Department of Energy
National Nuclear Security Administration
Washington, DC 20585

November 14, 2011

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

This is in reference to your August 19, 2011, letter concerning the National Nuclear Security Administration (NNSA) Savannah River Site Office (SRS) Tritium Facilities. SRS sent a letter (enclosed) to the NNSA Administrator dated November 4, 2011, outlining the path forward with a projected schedule to address the Defense Nuclear Facilities Safety Board's (DNFSB) concerns as well as SRS identified issues pertaining to site-specific meteorological parameters. Some actions have already occurred such as administratively controlling the Material at Risk (MAR) to lower levels, solicitation of technical panel input for atmospheric transport modeling, and added emphasis on emergency planning activities and drills. The other DNFSB concerns require time and funding, such as the research and selection of SRS-specific meteorological parameters, calculation of site-specific deposition velocity (DV), and site-wide emergency response activities, all of which are laid out in the attached SRS proposal. Due to the forecasted durations to complete this work, SRS is also pursuing additional interim safety controls for Tritium Facilities, such as MAR segregation.

In addition, NNSA has queried the Defense Programs sites to ascertain site-specific DV values, which will be analyzed in conjunction with the SRS data. The results of this activity and any future decisions will be coordinated with the pertinent Department of Energy/NNSA offices to ensure a consistent and integrated path forward regarding responses to field inquiries, Melcor Accident Consequence Code System, Version 2 computer code guidance, and its application. NNSA looks forward to working with the DNFSB and sharing progress in this matter, and we'll also coordinate a briefing to you on this matter in the near future.

If you have any questions, please contact Mr. James McConnell, Assistant Deputy Administrator for Nuclear Safety, Nuclear Operations, and Governance Reform, at (202) 586-4379.

Sincerely,

Donald L. Cook
Deputy Administrator
for Defense Programs

Enclosure

cc: M. Campagnone, HS-1.1
D. Dearolph, SRSO

National Nuclear Security Administration
Savannah River Site Office
P.O. Box A
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November 04, 2011

Mr. Thomas P. D'Agostino, Administrator
National Nuclear Security Administration
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0701

SUBJECT: Defense Nuclear Facilities Safety Board (DNFSB) Safety Basis Development Issues with the Tritium Facilities at the Savannah River Site (Letter, Winokur to D'Agostino, dated August 19, 2011)

Reference: Letter Lovett, Jr. and Elliott to Temple, *Savannah River Management & Operation (M&O) Contract DE-AC09-08SR22470; Concurrence with Action Plan to Address Safety Basis Development Issues*, dated October 27, 2011

Dear Mr. D'Agostino:

The DNFSB in the referenced letter expressed concerns about the safety philosophy in the tritium facilities at the Savannah River Site (SRS). Specifically, their concern pertains to the downgrading of safety controls and the analytical approach used to calculate dose consequences to the public. In the DNFSB's view, these changes have weakened the safety posture and increased the potential for both the workers and public to be exposed to higher consequences. It should be noted that in addition to the DNFSB's concerns about the analytical parameters used in the Melcor Accident Consequence Code System, Version 2 (MACCS2) computer code, other parameters have come into question (SRS meteorological data). Additionally, these analytical issues affect all nuclear facilities at SRS.

SRS has identified a path forward to address the DNFSB's concerns and the SRS identified issues. Each MACCS2 parameter in question will be evaluated. Technical recommendations will be documented and concurred on by independent experts. This is expected to be completed by April 2012. These recommendations will require centralized review by the National Nuclear Safety Administration, in coordination with the Office of Health, Safety and Security (HSS). Such a review would serve as a basis for providing any necessary clarification to the field ensuring the Department of Energy (DOE) maintains a consistent, defensible approach for performing analytical dose calculations.

