-16	3.14E-06	2.59E+06	8.36E-09	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	1.23E-17	4.55E-08	2.59E+06	9.41E-11	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	8.80E-20	3.26E-10	2.59E+06	4.38E-13	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	7.55E-18	2.79E-08	2.59E+06	2.58E-11	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.22E-14	1.19E-04	2.59E+06	5.20E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.16E-14	4.29E-05	2.59E+06	2.79E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	4.20E-16	1.55E-06	2.59E+06	7.45E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	2.61E-15	9.66E-06	2.59E+06	1.81E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	1.48E-17	5.48E-08	2.59E+06	7.41E-12	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	6.68E-15	2.47E-05	2.59E+06	3.33E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	8.73E-15	3.23E-05	2.59E+06	6.05E-09	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	1.26E-15	4.66E-06	2.59E+06	7.58E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	1.03E-17	3.81E-08	2.59E+06	4.75E-13	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	7.30E-16	2.70E-06	2.59E+06	1.01E-10	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	6.01E-17	2.22E-07	2.59E+06	8.34E-12	
												Total	1.58E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	2.75E-18	1.02E-08	2.59E+06	1.73E-06	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	2.14E-16	7.92E-07	2.59E+06	1.22E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.14E-16	4.22E-07	2.59E+06	1.19E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.24E-13	4.59E-04	2.59E+06	1.37E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	6.44E-18	2.38E-08	2.59E+06	4.90E-07	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	7.37E-14	2.73E-04	2.59E+06	2.96E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	6.68E-18	2.47E-08	2.59E+06	7.61E-07	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	6.48E-20	2.40E-10	2.59E+06	8.52E-11	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	1.77E-16	6.55E-07	2.59E+06	2.02E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	5.45E-19	2.02E-09	2.59E+06	2.68E-10	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	7.69E-16	2.85E-06	2.59E+06	9.72E-08	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	1.90E-15	7.03E-06	2.59E+06	2.40E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	5.99E-14	2.22E-04	2.59E+06	5.31E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	7.08E-19	2.62E-09	2.59E+06	8.59E-11	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	1.06E-18	3.92E-09	2.59E+06	8.54E-11	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	1.95E-14	7.22E-05	2.59E+06	7.87E-07	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	2.22E-15	8.21E-06	2.59E+06	6.12E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	6.74E-16	2.49E-06	2.59E+06	9.55E-09	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	2.23E-16	8.25E-07	2.59E+06	2.20E-09	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	1.09E-18	4.03E-09	2.59E+06	8.34E-12	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	7.08E-21	2.62E-11	2.59E+06	3.52E-14	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	2.65E-18	9.81E-09	2.59E+06	9.05E-12	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	2.80E-14	1.04E-04	2.59E+06	4.53E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.01E-14	3.74E-05	2.59E+06	2.43E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	2.00E-16	7.40E-07	2.59E+06	3.55E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	1.92E-15	7.10E-06	2.59E+06	1.33E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	1.13E-18	4.18E-09	2.59E+06	5.66E-13	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	5.50E-15	2.04E-05	2.59E+06	2.75E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	7.18E-15	2.66E-05	2.59E+06	4.98E-09	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	9.02E-16	3.34E-06	2.59E+06	5.43E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	9.69E-19	3.59E-09	2.59E+06	4.47E-14	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	5.51E-16	2.04E-06	2.59E+06	7.61E-11	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	1.72E-17	6.36E-08	2.59E+06	2.39E-12	
												Total	1.41E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	1.64E-16	6.07E-07	2.59E+06	9.37E-09	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.09E-16	4.03E-07	2.59E+06	1.13E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.23E-13	4.55E-04	2.59E+06	1.36E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	5.44E-18	2.01E-08	2.59E+06	4.14E-07	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	7.19E-14	2.66E-04	2.59E+06	2.88E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	5.70E-18	2.11E-08	2.59E+06	6.49E-07	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	5.63E-20	2.08E-10	2.59E+06	7.41E-11	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	1.62E-16	5.99E-07	2.59E+06	1.85E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	4.46E-19	1.65E-09	2.59E+06	2.19E-10	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	6.68E-16	2.47E-06	2.59E+06	8.45E-08	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	1.87E-15	6.92E-06	2.59E+06	2.36E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	5.87E-14	2.17E-04	2.59E+06	5.21E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	1.46E-18	5.40E-09	2.59E+06	1.77E-10	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	1.68E-18	6.22E-09	2.59E+06	1.35E-10	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	1.87E-14	6.92E-05	2.59E+06	7.54E-07	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	1.85E-15	6.85E-06	2.59E+06	5.10E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	5.21E-16	1.93E-06	2.59E+06	7.39E-09	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	1.86E-16	6.88E-07	2.59E+06	1.83E-09	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	1.65E-18	6.11E-09	2.59E+06	1.26E-11	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	1.13E-20	4.18E-11	2.59E+06	5.62E-14	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	2.67E-18	9.88E-09	2.59E+06	9.12E-12	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	2.73E-14	1.01E-04	2.59E+06	4.41E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	9.75E-15	3.61E-05	2.59E+06	2.34E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	1.56E-16	5.77E-07	2.59E+06	2.77E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	1.55E-15	5.74E-06	2.59E+06	1.07E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	1.89E-18	6.99E-09	2.59E+06	9.46E-13	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	5.00E-15	1.85E-05	2.59E+06	2.50E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	6.50E-15	2.41E-05	2.59E+06	4.51E-09	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	7.69E-16	2.85E-06	2.59E+06	4.63E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	1.43E-18	5.29E-09	2.59E+06	6.59E-14	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	4.77E-16	1.76E-06	2.59E+06	6.59E-11	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	1.72E-17	6.36E-08	2.59E+06	2.39E-12	
												Total	1.40E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	1.10E-15	4.07E-06	2.59E+06	6.28E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	2.20E-16	8.14E-07	2.59E+06	2.29E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.78E-13	6.59E-04	2.59E+06	1.97E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	2.28E-17	8.44E-08	2.59E+06	1.74E-06	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	1.20E-13	4.44E-04	2.59E+06	4.81E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	2.29E-17	8.47E-08	2.59E+06	2.61E-06	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	2.19E-19	8.10E-10	2.59E+06	2.88E-10	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	4.44E-16	1.64E-06	2.59E+06	5.07E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	2.18E-18	8.07E-09	2.59E+06	1.07E-09	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	2.49E-15	9.21E-06	2.59E+06	3.15E-07	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	2.99E-15	1.11E-05	2.59E+06	3.78E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	9.43E-14	3.49E-04	2.59E+06	8.37E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	8.82E-18	3.26E-08	2.59E+06	1.07E-09	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	9.30E-18	3.44E-08	2.59E+06	7.49E-10	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	3.53E-14	1.31E-04	2.59E+06	1.42E-06	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	8.09E-15	2.99E-05	2.59E+06	2.23E-07	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	2.87E-15	1.06E-05	2.59E+06	4.07E-08	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	1.22E-15	4.51E-06	2.59E+06	1.20E-08	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	9.26E-18	3.43E-08	2.59E+06	7.08E-11	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	7.09E-20	2.62E-10	2.59E+06	3.53E-13	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	9.47E-18	3.50E-08	2.59E+06	3.24E-11	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	4.63E-14	1.71E-04	2.59E+06	7.48E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.72E-14	6.36E-05	2.59E+06	4.13E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	8.16E-16	3.02E-06	2.59E+06	1.45E-09	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	7.47E-15	2.76E-05	2.59E+06	5.18E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	1.06E-17	3.92E-08	2.59E+06	5.31E-12	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	1.50E-14	5.55E-05	2.59E+06	7.49E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	2.00E-14	7.40E-05	2.59E+06	1.39E-08	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	3.20E-15	1.18E-05	2.59E+06	1.93E-11	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	7.90E-18	2.92E-08	2.59E+06	3.64E-13	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	1.88E-15	6.96E-06	2.59E+06	2.60E-10	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	7.94E-17	2.94E-07	2.59E+06	1.10E-11	
												Total	2.04E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.86E-16	1.43E-06	2.59E+06	2.20E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.18E-16	4.37E-07	2.59E+06	1.23E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.27E-13	4.70E-04	2.59E+06	1.40E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	7.33E-18	2.71E-08	2.59E+06	5.58E-07	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	7.57E-14	2.80E-04	2.59E+06	3.04E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	7.55E-18	2.79E-08	2.59E+06	8.60E-07	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	6.98E-20	2.58E-10	2.59E+06	9.18E-11	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	1.87E-16	6.92E-07	2.59E+06	2.14E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	6.75E-19	2.50E-09	2.59E+06	3.31E-10	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	8.33E-16	3.08E-06	2.59E+06	1.05E-07	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	1.95E-15	7.22E-06	2.59E+06	2.47E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	6.15E-14	2.28E-04	2.59E+06	5.46E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	4.19E-18	1.55E-08	2.59E+06	5.08E-10	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	4.01E-18	1.48E-08	2.59E+06	3.23E-10	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	2.01E-14	7.44E-05	2.59E+06	8.11E-07	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	2.41E-15	8.92E-06	2.59E+06	6.65E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	7.83E-16	2.90E-06	2.59E+06	1.11E-08	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	4.64E-16	1.72E-06	2.59E+06	4.58E-09	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.92E-18	1.45E-08	2.59E+06	3.00E-11	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.58E-20	1.32E-10	2.59E+06	1.78E-13	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	3.88E-18	1.44E-08	2.59E+06	1.33E-11	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	2.88E-14	1.07E-04	2.59E+06	4.66E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.03E-14	3.81E-05	2.59E+06	2.47E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	2.81E-16	1.04E-06	2.59E+06	4.99E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	2.09E-15	7.73E-06	2.59E+06	1.45E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	4.91E-18	1.82E-08	2.59E+06	2.46E-12	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	5.76E-15	2.13E-05	2.59E+06	2.88E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	7.52E-15	2.78E-05	2.59E+06	5.21E-09	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	9.94E-16	3.68E-06	2.59E+06	5.98E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.32E-18	1.23E-08	2.59E+06	1.53E-13	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	5.94E-16	2.20E-06	2.59E+06	8.21E-11	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	2.95E-17	1.09E-07	2.59E+06	4.09E-12	
												Total	1.45E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	DDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	3.31E-19	1.22E-09	2.59E+06	2.09E-07	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	3.80E-16	1.41E-06	2.59E+06	2.17E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.19E-16	4.40E-07	2.59E+06	1.24E-03	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.26E-13	4.66E-04	2.59E+06	1.39E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	7.53E-18	2.79E-08	2.59E+06	5.73E-07	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	7.57E-14	2.80E-04	2.59E+06	3.04E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	7.74E-18	2.86E-08	2.59E+06	8.81E-07	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	7.25E-20	2.68E-10	2.59E+06	9.54E-11	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	1.90E-16	7.03E-07	2.59E+06	2.17E-07	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	6.93E-19	2.56E-09	2.59E+06	3.40E-10	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	8.53E-16	3.16E-06	2.59E+06	1.08E-07	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	1.95E-15	7.22E-06	2.59E+06	2.47E-07	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	6.14E-14	2.27E-04	2.59E+06	5.45E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	4.91E-18	1.82E-08	2.59E+06	5.96E-10	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	4.88E-18	1.81E-08	2.59E+06	3.93E-10	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	2.02E-14	7.47E-05	2.59E+06	8.15E-07	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	2.49E-15	9.21E-06	2.59E+06	6.87E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	8.18E-16	3.03E-06	2.59E+06	1.16E-08	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	4.53E-16	1.68E-06	2.59E+06	4.47E-09	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	4.75E-18	1.76E-08	2.59E+06	3.63E-11	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	3.61E-20	1.34E-10	2.59E+06	1.80E-13	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	4.24E-18	1.57E-08	2.59E+06	1.45E-11	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	2.88E-14	1.07E-04	2.59E+06	4.66E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.04E-14	3.85E-05	2.59E+06	2.50E-06	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	2.79E-16	1.03E-06	2.59E+06	4.95E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	2.18E-15	8.07E-06	2.59E+06	1.51E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	5.69E-18	2.11E-08	2.59E+06	2.85E-12	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	5.88E-15	2.18E-05	2.59E+06	2.94E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	7.69E-15	2.85E-05	2.59E+06	5.33E-09	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	1.03E-15	3.81E-06	2.59E+06	6.20E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	4.01E-18	1.48E-08	2.59E+06	1.85E-13	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	6.15E-16	2.28E-06	2.59E+06	8.50E-11	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	3.17E-17	1.17E-07	2.59E+06	4.40E-12	
												Total	1.44E-01	

MPC-68														
Accident Conditions														
Effective Dose Equivalent From Submersion														
Nuclide	Inventory (Ci/Assy)	% remain airborne	No. Assy	MPC Vol (cm3)	L_{acc} Rate at Upstream (cm3/s)	Fraction Released per sec	Release Fraction	Release Rate (Ci/sec)	X/Q (sec/m3)	DCF (Sv/Bq)	DCF (mRem/uCi)	Occ Time (sec)	SDE (mRem)	
								Gases						
H 3	1.24E+02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	8.23E-09	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
I129	1.12E-02	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	7.45E-13	8.00E-03	1.10E-15	4.07E-06	2.59E+06	6.28E-08	
KR 85	2.04E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	0.30	1.36E-07	8.00E-03	1.32E-14	4.88E-05	2.59E+06	1.37E-01	
								Crud						
Co-60	6.50E+01	100%	68	5.99E+06	1.95E-05	3.26E-12	1.00	1.44E-08	8.00E-03	1.45E-13	5.37E-04	2.59E+06	1.60E-01	
								Volatiles						
SR 90	2.24E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	9.93E-10	8.00E-03	9.20E-15	3.40E-05	2.59E+06	7.01E-04	
RU106	4.71E+03	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	2.09E-10	8.00E-03	0.00E+00	0.00E+00	2.59E+06	0.00E+00	
CS134	1.18E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	5.23E-10	8.00E-03	9.45E-14	3.50E-04	2.59E+06	3.79E-03	
CS137	3.35E+04	100%	68	5.99E+06	1.95E-05	3.26E-12	2.00E-04	1.49E-09	8.00E-03	8.63E-15	3.19E-05	2.59E+06	9.83E-04	
								Fines						
PU241	2.58E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.72E-11	8.00E-03	1.17E-19	4.33E-10	2.59E+06	1.54E-10	
Y 90	2.24E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.49E-11	8.00E-03	6.24E-14	2.31E-04	2.59E+06	7.13E-05	
PM147	9.63E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.41E-12	8.00E-03	8.11E-16	3.00E-06	2.59E+06	3.98E-07	
CE144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	2.93E-15	1.08E-05	2.59E+06	3.71E-07	
PR144	2.48E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.65E-12	8.00E-03	8.43E-14	3.12E-04	2.59E+06	1.07E-05	
EU154	1.74E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.16E-12	8.00E-03	8.29E-14	3.07E-04	2.59E+06	7.36E-06	
CM244	2.38E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.58E-12	8.00E-03	3.91E-17	1.45E-07	2.59E+06	4.75E-09	
PU238	1.58E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.05E-12	8.00E-03	4.09E-17	1.51E-07	2.59E+06	3.30E-09	
SB125	7.91E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	5.26E-13	8.00E-03	2.65E-14	9.81E-05	2.59E+06	1.07E-06	
EU155	5.41E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.60E-13	8.00E-03	3.39E-15	1.25E-05	2.59E+06	9.35E-08	
AM241	2.78E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.85E-13	8.00E-03	1.28E-15	4.74E-06	2.59E+06	1.81E-08	
TE125M	1.93E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.29E-13	8.00E-03	1.94E-15	7.18E-06	2.59E+06	1.91E-08	
PU240	1.50E+02	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.98E-14	8.00E-03	3.92E-17	1.45E-07	2.59E+06	3.00E-10	
SM151	9.76E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.49E-14	8.00E-03	1.90E-19	7.03E-10	2.59E+06	9.46E-13	
PU239	6.70E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	4.46E-14	8.00E-03	1.86E-17	6.88E-08	2.59E+06	6.35E-11	
BA137M	3.17E+04	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.11E-11	8.00E-03	3.73E-14	1.38E-04	2.59E+06	6.03E-05	
RH106	4.71E+03	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	3.13E-12	8.00E-03	1.09E-13	4.03E-04	2.59E+06	2.62E-05	
PR144M	3.48E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	2.31E-14	8.00E-03	5.08E-16	1.88E-06	2.59E+06	9.01E-10	
AM243	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	2.75E-15	1.02E-05	2.59E+06	1.91E-09	
CM242	9.82E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.53E-15	8.00E-03	4.29E-17	1.59E-07	2.59E+06	2.15E-11	
CM243	9.79E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.51E-15	8.00E-03	9.79E-15	3.62E-05	2.59E+06	4.89E-09	
NP239	1.36E+01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	9.05E-15	8.00E-03	1.60E-14	5.92E-05	2.59E+06	1.11E-08	
NP237	1.18E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	7.85E-17	8.00E-03	1.54E-15	5.70E-06	2.59E+06	9.27E-12	
PU242	9.04E-01	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	6.01E-16	8.00E-03	3.27E-17	1.21E-07	2.59E+06	1.51E-12	
AM242	2.71E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.80E-15	8.00E-03	8.20E-15	3.03E-05	2.59E+06	1.13E-09	
AM242M	2.72E+00	10%	68	5.99E+06	1.95E-05	3.26E-12	3.00E-05	1.81E-15	8.00E-03	1.36E-16	5.03E-07	2.59E+06	1.89E-11	
												Total	3.03E-01	

CHAPTER 8: OPERATING PROCEDURES†

8.0 INTRODUCTION:

This chapter outlines the loading, unloading, and recovery procedures for the HI-STORM 100 System for storage operations. The procedures provided in this chapter are prescriptive to the extent that they provide the basis and general guidance for plant personnel in preparing detailed, written, site-specific, loading, handling, storage and unloading procedures. Users may add, *modify the sequence of, perform in parallel,* or delete steps as necessary provided that the intent of this guidance is met *and the requirements of the CoC are met. Such changes are within the scope of this chapter and do not require a 72.48 evaluation.* The information provided in this chapter meets all requirements of NUREG-1536 [8.0.1].

Section 8.1 provides the guidance for loading the HI-STORM 100 System in the spent fuel pool. Section 8.2 provides the procedures for ISFSI operations and general guidance for performing maintenance and responding to abnormal events. Responses to abnormal events that may occur during normal loading operations are provided with the procedure steps. Section 8.3 provides the procedure for unloading the HI-STORM 100 System in the spent fuel pool. Section 8.4 provides the guidance for MPC transfer to the HI-STAR 100 Overpack for transport or storage. Section 8.4 can also be used for recovery of a breached MPC for transport or storage. Section 8.5 provides the guidance for transfer of the MPC into HI-STORM from the HI-STAR 100 transport overpack. The Technical Specifications in Appendix A to CoC 72-1014 provide Limiting Conditions of Operation (LCO), Surveillance Requirements (SR's), as well as administrative information, such as Use and Application. Appendix B to COC 72-1014 provides the approved contents and design features applicable to the HI-STORM 100 System. TSAR Appendix 12.A includes the Bases for the LCOs. The Technical Specifications impose restrictions and requirements that must be applied throughout the loading and unloading process. Equipment specific operating details such as vacuum drying system, valve manipulation and Transporter operation are not within the scope of this TSAR and will be provided to users based on the specific equipment selected by the users and the configuration of the site.

The procedures contained herein describe acceptable methods for performing HI-STORM 100 loading and unloading operations. *Unless otherwise stated, references to the HI-STORM 100 apply equally to the HI-STORM 100 and the HI-STORM 100S.* Users may alter these procedures to allow alternate methods and operations to be performed in parallel or out of sequence as long as the general intent of the procedure is met. In the figures following each section, acceptable configurations of rigging, piping, and instrumentation are shown. In some cases, the figures are artists renditions. Users may select alternate configurations, equipment and methodology to accommodate their specific needs. *provided that the intent of this guidance is met and the requirements of the CoC are met. Such changes are within the scope of this chapter and do not*

† This chapter has been prepared in the format and section organization set forth in Regulatory Guide 3.61. However, the material content of this chapter also fulfills the requirements of NUREG 1536. Pagination and numbering of sections, figures, and tables are consistent with the convention set down in Chapter 1, Section 1.0, herein. Finally, all terms-of-art used in this chapter are consistent with the terminology of the glossary (Table 1.0.1) and component nomenclature of the Bill-of-Materials (Section 1.5).

require a 72.48 evaluation. All rigging should be approved by the user's load handling authority prior to use. User-developed procedures and the design and operation of any alternate equipment must be reviewed by the Certificate holder prior to implementation.

Licensees (Users) will utilize the procedures provided in this chapter, the Technical Specifications in Appendix A to CoC 72-1014, the conditions of the Certificate of Compliance, equipment-specific operating instructions, and plant working procedures and apply them to develop the site specific written, loading and unloading procedures.

The loading and unloading procedures in Section 8.1 and 8.3 can also be appropriately revised into written site-specific procedures to allow dry loading and unloading of the system in a hot cell or other remote handling facility. The Dry Transfer Facility (DTF) loading and unloading procedures are essentially the same with respect to loading and vacuum drying, inerting, and leakage testing of the MPC. The dry transfer facility shall develop the appropriate site-specific procedures as part of the DTF facility license.

Tables 8.1.1 through 8.1.4 provide the handling weights for each of the HI-STORM 100 System major components and the loads to be lifted during various phases of the operation of the HI-STORM 100 System. Users shall take appropriate actions to ensure that the lift weights do not exceed user-supplied lifting equipment rated loads. Table 8.1.5 provides the HI-STORM 100 System bolt torque and sequencing requirements. Table 8.1.6 provides an operational description of the HI-STORM 100 System ancillary equipment along with its safety designation and QA category, where applicable. Fuel assembly selection and verification shall be performed by the licensee in accordance with written, approved procedures which ensure that only SNF assemblies authorized in the Certificate of Compliance and as defined in the Appendix B to CoC 72-1014 are loaded into the HI-STORM 100 System.

In addition to the requirements set forth in the CoC, users will be required to develop or modify existing programs and procedures to account for the operation of an ISFSI. Written procedures will be required to be developed or modified to account for such things as nondestructive examination (NDE) of the MPC welds, handling and storage of items and components identified as Important to Safety, 10CFR72.48 [8.1.1] programs, specialized instrument calibration, special nuclear material accountability at the ISFSI, security modifications, fuel handling procedures, training and emergency response, equipment and process qualifications. Users are required to take necessary actions to prevent boiling of the water in the MPC. This may be accomplished by performing a site-specific analysis to identify a time limitation to ensure that water boiling will not occur in the MPC prior to the initiation of draining operations. Chapter 4 of the TSAR provides some sample time limits for the time to initiation of draining for various spent fuel pool water temperatures using design basis heat loads.

Table 8.1.7 summarizes some of the instrumentation used to load and unload the HI-STORM 100 System. Other instrumentation that meets the requirements of the Technical Specifications is also acceptable. Tables 8.1.8, 8.1.9, and 8.1.10 provide sample receipt inspection checklists for the HI-STORM 100 overpack, the MPC, and the HI-TRAC Transfer Cask, respectively. Users ~~*shall*~~ *may* develop site-specific receipt inspection checklists, as required for their equipment.

Fuel handling, including the handling of fuel assemblies in the Damaged Fuel Container (DFC) shall be performed in accordance with written site-specific procedures. DFCs shall be loaded in the spent fuel pool racks prior to placement into the MPC.

Technical and Safety Basis for Loading and Unloading Procedures

The procedures herein (Sections 8.1.2 through 8.1.5) are developed for the loading, storage, unloading, and recovery of spent fuel in the HI-STORM 100 System. The activities involved in loading of spent fuel in a canister system, if not carefully performed, may present risks. The design of the HI-STORM 100 System, including these procedures, the ancillary equipment and the Technical Specifications, serve to minimize risks and mitigate consequences of potential events. To summarize, consideration is given in the loading and unloading systems and procedures to the potential events listed in Table 8.0.1.

The primary objective is to reduce the risk of occurrence and/or to mitigate the consequences of the event. The procedures contain Notes, Warnings, and Cautions to notify the operators to upcoming situations and provide additional information as needed. The Notes, Warnings and Cautions are purposely bolded and boxed and immediately precede the applicable steps.

In the event of an extreme abnormal condition (e.g., cask drop or tip-over event) the user shall have appropriate procedural guidance to respond to the situation. As a minimum, the procedures shall address establishing emergency action levels, implementation of emergency action program, establishment of personnel exclusions zones, monitoring of radiological conditions, actions to mitigate or prevent the release of radioactive materials, and recovery planning and execution and reporting to the appropriate regulatory agencies, as required.

Table 8.0.1
OPERATIONAL CONSIDERATIONS

POTENTIAL EVENTS	METHODS USED TO ADDRESS EVENT	COMMENTS/ REFERENCES
Cask Drop During Handling Operations	Cask lifting and handling equipment is designed to ANSI N14.6. Procedural guidance is given for cask handling, inspection of lifting equipment, and proper engagement to the trunnions. Technical Specifications limit the cask and overpack lift height outside the fuel building.	See Section 8.1.2. See Technical Specifications in Appendix A to CoC 72-1014 for HI-TRAC and HI-STORM lift height limitations.
Cask Tip-Over Prior to welding of the MPC lid	The lid retention system is available to secure the MPC lid during movement between the spent fuel pool and the cask preparation area.	See Section 8.1.5 Step 1. See Figure 8.1.15.
Contamination of the MPC external shell	The annulus seal, pool lid, and annulus overpressure system minimize the potential for the MPC external shell to become contaminated from contact with the spent fuel pool water. Technical Specifications require surveys of certain components of the HI-STORM 100 System to monitor for removable contamination.	See Figures 8.1.13 and 8.1.14. See Technical Specifications in Appendix A to CoC 72-1014.
Contamination spread from cask process system exhausts	Processing systems are equipped with exhausts that can be directed to the plant's processing systems.	See Figures 8.1.19-8.1.22.
Damage to fuel assembly cladding from oxidation/thermal shock	Fuel assemblies are never subjected to air or oxygen during loading and unloading operations. Cool-Down System brings fuel assembly *bulk* temperatures to below water boiling temperature prior to flooding.	See Section 8.1.5 Step 24b, Section 8.3.3 ~~Step 8~~ and LCO 3.1.3.
Damage to Vacuum Drying System vacuum gauges from positive pressure	Vacuum Drying System is separate from pressurized gas and water systems.	See Figure 8.1.22 and 8.1.23.

Table 8.0.1
OPERATIONAL CONSIDERATIONS
(CONTINUED)

POTENTIAL EVENTS	METHODS USED TO ADDRESS EVENT	COMMENTS/ REFERENCES
Excess dose from failed fuel assemblies	MPC gas sampling allows operators to determine the integrity of the fuel cladding prior to opening the MPC. This allows preparation and planning for failed fuel. The RVOAs allow the vent and drain ports to be operated like valves and prevent the need to hot tap into the penetrations during unloading operation.	See Figure 8.1.16 and Section 8.3.3 Step *4*~~7~~.
Excess dose to operators	The procedures provide ALARA Notes and Warnings when radiological conditions may change.	See ALARA Notes and Warnings throughout the procedures.
Excess generation of radioactive waste	The HI-STORM system uses process systems that minimize the amount of radioactive waste generated. Such features include smooth surfaces for ease of decontamination efforts, prevention of avoidable contamination, and procedural guidance to reduce decontamination requirements. Where possible, items are installed by hand and require no tools.	Examples: HI-TRAC bottom protective cover, bolt plugs in empty holes, pre-wetting of components.
Fuel assembly misloading event	Procedural guidance is given to perform assembly selection verification and a post-loading visual verification of assembly identification prior to installation of the MPC lid.	See Section 8.1.4 Steps 1 and 3.
Incomplete moisture removal from MPC	The vacuum drying process reduces the MPC pressure in stages to prevent the formation of ice. Vacuum is held below 3 torr for 30 minutes with the vacuum pump isolated to assure dryness.	See Section 8.1.5 Step *6*~~28~~ and Technical Specification LCO 3.1.1.
Incorrect *MPC* lid installation	Procedural guidance is given to visually verify correct MPC lid installation prior to HI-TRAC removal from the spent fuel pool.	See Section 8.1.5 Step *1.j*~~6~~ and ~~10~~*3*.

Table 8.0.1
OPERATIONAL CONSIDERATIONS
(CONTINUED)

POTENTIAL EVENTS	METHODS USED TO ADDRESS EVENT	COMMENTS/ REFERENCES
Load Drop	Rigging diagrams and procedural guidance are provided for all lifts. Component weights are provided in Tables 8.1.1 through 8.1.4.	See Figures 8.1.6, 8.1.7, 8.1.9, 8.1.25 and 8.1.27. See Tables 8.1.1 through 8.1.4.
Over-pressurization of MPC during loading and unloading	Pressure relief valves in the water and gas processing systems limit the MPC pressure to acceptable levels.	See Figures 8.1.20, 8.1.21, 8.1.23 and 8.3.4.
Overstressing MPC lift lugs from side loading	The MPC is upended using the upending frame. The lift lugs are never side loaded.	See Figure 8.1.6 and Section 8.1.2 Step 6.
Overweight cask lift	Procedural guidance is given to alert operators to potential overweight lifts.	See Section 8.1.7 Step 6 for example. See Tables 8.1.1 through 8.1.4.
Personnel contamination by cutting/grinding activities	Procedural guidance is given to warn operators prior to cutting or grinding activities.	See Section 8.1.5 Step *3*~~25~~ and Section 8.3.3 Step *3*~~5~~.
Transfer cask carrying hot particles out of the spent fuel pool	Procedural guidance is given to scan the transfer cask prior to removal from the spent fuel pool.	See Section 8.1.3 Step 1 and Section 8.1.5 Step *1*~~9~~.
Unplanned or uncontrolled release of radioactive materials	The MPC vent and drain ports are equipped with metal-to-metal seals to minimize the leakage during vacuum drying and backfill operations. Unlike elastomer seals, the metal seals resist degradation due to temperature and radiation and allow future access to the MPC ports without hot tapping. The RVOAs allow the port to be opened and closed like a valve so gas sampling may be performed.	See Figure 8.1.11 and 8.1.16. See Section 8.3.3 Step *4*~~7~~.
~~Weld deficiencies from condensation of water on the weld joint~~	~~A vacuum source on the MPC prevents water vapor from condensing on the MPC weld joint.~~	~~Step 25.~~

8.1 PROCEDURE FOR LOADING THE HI-STORM 100 SYSTEM IN THE SPENT FUEL POOL

8.1.1 Overview of Loading Operations:

The HI-STORM 100 System is used to load, transfer and store spent fuel. Specific steps are performed to prepare the HI-STORM 100 System for fuel loading, to load the fuel, to prepare the system for storage and to place it in storage at an ISFSI. The MPC transfer may be performed in the *cask receiving area* ~~*truck bay*~~, at the ISFSI, or any other location deemed appropriate by the user. HI-TRAC and/or HI-STORM may be transferred between the ISFSI and the fuel loading facility using a specially designed transporter, heavy haul transfer trailer, or any other load handling equipment designed for such applications as long as the Technical Specification lift height restrictions are met *(lift height restrictions apply only to suspended forms of transport)*. Users shall develop detailed written procedures to control on-site transport operations. Section 8.1.2 provides the general procedures for rigging and handling of the HI-STORM overpack and HI-TRAC transfer cask. Figure 8.1.1 shows a flow *general* diagram of the HI-STORM loading operations.

The following description and operating procedures outline the use of a HI-TRAC transfer cask with separate pool lid and transfer lid. Users may opt to use other configurations (e.g., a single lid) as long as there is sufficient crane capacity, available room to perform the operations and that appropriate measures are available to prevent contamination of the MPC external shell. Any alternate configuration must be evaluated by the certificate holder on a site-specific basis to ensure that the design margins for criticality, shielding, structural and thermal remain adequate and that all appropriate operational and safety features are maintained.

Refer to the boxes of Figure 8.1.2 for the following description. At the start of loading operations, an empty MPC is upended (Box 1). The empty MPC is raised and inserted into HI-TRAC (Box 2). The annulus is filled with plant demineralized water† and the MPC is filled with either spent fuel pool water or plant demineralized water (Box 3). An inflatable seal is installed in the *upper end of the* annulus between the MPC and HI-TRAC to prevent spent fuel pool water from contaminating the exterior surface of the MPC. HI-TRAC and the MPC are then raised and lowered into the spent fuel pool for fuel loading using the lift yoke (Box 4). Pre-selected assemblies are loaded into the MPC and a visual verification of the assembly identification is performed (Box 5).

While still underwater, a thick shielded lid (the MPC lid) is installed using either slings attached to the lift yoke or the optional lid retention system (Box 6). The lift yoke remotely engages to the HI-TRAC lifting trunnions to lift the HI-TRAC and loaded MPC close to the spent fuel pool surface (Box 7). When radiation dose rate measurements confirm that it is safe to remove the HI-TRAC from the spent fuel pool, the cask is removed from the spent fuel pool. If the lid retention system is being used, the HI-TRAC top lid bolts are installed to secure the MPC lid for the transfer to the cask preparation area. The lift yoke and HI-TRAC are sprayed with demineralized

† Users may substitute domestic water in each step where demineralized water is specified.

water to help remove contamination as they are removed from the spent fuel pool.

HI-TRAC is placed in the designated preparation area and the lift yoke and lid retention system (if utilized) are removed. The next phase of decontamination is then performed. The top surfaces of the MPC lid and the upper flange of HI-TRAC are decontaminated. The temporary shield ring (if utilized) is installed and filled with water and the neutron shield jacket is filled with water (if drained). The inflatable annulus seal is removed, and the annulus shield (if utilized) is installed. The temporary shield ring provides additional personnel shielding around the top of the HI-TRAC during MPC closure operations. The annulus shield provides additional personnel shielding at the top of the annulus and also prevents small items from being dropped into the annulus. Dose rates are measured at the MPC lid to ensure that the dose rates are within expected values.

The MPC water level is lowered slightly, the MPC is vented, and the MPC lid is seal welded using the automated welding system (Box 8). Visual examinations are performed on the tack welds. Liquid penetrant (PT) examinations are performed on the root and final passes. ~~A volumetric examination is performed on the MPC welds to ensure that the completed weld is satisfactory. As an alternative to volumetric examination of the MPC lid-to-shell weld, a multi-layer PT is performed including one intermediate examination after approximately every three-eighth inch of weld depth.~~ *An ultrasonic or multi-layer PT examination is performed on the MPC Lid-to-Shell weld to ensure that the weld is satisfactory. As an alternative to volumetric examination of the MPC lid-to-shell weld, a multi-layer PT is performed including one intermediate examination after approximately every three-eighth inch of weld depth.* The water level is raised to the top of the MPC and a hydrostatic test followed by an additional liquid penetrant examination is performed on the MPC Lid-to-Shell weld to verify structural integrity. A small amount of water is displaced with helium gas for leakage testing. A leakage rate test is performed on the MPC lid-to-shell weld to verify weld integrity and to ensure that leakage rates are within acceptance criteria (See Technical Specification LCO 3.1.1).

~~The water level is raised to the top of the MPC again and then the MPC water is displaced from the MPC by blowing pressurized helium or nitrogen gas into the vent port of the MPC thus displacing the water through the drain line. The volume of water displaced from the MPC is measured to determine the free volume inside the MPC. This information is used to determine the helium backfill requirements for the MPC.~~

The vacuum drying system is connected to the MPC and is used to remove all liquid water from the MPC in a stepped evacuation process (Box 9). A stepped evacuation process is used to preclude the formation of ice in the MPC and vacuum drying system lines. The internal pressure is reduced to below 3 torr and held for 30 minutes to ensure that all liquid water is removed (See Technical Specification LCO 3.1.1).

Following this dryness test, the vacuum drying system is disconnected, the helium backfill system is attached, and the MPC is backfilled with a predetermined *pressure* ~~*amount*~~ of helium gas (See Technical Specification LCO 3.1.1). The helium backfill ensures adequate heat transfer during storage, provides an inert atmosphere for long-term fuel integrity, and provides

the means of future leakage rate testing of the MPC confinement boundary welds. Cover plates are installed and seal welded over the MPC vent and drain ports with liquid penetrant examinations performed on the root and final passes *(for multi-pass welds)* (Box 10). The cover plates are helium leakage tested to confirm that they meet the established leakage rate criteria.

The MPC closure ring is then placed on the MPC and dose rates are measured at the MPC lid to ensure that the dose rates are within expected values. The closure ring is aligned, tacked in place and seal welded providing redundant closure of the MPC confinement boundary closure welds. Tack welds are visually examined, and the root and final welds are inspected using the liquid penetrant examination technique to ensure weld integrity.

The annulus shield (if utilized) is removed and the remaining water in the annulus is drained. The temporary shield ring (if utilized) is drained and removed. The MPC lid and accessible areas of the top of the MPC shell are smeared for removable contamination (See Technical Specification LCO 3.2.2) and HI-TRAC dose rates are measured. HI-TRAC top lid is installed and the bolts are torqued (Box 11). The MPC lift cleats are installed on the MPC lid. The MPC lift cleats are the primary lifting point on the MPC. The two cleats provide redundant support of the MPC when it is lifted or supported. Two or four stays (depending on the site crane hook configuration) are installed between the MPC lift cleats and the lift yoke main pins. The stays secure the MPC within HI-TRAC while the pool lid is replaced with the transfer lid (Box 12).

The HI-TRAC is positioned approximately one inch above the transfer slide to prepare for bottom lid replacement. The transfer slide consists of an adjustable-height rolling carriage and a pair of channel tracks. The transfer slide supports the transfer step which is used to position the two lids at the same elevation and creates a tight seam between the two lids to eliminate radiation streaming. The overhead crane is shut down to prevent inadvertent operation. The transfer slide carriage is raised to support the pool lid while the bottom lid bolts are removed. The transfer slide then lowers the pool lid and simultaneously replaces the pool lid with the transfer lid. The carriage is raised and the bottom lid bolts are replaced. The MPC lift cleats and stays support the MPC during the transfer operations. Following the transfer, the MPC stays are disconnected and HI-TRAC is positioned for MPC transfer into HI-STORM.

MPC transfer may be performed inside or outside the fuel building (Box 13). Similarly, HI-TRAC and HI-STORM may be transferred to the ISFSI in several different ways (Box 14 and 15). The empty HI-STORM overpack is inspected and positioned with the lid removed. Vent duct shield inserts[1] are installed in the HI-STORM exit vent ducts. The vent duct shield inserts prevent radiation streaming *from the HI-STORM Overpack* as the MPC is lowered past the exit vents. The HI-TRAC is placed on top of HI-STORM. Alignment *guides* ~~pins~~ (or alternate alignment methods) help guide HI-TRAC during this operation[2]. The MPC may be lowered using the MPC downloader, the main crane hook or other similar devices. The MPC downloader (if used) may be attached to the HI-TRAC lid or mounted to the overhead lifting device. The

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1 *Vent duct shield inserts are only used on the HI-STORM 100.*

2 *The alignment guide may be configured in many different ways to accommodate the specific sites. See Table 8.1.6.*

MPC lift slings are attached to the MPC lift cleats. The MPC is raised slightly, the transfer lid door locking pins are removed and the doors are opened. Optional trim plates may be installed on the top and bottom of both doors and secured using hand clamps. The trim plates eliminate radiation streaming above and below the doors. The MPC is lowered into HI-STORM. Following verification that the MPC is fully lowered, the MPC lift slings are disconnected from the lifting ~~structure~~ device and lowered onto the MPC lid. The trim plates are removed, the doors are closed and the locking pins are installed. *The empty HI-TRAC must be removed with the doors open when the HI-STORM 100S is used to prevent interference with the lift cleats and slings.* HI-TRAC is removed from on top of HI-STORM *and HI-STORM 100 is moved from under HI-TRAC as necessary.* The MPC lift slings and MPC lift cleats are removed. Hole plugs are installed in the empty MPC lifting holes to fill the voids left by the lift cleat bolts. The vent duct shield inserts *(if used)* and alignment guides are removed, the HI-STORM lid is installed, and gamma shield cross plates and thermocouples (if used) are installed. The inlet[3] and exit vent screens are installed. The HI-STORM lid studs and nuts are installed and torqued. The shielding effectiveness test is performed and HI-STORM is secured to the transporter (as applicable) and moved to the ISFSI pad. ~~If necessary, the inlet vent screens are installed.~~ The HI-STORM Overpack and HI-TRAC transfer cask may be moved using a number of methods as long as the lifting equipment requirements in the Technical Specification are met. [redacted] -Once located at the storage pad, the thermocouple instrument connections are made (if used), and the air temperature rise testing (if required by the Technical Specifications) is performed to ensure that the system is functioning within its design parameters.

8.1.2 HI-TRAC and HI-STORM Receiving and Handling Operations:

Note:
HI-TRAC may be received and handled in several different configurations and may be transported on-site in a horizontal or vertical orientation. This section provides general guidance for HI-TRAC and HI-STORM handling. Site-specific procedures shall specify the required operational sequences based on the handling configuration at the sites. Refer to the Technical Specifications for loaded HI-TRAC and HI-STORM 100 Overpack handling limitations.

1. Vertical Handling of HI-TRAC:

   a. Verify that the lift yoke load test certifications are current.

   b. Visually inspect the lifting device (lift yoke or lift links) and the lifting trunnions for gouges, cracks, deformation or other indications of damage. Replace or repair damaged components as necessary.

   c. Engage the lift yoke to the lifting trunnions. See Figure 8.1.3.

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3 *Depending on the mode of transport, the inlet vents may be required to be left out until placement on the ISFSI pad. This may be required to allow jacks to be inserted into the HI-STORM 100 Overpack ducts.*

d. Apply lifting tension to the lift yoke and verify proper engagement of the lift yoke.

Note:
Refer to the site's heavy load handling procedures for lift height, load path, floor loading and other applicable load handling requirements. Refer to Technical Specification 4.9 for additional equipment handling requirements.
Warning:
When lifting the loaded HI-TRAC with only the pool lid, the HI-TRAC should be carried as low as practicable. This minimizes the dose rates due to radiation scattering from the floor. Personnel should remain clear of the area and the HI-TRAC should be placed in position as soon as practicable.

e. Raise HI-TRAC and position it accordingly.

2. Upending of HI-TRAC in the transfer frame:

a. Position HI-TRAC under the lifting device. Refer to Step 1, above.

b. If necessary, remove the missile shield from the HI-TRAC transfer frame. See Figure 8.1.4.

c. Verify that the lift yoke load test certifications are current.

d. Visually inspect the lift yoke and the lifting trunnions for gouges, cracks, deformation or other indications of damage. Repair or replace damaged components as necessary.

e. *If necessary,* place a light layer of Fel-Pro Chemical Products, N-5000, Nuclear Grade Lubricant (or equivalent) on the cask trunnions and the palms of the lift yoke.

f. Engage the lift yoke to the lifting trunnions. See Figure 8.1.3.

g. Apply lifting tension to the lift yoke and verify proper engagement of the lift yoke.

h. Slowly rotate HI-TRAC to the vertical position keeping all rigging as close to vertical as practicable. See Figure 8.1.4.

i. Lift the pocket trunnions clear of the transfer frame rotation trunnions.

3. Downending of HI-TRAC in the transfer frame:

ALARA Warning:
A loaded HI-TRAC should only be downended with the transfer lid *or other auxiliary shielding* installed.

a. Position the transfer frame under the lifting device.

b. Verify that the lift yoke load test certifications are current.

c. Visually inspect the lift yoke and the lifting trunnions for gouges, cracks, deformation or other indications of damage. Repair or replace damaged components as necessary.

d. If necessary, place a light layer of Fel-Pro Chemical Products, N-5000, Nuclear Grade Lubricant (or equivalent) on the cask trunnions and the palms of the lift yoke.

e. Place a light layer of Fel-Pro Chemical Products, N-5000, Nuclear Grade Lubricant (or equivalent) on the inside surfaces of the cask rotation trunnion pockets and the corresponding surfaces of the transfer frame.

f. Engage the lift yoke to the lifting trunnions. See Figure 8.1.3.

g. Apply lifting tension to the lift yoke and verify proper lift yoke engagement.

h. Position the pocket trunnions to receive the transfer frame rotation trunnions. See Figure 8.1.4.

i. Slowly rotate HI-TRAC to the horizontal position keeping all rigging as close to vertical as practicable.

j. Disengage the lift yoke.

4. Horizontal Handling of HI-TRAC in the Transfer Frame:

a. Verify that the transfer frame is secured to the transport vehicle as necessary.

b. Downend HI-TRAC on the transfer frame per Step 3, if necessary.

c. If necessary, install the HI-TRAC missile Shield on the HI-STAR 100 transfer frame (See Figure 8.1.4).

5. Vertical Handling of HI-STORM:

Note:
The HI-STORM 100 Overpack is lifted using a special lifting device that connects the overhead lifting device (i.e. transporter or crane) to HI-STORM 100 lifting. The device is designed in accordance with ANSI N14.6 and maintains even (balanced) loading on all four HI-STORM 100 Overpack lift points.

a. Visually inspect the HI-STORM lifting device ~~studs~~ for gouges, cracks, deformation or other indications of damage.

b. Visually inspect the transporter attachment points for gouges, cracks, deformation or other indications of damage. Repair or replace damaged components as necessary.

c. If necessary, attach the transporter's lifting points to the HI-STORM *lifting device.*

d. Raise and position HI-STORM accordingly. See Figure 8.1.5.

6. Empty MPC Installation in HI-TRAC:

Note:
To avoid side loading the MPC lift lugs, the MPC must be upended in the MPC upending frame (or equivalent). See Figure 8.1.6.

a. If necessary, rinse off any road dirt with water. Remove any foreign objects from the MPC internals.

b. If necessary, upend the MPC as follows:

1. Visually inspect the MPC upending frame for gouges, cracks, deformation or other indications of damage. Repair or replace damaged components as necessary.

2. Install the MPC on the upending frame. Make sure that the banding straps are secure around the MPC shell. See Figure 8.1.6.

3. Inspect the upending frame slings in accordance with the site's lifting equipment inspection procedures. Rig the slings around the bar in a choker configuration to the outside of the cleats. See Figure 8.1.6.

4. Attach the MPC upper end slings of the upending frame to the main overhead lifting device. Attach the bottom-end slings to a secondary lifting device (or a chain fall attached to the primary lifting device) (See Figure 8.1.6).

5. Raise the MPC in the upending frame.

Warning:
The upending frame corner should be kept close to the ground during the upending process.

6. Slowly lift the upper end of the upending frame while lowering the bottom end of the upending frame.

7. When the MPC approaches the vertical orientation, tension on the lower slings may be released.

8. Place the MPC in a vertical orientation.

9. Disconnect the MPC straps and disconnect the rigging.

c. Install the MPC in HI-TRAC as follows:

1. Install the four point lift sling to the lift lugs inside the MPC. See Figure 8.1.7.

2. Raise and place the MPC inside HI-TRAC.

Note:
An alignment punch mark is provided on HI-TRAC and the top edge of the MPC. Similar marks are provided on the MPC lid and closure ring. See Figure 8.1.8.

3. Rotate the MPC so the alignment marks agree and seat the MPC inside HI-TRAC. Disconnect the MPC rigging or the MPC lift rig.

8.1.3 HI-TRAC and MPC Receipt Inspection and Loading Preparation

ALARA Note:
A bottom protective cover may be attached to HI-TRAC pool lid bottom. This will help prevent imbedding contaminated particles in HI-TRAC bottom surface and ease the decontamination effort.

1. Place HI-TRAC in the cask receiving area. Perform appropriate contamination and security surveillances, as required.

2. If necessary, remove HI-TRAC top lid by removing the top lid bolts and using the lift sling. See Figure 8.1.9 for rigging.

a. Rinse off any road dirt with water. Inspect all cavity locations for foreign objects. Remove any foreign objects.

b. Perform a radiological survey of the inside of HI-TRAC to verify there is no residual contamination from previous uses of the cask.

3. Disconnect the rigging.

4. Store the top lid and bolts in a site-approved location.

5. If necessary, configure HI-TRAC with the pool lid as follows:

ALARA Warning:
The bottom lid replacement as described below may be performed only on an empty HI-TRAC.

a. Inspect the seal on the pool lid for cuts, cracks, gaps and general condition. Replace the seal if necessary.

b. Remove the bottom lid bolts and store them temporarily.

c. Raise the empty HI-TRAC and position it on top of the pool lid. A circular tongue and groove arrangement helps align the pool lid with the HI-TRAC body.

d. Inspect the pool lid bolts for general condition. Replace worn or damaged bolts with new bolts.

e. Install the pool lid bolts. See Table 8.1.5 for torque requirements.

f. If necessary, thread the drain connector pipe to the pool lid.

g. Store the HI-TRAC Transfer Lid in a site-approved location.

