Attachment 3

In general, quantitative methods will be utilized for those events where risk reduction is required for the site worker or the public/environment as defined by 10 CFR §70.61. The level of risk reduction will be demonstrated to be at least equivalent to the application of qualitative methods (i.e., double contingency and/or single-failure criteria).

5.4.4 Methodology for Assessing Radiological Consequences

The methodology for assessing radiological consequences for events releasing radioactive materials is based on guidance provided in NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook* (NRC 1998b). The methodology for evaluating the consequences of a criticality event is described in Section 5.5.3.4. In this section, the methodology used to calculate radiological consequences is provided for the unmitigated and mitigated cases. Unmitigated results established from the application of this methodology are used to establish a safety strategy. Mitigated results established from the application of this methodology are presented in Section 5.5.3.

The radiological consequences for the facility worker, site worker, environment, and member of the public are assessed for events identified in the hazard evaluation. The facility worker is considered to be located near a potential accident release point. The site worker is considered to be 328 ft (100 m) from the MFFF building stack. The member of the public and the environment are considered to be located outside of the controlled area boundary approximately 5 mi (8 km) from the MFFF building stack. In the following analyses, consequences to the member of the public and environment are simply referred to as the public. Thus, limits associated with these two dose receptors, as specified in Table 5.4-1, are jointly considered when specifying event consequences.

Radiological releases are modeled as instantaneous releases to the facility worker and are conservatively modeled for the site worker and the public using a 0- to 2-hour 95th percentile dispersion χ/Q. No evacuation is credited for the assessment of the unmitigated radiological consequences.

5.4.4.1 Quantitative Unmitigated Consequence Analysis to Site Worker and Public

For each identified event sequence in the hazard evaluation, a bounding consequence for that event sequence is calculated. The bounding consequence is established by determining the applicable locations and locating the specific materials at risk from Table 5.5-2. The applicable, bounding material-at-risk values are then established from the identified values by selecting the maximum value for each form and each compound. Values for each form and compound are conservatively selected due to the dependence of the airborne release fraction, the respirable fraction, the specific activity, and the dose conversion factors.

5.4.4.1.1 Source Term Evaluation

The first step in the evaluation of the unmitigated consequences is to determine the source term. The source term is determined based on the five-factor formula as described in NUREG/CR-6410 (NRC 1998b). The five-factor formula consists of the following parameters:

- MAR – Material At Risk
- DR – Damage Ratio
- ARF – Airborne Release Fraction
- RF – Respirable Fraction
- LPF – Leak Path Factor.

These parameters are multiplied together to produce a source term (ST) representative of the amount of airborne respirable hazardous material released per a bounding scenario, as follows:

$$[ST]=[MAR]\times[DR]\times[ARF]\times[RF]\times[LPF] \qquad (5.4\text{-}1)$$

Applicable, bounding quantities are established for each of these factors. Note that for entrainment events, the airborne release fraction is replaced with the airborne release rate (ARR) multiplied by the entrainment duration (i.e., ARF = ARR x duration).

The LPF in all unmitigated cases is conservatively assumed to be one (i.e., no credit is taken for leak paths). A discussion crediting LPFs in mitigated radiological consequence evaluations is provided in Section 5.4.4.3.

Applicable ARF and RF values are established for the material forms (i.e., powder, solution, pellet, rod, and filter), the material types available at the MFFF, and the release mechanisms that could potentially occur at the MFFF from values presented in NUREG/CR-6410 and DOE-HDBK-3010, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE 1994). Bounding ARF and RF values are then established for each material form per release mechanism by maximizing the product of these two factors of the potential material types found at the MFFF (i.e., maximizing ARF x RF for each form and per release mechanism). Thus, the result is applicable bounding ARF and RF values for specific release mechanisms for specific material forms.

For some events identified in the hazard evaluation, the identified event may encompass a number of release mechanisms. In these cases, the bounding product of the ARF and RF, per material form, will be applied to the MAR. The bounding products considered are based on the entrainment, explosive detonation, explosive overpressurization, fire/boil, and drop/crush release mechanisms for materials of a specific form.

A DR of one (1.0) is conservatively utilized to determine the radiological consequences. The sole exception is in the case of fuel rods. In this case, the DR is based upon a conservative engineering analysis of the response of structural materials for containment to the type and level of stress or force generated by the evaluated event based on available literature (e.g., SAND 1981, SAND 1987, SAND 1991).