Once the analytical parameters are agreed upon (with NA-17, Chief of Defense Nuclear Safety, etc.), facility specific consequence calculations will be performed. Other facility input and assumptions to these calculations will be revised as deemed necessary. A review of the control selection for the design basis events considering the new analysis will be performed. Emphasis will be placed on utilizing existing passive and active engineered controls vice administrative controls. Any changes to controls will be reflected in a future update to the Documented Safety Analysis (DSA).

The National Nuclear Safety Administration Savannah River Site Office (NNSA-SRSO), along with the Department of Energy Savannah River (DOE-SR) concurred with an Action Plan to complete the work described above per the referenced letter. Enclosed is the current Action Plan and path forward.

The DNFSB also expressed concerns about the effectiveness of the Emergency Preparedness (EP) program to protect the collocated workers. The tritium facilities have been working to improve the capabilities of the EP program. Graded drills have been conducted simulating damage to multiple facilities inside the tritium fence during a seismic event. Site subject matter experts have been consulted regarding the survivability of buildings and infrastructure during a design basis earthquake. This input has been incorporated into the drill scenarios, resulting in simulated damage to several buildings at once, requiring evacuations during a "remain indoors" protective action. Five drills have been conducted to date, resulting in one failure. Additionally, actions have been taken to procure equipment to ensure uninterrupted communications between the tritium facilities and site emergency management center during natural phenomenon events. This equipment is expected to be in use in early 2012.

The next step to improve the EP program is to conduct site level multi-facility drills. Based on an S-2 Memorandum dated September 16, 2011, guidance to conduct these drills from HSS is forthcoming via changes to various DOE standards and guides. SRS will comply with this guidance as required. Short term actions per the memorandum, which include conducting drills, should be complete by March 31, 2012.

If you have any questions or comments, please contact me or Tim Smith of my staff at 803-208-0578.

Sincerely,

Douglas J. Dearolph
Manager

SV:TMS:cdc

COR-SRSOMO-10.17.2011-390511

Enclosure: Action Plan with Figure (Path Forward)

cc: L. Schifer, SRNS
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DISPERSION MODELING ISSUES PLAN

Purpose:

This plan addresses the dispersion parameters and deposition velocity (DV) issues of Reference 1 (qualified in Reference 2) specific to the Tritium facilities. Many of these actions will affect EM facilities. Actions within this plan include evaluation of meteorological data collection. evaluation of meteorological data normalization methods. development of SRS specific deposition velocities for particulates and Tritium Oxide (waters). evaluation of dispersion coefficient options, and evaluation of surface roughness values appropriate for onsite and offsite receptors.

Background:

Site wind turbulence data is collected and translated into corresponding stability class distributions. Data is collected from site weather towers including wind speed and direction. and direct turbulence measurement. This data is then used in the Melcor Accident Consequence Code System. version 2. (MACCS2) computer code. which translates the stability class data via user specified correlations into dispersion coefficients. The dispersion coefficients are used in conjunction with other inputs including surface roughness and deposition velocity to calculate the potential dose consequence to receptor groups in accident scenarios for control selection and reporting in Documented Safety Analyses (DSAs). The basic regulatory expectations for the input data and its use for dose calculation stem from DOE-STD-3009 (Reference 5). although there are changes in the reference guidance from that Standard as well as emerging DOE guidance. Issues have been identified requiring regulatory and technical resolution in several communications:

- Reference 1 directs a determination of the appropriate site specific tritium dispersion parameters and deposition velocity to address whether the use of current plume dispersion parameters and deposition velocity used in MACCS2 produce conservative results for conditions at the tritium facilities.

- Reference 3 provides HSS recommendations for calculation of conservative results for accident dose consequence estimates when using MACCS2 particular to dry deposition velocity (DV). For some facilities, this may take the form of a technical justification that demonstrates the existing DSA accident dose calculation is reasonably conservative and meets the methodology by which the DSA was developed.

