Deactivated SM-1 Nuclear Reactor Facility Decommissioning and Dismantlement

Draft Environmental Assessment - Vol. I

December 2019

UNITED STATES ARMY GARRISON FORT BELVOIR
FAIRFAX COUNTY, VIRGINIA

US Army Corps of Engineers®

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Draft Environmental Assessment
Decommissioning and Dismantlement of the
Deactivated SM-1 Nuclear Reactor Facility

US Army Garrison Fort Belvoir, Fairfax County, Virginia

Vol. I

December 2019

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Draft Environmental Assessment
Decommissioning and Dismantlement of the Deactivated SM-1 Nuclear Reactor Facility

ABSTRACT

The United States Army Corps of Engineers (USACE) has prepared this Environmental Assessment (EA) to evaluate the potential environmental consequences of the proposed decommissioning and dismantlement of the United States (US) Army's Deactivated Stationary Medium Power Model 1 (SM-1) Nuclear Reactor Facility at US Army Garrison Fort Belvoir (Fort Belvoir) in Fairfax County, Virginia ("Proposed Action"). The Proposed Action would decommission and remove all radioactive and non-radioactive materials (e.g., buildings, underground utility lines, contaminated soil) from the SM-1 site. Radioactive, hazardous, and non-radioactive waste would be segregated and prepared on-site for transport to an appropriate disposal or recycling facility. The proposed decommissioning and dismantlement of SM-1 would reduce residual radioactivity to levels that allow USACE to release the site for unrestricted use as defined in 10 Code of Federal Regulations (CFR) Part 20.1402, *Radiological Criteria for License Termination* and return the property to Fort Belvoir for future use. In accordance with Army Regulation 50-7, *Army Reactor Program*, implementing the Proposed Action is necessary to complete the decommissioning of SM-1 within 60 years of the reactor's deactivation.

This EA has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; Title 42, United States Code [USC] Part 4321 et seq.); the NEPA-implementing regulations of the Council on Environmental Quality (CEQ) (40 CFR Parts 1500–1508); and the Army's NEPA regulations (32 CFR Part 651, *Environmental Analysis of Army Actions*). The EA considers several alternatives to implement the Proposed Action, but determined that only one alternative would satisfy the Proposed Action's purpose and need. Accordingly, this EA provides a detailed analysis of two alternatives: the Proposed Action Alternative and No Action Alternative, or status quo. Resources or resource areas evaluated in the EA include: water resources, including water-based recreation; air quality; biological resources; radiological and occupational safety and health; cultural resources; transportation and traffic; non-radiological hazardous materials and waste, and non-hazardous solid waste; and geology, topography, and soils. With implementation of best management practices (BMP) and mitigation measures, the EA concludes that adverse impacts would not meet the conditions requiring preparation of an Environmental Impact Statement (EIS) (32 CFR Part 651.41, *Conditions requiring an EIS*). The Proposed Action Alternative would have no significant adverse impacts on the natural or human environment and therefore, is not an action normally requiring preparation of an EIS (32 CFR 651.42, *Actions normally requiring an EIS*).

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US Army Garrison Fort Belvoir, Fairfax County, Virginia

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Executive Summary

ES.1 Introduction

This Environmental Assessment (EA) evaluates the potential environmental impacts of decommissioning and dismantling the United States (US) Army's Deactivated Stationary Medium Power Model 1 (SM-1) Nuclear Reactor Facility at US Army Garrison Fort Belvoir (Fort Belvoir) in Fairfax County, Virginia ("Proposed Action"). The Deactivated SM-1 Nuclear Reactor Facility is located on Fort Belvoir's South Post along the shoreline of Gunston Cove, a tidal embayment of the Potomac River. The US Army Corps of Engineers (USACE) maintains SM-1 in accordance with USACE's current Reactor Possession Permit Number SM1-1-19 (USANCA, 2019) issued by the US Army Nuclear and Countering Weapons of Mass Destruction Agency (USANCA). The Army Reactor Office (ARO), established by USANCA, oversees the Army Reactor Program (ARP) and designates the ARP Manager.

ES.2 Background

SM-1 was the Army's first nuclear-powered, electricity-generating station and the first pressurized water reactor to be connected to an electrical grid in the US. SM-1 operated from 1957 to 1973 and was primarily used to train military personnel in nuclear reactor operations. From 1973 to 1974, SM-1 was deactivated. Deactivation consisted of removal and disposal of the nuclear fuel, minor decontamination, shipment of necessary radioactive waste, sealing the reactor vessel, and installation of appropriate warning signs and monitoring devices in accordance with the *SM-1 Decommissioning and Conversion Plan* as approved by the Army Reactor Systems Health and Safety Review Committee (US Army, 1975). The SM-1 vapor container, which contains the reactor pressure vessel, reactor shield tank, and the primary system components, was also sealed and the facility was placed under a routine monitoring program currently implemented by USACE.