6. At the site's discretion, perform an MPC receipt inspection and cleanliness inspection in accordance with a site-specific inspection checklist.

7. Install the MPC inside HI-TRAC and place HI-TRAC in the designated preparation area. See Section 8.1.2.

Note:
Upper fuel spacers are fuel-type specific. Not all fuel types require fuel spacers.

8. Install the upper fuel spacers in the MPC lid as follows:

Warning:
Never work under a suspended load.

a. Position the MPC lid on supports to allow access to the underside of the MPC lid.

b. Thread the fuel spacers into the holes provided on the underside of the MPC lid. See Figure 8.1.10 and Table 8.1.5 for torque requirements.

c. Install threaded plugs in the MPC lid where and when spacers will not be installed, if necessary. See Table 8.1.5 for torque requirements.

9. At the user's discretion perform an MPC lid and closure ring fit test:

Note:
It may be necessary to perform the MPC installation and inspection in a location that has sufficient crane clearance to perform the operation.

a. Visually inspect the MPC lid rigging (See Figure 8.1.9).

b. At the user's discretion, raise the MPC lid such that the drain line can be installed. Install the drain line to the underside of the MPC lid. Ensure that the reducer is fully seated against the bottom of the MPC lid. See Figure 8.1.11.

c. Align the MPC lid and lift yoke so the drain line will be positioned in the MPC drain location. See Figure 8.1.12. Install the MPC lid. Verify that the MPC lid fit and weld prep are in accordance with the design drawings.

ALARA Note:
The closure ring is installed by hand. ~~No tools are required~~*Some grinding may be required on the closure ring to adjust the fit.*

d. Install, *align and fit-up* the closure ring.

e. Verify that closure ring fit and weld prep are in accordance with the fabrication drawings or the approved design drawings.

f. Remove the closure ring, vent and drain port cover plates and the MPC lid. Disconnect the drain line. Store these components in an approved plant storage location.

10. At the user's discretion, perform an MPC vent and drain port cover plate fit test and verify that the weld prep is in accordance with the approved fabrication drawings.

Note:
Fuel spacers are fuel-type specific. Not all fuel types require fuel spacers. Lower fuel spacers are set in the MPC cells manually. No restraining devices are used.

11. Install lower fuel spacers in the MPC (if necessary). See Figure 8.1.10.

12. Fill the MPC and annulus as follows:

a. Fill the annulus with plant demineralized water to just below the inflatable seal seating surface.

Caution:
Do not use any sharp tools or instruments to install the inflatable seal. Some air in the inflatable seal helps in the installation.

b. Manually insert the inflatable annulus seal around the MPC. See Figure 8.1.13.

c. Ensure that the seal is uniformly positioned in the annulus area.

d. Inflate the seal to between 30 and 35 psig *or as directed by the manufacturer.*

e. Visually inspect the seal to ensure that it is properly seated in the annulus. Deflate, adjust and inflate the seal as necessary. Replace the seal as necessary.

ALARA Note:
Bolt plugs, placed in, or waterproof tape over empty bolt holes, reduce the time required for decontamination.

13. At the user's discretion, install HI-TRAC top lid bolt plugs and/or apply waterproof tape over any empty bolt holes.

ALARA Note:
Keeping the water level below the top of the MPC prevents splashing during handling.

14. Fill the MPC with either demineralized water or spent fuel pool water to approximately 12 inches below the top of the MPC shell. *Refer to LCO 3.3.1 for boron concentration requirements.*

15. If necessary for plant crane capacity limitations, drain the water from the neutron shield jacket. See Tables 8.1.1 through 8.1.4 *as applicable.*

16. Place HI-TRAC in the spent fuel pool as follows:

ALARA Note:
The optional annulus overpressure system is used to provide further protection against MPC external shell contamination during in-pool operations. The annulus overpressure system is equipped with double-locking quick disconnects to prevent inadvertent draining.

a. If used, fill the annulus overpressure system lines and reservoir with demineralized water and close the reservoir valve. Attach the annulus overpressure system to the HI-TRAC. See Figure 8.1.14.

b. Verify spent fuel pool for boron concentration requirements in accordance with LCO 3.3.1.

c. Engage the lift yoke to HI-TRAC lifting trunnions and position HI-TRAC over the cask loading area with the basket aligned to the orientation of the spent fuel racks.

ALARA Note:
Wetting the components that enter the spent fuel pool may reduce the amount of decontamination work to be performed later.

d. Wet the surfaces of HI-TRAC and lift yoke with plant demineralized water while slowly lowering HI-TRAC into the spent fuel pool.

e. When the top of the HI-TRAC reaches the elevation of the reservoir, open the annulus overpressure system reservoir valve. Maintain the reservoir water level at approximately 3/4 full the entire time the cask is in the spent fuel pool.

f. Place HI-TRAC on the floor of the cask loading area and disengage the lift yoke. Visually verify that the lift yoke is fully disengaged. Remove the lift yoke from the spent fuel pool while spraying the crane cables and yoke with plant demineralized water.

g. Observe the annulus seal for signs of air leakage. If leakage is observed (by the steady flow of bubbles emanating from one or more discrete locations) then immediately remove the HI-TRAC from the spent fuel pool and repair or replace the seal.

8.1.4 MPC Fuel Loading

Note:
An underwater camera or other suitable viewing device may be used for monitoring underwater operations.

1. Perform a fuel assembly selection verification using plant fuel records to ensure that only fuel assemblies that meet all the conditions for loading as specified in Appendix B to CoC 72-1014 have been selected for loading into the MPC.

2. Load the pre-selected fuel assemblies into the MPC in accordance with the approved fuel loading pattern.

3. Perform a post-loading visual verification of the assembly identification to confirm that the serial numbers match the approved fuel loading pattern.

8.1.5 MPC Closure

Note:
The user may elect to use the lid retention system (See Figure 8.1.15) to assist in the installation of the MPC lid and lift yoke, and to provide the means to secure the MPC lid in the event of a drop accident during loaded cask handling operations outside of the spent fuel pool. The user is responsible for evaluating the additional weight imposed on the cask, lift yoke, crane and floor prior to use. See Tables 8.1.1 through 8.1.4 as applicable.

1. Remove the HI-TRAC from the spent fuel pool as follows:

   a. Visually inspect the MPC lid rigging or lid retention system in accordance with site-approved rigging procedures. Attach the MPC lid to the lift yoke so that MPC lid, drain line and trunnions will be in relative alignment. Raise the MPC lid and adjust the rigging so the MPC lid hangs level as necessary.

   b. Install the drain line to the underside of the MPC lid. Ensure that the reducer is fully seated against the bottom of the MPC lid. See Figure 8.1.17.

   c. Align the MPC lid and lift yoke so the drain line will be positioned in the MPC drain location and the cask trunnions will also engage. See Figure 8.1.11 and 8.1.17.

ALARA Note:
Pre-wetting the components that enter the spent fuel pool may reduce the amount of decontamination work to be performed later.

   d. Slowly lower the MPC lid into the pool and insert the drain line into the drain access location and visually verify that the drain line is correctly oriented. See Figure 8.1.12.

   e. Lower the MPC lid while monitoring for any hang-up of the drain line. If the drain line becomes kinked or disfigured for any reason, remove the MPC lid and replace the drain line.

Note:
The outer diameter of the MPC lid will seat flush with the top edge of the MPC shell when properly installed.

   f. Seat the MPC lid in the MPC and visually verify that the lid is properly installed.

   g. Engage the lift yoke to HI-TRAC lifting trunnions.

   h. Apply a slight tension to the lift yoke and visually verify proper engagement of the lift yoke to the lifting trunnions.

ALARA Note:
Activated debris may have settled on the top face of HI-TRAC and MPC during fuel loading. The cask top surface should be kept under water until a preliminary dose rate scan clears the cask for removal. Users are responsible for any water dilution considerations.

i. Raise HI-TRAC until the MPC lid is just below the surface of the spent fuel pool. Survey the area above the cask lid to check for hot particles. ~~Raise and flush the upper surface of HI-TRAC and MPC with plant demineralized water as necessary to r~~*R*emove any activated *or highly radioactive* particles from HI-TRAC or MPC.

j. Visually verify that the MPC lid is properly seated. Lower HI-TRAC, reinstall the lid, and repeat ~~Step 5,~~ as necessary.

k. Install the lid retention system bolts if the lid retention system is used.

l. Continue to raise the HI-TRAC under the direction of the plant's radiological control personnel. Continue rinsing the surfaces with demineralized water. When the top of the HI-TRAC reaches the same elevation as the reservoir, close the annulus overpressure system reservoir valve (if used). See Figure 8.1.14.

Caution:
Users are required to take necessary actions to prevent boiling of the water in the MPC. This may be accomplished by performing a site-specific analysis to identify a time limitation to ensure that water boiling will not occur in the MPC prior to the initiation of draining operations. Chapter 4 of the TSAR provides some sample time limits for the time to initiation of draining for various spent fuel pool water temperatures using design basis heat loads. These time limits may be adopted if the user chooses not to perform a site-specific analysis. If time limitations are imposed, users shall have appropriate procedures and equipment to take action. One course of action involves initiating an MPC water flush for a certain duration and flow rate. Any site-specific analysis shall identify the methods to respond should it become likely that the imposed time limit could be exceeded. *Refer to LCO 3.3.1 for boron concentration requirements whenever water is added to the loaded MPC.*

m. Remove HI-TRAC from the spent fuel pool while spraying the surfaces with plant demineralized water. Record the time.

ALARA Note:
Decontamination of HI-TRAC bottom should be performed using remote cleaning methods, covering or other methods to minimize personnel exposure. The bottom lid decontamination may be deferred until the after bottom lid replacement. Any initial decontamination should only be sufficient to preclude spread of contamination within the fuel building.

n. Decontaminate HI-TRAC bottom and HI-TRAC exterior surfaces including the pool lid bottom. Remove the bottom protective cover, if used.

o. If used, disconnect the annulus overpressure system from the HI-TRAC via the quick disconnect. See Figure 8.1.14.

p. Set HI-TRAC in the designated cask preparation area.

> Note:
> If the transfer cask is expected to be operated in an environment below 32 °F, the water jacket shall be filled with an ethylene glycol solution (25% ethylene glycol). Otherwise, the jacket shall be filled with demineralized water.

q. If previously drained, fill the neutron shield jacket with plant demineralized water or an ethylene glycol solution (25% ethylene glycol) as necessary.

r. Disconnect the lifting slings or lid retention system (if used) from the MPC lid and disengage the lift yoke. Decontaminate and store these items in an approved storage location.

> ***Warning:***
> *MPC lid dose rates are measured to ensure that dose rates are within expected values. Dose rates exceeding the ~~429 mrem/hour~~ expected values could indicate that fuel assemblies not meeting the ~~Technical Specifications~~ CoC may have been loaded~~.~~.*

s. Measure the dose rates at the MPC lid and verify that the combined gamma and neutron dose rate is below 429 mrem/hour.

t. Perform decontamination and a dose rate/contamination survey of HI-TRAC.

u. Prepare the MPC annulus for MPC lid welding as follows:

> **ALARA Note:**
> If the temporary shield ring is not used, some form of gamma shielding (e.g., lead bricks or blankets) should be placed in the trunnion recess areas of the HI-TRAC water jacket to eliminate the localized hot spot.

v. Decontaminate the area around the HI-TRAC top flange and install the temporary shield ring, (if used). See Figure 8.1.18.

> **ALARA Note:**
> The water in the HI-TRAC-to-MPC annulus provides personnel shielding. The level should be checked periodically and refilled accordingly.

w. Attach the drain line to the HI-TRAC drain port and lower the annulus water level approximately 6 inches.

2. Prepare for MPC lid welding as follows:

Note:
The following steps use two identical Removable Valve Operating Assemblies (RVOAs) (See Figure 8.1.16) to engage the MPC vent and drain ports. The MPC vent and drain ports are equipped with metal-to-metal seals to minimize leakage during vacuum drying, and to withstand the long-term effects of temperature and radiation. The RVOAs allow the vent and drain ports to be operated like valves and prevent the need to hot tap into the penetrations during unloading operations. The RVOAs are purposely not installed until the cask is removed from the spent fuel pool to reduce the amount of decontamination.

Note:
The vent and drain ports are opened by pushing the RVOA handle down to engage the square nut on the cap and turning the handle fully in the counter-clockwise direction. The handle will not turn once the port is fully open. Similarly, the vent and drain ports are closed by turning the handle fully in the clockwise direction. The ports are closed when the handle cannot be turned further.

a. Clean the vent and drain ports to remove any dirt. Install the RVOAs (See Figure 8.1.16) to the vent and drain ports leaving caps open.

ALARA Warning:
Personnel should remain clear of the drain hoses any time water is being pumped or purged from the MPC. Assembly crud, suspended in the water, may create a radiation hazard to workers. Controlling the amount of water pumped from the MPC prior to welding keeps the fuel assembly cladding covered with water yet still allows room for thermal expansion.

b. Attach the water pump to the drain port (See Figure 8.1.19) and pump ~~between approximately~~ *between* 50 *and*~~to~~ 120 gallons to the spent fuel pool or liquid radwaste system. The water level is lowered to keep moisture away from the weld region.

c. Disconnect the water pump.

d. Carefully decontaminate the MPC lid top surface and the shell area above the inflatable annulus seal.

e. Deflate and remove the inflatable annulus seal.

ALARA Note:
The MPC exterior shell survey is performed to evaluate the performance of the inflatable annulus seal. Indications of contamination could require the MPC to be unloaded. In the event that the MPC shell is contaminated, users must decontaminate the annulus. If the contamination cannot be reduced to acceptable levels, the MPC must be returned to the spent fuel pool and unloaded. The MPC may then be removed and the external shell decontaminated.

f. Survey the MPC lid top surfaces and the accessible areas of the top three inches of the MPC shell in accordance with the requirements of Technical Specification LCO 3.2.2.

ALARA Note:
The annulus shield is used to prevent objects from being dropped into the annulus and helps reduce dose rates directly above the annulus region. ~~The annulus shield is hand installed and requires no tools.~~

g. Install the annulus shield. See Figure 8.1.13.

3. Weld the MPC lid as follows:

ALARA Warning:
Grinding of MPC welds may create the potential for contamination. All grinding activities shall be performed under the direction of radiation protection personnel.

ALARA Warning:
It may be necessary to rotate or reposition the MPC lid slightly to achieve uniform weld gap and lid alignment. A punch mark is located on the outer edge of the MPC lid and shell. These marks are aligned with the alignment mark on the top edge of the HI-TRAC Transfer Cask (See Figure 8.1.8). If necessary, the MPC lid lift should be performed using a hand operated chain fall to closely control the lift to allow rotation and repositioning by hand. If the chain fall is hung from the crane hook, the crane should be tagged out of service to prevent inadvertent use during this operation. Continuous radiation monitoring is recommended.

a. If necessary center the lid in the MPC shell using a hand-operated chain fall.

Note:
The MPC is equipped with lid shims that serve to close the gap in the joint for MPC lid closure weld.

b. As necessary, install the MPC lid shims around the MPC lid to make the weld gap uniform.

ALARA Note:
The AWS Baseplate shield is used to further reduce the dose rates to the operators working around the top cask surfaces.

c. Install the automated welding system. See Figure 8.1.9 for rigging.

Note:
It may be necessary to remove the RVOAs to allow access for the automated welding system. In this event, the vent and drain port caps should be opened to allow for thermal expansion of the MPC water.

d. Tack weld the MPC lid.

e. Visually inspect the tack welds.

Note:

The Lid-to-Shell weld may be examined by either volumetric examination (UT) or multi-layer liquid penetrant examination. If volumetric examination is used, it shall be the ultrasonic method and shall include a liquid penetrant (PT) of the root and final weld layers. If PT alone is used, at a minimum, it must include the root and final weld layers and each 3/8-inch of weld depth.

For all liquid penetrant examinations in this procedure, ASME Boiler and Pressure Vessel Code [8.1.3], Section V, Article 6 provides the liquid penetrant examination methods. The acceptance standards for liquid penetrant examination shall be in accordance with ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-5350 as specified on the Design Drawings. ASME Code, Section III, Subsection NB, Article NB-4450 provides acceptable requirements for weld repair. NDE personnel shall be qualified per the requirements of Section III and V of the Code or site-specific program.

Volumetric examination of the MPC Lid-to-Shell weld by ultrasonic test method is defined in ASME Boiler and Pressure Vessel Code, Section V, Article 5. The acceptance standards for UT examination are per Section III, Subsection NB, Article NB-5332 for UT as defined on the Design Drawings. NDE personnel shall be qualified per the requirements of Section III and V of the Code or site-specific program.

f. Lay the root weld.

g. Perform a liquid penetrant examination of the weld root.

h. Complete the MPC lid welding performing intermediate PTs as required.

i. Perform a liquid penetrant examination on the MPC lid final pass.

4. Perform hydrostatic and MPC leakage rate testing as follows:

ALARA Note:

The leakage rates are determined before the MPC is drained for ALARA reasons. A weld repair is a lower dose activity if water remains inside the MPC.

a. Attach the drain line to the vent port and route the drain line to the spent fuel pool or the plant liquid radwaste system. See Figure 8.1.20 for the hydrostatic test arrangement.

ALARA Warning:

Water flowing from the MPC may carry activated particles and fuel particles. Apply appropriate ALARA practices around the drain line.

b. Fill the MPC with either spent fuel pool water or plant demineralized water until water is observed flowing out of the vent port drain hose. *Refer to LCO 3.3.1 for boron concentration requirements.*

c. Perform a hydrostatic test of the MPC as follows:

1. Close the drain valve and pressurize the MPC to 125 +5/-0 psig.

2. Close the inlet valve and monitor the pressure for a minimum of 10 minutes. The pressure shall not drop during the performance of the test.

3. Following the 10-minute hold period, visually examine the MPC lid-to-shell weld for leakage of water. The acceptance criteria is no observable water leakage.

4. Release the MPC internal pressure, disconnect the water fill line and drain line from the vent and drain port RVOAs leaving the vent and drain port caps open.

d. Repeat the liquid penetrant examination on the MPC lid final pass.

e. Attach a regulated helium supply (pressure set to *90*~~10~~+10/-0 psig) to the vent port and attach the drain line to the drain port as shown on Figure 8.1.21.

~~e.Reset the totalizer on the drain line.~~

f. Verify the correct pressure (pressure set to *90*~~10~~+10/-0 psig) on the helium supply and open the helium supply valve. Drain approximately twenty gallons~~ as measured by the totalizer.~~.

g. Close the drain port valve and pressurize the MPC to 9~~1~~0+10/-0 psig helium.

h. Close the vent port.

Note:
The leakage detector may detect residual helium in the atmosphere. If the leakage tests detects a leak, the area should be flushed with nitrogen or compressed air and the location should be retested. *Users may correlate the leakage rate acceptance criteria based on the conditions of the test.*

i. Perform a helium sniffer probe leakage rate test of the MPC lid-to shell weld in accordance with the Mass Spectrometer Leak Detector (MSLD) manufacturer's instructions and ANSI N14.5 [8.1.2]. The MPC Helium Leak Rate shall be < 5.0E-6 atm cc/sec (He) *based on a 1 atmosphere pressure differential across the weld joint.* See Technical Specification LCO 3.1.1.

j. Repair any weld defects in accordance with the site's approved weld repair procedures. Reperform the Ultrasonic (if necessary), PT, Hydrostatic and Helium Leakage tests if weld repair is performed.

5. Drain the MPC as follows:

a. Attach the drain line to the vent port and route the drain line to the spent fuel pool or the plant liquid radwaste system. See Figure 8.1.20.

ALARA Warning:
Water flowing from the MPC may carry activated particles and fuel particles. Apply appropriate ALARA practices around the drain line.

~~Attach the water fill line to the drain port (water pressure set to 15+5/-0 psig) and fill the MPC with either spent fuel pool water or plant demineralized water until water is observed flowing out of the drain line.~~

b. Disconnect the water fill and drain lines from the MPC leaving the vent port valve open to allow for thermal expansion of the MPC water.

ALARA Warning:
Dose rates will rise as water is drained from the MPC. Continuous dose rate monitoring is recommended.

c. Attach a regulated helium or nitrogen supply (pressure set to 2~~1~~5+5/-0 psig) to the vent port.

d. Attach a drain line to the drain port shown on Figure 8.1.21.

~~f.Reset the totalizer on the drain line.~~

e. Verify the correct pressure (pressure set to 25+5/-0) on the gas supply.

f. Open the gas supply valve and record the time at the start of MPC drain*ing*~~down~~.

Note:
An optional warming pad may be placed under the HI-TRAC Transfer Cask to replace the heat lost during the evaporation process of vacuum drying. This may be used at the user's discretion for older and colder fuel assemblies to reduce vacuum drying times.

g. Start the warming pad, if used.

Note:
Users may continue to purge the MPC to remove as much water as possible.

h. Drain the water out of the MPC until water ceases to flow out of the drain line. Shut the gas supply valve. See Figure 8.1.21.

~~k.Record the volume of water (as measured on the totalizer) drained from the MPC.~~

i. Disconnect the gas supply line from the MPC.

j. Disconnect the drain line from the MPC.

6. Vacuum Dry the MPC as follows:

Note:
Vacuum drying is performed to remove moisture and oxidizing gasses from the MPC. This ensures a suitable environment for long-term storage of spent fuel assemblies and ensures that the MPC pressure remains within design limits. The vacuum drying process reduces the MPC internal pressure in stages. Dropping the internal pressure too quickly may cause the formation of ice in the fittings. Ice formation could result in incomplete removal of moisture from the MPC.

a. Attach the vacuum drying system (VDS) to the vent and drain port RVOAs. See Figure 8.1.22.

Note:
The vacuum drying system may be configured with an optional fore-line condenser to increase vacuum pump efficiency. Water may need to be periodically drained. ~~The volume of condensed water should be measured and added to the water volume measured during MPC draining.~~

b. Reduce the MPC pressure to approximately 100 torr and throttle the VDS suction valve to maintain this pressure for approximately 15 minutes.

c. Reduce the MPC pressure to approximately 70 torr and throttle the VDS suction valve to maintain this pressure for approximately 15 minutes.

d. Reduce the MPC pressure to approximately 50 torr and throttle the VDS suction valve to maintain this pressure for approximately 15 minutes.

e. Reduce the MPC pressure to approximately 30 torr and throttle the VDS suction valve to maintain this pressure for approximately 15 minutes.

Note:
The vacuum drying system pressure will remain at about 30 torr until most of the liquid water has been removed from the MPC.

f. When the MPC pressure begins to drop (without any operator action), completely open the VDS suction valve and reduce the MPC pressure to below 3 torr.

g. Shut the VDS valves and verify a stable MPC pressure on the vacuum gage.

Note:
The MPC pressure may rise due to the presence of water in the MPC. The dryness test may need to be repeated several times until all the water has been removed. Leaks in the vacuum drying system, damage to the vacuum pump, and improper vacuum gauge calibration may cause repeated failure of the dryness verification test. These conditions should be checked as part of the corrective actions if repeated failure of the dryness verification test is occurring.

h. Perform the MPC drying pressure test in accordance with the Technical Specification LCO 3.1.1.

i. Close the vent and drain port valves.

j. Disconnect the VDS from the MPC.

k. Stop the warming pad, if used.

l. Close the drain port RVOA cap and remove the drain port RVOA.

7. Backfill the MPC as follows:

Note:
Helium backfill shall be in accordance with the Technical Specification at 99.995% (minimum) purity.

a. *Set the helium bottle regulator pressure to 70+5/-0 psig.*

b. *Purge the* helium backfill system *to remove oxygen from the lines.*

c. *Attach the* helium backfill system *to the vent port as shown on Figure 8.1.23 and open the vent port.*

d. *Slowly open the helium supply valve while monitoring the pressure rise in the MPC.*

Note:
If helium bottles need to be replaced, the bottle valve needs to be closed and the entire regulator assembly transferred to the new bottle.

e. *Carefully backfill the MPC to greater than 0 psig and less than the maximum pressure specified in LCO 2.1.1.*

f. *Disconnect the* helium backfill system *from the MPC.*

g. *Close the vent port RVOA and disconnect the vent port RVOA.*

~~**Note:**~~
~~If helium bottles need to be replaced, the bottle valve needs to be closed and the entire regulator assembly transferred to the new bottle.~~

~~h.Backfill the MPC to between M_{max} and M_{min} as determined in Step. and verify correct helium density per Technical Specification LCO 3.1.1.~~

~~i.Disconnect the HBS from the MPC.~~

~~j.Close the vent port RVOA and disconnect the vent port RVOA.~~

8. Weld the vent and drain port cover plates as follows:

Note:
The process provided herein may be modified to perform actions in parallel. Users may perform the final PT on the circumferential and plug welds at the same time.

a. Wipe the inside area of the vent and drain port recesses to dry and clean the surfaces.

b. Place the cover plate over the vent port recess.~~Raise the edge of the cover plate and insert the nozzle of the helium supply into the vent port recess to displace the oxygen with helium.~~

~~**Note:**~~
~~Helium gas is required to be injected into the port recesses to ensure that the leakage test is valid.~~

~~d.Displace the air in the recess using the helium nozzle and immediately close the cover plate.~~

Note:
The vent and drain ports are provided with two small threaded holes for the injection of helium. The set screws may be installed or removed during welding.

c. Tack weld the cover plate.

d. Visually inspect the tack welds.

e. Weld the root pass on the vent port cover plate.

Note:
ASME Boiler and Pressure Vessel Code [8.1.3], Section V, Article 6 provides the liquid penetrant inspection methods. The acceptance standards for liquid penetrant examination shall be in accordance with ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-5350 as specified on the Design Drawings. ASME Code, Section III, Subsection NB, Article NB-4450 provides acceptable requirements for weld repair. NDE personnel shall be qualified per the requirements of Section V of the Code or site-specific program.

f. Perform a liquid penetrant examination on the vent port cover plate root weld.

g. Complete the vent port cover plate welding.

Note:
ASME Boiler and Pressure Vessel Code [8.1.3], Section V, Article 6 provides the liquid penetrant inspection methods. The acceptance standards for liquid penetrant examination shall be in accordance with ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-5350 as specified on the Design Drawings. ASME Code, Section III, Subsection NB, Article NB-4450 provides acceptable requirements for weld repair. NDE personnel shall be qualified per the requirements of Section V of the Code or site-specific program.

h. Perform a liquid penetrant examination on the vent port cover weld.

i. Repeat for the drain port cover plate.

9. Perform a leakage test of the MPC vent and drain port cover plates as follows:

Note:
The leakage detector may detect residual helium in the atmosphere from the helium injection process. If the leakage tests detects a leak, the area should be blown clear with compressed air or nitrogen and the location should be retested.

Note:
The following process provides a high concentration of helium gas in the cavity. Other methods that ensure a high concentration of helium gas are also acceptable.

a. *If necessary, remove the cover plate set screws.*

b. *Flush the cavity with helium to remove the air and immediately install the set screws recessed ¼-inch below the top of the cover plate.*

c. *Plug weld the recess above each set screw to complete the penetration closure welding.*

Note:
ASME Boiler and Pressure Vessel Code [8.1.3], Section V, Article 6 provides the liquid penetrant inspection methods. The acceptance standards for liquid penetrant examination shall be in accordance with ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-5350 as specified on the Design Drawings. ASME Code, Section III, Subsection NB, Article NB-4450 provides acceptable requirements for weld repair. NDE personnel shall be qualified per the requirements of Section V of the Code or site-specific program.

d. *Perform a liquid penetrant examination on the plug weld.*

e. Flush the area around the vent and drain cover plates with compressed air or nitrogen to remove any residual helium gas.

f. Perform a helium leakage rate test of vent and drain cover plate welds in accordance with the Mass Spectrometer Leak Detector (MSLD) manufacturer's instructions and ANSI N14.5 [8.1.2]. The MPC Helium Leak Rate acceptance criteria is provided in the Technical Specification LCO 3.1.1.

g. Repair any weld defects in accordance with the site's approved code weld repair procedures. Re-perform the leakage test as required.

10. Weld the MPC closure ring as follows:

ALARA Note:
The closure ring is installed by hand. No tools are required.

a. Install and align the closure ring. See Figure 8.1.8.

b. Tack weld the closure ring to the MPC shell and the MPC lid.

c. Visually inspect the tack welds.

d. Lay the root weld between the closure ring and the MPC shell.

e. Lay the root weld between the closure ring and the MPC lid.

f. Lay the root weld connecting the two closure ring segments.

Note:
ASME Boiler and Pressure Vessel Code [8.1.3], Section V, Article 6 provides the liquid penetrant inspection methods. The acceptance standards for liquid penetrant examination shall be in accordance with ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-5350 as specified on the Design Drawings. ASME Code, Section III, Subsection NB, Article NB-4450 provides acceptable requirements for weld repair. NDE personnel shall be qualified per the requirements of Section V of the Code or site-specific program.

g. Perform a liquid penetrant examination on the closure ring root welds.

h. Complete the closure ring welding.

Note:
ASME Boiler and Pressure Vessel Code [8.1.3], Section V, Article 6 provides the liquid penetrant inspection methods. The acceptance standards for liquid penetrant examination are contained in the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-5350. ASME Code, Section III, Subsection NB, Article NB-4450 provides acceptable requirements for weld repair. NDE personnel shall be qualified per the requirements of Section V of the Code or site-specific program.

i. Perform a liquid penetrant examination on the closure ring final weld.

~~j. Remove the automated welding system.~~

j. If necessary, remove the AWS ~~baseplate shield~~. See Figure 8.1.7 for rigging.

8.1.6 Preparation for Storage

ALARA Warning:
Dose rates will rise around the top of the annulus as water is drained from the annulus. Apply appropriate ALARA practices.

1. Remove the annulus shield *(if used)* and store it in an approved plant storage location

2. Attach a drain line to the HI-TRAC and drain the remaining water from the annulus to the spent fuel pool or the plant liquid radwaste system.

3. Install HI-TRAC top lid as follows:

Warning:
When traversing the MPC with the HI-TRAC top lid *using non-single-failure proof (or equivalent safety factors)*, the lid shall be kept less than 2 feet above the top surface of the MPC. This is performed to protect the MPC lid from a potential lid drop.

a. Install HI-TRAC top lid. Inspect the bolts for general condition. Replace worn or damaged bolts with new bolts.

b. Install and torque the top lid bolts. See Table 8.1.5 for torque requirements.

4. Inspect the lift cleat bolts for general condition. Replace worn or damaged bolts with new bolts.

5. Install the MPC lift cleats and MPC support stays to the MPC lid and torque the bolts. See Figure 8.1.24 and 8.1.25. See Table 8.1.5 for torque requirements.

6. Drain the temporary shield ring, if used. Remove the ring segments (or site-supplied temporary shielding) and store them in an approved plant storage location.

7. Replace the pool lid with the transfer lid as follows:

ALARA Note:
The transfer slide is used to perform the bottom lid replacement and eliminate the possibility of directly exposing the bottom of the MPC. The transfer slide consists of the glide rails, rollers, transfer step and carriage. The transfer slide carriage and jacks are powered and operated by remote control. The carriage consists of four short-stroke hydraulic jacks that raise the carriage to support the weight of the bottom lid. The transfer step produces a tight level seam between the transfer lid and the pool lid to minimize radiation streaming. The transfer slide jacks do not have sufficient lift capability to support the entire weight of the HI-TRAC. This was selected specifically to limit floor loads. Users should designate a specific area that has sufficient room and support for performing this operation.

Note:
The following steps are performed to pretension the MPC support stays.

a. Lower the lift yoke and attach the MPC support stays to the lift yoke. See Figure 8.1.25.

b. Rise the lift yoke and engage the lift yoke to the HI-TRAC lifting trunnions.

Note:
The MPC lift cleats and support stays provide redundant support of the MPC during the bottom lid replacement.

c. If necessary, position the transfer step and transfer lid adjacent to one another on the transfer slide carriage. See Figure 8.1.26. See Figure 8.1.9 for transfer step rigging.

d. Test the travel and lift features of the transfer slide to ensure its operability.

e. Position HI-TRAC with the pool lid centered over the transfer step approximately one inch above the transfer step.

f. Raise the transfer slide carriage so the transfer step is supporting the pool lid bottom. Remove the bottom lid bolts and store them temporarily.

ALARA Warning:
Clear all personnel away from the immediate operations area. The transfer slide carriage and jacks are remotely operated. The carriage has fine adjustment features to allow precise positioning of the lids.

g. Lower the transfer carriage and position the transfer lid under HI-TRAC.

h. Raise the transfer slide carriage to place the transfer lid against the HI-TRAC bottom lid bolting flange.

i. Inspect the transfer lid bolts for general condition. Replace worn or damaged bolts with new bolts.

j. Install the transfer lid bolts. See Table 8.1.5 for torque requirements.

k. Raise and remove the HI-TRAC from the transfer slide.

l. Disconnect the MPC support stays and store them in an approved plant storage location.

Note:
HI-STORM receipt inspection *and preparation* may be performed independent of procedural sequence.

8. Perform a HI-STORM receipt inspection and cleanliness inspection in accordance with a site-approved inspection checklist, if required. See Figure 8.1.27 for HI-STORM lid rigging.

Note:
MPC transfer may be performed in the cask receiving area, at the ISFSI, or any other location deemed appropriate by the licensee. The following steps describe the general transfer operations (See Figure 8.1.28). The HI-STORM may be positioned on an air pad, roller skid in the cask receiving area or at the ISFSI. The HI-STORM or HI-TRAC may be transferred to the ISFSI using a heavy haul transfer trailer, special transporter or other equipment specifically designed for such a function (See Figure 8.1.29) as long as the HI-TRAC and HI-STORM lifting requirements as described in the Technical Specifications are not exceeded. The licensee is responsible for assessing and controlling floor loading conditions during the MPC transfer operations. *Installation of the lid, vent screen, and other components may vary according to the cask movement methods and location of MPC transfer.*

8.1.7 Placement of HI-STORM into Storage

1. Position an empty HI-STORM module at the designated MPC transfer location. The HI-STORM may be positioned on the ground, on a deenergized air pad, on a roller skid, ~~or~~ on a flatbed trailer *or other special device designed for such purposes*. If necessary, remove the exit vent screens and gamma shield cross plates *,temperature elements* and the HI-STORM lid. See Figure 8.1.28 for some of the various MPC transfer options.

   a. Rinse off any road dirt with water. Inspect all cavity locations for foreign objects. Remove any foreign objects.

   b. Transfer the HI-TRAC to the MPC transfer location.

2. Deenergize the air pad or chock the vehicle wheels to prevent movement of the HI-STORM during MPC transfer and to maintain level, as required.

ALARA Note:
The HI-STORM vent duct shield inserts eliminate the streaming path created when the MPC is transferred past the exit vent ducts. *Vent duct shield inserts are not used with the HI-STORM 100S.*

3. If necessary, i~~I~~nstall the HI-STORM vent duct shield inserts in the HI-STORM exit vents. See Figure 8.1.30.

4. Install the alignment *guides*. See Figure 8.1.31 (detail).

Warning:
Depending on the specific site and mode of transfer operation selected, the HI-TRAC may require independent support by the lifting device or independent restraint on top of HI-STORM 100 during the MPC transfer operations. This may be achieved by maintaining continuous hold of the HI-TRAC by the lifting device or by the use of mechanical restraints securing the HI-TRAC in position.

5. *P*osition *HI-TRAC* above HI-STORM. See Figures 8.1.28 and 8.1.31.

6. Align HI-TRAC over HI-STORM (See Figure 8.1.31) and mate the overpacks.

7. If necessary, *attach* ~~install the~~ *the* MPC downloader. ~~on top of HI-TRAC.~~ See Figure 8.1.32.

8. Attach the MPC lift slings to the MPC lift cleats.

9. Raise the MPC slightly to remove the weight of the MPC from the transfer lid doors.

10. Remove the transfer lid door locking pins and open the doors.

ALARA Warning:
MPC trim plates are used to eliminate the streaming path above and below the doors. If trim plates are not used, personnel should remain clear of the immediate door area during MPC downloading since there may be some radiation streaming during MPC raising and lowering operations.

11. At the user's discretion, install trim plates to cover the gap above and below the door. The trim plates may be secured using hand clamps or any other method deemed suitable by the user. See Figure 8.1.33.

12. Lower the MPC into HI-STORM.

13. Disconnect the slings from the MPC lifting device and lower them onto the MPC lid.~~Remove the trim plates (if used), close the doors and install the locking pins. See Table 8.1.5 for torque requirements.~~

ALARA Warning:
Personnel should remain clear (to the maximum extent practicable) of the HI-STORM annulus when HI-TRAC is removed due to radiation streaming.

Note:
It may be necessary, due to site-specific circumstances, to move HI-STORM from under the empty HI-TRAC to install the HI-STORM lid, while inside the Part 50 facility. In these cases. users shall evaluate the specifics of their movements within the requirements of their Part 50 license.

14. Remove HI-TRAC from on top of HI-STORM.

15. Remove the MPC lift cleats and MPC lift slings and install hole plugs in the empty MPC bolt holes. See Table 8.1.5 for torque requirements.

16. Place HI-STORM in storage as follows:

    a. Remove the HI-STORM vent duct shield inserts *(if used)*. See Figure 8.1.30.

    b. Inspect the HI-STORM lid studs nuts for general condition. Replace worn or damaged components with new ones.

    c. [redacted]

    ~~c.~~*d.* Remove the *alignment guides* and install the four studs to full (bottomed-out) engagement.

Warning:
Unless the lift is single-failure proof (or equivalent safety factor) the HI-STORM lid, the lid shall be kept less than 2 feet above the top surface of the overpack. This is performed to protect the *MPC* lid from a potential HI-STORM 100 lid drop.

Note:
Shims may be needed on the HI-STORM 100 lid studs. The shims shall be positioned to ensure a radial gap of less than 1/16 inch around each stud. *The method of cask movement will determine the most effective sequence for vent screen, lid, temperature element, and vent gamma shield cross plate installation.*

~~d.~~*e.* Install the HI-STORM lid and install the lid nuts.. See Table 8.1.5 for bolting requirements. Install the HI-STORM 100 lid stud shims if necessary. See Figure 8.1.27 for rigging.

~~e.~~*f.* *If necessary, i*~~I~~nstall the HI-STORM exit vent gamma shield cross plates, thermocouples and vent screens. See Table 8.1.5 for torque requirements. See Figure 8.1.34a and 8.1.34b.

~~f.~~*g.* Remove the HI-STORM lid lifting device and install the hole plugs in the empty holes. Store the lifting device in an approved plant storage location. See Table 8.1.5 for torque requirements.

~~g.~~*h.* Perform shielding effectiveness testing per Technical Specification LCO 3.2.3.

~~h.~~*i.* Secure HI-STORM to the *transporter* ~~transfer~~ device as necessary.

17. Perform a transport route walkdown to ensure that the cask transport conditions are met. See Technical Specification for the on-site cask handling limitations.

~~a.~~*18.* Transfer the HI-STORM to its designated storage location at the appropriate pitch. See Figure 8.1.35.

Note:
Any jacking system shall have the provisions to ensure uniform loading of all four jacks during the lifting operation.

~~b.~~*a.* If air pads were used, insert the HI-STORM lifting jacks and raise HI-STORM. See Figure 8.1.36. Remove the air pad.

~~c.~~*b.* Lower and remove the HI-STORM lifting jacks, if used.

[redacted]

[redacted]

[redacted]

~~19.~~*20.* Perform an air temperature rise test as follows for the first HI-STORM 100 System placed in service:

Note:
The air temperature rise test shall be performed between 5 and 7 days after installation of the HI-STORM 100 lid to allow thermal conditions to stabilize. The purpose of this test is to confirm the initial performance of the HI-STORM 100 ventilation system.

a. Measure the inlet air (or screen surface) temperature at the center of each of the four vent screens. Determine the average inlet air (or surface screen) temperature.

b. Measure the outlet air (or screen surface) temperature at the center of each of the four vent screens. Determine the average outlet air (or surface screen) temperature.

c. Determine the average air temperature rise by subtracting the results of the average inlet screen temperature from the average outlet screen temperature.

d. Report the results to the certificate holder.

Table 8.1.1
HI-STORM 100 SYSTEM COMPONENT AND HANDLING WEIGHTS
125-TON HI-TRAC

Component	MPC-24 (Lbs.)	MPC-32 (Lbs.)	MPC-68 (Lbs.)	Case[4] Applicability					
				1	2	3	4	5	6
Empty HI-STORM 100 overpack (without lid) [5]	245,040	245,040	245,040					1	
HI-STORM 100 lid (without rigging)	23,963	23,963	23,963					1	
Empty HI-STORM 100S overpack (without lid) [4]	226,326	226,326	226,326					1	
HI-STORM 100S lid (without rigging)	24,905	24,905	24,905					1	
Empty MPC (without lid or closure ring including drain line)	29,845	24,503	29,302	1	1	1	1	1	1
MPC lid (without fuel spacers or drain line)	9677	9677	10,194	1	1	1	1	1	1
MPC Closure Ring	145	145	145			1	1	1	1
Fuel (design basis)	40,320	53,760	47,600	1	1	1	1	1	1
Damaged Fuel Container (Dresden 1)	0	0	150						
Damaged Fuel Container (Humboldt Bay)	0	0	120						
MPC water (with fuel in MPC)	17,630	17,630	16,957	1	1				
Annulus Water	256	256	256	1	1				
HI-TRAC Lift Yoke (with slings)	3600	3600	3600	1	1	1			
Annulus Seal	50	50	50	1	1				
Lid Retention System	2300	2300	2300						
Transfer frame	6700	6700	6700						1
Empty HI-TRAC (without Top Lid, neutron shield jacket water, or bottom lids)	117,803	117,803	117,803	1	1	1			1
HI-TRAC Top Lid	2745	2745	2745			1			1
HI-TRAC Pool Lid (with bolts)	11,871	11,871	11,871	1	1				
HI-TRAC Transfer Lid (with bolts)	23,437	23,437	23,437			1			1
HI-TRAC Neutron Shield Jacket Water	8281	8281	8281		1	1			1
MPC Stays (total of 2)	200	200	200						
MPC Lift Cleat	480	230	480			1	1		1

[4] See Table8.1.2 for a description of each load handling case.
[5] Add an additional 1955 lbs. for the HI-STORM 100A overpack.

TABLE 8.1.2
MAXIMUM HANDLING WEIGHTS
125-TON HI-TRAC

Caution:
The maximum weight supported by the 125-Ton HI-TRAC lifting trunnions cannot exceed 250,000 lbs. Users must take actions to ensure that this limit is not exceeded.

Note:
The weight of the fuel spacers and the damaged fuel container are less than the weight of the design basis fuel assembly for each MPC and are therefore not included in the maximum handling weight calculations. Fuel spacers are determined to be the maximum combination weight of fuel + spacer. Users should determine their specific handling weights based on the MPC contents and the expected handling modes.

Case No.	*Load Handling Evolution*	*Weight (lbs)*		
		MPC-24	*MPC-32*	*MPC-68*
1	*Loaded HI-TRAC removal from spent fuel pool (neutron tank empty)*	*231,052*	*239,150*	*237,633*
2	*Loaded HI-TRAC removal from spent fuel pool (neutron tank full)*	*239,334*	*247,432*	*245,915*
3	*Loaded HI-TRAC During Movement through Hatchway*	*236,334*	*244,182*	*243,588*
4	*MPC during transfer operations*	*80,467*	*88,315*	*87,721*
5A	*Loaded HI-STORM 100 in storage (See Note 5 to Table 8.1.1)*	*348,990*	*357,088*	*356,244*
5B	*Loaded HI-STORM 100S in storage (See Note 5 to Table 8.1.1)*	*331,218*	*339,316*	*338,472*
6	*Loaded HI-TRAC and transfer frame during on site handling*	*239,434*	*247,282*	*246,688*

Table 8.1.3
HI-STORM 100 SYSTEM COMPONENT AND HANDLING WEIGHTS
100-TON HI-TRAC

Component	*MPC-24 (Lbs.)*	*MPC-32 (Lbs.)*	*MPC-68 (Lbs.)*	*Case[6] Applicability*					
				1	*2*	*3*	*4*	*5*	*6*
Empty HI-STORM 100 overpack (without lid) (See Note 5 to Table 8.1.1)	*245,040*	*245,040*	*245,040*					*1*	
HI-STORM 100 lid (without rigging)	*23,963*	*23,963*	*23,963*					*1*	
Empty HI-STORM 100S overpack (without lid) (See Note 5 to Table 8.1.1)	*226,326*	*226,326*	*226,326*						
HI-STORM 100S lid (without rigging)	*24,905*	*24,905*	*24,905*						
Empty MPC (without lid or closure ring including drain line)	*29,845*	*24,503*	*29,302*	*1*	*1*	*1*	*1*	*1*	*1*
MPC lid (without fuel spacers or drain line)	*9677*	*9677*	*10,194*	*1*	*1*	*1*	*1*	*1*	*1*
MPC Closure Ring	*145*	*145*	*145*			*1*	*1*	*1*	*1*
Fuel (design basis)	*40,320*	*53,760*	*47,600*	*1*	*1*	*1*	*1*	*1*	*1*
Damaged Fuel Container (Dresden 1)	*0*	*0*	*150*						
Damaged Fuel Container (Humboldt Bay)	*0*	*0*	*120*						
MPC water (with fuel in MPC)	*17,630*	*17,630*	*16,957*	*1*	*1*				
Annulus Water	*256*	*256*	*256*	*1*	*1*				
HI-TRAC Lift Yoke (with slings)	*3200*	*3200*	*3200*	*1*	*1*	*1*			
Annulus Seal	*50*	*50*	*50*	*1*	*1*				
Lid Retention System	*2300*	*2300*	*2300*						
Transfer frame	*6700*	*6700*	*6700*						*1*
Empty HI-TRAC (without Top Lid, neutron shield jacket water, or bottom lids)	*84,003*	*84,003*	*84,003*	*1*	*1*	*1*			*1*
HI-TRAC Top Lid	*1,189*	*1,189*	*1,189*			*1*			*1*
HI-TRAC Pool Lid	*7,863*	*7,863*	*7,863*	*1*	*1*				
HI-TRAC Transfer Lid	*16,686*	*16,686*	*16,686*			*1*			*1*
HI-TRAC Neutron Shield Jacket Water	*7,583*	*7,583*	*7,583*		*1*	*1*			*1*
MPC Stays (total of 2)	*200*	*200*	*200*						
MPC Lift Cleat	*480*	*480*	*480*				*1*		*1*

6 *See Table 8.1.4 for a description of each load handling case.*

Table 8.1.4
MAXIMUM HANDLING WEIGHTS
100-TON HI-TRAC

Caution:
The maximum weight supported by the 100-Ton HI-TRAC lifting trunnions cannot exceed 200,000 lbs. Users must take actions to ensure that this limit is not exceeded.

Note:
The weight of the fuel spacers and the damaged fuel container are less than the weight of the design basis fuel assembly and therefore not included in the maximum handling weight calculations. Fuel spacers are determined to be the maximum combination weight of fuel + spacer. Users should determine the handling weights based on the contents to be loaded and the expected mode of operations.

Case No.	*Load Handling Evolution*	*Weight (lbs)*		
		MPC-24	*MPC-32*	*MPC-68*
1	*Loaded HI-TRAC removal from spent fuel pool (neutron tank empty)*	*192,844*	*200,942*	*199,425*
2	*Loaded HI-TRAC removal from spent fuel pool (neutron tank full)*	*200,427*	*208,525*	*207,008*
3	*Loaded HI-TRAC During Movement through Hatchway*	*192,647*	*200,745*	*199,901*
4	*MPC during transfer operations*	*80,467*	*88,565*	*87,721*
5a	*Loaded HI-STORM 100 in storage (See Note 5 to Table 8.1.1)*	*348,990*	*357,088*	*356,244*
5b	*Loaded HI-STORM 100S in storage (See Note 5 to Table 8.1.1)*	*331,218*	*339,316*	*338,472*
6	*Loaded HI-TRAC and transfer frame during on site handling*	*196,627*	*204,725*	*203,881*

Table 8.1.5
HI-STORM 100 SYSTEM TORQUE REQUIREMENTS

Fastener†	**Torque (ft-lbs)** ††	**Pattern**†††
HI-TRAC Top Lid Bolts†	*10039* ft-lbs	Figure 8.1.37
HI-TRAC Pool Lid Bolts†	*10058* ft-lbs	Figure 8.1.37
100-Ton HI-TRAC Transfer Lid Bolts†	203 ft-lbs	Figure 8.1.37
125-Ton HI-TRAC Transfer Lid Bolts†	270 ft-lbs	Figure 8.1.37
MPC Lift Cleats *Stud Nuts*~~Bolts~~†	453 ft-lbs	None
MPC Lift Hole Plugs†	Hand tight	None
Threaded Fuel Spacers	Hand Tight	None
HI-STORM Lid Nuts †	100 ft-lbs	None
HI-STORM 100S Lid Nuts (Temporary and Permanent Lids)	*Hand Tight +1/8 to ½ turn*	*None*
Door Locking Pins	Hand Tight + 1/8 to 1/2 turn	None
HI-STORM 100 Vent Screen/Thermocouple Screws	Hand Tight	None
[redacted]	[redacted]	[redacted]

† Bolts shall be cleaned and inspected for damage or excessive thread wear (replace if necessary) and coated with a light layer of Fel-Pro Chemical Products, N-5000, Nuclear Grade Lubricant (or equivalent).

