

**SAFETY EVALUATION REPORT
APPROVAL OF DEPARTMENT OF THE NAVY DECOMMISSIONING PLAN
NAVAL RESEARCH LABORATORY, HYPERVELOCITY GUN FACILITY
CHESAPEAKE BEACH, MARYLAND
DOCKET 03029462**

1.0 Executive Summary

This Safety Evaluation Report (SER) supports a license amendment to Materials License No. 45-23645-01NA. This license is held by the Department of the Navy (Navy). This is a Master Materials License (MML) and covers many sites around the country, and allows the Navy to issue permits and perform inspections of those permits. Decommissioning responsibilities are shared between the NRC and the Navy. The Navy submits decommissioning plans (DPs) to the NRC for approval.

The Navy is in the process of decommissioning the Hypervelocity Gun Facility (Building 218) at the Naval Research Facility in Chesapeake, MD, with the intent to terminate Navy Radioactive Materials Permit (NRMP) No. 08-00174-E1NP. The HGF was used to test the impact of high velocity projectiles on depleted uranium (DU) targets. The testing was conducted from the early 1970s until the early 1990s. Testing was authorized under NRC license No. SMB-448, and subsequently, by Naval Radioactive Materials Permit No. 08-00173-E1NP. NRMP No. 08-00173-E1NP remains active under the Navy's MML. Depleted Uranium was stored and used in the Building 218C target chamber and Building 227 vault. The Navy has submitted a DP which includes site-specific derived concentration guidelines (DCGLs) to allow unrestricted release of the Facility.

2.0 Facility Operating History

NRC staff has reviewed the information in the "Facility Operating History" section of the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 16.2 (Facility Operating History). Based on this review, NRC staff has determined that the Navy has provided sufficient information to aid NRC staff in evaluating the Navy's determination of the radiological status of the Facility and the Navy's planned decommissioning activities, to ensure that the decommissioning can be conducted in accordance with NRC requirements.

The last use of DU at the HGF was in the fall of 1992. Other non-DU tests were conducted in the gun after the fall of 1992 and for the first several tests; some DU dust shook loose from nooks and crannies and was collected for disposal as low level radioactive waste. The facility is currently not in use.

3.0 Facility Description

The NRL occupies a 168 acre site near Chesapeake Beach, Maryland, and provides facilities and support services for research in radar, electronic warfare, optical devices, materials, communications, and fire research.

The HGF is located in a lightly occupied area against a hillside that is approximately 1000 feet from Chesapeake Bay on the NRL site.

The HGF consists of a light gas gun, a blast tank at the gun muzzle, a shadowgraph tube with optics to measure the projectile velocity, an orthogonal room, a quick closing gate valve, a flight tube between the orthogonal room and the target chamber, and a spherical target chamber that is 12 feet in diameter. All components are steel except for aluminum in a quick closing valve and the shadowgraph tube. Part of the gas gun is enclosed by concrete walls and ceilings and buried in the hill. The entire blast tube is buried in the hillside with a small access to crawl into the tube. The optics room containing the shadowgraph tube and orthogonal room is easily accessible. The target chamber is contained in a structure called the environmental room.

4.0 Radiological Status of the Facility

NRC staff has reviewed the information in the "Facility Radiological Status" section of the DP for the Facility according to Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 16.4 (Radiological Status of the Facility). Based on this review, NRC staff has determined that the Navy has described the types and activity of radioactive material contamination in the facility sufficiently to allow the NRC staff to evaluate the potential safety issues associated with the Facility, whether the remediation activities and radiation control measures proposed by the Navy are appropriate for the type of radioactive material present at the facility, whether the Navy's waste management practices are appropriate, and whether the Navy's cost estimates are plausible given the amount of contaminated material that will need to be removed or remediated.

High velocity projectiles were impacted on depleted uranium, and in some cases, depleted uranium and explosives. Depleted uranium targets were located in a spherical target chamber with target debris contained in the target chamber and flight tube. In a few tests, the quick closing valve did not function and allowed target debris from explosive tests to blow back through the flight tube into the orthogonal room, shadowgraph tube, and blast tank as far as the muzzle of the projectile launch tube. DU remains embedded in some walls of the blast tank. Surveys were conducted periodically and areas decontaminated. It is possible that DU is lodged in inaccessible areas that were not affected by periodic cleaning and decontamination.

5.0 Unrestricted Release Criteria

The staff has reviewed the dose modeling analysis for the site-specific DCGLs as part of the review of the Navy's DP, using the Consolidated Decommissioning Guidance, Volume 2, Revision 1, Section 5.2 (Unrestricted Release Using Site-Specific Information). The staff concludes that the dose modeling is reasonable and is appropriate for the exposure scenarios under consideration. In addition, the dose estimate provides reasonable assurance that the dose to the average member of the critical group is not likely to exceed the 0.25 mSv (25 mrem) annual dose criterion in 10 CFR 20.1402. This conclusion is based on the modeling effort performed by the Navy and the independent analysis performed by the staff.

The Navy calculated a DCGL for DU on building surfaces of 1150 disintegrations per minute gross alpha per 100 square-centimeter area (dpm/100 cm²). The DU DCGL was calculated using the formula for gross activity DCGL found in MARSSIM Equation 4-4, and the DandD code Version 2.1 with its default building occupancy scenario. This resulted in a DCGL for DU of 81 dpm/100 cm² (42 dpm/100 cm² of U-238 + 39 dpm/100

cm² of U-234). The contribution of U-235 to the DU DCGL is less than 1 dpm/100 cm². The Navy then calculated an adjustment factor of 14.2 for the resuspension factor by comparing the recommended value of 1×10^{-6} found in draft NUREG-1720 "Re-evaluation of the Indoor Resuspension Factor for the Screening Analysis of the Building Occupancy Scenario for NRC's License Termination Rule" to the 1.42×10^{-5} value used in DandD Version 2.1. The DCGL of 81 dpm/100 cm² was multiplied by the adjustment factor to arrive at an adjusted gross alpha DCGL of 1150 dpm/100 cm².

