DEFENSE NUCLEAR FACILITIES SAFETY BOARD
Washington, DC 20004-2901

July 25, 2025

The Honorable Chris Wright
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Wright:

The Defense Nuclear Facilities Safety Board (Board) reviewed the safety basis for the Area G radioactive waste facility at Los Alamos National Laboratory. The Board commends the Department of Energy (DOE) for developing and approving the first safety basis for a defense nuclear facility using DOE Standard 5506-2021, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities.*

The safety basis relies primarily on restricting the scope of work and imposing limits on radioactive and combustible materials through means that are vulnerable to human error. As such, rigorous implementation of these safety controls is paramount to avoid potentially significant consequences in the event of an accident due to the proximity of Area G to the public. Therefore, the Board urges DOE to develop rigorous safety procedures and training to support the safety basis.

After the Board's staff reviewed the safety basis, DOE instructed its contractor to submit a revised safety basis that ensures safety controls can be implemented in an efficient and effective manner no later than March 31, 2026. Even when fully implemented, the upcoming revision will only authorize Area G personnel to perform a limited set of operations. In the future, this safety basis will need to be revised again to support the preparation of selected waste containers for offsite shipment and authorize activities related to buried defense nuclear waste. At that time, additional active or passive engineered safety systems, which are less vulnerable to human error, should be considered as a part of the hazard control strategy in accordance with the hierarchy of controls as defined by DOE.

The enclosed Board's staff report provides additional details on their review of the Area G documented safety analysis and technical safety requirements, offering insights to assist DOE

in enhancing safety at the facility during safety basis implementation as well as in future revisions of the safety basis.

Sincerely,

Thomas A. Summers
Acting Chairman

Enclosure

c: Mr. Roger A. Jarrell II, Principal Deputy Assistant Secretary for Environmental Management
Ms. Jessica Kunkle, Manager, Environmental Management Los Alamos Field Office
Mr. Joe Olencz, Director, Office of the Departmental Representative to the Board

DEFENSE NUCLEAR FACILITES SAFETY BOARD

Staff Report

March 5, 2025

Review of Area G Safety Basis at Los Alamos National Laboratory

Background. Los Alamos National Laboratory's (LANL) Area G is a hazard category 2 nuclear facility primarily used to store, repackage, remediate, characterize, certify, and ship transuranic and low-level radioactive waste. Area G is operated by Newport News Nuclear BWXT-Los Alamos, LLC (N3B), for the Department of Energy's (DOE) Office of Environmental Management (EM) under the Los Alamos Legacy Cleanup Contract.

Between January 2020 and March 2022, N3B declared 24 potential inadequacies of the safety analysis (PISA) and positive unreviewed safety question determinations related to the Area G safety basis. To address these issues, N3B submitted, and DOE-EM headquarters and the DOE-EM Los Alamos Field Office (EM-LA) approved, six justifications for continued operations that derived 49 new safety controls, most of which are administrative (e.g., procedural controls). On August 17, 2022, the Defense Nuclear Facilities Safety Board (DNFSB) issued a letter to the Secretary of Energy [1] encouraging DOE to expeditiously complete and implement a modern Area G safety basis and identify controls consistent with the hierarchy of controls detailed in DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis* [2].

On July 26, 2024, N3B submitted for DOE approval a draft documented safety analysis (DSA) [3] and technical safety requirements (TSR) [4] compliant with DOE Standard 3009-2014 [2], and DOE Standard 5506-2021, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities* [5]. This DSA (revision 0) is the first in the defense nuclear complex to be updated to comply with DOE Standard 5506-2021. The DOE-EM Chief of Nuclear Safety and EM-LA Deputy Field Office Manager approved the DSA and TSRs on November 12, 2024, [6], with nine conditions of approval and nine directed changes. Subsequently, N3B identified additional improvements to enhance the implementation of the DSA, which will require additional modifications beyond the version that DNFSB staff reviewed. EM-LA instructed N3B to proceed with modifying the DSA to address these improvements as well as the conditions of approval and submit a revised DSA for DOE approval no later than March 31, 2026. Then, N3B is required to update procedures, develop training, and go through the readiness process to fully implement the revised DSA no later than 90 days after DOE-EM provides its approval [7].

Discussion. The goal of this review was to evaluate the draft DSA and TSRs to assess alignment with requirements in DOE Standard 3009-2014 and DOE Standard 5506-2021. The DNFSB team reviewed the draft DSA and TSRs in parallel with DOE's Safety Basis Review Team (SBRT) and transmitted a list of specific questions related to potential safety concerns on September 16, 2024. The team discussed the most pressing questions with N3B and the DOE

SBRT on November 7, 2024. The SBRT issued its safety evaluation report [6], which provides DOE's basis for approving the DSA, on November 12, 2024.