5.4.4.1.2 Dose Evaluation

The source term is used to calculate the total effective dose equivalent (TEDE) and to establish the effluent concentration. TEDE values are calculated for exposure via the inhalation pathway to a site worker (S) and a member of the public offsite (P). Other potential pathways (e.g., submersion and ingestion) are not considered to contribute a significant fraction to the calculated

TEDE. The following expression is used to calculate the TEDE for potential radiological releases at the MFFF:

$$[TEDE]^{S,P} = [ST] \times [\chi/Q]^{S,P} \times [BR] \times [C] \times \sum_{X=1}^{N} [f]_X \times [DCF]_{effective,X} \qquad (5.4\text{-}2)$$

where:

ST	=	source term unique to each event
$[\chi/Q]^{S,P}$	=	atmospheric dispersion factor unique to the site worker and member of the public
BR	=	breathing rate
C	=	unit's conversion constant
f_X	=	includes the specific activity and the fraction of the total quantity of the MAR that is the radionuclide X
$DCF_{effective,X}$	=	effective inhalation dose conversion factor for the specified radionuclide X
N	=	total number of inhalation dose-contributing radionuclides involved in the evaluated event.

Table 5.4-3 lists the radionuclide composition of common materials located in the MFFF that have been evaluated for potential release in the hypothesized accident events.

A 24-hour average effluent concentration (EC) is calculated for a release to the environment of each of the released radionuclides using the following expression:

$$[EC]^X = \frac{[ST] \times [\chi/Q]^P \times [f]_X}{(3600 - \text{sec/hr})(24 - \text{hr})} \qquad (5.4\text{-}3)$$

Values for EC are compared to 5,000 times the values specified in Table 2 of Appendix B to 10 CFR Part 20. The ratios of the calculated value to the modified 10 CFR Part 20 value for each radionuclide are summed to ensure that the cumulative limit is satisfied, as follows:

$$\text{Total EC Ratio} = \sum_{X=1}^{N} \frac{[EC]^X}{5000 \times [EC]^X_{10CFR20}} < 1.0 \qquad (5.4\text{-}4)$$

Atmospheric dispersion factors (χ/Q) for the site worker and a member of the public were established from SRS data using the MACCS2 and ARCON96 computer codes. These codes are briefly discussed in Section 5.4.4.1.3.

The breathing rate (BR) is conservatively assumed to be 3.47×10^{-4} m^3/sec (20.8 L/min). This value is from Regulatory Guide 1.25 (NRC 1972) and is equivalent to the uptake volume (10 m^3)

of a worker in an 8-hour workday. The inhalation dose conversion factors (DCFs) are taken from Federal Guidance Report No. 11 (EPA 1989).

Once unmitigated radiological consequences (TEDE and EC) are established for each event identified in the hazard assessment, events are grouped and bounding events are established for each of these groupings under each event type. Unmitigated radiological consequences established for each bounding event are then compared to the limits in Table 5.4-1. Based on this comparison and potential prevention and/or mitigation features available to each event grouping, the safety strategy is established for each bounding event within an event type.

5.4.4.1.3 Atmospheric Dispersion Evaluation

5.4.4.1.3.1 MACCS2

The MACCS2 (MELCOR Accident Consequence Code System for the Calculation of the Health and Economic Consequences of Accidental Atmospheric Radiological Releases) computer code was used to compute the downwind relative air concentrations (χ/Q) for a 1-hour ground-level release from the MFFF. The relative concentration (atmospheric dispersion factors) (χ/Q) is the dilution provided relative to site meteorology and distance to the receptor(s). MACCS2 simulates the impact of accidental atmospheric releases of radioactive materials on the surrounding environment. A detailed description of the MACCS2 model is available in NUREG/CR-6613 (NRC 1998a).

A MACCS2 calculation consists of three phases: input processing and validation, phenomenological modeling, and output processing. The phenomenological models are based mostly on empirical data, and the solutions they entail are usually analytical in nature and computationally straightforward. The modeling phase is subdivided into three modules. ATMOS treats atmospheric transport and dispersion of material and its deposition from the air utilizing a Gaussian plume model with Pasquill-Gifford dispersion parameters. EARLY models consequences of the accident to the surrounding area during an emergency action period. CHRONIC considers the long-term impact in the period subsequent to the emergency action period.

The receptor of interest includes the maximally exposed offsite individual (MOI) at 5 mi (8 km). The input into the MACCS2 code included SRS meteorological data files. The SRS meteorological data files are composed of hourly data for SRS for each calendar year from 1987 through 1996. No credit is taken for building wake effects. The release is assumed to be from ground level at the MFFF, without sensible heat, over 1 hour. For conservatism, no wet or dry deposition has been assumed.