†† Unless specifically specified, torques have a +/- 5% tolerance.

††† No detorquing pattern is needed.

Table 8.1.6
HI-STORM 100 SYSTEM ANCILLARY EQUIPMENT OPERATIONAL DESCRIPTION

Equipment	Important To Safety Classification	Reference Figure†	Description
Air Pads/Rollers	Not Important To Safety	8.1.29	Used for HI-STORM or HI-TRAC cask positioning. May be used in conjunction with the cask transporter or *other HI-STORM 100 or* HI-TRAC lifting device.
Annulus Overpressure System	Not Important To Safety	8.1.14	The annulus overpressure system is used for protection against spent fuel pool water contamination of the external MPC shell and baseplate surfaces by providing a slight annulus overpressure *during in-pool operations.*~~.~~
Annulus Shield	Not Important To Safety	8.1.13	A ~~segmented solid~~ shield that is placed at the top of the HI-TRAC annulus to provide supplemental shielding to the operators performing cask loading and closure operations.
Automated Welding System	Not Important To Safety	8.1.2b	Used for remote *field* welding of the MPC. ~~lid, vent and drain port cover plates and the MPC closure ring.~~
AWS Baseplate Shield	Not Important To Safety	8.1.2b	*P*~~The AWS baseplate shield~~ provides supplemental shielding to the operators during the cask closure operations.
Bottom Lid Transfer Slide	Not Important To Safety	8.1.26	~~The Bottom Lid Transfer Slide is~~ *U*~~u~~sed to simultaneously replace the pool lid with the transfer lid under the suspended HI-TRAC and MPC. Used in conjunction with the bottom lid transfer step. ~~The transfer slide consists of the glide rails, rollers, transfer step and carriage. The transfer slide carriage and jacks are powered and operated by remote control. The transfer step produces a tight level seam between the transfer lid and the pool lid to minimize radiation streaming.~~
Cask Transporter	*Not Important to Safety unless site-specific conditions require transfer cask or overpack handling outside drop analysis basis.* ~~Determined by each licensee based on type and location, and height of lift being performed.~~	8.1.29a and 8.1.29b	Used for handling of the HI-STORM 100 Overpack and/or the HI-TRAC Transfer Cask around the site. The cask transporter may take the form of heavy haul transfer trailer, special transporter or other equipment specifically designed for such a function.
Cool-Down System	Not Important To Safety	8.3.4	*A* ~~a~~ closed-loop forced ventilation cooling system used to gas-cool the MPC fuel assemblies down to a temperature at which water can be introduced without the risk of uncontrolled pressure transients in the MPC due to flashing or thermally shocking the fuel assemblies. The ~~Cool Down System~~*cool-down system* is attached between the MPC drain and vent ports. ~~The CDS consists of the piping, blower, heat exchanger, valves, instrumentation, and connectors.~~ The *cool-down system*~~CDS~~ is used only for unloading operations.

Table 8.1.6
HI-STORM 100 SYSTEM ANCILLARY EQUIPMENT OPERATIONAL DESCRIPTION
(Continued)

Equipment	Important To Safety Classification	Reference Figure†	Description
Lid and empty component lifting rigging	Not Important To Safety, Rigging shall be provided in accordance with ANSI N14.6.	8.1.9	Used for rigging such components *such* as the HI-TRAC *top* ~~upper shield~~ lid, pool lid, MPC lid, transfer lid, AWS ~~Baseplate shield~~, *HI-STORM Lid* and *auxiliary shielding and the*~~Automated Welding System Baseplate Shield~~ ~~,~~ empty MPC.
Helium Backfill System	Not Important To Safety	8.1.23	Used for *controlled insertion of* helium *into the* ~~backfilling of the~~ MPC *for leakage testing, blowdown and placement into storage.* ~~System consists of the gas lines, mass flow monitor, integrator, and valved quick disconnect.~~
HI-STORM 100 Lifting Jacks	Not Important To Safety	8.1.36	~~Four~~ ~~j~~*J*ack *systems* used for lifting the HI-STORM overpack for installation or removal of the air pad *or other low clearance lifting devices.* ~~. The jacks are connected in series to ensure uniform lifting pressure is applied to the HI-STAR 100 ducts.~~
Alignment Guides	*Not Important To Safety*	*8.1.31*	*The alignment guides are used to provide alignment guidance during placement of HI-TRAC on top of HI-STORM for MPC transfers. The alignment guides may take several forms and may be attached to the bottom of HI-TRAC or the top of HI-STORM 100 or may be a separate component or components.*
HI-STORM Lifting Devices	Determined ~~by each licensee~~ *site-specifically* based on type, location, and height of lift being performed. Lifting devices shall be provided in accordance with ANSI N14.6.	Not shown.	*A special lifting device u*~~U~~sed for connecting the crane (or other primary lifting device) to the HI-STORM 100 for cask handling. Does not include the crane hook (or other primary lifting device) device. ~~The lifting device threaded into the HI-STORM 100 Overpack anchor blocks shall have shear area and strength properties (yield and ultimate) equivalent to the HI-STORM 100 Overpack lid studs. In addition the threaded components of the lifting device shall have a shoulder to ensure that the HI-STORM 100 lifting device cannot back-off.~~
HI-STORM Vent Duct Shield Inserts	Important to Safety Category B.	8.1.30	Used for prevention of radiation streaming from the HI-STORM *100* exit vents during MPC transfers to and from HI-STORM. *Not used with the HI-STORM 100S.*
HI-TRAC Drain Connector	Not Important To Safety	8.1.14	Used for *annulus* draining *and filing* ~~the annulus water following cask closure~~ operations. ~~The Drain~~
HI-TRAC Lift Yoke/Lifting Links	Determined ~~by each licensee~~ *site-specifically* based on type and location, and height of lift being performed. Lift yoke and lifting devices for loaded HI-TRAC handling shall be provided in accordance with ANSI N14.6.	8.1.3	Used for connecting the crane (or other primary lifting device) to the HI-TRAC for cask handling. Does not include the crane hook (or other primary lifting device) ~~device~~.

Table 8.1.6
HI-STORM 100 SYSTEM ANCILLARY EQUIPMENT OPERATIONAL DESCRIPTION
(Continued)

Equipment	Important To Safety Classification	Reference Figure†	Description
HI-TRAC transfer frame	Not Important To Safety	8.1.4	~~Optional.~~ A steel frame used to support HI-TRAC during *delivery,* on-site movement and upending/downending operations.
Cask Primary Lifting Device	Important to Safety *status determined site-specifically* ~~Category A.~~	8.1.28 and 8.1.32	An optional auxiliary (Non-Part 50) cask lifting device used for cask upending and downending and HI-TRAC raising for positioning on top of HI-STORM to allow MPC transfer. The device may consist of a crane, lifting platform, gantry system or any other suitable device used for such purpose.
Inflatable Annulus Seal	Not Important To Safety	8.1.13	Used to prevent spent fuel pool water from contaminating the external MPC shell and baseplate surfaces during in-pool operations.
Lid Retention System	*Important to* Safety ~~Related~~ Status determined by each licensee. MPC lid lifting portions of the lid retention system shall meet the requirements of ANSI N14.6.	8.1.15, 8.1.17	Optional. The lid retention system provides three functions; it *helps* guide~~s~~ the MPC lid into place during underwater installation, *helps* establish~~es~~ lift yoke alignment with the HI-TRAC trunnions, and *secures* ~~locks~~ the MPC lid in place during cask handling operations between the pool and decontamination pad.
MPC Lift Cleats	Important To Safety – Category A. MPC Lift Cleats shall requirements of ANSI N14.6.	8.1.24	*MPC lift cleats consist of the cleats and attachment hardware. The cleats are supplied as solid steel components that contain no weds. The MPC lift cleats are used* ~~Used~~ to secure the MPC inside HI-TRAC during bottom lid replacement and support the MPC during MPC transfer from HI-TRAC into HI-STORM and vice versa. *The ITS classification of the lifting device attached to the cleats may be lower than the cleat itself, as determined site-specifically.* ~~MPC cleats consist of the cleats and attachment bolts. Requires use of the MPC stays. The cleats are supplied as solid steel components that contain no welds.~~
Hydrostatic Test System	Not Important to Safety	8.1.20	Used to ~~hydrostatically~~ *pressure* test the MPC lid-to-shell weld.
MPC Downloader	Important To Safety *status determined site-specifically*— ~~Category A (MPC supporting members only)~~. MPC Downloader Shall meet the requirements of *CoC, Appendix B, Section 3.5* ~~Technical Specification 4.9~~.	8.1.28 and 8.1.32	~~MPC Downloader is a single failure proof~~*A* ~~hydraulic~~ lifting device used *to help* ~~for~~ raise~~ing~~ and lower~~ing~~ the MPC during MPC transfer operations *to limit the lift force of the MPC against the top lid of HI-TRAC.* ~~.~~*The MPC downloader may take several forms depending on the location of MPC transfer and may be used in conjunction with other lifting devices.*

Table 8.1.6
HI-STORM 100 SYSTEM ANCILLARY EQUIPMENT OPERATIONAL DESCRIPTION
(Continued)

Equipment	Important To Safety Classification	Reference Figure†	Description
MPC Drain Line	Not Important To Safety	8.1.21	Used for MPC *gas and* water *transfer operations.*~~raising and lowering operations. Consists of the drain hose and adapter for the MPC drain and vent RVOAs.~~
MPC Fill Pump System	Not Important To Safety	Not shown	Large pump used for filling the MPC with spent fuel pool water prior to cask insertion into the spent fuel pool. Also used for emptying of the MPC for unloading operations.
MPC Support Stays	Important To Safety – Category A – Stays shall meet requirements of ANSI N14.6.	8.1.25	Used to secure the MPC to the lift yoke during HI-TRAC bottom lid replacement operations. Attaches between the MPC lift cleats and the lift yoke. Can be configured for *different* ~~single pin or dual pin~~ crane hook configuration. ~~Requires special lift yoke-to-crane hook pin(s). The stays may be removed for inspection, load testing and replacement.~~
MPC Upending Frame	Not Important to Safety	8.1.6	A welded steel frame used to evenly support the MPC *and control the upending process.*~~during upending operations. The frame consists of the main frame, five MPC support saddles, two rigging bars, five wrap around straps, and five strap attachment lugs.~~
MSLD (Helium Leakage Detector)	Not Important To Safety	Not shown	Used for helium leakage testing of the MPC closure welds.
MSLD Calibration Sources.	Not Important To Safety	Not shown	Traceable leakage sources for periodic calibration of the MSLD.
Small Water Pump	Not Important To Safety	8.1.19	Used for lowering the MPC water level prior to lid welding.
Temporary Lid	*Not Important to Safety*	*Not shown*	*Used for interim movement of the loaded HI-STORM 100 prior to placement of the HI-STORM 100 lid. Defense-in-Depth design feature.*
Temporary Shield Ring	Not Important To Safety	8.1.18	A water-filled segmented tank that fits on the cask neutron shield around the upper forging and provides supplemental shielding to personnel performing cask loading and closure operations. ~~Shield segments are installed by hand, no tools are required.~~
Vacuum Drying System	Not Important To Safety	8.1.22	Used for removal of residual moisture from the MPC following water draining. Used for evacuation of the MPC *and other support equipment during closure and unloading operations.*~~to support backfilling operations. Used to support test volume samples for MPC unloading operations.~~
Vent and Drain RVOAs	Not Important To Safety	8.1.16	Used to *access* ~~drain, dry, inert and fill the MPC through~~ the vent and drain ports. The vent and drain RVOAs allow the vent and drain ports to be operated like valves and prevent the need to hot tap into the penetrations during unloading operation.

Table 8.1.6
HI-STORM 100 SYSTEM ANCILLARY EQUIPMENT OPERATIONAL DESCRIPTION
(Continued)

Equipment	Important To Safety Classification	Reference Figure†	Description
Water Totalizer	Not Important To Safety	8.1.19 and 8.1.21	Used for water pump-down prior to lid welding operations. ~~Used for determining the MPC free space volume which is the input for the calculation of the required helium backfill quantit~~*May take several forms.*~~ies.~~
Weld Removal System	Not Important To Safety	8.3.2b	Semi-automated weld removal system used for removal of the MPC *field weld to support unloading operations.*~~to shell weld, MPC to closure ring weld and closure ring to MPC shell weld. The WRS mechanically removes the welds using a high-speed cutter.~~

† ~~Pictures~~ *Figures* are ~~artist rendering~~ *representative* and may not represent final configuration.

Table 8.1.7
HI-STORM 100 SYSTEM INSTRUMENTATION SUMMARY FOR LOADING AND UNLOADING OPERATIONS†

Instrument	Function
Contamination Survey Instruments	Monitors fixed and non-fixed contamination levels.
Dose Rate Monitors/Survey Equipment	Monitors dose rate and contamination levels and ensures proper function of shielding. Ensures assembly debris is not inadvertently removed from the spent fuel pool during overpack removal.
Flow Rate Monitor	Monitors the air flow rate during assembly cool-down.
Helium Mass Flow Monitor	Determines the amount of helium introduced into the MPC during backfilling operations. Includes integrator.
Helium Mass Spectrometer Leak Detector (MSLD)	Ensures leakage rates of welds are within acceptance criteria.
Volumetric Examination Testing Rig	Used to assess the integrity of the MPC lid-to-shell weld.
Pressure Gauge*s*	Ensures correct *MPC* ~~helium~~ pressure during *closure and opening* ~~fuel cool-down~~ operations.
Temperature Gauge*s*	Monitors the state of *gas and water temperatures during closure and unloading operations.* ~~fuel cool-down prior to MPC flooding.~~
Temperature Surface Pyrometer	For HI-STORM vent operability testing.
Vacuum Gages	Used for vacuum drying operations and to prepare an MPC evacuated sample bottle for MPC gas sampling for unloading operations.
Water Pressure Gauge	Used for performance of the MPC Hydrostatic Test.
Water Totalizer	Used for water pump-down prior to lid welding operations. Used for determining the MPC free space volume which is the input for the calculation of the required helium backfill quantities.

† All instruments require calibration. See figures at the end of this section for additional instruments, controllers and piping diagrams.

Table 8.1.8
HI-STORM 100 SYSTEM OVERPACK INSPECTION CHECKLIST

Note:
This checklist provides the basis for establishing a site-specific inspection checklist for the HI-STORM 100 overpack. Specific findings shall be brought to the attention of the appropriate site organizations for assessment, evaluation and potential corrective action prior to use.

HI-STORM 100 Overpack Lid:

1. Lid studs and nuts shall be inspected for general condition.
2. The painted surfaces shall be inspected for corrosion and chipped, cracked or blistered paint.
3. All lid surfaces shall be relatively free of dents, scratches, gouges or other damage.
4. The lid shall be inspected for the presence or availability of studs and nuts and hole plugs.
5. Lid lifting device/ holes shall be inspected for dirt and debris and thread condition.
6. Lid bolt holes shall be inspected for general condition.

HI-STORM 100 Main Body:

1. Lid bolt holes shall be inspected for dirt, debris, and thread condition.
2. Vents shall be free from obstructions.
3. Vent screens shall be available, intact, and free of holes and tears in the fabric.
4. The interior cavity shall be free of debris, litter, tools, and equipment.
5. Painted surfaces shall be inspected for corrosion, and chipped, cracked or blistered paint.
6. The nameplate shall be inspected for presence, legibility, and general condition and conformance to Quality Assurance records package.

Table 8.1.9
MPC INSPECTION CHECKLIST

Note:
This checklist provides the basis for establishing a site-specific inspection checklist for MPC. Specific findings shall be brought to the attention of the appropriate site organizations for assessment, evaluation and potential corrective action prior to use.

MPC Lid and Closure Ring:

1. The MPC lid and closure ring surfaces shall be relatively free of dents, gouges or other shipping damage.
2. The drain line shall be inspected for straightness, thread condition, and blockage.
3. Vent and Drain attachments shall be inspected for availability, thread condition operability and general condition.
4. Upper fuel spacers (if used) shall be inspected for availability and general condition. Plugs shall be available for non-used spacer locations.
5. Lower fuel spacers (if used) shall be inspected for availability and general condition.
6. Drain and vent port cover plates shall be inspected for availability and general condition.
7. Serial numbers shall be inspected for readability.

MPC Main Body:

1. All visible MPC body surfaces shall be inspected for dents, gouges or other shipping damage.
2. Fuel cell openings shall be inspected for debris, dents and general condition.
3. Lift lugs shall be inspected for general condition.
4. Verify proper MPC basket type for contents.

Table 8.1.10
HI-TRAC TRANSFER CASK INSPECTION CHECKLIST

Note:
This checklist provides the basis for establishing a site-specific inspection checklist for the HI-TRAC Transfer Cask. Specific findings shall be brought to the attention of the appropriate site organizations for assessment, evaluation and potential corrective action prior to use.

HI-TRAC Top Lid:

1. The painted surfaces shall be inspected for corrosion and chipped, cracked or blistered paint.
2. All Top Lid surfaces shall be relatively free of dents, scratches, gouges or other damage.

HI-TRAC Main Body:

1. The painted surfaces shall be inspected for corrosion, chipped, cracked or blistered paint.
2. The top lid bolt holes shall be inspected for dirt, debris and thread damage.
3. The top lid lift holes shall be inspected for thread condition.
4. Lifting trunnions shall be inspected for deformation, cracks, end plate damage, corrosion, excessive galling, damage to the locking plate, presence or availability of locking plate and end plate retention bolts.
5. Pocket trunnion recesses shall be inspected for indications of overstressing (i.e., cracks, deformation, and excessive wear).
6. Annulus inflatable seal groove shall be inspected for cleanliness, scratches, dents, gouges, sharp corners, burrs or any other condition that may damage the inflatable seal.
7. The nameplate shall be inspected for presence and general condition.
8. The neutron shield jacket shall be inspected for leaks.
9. Neutron shield jacket pressure relief valve shall be inspected for presence, and general condition.
10. The neutron shield jacket fill and drain plugs shall be inspected for presence, leaks, and general condition.
11. Bottom lid flange surface shall be clean and free of large scratches and gouges.

Table 8.1.10 (Continued)
HI-TRAC OVERPACK INSPECTION CHECKLIST

HI-TRAC Transfer Lid:

1. The doors shall be inspected for smooth actuation.
2. The threads shall be inspected for general condition.
3. The bolts shall be inspected for indications of overstressing (i.e., cracks, deformation, thread damage, excessive wear) and replaced as necessary.
4. Door locking pins shall be inspected for indications of overstressing (i.e., cracks, and deformation, thread damage, excessive wear) and replaced as necessary.
5. Painted surfaces shall be inspected for corrosion and chipped, cracked or blistered paint.
6. Lifting holes shall be inspected for thread damage.

HI-TRAC Pool Lid:

1. Seal shall be inspected for cracks, breaks, cuts, excessive wear, flattening, and general condition.
2. Drain line shall be inspected for blockage and thread condition.
3. The lifting holes shall be inspected for thread damage.
4. The bolts shall be inspected for indications of overstressing (i.e., cracks and deformation, thread damage, and excessive wear).
5. Painted surfaces shall be inspected for corrosion and chipped, cracked or blistered paint.
6. Threads shall be inspected for indications of damage.

8.2 ISFSI OPERATIONS

The HI-STORM 100 System heat removal system is a totally passive system. Maintenance on the HI-STORM system is typically limited to cleaning and touch-up painting of the overpacks, repair and replacement of damaged vent screens, and removal of vent blockages (e.g., leaves, debris). The heat removal system operability surveillance (See Technical Specification LCO 3.1.2) should be performed after any event that may have an impact on the safe functioning of the HI-STORM system. These include, but are not limited to, wind storms, heavy snow storms, fires inside the ISFSI, seismic activity, flooding of the ISFSI, and/or observed animal or insect infestations. The responses to these conditions involve first assessing the dose impact to perform the corrective action (inspect the HI-STORM overpack, clear the debris, check the cask pitch, and/or replace damaged vent screens), perform the corrective action, verify that the system is operable (check ventilation flow paths and radiation). In the event of significant damage to the HI-STORM, the situation may warrant removal of the MPC, and repair or replacement of the damaged HI-STORM overpack. If necessary, the procedures in Section 8.1 may be used to reposition a HI-STORM overpack for minor repairs and maintenance. In extreme cases, Section 8.3 may be used as guidance for unloading the MPC from the HI-STORM.

Note:

The heat removal system operability surveillance involves performing a visual examination on the HI-STORM exit and inlet vent screens to ensure that the vents remain clear or verifying the temperature rise from ambient to outlet is within prescribed limits. The metallic vent screens if damaged may allow leaves, debris or animals to enter the duct and block the flow of air to the MPC.

ALARA Warning:

Operators should practice ALARA principals when inspecting the vent screens. In most cases, binoculars allow the operator to perform the surveillance from a low dose area.

8.2.1 Perform the heat removal operability surveillance in accordance with Technical Specification SR 3.1.2.1.

8.2.2 ISFSI Security Operations shall be performed in accordance with the approved site security program plan.

8.3 PROCEDURE FOR UNLOADING THE HI-STORM 100 SYSTEM IN THE SPENT FUEL POOL

8.3.1 Overview of HI-STORM 100 System Unloading Operations

ALARA Note:

The procedure described below uses the *weld removal system to*~~Weld Removal System, a remotely operated system that~~ removes the welds *necessary to enable the MPC lid to be removed.* Users may opt to remove some or all of the welds using hand operated equipment. The decision should be based on dose rates, accessibility, degree of weld removal, and available tooling and equipment.

The HI-STORM 100 System unloading procedures describe the general actions necessary to prepare the MPC for unloading, cool the stored fuel assemblies in the MPC, flood the MPC cavity, remove the lid welds, unload the spent fuel assemblies, and recover the HI-TRAC and empty MPC. Special precautions are outlined to ensure personnel safety during the unloading operations, and to prevent the risk of MPC over pressurization and thermal shock to the stored spent fuel assemblies. Figure 8.3.1 shows a flow diagram of the HI-STORM unloading operations. Figure 8.3.2 illustrates the major HI-STORM unloading operations.

Refer to the boxes of Figure 8.3.2 for the following description. The MPC is recovered from HI-STORM either at the ISFSI or the fuel building using the same methodologies as described in Section 8.1 (Box 1). The HI-STORM lid is removed and the MPC lift cleats are attached to the MPC to provide redundant lift support. The exit vent screens and gamma shield cross plates are removed *as necessary*. The vent duct shield inserts are installed in the HI-STORM *100 (not the HI-STORM 100S)* exit vent ducts to eliminate the streaming path when the MPC is moved past the HI-STORM exit vent ducts. MPC lift slings are attached to the MPC lift cleat *and positioned on the MPC lid.* HI-TRAC is ~~raised and~~ positioned on top of HI-STORM (Box 2) *and the slings are brought through the HI-TRAC top lid.* The MPC is raised into HI-TRAC, the HI-TRAC doors are closed and the door locking pins are installed. HI-TRAC is removed from on top of HI-STORM. The HI-TRAC is positioned in the transfer slide and the transfer lid is replaced with the pool lid ~~(~~Box 3) *using the same methodology as with the loading operations.*

HI-TRAC and its enclosed MPC are returned to the designated preparation area and the MPC stays, MPC lift cleat and top lid are removed. The temporary shield ring is installed on the HI-TRAC upper section and filled with plant demineralized water. The HI-TRAC top lid is removed *and a water flush is performed on the annulus. Water is fed into the annulus through the drain port and allowed to cool the MPC shell. - After a predetermined period (based on the fuel conditions),* ~~and~~ the annulus shield is installed to protect the annulus from debris produced from the lid removal process (Box 4). The weld removal system is installed (Box 7) and the MPC vent and drain ports are accessed (Box 5). The vent RVOA is attached to the vent port and an evacuated sample bottle is connected. The vent port is slightly opened to allow the sample bottle to obtain a gas sample from inside the MPC. A gas sample is performed to assess the condition of the fuel assembly cladding. A vent line is attached to the vent port and the MPC is vented to the fuel building ventilation system or spent fuel pool as determined by the site's radiation protection personnel. The MPC is cooled using the cool-down system to reduce the

MPC internal temperature to allow water flooding (Box 6). The cool-down process gradually reduces the cladding temperature to a point where the MPC may be flooded with water without thermally shocking the fuel assemblies or over-pressurizing the MPC from the formation of steam (See Technical Specification LCO 3.1.3). Following the fuel cool-down, the MPC is filled with water at a specified rate. The weld removal system then removes the MPC lid-to-shell weld. The weld removal system is removed with the MPC lid left in place (Box 7).

The top surfaces of the HI-TRAC and MPC are cleared of metal shavings. The inflatable annulus seal is installed and pressurized. The MPC lid is rigged to the lift yoke or lid retention system and the lift yoke is engaged to HI-TRAC lifting trunnions. If weight limitations require, the neutron shield jacket is drained of water. HI-TRAC is placed in the spent fuel pool and the MPC lid is removed (Boxes 8 and 9). All fuel assemblies are returned to the spent fuel storage racks and the MPC fuel cells are vacuumed to remove any assembly debris and crud (Box 10). HI-TRAC and MPC are returned to the designated preparation area (Box 11) where the MPC water is pumped back into the spent fuel pool or liquid radwaste facility. The annulus water is drained and the MPC and overpack are decontaminated (Box 12 and 13).

8.3.2 HI-STORM Recovery from Storage

Note:
The MPC transfer may be performed using the MPC downloader or the overhead crane.

1. Recover the MPC from HI-STORM as follows:

   a. If necessary, perform a transport route walkdown to ensure that the cask transport conditions are met. See Technical Specifications for the on-site lifting requirements.

   b. Transfer HI-STORM to the fuel building or site designated location for the MPC transfer.

   c. Position HI-STORM under the lifting device.

   d. Remove the HI-STORM lid nuts, *washers* and studs.

   e. Remove the HI-STORM lid lifting hole plugs and install the lid lifting sling. See Figure 8.1.27. See Table 8.1.5 for torque requirements.

Note:
The specific sequence for vent screen, thermocouple, and gamma shield cross plate removal may vary based on the mode(s) or transport.

   f. Remove the HI-STORM exit vent screens, thermocouples and gamma shield cross plates. See Figure 8.1.34a and b.

Warning:
Unless the lift is single-failure proof (or equivalent safety factor) the HI-STORM lid, the lid shall be kept less than 2 feet above the top surface of the overpack. This is performed to protect the MPC lid from a potential HI-STORM 100 lid drop.~~When traversing the HI-STORM 100 overpack with the HI-STORM 100 Lid, the lid shall be kept less than 2 feet above the top surface of the overpack. This is performed to protect the MPC lid from a potential HI-STORM 100 lid drop.~~

g. Remove the HI-STORM lid. See Figure 8.1.27.

h. Install the HI-STORM vent duct shield inserts *(HI-STORM 100 only)*. See Figure 8.1.30.

i. Install *the* alignment guides. See Figure 8.1.31.

j. Remove the MPC lift cleat hole plugs and install the MPC lift cleats to the MPC lid. See Table 8.1.5 for torque requirements.

k. If necessary, install the top lid on HI-TRAC. See Figure 8.1.9 for rigging. See Table 8.1.5 for torque requirements.

l. Attach the MPC lift slings to the MPC lift cleat and lay them on the lid.

2. If necessary, configure HI-TRAC with the transfer lid:

ALARA Warning:
The bottom lid replacement as described below may only be performed on an empty (i.e., no MPC) HI-TRAC.

a. Position HI-TRAC vertically adjacent to the transfer lid. See Section 8.1.2.

b. Remove the bottom lid bolts and plates and store them temporarily.

c. Raise the empty HI-TRAC and position it on top of the transfer lid.

d. Inspect the pool lid bolts for general condition. Replace worn or damaged bolts with new bolts.

e. Install the transfer lid bolts. See Table 8.1.5 for torque requirements.

~~3. If necessary, install the MPC Downloader on the HI-TRAC Top Lid. See Figure 8.1.32. See Table 8.1.5 for torque requirements.~~

3. ~~4.~~ At the site's discretion, perform a HI-TRAC receipt inspection and cleanliness inspection in accordance with a site-specific inspection checklist.

Note:
If the HI-TRAC is expected to be operated in an environment below 32 °F, the water jacket shall be filled with an ethylene glycol solution (25% ethylene glycol). Otherwise, the jacket shall be filled with demineralized water.

4. If previously drained, fill the neutron shield jacket with plant demineralized water or an ethylene glycol solution (25% ethylene glycol) as necessary. Ensure that the fill and drain plugs are installed not leaking.

5. *Remove the transfer lid door locking pins and open the doors.*

6. Engage the lift yoke to the HI-TRAC lifting trunnions.

7. Align HI-TRAC over HI-STORM and mate the overpacks. See Figure 8.1.31.

8. *If necessary, install the MPC downloader.*

9. Pull the MPC lift slings through the top lid hole using a pole and hook or similar method and attach them to the MPC lifting device.

~~Remove the transfer lid door locking pins and open the doors.~~

10. At the user's discretion, install trim plates to cover the gap above and below the door. The trim plates may be secured using hand clamps or any other method deemed suitable by the user. See Figure 8.1.33.

11. Attach the ends of the MPC lift sling to the lifting device *or MPC downloader*. See Figure 8.1.32.

ALARA Warning:
If trim plates are not used, personnel should remain clear of the immediate door area during MPC downloading since there may be some radiation streaming during MPC raising and lowering operations.

12. Raise the MPC into *HI-TRAC*.~~HI-STORM.~~

13. Verify the MPC is in the full-up position.

14. Close the HI-TRAC doors and install the door locking pins. See Table 8.1.5 for torque requirements.

15. Lower the MPC onto the transfer lid doors.

16. Disconnect the slings from the MPC lift cleats.

17. If necessary, remove the MPC downloader from the top of HI-TRAC.

18. Remove HI-TRAC from the top of HI-STORM.

8.3.3 Preparation for Unloading:

1. Replace the pool lid with the transfer lid as follows:

Note:
The MPC lift cleats and support stays provide redundant support of the MPC during the bottom lid replacement.

a. Lower the lift yoke and attach the MPC support stays between the lift cleats and the lift yoke. See Figure 8.1.25.

b. Engage the lift yoke to the HI-TRAC lifting trunnions.

c. Test the travel and lift features of the transfer slide to ensure its operability.

d. Raise HI-TRAC and position the transfer lid approximately one inch above the transfer step. See Figure 8.1.26.

e. Raise the transfer slide carriage so the transfer carriage is supporting the transfer lid bottom. Remove the transfer lid bolts and store them temporarily.

ALARA Warning:
Clear all personnel away from the immediate operations area. The transfer slide carriage and jacks are remotely operated. The carriage has fine adjustment features to allow precise positioning of the lids.

f. Lower the transfer carriage and position the pool lid under HI-TRAC.

g. Raise the transfer slide carriage to place the pool lid against the HI-TRAC bottom lid bolting flange.

h. Inspect the bottom lid bolts for general condition. Replace worn or damaged bolts with new bolts.

i. Install the pool lid bolts. See Table 8.1.5 for torque requirements.

j. Raise and remove the HI-TRAC from the transfer slide.

k. Disconnect the MPC support stays and lift cleats and store them in an approved plant storage location.

l. Install hole plugs in the empty lift cleat bolt holes.

m. Place the transfer lid in an approved storage location.

n. Place HI-TRAC in the designated preparation area.

Warning:
Unless the lift is single-failure proof (or equivalent safety factor) the HI-TRAC top lid, the top lid shall be kept less than 2 feet above the top surface of the MPC. This is performed to protect the MPC lid from a potential lid drop.~~When traversing the MPC with the HI-TRAC top lid, the lid shall be kept less than 2 feet above the top surface of the MPC. This is performed to protect the MPC lid from a potential lid drop.~~

2. *PREPARE for MPC cool-down as follows:*

a. Remove the top lid bolts and remove HI-TRAC top lid. See Figure 8.1.9 for rigging. Store the top lid and bolts in a site-approved location.

Warning:
At the start of annulus filling, the a~~A~~nnulus fill water may flash to steam due to high MPC shell temperatures. *Users may select the location and means of performing the annulus flush. Users may also elect the source of water and method for collecting the water flowing from the annulus.* -Water addition should be preformed in a slow and controlled manner *until water steam generation has ceased. Water flush should be performed for a minimum of 33 hours at a flow rate of 10 GPM or as specified for the particular heat load of the MPC.*~~.~~

b. *Perform annulus flush by injecting water into the HI-TRAC drain port and allowing the water to cool the MPC shell and lid.*

c. *Set the* ~~Slowly fill the annulus area with plant demineralized~~ *annulus* water *level* to approximately 4 inches below the top of the MPC shell and install the annulus shield. The annulus shield reduces the dose around the annulus area and prevents debris from entering the annulus during MPC lid weld removal operations. See Figure 8.1.13.

3. Access the MPC as follows:

ALARA Note:
The following procedures describe weld removal using a machine tool head. Other methods may also be used. The metal shavings may need to be periodically vacuumed.

ALARA Warning:
Weld removal may create an airborne radiation condition. Weld removal must be performed under the direction of the user's Radiation Protection organization.

a. Install bolt plugs and/or waterproof tape from HI-TRAC top bolt holes.

b. Using the marked locations of the vent and drain ports, core drill the closure ring and vent and drain port cover plates.

c. Remove the closure ring section and the vent and drain port cover plates.

ALARA Note:
The MPC vent and drain ports are equipped with metal-to-metal seals to minimize leakage and withstand the long-term effects of temperature and radiation. The vent and drain port design prevents the need to hot tap into the penetrations during unloading operation and eliminate the risk of a pressurized release of gas from the MPC.

4. Take an MPC gas sample as follows:

Note:
Users may select alternate methods of obtaining a gas sample.

a. Attach the RVOA~~s to the vent port~~ (See Figure 8.1.16).

b. Attach a sample bottle to the vent port RVOA as shown on Figure 8.3.3.

c. Using the vacuum drying system, evacuated the RVOA and Sample Bottle.

d. Slowly open the vent port cap using the RVOA and gather a gas sample from the MPC internal atmosphere.

e. Close the vent port cap and disconnect the sample bottle.

ALARA Note:
The gas sample analysis is performed to determine the condition of the fuel cladding in the MPC. The gas sample may indicate that fuel with damaged cladding is present in the MPC. The results of the gas sample test may affect personnel protection and how the gas is processed during MPC depressurization.

f. Turn the sample bottle over to the site's Radiation Protection or Chemistry Department for analysis.

g. Remove the drain port cover plate weld and remove the cover plate.

~~Install the RVOA in the drain port.~~

5. Fill the MPC cavity with water as follows:

a. Configure the cool-down system as shown on Figure 8.3.4.

b. Verify that the helium gas pressure regulator is set to 85+3/-3 psig.

c. Open the helium gas supply valve to purge the gas lines of air.

Note:
The coolant flow direction is into the drain port and out of the vent port.

d. Confirm the heat exchanger coolant flow direction.

e. If necessary, slowly open the helium supply valve and increase the Cool-Down System pressure to 100 +3/-3 psig. Close the helium supply valve.

f. Start the gas coolers.

g. Open the vent and drain port caps using the RVOAs.

h. Start the blower and monitor the gas exit temperature. Continue the fuel cool-down operations until the gas exit temperature meets the requirements of the Technical Specification LCO 3.1.3.

Note:
Water filling should commence immediately at the completion of fuel cool-down operations to prevent fuel assembly heat-up. Prepare the water fill line and the vent line in advance of water filling.

i. Prepare the MPC fill and vent lines as shown on Figure 8.1.20. Route the vent port line several feet below the spent fuel pool surface or to the radwaste gas facility. Turn off the blower and disconnect the gas lines to the vent and drain port RVOAs. Attach the vent line to the MPC vent port and slowly open the vent line valve to depressurize the MPC.

j. Attach the water fill line to the MPC drain port and slowly open the water supply valve and establish a pressure less than 90 psi. Fill the MPC until bubbling from the vent line has terminated. Close the water supply valve on completion.

k. Disconnect both lines from the drain and vent ports and install the drain line to the vent port to allow for thermal expansion of the water during MPC lid weld removal.

l. Remove the MPC lid-to-shell weld using the weld removal system. See Figure 8.1.9 for rigging.

m. Vacuum the top surfaces of the MPC and HI-TRAC to remove any metal shavings.

6. Install the inflatable annulus seal as follows:

Caution:
Do not use any sharp tools or instruments to install the inflatable seal.

a. Remove the annulus shield.

b. Manually insert the inflatable seal around the MPC. See Figure 8.1.13.

c. Ensure that the seal is uniformly positioned in the annulus area.

d. Inflate the seal between 30 and 35 psig or as directed by the manufacturer.

e. Visually inspect the seal to ensure that it is properly seated in the annulus. Deflate, adjust and inflate the seal as necessary.

7. Place HI-TRAC in the spent fuel pool as follows:

a. If necessary for plant weight limitations, drain the water from the neutron shield jacket.

b. Engage the lift yoke to HI-TRAC lifting trunnions, remove the MPC lid lifting hole plugs and attach the MPC lid slings or lid retention system to the MPC lid.

c. If the lid retention system is used, inspect the lid bolts for general condition. Replace worn or damaged bolts with new bolts.

d. Install the lid retention system bolts if the lid retention system is used.

ALARA Note:

The annulus overpressure system is used to provide protection against MPC external shell contamination during in-pool operations. The annulus overpressure system is equipped with double locking quick disconnects to prevent inadvertent draining. The reservoir valve must be closed to ensure that the annulus is not inadvertently drained through the annulus overpressure system when the cask is raised above the level of the annulus reservoir.

e. If used, fill the annulus overpressure system lines and reservoir with demineralized water and close the reservoir valve. Attach the annulus overpressure system to the HI-TRAC via the quick disconnect. See Figure 8.1.14.

f. Position HI-TRAC over the cask loading area with the basket aligned to the orientation of the spent fuel racks.

ALARA Note:

Wetting the components that enter the spent fuel pool may reduce the amount of decontamination work to be performed later.

g. Wet the surfaces of HI-TRAC and lift yoke with plant demineralized water while slowly lowering HI-TRAC into the spent fuel pool.

h. When the top of the HI-TRAC reaches the elevation of the reservoir, open the annulus overpressure system reservoir valve. Maintain the reservoir water level at approximately 3/4 full the entire time the cask is in the spent fuel pool.

i. If the lid retention system is used, remove the lid retention bolts when the top of HI-TRAC is accessible from the operating floor.

j. Place HI-TRAC on the floor of the cask loading area and disengage the lift yoke. Visually verify that the lift yoke is fully disengaged.

Note:
An underwater camera or other suitable viewing device may be used for monitoring the underwater operations.

k. Apply slight tension to the lift yoke and visually verify proper disengagement of the lift yoke from the trunnions.

l. Remove the lift yoke, MPC lid and drain line from the pool in accordance with directions from the site's Radiation Protection personnel. Spray the equipment with demineralized water as they are removed from the pool.

m. Disconnect the drain line from the MPC lid.

n. Store the MPC lid components in an approved location. Disengage the lift yoke from MPC lid. Remove any upper fuel spacers using the same process as was used in the installation.

o. Disconnect the lid retention system if used.

8.3.4 MPC Unloading

1. Remove the spent fuel assemblies from the MPC using applicable site procedures.

2. Vacuum the cells of the MPC to remove any debris or corrosion products.

3. Inspect the open cells for presence of any remaining items. Remove them as appropriate.

8.3.5 Post-Unloading Operations

1. Remove HI-TRAC and the unloaded MPC from the spent fuel pool as follows:

2. Engage the lift yoke to the top trunnions.

3. Apply slight tension to the lift yoke and visually verify proper engagement of the lift yoke to the trunnions.

4. Raise HI-TRAC until HI-TRAC flange is at the surface of the spent fuel pool.

ALARA Warning:
Activated debris may have settled on the top face of HI-TRAC during fuel unloading.

5. Measure the dose rates at the top of HI-TRAC in accordance with plant radiological procedures and flush or wash the top surfaces to remove any highly-radioactive particles.

6. Raise the top of HI-TRAC and MPC to the level of the spent fuel pool deck.

7. Close the annulus overpressure system reservoir valve.

8. Using a water pump, lower the water level in the MPC approximately 12 inches to prevent splashing during cask movement.

ALARA Note:
To reduce contamination of HI-TRAC, the surfaces of HI-TRAC and lift yoke should be kept wet until decontamination can begin.

9. Remove HI-TRAC from the spent fuel pool while spraying the surfaces with plant demineralized water.

10. Disconnect the annulus overpressure system from the HI-TRAC via the quick disconnect.

11. Place HI-TRAC in the designated preparation area.

12. Disengage the lift yoke.

13. Perform decontamination on HI-TRAC and the lift yoke.

14. Carefully decontaminate the area above the inflatable seal. Deflate, remove, and store the seal in an approved plant storage location.

15. Using a water pump, pump the remaining water in the MPC to the spent fuel pool or liquid radwaste system.

16. Drain the water in the annulus area by connecting the drain line to the HI-TRAC drain connector.

17. Remove the MPC from HI-TRAC and decontaminate the MPC as necessary.

18. Decontaminate HI-TRAC.

19. Remove the bolt plugs and/or waterproof tape from HI-TRAC top bolt holes.

20. Return any HI-STORM 100 equipment to storage as necessary.

8.4 MPC TRANSFER TO A HI-STAR 100 OVERPACK FOR TRANSPORT OR STORAGE

8.4.1 Overview of Operations

The MPC is recovered from storage and transferred into HI-TRAC using the *same or similar*~~identical~~ method as described in Section 8.3. Once the MPC is inside HI-TRAC, the HI-STAR 100 is brought to the transfer location and positioned for receiving of the MPC. *If used,* ~~t~~The temporary shield ring is installed and filled with water and the transfer collar is installed on the HI-STAR 100 Overpack. The temporary shield ring reduces operator dose rates during MPC transfer operations. The transfer collar adapts the top surface of the HI-STAR 100 Overpack to mate with the bottom of HI-TRAC. HI-TRAC is raised and positioned over the HI-STAR 100 Overpack. HI-TRAC and the HI-STAR 100 Overpack are mated and the downloader is extended to take the MPC weight off of the transfer lid doors. Depending on the site's crane and door configuration, the MPC downloader may be attached to either the HI-TRAC lid or the overhead lifting device (See Figure 8.1.32). The door locking pins are removed and the doors are opened. The MPC ~~piston~~ is *lowered* ~~the MPC~~ into the HI-STAR 100 Overpack. The slings are disconnected and lowered onto the MPC lid. HI-TRAC is removed from on top of the HI-STAR 100 Overpack. The MPC lift cleat, downloader slings, and transfer collar are removed. Hole plugs are installed in the empty MPC lid bolt holes. The HI-STAR 100 Overpack is prepared for storage or transport in accordance with the Certificate of Compliance for storage or transport, as applicable.

8.4.2 Recovery from Storage

1. Recover the MPC from storage and position it inside of HI-TRAC in accordance with Section 8.3.2. See the Technical Specifications for lifting requirements.

2. If necessary, remove HI-STORM from the operations area and remove the HI-STORM vent duct shield inserts. See Figure 8.1.30.

8.4.3 MPC Transfer into the HI-STAR 100 Overpack

Note:
The following steps outline the HI-STAR 100 operating steps. Refer to the HI-STAR 100 System Topical Safety Analysis Report (Docket No. 72-1008) and the HI-STAR 100 System Safety Analysis Report (Docket No. 71-9261) for HI-STAR 100 Overpack specific operations.

1. If necessary, remove the HI-STAR 100 closure plate and the removable shear ring segments. Perform a radiological survey of the inside of the HI-STAR 100 Overpack to verify there is no residual contamination from previous uses. If contamination levels are above specified limits, the HI-STAR 100 Overpack shall be decontaminated appropriately prior to use.

2. Discard any used metallic seals.

3. Perform a HI-STAR 100 receipt inspection in accordance with site-specific procedures.

4. Install the temporary shield ring on HI-STAR 100 and fill it with water, *if used*. See Figure 8.1.18.

5. Install the HI-STAR transfer collar. See Figure 8.4.1.

6. Position HI-STAR adjacent to HI-TRAC.

Note:
Lifting of the loaded HI-TRAC shall be performed in accordance with the Technical Specification.

7. Raise and align HI-TRAC over HI-STAR and mate the overpacks.

Note:
The MPC lift cleats and MPC downloader slings are still installed from the previous operation.

8. ~~8. Extend the MPC Downloader to its fully extended position~~*Attach the MPC downloader (if used).*

9. Remove the transfer lid door locking pins and open the doors.

ALARA Warning:
If trim plates are not used, personnel should remain clear of the immediate door area during MPC downloading since there may be radiation streaming during MPC raising and lowering operations.

10. At the user's discretion, install trim plates to cover the gap above and below the door. The trim plates may be secured using hand clamps or any other method deemed suitable by the user. See Figure 8.1.33.

11. Lower the MPC into HI-STAR.

12. When the MPC is fully seated, disconnect the slings from the MPC lifting device and lower them on to the MPC lid.

13. Remove HI-TRAC from on top of HI-STAR 100 Overpack.

14. Remove the HI-STAR 100 transfer collar.

15. Remove the MPC lift cleat from the MPC and install hole plugs in the empty bolt holes. See Table 8.1.5 for torque requirements.

16. Drain and remove the temporary shield ring *(if used)* and store it in an approved plant storage location.

17. Complete HI-STAR preparation for transport in accordance with the HI-STAR 100 Safety Analysis Report (Docket 71-9261) and the Certificate of Compliance, or complete HI-STAR preparation for storage in accordance with the HI-STAR 100 Topical Safety Analysis Report (Docket 72-1008) and the Certificate of Compliance, as applicable.

8.5 MPC TRANSFER INTO THE HI-STORM 100 OVERPACK DIRECTLY FROM TRANSPORT

8.5.1 Overview of Operations

HI-STAR 100 Dual-Purpose Cask System arrives at the receiving location and is surveyed for dose rates and contamination levels. The receiver reviews the shipping paperwork to ensure that the HI-STAR 100 Overpack met the internal contamination limits prior to transportation. The personnel barrier is removed, the impact limiters are removed, the tie-down is removed, and the HI-STAR 100 Overpack is upended. The HI-STAR 100 Overpack is positioned at the designated transfer area and the temporary shield ring is installed. The temporary shield ring reduces operator dose rates during MPC transfer operations. A gas sample is drawn from the annulus and analyzed. The gas sample provides an indication of MPC closure performance. The annulus is depressurized and the closure plate is removed. The transfer collar is installed and the MPC lift cleat is attached to the MPC. The transfer collar is used to provide the mating surface on top of the HI-STAR 100 Overpack. The MPC lift slings are attached to the MPC lift cleat.

HI-TRAC is configured with the transfer lid and the top lid is installed, if necessary. HI-TRAC is raised and positioned on top of HI-STAR. The MPC lift slings are attached to the lifting device using a pole and hook. The MPC is raised into HI-TRAC. The HI-TRAC doors are closed and the door locking pins are installed. HI-TRAC is raised and the HI-STAR 100 Overpack is removed from under HI-TRAC. The HI-STAR 100 Overpack is repositioned at the user's discretion.

HI-STORM is positioned for MPC receipt with the lid removed, the *alignment guides* installed, and the vent duct shield inserts installed in the exit vent ducts. HI-TRAC is raised and positioned on top of HI-STORM. The door locking pins are removed and the doors are opened. The MPC is lowered into HI-STORM . The MPC lift slings are disconnected and lowered onto the MPC lid. HI-TRAC is raised and positioned at the site's discretion. The MPC lift cleat, lift slings, vent duct shield inserts, and transfer collar are removed and hole plugs are installed in the empty bolt holes. HI-STORM is prepared for storage and transferred to the ISFSI pad in the same manner as described in Section 8.1.

8.5.2 HI-STAR 100 SYSTEM Receipt and Preparation for MPC Transfer

Note:
The following provides a general description of the HI-STAR 100 System operations. Refer to the HI-STAR 100 System Topical Safety Analysis Report (Docket 72-1008) and the Safety Analysis Report (Docket 71-9261) for HI-STAR-specific operations.

1. Review the shipping paperwork and verify that the HI-STAR 100 Overpack met the required internal contamination limits prior to transportation.