- Reference 4 reflects the Potential Inadequacy in the Safety Analysis (PISA) entered for SRNS facilities titled "Overestimating the effect of surface roughness in MACCS2 has led to potential non-conservative results for the offsite receptor at most facilities entered for SRNS facilities". This ultimately concluded in a series of negative USQ Evaluations. deferring to the associated regulatory policy issues.

Plan:

The overall plan is depicted in Figure 1. "Path Forward – Meteorological & Dispersion Modeling Issues". There are three basic phases to accomplish this plan: Phase I - concurrence on the overall plan: Phase II - Finalization of SRNS Technical Recommendations including

Independent Experts & Stakeholders concurrence and DOE approval (SRNS will lead the integrated actions for the Phase II, "Technical Recommendations Development and Approval" portion of the plan, which will consider input from Savannah River Remediation, LLC (SRR) and Parsons, and will identify areas of non-concurrence requiring DOE resolution); and Phase III - Prioritization and Implementation of revised methods in facility specific analyses. Phase I is to be accomplished through communications on this plan. Phase II is discussed in detail below, which basically covers the items up to the formal DOE/NNSA direction on Figure 1. Phase III items are only outlined at this time, as they are highly dependent on Phase II. Given the results of Phase II, prioritization and facility specific scope will determined and implemented in accordance with standard practice for safety basis revision.

Plan Phase I: DOE-SR/NNSA Direction/Plan Concurrence

I.1 Commencement of work under this plan is dependent on the following predecessor actions:

- Receipt of DOE direction regarding implementation of the HSS Bulletin (Reference 3) and overall dispersion modeling integrated plans.
- Resolution of funding. While the technical and policy issues are acknowledged, the actions need to be aligned with baseline funding. For instance, Reference 3 states "For existing facilities, DOE sites should consider actions recommended in this Safety Bulletin as constituting 'new requirements,' per Section 2.4 of DOE Guide 424.1-1B".

I.2 Expert Panel Review Report from August 29-30, 2011 (Napier, Rishel, and Bixler).

- An expert panel reviewed aspects of the issues of References 3 and 4, and the report of results and recommendations should be used to inform the execution of Phases II and III of this plan.

Plan Phase II: Technical Recommendations Development & Approval

- II.1 Evaluate Meteorological Data Options

  Action: Determine the meteorological data collection needs to ensure compatibility with input data requirements and use in MACCS2.

  The code of record meteorological data method is reference 6, which included allowance for direct turbulence measurement and use. The final Revision 1 version of the Regulatory Guide 1.23 (Reference 7) did not include direct turbulence measurement, and therefore a regulatory change has occurred. The input data for dose calculations may be established by multiple means. While the historic approach for SRS is direct data from onsite weather towers, and includes direct turbulence measurements to derive stability class distributions, that data may also be gained from regional National Weather Service (NWS) stations (typically from a local airport). It could also be gained by a different measurement method, particularly by delta-T measurements, although only one of the site towers is currently instrumented to support that method. This delta-T method was endorsed by the US Nuclear Regulatory Commission for commercial nuclear power by Reference 7. For consistent comparative (parametric) analysis, the 1997-2001 data set may be used. Ultimately, the data may be updated to the 2002-2006 or later data sets, including possible expansion of the dataset to be more inclusive than just a 5 year set.

Several considerations to be evaluated are use and conservatisms in National Weather Service data for stability class typing, site weather dataset use for continuity of dose calculation comparisons, application of the delta-T method at SRS, and application of direct turbulence measurement to either stability class typing (see II.2 below), or application of direct turbulence measurement as direct input to dose calculations.

- II.2 Evaluate Meteorological Data Normalization Options

Action: Review the MACCS2 assumptions for normalization of data, to ensure that the EPA method (Reference 9) or alternative method yields data compatible with MACCS2.
Action: Develop justification for application of Reference 9 method or alternate for meteorological data processing (normalization) for dispersion calculations input.