The dose incurred by the MOI is reported at the 95th percentile level without regard to sector. The MOI is assumed to be located at the closest site boundary, which is 5 mi (8 km) from the MFFF.

5.4.4.1.3.2 ARCON96

The ARCON96 computer code was used to compute the downwind relative air concentrations (χ/Q) for the onsite receptor located within 328 ft (100 m) of a ground-level release from the MFFF to account for low wind meander and building wake effects. ARCON96 implements a straight-line Gaussian dispersion model with dispersion coefficients that are modified to account for low wind meander and building wake effects (NRC 1997). A constant release rate is assumed for the entire period of release. Building wake effects are considered in the evaluation of relative concentration from ground-level releases. ARCON96 calculates relative concentration using hourly meteorological data. It then combines the hourly averages to estimate concentrations for periods ranging in duration from 2 hours to 30 days. Wind direction is considered as the averages are formed. As a result, the averages account for persistence in both diffusion conditions and wind direction. Cumulative frequency distributions are prepared from the average relative concentrations. Relative concentrations that are exceeded no more than 5% of the time (95th percentile relative concentrations) are determined from the cumulative frequency distributions for each averaging period.

Atmospheric dispersion factors (χ/Q) for ground-level releases to the site worker and a member of the public were established using these codes as 4.2×10^{-4} sec/m^3 and 3.7×10^{-6} sec/m^3, respectively.

5.4.4.2 Consequence Analysis for the Facility Worker

For the facility worker, conservative consequences are qualitatively estimated. The facility worker is assumed to be at the location of the release. Thus, for events evaluated in the preliminary accident analysis involving an airborne release of plutonium or americium, principal SSCs are deterministically applied. For events involving the release of uranium, the unmitigated consequences are estimated to be low and principal SSCs are not applied.

5.4.4.3 Quantitative Mitigated Consequence Analysis

The methodology used to establish the mitigated radiological consequences closely follows the methodology used to establish the unmitigated consequences. Mitigated consequences are calculated for those bounding events representing an event grouping in which mitigation features will be utilized to reduce the risk in accordance with 10 CFR §70.61.

To perform the mitigated consequence analysis, the consequence analysis methodology described in the previous section is utilized with the following modification: applicable bounding LPF values are used for the principal SSCs providing mitigation. This LPF is associated with the fraction of the radionuclides in the aerosol that are transported through some confinement deposition or filtration mechanism. There can be many LPFs for some events, and their cumulative effect is often expressed as one value that is the product of all leak path multiples. Inclusion of these multiples in a single LPF is done to clearly differentiate between calculations of doses without mitigation (where the LPF is assumed equal to one) and calculations of doses with mitigation (where the LPF reflects the dose credit provided to the controls). In this manner, the LPF represents the credit taken for the mitigating principal SSCs at the MFFF.

- Analysis of failure modes and common mode failures
- Special inspection, testing, and maintenance requirements
- Management measures applied to the item and the basis for grading
- Safety parameters controlled by the item, safety limit on the parameter
- Assessment of the impact of non-safety features on IROFS ability to perform their function.

These analyses will be applied to each event sequence with the potential to exceed 10 CFR §70.61 requirements. The analyses verify that single failure criterion or double contingency principle is effectively applied, that there are no common mode failures, that the IROFS will be effective in performing their intended safety function, that the conditions that the IROFS will be subjected to will not diminish the reliability of the IROFS, and also identify and verify appropriate IROFS failure detection methods. Each of the event sequences and the accompanying specific measures provided by the aforementioned deterministic criteria will be documented in the ISA and summarized in the ISA summary. This combination of analyses will demonstrate that the likelihood requirements of 10CFR70.61 are satisfied.

In conjunction with (but separate from) the safety/licensing basis to provide additional confidence in the demonstration of the adequacy of these deterministic design criteria, a supplemental likelihood assessment will be conducted for events (excluding NPH events) that could result in consequences that exceed the threshold criteria for the site worker or the public. This supplemental assessment will be based on the guidance provided in NUREG 1718 and will demonstrate a target likelihood comparable to a "score" or -5 as defined in Appendix A of NUREG 1718.