2. Measure the HI-STAR 100 dose rates in accordance with 10CFR20.205 [8.5.1].

3. Remove the personnel barrier.

4. Perform removable contamination surveys in accordance with 10CFR20.205 [8.5.1].

5. Remove the impact limiters.

6. Remove the tie-down.

7. Perform a visual inspection of the overpack for obvious signs of shipping damage.

8. Remove the removable shear ring segments from the overpack. (Approximate weight is 50 lbs each).

9. Transfer the HI-STAR 100 Overpack to the location for MPC transfer and position it vertically.

10. Install the temporary shield ring on the overpack top flange *if used.*

ALARA Warning:
Gas sampling is performed to assess the condition of the MPC confinement boundary. If a leak is discovered in the ~~MPC~~*MPC* boundary, the MPC may not be placed into HI-STORM. If no leak is detected, the annulus may be vented directly.

11. Perform gas sampling as follows:

    a. Remove the overpack vent port cover plate and attach the backfill tool with a sample bottle attached. See Figure 8.5.1. Store the cover plate in a site-approved location.

    b. Using a vacuum pump, evacuate the sample bottle and backfill tool.

    c. Slowly open the vent port plug and gather a gas sample from the annulus. Reinstall the overpack vent port plug.

12. Evaluate the gas sample and determine the condition of the MPC confinement boundary.

13. If the confinement boundary is intact (i.e., no radioactive gas is measured) then vent the overpack annulus by removing the overpack vent port seal plug (using the backfill tool). Otherwise return the HI-STAR 100 to the spent fuel pool for MPC unloading in accordance with the HI-STAR 100 SAR.

14. Remove the closure plate bolts and remove the overpack closure plate. Store the closure plate on cribbing to protect the seal seating surfaces. Store the closure plate bolts in a site-approved location.

15. Install the HI-STAR 100 Seal Surface Protector.

16. Install the transfer collar on HI-STAR. See Figure 8.4.1.

Note:
The location of MPC transfer may be selected at the user's discretion.

17. Remove the MPC lift cleat hole plugs and install the MPC lift cleats. See Figure 8.1.24. See Table 8.1.5 for torque requirements.

18. Attach the MPC lift slings to the MPC lift cleat and lay them on the MPC lid.

Warning:
Unless the lift is single-failure proof (or equivalent safety factor) the HI-TRAC top lid, the lid shall be kept less than 2 feet above the top surface of the MPC. This is performed to protect the MPC lid from a potential lid drop.~~When traversing the MPC with the HI-TRAC top lid, the lid shall be kept less than 2 feet above the top surface of the MPC. This is performed to protect the MPC lid from a potential lid drop.~~

19. If necessary, install the HI-TRAC top lid. See Figure 8.1.9. See Table 8.1.5 for torque requirements.

20. If necessary, configure HI-TRAC with the transfer lid as follows:

ALARA Note:
The bottom lid replacement as described below may be performed only on an empty HI-TRAC.

21. Position HI-TRAC vertically adjacent to the transfer lid.

22. Remove the pool lid bolts and plates and store them in an approved plant storage location.

23. Raise the empty HI-TRAC and position it on top of the transfer lid.

24. Install the bottom lid bolts. See Table 8.1.5 for torque requirements.

25. Position HI-TRAC adjacent to HI-STAR.

26. Raise HI-TRAC above HI-STAR.

27. Align HI-TRAC over HI-STAR 100 and mate the overpacks. See Figure 8.1.31.

28. Remove the door locking pins and open the doors.

ALARA Warning:
If trim plates are not being used, personnel should remain clear of the door area during MPC downloading since there may be some radiation streaming during MPC raising and lowering operations.

29. At the users discretion, install trim plates to cover the gap above and below the door. The trim plates may be secured using clamps or any other method deemed suitable by the user. See Figure 8.1.33.

8.5.3 Perform MPC Transfer into HI-STORM 100

1. Raise the MPC into HI-TRAC by extending the MPC downloader.

2. Verify the MPC is in the full-up position.

3. Remove the trim plates (if used), close the doors and install the locking pins.

4. Close the HI-TRAC doors and install the door locking pins.

5. Raise HI-TRAC and remove the HI-STAR 100 Overpack from the operations area.

6. Transfer the MPC into HI-STORM in accordance with the steps provided in Section 8.1.

7. Place HI-STORM in storage in accordance with the steps provided in Section 8.1.

8. Perform shielding effectiveness testing in accordance with the HI-STORM 100 System Technical Specification LCO 3.2.3.

9. Perform an air temperature rise test per Step 8.1.7.22 if required by the Technical Specifications.

8.6 REFERENCES

[8.0.1] U.S. Nuclear Regulatory Commission, "Standard Review Plan for Dry Cask Storage Systems", NUREG-1536, Final Report, January 1997.

[8.1.1] *U.S. Code of Federal Regulations*, Title 10 "Energy", Part 72, "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste,"

[8.1.2] American National Standards Institute, Institute for Nuclear Materials Management, "American National Standard for Radioactive Materials – Leakage Tests on Packages for Shipment," ANSI N14.5-1987, January 1997.

[8.1.3] American Society of Mechanical Engineers "Boiler and Pressure Vessel Code".

[8.5.1] *U.S. Code of Federal Regulations,* Title 10 " Energy", Part 20, "Standards for Protection Against Radiation,"

installed in the MPC lid for the drain and vent ports. These caps are recessed inside the MPC lid and covered by the fully-welded vent and drain port cover plates. No credit is taken for the caps' ability to confine helium or radioactivity. After completion of drying and backfill operations, the drain and vent port cover plates are welded in place on the MPC lid and are leak tested to verify the MPC confinement boundary.

There is a pressure relief valve installed in the upper ledge surface of the HI-TRAC transfer cask water jacket. This pressure relief valve is provided for venting of the neutron shield jacket fluid under hypothetical fire accident conditions in which the design pressure of the water jacket may be exceeded. The pressure relief valve shall relieve at 60 psig.

9.1.4.2 Seals and Gaskets

There are no confinement seals or gaskets included in the HI-STORM 100 System.

9.1.5 Shielding Integrity

The HI-STORM 100 overpack and MPC have two designed shields for neutron and gamma ray attenuation. The HI-STORM overpack concrete provides both neutron and gamma shielding. Additional neutron shielding is provided by the encased Boral neutron absorber attached to the fuel basket cell surfaces inside the MPCs. The overpack's inner and outer steel shells, and the steel shield shell, provide radial gamma shielding. Concrete and steel plates provide axial neutron and gamma shielding. A concrete ring attached to the top of the overpack lid provides additional gamma and neutron shielding in the axial direction. Steel gamma shield cross plates, installed in the overpack air inlet and outlet vents, provide additional shielding for radiation through the vent openings.

The HI-TRAC transfer cask uses three different materials for primary shielding. The HI-TRAC's radial lead shield, and the top, in-pool, and transfer lids (which contain steel and lead) provide gamma shielding. The water jacket provides radial neutron shielding. Additionally, the top lid and transfer lid use Holtite-A to provide axial neutron shielding. Testing requirements for the shielding items are described below.

9.1.5.1 Fabrication Testing and Control

Holtite-A:

Neutron shield properties of Holtite-A are provided in Chapter 1, Section 1.2.1.3.2. Each *manufactured* lot ~~(mixed batch)~~ of neutron shield material shall be tested to verify the material composition (aluminum and hydrogen), boron concentration and neutron shield density (or specific gravity) meet the requirements specified in Chapter 1 and the Bill-of-Material. *A manufactured lot is defined as the total amount of material used to make any number of mixed batches comprised of constituent ingredients from the same lot/batch identification numbers supplied by the constituent manufacturer.* Testing shall be performed in accordance with written and approved procedures *and/or standards*. Material composition, boron concentration and density (or specific gravity) data

for each *manufactured* lot of neutron shield material shall become part of the quality documentation package.

The installation of the neutron shielding material shall be performed in accordance with written and qualified procedures. The procedures shall ensure that mix ratios and mixing methods are controlled in order to achieve proper material composition, boron concentration and distribution, and that pours are controlled in order to prevent gaps from occurring in the material. Samples of each *manufactured* lot of neutron shield material shall be maintained by Holtec International as part of the quality record documentation package.

Concrete:

The dimensions of the HI-STORM overpack steel shells and the density of the concrete shall be verified to be in accordance with TSAR Appendix 1.D and the Design Drawings prior to concrete installation. The dimensional inspection and density measurements shall be documented. Also, see Subsection 9.1.2.3 for concrete material testing requirements.

Lead:

The installation of the lead in the HI-TRAC transfer cask shall be performed using written and qualified procedures in order to ensure voids are minimized. Stand pipes or similar devices (as applicable) shall be placed on the upper portion of the cask to ensure the presence of an excess head of liquid lead. Vent risers shall be provided to allow for the air to escape. The HI-TRAC cask components shall be uniformly preheated prior to a lead pour. The temperature of the lead shall be verified to be in the correct temperature range and the lead shall be poured or pumped into place in the annulus (as applicable). The lead pour shall be followed by a controlled cooldown to minimize the gap between the lead and steel shells. The lead shall be cooled from the bottom up and additional molten lead shall be added to the standpipes as necessary to account for lead shrinkage. Each lot of lead shall be tested for chemical composition.

As an alternative to pouring molten lead, the lead shielding may be installed as pre-cast sections. If pre-cast sections are used, the design of the sections and the installation instructions shall minimize the gaps between adjacent lead sections and between the lead and the HI-TRAC transfer cask walls.

Steel:

Steel plates utilized in the construction of the HI-STORM 100 System shall be dimensionally inspected to assure compliance with the requirements specified on the Design Drawings.

General Requirements for Shield Materials:

1. Test results shall be documented and become part of the quality documentation package.

2. Dimensional inspections of the cavities containing the shielding materials shall

assure that the design required amount of shielding material is being incorporated into the fabricated item.

Shielding effectiveness tests shall be performed during fabrication and again after initial loading operations in accordance with Section 9.1.5.2 below and the operating procedures in Chapter 8.

9.1.5.2 Shielding Effectiveness Tests

The effectiveness of the lead pours in the HI-TRAC transfer cask body, pool lid, and transfer lid doors shall be verified during fabrication by performing gamma scanning on all accessible surfaces of the cask in the lead pour region. The gamma scanning ~~shall~~ *may* be performed prior to*, or after* installation of the water jacket. The purpose of the gamma scanning test is to demonstrate that the gamma shielding of the transfer cask body, pool lid, and transfer lid doors is at least as effective as that of a lead and steel test block. For the test block, the steel thickness shall be equivalent to the minimum design thickness of steel in the transfer cask component and the lead thickness shall be 5 percent lower than the minimum design thickness of lead in the transfer cask component (see the Design Drawings for the design values). Data shall be recorded on a 6-inch by 6-inch (nominal) grid pattern over the surfaces to be scanned. Should the measured gamma dose rates exceed those established with the test block, the shielding of that transfer cask component shall be deemed unacceptable. Corrective actions shall be taken as appropriate and the testing re-performed until successful results are achieved. Gamma scanning shall be performed in accordance with written and approved procedures. Dose rate measurements shall be documented and shall become part of the quality documentation package.

Following the first fuel loading of each HI-STORM 100 System (HI-TRAC transfer cask and HI-STORM storage overpack), a shielding effectiveness test shall be performed at the loading facility site to verify the effectiveness of the radiation shield. This test shall be performed after the HI-STORM overpack and HI-TRAC transfer cask have been loaded with an MPC containing spent fuel assemblies and the MPC has been drained, vacuum dried, and backfilled with helium.

Operational neutron and gamma shielding effectiveness tests shall be performed after fuel loading using written and approved procedures. Calibrated neutron and gamma dose rate meters shall be used to measure the actual neutron and gamma dose rates at the surface of the HI-STORM overpack and HI-TRAC. Measurements shall be taken at the locations specified in the Technical Specifications in Appendix A to CoC 72-1014 and, if necessary, average dose rates computed for comparison against the prescribed limits. The results of the dose rate measurements shall be compared to the limits specified in the Technical Specifications. The test is considered acceptable if the dose rate readings are less than or equal to limits in the Technical Specifications. If dose rates are higher than the limits, the Required Actions provided in the Technical Specifications shall be completed. Dose rate measurements shall be documented and shall become part of the quality documentation package.

9.1.5.3 Neutron Absorber Tests

After manufacturing, a statistical sample of each lot of Boral shall be tested using wet chemistry and/or neutron attenuation techniques to verify a minimum ^{10}B content (areal density) at the ends of

CHAPTER 10: RADIATION PROTECTION†

This chapter discusses the design considerations and operational features that are incorporated in the HI-STORM 100 Storage System design to protect plant personnel and the public from exposure to radioactive contamination and ionizing radiation during canister loading, closure, transfer, and on-site dry storage. Occupational exposure estimates for typical canister loading, closure, transfer operations, and ISFSI inspections are provided. An off-site dose assessment for a typical ISFSI is also discussed. Since the determination of off-site doses is necessarily site-specific, similar dose assessments are to be prepared by the licensee, as part of implementing the HI-STORM 100 Storage System in accordance with 10CFR72.212 [10.0.1]. The information provided in this chapter meets all requirements of NUREG-1536.

10.1 ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS-LOW-AS-REASONABLY-ACHIEVABLE (ALARA)

10.1.1 Policy Considerations

The HI-STORM 100 has been designed in accordance with 10CFR72 [10.0.1] and maintains radiation exposures ALARA consistent with 10CFR20 [10.1.1] and the guidance provided in Regulatory Guides 8.8 [10.1.2] and 8.10 [10.1.3]. Licensees using the HI-STORM 100 System will utilize and apply their existing site ALARA policies, procedures and practices for ISFSI activities to ensure that personnel exposure requirements of 10CFR20 [10.1.1] are met. Personnel performing ISFSI operations shall be trained on the operation of the HI-STORM 100 System, and be familiarized with the expected dose rates around the MPC, HI-STORM and HI-TRAC during all phases of loading, storage, and unloading operations. Chapter 12 provides dose rate limits at the HI-TRAC and HI-STORM surfaces to ensure that the HI-STORM 100 System is operated within design basis conditions and that ALARA goals will be met. Pre-job ALARA briefings should be held with workers and radiological protection personnel prior to work on or around the system. Worker dose rate monitoring, in conjunction with trained personnel and well-planned activities, will significantly reduce the overall dose received by the workers. When preparing or making changes to site-specific procedures for ISFSI activities, users shall ensure that ALARA practices are implemented and the 10CFR20 [10.1.1] standards for radiation protection are met in accordance with the site's written commitments. Users can further reduce dose rates around the HI-STORM 100 System by preferentially loading longer-cooled and lower-burnup spent fuel assemblies in the periphery fuel storage cells of the MPC, and loading assemblies with shorter cooling times and higher burnups in the inner MPC fuel storage cell locations. Users can also further reduce the dose rates around the HI-TRAC by the use of temporary shielding. In some cases, users may opt to upgrade their existing crane to take advantage of the increased shielding capabilities of the 125-Ton HI-TRAC transfer cask (versus

† This chapter has been prepared in the format and section organization set forth in Regulatory Guide 3.61. However, the material content of this chapter also fulfills the requirements of NUREG 1536. Pagination and numbering of sections, figures, and tables are consistent with the convention set down in Chapter 1, Section 1.0, herein. Finally, all terms-of-art used in this chapter are consistent with the terminology of the glossary (Table 1.0.1) and component nomenclature of the Bill-of-Materials (Section 1.5).

the 100-Ton HI-TRAC transfer cask). This decision should be based on a cost-benefit analysis. Temporary shielding *and use of special tools to reduce dose* is discussed in Section 10.1.4.

10.1.2 Design Considerations

Consistent with the design criteria defined in Section 2.3.5, the radiological protection criteria that limit exposure to radioactive effluents and direct radiation from an ISFSI using the HI-STORM 100 Storage System are as follows:

1. 10CFR72.104 [10.0.1] requires that for normal operation and anticipated occurrences, the annual dose equivalent to any real individual located beyond the owner-controlled area boundary must not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ. This dose would be a result of planned discharges, direct radiation from the ISFSI, and any other radiation from uranium fuel cycle operations in the area. The licensee is responsible for demonstrating site-specific compliance with these requirements.

2. 10CFR72.106 [10.0.1] requires that any individual located on or beyond the nearest owner-controlled area boundary may not receive from any design basis accident the more limiting of a total effective dose equivalent of 5 rem, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue)other than the lens of the eye) of 50 rem. The lens dose equivalent shall not exceed 15 rem and the shallow dose equivalent to skin or to any extremity shall not exceed 50 rem. The licensee is responsible for demonstrating site-specific compliance with this requirement.

3. 10CFR20 [10.1.1], Subparts C and D, limit occupational exposure and exposure to individual members of the public. The licensee is responsible for demonstrating site-specific compliance with this requirement.

4. Regulatory Position 2 of Regulatory Guide 8.8 [10.1.2] provides guidance regarding facility and equipment design features. This guidance has been followed in the design of the HI-STORM 100 Storage System as described below:

- Regulatory Position 2a, regarding access control, is met by locating the ISFSI in a Protected Area in accordance with 10CFR72.212(b)(5)(ii) [10.0.1]. Depending on the site-specific ISFSI design, other equivalent measures may be used. Unauthorized access is prevented once a loaded HI-STORM 100 Storage cask is placed in an ISFSI. Due to the nature of the system, only limited monitoring is required, thus reducing occupational exposure and supporting ALARA considerations. The licensee is responsible for site-specific compliance with these criteria.

- Regulatory Position 2b, regarding radiation shielding, is met by the storage cask and transfer cask biological shielding that minimizes personnel exposure, as described in Chapter 5 or later in this chapter. Fundamental design considerations that most directly influence occupational exposures with dry storage systems in general and which have been incorporated into the HI-STORM 100 System design include:

  - system designs that reduce or minimize the number of handling and transfer operations for each spent fuel assembly;
  - system designs that reduce or minimize the number of handling and transfer operations for each MPC loading;
  - system designs that maximize fuel capacity, thereby taking advantage of the self-shielding characteristics of the fuel and the reduction in the number of MPCs that must be loaded and handled;
  - system designs that minimize planned maintenance requirements;
  - system designs that minimize decontamination requirements at ISFSI decommissioning;
  - system designs that optimize the placement of shielding with respect to anticipated worker locations and fuel placement;
  - thick walled overpack that provides gamma and neutron shielding;
  - thick MPC lid which provides effective shielding for operators during MPC loading and unloading operations;
  - multiple welded barriers to confine radionuclides;
  - smooth surfaces to reduce decontamination time;
  - minimization of potential crud traps on the handling equipment to reduce decontamination requirements;
  - capability of maintaining water in the MPC during welding to reduce dose rates;
  - capability of maintaining water in the transfer cask annulus space and water jacket to reduce dose rates during closure operations;
  - MPC penetrations located and configured to reduce streaming paths;
  - HI-STORM and HI-TRAC designed to reduce streaming paths;

- MPC vent and drain ports with resealable caps to prevent the release of radionuclides during loading and unloading operations and facilitate draining, drying, and backfill operations;

- use of a separate pool lid, annulus seal, and Annulus Overpressure System to prevent contamination of the MPC shell outer surfaces during in-pool activities;

- temporary and auxiliary shielding to reduce dose rates around the HI-TRAC; and

- low-maintenance design to reduce doses during storage operation.

- Regulatory Position 2c, regarding process instrumentation and controls, is met since there are no radioactive systems at an ISFSI.

- Regulatory Position 2d, regarding control of airborne contaminants, is met since the HI-STORM 100 Storage System is designed to withstand all design basis conditions without loss of confinement function, as described in Chapter 7 of this TSAR, and no gaseous releases are anticipated. No significant surface contamination is expected since the exterior of the MPC is kept clean by using clean water in the HI-TRAC transfer cask-MPC annulus and by using an inflatable annulus seal.

- Regulatory Position 2e, regarding crud control, is not applicable to a HI-STORM 100 Storage System ISFSI since there are no radioactive systems at an ISFSI that could transport crud.

- Regulatory Position 2f, regarding decontamination, is met since the exterior of the loaded transfer cask is decontaminated prior to being removed from the plant's fuel building. The exterior surface of the HI-TRAC transfer cask is designed for ease of decontamination. In addition, an inflatable annulus seal is used to prevent fuel pool water from contacting and contaminating the exterior surface of the MPC.

- Regulatory Position 2g, regarding monitoring of airborne radioactivity, is met since the MPC provides confinement for all design basis conditions. There is no need for monitoring since no airborne radioactivity is anticipated to be released from the casks at an ISFSI.

- Regulatory Position 2h, regarding resin treatment systems, is not applicable to an ISFSI since there are no treatment systems containing radioactive resins.

- Regulatory Position 2i, regarding other miscellaneous ALARA items, is met since stainless steel is used in the MPC shell, the primary confinement boundary. This material is resistant to the damaging effects of radiation and is well proven in the SNF cask service. Use of this material quantitatively reduces or eliminates the need to perform maintenance (or replacement) on the primary confinement system.

10.1.3 Operational Considerations

Operational considerations that most directly influence occupational exposures with dry storage systems in general and that have been incorporated into the design of the HI-STORM 100 System include:

- totally-passive design requiring minimal maintenance and monitoring (other than security monitoring) during storage;
- remotely operated welding system, lift yoke, transfer slide and Vacuum Drying System (VDS) to reduce time operators spend in the vicinity of the loaded MPC;
- maintaining water in the MPC and the annulus region during MPC closure activities to reduce dose rates;
- low fuel assembly lift-over height of the HI-TRAC maximizes water coverage over assemblies during fuel assembly loading;
- a water-filled neutron shield jacket allows filling after removal of the HI-TRAC from the spent fuel pool. This maximizes the shielding on the HI-TRAC without exceeding the crane capacity;
- descriptive operating procedures that provide guidance to reduce equipment contamination, obtain survey information, minimize dose and alert workers to possible changing radiological conditions;
- preparation and inspection of the HI-STORM and HI-TRAC in low-dose areas;
- MPC lid fit tests and inspections prior to actual loading to ensure smooth operation during loading;
- gas sampling of the MPC and HI-STAR 100 annulus (receiving from transport) to assess the condition of the cladding and MPC confinement boundary;
- fuel cool-down operations developed for fuel unloading operations which minimize thermal shock to the fuel and therefore reduce the potential for fuel cladding rupture;

- HI-STORM vent thermocouples (See Chapter 12) allow remote monitoring of the vent operability surveillance;

- wetting of component surfaces prior to placement in the spent fuel pool to reduce the need for decontamination;

- decontamination practices which consider the effects of weeping during HI-TRAC transfer cask heat up and surveying of HI-TRAC prior to removal from the fuel handling building;

- a sequence of operations based on ALARA considerations; and

- use of mock-ups and dry run training to prepare personnel for actual work situations.

10.1.4 Auxiliary/Temporary Shielding

To minimize occupational dose during loading and unloading operations, a specially-designed set of auxiliary shielding is available. The HI-STORM 100 auxiliary shielding consists of the Automated Welding System Baseplate, the HI-TRAC Temporary Shield Ring, the annulus shield, HI-STORM vent shield insert, the HI-TRAC transfer step, and the shield panel trim plates. *Additional supplemental shielding such as lead blankets and bricks or other such shielding may also be used to help reduce dose rates.* Each auxiliary shield is described in Table 10.1.1, shown on Figure 10.1.1 and the procedures for utilization are provided in Chapter 8. *Other embodiments of the temporary shielding may also be used.* Table 10.1.2 provides the minimum requirements for use of the temporary shielding indicating optional and required shielding. Users shall evaluate the need for ~~additional~~ auxiliary and temporary shielding *and use of special tooling to reduce the overall exposure* based on an ALARA review of cask loading operations *and the MPC contents.*

Table 10.1.1
HI-STORM 100 AUXILIARY AND TEMPORARY SHIELDS

Temporary Shield	Description	Utilization
Automated Welding System Baseplate	Thick gamma and neutron shield circular plate that sits on the MPC lid. Plate is set directly on the MPC lid and has alignment pins for centering. Threaded lift holes are provided to assist in rigging.	Used during MPC closure and unloading operations in the cask preparation area to reduce the dose rates around the MPC lid. The design of the closure ring allows the baseplate shield to remain in place during the entire closure operation.
HI-TRAC Temporary Shield Ring	A series of eight custom-fit water-filled tanks that are placed atop of the HI-STAR or HI-TRAC neutron shield. The tanks, when secured together, form a complete shielding ring around the top flange.	Used during MPC and HI-TRAC closure operations and MPC transfers into HI-STAR to reduce dose rates to the operators around the top flange of the HI-TRAC.
Annulus Shield	A solid ring that is seated between the MPC shell and the HI-TRAC.	Used during MPC closure operations to reduce streaming from the annulus.
HI-TRAC Transfer Step	A stepped block used to position the pool lid and transfer lid at the same elevation. The transfer step creates a tight seam between the two lids to eliminate streaming during bottom lid replacement.	Used during HI-TRAC bottom lid replacement.
Shield Panel Trim Plates	Four steel plates approximately 0.25 inch by 3 inch by 80 inch that are placed at the ends of the transfer lid top and bottom plate and secured by clamps or other method deemed suitable by the user.	Used during MPC transfer to and from HI-TRAC to shield the small gap above and below the sliding doors on the transfer lid.
HI-STORM Vent Shield Inserts	Custom-fit concrete blocks shaped to fit into the HI-STORM exit vents.	Used during MPC transfer to and from HI-STORM to eliminate the streaming path from the exit vents during MPC transfer operations.

Table 10.1.2
HI-STORM 100 AUXILIARY AND TEMPORARY SHIELD REQUIREMENTS

Auxiliary Shielding	Required for the 100-Ton HI-TRAC	Required for the 125-ton HI-TRAC
Temporary Shield Ring	*Note 1*~~Yes~~	No
Automated Welding System Baseplate Shield	No	No
Annulus Shield	~~Yes~~*Note 1*	~~Yes~~*Note 1*
Vent Duct Shield Inserts	*Note 2*~~Yes~~	~~Yes~~*Note 2*
Transfer Step	Yes	Yes
Trim Plates	No	No

Notes:

1. *Users shall determine the need for this temporary shielding based on the specific operations and the MPC contents.*

2. *Not required for the HI-STORM 100S Overpack.*

10.2 RADIATION PROTECTION DESIGN FEATURES

The development of the HI-STORM 100 System has focused on design provisions to address the considerations summarized in Sections 10.1.2 and 10.1.3. The intent has been to improve on past concrete-based dry storage system designs by developing HI-STORM 100 as a hybrid of current metal and concrete storage system technologies. The design is, therefore, an evolution in storage systems, which incorporates preferred features from concrete storage, canister-based systems while retaining several of the advantages of metal casks as well. This approach results in a reduction in the need for maintenance, in overall radiation levels, and in the time spent on maintenance, when compared with current concrete-based dry storage systems. The following specific design features ensure a high degree of confinement integrity and radiation protection:

- HI-STORM 100 has been designed to meet storage condition dose rates required by 10CFR72 [10.0.1] for five-year cooled fuel;
- HI-STORM 100 has been designed to accommodate a maximum number of PWR or BWR fuel assemblies to minimize the number of cask systems that must be handled and stored at the storage facility and later transported off-site;
- HI-STORM 100 overpack structure is virtually maintenance free, especially over the years following its initial loading, because of the outer metal shell. The metal shell and its protective coating provide a high level of resistance to corrosion and other forms of degradation (e.g., erosion);
- HI-STORM 100 has been designed for redundant, multi-pass welded closures on the MPC; consequently, no monitoring of the confinement boundary is necessary and no gaseous or particulate releases occur for normal, off-normal or credible accident conditions;
- HI-TRAC transfer cask has a transfer step and other auxiliary shielding devices which eliminates streaming paths and simplify operations;
- The pool lid maximizes available fuel assembly water coverage in the spent fuel pool.
- The transfer lid is designed for quick alignment with HI-STORM; and
- HI-STORM 100 has been designed to allow close positioning (pitch) on the ISFSI storage pad, thereby increasing the ISFSI self-shielding by decreasing the view factors and reducing exposures to on-site and off-site personnel.

10.3 ESTIMATED ON-SITE COLLECTIVE DOSE ASSESSMENT

This section provides the estimates of the cumulative exposure to personnel performing loading, unloading and transfer operations using the HI-STORM system. This section uses the shielding analysis provided in Chapter 5 and the operations procedures provided in Chapter 8 to develop a dose assessment. The dose assessment is provided in Tables 10.3.1, 10.3.2, and 10.3.3.

The dose rates from the HI-STORM 100 overpack, MPC lid, HI-TRAC transfer cask, and HI-STAR 100 overpack are calculated to determine the dose to personnel during the various loading and unloading operations. The dose rates are also calculated for the various conditions of the cask that may affect the dose rates to the operators (e.g., MPC water level, HI-TRAC annulus water level, neutron shield water level, presence of temporary shielding). The dose rates around the 100-Ton HI-TRAC transfer cask are based on 24 PWR fuel assemblies with a burnup of ~~35,000~~*42,500* MWD/MTU and cooling of 5 years *including BPRAs*. The dose rates around the 125-Ton HI-TRAC transfer cask are based on 24 PWR fuel assemblies with a burnup of ~~45,000~~*57,500* MWD/MTU and cooling of ~~9~~*12* years *including BPRAs*. The dose rates around the HI-STORM 100 overpack are based on 24 PWR fuel assemblies with a burnup of ~~45,000~~*52,500* MWD/MTU and cooling of 5 years. The selection of these fuel assembly types in all fuel cell locations bound all possible PWR and BWR loading scenarios for the HI-STORM System from a dose-rate perspective. No assessment is made with respect to background radiation since background radiation can vary significantly by site. In addition, exposures are based on work being performed with the temporary shielding described in Table 10.1.2.

The choice of burnup and cooling times used in this chapter is extremely conservative. The bounding burnup and cooling time that resulted in the highest dose rates around the 100-ton and 125-ton HI-TRACs were used in conjunction with the very conservative burnup and cooling time for the HI-STORM 100 overpack (as discussed in Section 5.1). In addition, including the source term from BPRAs increases the level of conservatism. The maximum dose rate due to BPRAs was used in this analysis. As stated in Chapter 5, using the maximum source for the BPRAs in conjunction with the bounding burnup and cooling time for fuel assemblies is very conservative as it is not expected that burnup and cooling times of the BPRAs and fuel assemblies would be such that they are both at the maximum design basis values. This combined with the already conservative dose rates for the HI-TRACs and HI-STORMs results in an upper bound estimate of the occupational exposure. Users' radiation protection programs will assure appropriate temporary shielding is used based on actual fuel to be loaded and resulting dose rates in the field.

For each step in Tables 10.3.1 through 10.3.3, the operator work location is identified. These correspond to the locations identified in Figure 10.3.1. *The relative locations refer to both the HI-STORM 100 Overpack and the HI-STORM 100s Overpack.* The dose rate location points around the transfer cask and overpack were selected to model actual worker locations and cask

conditions during the operation. Cask operators typically work at an arms-reach distance from the cask. To account for this, an 18-inch distance was used to estimate the dose rate for the worker. This assessment addresses only the operators that perform work on or immediately adjacent to the cask.

Justification for the duration of operations along with the corresponding procedure steps from Chapter 8 are also provided in the tables. The assumptions used in developing time durations are based on mockups of the MPC, review of design drawings, walk-downs using other equipment to represent the HI-TRAC transfer cask and HI-STORM 100 overpack the HI-STAR 100 overpack and MPC-68 prototype, consultation with UST&D (weld examination) and consultation with cask operations personnel from Calvert Cliffs Nuclear Power Plant (for items such as lid installation and decontamination). In addition, for the shielding calculations, only the Temporary Shield Ring was assumed to be in place for applicable portions of the operations.

Tables 10.3.1a and 10.3.1b provide a summary of the dose assessment for a HI-STORM 100 System loading operation using the 125-ton HI-TRAC and the 100-ton HI-TRAC, respectively. Tables 10.3.2a and 10.3.2b provide a summary of the dose assessment for HI-STORM 100 System unloading operations operation using the 125-ton HI-TRAC transfer cask and the 100-ton HI-TRAC transfer cask, respectively. Tables 10.3.3a and 10.3.3.b provide a summary of the dose assessment for transferring the MPC to a HI-STAR 100 overpack as described in Section 8.5 of the operating procedures using the 125-ton HI-TRAC and the 100-ton HI-TRAC transfer cask, respectively.

10.3.1 Estimated Exposures for Loading and Unloading Operations

The assumptions used to estimate personnel exposures are conservative by design. The main factors attributed to actual personnel exposures are the age and burnup of the spent fuel assemblies and good ALARA practices. To estimate the dose received by a single worker, it should be understood that a canister-based system requires a diverse range of disciplines to perform all the necessary functions. The high visibility and often critical path nature of fuel movement activities have prompted utilities to load canister systems in a round-the-clock mode in most cases. This results in the exposure being spread out over several shifts of operators and technicians with no single shift receiving a majority of the exposure.

The total person-rem exposure from operation of the HI-STORM 100 System is proportional to the number of systems loaded. A typical utility will load approximately four MPCs per reactor cycle to maintain the current available spent fuel pool capacity. Utilities requiring dry storage of spent fuel assemblies typically have a large inventory of spent fuel assemblies that date back to the reactor's first cycle. The older fuel assemblies will have a significantly lower dose rate than the design basis fuel assemblies due to the extended cooling time (i.e., much greater than the values used to compute the dose rates). Users shall assess the cask loading for their particular fuel types (burnup, cooling time) to satisfy the requirements of 10CFR20 [10.1.1].

For licensees using the 100-Ton HI-TRAC transfer cask, design basis dose rates will be higher (than a corresponding 125-Ton HI-TRAC) due to the decreased mass of shielding~~ and longer cooling time for the 125-Ton HI-TRAC transfer cask~~. Due to the higher expected dose rates from the 100-Ton HI-TRAC, users ~~will~~ *may* need to use the auxiliary shielding (See Table 10.1.2), and should consider preferential loading, and increased precautions (e.g., additional temporary or auxiliary shielding, remotely operated equipment, additional contamination prevention measures). Actual use of optional dose reduction measures must be decided by each user based on the fuel to be loaded.

10.3.2 Estimated Exposures for Surveillance and Maintenance

Table 10.3.4 provides the maximum occupational exposure required for security surveillance and maintenance of an ISFSI. Although the HI-STORM 100 System requires only minimal maintenance during storage, maintenance will be required around the ISFSI for items such as security equipment maintenance, grass cutting, snow removal, vent system surveillance, drainage system maintenance, and lighting, telephone, and intercom repair. Security surveillance time is based on a daily security patrol around the perimeter of the ISFSI security fence. The estimated dose rates described below are based on a sample array of HI-STORM 100 overpacks fully loaded with design basis fuel assemblies, placed at their minimum required pitch, in a 2 x 6 HI-STORM array. The maintenance worker is assumed to be at a distance of 5 meters from the center of the long edge of the array. The security worker is assumed to be at a distance of 15 meters from the center of the long edge of the array. Users may opt to utilize electronic temperature monitoring of the HI-STORM modules or remote viewing methods instead of performing direct visual observation of the modules. Since security surveillances can be performed from outside the ISFSI, a dose rate of 3 mrem/hour is estimated. For maintenance of the casks and the ISFSI, a dose rate of 10 mrem/hour is estimated

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
Section 8.1.4								
LOAD PRE-SELECTED FUEL ASSEMBLIES INTO MPC	2	1020	1	2	1	17.0	34.0	15 MINUTES PER ASSEMBLY/68 ASSY
PERFORM POST-LOADING VISUAL VERIFICATION OF ASSEMBLY IDENTIFICATION	3	68	1	2	1	1.1	2.3	1 MINUTES PER ASSY/68 ASSY
Section 8.1.5								
INSTALL MPC LID AND ATTACH LIFT YOKE	1.g	45	2	2	2	1.5	3.0	CONSULTATION WITH CALVERT CLIFFS
RAISE HI-TRAC TO SURFACE OF SPENT FUEL POOL	1.i	20	2	2	2	0.7	1.3	40 FEET @ 2 FT/MINUTE (CRANE SPEED)
SURVEY MPC LID FOR HOT PARTICLES	1.i	3	3A	1	18.35	0.9	0.9	TELESCOPING DETECTOR USED
VERIFY MPC LID IS SEATED	1.j	0.5	3A	1	18.35	0.2	0.2	VISUAL VERIFICATION FROM 3 METERS
INSTALL LID RETENTION SYSTEM BOLTS	1.k	6	3B	2	19.45	1.9	3.9	24 BOLTS @ 1/PERSON-MINUTE
REMOVE HI-TRAC FROM SPENT FUEL POOL	1.m	8.5	3C	1	38.9	5.5	5.5	17 FEET @ 2 FT/MIN (CRANE SPEED)
DECONTAMINATE HI-TRAC BOTTOM	1.n	10	3D	1	51.45	8.6	8.6	LONG HANDLED TOOLS, PRELIMINARY DECON
TAKE SMEARS OF HI-TRAC EXTERIOR SURFACES	1.n	5	5B	1	59.31	4.9	4.9	50 SMEARS @ 10 SMEARS/MINUTE
DISCONNECT ANNULUS OVERPRESSURE SYSTEM	1.o	0.5	5C	1	31.89	0.3	0.3	QUICK DISCONNECT COUPLING
SET HI-TRAC IN CASK PREPARATION AREA	1.p	10	4A	1	19.45	3.2	3.2	100 FT @ 10 FT/MIN (CRANE SPEED)
REMOVE NEUTRON SHIELD JACKET FILL PLUG	1.q	2	4A	1	19.45	0.6	0.6	SINGLE PLUG, NO SPECIAL TOOLS
INSTALL NEUTRON SHIELD JACKET FILL PLUG	1.q	2	5B	1	59.31	2.0	2.0	SINGLE PLUG, NO SPECIAL TOOLS

† See notes at bottom of Table 10.3.4.

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
DISCONNECT LID RETENTION SYSTEM	1.r	6	5A	2	21.35	2.1	4.3	24 BOLTS @ 1 BOLT/PERSON MINUTES
MEASURE DOSE RATES AT MPC LID	1.t	3	5A	1	21.35	1.1	1.1	TELESCOPING DETECTOR USED
DECONTAMINATE AND SURVEY HI-TRAC	1.t	103	5B	1	59.31	101.8	101.8	490 SQ-FT@5 SQ-FT/PRERSON-MINUTE+50 SMEARS@10 SMEARS/MINUTE
INSTALL TEMPORARY SHIELD	1.v	16	6A	2	11.05	2.9	5.9	8 SEGMENTS @ 1 SEGMENT/PERSON MIN
FILL TEMPORARY SHIELD RING	1.v	25	6A	1	11.05	4.6	4.6	230 GAL @10GPM, LONG HANDLED SPRAY WAND
ATTACH DRAIN LINE TO HI-TRAC DRAIN PORT	1.w	0.5	5C	1	31.89	0.3	0.3	QUICK DISCONNECT COUPLING
INSTALL RVOAs	2.a	2	6A	1	11.05	0.4	0.4	SINGLE THREADED CONNECTION X 2 RVOAs
ATTACH WATER PUMP TO DRAIN PORT	2.b	2	6A	1	11.05	0.4	0.4	POSITION PUMP SELF PRIMING
DISCONNECT WATER PUMP	2.c	5	6A	1	11.05	0.9	0.9	DRAIN HOSES MOVE PUMP
DECONTAMINATE MPC LID TOP SURFACE AND SHELL AREA ABOVE INFLATABLE ANNULUS SEAL	2.d	6	6A	1	11.05	1.1	1.1	30 SQ-FT @5 SQ-FT/MINUTE+10 SMEARS@10 SMEARS/MINUTE
REMOVE INFLATABLE ANNULUS SEAL	2.e	3	6A	1	11.05	0.6	0.6	SEAL PULLS OUT DIRECTLY
SURVEY MPC LID TOP SURFACES AND ACCESSIBLE AREAS OF TOP THREE INCHES OF MPC SHELL	2.f	1	6A	1	11.05	0.2	0.2	10 SMEARS@10 SMEARS/MINUTE
INSTALL ANNULUS SHIELD	2.g	2	6A	1	11.05	0.4	0.4	SHIELD PLACED BY HAND
CENTER LID IN MPC SHELL	3.a	20	6A	3	11.05	3.7	11.1	CONSULTATION WITH CALVERT CLIFFS
INSTALL MPC LID SHIMS	3.b	12	6A	2	11.05	2.2	4.4	MEASURED DURING WELD MOCKUP TESTING
POSITION AWS BASEPLATE SHIELD ON MPC LID	3.c	20	7A	2	11.05	3.7	7.4	ALIGN AND REMOVE 4 SHACKLES

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL AUTOMATED WELDING SYSTEM ROBOT	3.c	8	7A	2	11.05	1.5	2.9	ALIGN AND REMOVE 4 SHACKLES/4 QUICK CONNECTS@1/MIN
VISUALLY INSPECT TACK WELD	3.e	5	7A	1	11.05	0.9	0.9	MEASURED DURING WELD MOCKUP TESTING
PERFORM LIQUID PENETRANT EXAMINATION OF WELD ROOT	3.g	45	7A	1	11.05	8.3	8.3	MEASURED DURING WELD MOCKUP TESTING
PERFORM INTERMEDIATE LIQUID PENETRANT EXAMINATION (3 SETS)	3.h	135	7A	1	11.05	24.9	24.9	MEASURED DURING WELD MOCKUP TESTING
PERFORM LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	3.i	45	7A	1	11.05	8.3	8.3	MEASURED DURING WELD MOCKUP TESTING
ATTACH DRAIN LINE TO VENT PORT	4.a	1	7A	1	11.05	0.2	0.2	1" THREADED FITTING NO TOOLS
VISUALLY EXAMINE MPC LID-TO-SHELL WELD FOR LEAKAGE OF WATER	4.c	10	7A	1	11.05	1.8	1.8	10 MIN TEST DURATION
DISCONNECT WATER FILL LINE AND DRAIN LINE	4.c	2	7A	1	11.05	0.4	0.4	1" THREADED FITTING NO TOOLS X 2
REPEAT LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	4.d	45	7A	1	11.05	8.3	8.3	5 MIN TO APPLY, 7 MIN TO WIPE, 5 APPLY DEV, INSP (24 IN/MIN)
ATTACH GAS SUPPLY TO VENT PORT	4.e	1	7A	1	11.05	0.2	0.2	1" THREADED FITTING NO TOOLS
ATTACH DRAIN LINE TO DRAIN PORT	4.e	1	7A	1	11.05	0.2	0.2	1" THREADED FITTING NO TOOLS
CONNECT MSLD SNIFFER TO AUTOMATED WELDING SYSTEM	4.i	4	8A	1	15.4	1.0	1.0	SIMPLE ATTACHMENT NO TOOLS
DISCONNECT MSLD SNIFFER FROM AUTOMATED WELDING SYSTEM	4.i	4	8A	1	15.4	1.0	1.0	SIMPLE ATTACHMENT NO TOOLS
ATTACH DRAIN LINE TO VENT PORT	5.a	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
ATTACH WATER FILL LINE TO [illegible]	5.a	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
DRAIN PORT								
DISCONNECT WATER FILL DRAIN LINES FROM MPC	5.b	2	8A	1	15.4	0.5	0.5	1" THREADED FITTING NO TOOLS X 2
ATTACH HELIUM OR NITROGEN SUPPLY TO VENT PORT	5.c	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
ATTACH DRAIN LINE TO DRAIN PORT	5.d	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
DISCONNECT GAS SUPPLY LINE FROM MPC	5.i	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
DISCONNECT DRAIN LINE FROM MPC	5.j	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
ATTACH VACUUM DRYING SYSTEM (VDS) TO VENT AND DRAIN PORT RVOAs	6.a	2	8A	1	15.4	0.5	0.5	1" THREADED FITTING NO TOOLS
DISCONNECT VDS FROM MPC	6.j	2	8A	1	15.4	0.5	0.5	1" THREADED FITTING NO TOOLS X 2
CLOSE DRAIN PORT RVOA CAP AND REMOVE DRAIN PORT RVOA	6.l	1.5	8A	1	15.4	0.4	0.4	SINGLE THREADED CONNECTION (1 RVOA)
ATTACH HELIUM BACKFILL SYSTEM TO VENT PORT	7.c	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
DISCONNECT HBS FROM MPC	7.f	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
CLOSE VENT PORT RVOA AND DISCONNECT VENT PORT RVOA	7.g	1.5	8A	1	15.4	0.4	0.4	SINGLE THREADED CONNECTION (1 RVOA)
WIPE INSIDE AREA OF VENT AND DRAIN PORT RECESSES	8.a	2	8A	1	15.4	0.5	0.5	2 PORTS, 1 MIN/PORT
PLACE COVER PLATE OVER VENT PORT RECESS	8.b	1	8A	1	15.4	0.3	0.3	INSTALLED BY HAND NO TOOLS (2/MIN)
VISUALLY INSPECT TACK WELDS	8.d	10	8A	1	15.4	2.6	2.6	MEASURED DURING WELD MOCKUP TESTING

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
PERFORM LIQUID PENETRANT EXAMINATION ON VENT AND DRAIN COVER PLATE ROOT WELD	8.f	45	8A	1	15.4	11.6	11.6	MEASURED DURING WELD MOCKUP TESTING
PERFORM A LIQUID PENETRANT EXAMINATION ON VENT AND DRAIN PORT COVER WELD	8.h	45	8A	1	15.4	11.6	11.6	CONSULTATION WITH UST&D ON PROTOTYPE
FLUSH CAVITY WITH HELIUM AND INSTALL SET SCREWS	9.b	2	8A	1	15.4	6.7	6.7	4 SET SCREWS @2/MINUTE
PLUG WELD OVER ET SCREWS	9.b	8	8A	1	15.4	6.7	6.7	FOUR SINGLE SPOT WELDS @ 1 PER 2 MINTES
INSTALL MSLD OVER VENT PORT COVER PLATE	9.f	2	8A	1	15.4	0.5	0.5	INSTALLED BY HAND NO TOOLS
INSTALL MSLD OVER DRAIN PORT COVER PLATE	9.f	2	8A	1	15.4	0.5	0.5	INSTALLED BY HAND NO TOOLS
INSTALL AND ALIGN CLOSURE RING	10.a	5	8A	1	15.4	1.3	1.3	INSTALLED BY HAND NO TOOLS
VISUALLY INSPECT TACK WELDS	10.c	5	8A	1	15.4	1.3	1.3	10 TACKS @ 2/MIN
PERFORM A LIQUID PENETRANT EXAMINATION ON CLOSURE RING ROOT WELDS	10.g	90	8A	1	15.4	23.1	23.1	MEASURED DURING WELD MOCKUP TESTING
PERFORM A LIQUID PENETRANT EXAMINATION ON CLOSURE RING FINAL WELD	10.g	90	8A	1	15.4	23.1	23.1	MEASURED DURING WELD MOCKUP TESTING
RIG AWS TO CRANE	10.j	12	8A	1	15.4	3.1	3.1	10 MIN TO DISCONNECT LINES, 4 SHACKLES@2/MIN
Section 8.1.6								
REMOVE ANNULUS SHIELD	1	1	8A	1	15.4	0.3	0.3	SHIELD PLACED BY HAND
ATTACH DRAIN LINE TO HI-TRAC	2	1	9D	1	135.28	2.3	2.3	1" THREADED FITTING NO TOOLS
POSITION HI-TRAC TOP LID	3	10	9B	2	15.4	2.6	5.1	VERTICAL FLANGED CONNECTION
TORQUE TOP LID BOLTS	4	12	9B	1	15.4	3.1	3.1	24 BOLTS AT 2/MIN (INSTALL AND TORQUE,1 PASS)
INSTALL MPC LIFT CLEATS AND MPC SUPPORT STAYS	5	25	9A	2	67.84	28.3	56.5	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
REMOVE TEMPORARY SHIELD RING DRAIN PLUGS	6	1	9B	1	15.4	0.3	0.3	8 PLUGS @ 8/MIN
REMOVE TEMPORARY SHIELD RING SEGMENTS	6	4	9A	1	67.84	4.5	4.5	REMOVED BY HAND NO TOOLS (8 SEGS@2/MIN)
ATTACH MPC SUPPORT STAYS TO LIFT YOKE	7.a	4	9A	2	67.84	4.5	9.0	INSTALLED BY HAND NO TOOLS
POSITION HI-TRAC ABOVE TRANSFER STEP	7.c	15	9C	1	38.9	9.7	9.7	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN
REMOVE BOTTOM LID BOLTS	7.f	6	10A	1	135.28	13.5	13.5	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED
INSTALL TRANSFER LID BOLTS	7.j	18	11B	1	135.28	40.6	40.6	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS
DISCONNECT MPC SUPPORT STAYS	7.l	4	9A	2	67.84	4.5	9.0	INSTALLED BY HAND NO TOOLS
Section 8.1.7								
POSITION HI-TRAC ON TRANSPORT DEVICE	1	20	11A	2	38.9	13.0	25.9	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
TRANSPORT HI-TRAC TO OUTSIDE TRANSFER LOCATION	1.b	90	12A	3	18.64	28.0	83.9	DRIVER AND 2 SPOTTERS
ATTACH OUTSIDE LIFTING DEVICE LIFT LINKS	5	2	12A	2	18.64	0.6	1.2	2 LINKS@1/MIN
MATE OVERPACKS	6	10	13B	2	41.91	7.0	14.0	ALIGNMENT GUIDES USED
ATTACH MPC LIFT SLINGS TO MPC LIFT CLEATS	7	10	13A	2	67.84	11.3	22.6	2 SLINGS@5MIN/SLING NO TOOLS
REMOVE TRANSFER LID DOOR LOCKING PINS AND OPEN DOORS	10	4	13B	2	41.91	2.8	5.6	2 PINS@2MIN/PIN
INSTALL TRIM PLATES	11	4	13B	2	41.91	2.8	5.6	INSTALLED BY HAND
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	13	10	13A	2	67.84	11.3	22.6	2 SLINGS@5MIN/SLING
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	15	10	14A	1	200.07	33.3	33.3	4 BOLTS,NO TORQUING

Table 10.3.1a
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	15	2	14A	1	200.07	6.7	6.7	4 PLUGS AT 2/MIN NO TORQUING
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	16.a	2	15A	1	7.85	0.3	0.3	4 SHACKLES@2/MIN
REMOVE ALIGNMENT DEVICE	16.c	4	15A	1	7.85	0.5	0.5	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	16.c	25	16A	2	2.96	1.2	2.5	INSTALL LID AND HYDRO TORQUE 4 BOLTS
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	16.e	4	16B	1	22.88	1.5	1.5	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS
INSTALL THERMOCOUPLES	16.e	20	16B	1	22.88	7.6	7.6	4@5MIN/THERMOCOUPLE
INSTALL EXIT VENT SCREENS	16.e	20	16B	1	22.88	7.6	7.6	4 SCREENS@5MIN/SCREEN
REMOVE HI-STORM LID LIFTING DEVICE	16.f	2	16A	1	2.96	0.1	0.1	4 SHACKLES@2/MIN
INSTALL HOLE PLUGS IN EMPTY HOLES	16.f	2	16A	1	2.96	0.1	0.1	4 PLUGS AT 2/MIN NO TORQUING
PERFORM SHIELDING EFFECTIVENESS TESTING	16.g	16	16D	2	9.96	2.7	5.3	16 POINTS@1 MIN
SECURE HI-STORM TO TRANSPORT DEVICE	16.h	10	16A	2	2.96	0.5	1.0	ASSUMES AIR PAD
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	17.a	40	16C	1	7.89	5.3	5.3	200 FEET @ 4FT/MIN
INSERT HI-STORM LIFTING JACKS	17.b	4	16D	1	9.96	0.7	0.7	4 JACKS@1/MIN
REMOVE AIR PAD	17.b	5	16D	2	9.96	0.8	1.7	1 PAD MOVED BY HAND
REMOVE HI-STORM LIFTING JACKS	17.c	4	16D	1	9.96	0.7	0.7	4 JACKS@1/MIN
INSTALL INLET VENT SCREENS/CROSS PLATES	18	20	16D	1	9.96	3.3	3.3	4 SCREENS@5MIN/SCREEN
PERFORM AIR TEMPERATURE RISE TEST	19	8	16B	1	22.88	3.1	3.1	8 MEASUREMENTS@1/MIN
TOTAL							787.4 PERSON-MREM	

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
Section 8.1.4								
LOAD PRE-SELECTED FUEL ASSEMBLIES INTO MPC	2	1020	1	2	3	51.0	102.0	15 MINUTES PER ASSEMBLY/68 ASSY
PERFORM POST-LOADING VISUAL VERIFICATION OF ASSEMBLY IDENTIFICATION	3	68	1	2	3	3.4	6.8	1 MINUTES PER ASSY/68 ASSY
Section 8.1.5								
INSTALL MPC LID AND ATTACH LIFT YOKE	1.g	45	2	2	3	2.3	4.5	CONSULTATION WITH CALVERT CLIFFS
RAISE HI-TRAC TO SURFACE OF SPENT FUEL POOL	1.i	20	2	2	3	1.0	2.0	40 FEET @ 2 FT/MINUTE (CRANE SPEED)
SURVEY MPC LID FOR HOT PARTICLES	1.i	3	3A	1	18.35	0.9	0.9	TELESCOPING DETECTOR USED
VERIFY MPC LID IS SEATED	1.j	0.5	3A	1	18.35	0.2	0.2	VISUAL VERIFICATION FROM 3 METERS
INSTALL LID RETENTION SYSTEM BOLTS	1.k	6	3B	2	64.04	6.4	12.8	24 BOLTS @ 1/PERSON-MINUTE
REMOVE HI-TRAC FROM SPENT FUEL POOL	1.m	8.5	3C	1	295.96	41.9	41.9	17 FEET @ 2 FT/MIN (CRANE SPEED)
DECONTAMINATE HI-TRAC BOTTOM	1.n	10	3D	1	234.04	39.0	39.0	LONG HANDLED TOOLS, PRELIMINARY DECON
TAKE SMEARS OF HI-TRAC EXTERIOR SURFACES	1.n	5	5B	1	376.05	31.3	31.3	50 SMEARS @ 10 SMEARS/MINUTE
DISCONNECT ANNULUS OVERPRESSURE SYSTEM	1.o	0.5	5C	1	125.48	1.0	1.0	QUICK DISCONNECT COUPLING
SET HI-TRAC IN CASK PREPARATION AREA	1.p	10	4A	1	64.04	10.7	10.7	100 FT @ 10 FT/MIN (CRANE SPEED)
REMOVE NEUTRON SHIELD JACKET FILL PLUG	1.q	2	4A	1	64.04	2.1	2.1	SINGLE PLUG, NO SPECIAL TOOLS

† See notes at bottom of Table 10.3.4.