Because the Navy's scoping surveys revealed that it was more efficient to measure beta radiation than alpha radiation, the Navy calculated a gross beta DCGL. The Navy determined that two beta particles are emitted for every disintegration of U-238, considering the U-238 decay chain down to U-234. The Navy stated that because U-235, U-234 and their progeny are removed to negligible amounts during the enrichment process, U-234 and its progeny can be ignored in the calculation of beta particles produced. Therefore the gross beta DCGL was calculated by multiplying the U-238 gross alpha DCGL of 42 dpm/100 cm² by 14.2 to adjust for the revised resuspension factor from NUREG-1720 and then multiplying that by 2 to account for the number of beta particles produced during decay. The result is a gross beta of 1150 dpm/100 cm².

The licensee's statement that U-234 is removed to a negligible amount is not entirely correct because even though it only makes up .005% of the fraction by weight, it accounts for 47.84% of the total activity. However, since U-234 does not emit a beta particle, the Navy's method for calculating the gross beta DCGL is acceptable.

The screening value for DU (U-238) for soil (14 pCi/g) that will be used by the Navy at the Facility was published in the Federal register on December 7, 1999 (Volume 64, Number 234, Pages 68395 – 68396).

6.0 Planned Decommissioning Activities

The NRC staff has reviewed the decommissioning activities described in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.1 (Planned Decommissioning Activities). Based on this review the NRC staff has determined that the Navy has provided sufficient information to allow the NRC staff to evaluate the Navy's planned decommissioning activities to ensure that the decommissioning can be conducted in accordance with NRC requirements.

7.0 Project Management and Organization

The NRC staff has reviewed the description of the decommissioning project management organization, position descriptions, management and safety position requirements and the manner in which the Navy will use contractors during the decommissioning of the facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.2 (Project Management and Organization). Based on this review, the NRC staff has determined that the Navy has provided sufficient information to allow the NRC staff to evaluate the Navy's decommissioning project management organization and structure to determine if the decommissioning can be conducted safely and in accordance with NRC requirements.

8.0 Radiation Safety and Health Program

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.3 (Radiation Safety and Health Program During Decommissioning). Based on this review, the NRC staff has determined that Navy has provided sufficient information to allow the NRC staff to conclude that the Navy's radiation safety and health program during decommissioning will comply with 10 CFR Parts 19 and 20.

9.0 Environmental Monitoring and Control Program

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.4 (Environmental Monitoring and Control Program). Based on this review, the NRC staff has determined that Navy has provided sufficient information to allow the NRC staff to conclude that the Navy's radiation safety and health program during decommissioning will comply with 10 CFR Part 20. The Navy does not anticipate the need for Environmental ALARA evaluation, Effluent Monitoring, or Effluent Control at the site. The contamination is contained within the HGF.

10. Radioactive Waste Management Program

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.5 (Environmental Monitoring and Control Program). Based on this review, the NRC staff has determined that Navy's program for the management of radioactive waste generated during decommissioning operations ensures that the waste will be managed in accordance with NRC requirements and in a manner that is protective of the public health and safety. The Navy does not anticipate generating liquid radioactive waste or mixed waste.

11.0 Quality Assurance Program

The NRC staff has reviewed the Quality Assurance Program for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.6 (Quality Assurance Program). Based on this review, the NRC staff has determined that the Navy's QA program is sufficient to ensure that information submitted to support the decommissioning of the Facility should be of sufficient quality to allow the staff to determine if the Navy's planned decommissioning activities were conducted in accordance with NRC requirements.

12.0 Facility Radiation Surveys

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 2, Revision 1, Section 4.2 (Scoping and Characterization Surveys). This review has determined that the radiological characterization of the Facility is adequate to permit planning for a remediation that will be effective and will not endanger the remediation workers, to demonstrate that it is unlikely that significant quantities of residual radioactivity have not gone undetected, and to provide information that will be used to design the final status survey.

The NRC staff also reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 2, Revision 1, Section 4.4 (Final

Status Survey Design). Based on this review, the NRC staff has determined that the Navy's final status survey design is adequate to demonstrate compliance with radiological criteria for permit termination.

13.0 Financial Assurance

The NRC staff has reviewed the cost estimate for the Facility according to the Consolidated Decommissioning Guidance, Volume 3, Section 4.1 (Cost Estimate (As Contained in a Decommissioning Funding Plan or Decommissioning Plan)). Based on this review, the NRC staff has determined that the cost estimate submitted by the Navy adequately reflects the costs to carry out all required decommissioning activities prior to the permit amendment releasing Building 200, Bay 4 and adjacent outdoor areas for unrestricted use.

The NRC staff also reviewed the financial assurance mechanism for the Navy according to the Consolidated Decommissioning Guidance, Volume 3, Section 4.3 (Financial Assurance Mechanisms). Based on this review, the NRC staff has determined that the financial assurance mechanism submitted by the Navy is adequate to ensure that sufficient funds will be available to carry out all the required decommissioning activities prior to the permit amendment releasing Building 200, Bay 4 and adjacent outdoor areas for unrestricted use.