5.4.4 Methodology for Assessing Radiological Consequences

The methodology for assessing radiological consequences for events releasing radioactive materials is based on guidance provided in NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook* (NRC 1998b). The methodology for evaluating the consequences of a criticality event is described in Section 5.5.3.4. In this section, the methodology used to calculate radiological consequences is provided for the unmitigated and mitigated cases. Unmitigated results established from the application of this methodology are used to establish a safety strategy. Mitigated results established from the application of this methodology are presented in Section 5.5.3.

The radiological consequences for the facility worker, site worker, member of the public, and the environment are assessed for events identified in the hazard evaluation. The facility worker is considered to be within the MFFF located inside a room near a potential accident release point. The site worker is considered to be 328 ft (100 m) from the MFFF building stack. The member of the public is considered to be located near the controlled area boundary at approximately 5 mi

(8 km) from the MFFF building stack. The controlled area is defined as an area outside of a restricted area but inside the site boundary to which access can be limited by the licensee for any reason. The nearest site boundary is 5.4 miles (8.8 km) and the nearest SRS controlled access point is 5.1 miles (8.1 km). A restricted area is an area to which access is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. The MFFF restricted area is coincident with the protected area, an area encompassed by physical barriers and to which access is controlled and is located at 170.6 ft (52 m) from the MFFF building stack. Radiological consequences to the environment are assessed outside the MFFF restricted area (i.e., at the Restricted Area Boundary).

Radiological releases are modeled as instantaneous releases to the facility worker and are conservatively modeled for the site worker, the public, and the environment using a 0- to 2-hour 95th percentile dispersion χ/Q. No evacuation is credited for the assessment of the unmitigated radiological consequences.

5.4.4.1 Quantitative Unmitigated Consequence Analysis to Site Worker and Public

For each identified event sequence in the hazard evaluation, a bounding consequence for that event sequence is calculated. The bounding consequence is established by determining the applicable locations and locating the specific materials at risk from Tables 5.5-3a and 5.5-3b. The applicable, bounding material-at-risk values are then established from the identified values by selecting the maximum value for each form and each compound. Values for each form and compound are conservatively selected due to the dependence of the airborne release fraction, the respirable fraction, the specific activity, and the dose conversion factors.

5.4.4.1.1 Source Term Evaluation

The first step in the evaluation of the unmitigated consequences is to determine the source term. The source term is determined based on the five-factor formula as described in NUREG/CR-6410 (NRC 1998b). The five-factor formula consists of the following parameters:

- MAR – Material At Risk
- DR – Damage Ratio
- ARF – Airborne Release Fraction
- RF – Respirable Fraction
- LPF – Leak Path Factor.

These parameters are multiplied together to produce a source term (ST) representative of the amount of airborne respirable hazardous material released per a bounding scenario, as follows:

$$[ST] = [MAR] \times [DR] \times [ARF] \times [RF] \times [LPF] \qquad (5.4\text{-}1)$$

Applicable, bounding quantities are established for each of these factors. Note that for entrainment events, the airborne release fraction is replaced with the airborne release rate (ARR) multiplied by the entrainment duration (i.e., ARF = ARR x duration). It has been assumed that the duration of the entrainment release is one hour, assuming no evacuation. The unmitigated consequences associated with entrainment events are orders of magnitude below those associated

with the bounding events. A longer duration of release up to the entire MAR involved in the event would not impact the safety strategy and the mitigated consequences would still be acceptable.

The LPF in all unmitigated cases is conservatively assumed to be one (i.e., no credit is taken for leak paths). A discussion crediting LPFs in mitigated radiological consequence evaluations is provided in Section 5.4.4.4.

Applicable ARF and RF values are established for the material forms (i.e., powder, solution, pellet, rod, and filter), the material types available at the MFFF, and the release mechanisms that could potentially occur at the MFFF from values presented in NUREG/CR-6410 and DOE-HDBK-3010, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE 1994). Bounding ARF and RF values are then established for each material form per release mechanism by maximizing the product of these two factors of the potential material types found at the MFFF (i.e., maximizing ARF x RF for each form and per release mechanism). Thus, the result is applicable bounding ARF and RF values for specific release mechanisms for specific material forms.

For some events identified in the hazard evaluation, the identified event may encompass a number of release mechanisms. In these cases, the bounding product of the ARF and RF, per material form, will be applied to the MAR. The bounding products considered are based on the entrainment, explosive detonation, explosive overpressurization, fire/boil, and drop/crush release mechanisms for materials of a specific form.