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL NEUTRON SHIELD JACKET FILL PLUG	1.q	2	5B	1	376.05	12.5	12.5	SINGLE PLUG, NO SPECIAL TOOLS
DISCONNECT LID RETENTION SYSTEM	1.r	6	5A	2	55.41	5.5	11.1	24 BOLTS @ 1 BOLT/PERSON MINUTES
MEASURE DOSE RATES AT MPC LID	1.t	3	5A	1	55.41	2.8	2.8	TELESCOPING DETECTOR USED
DECONTAMINATE AND SURVEY HI-TRAC	1.t	103	5B	1	376.05	645.6	645.6	490 SQ-FT@5 SQ-FT/PRERSON-MINUTE+50 SMEARS@10 SMEARS/MINUTE
INSTALL TEMPORARY SHIELD	1.v	16	6A	2	30.91	8.2	16.5	8 SEGMENTS @ 1 SEGMENT/PERSON MIN
FILL TEMPORARY SHIELD RING	1.v	25	6A	1	30.91	12.9	12.9	230 GAL @10GPM, LONG HANDLED SPRAY WAND
ATTACH DRAIN LINE TO HI-TRAC DRAIN PORT	1.w	0.5	5C	1	125.48	1.0	1.0	QUICK DISCONNECT COUPLING
INSTALL RVOAs	2.a	2	6A	1	30.91	1.0	1.0	SINGLE THREADED CONNECTION X 2 RVOAs
ATTACH WATER PUMP TO DRAIN PORT	2.b	2	6A	1	30.91	1.0	1.0	POSITION PUMP SELF PRIMING
DISCONNECT WATER PUMP	2.c	5	6A	1	30.91	2.6	2.6	DRAIN HOSES MOVE PUMP
DECONTAMINATE MPC LID TOP SURFACE AND SHELL AREA ABOVE INFLATABLE ANNULUS SEAL	2.d	6	6A	1	30.91	3.1	3.1	30 SQ-FT @5 SQ-FT/MINUTE+10 SMEARS@10 SMEARS/MINUTE
REMOVE INFLATABLE ANNULUS SEAL	2.e	3	6A	1	30.91	1.5	1.5	SEAL PULLS OUT DIRECTLY
SURVEY MPC LID TOP SURFACES AND ACCESSIBLE AREAS OF TOP THREE INCHES OF MPC SHELL	2.f	1	6A	1	30.91	0.5	0.5	10 SMEARS@10 SMEARS/MINUTE
INSTALL ANNULUS SHIELD	2.g	2	6A	1	30.91	1.0	1.0	SHIELD PLACED BY HAND
CENTER LID IN MPC SHELL	3.a	20	6A	3	30.91	10.3	30.9	CONSULTATION WITH CALVERT CLIFFS
INSTALL MPC LID SHIMS	3.b	12	6A	2	30.91	6.2	12.4	MEASURED DURING WELD MOCKUP TESTING

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
POSITION AWS BASEPLATE SHIELD ON MPC LID	3.c	20	7A	2	30.91	10.3	20.6	ALIGN AND REMOVE 4 SHACKLES
INSTALL AUTOMATED WELDING SYSTEM ROBOT	3.c	8	7A	2	30.91	4.1	8.2	ALIGN AND REMOVE 4 SHACKLES/4 QUICK CONNECTS@1/MIN
VISUALLY INSPECT TACK WELD	3.e	5	7A	1	30.91	2.6	2.6	MEASURED DURING WELD MOCKUP TESTING
PERFORM LIQUID PENETRANT EXAMINATION OF WELD ROOT	3.g	45	7A	1	30.91	23.2	23.2	MEASURED DURING WELD MOCKUP TESTING
PERFORM INTERMEDIATE LIQUID PENETRANT EXAMINATION (3 SETS)	3.h	135	7A	1	30.91	69.5	69.5	MEASURED DURING WELD MOCKUP TESTING
PERFORM LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	3.i	45	7A	1	30.91	23.2	23.2	MEASURED DURING WELD MOCKUP TESTING
ATTACH DRAIN LINE TO VENT PORT	4.a	1	7A	1	30.91	0.5	0.5	1" THREADED FITTING NO TOOLS
VISUALLY EXAMINE MPC LID-TO-SHELL WELD FOR LEAKAGE OF WATER	4.c	10	7A	1	30.91	5.2	5.2	10 MIN TEST DURATION
DISCONNECT WATER FILL LINE AND DRAIN LINE	4.c	2	7A	1	30.91	1.0	1.0	1" THREADED FITTING NO TOOLS X 2
REPEAT LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	4.d	45	7A	1	30.91	23.2	23.2	5 MIN TO APPLY, 7 MIN TO WIPE, 5 APPLY DEV, INSP (24 IN/MIN)
ATTACH GAS SUPPLY TO VENT PORT	4.e	1	7A	1	30.91	0.5	0.5	1" THREADED FITTING NO TOOLS
ATTACH DRAIN LINE TO DRAIN PORT	4.e	1	7A	1	30.91	0.5	0.5	1" THREADED FITTING NO TOOLS
CONNECT MSLD SNIFFER TO AUTOMATED WELDING SYSTEM	4.i	4	8A	1	52.84	3.5	3.5	SIMPLE ATTACHMENT NO TOOLS
DISCONNECT MSLD SNIFFER FROM AUTOMATED WELDING SYSTEM	4.i	4	8A	1	52.84	3.5	3.5	SIMPLE ATTACHMENT NO TOOLS
ATTACH DRAIN LINE TO VENT	5.a	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
PORT								
ATTACH WATER FILL LINE TO DRAIN PORT	5.a	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
DISCONNECT WATER FILL DRAIN LINES FROM MPC	5.b	2	8A	1	52.84	1.8	1.8	1" THREADED FITTING NO TOOLS X 2
ATTACH HELIUM OR NITROGEN SUPPLY TO VENT PORT	5.c	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
ATTACH DRAIN LINE TO DRAIN PORT	5.d	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
DISCONNECT GAS SUPPLY LINE FROM MPC	5.i	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
DISCONNECT DRAIN LINE FROM MPC	5.j	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
ATTACH VACUUM DRYING SYSTEM (VDS) TO VENT AND DRAIN PORT RVOAs	6.a	2	8A	1	52.84	1.8	1.8	1" THREADED FITTING NO TOOLS
DISCONNECT VDS FROM MPC	6.j	2	8A	1	52.84	1.8	1.8	1" THREADED FITTING NO TOOLS X 2
CLOSE DRAIN PORT RVOA CAP AND REMOVE DRAIN PORT RVOA	6.l	1.5	8A	1	52.84	1.3	1.3	SINGLE THREADED CONNECTION (1 RVOA)
ATTACH HELIUM BACKFILL SYSTEM TO VENT PORT	7.c	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
DISCONNECT HBS FROM MPC	7.f	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
CLOSE VENT PORT RVOA AND DISCONNECT VENT PORT RVOA	7.g	1.5	8A	1	52.84	1.3	1.3	SINGLE THREADED CONNECTION (1 RVOA)
WIPE INSIDE AREA OF VENT AND DRAIN PORT RECESSES	8.a	2	8A	1	52.84	1.8	1.8	2 PORTS, 1 MIN/PORT
PLACE COVER PLATE OVER VENT PORT RECESS	8.b	1	8A	1	52.84	0.9	0.9	INSTALLED BY HAND NO TOOLS (2/MIN)
VISUALLY INSPECT TACK WELDS	8.d	10	8A	1	52.84	8.8	8.8	MEASURED DURING WELD MOCKUP TESTING

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
PERFORM LIQUID PENETRANT EXAMINATION ON VENT AND DRAIN COVER PLATE ROOT WELD	8.f	45	8A	1	52.84	39.6	39.6	MEASURED DURING WELD MOCKUP TESTING
PERFORM A LIQUID PENETRANT EXAMINATION ON VENT AND DRAIN PORT COVER WELD	8.h	45	8A	1	52.84	39.6	39.6	CONSULTATION WITH UST&D ON PROTOTYPE
FLUSH CAVITY WITH HELIUM AND INSTALL SET SCREWS	9.b	2	8A	1	52.84	1.8	23.9	4 SET SCREWS @2/MINUTE
PLUG WELD OVER ET SCREWS	9.b	8	8A	1	52.84	7.0	23.9	FOUR SINGLE SPOT WELDS @ 1 PER 2 MINTES
INSTALL MSLD OVER VENT PORT COVER PLATE	9.f	2	8A	1	52.84	1.8	1.8	INSTALLED BY HAND NO TOOLS
INSTALL MSLD OVER DRAIN PORT COVER PLATE	9.f	2	8A	1	52.84	1.8	1.8	INSTALLED BY HAND NO TOOLS
INSTALL AND ALIGN CLOSURE RING	10.a	5	8A	1	52.84	4.4	4.4	INSTALLED BY HAND NO TOOLS
VISUALLY INSPECT TACK WELDS	10.c	5	8A	1	52.84	4.4	4.4	10 TACKS @ 2/MIN
PERFORM A LIQUID PENETRANT EXAMINATION ON CLOSURE RING ROOT WELDS	10.g	90	8A	1	52.84	79.3	79.3	MEASURED DURING WELD MOCKUP TESTING
PERFORM A LIQUID PENETRANT EXAMINATION ON CLOSURE RING FINAL WELD	10.g	90	8A	1	52.84	79.3	79.3	MEASURED DURING WELD MOCKUP TESTING
RIG AWS TO CRANE	10.j	12	8A	1	52.84	10.6	10.6	10 MIN TO DISCONNECT LINES, 4 SHACKLES@2/MIN
Section 8.1.6								
REMOVE ANNULUS SHIELD	1	1	8A	1	52.84	0.9	0.9	SHIELD PLACED BY HAND
ATTACH DRAIN LINE TO HI-TRAC	2	1	9D	1	804.79	13.4	13.4	1" THREADED FITTING NO TOOLS
POSITION HI-TRAC TOP LID	3	10	9B	2	52.84	8.8	17.6	VERTICAL FLANGED CONNECTION
TORQUE TOP LID BOLTS	4	12	9B	1	52.84	10.6	10.6	24 BOLTS AT 2/MIN (INSTALL AND TORQUE,1 PASS)
INSTALL MPC LIFT CLEATS AND MPC SUPPORT STAYS	5	25	9A	2	177.55	74.0	148.0	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
REMOVE TEMPORARY SHIELD RING DRAIN PLUGS	6	1	9B	1	52.84	0.9	0.9	8 PLUGS @ 8/MIN
REMOVE TEMPORARY SHIELD RING SEGMENTS	6	4	9A	1	177.55	11.8	11.8	REMOVED BY HAND NO TOOLS (8 SEGS@2/MIN)
ATTACH MPC SUPPORT STAYS TO LIFT YOKE	7.a	4	9A	2	177.55	11.8	23.7	INSTALLED BY HAND NO TOOLS
POSITION HI-TRAC ABOVE TRANSFER STEP	7.c	15	9C	1	316.83	79.2	79.2	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN
REMOVE BOTTOM LID BOLTS	7.f	6	10A	1	804.79	80.5	80.5	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED
INSTALL TRANSFER LID BOLTS	7.j	18	11B	1	804.79	241.4	241.4	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS
DISCONNECT MPC SUPPORT STAYS	7.l	4	9A	2	177.55	11.8	23.7	INSTALLED BY HAND NO TOOLS
Section 8.1.7								
POSITION HI-TRAC ON TRANSPORT DEVICE	1	20	11A	2	316.83	105.6	211.2	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
TRANSPORT HI-TRAC TO OUTSIDE TRANSFER LOCATION	1.b	90	12A	3	18.64	28.0	83.9	DRIVER AND 2 SPOTTERS
ATTACH OUTSIDE LIFTING DEVICE LIFT LINKS	5	2	12A	2	18.64	0.6	1.2	2 LINKS@1/MIN
MATE OVERPACKS	6	10	13B	2	284.51	47.4	94.8	ALIGNMENT GUIDES USED
ATTACH MPC LIFT SLINGS TO MPC LIFT CLEATS	7	10	13A	2	177.55	29.6	59.2	2 SLINGS@5MIN/SLING NO TOOLS
REMOVE TRANSFER LID DOOR LOCKING PINS AND OPEN DOORS	10	4	13B	2	284.51	19.0	37.9	2 PINS@2MIN/PIN
INSTALL TRIM PLATES	11	4	13B	2	284.51	19.0	37.9	INSTALLED BY HAND
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	13	10	13A	2	177.55	29.6	59.2	2 SLINGS@5MIN/SLING
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	15	10	14A	1	255.57	42.6	42.6	4 BOLTS,NO TORQUING

Table 10.3.1b
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	15	2	14A	1	255.57	8.5	8.5	4 PLUGS AT 2/MIN NO TORQUING
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	16.a	2	15A	1	27.85	0.9	0.9	4 SHACKLES@2/MIN
REMOVE ALIGNMENT DEVICE	16.c	4	15A	1	27.85	1.9	1.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	16.c	25	16A	2	4.26	1.8	3.6	INSTALL LID AND HYDRO TORQUE 4 BOLTS
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	16.e	4	16B	1	34.58	2.3	2.3	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS
INSTALL THERMOCOUPLES	16.e	20	16B	1	34.58	11.5	11.5	4@5MIN/THERMOCOUPLE
INSTALL EXIT VENT SCREENS	16.e	20	16B	1	34.58	11.5	11.5	4 SCREENS@5MIN/SCREEN
REMOVE HI-STORM LID LIFTING DEVICE	16.f	2	16A	1	4.26	0.1	0.1	4 SHACKLES@2/MIN
INSTALL HOLE PLUGS IN EMPTY HOLES	16.f	2	16A	1	4.26	0.1	0.1	4 PLUGS AT 2/MIN NO TORQUING
PERFORM SHIELDING EFFECTIVENESS TESTING	16.g	16	16D	2	34.76	9.3	18.5	16 POINTS@1 MIN
SECURE HI-STORM TO TRANSPORT DEVICE	16.h	10	16A	2	4.26	0.7	1.4	ASSUMES AIR PAD
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	17.a	40	16C	1	11.79	7.9	7.9	200 FEET @ 4FT/MIN
INSERT HI-STORM LIFTING JACKS	17.b	4	16D	1	34.76	2.3	2.3	4 JACKS@1/MIN
REMOVE AIR PAD	17.b	5	16D	2	34.76	2.9	5.8	1 PAD MOVED BY HAND
REMOVE HI-STORM LIFTING JACKS	17.c	4	16D	1	34.76	2.3	2.3	4 JACKS@1/MIN
INSTALL INLET VENT SCREENS/CROSS PLATES	18	20	16D	1	34.76	11.6	11.6	4 SCREENS@5MIN/SCREEN
PERFORM AIR TEMPERATURE RISE TEST	19	8	16B	1	34.58	4.6	4.6	8 MEASUREMENTS@1/MIN
TOTAL							2906.5 PERSON- MREM	

Table 10.3.2a
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
Section 8.3.2 (Step Sequence Varies By Site and Mode of Transport)								
REMOVE INLET VENT SCREENS	1	20	16D	1	9.96	3.3	3.3	4 SCREENS@5MIN/SCREEN
INSERT HI-STORM LIFTING JACKS	1	4	16D	1	9.96	0.7	0.7	4 JACKS@1/MIN
INSERT AIR PAD	1	5	16D	2	9.96	0.8	1.7	1 PAD MOVED BY HAND
REMOVE HI-STORM LIFTING JACKS	1	4	16D	1	9.96	0.7	0.7	4 JACKS@1/MIN
TRANSFER HI-STORM TO MPC TRANSFER LOCATION	1	40	16C	1	7.89	5.3	5.3	200 FEET @ 4FT/MIN
REMOVE HI-STORM LID STUDS/NUTS	1	10	16A	1	2.96	0.5	0.5	4 BOLTS NO TORQUE
REMOVE HI-STORM LID LIFTING HOLE PLUGS AND INSTALL LID LIFTING SLING	1	2	16A	1	2.96	0.1	0.1	4 PLUGS AT 2/MIN NO TORQUING
REMOVE GAMMA SHIELD CROSS PLATES	1	4	16B	1	22.88	1.5	1.5	4 PLATES@1/MIN
REMOVE THERMOCOUPLES	1	8	16B	1	22.88	3.1	3.1	4 THERMCPLS @ 2MIN/THERMCPL NO TORQUE
REMOVE HI-STORM LID	1	2	16A	1	2.96	0.1	0.1	4 SHACKLES@2/MIN
INSTALL HI-STORM VENT DUCT SHIELD INSERTS	1	2	15A	1	7.85	0.3	0.3	4 SHACKLES@2/MIN
INSTALL ALIGNMENT DEVICE	1	4	15A	1	7.85	0.5	0.5	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)
REMOVE MPC LIFT CLEAT HOLE PLUGS	1	2	14A	1	200.07	6.7	6.7	4 PLUGS AT 2/MIN NO TORQUING
INSTALL MPC LIFT CLEATS AND MPC LIFT SLINGS	1	2	14A	1	200.07	6.7	6.7	4 PLUGS AT 2/MIN NO TORQUING
ALIGN HI-TRAC OVER HI-STORM AND MATE OVERPACKS	7	10	13B	2	41.91	7.0	14.0	ALIGNMENT GUIDES USED

† See notes at bottom of Table 10.3.4.

Table 10.3.2a
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
PULL MPC LIFT SLINGS THROUGH TOP LID HOLE	9	10	13A	2	67.84	11.3	22.6	2 SLINGS@5MIN/SLING
INSTALL TRIM PLATES	10	4	13B	2	41.91	2.8	5.6	INSTALLED BY HAND NO FASTENERS
ATTACH MPC LIFT SLING TO LIFTING DEVICE	11	10	13A	1	67.84	11.3	11.3	2 SLINGS@5MIN/SLING NO BOLTING
CLOSE HI-TRAC DOORS AND INSTALL DOOR LOCKING PINS	14	4	13B	2	41.91	2.8	5.6	2 PINS@2MIN/PIN
DISCONNECT SLINGS FROM MPC LIFT CLEATS	16	10	13A	2	67.84	11.3	22.6	2 SLINGS@5MIN/SLING
DOWNEND HI-TRAC ON TRANSPORT FRAME	1	20	12A	2	18.64	6.2	12.4	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
TRANSPORT HI-TRAC TO FUEL BUILDING	1	90	12A	1	18.64	28.0	28.0	DRIVER RECEIVES MOST DOSE
UPEND HI-TRAC	1	20	12A	2	18.64	6.2	12.4	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
Section 8.3.3								
MOVE HI-TRAC TO TRANSFER SLIDE	1.a	20	11A	2	38.9	13.0	25.9	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
ATTACH MPC SUPPORT STAYS	1.a	4	9A	2	67.84	4.5	9.0	INSTALLED BY HAND NO TOOLS
REMOVE TRANSFER LID BOLTS	1.e	6	11B	1	135.28	13.5	13.5	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED
INSTALL POOL LID BOLTS	1.i	18	10A	1	135.28	40.6	40.6	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS
DISCONNECT MPC SUPPORT STAYS AND LIFT CLEATS	1.k	10	9A	1	67.84	11.3	11.3	4 BOLTS,NO TORQUING
PLACE HI-TRAC IN PREPARATION AREA	1.m	15	9C	1	38.9	9.7	9.7	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN
REMOVE TOP LID BOLTS	2.a	6	9B	1	15.4	1.5	1.5	24 BOLTS AT 4/MIN (NO TORQUE IMPACT TOOLS)
REMOVE HI-TRAC TOP LID	2.a	2	6A	1	11.05	0.4	0.4	4 SHACKLES@2/MIN
ATTACH WATER FILL LINE TO HI-TRAC DRAIN PORT	2.b	0.5	9D	1	135.28	1.1	1.1	QUICK DISCONNECT NO TOOLS

Table 10.3.2a
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL BOLT PLUGS OR WATERPROOF TAPE FROM HI-TRAC TOP BOLT HOLES	3.a	9	8A	1	15.4	2.3	2.3	18 HOLES@2/MIN
CORE DRILL CLOSURE RING AND VENT AND DRAIN PORT COVER PLATES	3.b	40	7A	2	11.05	7.4	14.7	20 MINUTES TO INSTALL/ALIGN +10 MIN/COVER
REMOVE CLOSURE RING SECTION AND VENT AND DRAIN PORT COVER PLATES	3.c	1	8A	1	15.4	0.3	0.3	2 COVERS@2/MIN NO TOOLS
ATTACH RVOAS	4.a	2	8A	1	15.4	0.5	0.5	SINGLE THREADED CONNECTION (1 RVOA)
ATTACH A SAMPLE BOTTLE TO VENT PORT RVOA	4.b	0.5	8A	1	15.4	0.1	0.1	1" THREADED FITTING NO TOOLS
GATHER A GAS SAMPLE FROM MPC	4.d	0.5	8A	1	15.4	0.1	0.1	SMALL BALL VALVE
CLOSE VENT PORT CAP AND DISCONNECT SAMPLE BOTTLE	4.e	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
ATTACH COOL-DOWN SYSTEM TO RVOAs	5.a	2	8A	1	15.4	0.5	0.5	1" THREADED FITTING NO TOOLS X 2
DISCONNECT GAS LINES TO VENT AND DRAIN PORT RVOAs	5.k	1	8A	1	15.4	0.3	0.3	1" THREADED FITTING NO TOOLS
VACUUM TOP SURFACES OF MPC AND HI-TRAC	5.m	10	6A	1	11.05	1.8	1.8	SHOP VACUUM WITH WAND + HAND WIPE
REMOVE ANNULUS SHIELD	6.a	1	8A	1	15.4	0.3	0.3	SHIELD PLACED BY HAND
MANUALLY INSTALL INFLATABLE SEAL	6.b	10	6A	2	11.05	1.8	3.7	CONSULTATION WITH CALVERT CLIFFS
OPEN NEUTRON SHIELD JACKET DRAIN VALVE	7.a	2	5C	1	31.89	1.1	1.1	SINGLE THREADED CONNECTION
CLOSE NEUTRON SHIELD JACKET DRAIN VALVE	7.a	2	5C	1	31.89	1.1	1.1	SINGLE THREADED CONNECTION
REMOVE MPC LID LIFTING HOLE PLUGS	7.b	2	5A	1	21.35	0.7	0.7	4 PLUGS AT 2/MIN NO TORQUING
ATTACH LID RETENTION SYSTEM	7.d	12	5A	1	21.35	4.3	4.3	24 BOLTS @ 2 MINUTES/BOLT

Table 10.3.2a
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
ATTACH ANNULUS OVERPRESSURE SYSTEM	7.e	0.5	5C	1	31.89	0.3	0.3	QUICK DISCONNECT NO TOOLS
POSITION HI-TRAC OVER CASK LOADING AREA	7.f	10	5C	1	31.89	5.3	5.3	100 FT @ 10 FT/MIN (CRANE SPEED)
LOWER HI-TRAC INTO SPENT FUEL POOL	7.g	8.5	3C	1	38.9	5.5	5.5	17 FEET @ 2 FT/MIN (CRANE SPEED)
REMOVE LID RETENTION BOLTS	7.i	12	3B	1	19.45	3.9	3.9	24 BOLTS @ 2/MINUTE
PLACE HI-TRAC ON FLOOR	7.j	20	2	2	2	0.7	1.3	40 FEET @ 2 FT/MINUTE (CRANE SPEED)
REMOVE MPC LID	7.l	20	2	2	2	0.7	1.3	CONSULTATION WITH CALVERT CLIFFS
Section 8.3.4								
REMOVE SPENT FUEL ASSEMBLIES FROM MPC	1	1020	1	2	1	17.0	34.0	15 MINUTES PER ASSEMBLY/68 ASSY
TOTAL							362.2 PERSON-MREM	

Table 10.3.2b
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
Section 8.3.2 (Step Sequence Varies By Site and Mode of Transport)								
REMOVE INLET VENT SCREENS	1	20	16D	1	34.76	11.6	11.6	4 SCREENS@5MIN/SCREEN
INSERT HI-STORM LIFTING JACKS	1	4	16D	1	34.76	2.3	2.3	4 JACKS@1/MIN
INSERT AIR PAD	1	5	16D	2	34.76	2.9	5.8	1 PAD MOVED BY HAND
REMOVE HI-STORM LIFTING JACKS	1	4	16D	1	34.76	2.3	2.3	4 JACKS@1/MIN
TRANSFER HI-STORM TO MPC TRANSFER LOCATION	1	40	16C	1	11.79	7.9	7.9	200 FEET @ 4FT/MIN
REMOVE HI-STORM LID STUDS/NUTS	1	10	16A	1	4.26	0.7	0.7	4 BOLTS NO TORQUE
REMOVE HI-STORM LID LIFTING HOLE PLUGS AND INSTALL LID LIFTING SLING	1	2	16A	1	4.26	0.1	0.1	4 PLUGS AT 2/MIN NO TORQUING
REMOVE GAMMA SHIELD CROSS PLATES	1	4	16B	1	34.58	2.3	2.3	4 PLATES@1/MIN
REMOVE THERMOCOUPLES	1	8	16B	1	34.58	4.6	4.6	4 THERMCPLS @ 2MIN/THERMCPL NO TORQUE
REMOVE HI-STORM LID	1	2	16A	1	4.26	0.1	0.1	4 SHACKLES@2/MIN
INSTALL HI-STORM VENT DUCT SHIELD INSERTS	1	2	15A	1	27.85	0.9	0.9	4 SHACKLES@2/MIN
INSTALL ALIGNMENT DEVICE	1	4	15A	1	27.85	1.9	1.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)
REMOVE MPC LIFT CLEAT HOLE PLUGS	1	2	14A	1	255.57	8.5	8.5	4 PLUGS AT 2/MIN NO TORQUING
INSTALL MPC LIFT CLEATS AND MPC LIFT SLINGS	1	2	14A	1	255.57	8.5	8.5	4 PLUGS AT 2/MIN NO TORQUING
ALIGN HI-TRAC OVER HI-STORM AND MATE OVERPACKS	7	10	13B	2	284.51	47.4	94.8	ALIGNMENT GUIDES USED
PULL MPC LIFT SLINGS THROUGH TOP LID HOLE	9	10	13A	2	177.55	29.6	59.2	2 SLINGS@5MIN/SLING

† See notes at bottom of Table 10.3.4.

Table 10.3.2b
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,0004~~2,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL TRIM PLATES	10	4	13B	2	284.51	19.0	37.9	INSTALLED BY HAND NO FASTENERS
ATTACH MPC LIFT SLING TO LIFTING DEVICE	11	10	13A	1	177.55	29.6	29.6	2 SLINGS@5MIN/SLING NO BOLTING
CLOSE HI-TRAC DOORS AND INSTALL DOOR LOCKING PINS	14	4	13B	2	284.51	19.0	37.9	2 PINS@2MIN/PIN
DISCONNECT SLINGS FROM MPC LIFT CLEATS	16	10	13A	2	177.55	29.6	59.2	2 SLINGS@5MIN/SLING
DOWNEND HI-TRAC ON TRANSPORT FRAME	1	20	12A	2	18.64	6.2	12.4	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
TRANSPORT HI-TRAC TO FUEL BUILDING	1	90	12A	1	18.64	28.0	28.0	DRIVER RECEIVES MOST DOSE
UPEND HI-TRAC	1	20	12A	2	18.64	6.2	12.4	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
Section 8.3.3								
MOVE HI-TRAC TO TRANSFER SLIDE	1.a	20	11A	2	316.83	105.6	211.2	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
ATTACH MPC SUPPORT STAYS	1.a	4	9A	2	177.55	11.8	23.7	INSTALLED BY HAND NO TOOLS
REMOVE TRANSFER LID BOLTS	1.e	6	11B	1	804 79	80.5	80.5	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED
INSTALL POOL LID BOLTS	1.i	18	10A	1	804.79	241.4	241.4	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS
DISCONNECT MPC SUPPORT STAYS AND LIFT CLEATS	1.k	10	9A	1	177.55	29.6	29.6	4 BOLTS,NO TORQUING
PLACE HI-TRAC IN PREPARATION AREA	1.m	15	9C	1	316.83	79.2	79.2	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN
REMOVE TOP LID BOLTS	2.a	6	9B	1	52.84	5.3	5.3	24 BOLTS AT 4/MIN (NO TORQUE IMPACT TOOLS)
REMOVE HI-TRAC TOP LID	2.a	2	6A	1	30.91	1.0	1.0	4 SHACKLES@2/MIN
ATTACH WATER FILL LINE TO HI-TRAC DRAIN PORT	2.b	0.5	9D	1	804.79	6.7	6.7	QUICK DISCONNECT NO TOOLS
INSTALL BOLT PLUGS OR WATERPROOF TAPE FROM HI-TRAC TOP BOLT HOLES	3.a	9	8A	1	52.84	7.9	7.9	18 HOLES@2/MIN

Table 10.3.2b
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
CORE DRILL CLOSURE RING AND VENT AND DRAIN PORT COVER PLATES	3.b	40	7A	2	30.91	20.6	41.2	20 MINUTES TO INSTALL/ALIGN +10 MIN/COVER
REMOVE CLOSURE RING SECTION AND VENT AND DRAIN PORT COVER PLATES	3.c	1	8A	1	52.84	0.9	0.9	2 COVERS@2/MIN NO TOOLS
ATTACH RVOAS	4.a	2	8A	1	52.84	1.8	1.8	SINGLE THREADED CONNECTION (1 RVOA)
ATTACH A SAMPLE BOTTLE TO VENT PORT RVOA	4.b	0.5	8A	1	52.84	0.4	0.4	1" THREADED FITTING NO TOOLS
GATHER A GAS SAMPLE FROM MPC	4.d	0.5	8A	1	52.84	0.4	0.4	SMALL BALL VALVE
CLOSE VENT PORT CAP AND DISCONNECT SAMPLE BOTTLE	4.e	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
ATTACH COOL-DOWN SYSTEM TO RVOAs	5.a	2	8A	1	52.84	1.8	1.8	1" THREADED FITTING NO TOOLS X 2
DISCONNECT GAS LINES TO VENT AND DRAIN PORT RVOAs	5.k	1	8A	1	52.84	0.9	0.9	1" THREADED FITTING NO TOOLS
VACUUM TOP SURFACES OF MPC AND HI-TRAC	5.m	10	6A	1	30.91	5.2	5.2	SHOP VACUUM WITH WAND + HAND WIPE
REMOVE ANNULUS SHIELD	6.a	1	8A	1	52.84	0.9	0.9	SHIELD PLACED BY HAND
MANUALLY INSTALL INFLATABLE SEAL	6.b	10	6A	2	30.91	5.2	10.3	CONSULTATION WITH CALVERT CLIFFS
OPEN NEUTRON SHIELD JACKET DRAIN VALVE	7.a	2	5C	1	125.48	4.2	4.2	SINGLE THREADED CONNECTION
CLOSE NEUTRON SHIELD JACKET DRAIN VALVE	7.a	2	5C	1	125.48	4.2	4.2	SINGLE THREADED CONNECTION
REMOVE MPC LID LIFTING HOLE PLUGS	7.b	2	5A	1	55.41	1.8	1.8	4 PLUGS AT 2/MIN NO TORQUING
ATTACH LID RETENTION SYSTEM	7.d	12	5A	1	55.41	11.1	11.1	24 BOLTS @ 2 MINUTES/BOLT
ATTACH ANNULUS OVERPRESSURE SYSTEM	7.e	0.5	5C	1	125.48	1.0	1.0	QUICK DISCONNECT NO TOOLS
POSITION HI-TRAC OVER CASK LOADING AREA	7.f	10	5C	1	125.48	20.9	20.9	100 FT @ 10 FT/MIN (CRANE SPEED)

Table 10.3.2b
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,0004~~2,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
LOWER HI-TRAC INTO SPENT FUEL POOL	7.g	8.5	3C	1	295.96	41.9	41.9	17 FEET @ 2 FT/MIN (CRANE SPEED)
REMOVE LID RETENTION BOLTS	7.i	12	3B	1	64.04	12.8	12.8	24 BOLTS @ 2/MINUTE
PLACE HI-TRAC ON FLOOR	7.j	20	2	2	3	1.0	2.0	40 FEET @ 2 FT/MINUTE (CRANE SPEED)
REMOVE MPC LID	7.l	20	2	2	3	1.0	2.0	CONSULTATION WITH CALVERT CLIFFS
Section 8.3.4								
REMOVE SPENT FUEL ASSEMBLIES FROM MPC	1	1020	1	2	3	51.0	102.0	15 MINUTES PER ASSEMBLY/68 ASSY
TOTAL							1384.2 PERSON-MREM	

Table 10.3.3a
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING THE 125-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
Section 8.5.2								
MEASURE HI-STAR DOSE RATES	2	16	17A	2	14.1	3.8	7.5	16 POINTS@1 POINT/MIN
REMOVE PERSONNEL BARRIER	3	10	17C	2	21.5	3.6	7.2	ATTACH SLING REMOVE 8 LOCKS
PERFORM REMOVABLE CONTAMINATION SURVEYS	4	1	17C	1	21.5	0.4	0.4	10 SMEARS@10 SMEARS/MINUTE
REMOVE IMPACT LIMITERS	5	16	17A	2	14.1	3.8	7.5	ATTACH FRAME REMOVE 22 BOLTS IMPACT TOOLS
REMOVE TIE-DOWN	6	6	17A	2	14.1	1.4	2.8	ATTACH 2-LEGGED SLING REMOVE 4 BOLTS
PERFORM A VISUAL INSPECTION OF OVERPACK	7	10	17B	1	9	1.5	1.5	CHECKSHEET USED
REMOVE REMOVABLE SHEAR RING SEGMENTS	8	4	17A	1	14.1	0.9	0.9	4 BOLTS EACH @2/MIN X 2 SEGMENTS
UPEND HI-STAR OVERPACK	9	20	17B	2	9	3.0	6.0	DISCONNECT LIFT YOKE
INSTALL TEMPORARY SHIELD RING SEGMENTS	10	16	18A	1	7.9	2.1	2.1	8 SEGMENTS @ 2 MIN/SEGMENT
FILL TEMPORARY SHIELD RING SEGMENTS	11	25	18A	1	7.9	3.3	3.3	230 GAL @10GPM, LONG HANDLED SPRAYER
REMOVE OVERPACK VENT PORT COVER PLATE	11.a	2	18A	1	7.9	0.3	0.3	4 BOLTS @2/MIN
ATTACH BACKFILL TOOL	11.a	2	18A	1	7.9	0.3	0.3	4 BOLTS @2/MIN
OPEN/CLOSE VENT PORT PLUG	11.c	0.5	18A	1	7.9	0.1	0.1	SINGLE TURN BY HAND NO TOOLS
REMOVE CLOSURE PLATE BOLTS	14	39	18A	2	7.9	5.1	10.3	52 BOLTS@4/MIN X 3 PASSES
REMOVE OVERPACK CLOSURE PLATE	14	2	18A	1	7.9	0.3	0.3	4 SHACKLES@2/MIN
INSTALL HI-STAR SEAL SURFACE PROTECTOR	15	2	19B	1	7.9	0.3	0.3	PLACED BY HAND NO TOOLS

† See notes at bottom of Table 10.3.4.

Table 10.3.3a
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING THE 125-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL TRANSFER COLLAR ON HI-STAR	16	10	19B	2	7.9	1.3	2.6	ALIGN AND POSITION REMOVE 4 SHACKLES
REMOVE MPC LIFT CLEAT HOLE PLUGS	17	2	19A	1	200.07	6.7	6.7	4 PLUGS AT 2/MIN NO TORQUING
INSTALL MPC LIFT CLEATS AND LIFT SLING	18	25	19A	2	200.07	83.4	166.7	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS
MATE OVERPACKS	27	10	20B	2	41.91	7.0	14.0	ALIGNMENT GUIDES USED
REMOVE DOOR LOCKING PINS AND OPEN DOORS	28	4	20B	2	41.91	2.8	5.6	2 PINS@2/MIN
INSTALL TRIM PLATES	29	4	20B	2	41.91	2.8	5.6	INSTALLED BY HAND NO FASTENERS
Section 8.5.3								
REMOVE TRIM PLATES	3	4	20B	2	41.91	2.8	5.6	INSTALLED BY HAND NO FASTENERS
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	6	10	20A	2	67.84	11.3	22.6	2 SLINGS@5/MIN
REMOVE TRIM PLATES	6	4	13B	2	41.91	2.8	5.6	INSTALLED BY HAND NO FASTENERS
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	6	10	14A	1	200.07	33.3	33.3	4 BOLTS,NO TORQUING
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	6	2	14A	1	200.07	6.7	6.7	4 PLUGS AT 2/MIN NO TORQUING
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	6	2	15A	1	7.85	0.3	0.3	4 SHACKLES@2/MIN
REMOVE ALIGNMENT DEVICE	6	4	15A	1	7.85	0.5	0.5	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	6	25	16A	2	2.96	1.2	2.5	INSTALL LID AND HYDRO TORQUE 4 BOLTS
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	6	4	16B	1	22.88	1.5	1.5	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS
INSTALL THERMOCOUPLES	6	20	16B	1	22.88	7.6	7.6	4@5MIN/THERMOCOUPLE
INSTALL EXIT VENT SCREENS	6	20	16B	1	22.88	7.6	7.6	4 SCREENS@5MIN/SCREEN

Table 10.3.3a
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING THE 125-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~45,000~~57,500 MWD/MTU, ~~9~~12-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
REMOVE HI-STORM LID LIFTING DEVICE	6	2	16A	1	2.96	0.1	0.1	4 SHACKLES@2/MIN
INSTALL HOLE PLUGS IN EMPTY HOLES	6	2	16A	1	2.96	0.1	0.1	4 PLUGS AT 2/MIN NO TORQUING
PERFORM SHIELDING EFFECTIVENESS TESTING	8	16	16D	1	9.96	2.7	2.7	16POINTS@1 MIN
SECURE HI-STORM TO TRANSPORT DEVICE	6	10	16A	1	2.96	0.5	0.5	ASSUMES AIR PAD
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	6	40	16C	1	7.89	5.3	5.3	200 FEET @ 4FT/MIN
INSERT HI-STORM LIFTING JACKS	6	4	16D	1	9.96	0.7	0.7	4 JACKS@1/MIN
REMOVE AIR PAD	6	5	16D	1	9.96	0.8	0.8	1 PAD MOVED BY HAND
REMOVE HI-STORM LIFTING JACKS	6	4	16D	1	9.96	0.7	0.7	4 JACKS@1/MIN
INSTALL INLET VENT SCREENS	6	20	16D	1	9.96	3.3	3.3	4 SCREENS@5MIN/SCREEN
PERFORM AIR TEMPERATURE RISE TEST	9	8	16B	1	22.88	3.1	3.1	8 MEASMT@1/MIN
TOTAL							362.8 PERSON–MREM	

Table 10.3.3b
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,0004~~2,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
Section 8.5.2								
MEASURE HI-STAR DOSE RATES	2	16	17A	2	14.1	3.8	7.5	16 POINTS@1 POINT/MIN
REMOVE PERSONNEL BARRIER	3	10	17C	2	21.5	3.6	7.2	ATTACH SLING REMOVE 8 LOCKS
PERFORM REMOVABLE CONTAMINATION SURVEYS	4	1	17C	1	21.5	0.4	0.4	10 SMEARS@10 SMEARS/MINUTE
REMOVE IMPACT LIMITERS	5	16	17A	2	14.1	3.8	7.5	ATTACH FRAME REMOVE 22 BOLTS IMPACT TOOLS
REMOVE TIE-DOWN	6	6	17A	2	14.1	1.4	2.8	ATTACH 2-LEGGED SLING REMOVE 4 BOLTS
PERFORM A VISUAL INSPECTION OF OVERPACK	7	10	17B	1	9	1.5	1.5	CHECKSHEET USED
REMOVE REMOVABLE SHEAR RING SEGMENTS	8	4	17A	1	14.1	0.9	0.9	4 BOLTS EACH @2/MIN X 2 SEGMENTS
UPEND HI-STAR OVERPACK	9	20	17B	2	9	3.0	6.0	DISCONNECT LIFT YOKE
INSTALL TEMPORARY SHIELD RING SEGMENTS	10	16	18A	1	7.9	2.1	2.1	8 SEGMENTS @ 2 MIN/SEGMENT
FILL TEMPORARY SHIELD RING SEGMENTS	11	25	18A	1	7.9	3.3	3.3	230 GAL @10GPM, LONG HANDLED SPRAYER
REMOVE OVERPACK VENT PORT COVER PLATE	11.a	2	18A	1	7.9	0.3	0.3	4 BOLTS @2/MIN
ATTACH BACKFILL TOOL	11.a	2	18A	1	7.9	0.3	0.3	4 BOLTS @2/MIN
OPEN/CLOSE VENT PORT PLUG	11.c	0.5	18A	1	7.9	0.1	0.1	SINGLE TURN BY HAND NO TOOLS
REMOVE CLOSURE PLATE BOLTS	14	39	18A	2	7.9	5.1	10.3	52 BOLTS@4/MIN X 3 PASSES
REMOVE OVERPACK CLOSURE PLATE	14	2	18A	1	7.9	0.3	0.3	4 SHACKLES@2/MIN
INSTALL HI-STAR SEAL SURFACE PROTECTOR	15	2	19B	1	7.9	0.3	0.3	PLACED BY HAND NO TOOLS

† See notes at bottom of Table 10.3.4.