The final version of RG 1.23 (Reference 7) did not include direct turbulence measurement, and therefore a regulatory change has occurred. Additionally, there is not a DOE endorsed method for normalization of data, and determination of an acceptable method is needed. It is noted that DOE sponsored the development of ANSI 3.11, which recognized the existence and methods of EPA 454 (Ref. 9).

Reference 9 reflects a methodology commonly used in commercial pollutant/chemical dispersion modeling. If Reference 9 is the chosen method for normalization of SRS data, ensure all applicable parameters are appropriately adjusted (e.g., measurement height, surface roughness, day/night wind speed), including re-assessing the justification provided in Reference 11 for not making the stability class adjustments to account for day/night wind speed. Another option for MOI and CW calculations is to use NWS data for stability class distributions, as NWS data collection is independent of in-situ surface roughness effects. Additionally, when making the wind speed height adjustment from 61 m to 10 m, the current calculation conservatively uses the ground rather than the top of the tree canopy as the reference point. The top of the tree canopy may be a more appropriate reference point.

- II.3 Develop SRS Specific Deposition Velocities for Particulate and Tritium Oxide

Action: Develop SRS Specific Deposition Velocities for Particulates and Tritium Oxide.

Concerning the deposition velocities for particles, one recommendation is to calculate site-specific deposition velocities using GENII2, with varying surface roughnesses (e.g., 3 cm, 30 cm, & 100 cm). The calculation will include identification of the needed parameters, use of GENII2 to calculate SRS-specific deposition velocities, and document the results in a signed technically-reviewed SRNS approved document, including references for GENII2 Quality Assurance. SRNS shall provide the final report to SRR +Parsons +URS+ etc., and will consider their input and support within the integrated actions for the Phase II, "Technical Recommendations Development and Approval" portion of the plan. SRNS will identify areas of non-concurrence requiring DOE resolution.

As is noted in Attachment 1 to the DOE interim guidance (Ref. 3), GENII is an acceptable code for calculating an unmitigated/unfiltered deposition velocity. However, for particulates that are characteristic of mitigated/filtered releases, GENII calculates a constant deposition velocity that does not match the theoretical minimum deposition velocity for that size range.

Therefore, for unmitigated/unfiltered particulate releases, it is recommended to calculate a site specific deposition velocity using the GENII Version 2.10 computer code (Napier et al. 2010), with surface roughness inputs of 3 cm, 30 cm, and 100 cm. For mitigated/ filtered particulate releases, it is recommended to use the default deposition velocity of 0.01 cm/s, as specified in DOE's interim guidance (Ref. 3).

The development of a site specific deposition velocity for tritium should include research of SRS data. A non-zero value (even up to the MACCS2 guide value of 0.5) may be justifiable.

Development of specific DVs for either particulates or tritium may take the form of a justification of existing values where they are deemed to be reasonably conservative, per the HSS bulletin (Reference 3).

- II.4 Evaluate Dispersion Coefficient Options

  Action: Evaluate Dispersion Coefficient Options for best application (reasonably conservative) in SRS dispersion calculations.

  The Tadmor-Gur dispersion coefficients may not be the best parameterization of the Pasquill-Gifford curves. Alternate NRC-related (Eimutis-Konieck) dispersion coefficients are a better parameterization of the Pasquill-Gifford curves and yield the same results as the Briggs model. Since there's a question as to whether it's ever appropriate to use the sigma-z scaling factor in MACCS2 when using the Briggs coefficients, the two options considered most appropriate for SRS are (1) the alternate NRC-related (Eimutis-Konieck) coefficients or (2) a lookup table of values taken directly from the Pasquill-Gifford curves. These two options allow the use of the sigma-z scaling factor in MACCS2 when the met data do not reflect surface roughness. Consider other options as appropriate, including the use of the sigma-y formula to account for plume meander at low wind speeds (specifically allowed in RG 1.145, Reg Position 1.3.1.a).