A DR of one (1.0) is conservatively utilized to determine the radiological consequences for most material forms and events. Exceptions include fuel rods and pellets for an explosive over-pressurization event, fires in select storage areas, and the drop of fuel assemblies.

5.4.4.1.2 Dose Evaluation

The source term is used to calculate the total effective dose equivalent (TEDE). TEDE values are calculated for exposure via the inhalation pathway to a site worker (S) and a member of the public offsite (P). Other potential pathways (e.g., submersion and ingestion) are not considered to contribute a significant fraction to the calculated TEDE. The following expression is used to calculate the TEDE for potential radiological releases at the MFFF:

$$[TEDE]^{S,P} = [ST] \times [\chi/Q]^{S,P} \times [BR] \times [C] \times \sum_{X=1}^{N} [f]_X \times [DCF]_{effective,X} \qquad (5.4\text{-}2)$$

where:

ST	=	source term unique to each event
$[\chi/Q]^{S,P}$	=	atmospheric dispersion factor unique to the site worker and member of the public
BR	=	breathing rate
C	=	unit's conversion constant

f_X	=	includes the specific activity and the fraction of the total quantity of the MAR that is the radionuclide X
$DCF_{effective,X}$	=	effective inhalation dose conversion factor for the specified radionuclide X
N	=	total number of inhalation dose-contributing radionuclides involved in the evaluated event.

Table 5.4-3 lists the radionuclide composition of common materials located in the MFFF that have been evaluated for potential release in the hypothesized accident events.

Atmospheric dispersion factors (χ/Q) for the site worker and a member of the public were established from SRS data using the MACCS2 and ARCON96 computer codes. These codes are briefly discussed in Section 5.4.4.1.3.

The breathing rate (BR) is conservatively assumed to be 3.47×10^{-4} m^3/sec (20.8 L/min). This value is from Regulatory Guide 1.25 (NRC 1972) and is equivalent to the uptake volume (10 m^3) of a worker in an 8-hour workday.

The inhalation dose conversion factors (DCFs) are taken from Federal Guidance Report No. 11 (EPA 1989), based on the form of the potential releases from the MFFF when received by the dose receptor. For the MFFF, dose receptors are conservatively assumed exposed to oxides of unpolished plutonium, polished plutonium, and/or uranium, and/or elemental americium. The oxides have specific activities (molecular) that are greater by a factor of 2 than those of other potential release forms (e.g., plutonium oxalates and nitrates). For many radionuclides, Federal Guidance Report No. 11 provides dose conversion factors for more than one chemical form (or solubility). The multiple forms are represented by transportability classes. For the MFFF, Y class DCFs have been used for all radionuclides except americium, which only has a W class DCF. Releases of soluble materials are bounded by those of the insoluble form because the amount of MAR in the bounding events for soluble releases is smaller than the amount of MAR for the insoluble releases.

Once unmitigated radiological consequences are established for each event identified in the hazard assessment, events are grouped and bounding events are established for each of these groupings under each event type. Unmitigated radiological consequences established for each bounding event are then compared to the limits in Table 5.4-1. Based on this comparison and potential prevention and/or mitigation features available to each event grouping, the safety strategy is established for each bounding event within an event type.

5.4.4.1.3 Atmospheric Dispersion Evaluation

5.4.4.1.3.1 MACCS2

The MACCS2 (MELCOR Accident Consequence Code System for the Calculation of the Health and Economic Consequences of Accidental Atmospheric Radiological Releases) computer code was used to compute the downwind relative air concentrations (χ/Q) for a 1-hour ground-level release from the MFFF. The relative concentration (atmospheric dispersion factors) (χ/Q) is the

dilution provided relative to site meteorology, elevation of release, and distance to the receptor(s). MACCS2 simulates the impact of accidental atmospheric releases of radioactive materials on the surrounding environment. A detailed description of the MACCS2 model is available in NUREG/CR-6613 (NRC 1998a).

A MACCS2 calculation consists of three phases: input processing and validation, phenomenological modeling, and output processing. The phenomenological models are based mostly on empirical data, and the solutions they entail are usually analytical in nature and computationally straightforward. The modeling phase is subdivided into three modules. ATMOS treats atmospheric transport and dispersion of material and its deposition from the air utilizing a Gaussian plume model with Pasquill-Gifford dispersion parameters. EARLY models consequences of the accident to the surrounding area during an emergency action period. CHRONIC considers the long-term impact in the period subsequent to the emergency action period.