The SM-1 site is located on Fort Belvoir's South Post (i.e., the portion of Main Post to the south of Richmond Highway/US Route 1) within the secured 300 Area. It is situated on an approximately 3.6-acre fenced parcel of land adjacent to Gunston Cove. The SM-1 site contains the reactor building (Building 372), an inactive wastewater lift station (Building 7350), a small warehouse (Building 349), a water intake pier and pump house (Building 375) that extends into Gunston Cove from the shoreline, and a concrete discharge pipe and outfall structure. Building 375, the concrete discharge pipe, and outfall structure are within the 100-year floodplain and tidal wetlands associated with Gunston Cove. (Other buildings formerly associated with the operation of SM-1 outside the facility's fenced perimeter have either been demolished or repurposed for other uses. These buildings are not addressed by the Proposed Action analyzed in this EA.)

SM-1 was designed, built and operated as part of the Army Nuclear Power Program (currently the ARP) under authority granted to the Department of Defense (DOD) by Section 91(b) of the Atomic Energy Act (AEA) of 1954, as amended (42 United States Code (USC) Part 2121). Section 91(b) authorizes DOD to procure and utilize special nuclear material in the interest of national defense and to acquire utilization facilities (i.e., reactors for military purposes). Section 110(b) of the AEA excludes reactor facilities acquired by DOD from the licensing requirements of the Act. The Proposed Action falls within the authorities granted to DOD under Sections 91(b) and 110(b) of the AEA, to regulate radioactive materials associated with a "utilization facility for military purposes."

The AEA also authorizes the ARO to administer the ARP. Army Regulation (AR) 50-7 implements this authority and sets forth program policies consistent with US Nuclear Regulatory Commission (NRC) regulations including decommissioning criteria set forth in 10 Code of Federal Regulations (CFR) 20 Subpart E, *Radiological Criteria for License Termination*. Today, the ARP helps ensure that Army reactors are decommissioned in a manner that is consistent with federal regulatory standards and guidelines, including those put forth by NRC, the National Council

on Radiation Protection (NCRP), and American National Standards Institute (ANSI). It is Army policy to implement project consistent with NRC guidelines as well as the recommendations of ANSI and NCRP.

ES.2.1 Decommissioning

Decommissioning includes the full range of actions taken to bring radioactivity levels at the site down to the unrestricted release standards provided in 10 CFR 20.1402. This includes construction-related activities such as facility dismantlement and removal, as well as other requirements that must be met prior to and during such activities.

AR 50-7 requires USACE to obtain a Decommissioning Permit from ARO in accordance with the Deactivated Reactor Management Plan (DRMP), which outlines a process for managing the Army's deactivated nuclear power plants, including SM-1 (US Army, 2016). As described in the DRMP, a four-phase All Hazards Assessment (AHA) is central to the licensing of these facilities. The four phases of an AHA include:

- **Phase I** consists of preparation of a historical site assessment (HSA) to quantify data quality objectives, and a conceptual site model to inform the conduct of a characterization survey. The HSA also includes an initial waste classification of large reactor components.
- **Phase II** consists of radiological and non-radiological sampling and analyses, and preparation of a Characterization Survey Report (CSR). Based on the CSR, a disposal alternatives evaluation and decommissioning and disposal cost estimate are also prepared.
- **Phase III** consists of developing detailed design plans to execute the selected hazards reduction approach, decommissioning, and disposal options.
- **Phase IV** consists of executing the Phase III plans and conducting a final status survey (FSS) for permit termination.

The planning, sampling, and analytical requirements of the AHA are integral parts of the decommissioning process that ensure proper waste classification, handling, treatment, disposal, and/or storage. The proposed decommissioning of SM-1 is currently in Phase III; Phase I and Phase II have been completed.

The ARP adopts the NRC's radiological dose criteria for releasing a facility or site for unrestricted use, as provided in 10 CFR Part 20.1402, Subpart E. This regulation states that a facility or site can be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent in excess of 25 millirems per year. Regulations at 10 CFR Part 20 also stipulate that residual activity be reduced to levels that are as low as reasonably achievable (ALARA).

NRC and the US Department of Transportation (USDOT) co-regulate the transportation of radioactive materials (44 *Federal Register* 38690, July 2, 1979). USDOT regulates all aspects of transportation to include packaging, documentation, and shipment or carrier responsibilities. NRC develops safety standards for packaging certain radioactive materials (adopted by USDOT) and licenses the transport of radioactive materials for compliance with USDOT-specific regulations that fall outside their purview (NRC, 2019). ARO does not regulate the transportation of radioactive materials.

Non-radioactive wastes generated from the proposed SM-1 decommissioning would fall under the regulatory jurisdiction of the US Environmental Protection Agency and applicable state agencies. These wastes may include lead-based paints, lead used as radiation shielding, mercury regulated under the Resource Conservation and Recovery Act (RCRA), and asbestos containing materials and polychlorinated biphenyls regulated under the Toxic Substances Control Act (TSCA). RCRA defines "mixed waste" in 40 CFR 266.210 as "a waste that contains both RCRA hazardous waste and source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954 as

amended." Mixed wastes generally require treatment (such as microencapsulation) prior to disposal at a radioactive waste disposal facility. Radiologically contaminated TSCA waste, while not technically “mixed waste,” also requires special waste management considerations.