Table 10.3.3b
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,000~~42,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
INSTALL TRANSFER COLLAR ON HI-STAR	16	10	19B	2	7.9	1.3	2.6	ALIGN AND POSITION REMOVE 4 SHACKLES
REMOVE MPC LIFT CLEAT HOLE PLUGS	17	2	19A	1	255.57	8.5	8.5	4 PLUGS AT 2/MIN NO TORQUING
INSTALL MPC LIFT CLEATS AND LIFT SLING	18	25	19A	2	255.57	106.5	213.0	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS
MATE OVERPACKS	27	10	20B	2	284.51	47.4	94.8	ALIGNMENT GUIDES USED
REMOVE DOOR LOCKING PINS AND OPEN DOORS	28	4	20B	2	284.51	19.0	37.9	2 PINS@2/MIN
INSTALL TRIM PLATES	29	4	20B	2	284.51	19.0	37.9	INSTALLED BY HAND NO FASTENERS
Section 8.5.3								
REMOVE TRIM PLATES	3	4	20B	2	284.51	19.0	37.9	INSTALLED BY HAND NO FASTENERS
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	6	10	20A	2	177.55	179.1	358.3	2 SLINGS@5/MIN
REMOVE TRIM PLATES	6	4	13B	2	284.51	19.0	37.9	INSTALLED BY HAND NO FASTENERS
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	6	10	14A	1	255.57	42.6	42.6	4 BOLTS,NO TORQUING
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	6	2	14A	1	255.57	8.5	8.5	4 PLUGS AT 2/MIN NO TORQUING
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	6	2	15A	1	27.85	0.9	0.9	4 SHACKLES@2/MIN
REMOVE ALIGNMENT DEVICE	6	4	15A	1	27.85	1.9	1.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	6	25	16A	2	4.26	1.8	3.6	INSTALL LID AND HYDRO TORQUE 4 BOLTS
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	6	4	16B	1	34.58	2.3	2.3	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS
INSTALL THERMOCOUPLES	6	20	16B	1	34.58	11.5	11.5	4@5MIN/THERMOCOUPLE
INSTALL EXIT VENT SCREENS	6	20	16B	1	34.58	11.5	11.5	4 SCREENS@5MIN/SCREEN

Table 10.3.3b
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING THE 100-TON HI-TRAC TRANSFER CASK
ESTIMATED OPERATIONAL EXPOSURES† (~~35,00042~~,500 MWD/MTU, 5-YEAR COOLED PWR FUEL)

ACTION	CHAPTER 8 STEP	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM/HR)	TOTAL DOSE (PERSON-MREM)	ASSUMPTIONS
REMOVE HI-STORM LID LIFTING DEVICE	6	2	16A	1	4.26	0.1	0.1	4 SHACKLES@2/MIN
INSTALL HOLE PLUGS IN EMPTY HOLES	6	2	16A	1	4.26	0.1	0.1	4 PLUGS AT 2/MIN NO TORQUING
PERFORM SHIELDING EFFECTIVENESS TESTING	8	16	16D	1	34.76	9.3	9.3	16POINTS@1 MIN
SECURE HI-STORM TO TRANSPORT DEVICE	6	10	16A	1	4.26	0.7	0.7	ASSUMES AIR PAD
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	6	40	16C	1	11.79	7.9	7.9	200 FEET @ 4FT/MIN
INSERT HI-STORM LIFTING JACKS	6	4	16D	1	34.76	2.3	2.3	4 JACKS@1/MIN
REMOVE AIR PAD	6	5	16D	1	34.76	2.9	2.9	1 PAD MOVED BY HAND
REMOVE HI-STORM LIFTING JACKS	6	4	16D	1	34.76	2.3	2.3	4 JACKS@1/MIN
INSTALL INLET VENT SCREENS	6	20	16D	1	34.76	11.6	11.6	4 SCREENS@5MIN/SCREEN
PERFORM AIR TEMPERATURE RISE TEST	9	8	16B	1	34.58	4.6	4.6	8 MEASMT@1/MIN
TOTAL							1004.3 PERSON-MREM	

Table 10.3.4
ESTIMATED EXPOSURES FOR HI-STORM 100 SURVEILLANCE AND MAINTENANCE
~~(45,000 MWD/MTU, 5 YEAR COOLED PWR FUEL)~~

ACTIVITY	ESTIMATED PERSONNEL	ESTIMATED HOURS PER YEAR	ESTIMATED DOSE RATE (MREM/HR)	OCCUPATIONAL DOSE TO INDIVIDUAL (PERSON-MREM)
SECURITY SURVEILLANCE	1	30	3	90
ANNUAL MAINTENANCE	2	15	10	300

Notes for Tables 10.3.1a, 10.3.1b, 10.3.2a, 10.3.2b, 10.3.3a, 10.3.3b and 10..3.4:

1. *Refer to Chapter 8 for detailed description of activities.*
2. *Number of operators may be set to 1 to simplify calculations where the duration is indirectly proportional to the number of operators. The total dose is equivalent in both respects.*
3. *HI-STAR 100 Operations assume that the cooling time is at least 10 years.*

10.4 ESTIMATED COLLECTIVE DOSE ASSESSMENT

10.4.1 Controlled Area Boundary Dose for Normal Operations

10CFR72.104 [10.0.1] limits the annual dose *equivalent* to any real individual at the controlled area boundary to a maximum of 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem for any other critical organ. This includes contributions from all uranium fuel cycle operations in the region.

It is not feasible to predict bounding controlled area boundary dose rates on a generic basis since radiation from plant and other sources; the location and the layout of an ISFSI; and the number and configuration of casks are necessarily site-specific. In order to compare the performance of the HI-STORM 100 System with the regulatory requirements, sample ISFSI arrays were analyzed in Chapter 5. These represent a full array of design basis fuel assemblies. Users are required to perform a site specific dose analysis for their particular situation in accordance with 10CFR72.212 [10.0.1]. The analysis must account for the ISFSI (size, configuration, fuel assembly specifics) and any other radiation from uranium fuel cycle operations within the region.

Table 5.1.9 presents dose rates at various distances from sample ISFSI arrays for the design basis burnup and cooling time which results in the highest off-site dose for the combination of maximum burnup and minimum cooling times analyzed in Chapter 5. 10CFR72.106 [10.0.1] specifies that the minimum distance from the ISFSI to the controlled area boundary is 100 meters. Therefore this was the minimum distance analyzed in Chapter 5. As a summary of Chapter 5, Table 10.4.1 presents the annual dose results for a single overpack at 100 and 200 meters and a 2x5 array of HI-STORM 100 systems at 350 meters. These annual doses are based on a full array of design basis fuel with a burnup of ~~45,000~~*52,500* MWD/MTU and 5-year cooling. This burnup and cooling time combination conservatively bounds the allowable burnup and cooling times listed in the Technical Specifications. In addition, 100% occupancy (8760 hours) is conservatively assumed. In the calculation of the annual dose, the casks were positioned on an infinite slab of soil to account for earth-shine effects. These results indicate that the calculated annual dose is less than the regulatory limit of 25 mrem/year at a distance of 200 meters for a single cask and at 350 meters for a 2x5 array of HI-STORM 100 Systems containing design basis fuel. These results are presented only as an illustration to demonstrate that the HI-STORM 100 System is in compliance with 10CFR72.104[10.0.1]. Neither the distances nor the array configurations become part of the Technical Specifications. Rather, users are required to perform a site specific analyses to demonstrate compliance with 10CFR72.104[10.0.1] contributors and 10CFR20[10.1.1].

An additional contributor to the controlled area boundary dose is the loaded HI-TRAC transfer cask, if the HI-TRAC is to be used at the ISFSI outside of the fuel building. Table 10.4.2

provides dose rates at 100, 200, and 300 meters for a 100-ton HI-TRAC transfer cask loaded with design basis fuel. The 100-ton HI-TRAC dose rates bound the 125-ton HI-TRAC by large margins. Based on the short duration that the loaded HI-TRAC is used outside at the ISFSI, the HI-STORM 100 System is in compliance with 10CFR72.104[10.0.1] when worst-case design basis fuel is loaded in all fuel cell locations. However, users are required to perform a site specific analysis to demonstrate compliance with 10CFR72.104[10.0.1] and 10CFR20[10.1.1] taking into account the actual site boundary distance and fuel characteristics.

A minor contributor to the minimum controlled area boundary is the normal storage condition leakage from the welded MPC. Although leakage is not expected, Section 7.2 provides an analysis for the annual dose *equivalent* based on a continuous leak from the MPC. ~~equal to the tested leakage rate plus the minimum test sensitivity.~~ The ~~total effective~~*annual* dose equivalent to an individual at the minimum controlled area boundary based on the assumed leakage rate and continuous occupancy ~~was computed to be less than 0.1 mrem for the worst-case MPC~~*is presented in Table 7.3.8*. The site licensee is required to perform a site-specific dose evaluation of all dose contributors as part of the ISFSI design. This evaluation will account for the location of the controlled area boundary, the total number of casks on the ISFSI and the effects of the radiation from uranium fuel cycle operations within the region.

10.4.2 Controlled Area Boundary Dose for Off-Normal Conditions

As demonstrated in Section 11.1, the postulated off-normal conditions (off-normal pressure, off-normal environmental temperatures, leakage of one MPC ~~seal~~ weld, partial blockage of air inlets, and off-normal handling of HI-TRAC) do not result in the degradation of the HI-STORM 100 System shielding effectiveness. Therefore, the dose at the controlled area boundary from direct radiation for off-normal conditions is equal to that of normal conditions.

However, the annual dose at the controlled area boundary as a result of an assumed effluent release under off-normal conditions is different than that under normal conditions. Under off-normal conditions, 10% of the fuel rods are assumed to have been breached, in lieu of 1% of the fuel rods for normal conditions. The resulting ~~total effective~~*annual* dose equivalent to an individual at the minimum controlled area boundary, based on the assumed leakage rate and continuous occupancy, ~~was computed to be less than 1.0 mrem for the worst case MPC.~~*is presented in Table 7.3.8*. The analysis to determine the off-normal dose at the controlled area boundary is described in Section 7.2.

10.4.3 Controlled Area Boundary Dose for Accident Conditions

10CFR72.106 [10.0.1] specifies that the maximum doses allowed to any individual at the controlled area boundary from any design basis accident (See Subsection 10.1.2). In addition, it is specified that the minimum distance from the ISFSI to the controlled area boundary be at least 100 meters.

Subsection 7.3 demonstrates that the resultant ~~effective~~ doses for a non-mechanistic postulated breach of the MPC confinement boundary at the regulatory minimum site boundary distance of 100 meters ~~are less than 45 mrem for continuous 30 day occupancy~~*is presented in Table 7.3.8.* ~~Specific organ doses are also~~ within the regulatory limits specified in 10CFR72.106 [10.0.1].

Chapter 11 presents the results of the evaluations performed to demonstrate that the HI-STORM 100 System can withstand the effects of all accident conditions and natural phenomena without the corresponding radiation doses exceeding the requirements of 10CFR72.106 [10.0.1]. The accident events addressed in Chapter 11 include: handling accidents, tip-over, fire, tornado, flood, earthquake, 100 percent fuel rod rupture, confinement boundary leakage, explosion, lightning, burial under debris, extreme environmental temperature, partial blockage of MPC basket air inlets, and 100% blockage of air inlets.

The worst-case shielding consequence of the accidents evaluated in Section 11.2 for the loaded HI-STORM overpack assumes that as a result of a fire, the outer-most one inch of the concrete experiences temperatures above the concrete's design temperature. Therefore, the shielding effectiveness of this outer-most one inch of concrete is degraded. However, with over 25 inches of concrete providing shielding, the loss of one inch will have a negligible effect on the dose at the controlled area boundary.

The worst case shielding consequence of the accidents evaluated in Section 11.2 for the loaded HI-TRAC transfer cask assumes that as a result of a fire, tornado missile, or handling accident, the all the water in the water jacket is lost. The shielding analysis of the 100-ton HI-TRAC transfer cask with complete loss of the water from the water jacket is discussed in Section 5.1.2. These results bound those for the 125-Ton HI-TRAC transfer cask by a large margin. The results in that section show that the resultant dose rate at the 100-meter controlled area boundary would be approximately ~~0.8~~*1.47* mrem/hour for the loaded HI-TRAC transfer cask during the accident condition. At the calculated dose rate, it would take approximately ~~260~~ *141* days for the dose at the controlled area boundary to reach 5 rem. This length of time is sufficient to implement and complete the corrective actions outlined in Chapter 11. Therefore, the dose requirement of 10CFR72.106 [10.0.1] is satisfied. Once again, this dose is calculated assuming design basis fuel in all fuel cell locations. Users will need to perform site-specific analysis considering the actual site boundary distance and fuel characteristics.

Table 10.4.1

ANNUAL DOSE FOR ARRAYS OF HI-STORM 100 OVERPACKS
WITH DESIGN BASIS ZIRCALOY CLAD FUEL
~~45,000~~*52,500* MWD/MTU AND 5-YEAR COOLING

Array Configuration	**1 Cask**	**1 Cask**	**2x5 Array**
Annual Dose (mrem/year)†	~~109.6~~*130.0*	~~17.0~~*20.19*	~~15.6~~*18.64*
Distance to Controlled Area Boundary (meters)††, †††	100	200	350

† 100% occupancy is assumed.
†† Dose location is at the center of the long side of the array.
††† Actual controlled area boundary dose rates will be lower because the maximum permissible burnup for 5-year cooling as specified in the Technical Specifications is lower than the burnup analyzed for the design basis fuel used in this table.

Table 10.4.2
DOSE RATE FOR THE 100-TON HI-TRAC TRANSFER CASK
WITH DESIGN BASIS ZIRCALOY CLAD FUEL

Fuel Burnup & Cooling Time	**100 Meters**	**200 Meters**	**300 Meters**
***~~35,000~~42,500* MWD/MTU & 5 Years**	*~~0.27~~0.42* mrem/hr	*~~0.04~~ 0.06* mrem/hr	*~~0.01~~0.02* mrem/hr
***~~45,000~~52,500* MWD/MTU & *~~9~~10* Years**	*~~0.16~~0.26* mrem/hr	*~~0.026~~0.04* mrem/hr	*~~0.007~~0.01* mrem/hr

10.5 REFERENCES

[10.0.1] *U.S. Code of Federal Regulations,* Title 10, "Energy" Part 72 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."

[10.1.1] *U.S. Code of Federal Regulations,* Title 10, "Energy" Part 20 "Standards for Protection Against Radiation."

[10.1.2] U.S. Nuclear Regulatory Commission "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power at Nuclear Power Stations will be As Low As Reasonably Achievable", Regulatory Guide 8.8, June 1978.

[10.1.3] U.S. Nuclear Regulatory Commission, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable", Regulatory Guide 8.10, Revision 1-R, May1997.

CHAPTER 11†: ACCIDENT ANALYSIS

This chapter presents the evaluation of the HI-STORM 100 System for the effects of off-normal and postulated accident conditions. The design basis off-normal and postulated accident events, including those resulting from mechanistic and non-mechanistic causes as well as those caused by natural phenomena, are identified in Sections 2.2.2 and 2.2.3. For each postulated event, the event cause, means of detection, consequences, and corrective action are discussed and evaluated. As applicable, the evaluation of consequences includes structural, thermal, shielding, criticality, confinement, and radiation protection evaluations for the effects of each design event.

The structural, thermal, shielding, criticality, and confinement features and performance of the HI-STORM 100 System are discussed in Chapters 3, 4, 5, 6, and 7. The evaluations provided in this chapter are based on the design features and evaluations described therein.

Chapter 11 is in full compliance with NUREG-1536; no exceptions are taken.

11.1 OFF-NORMAL CONDITIONS

During normal storage operations of the HI-STORM 100 System it is possible that an off-normal situation could occur. Off-normal operations, as defined in accordance with ANSI/ANS-57.9, are those conditions which, although not occurring regularly, are expected to occur no more than once a year. In this section, design events pertaining to off-normal operation for expected operational occurrences are considered. The off-normal conditions are listed in Subsection 2.2.2.

The following off-normal operation events have been considered in the design of the HI-STORM 100:

Off-Normal Pressures
Off-Normal Environmental Temperatures
Leakage of One MPC Seal Weld
Partial Blockage of Air Inlets
Off-Normal Handling of HI-TRAC Transfer Cask

For each event, the postulated cause of the event, detection of the event, analysis of the event effects and consequences, corrective actions, and radiological impact from the event are presented.

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† This chapter has been prepared in the format and section organization set forth in Regulatory Guide 3.61. However, the material content of this chapter also fulfills the requirements of NUREG-1536. Pagination and numbering of sections, figures, and tables are consistent with the convention set down in Chapter 1, Section 1.0, herein. Finally, all terms-of-art used in this chapter are consistent with the terminology of the glossary (Table 1.0.1) and component nomenclature of the Bill-of-Materials (Section 1.5).

The results of the evaluations performed herein demonstrate that the HI-STORM 100 System can withstand the effects of off-normal events without affecting function, and are in compliance with the applicable acceptance criteria. The following sections present the evaluation of the HI-STORM 100 System for the design basis off-normal conditions that demonstrate that the requirements of 10CFR72.122 are satisfied, and that the corresponding radiation doses satisfy the requirements of 10CFR72.106(b) and 10CFR20.

The load combinations evaluated for off-normal conditions are defined in Table 2.2.14. The load combinations include both normal and off-normal loads. The off-normal load combination evaluations are discussed in Section 11.1.5.

11.1.1 Off-Normal Pressures

The sole pressure boundary in the HI-STORM 100 System is the MPC internal pressure boundary. The off-normal pressure condition is specified in Section 2.2.2.1. The off-normal pressure for the MPC internal cavity is a function of the initial helium fill pressure and the temperature obtained with maximum decay heat load design basis fuel. The maximum off-normal environmental temperature is 100°F with full solar insolation. The MPC internal pressure is further increased by the conservative assumption that 10% of the fuel rods rupture and 100% of the fill gas, and 30% of the fission gases are released to the cavity.

11.1.1.1 Postulated Cause of Off-Normal Pressure

After fuel assembly loading, the MPC is drained, dried, and backfilled with an inert gas (helium) to assure long-term fuel cladding integrity during dry storage. Therefore, the probability of failure of intact fuel rods in dry storage is low. Nonetheless, the event is postulated and evaluated.

11.1.1.2 Detection of Off-Normal Pressure

The HI-STORM 100 System is designed to withstand the MPC off-normal internal pressure without any effects on its ability to meet its safety requirements. There is no requirement for detection of off-normal pressure and, therefore, no monitoring is required.

11.1.1.3 Analysis of Effects and Consequences of Off-Normal Pressure

Chapter 4 calculates the MPC internal pressure with an ambient temperature of 80°F, 10% fuel rods ruptured, full insolation, and maximum decay heat, and reports the maximum value of *75.0*~~62.8~~ psig in Table 4.4.14 at an average temperature of *513.6*~~503.5~~°K. Using this pressure, the off-normal temperature of 100°F (ΔT of 20°F or 11.1°K), and the ideal gas law, the off-normal resultant pressure is calculated to be below the normal condition MPC internal design pressure.

$$\frac{P_1}{P_2} = \frac{T_1}{T_2}$$

$$P_2 = \frac{P_1 T_2}{T_1}$$

$$P_2 = \frac{(75.0\,\text{psig} + 14.7)\,(513.6°\text{K} + 11.1°\text{K})}{513.6°\text{K}}$$

$$P_2 = 91.6\,\text{psia or } 76.9\,\text{psig}$$

The off-normal MPC internal design pressure of 100 psig (Table 2.2.1) has been established to bound the off-normal condition. Therefore, no additional analysis is required.

Structural

The structural evaluation of the MPC enclosure vessel for off-normal internal pressure conditions is equivalent to the evaluation at normal internal pressures, since the normal design pressure was set at a value which would encompass the off-normal pressure. Therefore, the resulting stresses from the off-normal condition are equivalent to that of the normal condition and are well within the short-term allowable values, as discussed in Section 3.4.

Thermal

The MPC internal pressure for off-normal conditions is calculated as presented above. As can be seen from the value above, the 100 psig design basis internal pressure for off-normal conditions used in the structural evaluation bounds the calculated value above.

Shielding

There is no effect on the shielding performance of the system as a result of this off-normal event.

Criticality

There is no effect on the criticality control features of the system as a result of this off-normal event.

Confinement

There is no effect on the confinement function of the MPC as a result of this off-normal event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this off-normal event.

Based on this evaluation, it is concluded that the off-normal pressure does not affect the safe operation of the HI-STORM 100 System.

11.1.1.4 Corrective Action for Off-Normal Pressure

The HI-STORM 100 System is designed to withstand the off-normal pressure without any effects on its ability to maintain safe storage conditions. There is no corrective action requirement for off-normal pressure.

11.1.1.5 Radiological Impact of Off-Normal Pressure

The event of off-normal pressure has no radiological impact because the confinement barrier and shielding integrity are not affected.

11.1.2 Off-Normal Environmental Temperatures

The HI-STORM 100 System is designed for use at any site in the United States. Off-normal environmental temperatures of -40 to 100°F (HI-STORM overpack) and 0 to 100°F (HI-TRAC transfer cask) have been conservatively selected to bound off-normal temperatures at these sites. The off-normal temperature range affects the entire HI-STORM 100 System and must be evaluated against the allowable component design temperatures. This off-normal event is of a short duration, therefore the resultant temperatures are evaluated against the accident condition temperature limits as listed in Table 2.2.3.

11.1.2.1 Postulated Cause of Off-Normal Environmental Temperatures

The off-normal environmental temperature is postulated as a constant ambient temperature caused by extreme weather conditions. To determine the effects of the off-normal temperatures, it is conservatively assumed that these temperatures persist for a sufficient duration to allow the HI-STORM 100 System to achieve thermal equilibrium. Because of the large mass of the HI-STORM 100 System with its corresponding large thermal inertia and the limited duration for the off-normal temperatures, this assumption is conservative.

11.1.2.2 Detection of Off-Normal Environmental Temperatures

The HI-STORM 100 System is designed to withstand the off-normal environmental temperatures without any effects on its ability to maintain safe storage conditions. There is no requirement for detection of off-normal environmental temperatures for the HI-STORM overpack and MPC. Chapter

2 provides operational limitations to the use of the HI-TRAC transfer cask at temperatures of ≤32°F and prohibits use of the HI-TRAC transfer cask below 0°F.

11.1.2.3 Analysis of Effects and Consequences of Off-Normal Environmental Temperatures

The off-normal event considering an environmental temperature of 100°F for a duration sufficient to reach thermal equilibrium is evaluated with respect to design temperatures listed in Table 2.2.3. The evaluation is performed with design basis fuel with the maximum decay heat and the most restrictive thermal resistance. The 100°F environmental temperature is applied with full solar insolation.

The HI-STORM 100 System maximum temperatures for components close to the design basis temperatures are listed in Subsection 4.4. These temperatures are conservatively calculated at an environmental temperature of 80°F. The maximum off-normal environmental temperature is 100°F, which is an increase of 20°F. ~~Including the effect of a hypothetical 10% rod rupture condition on the MPC cavity gas conductivity, c~~*C*onservatively bounding temperatures *for all MPC designs (Table 1.2.1)* ~~of the MPC-68 and MPC-24~~ are calculated to be as listed in Table 11.1.1. As illustrated by the table, all the maximum off-normal temperatures are below the short-term condition design basis temperatures. The maximum temperatures are the peak values and are based on the conservative assumptions applied in this analysis. The component temperatures for the HI-TRAC listed in Table 4.5.2 are all based on the maximum off-normal environmental temperature. The off-normal environmental temperature is of a short duration (several consecutive days would be highly unlikely) and the resultant temperatures are evaluated against short-term temperature limits. Therefore, all the HI-STORM 100 System maximum off-normal temperatures meet the design requirements.

Additionally, the off-normal environmental temperature generates a pressure that is evaluated in Subsection 11.1.1. The off-normal MPC cavity pressure is less than the design basis pressure listed in Table 2.2.1.

The off-normal event considering an environmental temperature of -40°F and no solar insolation for a duration sufficient to reach thermal equilibrium is evaluated with respect to material design temperatures of the HI-STORM overpack. The HI-STORM overpack and MPC are conservatively assumed to reach -40°F throughout the structure. The minimum off-normal environmental temperature specified for the HI-TRAC transfer cask is 0°F and the HI-TRAC is conservatively assumed to reach 0°F throughout the structure. For ambient temperatures from 0° to 32°F, a 25% ethylene glycol solution is added to the demineralized water in the water jacket to prevent freezing. Chapter 3, Subsection 3.1.2.3, details the structural analysis and testing performed to assure prevention of brittle fracture failure of the HI-STORM 100 System.

Structural

The effect on the MPC for the upper off-normal thermal conditions (i.e., 100°F) is an increase in the internal pressure. As shown in Subsection 11.1.1.3, the resultant pressure is well below the design pressure of 100 psig used in the structural analysis. The effect of the lower off-normal thermal conditions (i.e., -40°F) results in an evaluation of the potential for brittle fracture that is discussed in Section 3.1.2.3.

Thermal

The resulting off-normal system and fuel assembly cladding temperatures for the hot conditions are provided in Table 11.1.1 for the HI-STORM overpack and MPC. As can be seen from this table, all temperatures for off-normal conditions are within the short-term allowable values described in Table 2.2.3.

Shielding

There is no effect on the shielding performance of the system as a result of this off-normal event.

Criticality

There is no effect on the criticality control features of the system as a result of this off-normal event.

Confinement

There is no effect on the confinement function of the MPC as a result of this off-normal event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this off-normal event.

Based on this evaluation, it is concluded that the specified off-normal environmental temperatures do not affect the safe operation of the HI-STORM 100 System.

11.1.2.4 Corrective Action for Off-Normal Environmental Temperatures

The HI-STORM 100 System is designed to withstand the off-normal environmental temperatures without any effects on its ability to maintain safe storage conditions. There are no corrective actions required for off-normal environmental temperatures.

11.1.2.5 Radiological Impact of Off-Normal Environmental Temperatures

Off-normal environmental temperatures have no radiological impact, as the confinement barrier and shielding integrity are not affected.

11.1.3 Leakage of One Seal

The HI-STORM 100 System has a reliable welded boundary to contain radioactive fission products within the confinement boundary. The radioactivity confinement boundary is defined by the MPC shell, baseplate, MPC lid, and vent and drain port cover plates. The closure ring provides a redundant welded closure to the release of radioactive material from the MPC cavity through the field-welded MPC lid closures. Confinement boundary welds are inspected by radiography or ultrasonic examination except for field welds that are examined by the liquid penetrant method on the root *(for multi-pass welds)* and final pass, at a minimum. Field welds are performed on the MPC lid, the MPC vent and drain port covers, and the MPC closure ring. The welds on the MPC lid, and vent and drain port covers are leakage tested. Additionally, the MPC lid weld is subjected to a hydrostatic test to verify its integrity.

The MPC lid-to-MPC shell weld is postulated to fail to confirm the safety of the HI-STORM 100 confinement boundary. The failure of the MPC lid weld is equivalent to the MPC drain or vent port cover weld failing. The MPC lid-to-shell weld has been selected because it is the main closure weld performed in the field for the MPC. It is extremely unlikely that the weld examination, helium leakage testing and hydrostatic testing would fail to detect a poorly welded closure plate. The MPC lid weld failure affects the MPC confinement boundary; however, no leakage will occur.

11.1.3.1 Postulated Cause of Leakage of One Seal in the Confinement Boundary

Failure of the MPC confinement boundary is highly unlikely. The MPC confinement boundary is shown to withstand all normal, off-normal, and accident conditions. There are no credible conditions that could damage the integrity of the MPC confinement boundary. The MPC lid-to-MPC shell weld is liquid penetrant inspected on the root and final pass, volumetrically inspected or liquid penetrant inspected on multiple passes, hydrostatically tested, and helium leak tested. The initial integrity of the closure welds will be maintained throughout the design life because the MPC is stored within the HI-STORM overpack which provides physical protection and a weather shield. Failure of the MPC lid-to-MPC shell weld would require all of the following:

1. Improper weld by a qualified welding machine or welder using approved welding procedures.

2. Failure to detect the unacceptable indication during the liquid penetrant or volumetric inspections performed by a qualified inspector in accordance with approved procedures.

3. Failure of the qualified leakage test equipment to detect the leak in accordance with approved procedures.

4. Failure to detect the unacceptable leak during the hydrostatic test performed by qualified personnel in accordance with approved procedures.

The evaluation of the failure of the MPC lid-to-MPC shell weld has been postulated to demonstrate the safety of the HI-STORM 100 confinement system and cannot be derived from a credible loading condition.

11.1.3.2 Detection of Leakage of One Seal in the Confinement Boundary

The HI-STORM 100 System is designed to withstand the leakage of one field weld in the confinement boundary without any effects on its ability to meet its safety requirements. As the HI-STORM 100 System can withstand the failure of one field weld with no leakage, there is no requirement to detect leakage from one seal.

11.1.3.3 Analysis of Effects and Consequences of Leakage of One Seal in the Confinement Boundary

If the MPC lid-to-MPC shell weld were to fail, the MPC closure ring will retain the design pressure. The analysis of the MPC closure ring's ability to retain the design pressure is provided in Appendix 3.E of the HI-STAR TSAR Docket Number 72-1008. The consequences of the MPC lid-to-MPC shell weld failure are that the MPC closure ring maintains the integrity of the confinement boundary.

Structural

The stress evaluation of the closure ring is discussed in Appendix 3.E. All stresses are within the allowable values.

Thermal

There is no effect on the thermal performance of the system as a result of this off-normal event.

Shielding

There is no effect on the shielding performance of the system as a result of this off-normal event.

Criticality

There is no effect on the criticality control features of the system as a result of this off-normal event.

Confinement

There is no effect on the confinement function of the MPC as a result of this off-normal event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this off-normal event.

Based on this evaluation, it is concluded that the specified off-normal leakage of one seal event does not affect the safe operation of the HI-STORM 100 System.

11.1.3.4 Corrective Action for Leakage of One Seal in the Confinement Boundary

There is no corrective action required for the failure of one weld in the closure system of the confinement boundary. Leakage of one weld in the confinement boundary closure system does not affect the HI-STORM 100 System's ability to operate safely.

11.1.3.5 Radiological Impact of Leakage of One Seal in the Confinement Boundary

The off-normal event of the failure of one weld in the confinement boundary closure system has no radiological impact because the confinement barrier is not breached and shielding is not affected.

11.1.4 Partial Blockage of Air Inlets

The HI-STORM 100 System is designed with fine mesh screens on the inlet and outlet air ducts. These screens ensure the air ducts are protected from the incursion of foreign objects. There are four air inlet ducts 90° apart and it is highly unlikely that blowing debris during normal or off-normal operation could block all air inlet ducts. As required by the design criteria presented in Chapter 2, it is conservatively assumed that two of the four air inlet ducts are blocked. The blocked air inlet ducts are assumed to be completely blocked with an ambient temperature of 80°F (Table 2.2.2), full solar insolation, and maximum SNF decay heat values. This condition is analyzed to demonstrate the inherent thermal stability of the HI-STORM 100 System.

An additional evaluation is performed with three of the four air inlet ducts. While not required by the HI-STORM System design criteria, this additional evaluation is performed as a parametric study of the effects of incremental duct blockage. The purpose of the parametric study is to demonstrate the robustness of the HI-STORM System design beyond the design basis.

11.1.4.1 Postulated Cause of Partial Blockage of Air Inlets

It is conservatively assumed that the blocked air inlet ducts are completely blocked, although mesh screens prevent foreign objects from entering the ducts. The mesh screens are either inspected

periodically or the outlet duct air temperature is monitored as specified by Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~. It is, however, possible that blowing debris may block two air inlet ducts of the overpack. As already stated, the blockage of three inlet ducts is evaluated only to demonstrate the limited effects of additional incremental duct blockage.

11.1.4.2 Detection of Partial Blockage of Air Inlets

The detection of the partial blockage of air inlet ducts will occur during the routine visual inspection of the mesh screens or temperature monitoring of the outlet duct air as required and specified by Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~. The frequency of inspection is based on an assumed complete blockage of all four air inlet ducts. There is no inspection requirement as a result of the postulated two inlet duct blockage, because the complete blockage of all four air inlet ducts is bounding.

11.1.4.3 Analysis of Effects and Consequences of Partial Blockage of Air Inlets

Evaluations for two inlet ducts and three inlet ducts blocked are evaluated for the MPC-32 at its maximum decay heat load. Only the MPC-32 is evaluated because it has the highest decay heat load of all MPC designs (Table 1.2.1). The largest temperature rise of the MPC or its contents as a result of the blockage of two air inlet ducts is 25 °F, for the MPC shell. The largest temperature rise of the MPC or its contents as a result of the blockage of three air inlet ducts (performed as a parametric study of incremental duct blockage only) is 81 °F, also for the MPC shell. ~~T~~*Conservatively adding the largest component temperature rise to all cask system component temperatures,* the resultant *bounding* temperatures for the complete blockage of two air inlet ducts are provided in Table 11.1.2. ~~for the highest component temperatures from the MPC-68 or MPC-24, each with the maximum decay heat load.~~ ~~T~~*Following this same procedure of adding the largest component temperature rise to all cask system component temperatures,* the resultant *bounding* temperatures for the complete blockage of three air inlet ducts~~, performed as a parametric study of incremental duct blockage only,~~ are included in the same table for comparison purposes. These values are based on full insolation and an ambient temperature of 80°F. The analysis method for the blockage of two and three of the air inlet ducts is ~~identical~~*conservative with respect* to the analysis method for the normal condition. As a result of the air inlet duct blockages, the head loss is increased and the airflow is decreased thereby increasing component temperatures.

~~T~~*As stated above,* the largest temperature rise of the MPC or its contents as a result of the blockage of two air inlet ducts is ~~16~~*25*°F, for the MPC shell. A bounding MPC internal pressure as a result of this calculated temperature increase is computed, based on initial conditions presented previously in Subsection 11.1.1.3, as follows:

$$P_2 = P_1 \frac{T_1 + \Delta T}{T_1}$$

where:

P_2 = Bounding MPC Cavity Pressure (psia)

P_1 = Initial MPC Cavity Pressure (*89.7~~77.54~~* psia)
T_1 = Initial MPC Cavity Average Temperature (*513.6~~503.5~~*°K)
ΔT = Bounding MPC Temperature Rise (~~16~~*25*°F or ~~8.9~~*19.9*°K)

Substituting these values into the equation above, the bounding MPC internal pressure is obtained as:

$$P_2 = 89.7 \times \frac{513.6 + 13.9}{513.6} = 92.1 psia = 77.4 psig$$

The off-normal MPC internal design pressure of 100 psig (Table 2.2.1) has been established to bound this partial inlet duct blockage condition.

Although it is a beyond the design basis condition, the bounding pressure rise for the three blocked air inlet ducts condition can be determine in the same manner. ~~T~~*As stated above, t*he bounding temperature rise for this condition is ~~60~~*81*°F (~~33.3~~*44.9*°K), and the corresponding bounding MPC internal pressure is ~~82.6~~*97.5* psia (~~67.9~~*82.8* psig). This parametric evaluation demonstrates the insensitivity of the MPC internal pressure to incremental duct blockage, as the relatively large incremental flow area reduction increases the pressure by only ~~3.7~~*5.4* psi.

Structural

There are no structural consequences as a result of this off-normal event.

Thermal

Using the methodology and model discussed in Section 4.4, the thermal analysis for the two air inlet ducts blocked off-normal condition is performed. The analysis demonstrates that under steady-state conditions, no system components exceed the short-term allowable temperatures in Table 2.2.3.

The parametric study of incremental duct blockage, performed by evaluating a three air inlet ducts blocked condition, demonstrates the insensitivity of the system to relatively large incremental flow area reductions. This beyond the design basis condition results in relatively small temperature increases and temperatures well below the short-term allowable temperatures in Table 2.2.3, even though no such requirement exists.

Shielding

There is no effect on the shielding performance of the system as a result of this off-normal event.

Criticality

There is no effect on the criticality control features of the system as a result of this off-normal event.

Confinement

There is no effect on the confinement function of the MPC as a result of this off-normal event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this off-normal event.

Based on this evaluation, it is concluded that the specified off-normal partial blockage of air inlet ducts event does not affect the safe operation of the HI-STORM 100 System.

11.1.4.4 Corrective Action for Partial Blockage of Air Inlets

The corrective action for the partial blockage of air inlet ducts is the removal, cleaning, and replacement of the affected mesh screens. After clearing of the blockage, the storage module temperatures will return to the normal temperatures reported in Chapter 4. Partial blockage of air inlet ducts does not affect the HI-STORM 100 System's ability to operate safely.

Inspection of the HI-STORM overpack air duct screen covers is required with the frequency specified by Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~ or, alternatively, the outlet duct air temperature is monitored. The frequency of inspection is based on an assumed blockage of all four air inlet ducts analyzed in Subsection 11.2.

11.1.4.5 Radiological Impact of Partial Blockage of Air Inlets

The off-normal event of partial blockage of the air inlet ducts has no radiological impact because the confinement barrier is not breached and shielding is not affected.

11.1.5 Off-Normal Handling of HI-TRAC

During upending and/or downending of the HI-TRAC transfer cask, the total lifted weight is distributed among both the upper lifting trunnions and the lower pocket trunnions. Each of the four trunnions on the HI-TRAC therefore supports approximately one-quarter of the total weight. This even distribution of the load would continue during the entire rotation operation.

If the lifting device is allowed to "go slack", the total weight would be applied to the lower pocket trunnions only. Under this off-normal condition, the pocket trunnions would each be required to support one-half of the total weight, doubling the load per trunnion. This condition is analyzed to demonstrate that the pocket trunnions possess sufficient strength to support the increased load under this off-normal condition.

11.1.5.1 Postulated Cause of Off-Normal Handling of HI-TRAC

If the cable of the crane handling the HI-TRAC is inclined from the vertical, it would possible to unload the upper lifting trunnions such that the lower pocket trunnions are supporting the total cask weight and the lifting trunnions are only preventing cask rotation.

11.1.5.2 Detection of Off-Normal Handling of HI-TRAC

Handling procedures and standard rigging practice call for maintaining the crane cable in a vertical position by keeping the crane trolley centered over the lifting trunnions. In such an orientation it is not possible to completely unload the lifting trunnions without inducing rotation. If the crane cable were inclined from the vertical, however, the possibility of unloading the lifting trunnions would exist. It is therefore possible to detect the potential for this off-normal condition by monitoring the incline of the crane cable with respect to the vertical.

11.1.5.3 Analysis of Effects and Consequences of Off-Normal Handling of HI-TRAC

If the upper lifting trunnions are unloaded, the lower pocket trunnions will support the total weight of the loaded HI-TRAC. The analysis of the pocket trunnions to support the applied load of one-half of the total weight is provided in Appendices 3.AA and 3.AI of this TSAR. The consequence of off-normal handling of the HI-TRAC is that the pocket trunnions safely support the applied load.

Structural

The stress evaluations of the lower pocket trunnions are discussed in Appendices 3.AA and 3.AI. All stresses are within the allowable values.

Thermal

There is no effect on the thermal performance of the system as a result of this off-normal event.

Shielding

There is no effect on the shielding performance of the system as a result of this off-normal event.

Criticality

There is no effect on the criticality control features of the system as a result of this off-normal event.

Confinement

There is no effect on the confinement function of the MPC as a result of this off-normal event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this off-normal event.

Based on this evaluation, it is concluded that the specified off-normal handling of the HI-TRAC does not affect the safe operation of the system.

11.1.5.4 Corrective Action for Off-Normal Handling of HI-TRAC

The HI-TRAC transfer casks are designed to withstand the off-normal handling condition without any adverse effects. There are no corrective actions required for off-normal handling of HI-TRAC other than to attempt to maintain the crane cable vertical during HI-TRAC upending or downending.

11.1.5.5 Radiological Consequences of Off-Normal Handling of HI-TRAC

The off-normal event of off-normal handling of HI-TRAC has no radiological impact because the confinement barrier is not breached and shielding is not affected.

11.1.6 Off-Normal Load Combinations

Load combinations for off-normal conditions are provided in Table 2.2.14. The load combinations include normal loads with the off-normal loads. The load combination results are shown in Section 3.4 to meet all allowable values.

Table 11.1.1

MAXIMUM TEMPERATURES CAUSED BY OFF-NORMAL ENVIRONMENTAL TEMPERATURES~~†~~

Location	Temperature [°F]	Design Basis Limits [°F]
Fuel Cladding	*711*~~749~~ (PWR) *760*~~765~~ (BWR)	1058 short-term
MPC Basket	*740*~~745~~	950 short-term
MPC ~~Outer~~ Shell ~~Surface~~	*371*~~327~~	775 short-term
Overpack Air Outlet	*226*~~206~~	N/A
Overpack Inner Shell	*219*~~192~~	350 short-term (overpack concrete)
Overpack Outer Shell	*165*~~151~~	350 short-term (overpack concrete)

~~† Conservatively bounding temperatures reported in this table include a hypothetical rupture of 10% of the stored fuel rods.~~

Table 11.1.2

~~MAXIMUM~~*BOUNDING*[†] TEMPERATURES[‡] CAUSED BY PARTIAL BLOCKAGE OF AIR INLET DUCTS [°F]

Temperature Location	No Blockage of Inlet Ducts	Partial Blockage of Inlet Ducts		Off-Normal Design Basis
		2 Ducts Blocked	3 Ducts Blocked	
Fuel Cladding	~~729 (MPC-24) 745 (MPC-68)~~*740*	~~738 (MPC-24) 754 (MPC-68)~~*765*	~~760 (MPC-24) 778 (MPC-68)~~*821*	1058 short-term
MPC Basket	~~689 (MPC-24) 725 (MPC-68)~~*720*	~~698 (MPC-24) 734 (MPC-68)~~*745*	~~720 (MPC-24) 758 (MPC-68)~~*801*	950 short-term
MPC ~~Outer~~ Shell ~~Surface~~	~~306 (MPC-24) 302 (MPC-68)~~*351*	~~322 (MPC-24) 318 (MPC-68)~~*376*	~~366 (MPC-24) 361 (MPC-68)~~*432*	775 short-term
Overpack Air Outlet	~~184 (MPC-24) 186 (MPC-68)~~*206*	~~200 (MPC-24) 202 (MPC-68)~~*231*	~~243 (MPC-24) 242 (MPC-68)~~*287*	N/A
Overpack Inner Shell	~~170 (MPC-24) 172 (MPC-68)~~*199*	~~186 (MPC-24) 186 (MPC-68)~~*224*	~~232 (MPC-24) 231 (MPC-68)~~*280*	350 short-term (overpack concrete)
Overpack Outer Shell	~~131 (MPC-24) 130 (MPC-68)~~*145*	~~133 (MPC-24) 135 (MPC-68)~~*170*	~~149 (MPC-24) 149 (MPC-68)~~*226*	350 short-term (overpack concrete)

[†] *The bounding temperatures presented in this table are obtained by adding the maximum temperature rise of any cask component to the normal condition temperatures of every cask component.*

~~‡ Conservatively bounding temperatures reported in this table include a hypothetical rupture of 10% of the stored fuel rods.~~

11.2 ACCIDENTS

Accidents, in accordance with ANSI/ANS-57.9, are either infrequent events that could reasonably be expected to occur during the lifetime of the HI-STORM 100 System or events postulated because their consequences may affect the public health and safety. Section 2.2.3 defines the design basis accidents considered. By analyzing for these design basis events, safety margins inherently provided in the HI-STORM 100 System design can be quantified.

The results of the evaluations performed herein demonstrate that the HI-STORM 100 System can withstand the effects of all credible and hypothetical accident conditions and natural phenomena without affecting safety function, and are in compliance with the acceptable criteria. The following sections present the evaluation of the design basis postulated accident conditions and natural phenomena which demonstrate that the requirements of 10CFR72.122 are satisfied, and that the corresponding radiation doses satisfy the requirements of 10CFR72.106(b) and 10CFR20.

The load combinations evaluated for postulated accident conditions are defined in Table 2.2.14. The load combinations include normal loads with the accident loads. The accident load combination evaluations are provided in Section 3.4.

11.2.1 HI-TRAC Transfer Cask Handling Accident

11.2.1.1 Cause of HI-TRAC Transfer Cask Handling Accident

During the operation of the HI-STORM 100 System, the loaded HI-TRAC transfer cask can be transported to the ISFSI in the vertical or horizontal position. The loaded HI-TRAC transfer cask is typically transported by a heavy-haul vehicle that cradles the HI-TRAC horizontally or by a device with redundant drop protection that holds the HI-TRAC vertically. The height of the loaded overpack above the ground shall be limited to below the horizontal handling height limit determined in Chapter 3 and specified by the Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~ to limit the inertia loading on the cask in a horizontal drop to less than 45g's. Although a handling accident is remote, a cask drop from the horizontal handling height limit is a credible accident. A vertical drop of the loaded HI-TRAC transfer cask is not a credible accident as the loaded HI-TRAC shall be transported and handled in the vertical orientation by devices designed in accordance with the criteria specified in Subsection 2.3.3.1 as required by the Technical Specification.

11.2.1.2 HI-TRAC Transfer Cask Handling Accident Analysis

The handling accident analysis evaluates the effects of dropping the loaded HI-TRAC in the horizontal position. The analysis of the handling accident is provided in Chapter 3. The analysis shows that the HI-STORM 100 System meets all structural requirements and there is no adverse effect on the confinement, thermal or subcriticality performance of the contained MPC. Limited localized damage to the HI-TRAC water jacket shell and loss of the water in the water jacket may occur as a result of the handling accident. The HI-TRAC top lid and transfer lid housing are

demonstrated to remain attached by withstanding the maximum deceleration. The transfer lid doors are also shown to remain closed during the drop. Limiting the inertia loading to 60g's or less ensures the fuel cladding remains intact based on dynamic impact effects on spent fuel assemblies in the literature [11.2.1]. Therefore, demonstrating that the 45g limit for the HI-TRAC transfer cask is met ensures that the fuel cladding remains intact.

Structural

The structural evaluation of the MPC for 45g's is provided in Section 3.4. As discussed in Section 3.4, the MPC stresses as a result of the HI-TRAC side drop, 45g loading, are all within allowable values.

As discussed above, the water jacket enclosure shell could be punctured which results in a loss of the water within the water jacket. Additionally, the HI-TRAC top lid, transfer lid, and transfer lid doors are shown to remain in position under the 45g loading. Analysis of the lead in the HI-TRAC is performed in Appendix 3.F and it is shown that there is no appreciable change in the lead shielding.

Thermal

The loss of the water in the water jacket causes the temperatures to increase slightly due to a reduction in the thermal conductivity through the HI-TRAC water jacket. The temperatures of the MPC in the HI-TRAC transfer cask as a result of the loss of water in the water jacket are presented in Table 11.2.8. As can be seen from the values in the table, the temperatures are well below the short-term allowable fuel cladding and material temperatures provided in Table 2.2.3 for accident conditions.

Shielding

The loss of the water in the water jacket results in an increase in the radiation dose rates at locations adjacent to the water jacket. The shielding analysis results presented in Section 5.1.2 demonstrate that the requirements of 10CFR72.106 are not exceeded. As the structural analysis demonstrates that the HI-TRAC top lid, transfer lid, and transfer lid doors remain in place, there is no change in the dose rates at the top and bottom of the HI-TRAC.

Criticality

There is no effect on the criticality control features of the system as a result of this accident event.

Confinement

There is no effect on the confinement function of the MPC as a result of this accident event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

There is no degradation in the confinement capabilities of the MPC, as discussed above. There are increases in the local dose rates adjacent *to the* water jacket. The dose rate at 1 meter from the water jacket after the water is lost is calculated *in* ~~to be less than 1 R/hr (~~Table 5.1.10~~)~~. Immediately after the drop accident a radiological inspection of the HI-TRAC will be performed and temporary shielding shall be installed to limit the exposure to the public. Based on a minimum distance to the controlled area boundary of 100 meters, the dose rate at the controlled area boundary will be approximately ~~0.8~~*1.47* mrem/hr *(Section 5.1.2)*. Therefore, it is evident, based on the short duration of the accident, that the requirements of 10CFR72.106 (5 Rem) will not be exceeded.

11.2.1.3 HI-TRAC Transfer Cask Handling Accident Dose Calculations

The handling accident could cause localized damage to the HI-TRAC water jacket shell and loss of the water in the water jacket as the neutron shield impacts the ground.

When the water jacket is impacted, the HI-TRAC transfer cask surface dose rate could increase. The HI-TRAC's post-accident shielding analysis presented in Section 5.1.2 assumes complete loss of the water in the water jacket and bounds the dose rates anticipated for the handling accident.

If the water jacket of the loaded HI-TRAC is damaged beyond immediate repair and the MPC is not damaged, the loaded HI-TRAC may be unloaded into a HI-STORM overpack, a HI-STAR overpack, or simply unloaded in the fuel pool. If the MPC is damaged, the loaded HI-TRAC must be returned to the fuel pool for unloading. Depending on the damage to the HI-TRAC and the current location in the loading or unloading sequence, less personnel exposure may be received by continuing to load the MPC into a HI-STORM or HI-STAR overpack. Once the MPC is placed in the HI-STORM or HI-STAR overpack, the dose rates are greatly reduced. The highest personnel exposure will result from returning the loaded HI-TRAC to the fuel pool to unload the MPC.

As a result of the loss of water from the water jacket, the dose rates at 1 meter adjacent to the water jacket mid-height increase~~d from 42 mrem/hr to 736 mrem/hr (125-ton HI-TRAC, Table 5.1.10) and 380 mrem/hr to 1090 mrem/hr~~ (~~100-ton HI-TRAC,~~ Table 5.1.10). Increasing the personnel exposure for each task ~~e~~*a*ffected by the increased dose rate adjacent to the water jacket by the ratio of the one meter dose rate increase results in a ~~cummulative~~*cumulative* dose of less than ~~2.0~~*5.0* person-rem, for the 125-ton HI-TRAC or 100-ton HI-TRAC. Using the ratio of the water jacket mid-height dose rates at one meter is very conservative. Dose rate at the top and bottom of the HI-TRAC water jacket

would not increase as much as the peak mid-height dose rates. In the determination of the personnel exposure, dose rates at the top and bottom of the loaded HI-TRAC are assumed to remain constant.

The analysis of the handling accident presented in Section 3.4 shows that the MPC confinement barrier will not be compromised and, therefore, there will be no release of radioactive material from the confinement vessel. Any possible rupture of the fuel cladding will have no effect on the site boundary dose rates because the magnitude of the radiation source has not changed.