DOE's priority for this DSA was to move away from operations under multiple justifications for continued operations and to create a document that is compliant with DOE Standard 3009-2014 and DOE Standard 5506-2021. The DSA development process considered the facility configuration as it currently exists, with no significant physical improvements to Area G. The scope of this DSA does not include the full range of activities that will likely be completed at Area G in the future. The safety evaluation report notes that, "A revision of the Area G [safety basis] documents will be necessary in the future to prepare this limited population of waste containers for offsite shipment and authorize activities associated with other waste currently buried underground. At that time, the hazard control strategy shall be revisited, including consideration of active safety systems." The limited scope of authorized work in the DSA is already creating challenges because high-priority, near-term activities, including flanged tritium waste container venting project [8] and partial overburden removal and soil sampling of the Pit 9 area, are not in the scope of the newly approved DSA. Delays to implementing the DSA create additional safety risks to DOE.

The Area G DSA development approach did not include physical changes to enhance the safety of operations such as new engineered controls or significant upgrades to the existing structures, systems, and components (SSC). Ideally, the safety basis process should identify hazards of the scope of work for the facility, evaluate accident scenarios, and then derive the most appropriate controls for a given situation, regardless of whether the identified controls are already present in the facility. As a result of this DSA development approach, the staff team identified the following observations.

Heavy Reliance on Administrative Controls—In the current safety basis, several significant accidents that result in unmitigated consequences that exceed the evaluation guideline are mitigated only with specific administrative controls (SAC), rather than SSCs. For example, for a fuel pool or combustible fire involving sealed sources, the maximum unmitigated dose consequence to the public is 188 rem total equivalent dose. The controls credited for reducing the consequence of this event are SACs that limit: (1) co-locating certified sealed source material and non-grout waste in certain areas, (2) the plutonium-239 equivalent activity of the sealed sources, and (3) the presence of gasoline or diesel fuel to eliminate the potential for a fuel pool fire. Collectively, these SACs are credited to provide a safety class mitigative function and reduce the maximum consequence for the event from 188 rem (unmitigated) to 18.2 rem (mitigated) [3].

Relying on SACs in the DSA rather than SSCs is not explicitly disallowed by DOE requirements. However, DOE's hierarchy of controls, as described in DOE Standard 1189-2016, *Integration of Safety into the Design Process* [9], notes that "SSCs are preferred over administrative controls." Implementing SSCs as controls rather than SACs can reduce the risk of human error and variability. The Area G DSA includes several instances in which physical improvements were not selected and limited technical justification was given for selecting administrative controls over SSCs. This DSA therefore does not strictly follow either the hierarchy of controls or the process required when not doing so.

High Mitigated Doses—DOE Standard 3009-2014 recommends that, "If *unmitigated* off-site doses between 5 rem and 25 rem are calculated (i.e., challenging the [evaluation guideline]), [safety class] controls should be considered, and the rationale should be described for decisions on whether or not to classify controls as [safety class]" (emphasis added). The staff team acknowledges that the standard does not explicitly recommend considering additional safety class controls for accidents where the mitigated dose has been reduced to just below the evaluation guideline with safety class controls. However, the calculated dose would be the same whether: (1) an accident has no controls to reduce the unmitigated dose below 5 rem or (2) safety class controls are in place but do not reduce the dose below 5 rem.

Based on this logic, the DNFSB staff team reviewed Area G design basis accidents with mitigated doses that challenge the evaluation guideline (off-site mitigated doses between 5 rem and 25 rem) to determine whether adequate justification was provided for not choosing additional safety class controls to mitigate the consequence below 5 rem. Several accident scenarios with mitigated dose consequences that challenge the evaluation guideline (e.g., 18 rem) did not have adequate technical justification in the DSA for not classifying additional controls as safety class controls. In response, during the November 7, 2024, interaction, DOE and N3B staff members described administrative controls, safety programs, and conservatisms in the analyses for each event discussed. Notably, the safety evaluation report identified each accident with mitigated doses that challenge the evaluation guideline and documented the SBRT's justification for accepting the dose (based on conservatism, low accident frequencies, and/or lack of other available controls). Some of those conservative assumptions were already part of the methodology recommended in DOE Standard 3009-2014, so it is unclear if they can also be used as additional technical justification for not classifying safety class controls for accidents with mitigated doses that challenge the evaluation guideline. The DNFSB staff team verified that there was additional conservatism related to accident analysis assumptions for each of the accident scenarios discussed.

Inadequate Consideration of Engineered Controls—The DSA states, "Automatic fire suppression systems and confinement ventilation systems are not available without substantial design improvements. Area G is a limited life facility that does not warrant construction of new fire suppression systems and confinement ventilation systems in these facilities." It is not appropriate to consider Area G a limited life facility. Remediation work at Area G, including preparation of aboveground waste containers for offsite shipment and activities associated with other waste currently buried underground, will potentially carry on for the foreseeable future. Additional significant remediation campaigns (e.g., Pit 9 work) have already been discussed publicly and are planned.