ES.3 Purpose and Need

Under USACE’s Deactivated Nuclear Power Plant Program, decommissioning a nuclear reactor is required within 60 years of its final shutdown in order to be consistent with the NRC regulations (as adopted by the ARP in AR 50-7). The Deactivated SM-1 Nuclear Reactor Facility has been in a safe storage (SAFSTOR) condition and subject to regular inspection and monitoring for more than 46 years. Accordingly, the ***purpose*** of the Proposed Action is to safely remove, transport, and dispose of all materials and equipment (M&E) and structures associated with the Deactivated SM-1 Nuclear Reactor Facility and remediate environmental impacts from the facility such that residual radioactivity levels meet the applicable criteria for unrestricted use. The Proposed Action would accomplish this objective and terminate the ARO Decommissioning Permit for SM-1.

USACE maintenance of the Deactivated SM-1 Nuclear Reactor Facility is costly and not sustainable over the long-term. In its current state, the SM-1 site does not support the military mission on Fort Belvoir, now or in the future. Therefore, the ***need*** for the Proposed Action is to complete the decommissioning of the Deactivated SM-1 Nuclear Reactor Facility within 60 years of its final shutdown in accordance with the NRC regulations as adopted by the ARP in AR 50-7. The Proposed Action would complete Phase IV of the multi-phased AHA by implementing the detailed design and execution plans prepared as part of Phase III. Upon ARO approval of the final, site-specific Decommissioning Plan (DP) outlining the proposed decommissioning approach for SM-1, decommissioning activities for SM-1 would proceed to completion. Implementing the Proposed Action in this manner would result in a cost savings to USACE as maintenance of the site would no longer be required. Upon its completion, the Proposed Action would return the property to Fort Belvoir. Further, the Proposed Action allows USACE to meet mission objectives to decommission SM-1 and terminate the SM-1 possession permit.

ES.4 Alternatives

This EA evaluates the No Action and Proposed Action Alternatives. If implemented, the Proposed Action Alternative would complete the decommissioning of the Deactivated SM-1 Nuclear Reactor Facility in accordance with the ARO-approved DP. The No Action Alternative would continue to maintain SM-1 in a SAFSTOR condition. None of the other evaluated alternatives satisfied the Proposed Action’s purpose and need.

ES.4.1 No Action Alternative

Under the No Action Alternative, USACE would continue to maintain the Deactivated SM-1 Nuclear Reactor Facility in a SAFSTOR condition under Reactor Possession Permit Number SM1-1-19 and future permit extensions. The ARP’s mission to deactivate SM-1 and return the property to Fort Belvoir would be delayed or defunct, should decommissioning not take place within 60 years of its deactivation. Under the No Action Alternative, USACE would continue to bear the cost of maintaining the Deactivated SM-1 Nuclear Reactor Facility, including regular inspection and monitoring. The site would not be restored, allowed to return to a natural state, or re-purposed to support the military mission of Fort Belvoir under this Alternative. While the No Action Alternative would not meet the Proposed Action’s purpose and need, it is analyzed in the EA to provide a comparative baseline in accordance with 40 CFR Part 1502.14.

ES.4.2 Proposed Action Alternative

The Proposed Action Alternative would execute the ARO-approved SM-1 DP in compliance with USACE safety requirements and applicable federal and state laws and regulations. Decommissioning and dismantlement of the Deactivated SM-1 Nuclear Reactor Facility under this Alternative would include the following types of activities:

- Mobilization and site preparation
- Removal of radioactive M&E
- Decontamination
- Removal of non-radioactive M&E
- Dismantlement and debris removal
- Site remediation and restoration
- Demobilization

The Proposed Action Alternative would generally be sequenced in the order presented above; however, the final decommissioning approach would be organized and conducted based on factors such as scheduling, permitting, and the availability of personnel and specialized equipment. During the course of the Proposed Action Alternative, waste characterization and shipping, and material/facility release surveys would be conducted on a routine basis.

All radioactive waste generated from decommissioning activities would be packaged, transported, and disposed of in accordance with applicable laws and regulations. Waste transport from the SM-1 site would be distributed over the approximately 5-year decommissioning period; however, it is anticipated that 50 percent of waste shipments would occur during the middle 12 months (i.e., months 19 through 30) of the project (USACE, 2018c).

The removal of Building 375, the concrete discharge pipe, and outfall structure would require work within the 100-year floodplain and tidal wetlands associated with Gunston Cove. In accordance with Executive Order 11988, USACE has prepared a Draft Finding of No Practicable Alternative (FONPA) explaining its decision to implement the Proposed Action Alternative in the 100-year floodplain.

Site restoration would include the placement of clean fill soils and grading to mimic the site's current elevation and topography. A loamy top soil seeded with native grasses and shrubs to promote revegetation would then be applied to the site. USACE would also comply with Fort Belvoir's Policy Memorandum #27, *Tree Removal and Protection*, by replanting trees at a 2-to-1 replacement ratio, either on-site or elsewhere on Fort Belvoir (Fort Belvoir, 2018b). The removal of structures from the 100-year floodplain and tidal wetlands associated with Gunston Cove would enable those areas to return to a pre-disturbance condition in the long term.

Under the Proposed Action Alternative, Fort Belvoir's existing road network would be used to access the SM-1 site, and to transport materials and waste for disposal or recycling off-post. The primary routes designated for this purpose include Wilson Road and Totten Road within the 300 Area, and Theote Road and Pohick Road from the 300 Area to US Route 1 (Richmond Highway).