11.2.1.4 HI-TRAC Transfer Cask Handling Accident Corrective Action

Following a handling accident, the ISFSI operator shall first perform a radiological and visual inspection to determine the extent of the damage to the HI-TRAC transfer cask and MPC to the maximum practical extent. As appropriate, place temporary shielding around the HI-TRAC to reduce radiation dose rates. Special handling procedures will be developed and approved by the ISFSI operator to lift and upright the HI-TRAC. Upon uprighting, the portion of the overpack not previously accessible shall be radiologically and visually inspected. If damage to the water jacket is limited to a local penetration or crushing, local repairs can be performed to the shell and the water replaced. If damage to the water jacket is extensive, the damage shall be repaired and re-tested in accordance with Chapter 9, following removal of the MPC.

If upon inspection of the damaged HI-TRAC transfer cask and MPC, damage of the MPC is observed, the loaded HI-TRAC transfer cask will be returned to the facility for fuel unloading in accordance with Chapter 8. The handling accident will not affect the ability to unload the MPC using normal means as the structural analysis of the 60g loading (HI-STAR Docket Numbers 71-9261 and 72-1008) shows that there will be no gross deformation of the MPC basket. After unloading, the structural damage of the HI-TRAC and MPC shall be assessed and a determination shall be made if repairs will enable the equipment to return to service. Subsequent to the repairs, the equipment shall be inspected and appropriate tests shall be performed to certify the equipment for service. If the equipment cannot be repaired and returned to service, the equipment shall be disposed of in accordance with the appropriate regulations.

11.2.2 HI-STORM Overpack Handling Accident

11.2.2.1 Cause of HI-STORM Overpack Handling Accident

During the operation of the HI-STORM 100 System, the loaded HI-STORM overpack is lifted in the vertical orientation. The height of the loaded overpack above the ground shall be limited to below the vertical handling height limit determined in Chapter 3 and specified by the ~~t~~*T*echnical Specifications in *Appendix A to the CoC*~~Chapter 12~~. This vertical handling height limit will maintain the inertial loading on the cask in a vertical drop to 45g's or less. Although a handling accident is remote, a drop from the vertical handling height limit is a credible accident.

11.2.2.2 HI-STORM Overpack Handling Accident Analysis

The handling accident analysis evaluates the effects of dropping the loaded overpack in the vertical orientation. The analysis of the handling accident is provided in Chapter 3. The analysis shows that the HI-STORM 100 System meets all structural requirements and there are no adverse effects on the structural, confinement, thermal or subcriticality performance of the HI-STORM 100 System. Limiting the inertia loading to 60g's or less ensures the fuel cladding remains intact based on dynamic impact effects on spent fuel assemblies in the literature [11.2.1].

Structural

The structural evaluation of the MPC under a 60g vertical load is presented in the HI-STAR TSAR and SAR [11.2.6 and 11.2.7] and it is demonstrated therein that the stresses are within allowable limits. The structural analysis of the HI-STORM overpack is presented in Section 3.4. The structural analysis of the overpack shows that the concrete shield attached to the underside of the overpack lid remains attached and air inlet ducts do not collapse.

Thermal

As the structural analysis demonstrates that there is no change in the MPC or overpack, there is no effect on the thermal performance of the system as a result of this event.

Shielding

As the structural analysis demonstrates that there is no change in the MPC or overpack, there is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the vertical drop of the HI-STORM Overpack with the MPC inside does not affect the safe operation of the HI-STORM 100 System.

11.2.2.3 HI-STORM Overpack Handling Accident Dose Calculations

The vertical drop handling accident of the loaded HI-STORM overpack will not cause any change of the shielding or breach of the MPC confinement boundary. Any possible rupture of the fuel cladding will have no affect on the site boundary dose rates because the magnitude of the radiation source has not changed. Therefore, the dose calculations are equivalent to the normal condition dose rates.

11.2.2.4 HI-STORM Overpack Handling Accident Corrective Action

Following a handling accident, the ISFSI operator shall first perform a radiological and visual inspection to determine the extent of the damage to the overpack. Special handling procedures, as required, will be developed and approved by the ISFSI operator.

If upon inspection of the MPC, structural damage of the MPC is observed, the MPC is to be returned to the facility for fuel unloading in accordance with Chapter 8. After unloading, the structural damage of the MPC shall be assessed and a determination shall be made if repairs will enable the MPC to return to service. Likewise, the HI-STORM overpack shall be thoroughly inspected and a determination shall be made if repairs will enable the HI-STORM overpack to return to service. Subsequent to the repairs, the equipment shall be inspected and appropriate tests shall be performed to certify the HI-STORM 100 System for service. If the equipment cannot be repaired and returned to service, the equipment shall be disposed of in accordance with the appropriate regulations.

11.2.3 Tip-Over

11.2.3.1 Cause of Tip-Over

The analysis of the HI-STORM 100 System has shown that the overpack does not tip over as a result of the accidents (i.e., tornado missiles, flood water velocity, and seismic activity) analyzed in this section. It is highly unlikely that the overpack will tip-over during on-site movement because of the low handling height limit. The tip-over accident is stipulated as a non-mechanistic accident.

For the anchored HI-STORM designs (HI-STORM 100A and 100SA), a tip-over accident is not possible. As described in Chapter 2 of this TSAR, these system designs are not evaluated for the hypothetical tip-over. As such, the remainder of this accident discussion applies only to the non-anchored designs (i.e., the 100 and 100S designs only).

11.2.3.2 Tip-Over Analysis

The tip-over accident analysis evaluates the effects of the loaded overpack tipping-over onto a reinforced concrete pad. The tip-over analysis is provided in Section 3.4. The structural analysis provided in Appendix 3.A demonstrates that the resultant deceleration loading on the MPC as a result of the tip-over accident is less than the design basis 45g's. The analysis shows that the HI-STORM 100 System meets all structural requirements and there is no adverse effect on the structural, confinement, thermal, or subcriticality performance of the MPC. However, the side impact will cause some localized damage to the concrete and outer shell of the overpack in the radial area of impact.

Structural

The structural evaluation of the MPC presented in Section 3.4 demonstrates that under a 45g loading the stresses are well within the allowable values. Analysis presented in Chapter 3 shows that the concrete shields attached to the underside and top of the overpack lid remains attached. As a result of the tip-over accident there will be localized crushing of the concrete in the area of impact.

Thermal

The thermal analysis of the overpack and MPC is based on vertical storage. The thermal consequences of this accident while the overpack is in the horizontal orientation are bounded by the burial under debris accident evaluated in Subsection 11.2.14. Damage to the overpack will be limited as discussed above. As the structural analysis demonstrates that there is no significant change in the MPC or overpack, once the overpack and MPC are returned to their vertical orientation there is no effect on the thermal performance of the system.

Shielding

The effect on the shielding performance of the system as a result of this event is limited to a localized decrease in the shielding thickness of the concrete.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is a very localized reduction in shielding and no effect on the confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this accident event.

Based on this evaluation, it is concluded that the accident pressure does not affect the safe operation of the HI-STORM 100 System.

11.2.3.3 Tip-Over Dose Calculations

The tip-over accident could cause localized damage to the radial concrete shield and outer steel shell where the overpack impacts the surface. The overpack surface dose rate in the affected area could increase due to the damage. However, there should be no noticeable increase in the ISFSI site or boundary dose rate, because the affected areas will be small and localized. The analysis of the tip-over accident has shown that the MPC confinement barrier will not be compromised and, therefore, there will be no release of radioactivity or increase in site-boundary dose rates.

11.2.3.4 Tip-Over Accident Corrective Action

Following a tip-over accident, the ISFSI operator shall first perform a radiological and visual inspection to determine the extent of the damage to the overpack. Special handling procedures will be developed and approved by the ISFSI operator.

If upon inspection of the MPC, structural damage of the MPC is observed, the MPC shall be returned to the facility for fuel unloading in accordance with Chapter 8. After unloading, the structural damage of the MPC shall be assessed and a determination shall be made if repairs will enable the MPC to return to service. Likewise, the HI-STORM overpack shall be thoroughly inspected and a determination shall be made if repairs are required and will enable the HI-STORM overpack to return to service. Subsequent to the repairs, the equipment shall be inspected and appropriate tests shall be performed to certify the HI-STORM 100 System for service. If the equipment cannot be repaired and returned to service, the equipment shall be disposed of in accordance with the appropriate regulations.

11.2.4 Fire Accident

11.2.4.1 Cause of Fire

Although the probability of a fire accident affecting a HI-STORM 100 System during storage operations is low due to the lack of combustible materials at the ISFSI, a conservative fire has been assumed and analyzed. The analysis shows that the HI-STORM 100 System continues to perform its structural, confinement, thermal, and subcriticality functions.

11.2.4.2 Fire Analysis

11.2.4.2.1 Fire Analysis for HI-STORM Overpack

The possibility of a fire accident near an ISFSI is considered to be extremely remote due to an absence of combustible materials within the ISFSI and adjacent to the overpacks. The only credible concern is related to a transport vehicle fuel tank fire, causing the outer layers of the storage overpack to be heated by the incident thermal radiation and forced convection heat fluxes. The amount of combustible fuel in the on-site transporter is limited to a volume of 50 gallons based on a Technical Specification in *Appendix A to the CoC*~~Chapter 12~~.

With respect to fire accident thermal analysis, NUREG-1536 (4.0,V,5.b) states:

> "Fire parameters included in 10 CFR 71.73 have been accepted for characterizing the heat transfer during the in-storage fire. However, a bounding analysis that limits the fuel source thus limits the length of the fire (e.g., by limiting the source of the fuel in the transporter) has also been accepted."

Based on this NUREG-1536 guidance, the fire accident thermal analysis is performed using the 10 CFR 71.73 parameters and the fire duration is determined from the limited fuel volume of 50 gallons. The entire transient evaluation of the storage fire accident consists of three parts: (1) a bounding steady-state initial condition, (2) the short-duration fire event, and (3) the post-fire temperature relaxation period.

As stated above, the fire parameters from 10 CFR 71.73 are applied to the HI-STORM fire accident evaluation. 10 CFR 71 requirements for thermal evaluation of hypothetical accident conditions specifically define pre- and post-fire ambient conditions, specifically:

> "the ambient air temperature before and after the test must remain constant at that value between -29°C (-20°F) and +38°C (100°F) which is most unfavorable for the feature under consideration."

The ambient air temperature is therefore set to 100°F both before (bounding steady state) and after (post-fire temperature relaxation period) the short-duration fire event.

During the short-duration fire event, the following parameters from 10CFR71.71(c)(4) are applied:

1. Except for a simple support system, the cask must be fully engulfed. The ISFSI pad is a simple support system, so the fire environment is not applied to the overpack baseplate. By fully engulfing the overpack, additional heat transfer surface area is conservatively exposed to the elevated fire temperatures.

2. The average emissivity coefficient must be at least 0.9. During the entire duration of the fire, the painted outer surfaces of the overpack are assumed to remain intact, with an emissivity of 0.85. It is conservative to assume that the flame emissivity is 1.0, the limiting maximum value corresponding to a perfect blackbody emitter. With a flame emissivity conservatively assumed to be 1.0 and a painted surface emissivity of 0.85, the effective emissivity coefficient is 0.85. Because the minimum required value of 0.9 is greater than the actual value of 0.85, use of an average emissivity coefficient of 0.9 is conservative.

3. The average flame temperature must be at least 800°C (1475°F). Open pool fires typically involve the entrainment of large amounts of air, resulting in lower average flame temperatures. Additionally, the same temperature is applied to all exposed cask surfaces, which is very conservative considering the size of the HI-STORM cask. It is therefore conservative to use the 1475°F temperature.

4. The fuel source must extend horizontally at least 1 m (40 in), but may not extend more than 3 m (10 ft), beyond the external surface of the cask. Use of the minimum ring width of 1 meter yields a deeper pool for a fixed quantity of combustible fuel, thereby conservatively maximizing the fire duration.

5. The convection coefficient must be that value which may be demonstrated to exist if the cask were exposed to the fire specified. Based upon results of large pool fire thermal measurements [11.2.2], a conservative forced convection heat transfer coefficient of 4.5 Btu/(hr×ft^2×°F) is applied to exposed overpack surfaces during the short-duration fire.

Due to the severity of the fire condition radiative heat flux, heat flux from incident solar radiation is negligible and is not included. Furthermore, the smoke plume from the fire would block most of the solar radiation.

Based on the 50 gallon fuel volume, the overpack outer diameter and the 1 m fuel ring width, the fuel ring surrounding the overpack covers 147.6 ft^2 and has a depth of 0.54 in. From this depth and a linear fuel consumption rate of 0.15 in/min, the fire duration is calculated to be 3.622 minutes (217 seconds). The linear fuel consumption rate of 0.15 in/min is the smallest value given in a Sandia Report on large pool fire thermal testing [11.2.2]. Use of the minimum linear consumption rate conservatively maximizes the duration of the fire.

It is recognized that the ventilation air in contact with the inner surface of the HI-STORM overpack with design-basis decay heat under maximum normal ambient temperature conditions varies between 80°F at the bottom and *206*~~186~~°F at the top of the overpack. It is further recognized that the inlet and outlet ducts occupy only 1.25% of area of the cylindrical surface of the massive HI-STORM overpack. Due to the short duration of the fire event and the relative isolation of the ventilation passages from the outside environment, the ventilation air is expected to experience little intrusion of the fire combustion products. As a result of these considerations, it is conservative to assume that

the air in the HI-STORM overpack ventilation passages is held constant at a substantially elevated temperature of 300°F during the entire duration of the fire event.

The thermal transient response of the storage overpack is determined using the ANSYS finite element program. Time-histories for points in the storage overpack are monitored for the duration of the fire and the subsequent post-fire equilibrium phase.

Heat input to the HI-STORM overpack while it is subjected to the fire is from a combination of an incident radiation and convective heat fluxes to all external surfaces. This can be expressed by the following equation:

$$q_F = h_{fc}(T_A - T_S) + 0.1714\times10^8 \varepsilon [(T_A + 460)^4 - (T_S + 460)^4]$$

where:

q_F =Surface Heat Input Flux (Btu/ft^2-hr)
h_{fc} = Forced Convection Heat Transfer Coefficient (4.5 Btu/ft^2-hr-°F)
T_A = Fire Condition Temperature (1475°F)
T_S = Transient Surface Temperature (°F)
ε = Average Emissivity (0.90 per 10 CFR 71.73)

The forced convection heat transfer coefficient is based on the results of large pool fire thermal measurements [11.2.2].

After the fire event, the ambient temperature is restored to 100°F and the storage overpack cools down (post-fire temperature relaxation). Heat loss from the outer surfaces of the storage overpack is determined by the following equation:

$$q_S = h_S(T_S - T_A) + 0.1714\times10^8 \varepsilon [(T_S + 460)^4 - (T_A + 460)^4]$$

where:

q_S =Surface Heat Loss Flux (Btu/ft^2-hr)
h_S = Natural Convection Heat Transfer Coefficient (Btu/ft^2-hr-°F)
T_S = Transient Surface Temperature (°F)
T_A = Ambient Temperature (°F)
ε = Surface Emissivity

In the post-fire temperature relaxation phase, the surface heat transfer coefficient (h_S) is determined by the following equation:

$$h_S = 0.19\times(T_A - T_S)^{1/3}$$

where:

h_S = Natural Convection Heat Transfer Coefficient (Btu/ft^2-hr-°F)
T_A = External Air Temperature (°F)
T_S = Transient Surface Temperature (°F)

As discussed in Subsection 4.5.1.1.2, this equation is appropriate for turbulent natural convection from vertical surfaces. For the same conservative value of the Z parameter assumed earlier (2.6×10^5) and the HI-STORM overpack height of approximately 19 feet, the surface-to-ambient temperature difference required to ensure turbulence is 0.56 °F.

A two-dimensional, axisymmetric model was developed for this analysis. Material thermal properties used were taken from Section 4.2. An element plot of the 2-D axisymmetric ANSYS model is shown in Figure 11.2.1. The outer surface and top surface of the overpack are exposed to the ambient conditions (fire and post-fire), and the base of the overpack is insulated. The transient study is conducted for a period of 5 hours, which is sufficient to allow temperatures in the overpack to reach their maximum values and begin to recede.

Based on the results of the analysis, the maximum temperature increases at several points near the overpack mid-height are summarized in Table 11.2.2 along with the corresponding peak temperatures. Temperature profiles through the storage overpack wall thickness near the mid-height of the cask are included in Figures 11.2.2 through 11.2.4. A plot of temperature versus time is shown in Figure 11.2.5 for several points through the overpack wall, near the mid-height of the cask. The temperature profile plots (Figures 11.2.2 through 11.2.4) each contain profiles corresponding to time "snapshots". Profiles are presented at the following times: 1 minute (60 seconds), 2 minutes (120 seconds), 3.622 minutes (217 seconds – end of fire), 10 minutes (600 seconds), 20 minutes (1200 seconds), 40 minutes and 90 minutes.

The primary shielding material in the storage overpack is concrete, which can suffer a reduction in neutron shielding capability at sustained high temperatures due to a loss of water. As shown in Figure 11.2.5, less than 1 inch of the concrete near the outer overpack surface exceeds the material short-term temperature limit. This condition is addressed specifically in NUREG-1536 (4.0,V,5.b), which states:

> "The NRC accepts that concrete temperatures may exceed the temperature criteria of ACI 349 for accidents if the temperatures result from a fire."

These results demonstrate that the fire accident event does not substantially affect the HI-STORM overpack. Only localized regions of concrete are exposed to temperatures in excess of the allowable short-term temperature limit. No portions of the steel structure exceed the allowable temperature limits.

Having evaluated the effects of the fire on the overpack, we must now evaluate the effects on the MPC and contained fuel assemblies. Guidance for the evaluation of the MPC and its internals during a fire event is provided by NUREG-1536 (4.0,V,5.b), which states:

"For a fire of very short duration (i.e., less than 10 percent of the thermal time constant of the cask body), the NRC finds it acceptable to calculate the fuel temperature increase by assuming that the cask inner wall is adiabatic. The fuel temperature increase should then be determined by dividing the decay energy released during the fire by the thermal capacity of the basket-fuel assembly combination."

The time constant of the cask body (i.e., the overpack) can be determined using the formula:

$$\tau = \frac{c_p \times \rho \times L_c^2}{k}$$

where:

c_p = Overpack Specific Heat Capacity (Btu/lb-°F)
ρ = Overpack Density (lb/ft^3)
L_c = Overpack Characteristic Length (ft)
k = Overpack Thermal Conductivity (Btu/ft-hr-°F)

The concrete contributes the majority of the overpack mass and volume, so we will use the specific heat capacity (0.156 Btu/lb-°F), density (142 lb/ft^3) and thermal conductivity (1.05 Btu/ft-hr-°F) of concrete for the time constant calculation. The characteristic length of a hollow cylinder is its wall thickness. The characteristic length for the HI-STORM overpack is therefore 29.5 in, or approximately 2.46 ft. Substituting into the equation, the overpack time constant is determined as:

$$\tau = \frac{0.156 \times 142 \times 2.46^2}{1.05} = 127.7 hrs$$

One-tenth of this time constant is approximately 12.8 hours (766 minutes), substantially longer than the fire duration of 3.622 minutes, so the MPC is evaluated by considering the MPC canister as an adiabatic boundary. The temperature of the MPC is therefore increased by the contained decay heat only.

Table 4.5.5 lists lower-bound thermal inertia values for the MPC and the contained fuel assemblies of *46804~~200~~* Btu/°F and 2240 Btu/°F, respectively. Applying an upper-bound decay heat load of *28.74~~22.25~~* kW (*98,090~~76,028~~* Btu/hr) for the 3.622 minute (0.0604 hours) fire duration results in the contained fuel assemblies heating up by only:

$$\Delta T_{fuel} = \frac{98090 \times 0.0604}{4680 + 2240} = 0.86°F$$

This is a negligible increase in the fuel temperature. Consequently, the impact on the MPC internal helium pressure will be negligible as well. Based on a conservative analysis of the HI-STORM 100

System response to a hypothetical fire event, it is concluded that the fire event does not significantly affect the temperature of the MPC or contained fuel. Furthermore, the ability of the HI-STORM 100 System to cool the spent nuclear fuel within design temperature limits during post-fire temperature relaxation is not compromised.

Structural

As discussed above, there are no structural consequences as a result of the fire accident condition.

Thermal

As discussed above, the MPC internal pressure increases a negligible amount and is bounded by the 100% fuel rod rupture accident in Section 11.2.9. As shown in Table 11.2.2, the peak fuel cladding and material temperatures are well below short-term accident condition allowable temperatures of Table 2.2.3.

Shielding

With respect to concrete damage from a fire, NUREG-1536 (4.0,V,5.b) states: "the loss of a small amount of shielding material is not expected to cause a storage system to exceed the regulatory requirements in 10 CFR 72.106 and, therefore, need not be estimated or evaluated in the SAR." Less than one-inch of the concrete (less than 4% of the total overpack radial concrete section) exceeds the short-term temperature limit.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event.

Radiation Protection

Since there is a very localized reduction in shielding and no effect on the confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this accident event.

Based on this evaluation, it is concluded that the overpack fire accident does not affect the safe operation of the HI-STORM 100 System.

11.2.4.2.2 Fire Analysis for HI-TRAC Transfer Cask

To demonstrate the fuel cladding and MPC pressure boundary integrity under an exposure to a hypothetical short duration fire event during on-site handling operations, a fire accident analysis of the loaded 100-ton HI-TRAC is performed. This analysis, because of the lower mass of the 100-ton HI-TRAC, bounds the effects for the 125-ton HI-TRAC. In this analysis, the contents of the HI-TRAC are conservatively postulated to undergo a transient heat-up as a lumped mass from the decay heat input and heat input from the short duration fire. The rate of temperature rise of the HI-TRAC depends on the thermal inertia of the cask, the cask initial conditions, the spent nuclear fuel decay heat generation, and the fire heat flux. All of these parameters are conservatively bounded by the values in Table 11.2.3, which are used for the fire transient analysis.

Using the values stated in Table 11.2.3, a bounding cask temperature rise of ~~9.332~~*5.509*°F per minute is determined from the combined radiant and forced convection fire and decay heat inputs to the cask. During the handling of the HI-TRAC transfer cask, the transporter is limited to a maximum of 50 gallons, in accordance with a Technical Specification in *Appendix A to the CoC*~~Chapter 12~~. The duration of the 50-gallon fire is 4.775 minutes. Therefore, the fuel cladding will not exceed the short-term fuel cladding temperature limit (see Table 11.2.5).

The elevated temperatures as a result of the fire accident will cause the pressure in the water jacket to increase and cause the overpressure relief valve to vent steam to the atmosphere. Based on the fire heat input to the water jacket, less than *11*~~20~~% of the water in the water jacket can be boiled off. However, it is conservatively assumed, for dose calculations, that all the water in the water jacket is lost. In the 125-ton HI-TRAC, which uses Holtite in the lids for neutron shielding, the elevated fire temperatures would cause the Holtite to exceed its design accident temperature limits. It is conservatively assumed, for dose calculations, that all the Holtite in the 125-ton HI-TRAC is lost.

Due to the increased temperatures the MPC experiences as a result of the fire accident in the HI-TRAC transfer cask, the MPC internal pressure increases. Table 11.2.4 provides the MPC maximum internal pressures as a result of the HI-TRAC fire accident. *The values presented in Table 11.2.4 are determined using a bounding temperature rise of 43.2 °F, instead of the calculated 26.3 °F temperature rise, and are therefore conservative.* Table 11.2.5 provides a summary of the loaded HI-TRAC bounding maximum temperatures for the hypothetical fire accident condition.

Structural

As discussed above, there are no structural consequences as a result of the fire accident condition.

Thermal

As discussed above, the MPC internal pressure increases as a result of the fire accident, but the internal pressure, conservatively including a non-mechanistic 100% fuel rod rupture, is shown in Table 11.2.4 to be less than the accident condition MPC internal design pressure of *200*~~125~~ psig

(Table 2.2.1). As shown in Table 11.2.5, the peak fuel cladding and material temperatures are well below short-term accident condition allowable temperatures of Table 2.2.3.

The loss of the water in the water jacket causes the temperatures to increase slightly due to a reduction in the thermal conductivity through the HI-TRAC water jacket. The temperatures of the MPC in the HI-TRAC transfer cask as a result of the loss of water in the water jacket are presented in Table 11.2.8 based on an assumed start at normal on-site transport conditions. As can be seen from the values in the table, the temperatures increase by less than 20°F. Therefore, if the temperatures presented in Table 11.2.5 were increased by 20°F to account for the decrease in conductivity of the water jacket, the resultant temperatures will still be well below the short-term allowable fuel cladding and material temperatures provided in Table 2.2.3 for accident conditions.

Shielding

The assumed loss of all the water in the water jacket results in an increase in the radiation dose rates at locations adjacent to the water jacket. The assumed loss of all the Holtite in the 125-ton HI-TRAC lids results in an increase in the radiation dose rates at locations adjacent to the lids. The shielding analysis results presented in Section 5.1.2 demonstrate that the requirements of 10CFR72.106 are not exceeded.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event, since the internal pressure does not exceed the accident condition design pressure and the MPC confinement boundary temperatures do not exceed the short-term allowable temperature limits.

Radiation Protection

There is no degradation in confinement capabilities of the MPC, as discussed above. There are increases in the local dose rates adjacent water jacket. HI-TRAC dose rates at 1 meter and 100 meters from the water jacket, after the water is lost, have already been reported in Subsection 11.2.1.2. Immediately after the fire accident a radiological inspection of the HI-TRAC will be performed and temporary shielding shall be installed to limit the exposure to the public.

11.2.4.3 Fire Dose Calculations

The complete loss of the HI-TRAC neutron shield along with the water jacket shell is assumed in the shielding analysis for the post-accident analysis of the loaded HI-TRAC in Chapter 5 and bounds

the determined fire accident consequences. The loaded HI-TRAC following a fire accident meets the accident dose rate requirement of 10CFR72.106.

The elevated temperatures experienced by the HI-STORM overpack concrete shield is limited to the outermost layer. Therefore, any corresponding reduction in neutron shielding capabilities is limited to the outermost layer. The slight increase in the neutron dose rate as a result of the concrete in the outer inch reaching elevated temperatures will not significantly increase the site boundary dose rate, due to the limited amount of the concrete shielding with reduced effectiveness and the negligible neutron dose rate calculated for normal conditions at the site boundary. The loaded HI-STORM overpack following a fire accident meets the accident dose rate requirement of 10CFR72.106.

The analysis of the fire accident shows that the MPC confinement boundary is not compromised and therefore, there is no release of airborne radioactive materials.

11.2.4.4 Fire Accident Corrective Actions

Upon detection of a fire adjacent to a loaded HI-TRAC or HI-STORM overpack, the ISFSI operator shall take the appropriate immediate actions necessary to extinguish the fire. Fire fighting personnel should take appropriate radiological precautions, particularly with the HI-TRAC as the pressure relief valves may have opened and water loss from the water jacket may have occurred resulting in an increase in radiation doses. Following the termination of the fire, a visual and radiological inspection of the equipment shall be performed.

As appropriate, install temporary shielding around the HI-TRAC. Specific attention shall be taken during the inspection of the water jacket of the HI-TRAC. If damage to the HI-TRAC is limited to the loss of water in the water jacket due to the pressure increase, the water may be replaced by adding water at pressure. If damage to the HI-TRAC water jacket or HI-TRAC body is widespread and/or radiological conditions require, the HI-TRAC shall be unloaded in accordance with Chapter 8, prior to repair.

If damage to the HI-STORM storage overpack as the result of a fire event is widespread and/or as radiological conditions require, the MPC shall be removed from the HI-STORM overpack in accordance with Chapter 8. However, the thermal analysis described herein demonstrates that only the outermost layer of the radial concrete exceeds its design temperature. The HI-STORM overpack may be returned to service if there is no increase in the measured dose rates (i.e., the overpack's shielding effectiveness is confirmed) and if the visual inspection is satisfactory.

11.2.5 Partial Blockage of MPC Basket Vent Holes

Each MPC basket fuel cell wall has elongated vent holes at the bottom and top. The partial blockage of the MPC basket vent holes analyzes the effects on the HI-STORM 100 System due to the restriction of the vent openings.

11.2.5.1 Cause of Partial Blockage of MPC Basket Vent Holes

After the MPC is loaded with spent nuclear fuel, the MPC cavity is drained, vacuum dried, and backfilled with helium. There are only two possible sources of material that could block the MPC basket vent holes. These are the fuel cladding/fuel pellets and crud. Due to the maintenance of relatively low cladding temperatures during storage, it is not credible that the fuel cladding would rupture, and that fuel cladding and fuel pellets would fall to block the basket vent holes. It is conceivable that a percentage of the crud deposited on the fuel rods may fall off of the fuel assembly and deposit at the bottom of the MPC.

Helium in the MPC cavity provides an inert atmosphere for storage of the fuel. The HI-STORM 100 System maintains the peak fuel cladding temperature below the required long-term storage limits. All credible accidents do not cause the fuel assembly to experience an inertia loading greater than 60g's. Therefore, there is no mechanism for the extensive rupture of spent fuel rod cladding.

Crud can be made up of two types of layers, loosely adherent and tightly adherent. The SNF assembly movement from the fuel racks to the MPC may cause a portion of the loosely adherent crud to fall away. The tightly adherent crud is not removed during ordinary fuel handling operations. *The MPC vent holes that act as the bottom plenum for the MPC internal thermosiphon are of an elongated, semi-circular design to ensure that the flow passages will remain open under a hypothetical shedding of the crud on the fuel rods. For conservatism, only the minimum semi-circular hole area is credited in the thermal models (i.e., the elongated portion of the hole is completely neglected).*

The amount of crud on fuel assemblies varies greatly from plant to plant. Typically, BWR plants have more crud than PWR plants. Based on the maximum expected crud volume per fuel assembly provided in reference [11.2.5], and the area at the base of the MPC basket fuel storage cell, the maximum depth of crud at the bottom of the MPC-68 was determined. For the *PWR-style MPC designs (see Table 1.2.1*~~MPC-24~~*)*, 90% of the maximum crud volume was used to determine the crud depth. The maximum crud depths calculated for each of the MPCs is listed in Table 2.2.8. The maximum amount of crud was assumed to be present on all fuel assemblies within the MPC. Both the tightly and loosely adherent crud was conservatively assumed to fall off of the fuel assembly. As can be seen by the values listed in the table, the maximum amount of crud depth does not totally block any of the MPC basket vent holes *as the crud accumulation depth is less than the elongation of the vent holes. Therefore, the available vent holes area is greater than that used in the thermal models.*

11.2.5.2 Partial Blockage of MPC Basket Vent Hole Analysis

The partial blockage of the MPC basket vent holes has no affect on the structural, confinement and thermal analysis of the MPC. There is no affect on the shielding analysis other than a slight increase of the gamma radiation dose rate at the base of the MPC due to the accumulation of crud. As the

MPC basket vent holes are not completely blocked, preferential flooding of the MPC fuel basket is not possible, and, therefore, the criticality analyses are not affected.

Structural

There are no structural consequences as a result of this event.

Thermal

There is no effect on the thermal performance of the system as a result of this event.

Shielding

There is no effect on the shielding performance of the system as a result of this accident event.

Criticality

There is no effect on the criticality control features of the system as a result of this accident event.

Confinement

There is no effect on the confinement function of the MPC as a result of this accident event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this accident event.

Based on this evaluation, it is concluded that the partial blockage of MPC vent holes does not affect the safe operation of the HI-STORM 100 System.

11.2.5.3 Partial Blockage of MPC Basket Vent Holes Dose Calculations

Partial blockage of basket vent holes will not result in a compromise of the confinement boundary. Therefore, there will be no effect on the site boundary dose rates because the magnitude of the radiation source has not changed. There will be no radioactive material release.

11.2.5.4 Partial Blockage of MPC Basket Vent Holes Corrective Action

There are no consequences that exceed normal storage conditions. No corrective action is required for the partial blockage of the MPC basket vent holes.

11.2.6 Tornado

11.2.6.1 Cause of Tornado

The HI-STORM 100 System will be stored on an unsheltered ISFSI concrete pad and subject to environmental conditions. Additionally, the transfer of the MPC from the HI-TRAC transfer cask to the overpack may be performed at the unsheltered ISFSI concrete pad. It is possible that the HI-STORM System (storage overpack and HI-TRAC transfer cask) may experience the extreme environmental conditions of a tornado.

11.2.6.2 Tornado Analysis

The tornado accident has two effects on the HI-STORM 100 System. The tornado winds and/or tornado missile attempt to tip-over the loaded overpack or HI-TRAC transfer cask. The pressure loading of the high velocity winds and/or the impact of the large tornado missiles act to apply an overturning moment. The second effect is tornado missiles propelled by high velocity winds which attempt to penetrate the storage overpack or HI-TRAC transfer cask.

During handling operations at the ISFSI pad, the loaded HI-TRAC transfer cask, while in the vertical orientation, shall be attached to a lifting device designed in accordance with the requirements specified in Subsection 2.3.3.1. Therefore, it is not credible that the tornado missile and/or wind could tip-over the loaded HI-TRAC while being handled in the vertical orientation. During handling of the loaded HI-TRAC in the horizontal orientation, it is possible that the tornado missile and/or wind may cause the rollover of the loaded HI-TRAC on the transport vehicle. The horizontal drop handling accident for the loaded HI-TRAC, Subsection 11.2.1, evaluates the consequences of the loaded HI-TRAC falling from the horizontal handling height limit and consequently this bounds the effect of the roll-over of the loaded HI-TRAC on the transport vehicle.

Structural

Section 3.4 provides the analysis of the pressure loading which attempts to tip-over the storage overpack and the analysis of the effects of the different types of tornado missiles. These analyses show that the loaded storage overpack does not tip-over as a result of the tornado winds and/or tornado missiles.

Analyses provided in Section 3.4 also shows that the tornado missiles do not penetrate the storage overpack or HI-TRAC transfer cask to impact the MPC. The result of the tornado missile impact on the storage overpack or HI-TRAC transfer cask is limited to damage of the shielding.

Thermal

The loss of the water in the water jacket causes the temperatures to increase slightly due to a reduction in the thermal conductivity through the HI-TRAC water jacket. The temperatures of the

MPC in the HI-TRAC transfer cask as a result of the loss of water in the water jacket are presented in Table 11.2.8. As can be seen from the values in the table, the temperatures are well below the short-term allowable fuel cladding and material temperatures provided in Table 2.2.3 for accident conditions.

Shielding

The loss of the water in the water jacket results in an increase in the radiation dose rates at locations adjacent to the water jacket. The shielding analysis results presented in Section 5.1.2 demonstrate that the requirements of 10CFR72.106 are not exceeded.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event.

Radiation Protection

There is no degradation in confinement capabilities of the MPC, since the tornado missiles do not impact the MPC, as discussed above. There are increases in the local dose rates adjacent water jacket as a result of the loss of water in the HI-TRAC water jacket. HI-TRAC dose rates at 1 meter and 100 meters from the water jacket, after the water is lost, have already been reported in Subsection 11.2.1.2. Immediately after the tornado accident a radiological inspection of the HI-TRAC will be performed and temporary shielding shall be installed to limit the exposure to the public.

11.2.6.3 Tornado Dose Calculations

The tornado winds do not tip-over the loaded storage overpack; damage the shielding materials of the overpack or HI-TRAC; or damage the MPC confinement boundary. There is no affect on the radiation dose as a result of the tornado winds. A tornado missile may cause localized damage in the concrete radial shielding of the storage overpack. However, the damage will have a negligible effect on the site boundary dose. A tornado missile may penetrate the HI-TRAC water jacket shell causing the loss of the neutron shielding (water). The effects of the tornado missile damage on the loaded HI-TRAC transfer cask is bounded by the post-accident dose assessment performed in Chapter 5, which conservatively assumes complete loss of the water in the water jacket and the water jacket shell.

11.2.6.4 Tornado Accident Corrective Action

Following exposure of the HI-STORM 100 System to a tornado, the ISFSI operator shall perform a visual and radiological inspection of the overpack and/or HI-TRAC transfer cask. Damage sustained by the overpack outer shell, concrete, or vent screens shall be inspected and repaired. Damage sustained by the HI-TRAC shall be inspected and repaired.

11.2.7 Flood

11.2.7.1 Cause of Flood

The HI-STORM 100 System will be located on an unsheltered ISFSI concrete pad. Therefore, it is possible for the storage area to be flooded. The potential sources for the flood water could be unusually high water from a river or stream, a dam break, a seismic event, or a hurricane.

11.2.7.2 Flood Analysis

The flood accident affects the HI-STORM 100 overpack structural analysis in two ways. The flood water velocity acts to apply an overturning moment, which attempts to tip-over the loaded overpack. The flood affects the MPC by applying an external pressure.

Structural

Section 3.4 provides the analysis of the flood water applying an overturning moment. The results of the analysis show that the loaded overpack does not tip over if the flood velocity does not exceed the value stated in Table 2.2.8.

The structural evaluation of the MPC for the accident condition external pressure (Table 2.2.1) is presented in Section 3.4 and the resulting stresses from this event are shown to be well within the allowable values.

Thermal

For a flood of sufficient magnitude to allow the water to come into contact with the MPC, there is no adverse effect on the thermal performance of the system. The thermal consequence of such a flood is an increase in the rejection of the decay heat. Because the storage overpack is ventilated, water from a large flood will enter the annulus between the MPC and the overpack. The water would actually provide cooling that exceeds that available in the air filled annulus, due to water's higher thermal conductivity, density and heat capacity, and the forced convection coefficient associated with flowing water. Since the flood water temperature will be within the off-normal temperature range specified in Table 2.2.2, the thermal transient associated with the initial contact of the floodwater will be bounded by the off-normal operation conditions.

For a smaller flood that blocks the air inlet ducts but is not sufficient to allow water to come into contact with the MPC, a thermal analysis is included in Subsection 11.2.13 of this TSAR.

Shielding

There is no effect on the shielding performance of the system as a result of this event. The flood water acts as a radiation shield and will reduce the radiation doses.

Criticality

There is no effect on the criticality control features of the system as a result of this event. The criticality analysis is unaffected because under the flooding condition water does not enter the MPC cavity and therefore the reactivity would be less than the loading condition in the fuel pool which is presented in Section 6.1.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the flood accident does not affect the safe operation of the HI-STORM 100 System.

11.2.7.3 Flood Dose Calculations

Since the flood accident produces no leakage of radioactive material and no reduction in shielding effectiveness, there are no adverse radiological consequences.

11.2.7.4 Flood Accident Corrective Action

As shown in the analysis of the flood accident, the HI-STORM 100 System sustains no damage as a result of the flood. At the completion of the flood, the exterior and interior of the overpack, and the exterior of the MPC shall be cleaned to maintain the proper air flow and emissivity.

11.2.8 Earthquake

11.2.8.1 Cause of Earthquake

The HI-STORM 100 System may be employed at any reactor or ISFSI facility in the United States. It is possible that during the use of the HI-STORM 100 System, the ISFSI may experience an earthquake.

11.2.8.2 Earthquake Analysis

The earthquake accident analysis evaluates the effects of a seismic event on the loaded HI-STORM 100 System. The objective is to determine the stability limits of the HI-STORM 100 System. Based on a static stability criteria, it is shown in Chapter 3 that the HI-STORM 100 System is qualified to seismic activity less than or equal to the values specified in Table 2.2.8. The analyses in Chapter 3 show that the HI-STORM 100 System will not tip over under the conditions evaluated. The seismic activity has no adverse thermal, criticality, confinement, or shielding consequences.

Some ISFSI sites will have earthquakes that exceed the seismic activity specified in Table 2.2.8. For these high-seismic sites, anchored HI-STORM designs (the HI-STORM 100A and 100SA) have been developed. The design of these anchored systems is such that seismic loads cannot result in tip-over or lateral displacement. Chapter 3 provides a detailed discussion of the anchored systems design.

Structural

The sole structural effect of the earthquake is an inertial loading of less than 1g. This loading is bounded by the tip-over analysis presented in Section 11.2.3, which analyzes a deceleration of 45g's and demonstrates that the MPC allowable stress criteria are met.

Thermal

There is no effect on the thermal performance of the system as a result of this event.

Shielding

There is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the earthquake does not affect the safe operation of the HI-STORM 100 System.

11.2.8.3 Earthquake Dose Calculations

Structural analysis of the earthquake accident shows that the loaded overpack will not tip over as a result of the specified seismic activity. If the overpack were to tip over, the resultant damage would be equal to that experienced by the tip-over accident analyzed in Subsection 11.2.3. Since the loaded overpack does not tip-over, there is no increase in radiation dose rates or release of radioactivity.

11.2.8.4 Earthquake Accident Corrective Action

Following the earthquake accident, the ISFSI operator shall perform a visual and radiological inspection of the overpacks in storage to determine if any of the overpacks have tipped-over. In the unlikely event of a tip-over, the corrective actions shall be in accordance with Subsection 11.2.3.4.

11.2.9 100% Fuel Rod Rupture

This accident event postulates that all the fuel rods rupture and that the appropriate quantities of fission product gases and fill gas are released from the fuel rods into the MPC cavity.

11.2.9.1 Cause of 100% Fuel Rod Rupture

Through all credible accident conditions, the HI-STORM 100 System maintains the spent nuclear fuel in an inert environment while maintaining the peak fuel cladding temperature below the required short-term temperature limits, thereby providing assurance of fuel cladding integrity. There is no credible cause for 100% fuel rod rupture. This accident is postulated to evaluate the MPC confinement barrier for the maximum possible internal pressure based on the non-mechanistic failure of 100% of the fuel rods.

11.2.9.2 100% Fuel Rod Rupture Analysis

The 100% fuel rod rupture accident has no thermal, structural, criticality or shielding consequences. The event does not change the reactivity of the stored fuel, the magnitude of the radiation source which is being shielded, the shielding capability, or the criticality control features of the HI-STORM 100 System. The determination of the maximum accident pressure is provided in Chapter 4. The MPC design basis internal pressure bounds the pressure developed assuming 100% fuel rod rupture.

The structural analysis provided in Chapter 3 evaluates the MPC confinement boundary under the accident condition internal pressure.

Structural

The structural evaluation of the MPC for the accident condition internal pressure presented in Section 3.4 demonstrates that the MPC stresses are well within the allowable values.

Thermal

The MPC internal pressure for the 100% fuel rod rupture condition is presented in Table 4.4.14. As can be seen from the values, the *200*~~125~~ psig design basis accident condition MPC internal pressure used in the structural evaluation bounds the calculated value.

Shielding

There is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the non-mechanistic 100% fuel rod rupture accident does not affect the safe operation of the HI-STORM 100 System.

11.2.9.3 100% Fuel Rod Rupture Dose Calculations

The MPC confinement boundary maintains its integrity. There is no effect on the shielding effectiveness, and the magnitude of the radiation source is unchanged. However, the radiation source could redistribute within the sealed MPC cavity causing a slight change in the radiation dose rates at certain locations. Therefore, there is no release of radioactive material or significant increase in radiation dose rates.

11.2.9.4 100% Fuel Rod Rupture Accident Corrective Action

As shown in the analysis of the 100% fuel rod rupture accident, the MPC confinement boundary is not damaged. The HI-STORM 100 System is designed to withstand this accident and continue performing the safe storage of spent nuclear fuel under normal storage conditions. No corrective actions are required.

11.2.10 Confinement Boundary Leakage

The confinement boundary leakage accident assumes simultaneous rupture of 100% of the fuel rods and the release of the available radioactive gas inventory to the environment at a rate~~ equal to the maximum leak test rate of the MPC confinement boundary plus the test sensitivity~~ *based on 150% of the maximum leak rate under reference conditions.*

11.2.10.1 Cause of Confinement Boundary Leakage

There is no credible cause for confinement boundary leakage. The accidents analyzed in this chapter show that the MPC confinement boundary withstands all credible accidents. There are no man-made or natural phenomena that could cause failure of the confinement boundary restricting radioactive material release. The release is analyzed to demonstrate the safety of the HI-STORM 100 System.

11.2.10.2 Confinement Boundary Leakage Analysis

The following is the basis for the conservative analysis of the confinement boundary leakage accident.

1. All the fuel stored in the MPC has been cooled for 5 years~~ and has a burnup of 40,000 MWD/MTU~~. The PWR fuel type is the B&W 15×15 ~~with 3.4%~~*at 4.8%* enrichment *with a burnup of 70,000 MWD/MTU*. The BWR fuel type is the GE 7×7 ~~with 3.0%~~*at 4.4%* enrichment *with a burnup of 60,000 MWD/MTU*. These fuel characteristics bound the design basis fuel for the HI-STORM 100 System.

2. One hundred percent of all the fuel rods are assumed to rupture.

3. The releasable source term and release fractions are in accordance with NUREG-~~6487, Section 7.0.~~*1536, ISG-5 and ISG-11.*

4. The maximum possible leakage rate of radionuclides to the environment is ~~equal to the maximum allowable leakage plus the measurement sensitivity from the~~*based on the helium leak rate under reference test conditions from the* ~~t~~*T*echnical Specification in *Appendix A to the CoC*~~Chapter 12~~.

Chapter 7 presents an evaluation of the consequences of a non-mechanistic postulated ground-level breach of the MPC confinement boundary under hypothetical accident conditions of storage. The resulting Total Effective Dose Equivalent (TEDE) and ~~thyroid~~*other* dose *equivalents* at a downstream distance of 100 meters are evaluated for each MPC type~~ (MPC-24, MPC-68 and MPC-68F)~~.

Structural

There are no structural consequences of the loss of confinement accident.

Thermal

Since this event is a non-mechanistic assumption, there are no realistic thermal consequences. As discussed in the Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~, the leak test rate would result in a negligible loss of helium fill gas over the design life of the MPC, which would have an inconsequential effect on thermal performance.

Shielding

There is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

This event is based upon an assumed instantaneous breach of the confinement.

Radiation Protection

The postulated release will result in an increase in dose to the public. The analysis of this event is provided in Section 7.3. As shown therein, the postulated breach results in dose rates to the public less than the limit established by 10CFR72.106(b) for the site boundary.

11.2.10.3 Confinement Boundary Leakage Dose Calculations

10CFR72.106 requires that any individual located at or beyond the nearest controlled area boundary must not receive a dose greater than 5 Rem to the whole body or any organ from any design basis accident. The maximum whole body dose contribution as a result of the instantaneous leak accident is calculated in Chapter 7 (Table 7.3.~~2~~*8*~~) to be 54.4 mRem~~. The maximum ~~thyroid~~ dose*s* as a result of the ~~instantaneous~~*confinement boundary* leak accident is calculated in Chapter 7 *(Table 7.3.8)*~~to be 0.016 mRem~~. Both values are well below the regulatory limit of 5 Rem.

11.2.10.4 Confinement Boundary Leakage Accident Corrective Action

A detected breached MPC will need to be repaired or the fuel removed and placed into a new MPC. First, the breached MPC must be returned to the facility in accordance with the procedures provided in Chapter 8. If the leak can be detected and repaired, and testing can be performed to verify the integrity of the confinement boundary, the MPC may be placed back into service. Otherwise, the MPC should be unloaded in accordance with the procedures provided in Chapter 8.

11.2.11 Explosion

11.2.11.1 Cause of Explosion

An explosion within the bounds of an ISFSI is improbable since there are no explosive materials within the site boundary. An explosion as a result of combustion of the fuel contained in cask transport vehicle is possible. The fuel available for the explosion would be limited and therefore, any explosion would be limited in size. Any explosion stipulated to occur beyond the site boundary would have a minimal effect on the HI-STORM 100 System.

11.2.11.2 Explosion Analysis

Any credible explosion accident is bounded by the accident external pressure of 60 psig (Table 2.2.1) analyzed as a result of the flood accident water depth in Subsection 11.2.7 and the tornado missile accident of Subsection 11.2.6, because explosive materials will not be stored within close proximity to the casks. The HI-STORM Overpack does not experience the 60 psi external pressure since it is not a sealed vessel. However, a pressure differential of 10.0 psi (Table 2.2.1) is applied to the overpack. Section 3.4 provides the analysis of the accident external pressure on the MPC and overpack. The analysis shows that the MPC can withstand the effects of the accident condition external pressure, while conservatively neglecting the MPC internal pressure.

Structural

The structural evaluations for the MPC accident condition external pressure and overpack pressure differential are presented in Section 3.4 and demonstrate that all stresses are within allowable values.

Thermal

There is no effect on the thermal performance of the system as a result of this event.

Shielding

There is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the explosion accident does not affect the safe operation of the HI-STORM 100 System.

11.2.11.3 Explosion Dose Calculations

The bounding external pressure load has no effect on the HI-STORM 100 overpack and MPC. Therefore, no effect on the shielding, criticality, thermal or confinement capabilities of the HI-STORM 100 System is experienced as a result of the explosion pressure load. The effects of explosion generated missiles on the HI-STORM 100 System structure is bounded by the analysis of tornado generated missiles.