The receptor of interest includes the maximally exposed offsite individual (MOI) at the controlled area boundary. The input into the MACCS2 code included SRS meteorological data files. The SRS meteorological data files are composed of hourly data for SRS for each calendar year from 1987 through 1996. No credit is taken for building wake effects. The release is assumed to be from ground level at the MFFF, without sensible heat, over 1 hour. For conservatism, no wet or dry deposition has been assumed.

The dose incurred by the MOI is reported at the 95th percentile level without regard to sector. The MOI is assumed to be located at the closest site boundary to the MFFF. The one-hour atmospheric dispersion factor (χ/Q) for ground-level releases to a member of the public located at the controlled area boundary (approximately 5 mi [8 km] from the MFFF stack) was computed by MACCS2 to be 3.7×10^{-6} sec/m^3.

5.4.4.1.3.2 ARCON96

The ARCON96 computer code was used to compute the downwind relative air concentrations (χ/Q) for the site worker located within 328 ft (100 m) of a ground-level release from the MFFF to account for low wind meander and building wake effects.

ARCON96 implements a normal straight-line Gaussian dispersion model with dispersion coefficients that are empirically modified from atmospheric tracer and wind tunnel experimental data to account for low wind meander and aerodynamic effects of buildings on the near-field wind field (e.g., wake and cavity regions) (NRC 1997). Hourly, normalized concentrations (χ/Qs) are calculated from hourly-averaged meteorological data. The hourly values are averaged to develop χ/Qs for five periods ranging from 2 to 720 (i.e., 0 to 2 hr, 2 to 8 hr, 8 to 24 hr, 1 to 4 days, and 4 to 30 days) hours in duration. Of these time periods, only the 0 to 2 hr interval is used for dose calculations. ARCON96 accounts for wind direction as the averages are formed. To ensure that the most conservative χ/Q was selected for dose calculations, χ/Q determinations were made for 16 different wind directions. As a result, the averages account for persistence in both diffusion conditions and wind direction. Cumulative frequency distributions are prepared from the average relative concentrations. Relative concentrations that are exceeded no more than

5% of the time (i.e., 95th percentile relative concentrations) are determined from the cumulative frequency distributions for each averaging period.

The two-hour atmospheric dispersion factor (χ/Q) for ground-level releases to the site worker at 328 ft (100 m) was calculated by ARCON96 to be 6.1×10^{-4} sec/m^3.

5.4.4.2 Consequence Analysis for the Facility Worker

For the facility worker, conservative consequences are qualitatively estimated. The facility worker is assumed to be at the location of the release. Thus, for events evaluated in the preliminary accident analysis involving an airborne release of plutonium or americium, principal SSCs are deterministically applied. For events involving the release of uranium, the unmitigated consequences are estimated to be low and principal SSCs are not applied.

5.4.4.3 Environmental Consequences

A 24-hour average effluent concentration (EC) is calculated for a release to the environment of each of the released radionuclides using the following expression:

$$[EC]^{X} = \frac{[ST]/[RF] \times [\chi/Q]^{RA} \times [f]_{X}}{(3600 - \text{sec/hr})(24 - \text{hr})} \quad (5.4\text{-}3)$$

where:

$[\chi/Q]^{RA}$ = atmospheric dispersion factor unique to the restricted area boundary

The 24-hour average atmospheric dispersion factor $(\chi/Q)^{RA}$ for ground-level releases at the restricted area boundary (171 ft [52 m]) was calculated to be 2.79×10^{-04} sec/m^3 by ARCON96.

Since the radiological consequences to the environment are limited to an airborne effluent concentration and not a respirable quantity, the respirable fraction (RF) in Equation 5.4-3 corrects the source term (Equation 5.4-2) such that the source term reflects an airborne quantity.

Table 5.4-3 lists the radionuclide composition of common materials located in the MFFF that have been evaluated for potential release in the hypothesized accident events.

Values for EC are compared to 5,000 times the values specified in Table 2 of Appendix B to 10 CFR Part 20, which are listed in Table 5.4-3. The ratios of the calculated value to the modified 10 CFR Part 20 value for each radionuclide are summed to ensure that the cumulative limit is satisfied, as follows:

$$\text{Total EC Ratio} = \sum_{X=1}^{N} \frac{[EC]^{X}}{5000 \times [EC]^{X}_{10CFR20}} < 1.0 \quad (5.4\text{-}4)$$

Once unmitigated environmental consequences are established for each event identified in the hazard assessment, events are grouped, and bounding events are established for each of these groupings under each event type. Unmitigated environmental consequences established for each