ES.5 Public and Agency Involvement

USACE outreach regarding the Proposed Action is ongoing and will include a six-week public review and comment period for the Draft EA. The availability of the Draft EA for public review will be announced via publication of a Notice of Availability (NOA) in local newspaper(s) and on social media platforms maintained by USACE and Fort Belvoir. Additionally, printed copies of the Draft EA will be made available for public review at the Fort Belvoir Library, Kingstowne Library in Alexandria, Virginia, and Lorton Library in Lorton, Virginia. All substantive comments received during the public review period will be addressed in the Final EA. Additional information about the

proposed SM-1 decommissioning is accessible online at https://www.nab.usace.army.mil/Missions/Environmental/SM-1/.

USACE consulted with numerous regulatory agencies concerning the proposed decommissioning of the Deactivated SM-1 Nuclear Reactor Facility, including the Virginia Department of Historic Resources (VDHR; the Commonwealth of Virginia's State Historic Preservation Office [SHPO]), the US Fish and Wildlife Service (USFWS), and National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NOAA Fisheries). In accordance with DOD Instruction 4710.02, *Interactions with Federally Recognized Tribes*, USACE also coordinated with recognized state and federal Native American tribes having possible ancestral ties to the region. Substantive public and agency comments received to date are addressed in this EA, as appropriate.

ES.6 Environmental Consequences

The potential environmental consequences of the No Action and Proposed Action Alternatives are summarized in **Table ES-1**. For all resources analyzed in the Draft EA, adverse impacts would be less than significant and would not meet the conditions requiring preparation of an EIS as defined at 32 CFR Part 651.41, *Conditions requiring an EIS*. Therefore, the Army has determined that the Proposed Action is not an action normally requiring preparation of an EIS as defined at 32 CFR Part 651.42, *Actions normally requiring an EIS*.

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Water Resources, including Water-Dependent Recreation	***No impacts***. There would be no impacts on water resources, water quality, or water-dependent recreation as no decommissioning activities would occur. Existing conditions would continue.	***Short-term, less-than-significant adverse impacts*** on groundwater, surface water, water quality, and stormwater from potential release of waste fluids and sedimentation during decommissioning and dismantlement activities. ***Short -term, less-than-significant adverse impacts*** on wetlands, floodplains, Resource Protection Areas (RPAs), and water-dependent recreation from decommissioning and dismantlement activities occurring in these areas. ***Long-term, beneficial impacts*** on groundwater, water quality, RPAs, stormwater, floodplains, and water-dependent recreation from restoration of the SM-1 site to a permeable, vegetated condition, and removal of in-water structures from the 100-year floodplain and wetlands.	• Capture, containerize, and characterize waste fluids during dismantlement activities, transport from the site by licensed contractors, and dispose of at permitted off-post facilities. • Provide spill kits on the site in the event that containment and cleanup of accidental spills is needed. • Plan, review, and evaluate activities with the potential to release residual or waste fluids to identify best practices and procedures to contain fluids and prevent accidental releases. • Cut support piles below the mudline during removal of the intake pier/pump house structure and leave portions below the mudline in place to minimize sediment and subaqueous bottom disturbance. • Use containment booms, turbidity curtains, and/or similar measures during in-water work to prevent the downstream migration of floating debris and disturbed sediments, and ensure that disturbed sediments re-settle near their original location. • Obtain permit coverage pursuant to Sections 401/404 of the Clean Water Act (CWA) prior to wetland disturbance. • Mitigate tree removal in Resource Protection Areas (RPAs) through the planting of two new trees for the removal of every tree four inches dbh or greater in accordance with Fort Belvoir Policy Memorandum #27, *Tree Removal and Protection.* • Obtain coverage under the Virginia Department of Environmental Quality's (VDEQ) Construction General Permit (CGP) prior to earth disturbance. • Post signage or provide additional notification as determined necessary to ensure that boaters maintain a safe distance during removal of the intake pier/pump house.

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Air Quality	***No impacts***. There would be no impacts on air quality. Existing conditions would continue.	***Short -term, less-than-significant adverse impacts*** on air quality from emissions of Criteria pollutants, hazardous air pollutants (HAP), and greenhouse gas (GHG) by construction equipment and vehicles during decommissioning and dismantlement activities. **No long-term impacts.**	• Cover truck beds while in transit to limit fugitive emissions. • Spray water on any unpaved roads or stockpiles to limit fugitive emissions. • Use ultra-low sulfur diesel as a fuel source where appropriate to minimize oxides of sulfur emissions. • Use clean diesel in construction equipment and vehicles through the implementation of add-on control technologies (e.g., diesel particulate filters and diesel oxidation catalysts, repowers, and/or newer and cleaner equipment). Use electric-powered equipment in lieu of diesel-powered equipment when feasible. • Implement control measures for heavy construction equipment and vehicles (e.g., minimizing operating and idling time), to limit criteria pollutant emissions. • Obtain air quality permits as necessary, in compliance with federal, state, and local standards.