11.2.11.4 Explosion Accident Corrective Action

The explosive overpressure caused by the explosion is bounded by the external pressure exerted by the flood accident. The external pressure from the flood is shown not to damage the HI-STORM 100 System. Following an explosion, the ISFSI operator shall perform a visual and radiological inspection of the overpack. If the outer shell or concrete is damaged as a result of explosion generated missiles, the concrete material may be replaced and the outer shell repaired.

11.2.12 Lightning

11.2.12.1 Cause of Lightning

The HI-STORM 100 System will be stored on an unsheltered ISFSI concrete pad. There is the potential for lightning to strike the overpack. This analysis evaluates the effects of lightning striking the overpack.

11.2.12.2 Lightning Analysis

The HI-STORM 100 System is a large metal/concrete cask stored in an unsheltered ISFSI. As such, it may be subject to lightning strikes. When the HI-STORM 100 System is hit with lightning, the lightning will discharge through the steel shell of the overpack to the ground. Lightning strikes have high currents, but their duration is short (i.e., less than a second). The overpack outer shell is composed of conductive carbon steel and, as such, will provide a direct path to ground.

The MPC provides the confinement boundary for the spent nuclear fuel. The effects of a lightning strike will be limited to the overpack. The lightning current will discharge into the overpack and directly into the ground. Therefore, the MPC will be unaffected.

The lightning accident shall have no adverse consequences on thermal, criticality, confinement, shielding, or structural performance of the HI-STORM 100 System.

Structural

There is no structural consequence as a result of this event.

Thermal

There is no effect on the thermal performance of the system as a result of this event.

Shielding

There is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the lightning accident does not affect the safe operation of the HI-STORM 100 System.

11.2.12.3 Lightning Dose Calculations

An evaluation of lightning strikes demonstrates that the effect of a lightning strike has no effect on the confinement boundary or shielding materials. Therefore, no further analysis is necessary.

11.2.12.4 Lightning Accident Corrective Action

The HI-STORM 100 System will not sustain any damage from the lightning accident. There is no surveillance or corrective action required.

11.2.13 100% Blockage of Air Inlets

11.2.13.1 Cause of 100% Blockage of Air Inlets

This event is defined as a complete blockage of all four bottom inlets. Such blockage of the inlets may be postulated to occur as a result of a flood, blizzard snow accumulation, tornado debris, or volcanic activity.

11.2.13.2 100% Blockage of Air Inlets Analysis

The immediate consequence of a complete blockage of the air inlet ducts is that the normal circulation of air for cooling the MPC is stopped. A*n* ~~small~~ amount of heat will continue to be removed by localized air circulation patterns in the overpack annulus and outlet ducts, and the MPC will continue to radiate heat to the relatively cooler storage overpack. *As the temperatures of the MPC and its contents rise, the rate of heat rejection will increase correspondingly.* Under this condition, the temperatures of the overpack, the MPC and the stored fuel assemblies will rise as a function of time.

As a result of the large mass, and correspondingly large thermal capacity, of the storage overpack (in excess of 170,000 lbs), it is expected that a significant temperature rise is only possible if the completely blocked condition is allowed to persist for a number of days. This accident condition is, however, a short duration event that will be identified and corrected by scheduled periodic surveillance at the ISFSI site. Thus, the worst possible scenario is a complete loss of ventilation air during the scheduled surveillance time interval in effect at the ISFSI site.

It is noted that there is a large thermal margin, between the maximum calculated fuel cladding temperature with design-basis fuel decay heat (Tables 4.4.9, ~~and~~ 4.4.10, *4.4.46 and 4.4.27*) and the short-term fuel cladding temperature limit (1058°F), to meet the transient short-term fuel cladding temperature excursion. In other words, the fuel stored in a HI-STORM system can heat up by over 300°F before the short-term peak temperature limit is reached. The concrete in the overpack has a smaller, but nevertheless significant, margin between its calculated maximum long-term temperature and its short-term temperature limit, with which to withstand such extreme hypothetical events.

To rigorously evaluate the minimum time available before the short-term temperature limits of either the concrete or fuel cladding are exceeded, a transient thermal model of the HI-STORM System is developed. The HI-STORM system transient model with all four air inlet ducts completely blocked is created as an axisymmetric finite-volume (FLUENT) model. With the exceptions of the inlet air duct blockage and the specification of thermal inertia properties (i.e., density and heat capacity), the model is identical to the steady-state models discussed in Chapter 4 of this TSAR. The model includes the lowest MPC thermal inertia of any MPC design~~ and conservatively bounding fuel decay heat load is applied~~.

In the first step of the transient solution, the decay heat load is set equal to 22.25 kW and the MPC internal convection (i.e., thermosiphon) is suppressed. This evaluation provides the peak temperatures of the fuel cladding, the MPC confinement boundary and the concrete overpack shield wall, all as a function of time. Because the MPC with the lowest thermal inertia is used in the analysis, the~~The~~ temperature rise results obtained from evaluation of this *transient* model, therefore, bound the temperature rises for *all MPC* ~~the MPC-24 or MPC-68~~ designs *(Table 1.2.1)* under this postulated event.

The results of the blocked duct thermal transient evaluation are presented in Figure~~s~~ 11.2.7~~ and 11.2.8,~~ and Table 11.2.9. Figure 11.2.7 presents the temperature rise as a function of time after complete air inlet duct blockage for the following:

i. Fuel Cladding at the Location of Initial Maximum Temperature
ii. MPC Shell at the Location of Initial Maximum Temperature
iii. Overpack Inner Concrete at the Active Fuel Axial Mid-Height
iv. Overpack Inner Concrete at the Location of Initial Maximum Temperature
v. Overpack Outer Concrete at the Active Fuel Axial Mid-Height
vi. Overpack Outer Concrete at the Location of Initial Maximum Temperature

~~Figure 11.2.8 presents temperature contour plots at several instants in time to illustrate the transient heatup of the HI-STORM System.~~ The concrete reaches its short-term temperature limit in approximately 33 hours. Both the fuel cladding and the MPC confinement boundary temperatures remain ~~substantially~~ below their respective short-term temperature limits at 72 hours, *the fuel cladding by over 150°F and the confinement boundary by almost 175°F*. Table 11.2.9 summarizes the temperatures at several points in the HI-STORM System at 33 hours and 72 hours after complete inlet air duct blockage. These results establish the design-basis minimum surveillance interval (i.e., 24 hours per Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~) for the duct screens.

Incorporation of the MPC thermosiphon internal natural convection, as described in Chapter 4, enables the maximum design basis decay heat load to rise to about 29 kW. The thermosiphon effect also shifts the highest temperatures in the MPC enclosure vessel toward the top of the MPC. The peak MPC closure plate outer surface temperature, for example, is computed to be about 450°F in the thermosiphon-enabled solution compared to about 210°F in the thermosiphon-suppressed solution, with both solutions computing approximately the same peak clad temperature. In the 100%

inlet duct blockage condition, the heated MPC closure plate and MPC shell become effective heat dissipaters because of their proximity to the overpack outlet ducts and by virtue of the fact that thermal radiation heat transfer rises at the fourth power of absolute temperature. As a result of this increased heat rejection from the upper region of the MPC, the time limits for reaching the short-term concrete and peak fuel cladding temperature limits (33 hours and 72 hours, respectively) remain applicable.

It should be noted that the rupture of 100% of the fuel rods and the subsequent release of the contained rod gases has a significant positive impact on the MPC internal thermosiphon heat transport mechanism. The increase in the MPC internal pressure accelerates the thermosiphon, as does the introduction of higher molecular weight gaseous fission products. The values reported in Table 11.2.9 do not reflect this improved heat transfer and will actually be lower than reported. Crediting the increased MPC internal pressure only and neglecting the higher molecular weights of the gaseous fission products, the MPC bulk average gas temperature will be reduced by approximately 34.5 °C (62.1 °F).

Under the complete air inlet ducts blockage accident condition, it must be demonstrated that the MPC internal pressure does not exceed its design-basis accident limit during this event. Chapter 4 presented the MPC internal pressure calculated at an ambient temperature of 80°F, 100% fuel rods ruptured, full insolation, and maximum decay heat. This calculated pressure is *174.8*~~97.6~~ psi*a*~~g~~, as reported in Table 4.4.14, at an average temperature of *513.6*~~503.5~~°K. Using this pressure, a bounding increase in the MPC cavity temperature of 184°F (*102.2 °K*, maximum of MPC shell or fuel cladding temperature rise 33 hours after blockage of all four ducts, see Table 11.2.9), *the reduction in the bulk average gas temperature of 34.5 °C,* and the ideal gas law, the resultant MPC internal pressure is calculated below.

$$\frac{P_1}{P_2} = \frac{T_1}{T_2}$$

$$P_2 = \frac{P_1 T_2}{T_1}$$

$$P_2 = \frac{(174.8\,\text{psi}\,a)\,(513.6°\text{K} + 102.2°\text{K} - 34.5°\text{K})}{513.6°\text{K}}$$

$$P_2 = 197.8\,\text{psia or } 183.1\,\text{psig}$$

The accident MPC internal design pressure of ~~125~~*200* psig (Table 2.2.1) bounds the resultant pressure calculated above. Therefore, no additional analysis is required.

Structural

There are no structural consequences as a result of this event.

Thermal

Thermal analysis is performed to determine the time until the local maximum concrete temperature approaches its short-term temperature limit. At the specified time limit, the peak fuel cladding temperature remains below its short-term temperature limits. The MPC internal pressure for this event is calculated as presented above. As can be seen from the value above, the ~~125~~*200* psig design basis internal pressure for accident conditions used in the structural evaluation bounds the calculated value above.

To demonstrate the robustness of the HI-STORM System design, the results of the parametric study of incremental duct blockage performed in Subsection 11.1.4 are examined again. Even with three air inlet ducts completely blocked, as shown in Table 11.1.2, large steady-state margins against the short-term temperature limits exist for all system components and the fuel cladding of the stored assemblies. The temperature of the inner radial concrete surface, the limiting temperature under the 100% blockage condition, with a single open duct is ~~over~~ *approximately* ~~100~~*70*°F less than the short-term temperature limit. These results show that only a relatively small amount of the total air inlet duct area, on the order of 25% or less, must remain open to prevent exceeding system short-term temperature limits under steady-state conditions.

Shielding

There is no effect on the shielding performance of the system as a result of this event, since the concrete temperatures do not exceed the short-term condition design temperature provided in Table 2.2.3.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the 100% blockage of air inlets accident does not affect the safe operation of the HI-STORM 100 System, if the blockage is removed in the specified time period. The Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~ specify the time interval to ensure that the blockage duration cannot exceed the time limit calculated herein.

11.2.13.3 100% Blockage of Air Inlets Dose Calculations

As shown in the analysis of the 100% blockage of air inlets accident, the shielding capabilities of the HI-STORM 100 System are unchanged because the peak concrete temperature does not exceed its short-term condition design temperature. The elevated temperatures will not cause the breach of the confinement system and the short term fuel cladding temperature limit is not exceeded. Therefore, there is no radiological impact.

11.2.13.4 100% Blockage of Air Inlets Accident Corrective Action

Analysis of the 100% blockage of air inlet ducts accident shows that the fuel cladding peak temperatures remain substantially below the short-term temperature limits if the blockage is cleared within 72 hours. Overpack localized concrete temperatures will not exceed the short-term temperature limit if the blockage is cleared within 33 hours. Upon detection of the complete blockage of the air inlet ducts, the ISFSI operator shall assign personnel to clear the blockage with mechanical and manual means as necessary. After clearing the overpack ducts, the overpack shall be visually and radiologically inspected for any damage. Per the Technical Specifications in *Appendix A to the CoC*~~Chapter 12~~, visual inspection of the duct screens is specified on a frequency of 24 hours, or air outlet temperature monitoring is required. Therefore, an undetected blockage event could not exceed 24 hours.

If exit air temperature monitoring is performed in lieu of direct visual inspections, the difference between the ambient air temperature and the exit air temperature will be the basis for assurance that the temperature limits are not exceeded. A measured temperature difference between the ambient air and the exit air that exceeds the design-basis maximum air temperature rise, calculated in Section 4.4.2, will indicate blockage of the overpack air ducts.

For a flood that blocks the air inlet ducts but does not immerse the MPC, the site's emergency plan shall include provisions to either remove the water blocking the air inlet ducts or provide supplemental cooling prior to exceeding the time when the local concrete temperature reaches its short-term temperature limit.

11.2.14 Burial Under Debris

11.2.14.1 Cause of Burial Under Debris

Burial of the HI-STORM System under debris is not a credible accident. During storage at the ISFSI, there are no structures over the casks. The minimum regulatory distance of 100 meters from the ISFSI to the nearest site boundary and the controlled area around the ISFSI concrete pad precludes the close proximity of substantial amounts of vegetation.

There is no credible mechanism for the HI-STORM System to become completely buried under debris. However, for conservatism, complete burial under debris is considered. Blockage of the HI-STORM overpack air inlet ducts has already been considered in Subsection 11.2.13.

11.2.14.2 Burial Under Debris Analysis

Burial of the HI-STORM System does not impose a condition that would have more severe consequences for criticality, confinement, shielding, and structural analyses than that performed for the other accidents analyzed. The debris would provide additional shielding to reduce radiation doses. The accident external pressure encountered during the flood bounds any credible pressure loading caused by the burial under debris.

Burial under debris can affect thermal performance because the debris acts as an insulator and heat sink. This will cause the HI-STORM System and fuel cladding temperatures to increase. A thermal analysis has been performed to determine the time for the fuel cladding temperatures to reach the short term accident condition temperature limit during a burial under debris accident.

To demonstrate the inherent safety of the HI-STORM System, a bounding analysis that considers the debris to act as a perfect insulator is considered. Under this scenario, the contents of the HI-STORM System will undergo a transient heat up under adiabatic conditions. The minimum time required for the fuel cladding to reach the short term design fuel cladding temperature limit depends on the amount of thermal inertia of the cask, the cask initial conditions, and the spent nuclear fuel decay heat generation.

As stated in Subsection 11.2.13.2, there is a margin of over 300°F between the maximum calculated fuel cladding temperature and the short-term fuel cladding temperature limit. If *a highly conservative 150*~~300~~°F is postulated as the permissible fuel cladding temperature rise for the burial under debris scenario, then a curve representing the relationship between the time required and decay heat load can be constructed. This curve is shown in Figure 11.2.6. In this figure, plots of the burial period at different levels of heat generation in the MPC are shown based on a *150*~~300~~°F rise in fuel cladding temperature resulting from transient heating of the HI-STORM System. Using the values stated in Table 11.2.6, the allowable time before the cladding temperatures meet the short-term fuel cladding temperature limit can be determined using:

$$\Delta t = \frac{m \times c_p \times \Delta T}{Q}$$

where:

Δt = Allowable Burial Time (hrs)
m = Mass of HI-STORM System (lb)
c_p = Specific Heat Capacity (Btu/lb×°F)
ΔT = Permissible Fuel Cladding Temperature Rise (*150*~~300~~°F)
Q = Total Decay Heat Load (Btu/hr)

The allowable burial time as a function of total decay heat load (Q) is presented in Figure 11.2.6.

The MPC cavity internal pressure under this accident scenario is bounded by the calculated internal pressure for the hypothetical 100% air inlets blockage previously evaluated in Subsection 11.2.13.2.~~Conservatively including a hypothetical 10% rods rupture condition, a bounding MPC internal gas pressure (P_2) resulting from a 300°F (ΔT = 166.7°K) temperature rise is computed below:~~

$$\cancel{P_2 = \frac{P_1(T_1 + \Delta T)}{T_1}}$$

~~where:~~

~~P_1 = Initial cavity pressure (62.8 psig, [Table 4.4.14])~~
~~T_1 = Initial MPC cavity average gas temperature (503.5°K) at normal storage condition~~

~~Thus:~~

~~This pressure is below the accident condition MPC design pressure (125 psig). Thus confinement boundary structural integrity is maintained.~~

Structural

The structural evaluation of the MPC enclosure vessel for accident internal pressure conditions bounds the pressure calculated herein. Therefore, the resulting stresses from this event are well within the allowable values, as demonstrated in Section 3.4.

Thermal

With the cladding temperature rise limited to *150*~~300~~°F, the corresponding pressure rise, *bounded by the calculations in Subsection 11.2.13.2,* ~~calculation performed herein~~ demonstrates large margins of safety for the MPC vessel structural integrity. Consequently, cladding integrity and confinement function of the MPC are not compromised.

Shielding

There is no effect on the shielding performance of the system as a result of this event.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the burial under debris accident does not affect the safe operation of the HI-STORM 100 System, if the debris is removed within the specified time (Figure 11.2.6). The 24-hour minimum duct inspection interval specified in the Technical Specification in *Appendix A to the CoC*~~Subsection 12.3.18~~ ensures that a burial under debris condition will be detected long before the allowable burial time is reached.

11.2.14.3 Burial Under Debris Dose Calculations

As discussed in burial under debris analysis, the shielding is enhanced while the HI-STORM System is covered.

The elevated temperatures will not cause the breach of the confinement system and the short term fuel cladding temperature limit is not exceeded. Therefore, there is no radiological impact.

11.2.14.4 Burial Under Debris Accident Corrective Action

Analysis of the burial under debris accident shows that the fuel cladding peak temperatures will not exceed the short term limit if the debris is removed within *45*~~100~~ hours. Upon detection of the burial under debris accident, the ISFSI operator shall assign personnel to remove the debris with mechanical and manual means as necessary. After uncovering the storage overpack, the storage overpack shall be visually and radiologically inspected for any damage. The loaded MPC shall be removed from the storage overpack with the HI-TRAC transfer cask to allow complete inspection of the overpack air inlets and outlets, and annulus. Removal of obstructions to the air flow path shall be performed prior to the re-insertion of the MPC. The site's emergency action plan shall include provisions for the performance of this corrective action.

11.2.15 Extreme Environmental Temperature

11.2.15.1 Cause of Extreme Environmental Temperature

The extreme environmental temperature is postulated as a constant ambient temperature caused by extreme weather conditions. To determine the effects of the extreme temperature, it is conservatively assumed that the temperature persists for a sufficient duration to allow the HI-STORM 100 System to achieve thermal equilibrium. Because of the large mass of the HI-STORM 100 System, with its

corresponding large thermal inertia and the limited duration for the extreme temperature, this assumption is conservative.

11.2.15.2 Extreme Environmental Temperature Analysis

The accident condition considering an environmental temperature of 125°F for a duration sufficient to reach thermal equilibrium is evaluated with respect to accident condition design temperatures listed in Table 2.2.3. The evaluation is performed with design basis fuel with the maximum decay heat and the most restrictive thermal resistance. The 125°F environmental temperature is applied with full solar insolation.

The HI-STORM 100 System maximum temperatures for components close to the design basis temperatures are listed in Section 4.4. These temperatures are conservatively calculated at an environmental temperature of 80°F. The extreme environmental temperature is 125°F, which is an increase of 45°F. ~~Including the effect of a hypothetical 10% rods rupture condition on the MPC cavity gas conductivity, c~~Conservatively bounding temperatures ~~of~~*for all* the *MPC designs* ~~MPC-24 and MPC-68~~ are obtained and reported in Table 11.2.7. As illustrated by the table, all the temperatures are well below the accident condition design basis temperatures. The extreme environmental temperature is of a short duration (several consecutive days would be highly unlikely) and the resultant temperatures are evaluated against short-term accident condition temperature limits. Therefore, the HI-STORM 100 System extreme environmental temperatures meet the design requirements.

Additionally, the extreme environmental temperature generates a pressure that is bounded by the pressure calculated for the complete inlet duct blockage condition because the duct blockage condition temperatures are much higher than the temperatures that result from the extreme environmental temperature. As shown in Subsection 11.2.13.2, the accident condition pressures are below the accident limit specified in Table 2.2.1.

Structural

The structural evaluation of the MPC enclosure vessel for accident condition internal pressure bounds the pressure resulting from this event. Therefore, the resulting stresses from this event are bounded by that of the accident condition and are well within the allowable values, as discussed in Section 3.4.

Thermal

The resulting temperatures for the system and fuel assembly cladding are provided in Table 11.2.7. As can be seen from this table, all temperatures are within the short-term accident condition allowable values specified in Table 2.2.3.

Shielding

There is no effect on the shielding performance of the system as a result of this event, since the concrete temperature does not exceed the short-term temperature limit specified in Table 2.2.3.

Criticality

There is no effect on the criticality control features of the system as a result of this event.

Confinement

There is no effect on the confinement function of the MPC as a result of this event. As discussed in the structural evaluation above, all stresses remain within allowable values, assuring confinement boundary integrity.

Radiation Protection

Since there is no degradation in shielding or confinement capabilities as discussed above, there is no effect on occupational or public exposures as a result of this event.

Based on this evaluation, it is concluded that the extreme environment temperature accident does not affect the safe operation of the HI-STORM 100 System.

11.2.15.3 Extreme Environmental Temperature Dose Calculations

The extreme environmental temperature will not cause the concrete to exceed its normal design temperature. Therefore, there will be no degradation of the concrete's shielding effectiveness. The elevated temperatures will not cause a breach of the confinement system and the short-term fuel cladding temperature is not exceeded. Therefore, there is no radiological impact on the HI-STORM 100 System for the extreme environmental temperature and the dose calculations are equivalent to the normal condition dose rates.

11.2.15.4 Extreme Environmental Temperature Corrective Action

There are no consequences of this accident that require corrective action.

Table 11.2.1

INTENTIONALLY DELETED

Table 11.2.2

HI-STORM 100 OVERPACK ~~MID-HEIGHT~~*MAXIMUM* TEMPERATURES
AS A RESULT OF THE HYPOTHETICAL FIRE CONDITION

Material/Component	**Initial† Condition (°F)**	**During Fire (°F)**	**Post-Fire†† Cooldown (°F)**
Fuel Cladding	*691~~729~~* (MPC-24) *691 (MPC-24E)* *691 (MPC-32)* *740~~745~~* (MPC-68)	*692~~730~~* (MPC-24) *692 (MPC-24E)* *692 (MPC-32)* *741~~746~~* (MPC-68)	*692~~730~~* (MPC-24) *692 (MPC-24E)* *692 (MPC-32)* *741~~746~~* (MPC-68)
MPC Fuel Basket	*650~~689~~* (MPC-24) *650 (MPC-24E)* *660 (MPC-32)* *720~~725~~* (MPC-68~~24~~)	*651~~690~~* (MPC-24) *651 (MPC-24E)* *661 (MPC-32)* *721~~726~~* (MPC-68~~24~~)	*651~~690~~* (MPC-24) *651 (MPC-24E)* *661 (MPC-32)* *721~~726~~* (MPC-68~~24~~)
Overpack Inner Shell	195	300	195
Overpack Radial Concrete Inner Surface	195	281	282
Overpack Radial Concrete Mid-Surface	173	173	184
Overpack Radial Concrete Outer Surface	157	529	530
Overpack Outer Shell	157	570	570

† Bounding 195°F uniform inner surface and 157°F uniform outer surface temperatures assumed.

†† Maximum temperature during post-fire cooldown.

Table 11.2.3

SUMMARY OF INPUTS FOR HI-TRAC FIRE ACCIDENT HEAT-UP

Minimum Weight of Loaded HI-TRAC with Pool Lid (lb)	~~180,574~~*180,436*
Lower Heat Capacity of Carbon Steel (Btu/lbm·°R)	0.1
Heat Capacity UO_2 (Btu/lbm·°R)	0.056
Heat Capacity Lead (Btu/lbm·°R)	0.031
Maximum Decay Heat (kW)	*28.7*~~22.25~~
Total Fuel Assembly Weight (lb)	40,320
Lead Weight (lb)	52,*478*~~525~~
Water Weight (lb)	7,59~~558~~

Table 11.2.4

BOUNDING HI-TRAC HYPOTHETICAL
FIRE CONDITION PRESSURES†

Condition	**Pressure (psig)**			
	MPC-24	***MPC-24E***	***MPC-32***	**MPC-68**
Without Fuel Rod Rupture	*79.8~~70.3~~*	*79.8*	*79.8*	*79.8~~70.7~~*
With 100% Fuel Rod Rupture	*158.9~~114.9~~*	*159.3*	*191.1*	*126.4~~106.3~~*

† The reported pressures are based on temperatures that exceed the calculated maximum temperatures and are therefore slightly conservative.

Table 11.2.5

SUMMARY OF BOUNDING MPC PEAK TEMPERATURES
DURING A HYPOTHETICAL HI-TRAC FIRE ACCIDENT CONDITION

Location	**Initial Steady State Temperature [°F]**	**Bounding Temperature Rise [°F]**	**Hottest MPC Cross Section Peak Temperature [°F]**
Fuel Cladding	*872~~902~~*	*26.34~~5~~*	*898.39~~47~~*
Basket Periphery	*600~~527~~*	*26.34~~5~~*	*626.3~~572~~*
MPC Shell	*455~~459~~*	*26.34~~5~~*	*481.35~~04~~*

Table 11.2.6

SUMMARY OF INPUTS FOR ADIABATIC CASK HEAT-UP

Minimum Weight of HI-STORM 100 System (lb) (overpack and MPC)	300,000
Lower Heat Capacity of Carbon Steel (BTU/lb/°F)	0.1
Initial Uniform Temperature of Cask (°F)	*740~~745~~*†
Bounding Decay Heat (kW)	*28.74~~22.25~~*

† The cask is conservatively assumed to be at a uniform temperature equal to the maximum fuel cladding temperature.

Table 11.2.7

MAXIMUM TEMPERATURES CAUSED BY EXTREME ENVIRONMENTAL TEMPERATURES† [°F]

Location	**Temperature**	**Accident Temperature Limit**
Fuel Cladding	*736~~774~~* (PWR) *785~~790~~* (BWR)	1058
MPC Basket	*765~~770~~*	950
MPC ~~Outer~~ Shell ~~Surface~~	*396~~352~~*	775
Overpack Air Exit	*251~~231~~*	N/A
Overpack Inner Shell	*244~~217~~*	350 (overpack concrete)
Overpack Outer Shell	*190~~176~~*	350 (overpack concrete)

† Conservatively bounding temperatures reported include a hypothetical rupture of 10% of the fuel rods.

Table 11.2.8

MAXIMUM TEMPERATURES CAUSED BY LOSS OF WATER FROM THE HI-TRAC WATER JACKET [°F]

Temperature Location	**Normal**	**Calculated Without Water in Water Jacket**	**Accident Condition Design Temperature**
Fuel Cladding	~~902~~*872*	~~914~~*888*	1058 short-term
MPC Basket	~~884~~*852*	~~896~~*868*	950 short-term
MPC Basket Periphery	~~527~~*600*	~~541~~*612*	950 short-term
MPC ~~Outer~~ Shell ~~Surface~~	~~459~~*455*	~~476~~*466*	775 short-term
HI-TRAC Inner Shell	~~323~~*322*	~~345~~*342*	400 long-term 600 short-term
HI-TRAC Water Jacket Inner Surface	~~315~~*314*	~~329~~*334*	350 long-term
HI-TRAC Enclosure Shell Outer Surface	~~223~~*224*	~~221~~*222*	350 long-term
Axial Neutron Shield†	~~175~~*258*	~~177~~*261*	300 long-term

Note: Where it can be shown that the temperatures are below the normal long-term condition limits, the calculated temperatures are compared to the normal long-term temperature limits for conservatism. The corresponding short-term temperature limits are higher temperatures as presented in Table 2.2.3.

† *Local maximum section temperature.*

Table 11.2.9

SUMMARY OF BLOCKED AIR INLET DUCT EVALUATION RESULTS

	Max. Initial Steady-State Temp. † **(°F)**	**Temperature Rise (°F)**		**Transient Temperature (°F)**		**Short-Term Temperature Limit (°F)**
		at 33 hrs	at 72 hrs	at 33 hrs	at 72 hrs	
Fuel Cladding	~~745~~*740*	101	160	~~846~~*841*	~~905~~*900*	1058
MPC Shell	~~306~~*351*	184	250	~~490~~*535*	~~556~~*601*	775
Overpack Inner Shell #1††	~~172~~*199*	113	174	~~285~~*312*	~~346~~*373*	350 (overpack concrete)
Overpack Inner Shell #2†††	155	193	286	348	441	350 (overpack concrete)
Overpack Outer Shell	~~131~~*145*	14	40	~~145~~*159*	~~171~~*185*	350

† Conservatively bounding temperatures reported includes a hypothetical rupture of 10% of the fuel rods.

†† Coincident with location of initial maximum.

††† Coincident with active fuel axial mid-height.

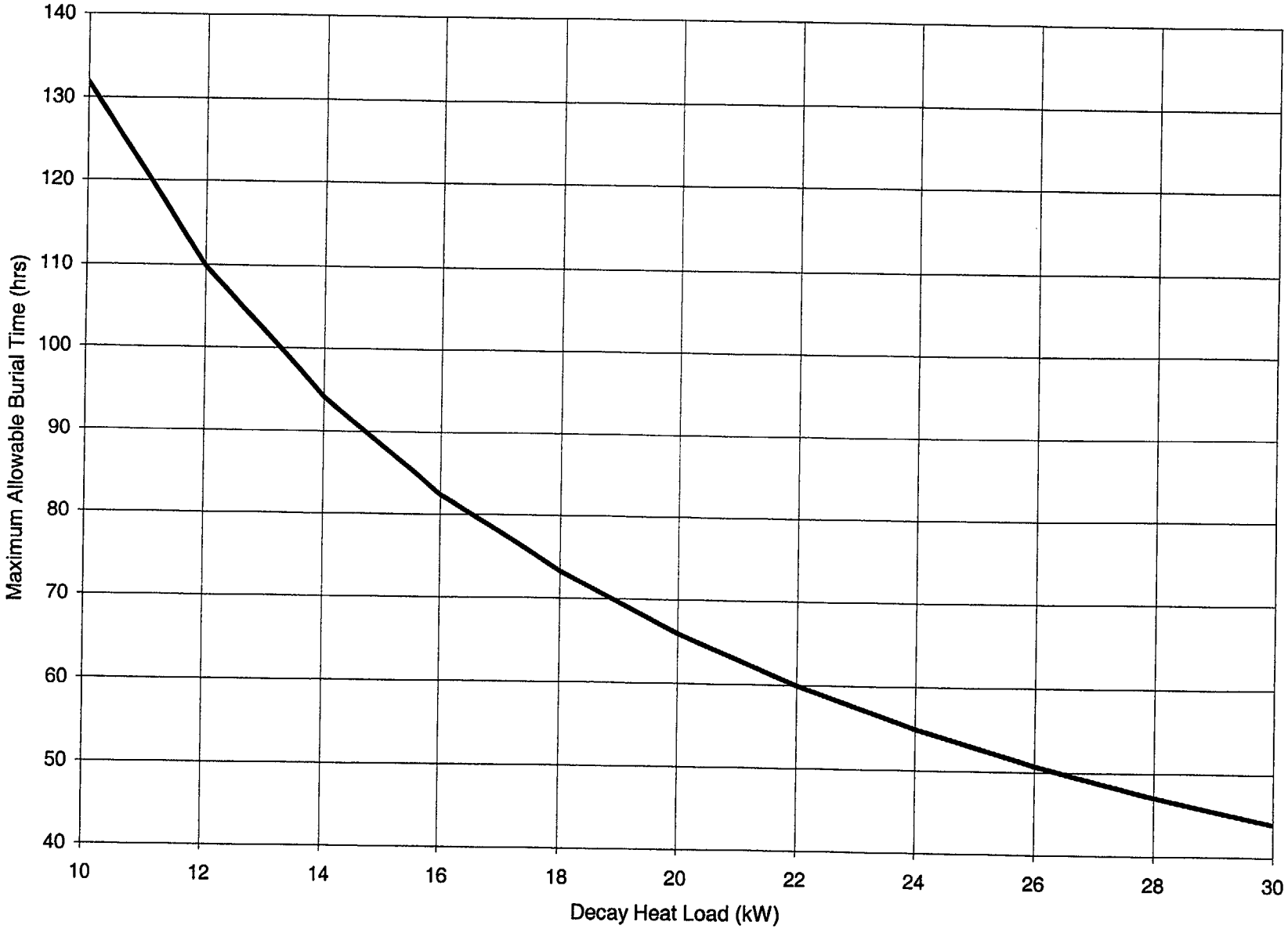

FIGURE 11.2.6; ALLOWABLE BURIAL UNDER DEBRIS TIME VERSUS DECAY HEAT LOAD

FIGURE 11.2.8; INTENTIONALLY DELETED

12.1 PROPOSED OPERATING CONTROLS AND LIMITS

12.1.1 NUREG-1536 (Standard Review Plan) Acceptance Criteria

12.1.1.1 This portion of the TSAR establishes the commitments regarding the HI-STORM 100 System and its use. Other 10CFR72 [12.1.2] and 10CFR20 [12.1.3] requirements in addition to the Technical Specifications may apply. The conditions for a general license holder found in 10CFR72.212 [12.1.2] shall be met by the licensee prior to loading spent fuel into the HI-STORM 100 System. The general license conditions governed by 10CFR72 [12.1.2] are not repeated with these Technical Specifications. Licensees are required to comply with all commitments and requirements.

12.1.1.2 The Technical Specifications provided in Appendix A to CoC 72-1014 and the authorized contents and design features provided in Appendix B to CoC 72-1014 are primarily established to maintain subcriticality, confinement boundary integrity, shielding and radiological protection, heat removal capability, and structural integrity under normal, off-normal and accident conditions. Table 12.1.1 addresses each of these conditions respectively and identifies the appropriate Technical Specification(s) designed to control the condition. Table 12.1.2 provides the list of Technical Specifications for the HI-STORM 100 System.

Table 12.1.1

HI-STORM 100 SYSTEM CONTROLS

Condition to be Controlled	Applicable Technical Specifications[1]
Criticality Control	Refer to Appendix B to Certificate of Compliance 72-1014 for fuel specifications and design features *3.3.1 Boron Concentration*
Confinement Boundary Integrity	3.1.1 Multi-Purpose Canister (MPC)
Shielding and Radiological Protection	Refer to Appendix B to Certificate of Compliance 72-1014 for fuel specifications and design features 3.1.1 Multi-Purpose Canister (MPC) 3.1.3 Fuel Cool-Down 3.2.1 TRANSFER CASK Average Surface Dose Rates 3.2.2 TRANSFER CASK Surface Contamination 3.2.3 OVERPACK Average Surface Dose Rates
Heat Removal Capability	Refer to Appendix B to Certificate of Compliance 72-1014 for fuel specifications and design features 3.1.1 Multi-Purpose Canister (MPC) 3.1.2 SFSC Heat Removal System
Structural Integrity	3.5 Cask Transfer Facility (CTF) (CoC 72-1014, Appendix B – Design Features) 5.5 Cask Transport Evaluation Program

[1] Technical Specifications are located in Appendix A to CoC 72-1014

Table 12.1.2

HI-STORM 100 SYSTEM TECHNICAL SPECIFICATIONS

NUMBER	TECHNICAL SPECIFICATION
1.0	USE AND APPLICATION 1.1 Definitions 1.2 Logical Connectors 1.3 Completion Times 1.4 Frequency
2.0	Not Used. Refer to Appendix B to CoC 72-1014 for fuel specifications.
3.0	LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY SURVEILLANCE REQUIREMENT (SR) APPLICABILITY
3.1.1	Multi-Purpose Canister (MPC)
3.1.2	SFSC Heat Removal System
3.1.3	Fuel Cool-Down
3.2.1	TRANSFER CASK Average Surface Dose Rates
3.2.2	TRANSFER CASK Surface Contamination
3.2.3	OVERPACK Average Surface Dose Rates
3.3.1	*Boron Concentration*
Table 3-1	MPC Model-Dependent Limits
4.0	Not Used. Refer to Appendix B to CoC 72-1014 for design features.
5.0	ADMINSTRATIVE CONTROLS AND PROGRAMS
5.1	Training Program
5.2	Pre-Operational testing and Training Exercise
5.3	Special Requirements For First System In Place
5.4	Radioactive Effluent Control Program
5.5	Cask Transport Evaluation Program
Table 5-1	TRANSFER CASK and OVERPACK Lifting Requirements

B 3.1 SFSC Integrity

B 3.1.1 Multi-Purpose Canister (MPC)

BASES

BACKGROUND

A TRANSFER CASK with an empty MPC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the ~~Functional and Operating Limits~~ *CoC*. A lid is then placed on the MPC. The TRANSFER CASK and MPC are raised to the top of the spent fuel pool surface. The TRANSFER CASK and MPC are then moved into the cask preparation area where dose rates are measured and the MPC lid is welded to the MPC shell and the welds are inspected and tested. The water is drained from the MPC cavity and vacuum drying is performed. The MPC cavity is backfilled with helium. Additional dose rates are measured and the MPC vent and drain cover plates and closure ring are installed and welded. Inspections are performed on the welds. *If the two-lid option is used, the* TRANSFER CASK bottom pool lid is replaced with the transfer lid to allow eventual transfer of the MPC into the OVERPACK.

MPC cavity vacuum drying is utilized to remove residual moisture from the MPC fuel cavity after the MPC has been drained of water. Any water that has not drained from the fuel cavity evaporates from the fuel cavity due to the vacuum. This is aided by the temperature increase due to the temperature of the fuel and by the heat added to the MPC from the optional warming pad, if used.

After the completion of vacuum drying, the MPC cavity is backfilled with helium meeting the pressure requirements of the CoC.

Backfilling of the MPC fuel cavity with helium promotes *gaseous* heat *dissipation* ~~transfer from the fuel~~ and the inert atmosphere protects the fuel cladding. Providing a helium pressure greater than atmospheric pressure ~~ensures that there will be no in-leakage of air over the life of the MPC~~ *at room temperature (70°F), eliminates air inleakage over the life of the MPC because the cavity pressure rises due to heat up of the confined gas by the fuel decay heat during storage.*

(continued)

BASES

BACKGROUND (continued)

In-leakage of air could be harmful to the fuel. Prior to moving the SFSC to the storage pad, the MPC helium leak rate is determined to ensure that the fuel is confined.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactivity during the storage of spent fuel in the MPC is ensured by the multiple confinement boundaries and systems. The barriers relied on are the fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the MPC in which the fuel assemblies are stored. Long-term integrity of the fuel and cladding depend on storage in an inert atmosphere. This is accomplished by removing water from the MPC and backfilling the cavity with an inert gas. The thermal analyses of the MPC assume that the MPC cavity is filled with dry helium.

LCO

A dry, helium filled and sealed MPC establishes an inert heat removal environment necessary to ensure the integrity of the multiple confinement boundaries. Moreover, it also ensures that there will be no air in-leakage into the MPC cavity that could damage the fuel cladding over the storage period.

APPLICABILITY

The dry, sealed and inert atmosphere is required to be in place during TRANSPORT OPERATIONS and STORAGE OPERATIONS to ensure both the confinement barriers and heat removal mechanisms are in place during these operating periods. These conditions are not required during LOADING OPERATIONS or UNLOADING OPERATIONS as these conditions are being established or removed, respectively during these periods in support of other activities being performed with the stored fuel.

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each MPC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for

(continued)

BASES

ACTIONS
(continued)

each MPC not meeting the LCO. Subsequent MPCs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the cavity vacuum drying pressure limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the potential quantity of moisture left within the MPC cavity. Since moisture remaining in the cavity during these modes of operation may represent a long-term degradation concern, immediate action is not necessary. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

A.2

Once the quantity of moisture potentially left in the MPC cavity is determined, a corrective action plan shall be developed and actions initiated to the extent necessary to return the MPC to an analyzed condition. Since the quantity of moisture estimated under Required Action A.1 can range over a broad scale, different recovery strategies may be necessary. Since moisture remaining in the cavity during these modes of operation may represent a long-term degradation concern, immediate action is not necessary. The Completion Time is sufficient to develop and initiate the corrective actions commensurate with the safety significance of the CONDITION.

B.1

If the helium backfill *pressure* ~~density~~ limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the ~~quantity of~~ helium *pressure* within the MPC cavity. Since too much or too little helium in the MPC

(continued)

BASES

ACTIONS (continued)

B.1 (continued)

during these modes represents a potential overpressure or heat removal degradation concern, an engineering evaluation shall be performed in a timely manner. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

B.2

Once the ~~quantity of~~ helium *pressure* in the MPC cavity is determined, a corrective action plan shall be developed and initiated to the extent necessary to return the MPC to an analyzed condition. Since the ~~quantity of~~ helium *pressure* estimated under Required Action B.1 can range over a broad scale, different recovery strategies may be necessary. Since elevated or reduced helium ~~quantities~~ *pressure* existing in the MPC cavity represent*s a* potential overpressure or heat removal degradation concern, corrective actions should be developed and implemented in a timely manner. The Completion Time is sufficient to develop and initiate the corrective actions commensurate with the safety significance of the CONDITION.

C.1

If the helium leak rate limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the impact of increased helium leak rate on heat removal and off-site dose. Since the HI-STORM OVERPACK is a ventilated system, any leakage from the MPC is transported directly to the environment. Since an increased helium leak rate represents a potential challenge to MPC heat removal and the off-site doses calculated in the TSAR confinement analyses, reasonably rapid action is warranted. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

(continued)

BASES

ACTIONS

A.2 (continued)

1. Ensure the annulus between the MPC and the TRANSFER CASK is filled with water. This places the system in a heat removal configuration which is bounded by the TSAR thermal evaluation of the system considering a vacuum in the MPC. The system is open to the ambient environment which limits the temperature of the ultimate heat sink (the water in the annulus) and, therefore, the MPC shell to 212° F.

2. Remove the TRANSFER CASK from the pit or vault and place it in an open area such as the refuel floor with a reasonable amount of clearance around the cask and not near a significant source of heat.

3. Supply nominally 1000 SCFM of ambient (or cooler) air to the space inside the vault at the bottom of the TRANSFER CASK to aid the convection heat transfer process. This quantity of air is sufficient to limit the temperature rise of the air in the cask-to-vault annulus to approximately 60° F at design basis maximum heat load while providing enhanced cooling of the cask by the forced flow.

Twenty-~~four~~ *two (22)* hours is an acceptable time frame to allow for completion of Required Action A.2 based on a thermal evaluation of a TRANSFER CASK located in a pit or vault. *In such a configuration, passive cooling mechanisms will be largely diminished.* Eliminating ~~all credit for~~ *90% of the* passive cooling mechanisms with the cask emplaced in the vault, the thermal inertia of the cask (approximately 20,000 Btu/° F) will limit the rate of ~~adiabatic~~ temperature rise with design basis maximum heat load to ~~less than four~~ *approximately 4.5* degrees F per hour. Thus, the fuel cladding temperature rise in ~~24~~ *22* hours will be less than 100° F. Large short term temperature margins exist to preclude any cladding integrity concerns under this temperature rise.

(continued)

B 3.3 SFSC Criticality Control

B 3.3.1 Boron Concentration

BASES

BACKGROUND

A TRANSFER CASK with an empty MPC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Certificate of Compliance. A lid is then placed on the MPC. The TRANSFER CASK and MPC are raised to the top of the spent fuel pool surface. The TRANSFER CASK and MPC are then moved into the cask preparation area where dose rates are measured and the MPC lid is welded to the MPC shell and the welds are inspected and tested. The water is drained from the MPC cavity and vacuum drying is performed. The MPC cavity is backfilled with helium. Additional dose rates are measured and the MPC vent and drain cover plates and closure ring are installed and welded. Inspections are performed on the welds. The TRANSFER CASK bottom pool lid is replaced with the transfer lid to allow eventual transfer of the MPC into the OVERPACK.

For those MPCs containing PWR fuel assemblies of relatively high initial enrichment, credit is taken in the criticality analyses for boron in the water within the MPC. To preserve the analysis basis, users must verify that the boron concentration of the water in the MPC meets specified limits when there is fuel and water in the MPC. This may occur during LOADING OPERATIONS and UNLOADING OPERATIONS.

APPLICABLE SAFETY ANALYSIS

The spent nuclear fuel stored in the SFSC is required to remain subcritical ($k_{eff} < 0.95$) under all conditions of storage. The HI-STORM 100 SFSC is analyzed to stored a wide variety of spent nuclear fuel assembly types with differing initial enrichments. For all PWR fuel loaded in the MPC-32, and for relatively high enrichment PWR fuel loaded in the MPC-24, -24E, and -24EF, credit was taken in the criticality analyses for neutron poison in the form of soluble boron in the water within the MPC. Compliance with this LCO preserves the assumptions made in the criticality analyses regarding credit for soluble boron.

(continued)

BASES (continued)

LCO

Compliance with this LCO ensures that the stored fuel will remain subcritical with a $k_{eff} \leq 0.95$ while water is in the MPC. LCOs 3.3.1.a and 3.3.1.b provide the minimum concentration of soluble boron required in the MPC water for the MPC-24, and MPC-24E/24EF, respectively. The limits are applicable to the respective MPCs if one or more fuel assemblies to be loaded in the MPC had an initial enrichment of U-235 greater than the value in Table 2.1-2 for loading with no soluble boron credit.

LCO 3.3.1.c provides the minimum boron concentration required in the MPC water for the MPC-32 if one or more to fuel assemblies to be loaded had an initial enrichment less than or equal to 4.1 wt.% U-235. LCO 3.3.1.d provides the minimum boron concentration required in the MPC water for the MPC-32 if one or more to fuel assemblies to be loaded had an initial enrichment greater than 4.1 wt.% U-235.

All fuel assemblies loaded into the MPC-24, MPC-24E, MPC-24EF, and MPC-32 are limited by analysis to maximum enrichments of 5.0 wt.% U-235.

APPLICABILITY

The boron concentration LCO is applicable whenever an MPC-24, -24E, -24EF, or -32 has at least one PWR fuel assembly in a storage location and water in the MPC, For the MPC-24 and MPC-24E/24EF, when all fuel assemblies to be loaded have initial enrichments less than the limit for no soluble boron credit as provided in CoC Appendix B, Table 2.1-2, the boron concentration requirement is implicitly understood to be zero.

During LOADING OPERATIONS, the LCO is applicable immediately upon the loading of the first fuel assembly in the MPC. It remains applicable until the MPC is drained of water

(continued)

BASES

LCO (continued)

During UNLOADING OPERATIONS, the LCO is applicable when the MPC is re-flooded with water after helium cooldown operations. Note that compliance with SR 3.0.4 assures that the water to be used to flood the MPC is of the correct boron concentration to ensure the LCO is upon entering the Applicability.

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each MPC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each MPC not meeting the LCO. Subsequent MPCs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1 and A.2

Continuation of LOADING OPERATIONS, UNLOADING OPERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the SFSC in compliance with the LCO. If the boron concentration of water in the MPC is less than its limit, all activities LOADING OPERATIONS, UNLOADING OPERATIONS or positive reactivity additions must be suspended immediately.

A.3

In addition to immediately suspending LOADING OPERATIONS, UNLOADING OPERATIONS and positive reactivity additions, action to restore the concentration to within the limit specified in the LCO must be initiated immediately.

(continued)

ACTIONS (continued)

A.3 (cont'd)

One means of complying with this action is to initiate boration of the affected MPC. In determining the required combination of boration flow rate and concentration, there is no unique design basis event that must be satisfied; only that boration be initiated without delay. In order to raise the boron concentration as quickly as possible, the operator should begin boration with the best source available for existing plant conditions.

Once boration is initiated, it must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

B.1

If the helium backfill density limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the quantity of helium within the MPC cavity. Since too much or too little helium in the MPC cavity during these modes represents a potential overpressure or heat removal degradation concern, an engineering evaluation shall be performed in a timely manner. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1

The boron concentration in the MPC water must be verified to be within the applicable limit within four hours of entering the Applicability of the LCO. For LOADING OPERATIONS, this means within four hours of loading the first fuel assembly into the cask.

For UNLOADING OPERATIONS, this means verifying the source of borated water to be used to re-flood the MPC within four hours of commencing re-flooding operations. This ensures that when the LCO is applicable (upon introducing water into the MPC), the LCO will be met.

Surveillance Requirement 3.3.1.1 is modified by a note which states that SR 3.3.1.1 is only required to be performed if the MPC is submerged in water or if water is to be added to, or recirculated through the MPC. This reflects the underlying premise of this SR which is to ensure, once the correct boron concentration is established, it need only be verified thereafter if the MPC is in a state where the concentration could be changed.

There is no need to re-verify the boron concentration of the water in the MPC after it is removed from the spent fuel pool unless water is to be added to, or recirculated through the MPC., because these are the only credible activities that could potentially change the boron concentration during this time. This note also prevents the interference of unnecessary sampling activities while lid closure welding and other MPC storage preparation activities are taking place in an elevated radiation area atop the MPC. Plant procedures should ensure that any water to be added to, or recirculated through the MPC is at a boron concentration greater than or equal to the minimum boron concentration specified in the LCO

REFERENCES

1. *TSAR Chapter 6.*