In response to this concern, DOE's safety evaluation report documents that "the capabilities of the fire sprinkler system to mitigate this type of fire could not be substantiated," and that this conclusion, "together with analytical conservatism presented in the DSA, were sufficient to support acceptance of the mitigated consequences that challenged the [evaluation guideline], without consideration related to the cost of design improvements or limited facility life." The staff team verified that there was additional analytical conservatism related to the most significant fire accident scenarios given the facility's current operating posture. However,

when the DSA is updated to include other activities at Area G, additional engineered safety systems including fire suppression systems should be considered as a part of the hazard control strategy.

In addition, several quotes in the DSA implied that cost was a consideration for not implementing vehicle barriers as controls for events. N3B staff members noted that these quotes mischaracterized the rationale for not adding additional vehicle barriers.

Timely Resolution of Safety Concerns—The timing of this review allowed the DNFSB to efficiently communicate and resolve safety issues at the staff-to-staff level before DOE officially approved the safety basis documents. Specifically, several of the directed changes and conditions of approval in the safety evaluation report for this DSA were informed by safety concerns identified by the staff team.

For example, one staff team question highlighted that the DSA defined an unmitigated high hazard to facility workers for a specific fire event involving the entire material inventory and subsequent fuel pool fire with no safety controls. The safety evaluation report notes that the facility worker hazard should have been identified as low based on the hazard evaluation and required that the mistake be corrected in a condition of approval. In addition, some staff questions about the efficacy of various SACs were resolved because the safety evaluation report requires that specific safety functions be added or clarified in the DSA and TSR.

These resolved concerns highlight the effective and efficient coordination between the DNFSB staff team and the SBRT. However, it is important to note that the DNFSB review was conducted independently from the SBRT review. Each review team identified unique safety concerns.

This review demonstrates that communicating safety concerns on the draft safety basis while DOE staff is preparing the safety evaluation report can provide an efficient mechanism to resolve the safety concerns. The DNFSB staff team notes that this may not be appropriate or feasible in all DNFSB safety basis reviews and that, in all cases, it is important for DOE to perform a thorough, independent review of the safety basis as required in DOE Standard 1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents* [10].

Conclusion. The emphasis on SACs in the current Area G safety basis makes rigorous implementation of those SACs paramount. EM-LA has directed N3B to further revise the DSA by March 31, 2026 [7]. When N3B conducts its implementation verification review for the revised DSA, DOE should independently confirm the proper implementation of SACs in accordance with DOE Guide 423.1-1B, *Implementation Guide for use in Developing Technical Safety Requirements* [11]. In addition, when N3B revises the DSA to account for higher hazard work, additional active or passive engineered safety systems should be considered to further mitigate accident consequences. In summary, based on the observations identified in this report, DOE should: (1) ensure robust implementation of SACs and (2) prioritize additional engineered safety systems in the future.

References

[1] Defense Nuclear Facilities Safety Board, *Letter to The Honorable Jennifer Granholm from Chair Joyce Connery*, August 17, 2022.

[2] Department of Energy Standard 3009, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, November 2014.

[3] Newport News Nuclear BWXT-Los Alamos, LLC, *Documented Safety Analysis for Technical Area 54, Area G*, N3B-DSA-AREAG-0001, Revision 0, July 26, 2024.

[4] Newport News Nuclear BWXT-Los Alamos, LLC, *Technical Safety Requirements for Technical Area 54, Area G*, N3B-TSR-AREAG-0001, Revision 0, July 26, 2024.

[5] Department of Energy Standard 5506, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*, August 2021.

[6] Department of Energy Environmental Management Los Alamos Field Office, *Approval of N3B-DSA-AREAG-0001, Revision 0, Documented Safety Analysis for Technical Area 54, Area G, and N3B-TSR-AREAG- 0001, Revision 0, Technical Safety Requirements for Technical Area 54, Area G,* November 12, 2024.

[7] Department of Energy Environmental Management Los Alamos Field Office, *Documented Safety Analysis Optimization Path Forward,* EMLA-25-329-1-2, July 17, 2025.

[8] Department of Energy Environmental Management Los Alamos Field Office, *Documented Safety Analysis Implementation Direction Clarification*, EMLA-25-126-0-1, January 24, 2025.

[9] Department of Energy Standard 1189, *Integration of Safety into the Design Process*, December 2016.

[10] Department of Energy Standard 1104, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, December 2016.

[11] Department of Energy Guide 423.1-1B, *Implementation Guide for use in Developing Technical Safety Requirements*, March 2015.