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Biological Resources	***No impacts***. Continued maintenance of the Deactivated SM-1 Nuclear Reactor Facility would have no effects on biological resources on and in the vicinity of the site.	***Short -term, less-than-significant adverse impacts*** on vegetation and plant communities, wildlife and habitat, protected species, and Special Natural Areas from disturbance of terrestrial and aquatic environments (including osprey nesting areas) during decommissioning and dismantlement activities. ***Long-term, beneficial impacts*** on wildlife, protected species, and habitats from site restoration and revegetation. **Endangered Species Act (ESA) Section 7 and Magnuson-Stevens Fishery Conservation and Management Act (MSA) determinations:** ***Not likely to adversely affect*** the federally threatened northern long-eared bat (NLEB) and ***no effect*** on terrestrial critical habitat; USFWS concurrence received. ***May affect, but unlikely to adversely affect*** Essential Fish Habitat (EFH); NOAA Fisheries concurrence received. ***May affect, but unlikely to adversely affect*** federally listed fish species and ***no effect*** on aquatic critical habitat; NOAA Fisheries concurrence pending.	• Replant cleared trees on-site where deemed suitable in accordance with Fort Belvoir policy; reseed other disturbed areas with native grasses and/or shrubs to promote revegetation. • Relocate active osprey nests (e.g., on Building 372 and the intake pier) according to VDGIF's *Removal or Relocation of Osprey Nests in Virginia: A Guideline for Landowners* (VDGIF, 2010) and Fort Belvoir's Policy Memorandum #78, *Conservation of Migratory Birds.* • Cut support piles below the mudline during removal of the intake pier/pump house structure and leave portions below the mudline in place to minimize sediment and subaqueous bottom disturbance. • Use containment booms, turbidity curtains, and/or similar measures during in-water work to prevent the downstream migration of floating debris and disturbed sediments, and ensure that disturbed sediments re-settle near their original location. • Inform workers and personnel on the SM-1 site of the bald eagle's active nesting season (15 November to 15 June). Coordinate with Fort Belvoir's Environmental Division, USFWS, and VDGIF as necessary. • Prohibit vegetation clearing between April 1 and July 15 of any year to prevent or minimize impacts on migratory birds; or, conduct surveys for birds and/or active nests prior to vegetation clearing if such activities cannot be avoided during that time period. • Prohibit vegetation clearing between April 15 and September 15 to protect special status bat species. • Update protected species queries and re-initiate consultation with applicable regulatory agencies if it is determined that the Proposed Action would potentially affect new or additional protected species not addressed in this EA. • Mitigate dust levels with water sprays and covers over dust-creating stockpiles and truck transport (e.g., soils). • Follow time of year restrictions to minimize or avoid impacts on bald eagle habitat, as necessary, for activities within the Potomac River Eagle Concentration Area.

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Radiological Safety and Health	***No impacts.*** While there would be no radiological impacts on safety, contamination, waste, or disposal from the No Action Alternative, there would be a need for continued environmental monitoring and security protocols to ensure long-term environmental and public safety. Very limited quantities of solid waste would be generated at the facility from routine surveillance operations.	***Short-term, less-than-significant adverse impacts*** on radiological exposure (human health and safety); waste generation, transportation, and disposal, and potential accidental release of radioactive materials from decommissioning and dismantlement activities. ***Long-term, beneficial impacts*** from removal and disposal of radioactive waste in licensed/permitted landfills.	• Implement a Radiation Safety Program, an Environmental Monitoring and Control Program, and a Waste Management program to ensure the safe removal of activated and/or contaminated components and reduce the risk of potential release to the environment. These programs would also require routine measurement of the quantity of direct radiation and radioactive material releases. • Provide appropriate monitoring of occupational radiation exposure to staff entering and working in the restricted area in accordance with EM 385-1-1. An individual's access to radiation areas will be restricted as the individual approaches the exposure dose limit to minimize further occupational exposure and ensure regulatory limits are not exceeded. • Implement a Waste Management Plan (WMP) during the decommissioning process for safe handling and management of LLRW. Perform sorting, segregation, and decontamination to the extent practical to minimize the amount of radioactive waste requiring treatment and disposal. Notify all appropriate authorities and satisfy all regulatory requirements prior to off-site shipment of any radioactive material.
Occupational Safety and Health	**Less-than-significant adverse short- and long-term direct impacts** on occupational safety and health from continued maintenance of the Deactivated SM-1 Nuclear Reactor Facility. **No short- or long-term indirect impacts** on occupational safety and health from continued maintenance of the Deactivated SM-1 Nuclear Reactor Facility.	***Short- and long-term, less-than-significant adverse impacts*** on occupational safety and health during decommissioning and dismantlement activities and site maintenance following restoration.	• Prepare, implement, and adhere to an accident prevention plan (APP) before performing work. Review and update the APP throughout the Proposed Action Alternative as project phases and/or conditions change. USACE would provide continuous oversight of the APP. • Enter into one or more MOAs with on- and off-post fire and emergency response services and/or emergency health care providers to define roles and responsibilities and establish conditions for response, oversight, and monitoring.