  For the onsite (100m) receptor, an option could be to use the X/Q for collocated workers contained in Appendix A of DOE-STD-1189, *Integration of Safety into the Design Process*. This option should be directly considered, which may require DOE concurrence.

- II.5 Evaluate MOI & CW Surface Roughness Values

  Action: Evaluate Maximally Exposed Offsite Individual (MOI) & Collocated Worker (CW) Surface Roughness Values for best application (reasonably conservative) in SRS dispersion calculations. Specifically include evaluation of application of a 3 cm value as overly conservative for use at SRS. This evaluation may result in simply confirming the established surface roughness values as valid, and also evaluating and/or confirming the scaling factor exponent.

  Current SRS safety analyses use surface roughness values of 3 cm, 30 cm, and 100 cm for onsite (100m) and offsite consequence calculations. In addition, the sigma-z scaling factor formula using these surface roughness values has an exponent of 0.2. As part of the overall plan herein, re-evaluation of the appropriate surface roughness values for onsite and offsite calculations will be performed as well as the appropriate exponent for various receptor distances.

An exponent of 0.2 is currently used in the formula for calculating the sigma-z scaling factor in MACCS2 (e.g., [100/3]^0.2=2.02). The indications based on a recent literature search are that the 0.2 value is appropriate for distances up to 1 km. At distances greater than 1 km, the value should be lower, as low as 0.1 for distances approaching 10 km.

Plan Phase III: Prioritization and Implementation

III.1 Action: Apply Technical Recommendations Review and Approval for each of the Phase II actions, including consideration of DSA accident dose calculations as reasonably conservative.

The technical recommendations need to be reviewed by the stakeholders for final direction by DOE. The level of involvement and form of reviews will be determined particular to each technical element as appropriate. The stakeholders include:

- DOE-SRS & NNSA-SRSO
- DOE HQ (HSS, EM, NNSA)
- NNSA-NA-26
- DNFSB
- Site Contractors
- Independent Experts
- Committees and Agencies (EPA, NRC, DMCC)