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Cultural Resources	***Less-than-significant adverse impacts*** on Buildings 372, 349, 350/7350, and 375, which would not be repurposed and would be inefficient to maintain in their present condition.	***Less-than-significant adverse effect*** on National Register of Historic Places (NRHP)-eligible architectural resources from dismantlement of SM-1 and associated structures. SHPO concurrence received. ***No effect*** on traditional cultural resources.	• Adhere to the policies and procedures for unanticipated discoveries per 36 CFR. Part 800.13, *Post-review Discoveries,* including immediately ceasing work and notifying the SHPO, Native American tribes, ACHP, and other relevant parties upon discovery of materials or human remains during ground disturbance activities. • Adhere to mitigation measures outlined in a Memorandum of Agreement (MOA) with the SHPO, including production of a modified Historic American Engineering Record (HAER) for SM-1. • Conduct historic research of the facility as well as interviews with personnel associated with SM-1 for inclusion in the modified HAER document. • Provide SHPO with a thirty (30)-day opportunity to review and comment on the HAER documentation. • Remove the commemorative plaque from Building 372 and move it to a yet-to-be determined facility for restoration and display; develop a historical marker commemorating SM-1; and salvage historical items, when possible, from SM-1 for loan to traveling exhibits. • Complete the HAER and, within six months of completion of the Proposed Action Alternative, other identified mitigation measures such as installation of a commemorative marker and salvage of historic materials.

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Transportation and Traffic	***No impacts***. There would be no impacts on the on-post and off-post transportation network.	***Short-term, less-than-significant adverse impacts*** on the on- and off-post transportation network, road conditions, and health and safety from the transport of waste, import of fill material, and workers' commuting vehicles. ***No long-term impacts*.**	• Implement a project-specific transportation management plan identifying approved travel routes to and from the site for decommissioning personnel and heavy trucks transporting materials, equipment, and debris. • Notify on- and off-post emergency responders of the types of shipments that would be transported to support preparation for potential transportation-related accidents. • Schedule decommissioning-related traffic for off-peak hours in coordination with Fort Belvoir and other affected organizations to minimize roadway congestion. • Package and ship all radioactive waste and other debris generated at the SM-1 site in accordance with the WMP and consistent with NRC and USDOT regulatory requirements.
Non-Radiological Hazardous Materials and Waste, and Non-Hazardous Solid Waste	***Less-than-significant adverse impacts*** from non-radioactive hazardous materials that would remain in Building 372 and on the SM-1 site. The only hazardous or non-hazardous solid waste would be generated at the facility from routine surveillance operations.	***Short-term, less-than-significant adverse impacts*** on non-radiological hazardous waste and non-hazardous solid waste generated from dismantlement of the facility. ***No long-term impacts*.**	• Generate, handle, manage, store, package, characterize, transport, and dispose of all waste generated during the Proposed Action Alternative in accordance with written procedures and requirements set forth in applicable management plans (e.g., the WMP and DP).

Table ES-1: Summary of Environmental Impacts and Management and/or Mitigation Measures

Resource Area	No Action Alternative	Proposed Action Alternative	Management and/or Mitigation Measures (Proposed Action Alternative)
Geology, Topography, and Soils	***Less-than-significant adverse impacts*** from radiologically contaminated soils that would not be removed from the site.	***Short-term, less-than-significant adverse impacts*** on topography, soils, bathymetry, and sediments from dismantlement and excavation activities. **No short- or long-term impacts** on geology. **No long-term adverse impacts** on topography, bathymetry, or sediments**. Long-term beneficial impacts** on soils from the removal and disposal of soils containing low levels of residual radiological contaminants.	• Obtain ground disturbance permits from Fort Belvoir Directorate of Public Works. • Obtain coverage under the CGP and adhere to the requirements of a site-specific stormwater pollution prevention plan (SWPPP), erosion and sediment control (E&SC) plan, and stormwater management plan (SWMP) to minimize the erosion of exposed soils and corresponding concentrations of sediments and pollutants in stormwater generated on the project site and discharged to receiving water bodies. • Use containment booms, sediment curtains, and other applicable measures during in-water and nearshore work to prevent the migration of disturbed sediments into the water column, minimize turbidity, and ensure disturbed sediments settle near their original location. • Restore the SM-1 site to a permeable, vegetated condition to minimize or prevent continued soil erosion and corresponding sedimentation of receiving water bodies.

Table of Contents

Vol. I

Vol. II – Appendices

List of Tables

List of Figures

Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
ACHP	Advisory Council on Historic Preservation
ACM	Asbestos-Containing Materials
ACP	Access Control Point
ADP	Area Development Plan
AEA	Atomic Energy Act
AHA	All Hazards Assessment
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
APE	Area of Potential Effects
APP	Accident Prevention Plan
AR	Army Regulation
ARO	Army Reactor Office
ARP	Army Reactor Program
BFE	Base Flood Elevation
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BMP	Best Management Practice
CAA	Clean Air Act
CBPA	Chesapeake Bay Preservation Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CGP	Construction General Permit
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide equivalent
CSR	Characterization Survey Report
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DAAF	Davison Army Airfield
DA-PAM	Department of the Army Pamphlet
dBA	A-weighted decibels
dbh	diameter at breast height
DDT	Dichlorodiphenyltrichloroethane
DES	Directorate of Emergency Services
DO	Dissolved Oxygen
DOD	Department of Defense
DOE	Department of Energy
DP	Decommissioning Plan
DPS	Distinct Population Segment
E&SC	Erosion and Sediment Control

EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EM	Engineering Manual
EO	Executive Order
ESA	Endangered Species Act
FNSI	Finding of No Significant Impact
FONPA	Finding of No Practicable Alternative
FR	Federal Register
FSS	Final Status Survey
FSSP	Final Status Survey Plan
FY	Fiscal Year
GEIS	Generic Environmental Impact Statement
GHG	Greenhouse Gas
HAP	Hazardous Air Pollutant
HAER	Historical American Engineering Record
HSA	Historical Site Assessment
I-95	Interstate 95
IICEP	Intergovernmental and Interagency Coordination for Environmental Planning
INRMP	Integrated Natural Resources Management Plan
IPaC	Information, Planning, and Consultation
ISW	Industrial Stormwater
JPA	Joint Permit Application
LBP	Lead-Based Paint
LIDAR	Light Detection and Ranging
LLRW	Low-level Radioactive Waste
LLW	Low-level Waste
M&E	Materials and Equipment
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MBTA	Migratory Bird Treaty Act
mg/L	milligram per liter
mg/m^3	milligram per cubic meter
MH-1A	Mobile High Power Model 1A (Nuclear Reactor Facility)
MOA	Memorandum of Agreement
MS4	Small Municipal Separate Storm Sewer Systems
mrem	millirem
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSW	Municipal Solid Waste
MWt	Megawatt Thermal
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves and Protection and Repatriation Act
NCR	National Capital Region
NCRP	National Council on Radiation Protection
NEI	National Emission Inventory
NEPA	National Environmental Policy Act

NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NLEB	Northern Long-Eared Bat
NMUSA	National Museum of the US Army
NO_2	Nitrogen Dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen Oxides
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	Ozone
OSHA	Occupational Safety and Health Administration
OSH	Occupational Safety and Health
Pb	Lead
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PST	Primary Shield Tank
PM	Particulate Matter
RCRA	Resource Conservation and Recovery Act
ROCs	Radionuclides of Concern
ROI	Region of Influence
RONA	Record of Non-Applicability
ROPCs	Radionuclides of Potential Concern
RPA	Resource Protection Area
RPMP	Real Property Master Plan
RPV	Reactor Pressure Vessel
SAFSTOR	Safe Storage
SARA	Superfund Amendments and Reauthorization Act
SAV	Submerged Aquatic Vegetation
sf	square feet
SHPO	State Historic Preservation Office(r)
SM-1	Stationary Medium Power Model 1 (Nuclear Reactor Facility)
SO_2	Sulfur Dioxide
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
tpy	tons per year
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solid
$\mu g/m^3$	micrograms per cubic meter

US	United States
USACE	US Army Corps of Engineers
USANCA	US Army Nuclear and Countering Weapons of Mass Destruction Agency
USC	United States Code
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VAC	Virginia Administrative Code
VC	Vapor Container
VDCR-NH	Virginia Department of Conservation and Recreation Natural Heritage Program
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VDGIF	Virginia Department of Game and Inland Fisheries
VOC	Volatile Organic Compound
WCS	Waste Control Specialists
WMP	Waste Management Plan
WOUS	Waters of the United States
yd^3	cubic yards

1 Purpose and Need

1.1 Introduction

The United States Army Corps of Engineers (USACE) has prepared this environmental assessment (EA) to identify, analyze, and document the potential physical, environmental, socioeconomic, and cultural effects of decommissioning and dismantling the United States (US) Army's Deactivated Stationary Medium Power Model 1 (SM-1) Nuclear Reactor Facility at US Army Garrison Fort Belvoir (Fort Belvoir). The EA has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; Title 42, United States Code [USC] Part 4321 et seq.); the NEPA-implementing regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500–1508); and the Army's NEPA regulations (32 CFR Part 651, *Environmental Analysis of Army Actions*).

USACE maintains the Deactivated SM-1 Nuclear Reactor Facility in accordance with Army Regulation (AR) 50-7, *Army Reactor Program*, and Reactor Possession Permit No. SM1-1-19 issued by the US Army Nuclear and Countering Weapons of Mass Destruction Agency (USANCA) (USANCA, 2019). The Army Reactor Office (ARO), established by USANCA, oversees the Army Reactor Program (ARP) and designates the ARP Manager. USACE proposes to complete the decommissioning of SM-1 to a standard that allows for release of the SM-1 site for unrestricted use (also referred to as the "Proposed Action").

The ARP adopts the US Nuclear Regulatory Commission's (NRC) radiological dose criteria for releasing a facility or site for unrestricted use, as provided in 10 CFR Part 20.1402, *Radiological Criteria for Unrestricted Use*. This regulation states that a facility or site can be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a total effective dose equivalent in excess of 25 millirems (mrem) per year. Regulations at 10 CFR Part 20 also stipulate that residual activity be reduced to levels that are as low as reasonably achievable (ALARA) (radiological safety and health is discussed in **Section 3.6** of this EA).

The Proposed Action requires an ARO-approved Decommissioning Plan (DP) prior to the removal of contaminated structures, equipment, and media from the SM-1 site. Following approval of the DP, USANCA would transition the SM-1 Reactor Possession Permit Number SM1-1-19 to a Reactor Decommissioning Permit. Upon completion of the Proposed Action (see **Section 2.2**), including validation that applicable radiation dose-based cleanup standards have been met, ARO would terminate the SM-1 Decommissioning Permit. The proposed decommissioning of SM-1 would occur over an approximately 5-year time period from 2020 to 2025.