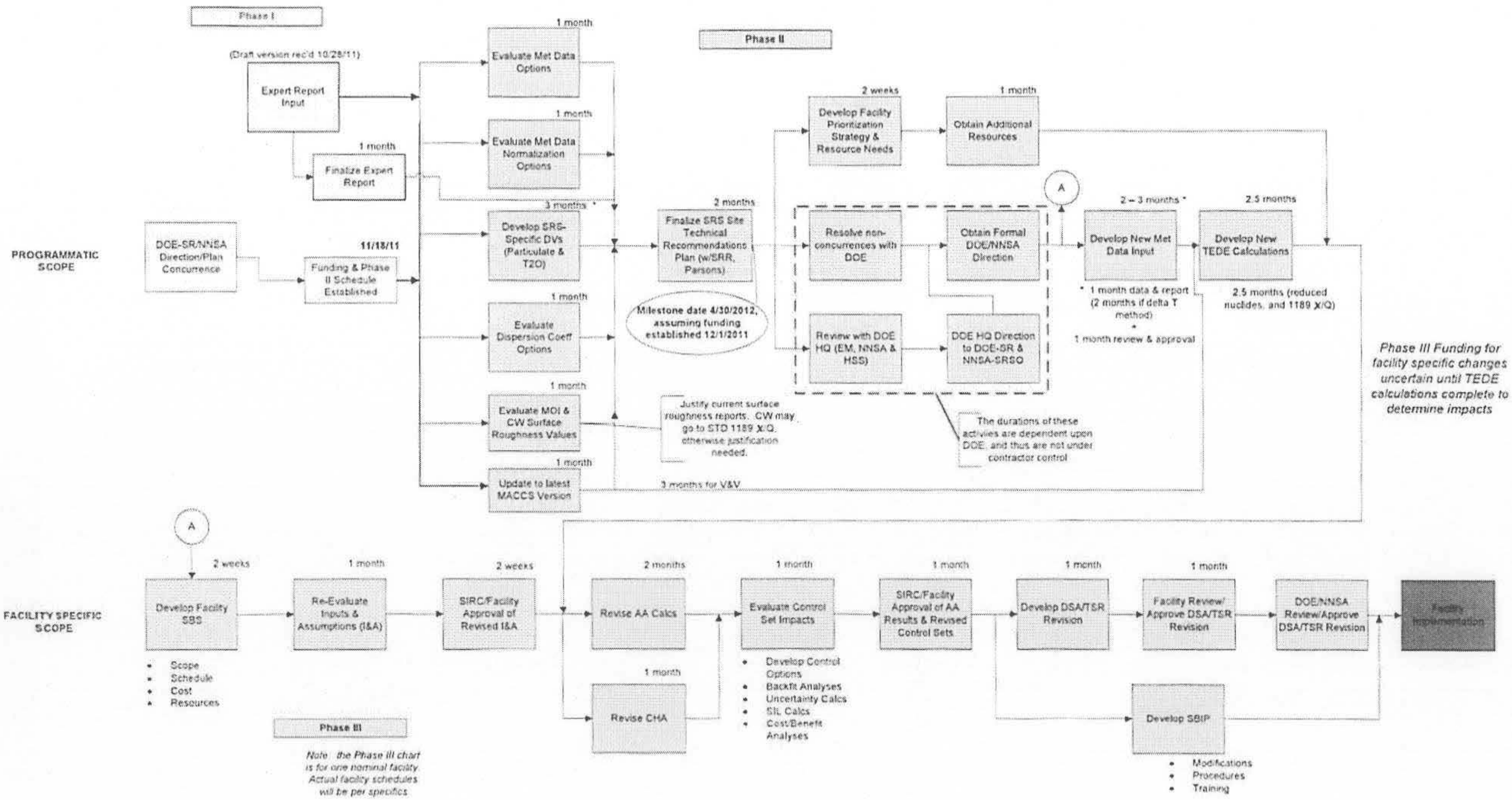
Final direction in writing from DOE-SRS / NNSA-SRSO should precede commencement of Phase III facility specific analysis.

References

1. Carol R. Elliott to John W. Temple, *Savannah River M&O Contract DE-AC09-08SR22470: Safety Basis Development*, COR-SRSOMO-9.1.2011-374939, September 2, 2011.
2. John W. Temple to Carol R. Elliott to, *Savannah River M&O Contract DE-AC09-08SR22470: Five-Day Response Letter Regarding Safety Basis Development*, SRNS-U1000-2011-000309, September 12, 2011.
3. Office of Health, Safety and Security Safety Bulletin No. 2011-02, *Accident Analysis Parameter Update*, May 2011.
4. PI-2011-0007 through -0018, and PI-2011-0020, *Overestimating the effect of surface roughness in MACCS2 has led to potential non-conservative results for the offsite receptor at most facilities*, Initiated August 9, 2011.
5. DOE STD 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*.
6. NRC Reg Guide 1.23, *Meteorological Monitoring Programs for Nuclear Power Plants*, proposed Revision 1, September 1980.
7. NRC Reg Guide 1.23, *Meteorological Monitoring Programs for Nuclear Power Plants*, Revision 1, March 2007.
8. NRC Reg Guide 1.145, *Atmospheric Dispersion Models For Potential Accident Consequence Assessments At Nuclear Power Plants*.

9. U. S. Environmental Protection Agency, *Meteorological Monitoring Programs for Regulatory Modeling Applications*, EPA-454/R-99-005 (2000).
10. DOE G 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*.
11. WSRC-TR-2002-00445, *Summary of Data Processing for the 1997-2001 SRS Meteorological Database*, October 29, 2002.

FIGURE 1 - PATH FORWARD – METEOROLOGICAL & DISPERSION MODELING ISSUES



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