1.2 Project Location, Environmental Setting, and Description

Fort Belvoir, located in Fairfax County, Virginia is a strategic sustaining base for the Army that provides logistical, intelligence, and administrative support to a diverse mix of tenant commands, activities, and agencies. The installation is within the National Capital Region (NCR), approximately 11 miles south of Alexandria, Virginia and 17 miles southwest of Washington, D.C (**Figure 1.2-1**). Approximately 40,000 military and civilian personnel work on the post and it has a resident population of about 5,000 people (Fort Belvoir, 2014).

The Deactivated SM-1 Nuclear Reactor Facility is situated on Fort Belvoir's South Post (i.e., the portion of Main Post to the south of Richmond Highway/US Route 1) within a secured area known as the "300 Area". The approximately 3.6-acre site is positioned along the shoreline of Gunston Cove, a tidal embayment of the Potomac River (**Figure 1.2-2**). The SM-1 site contains the reactor building (Building 372), an inactive wastewater lift station (Building 7350), a small warehouse (Building 349), a water intake pier and pump house (Building 375) that extends approximately 100 feet into Gunston Cove from the shoreline, and a concrete discharge pipe and concrete outfall structure (**Figure 1.2-3**).

Figure 1.2-1: Location of Fort Belvoir

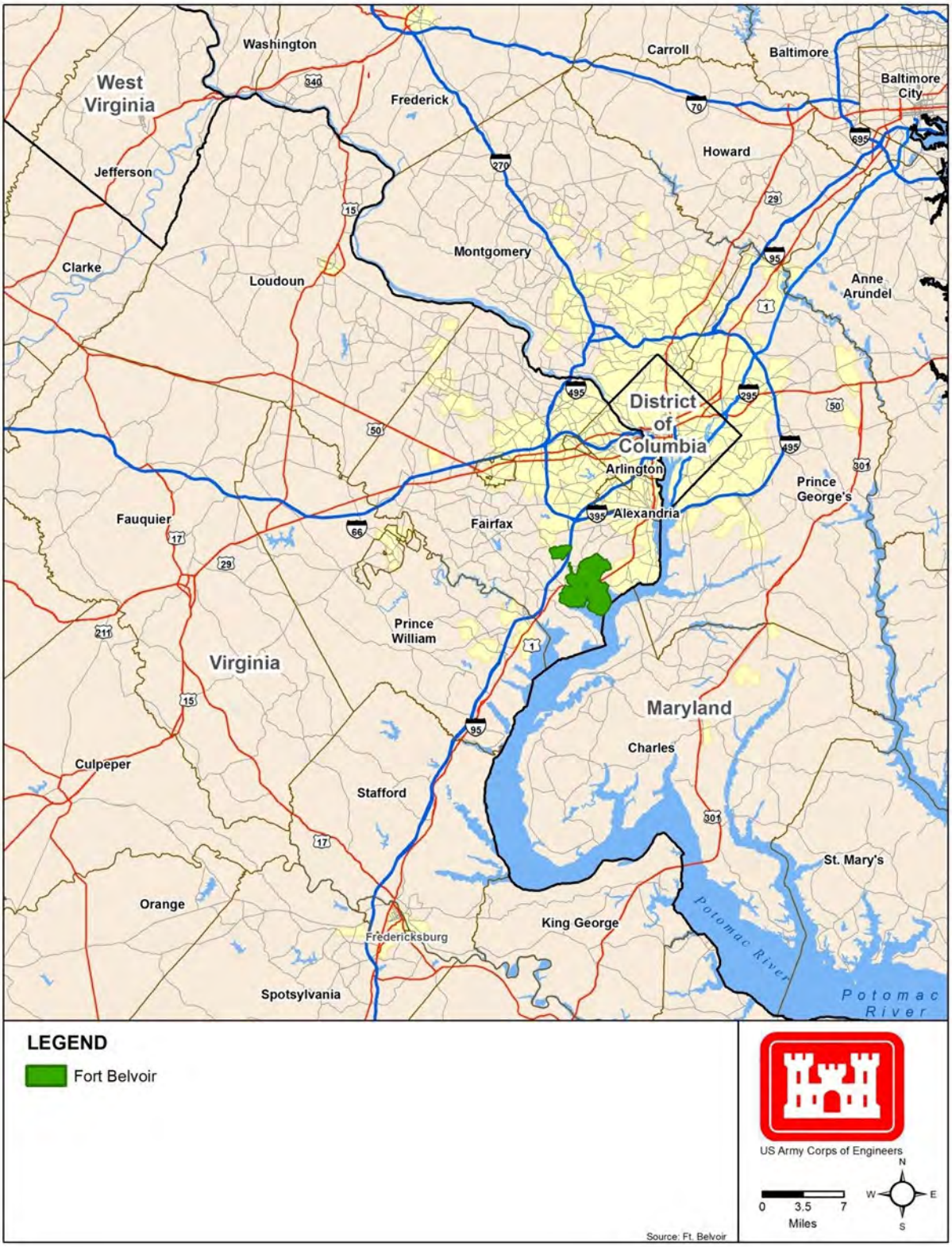


Figure 1.2-2: Location of the Deactivated SM-1 Nuclear Reactor Facility

Figure 1.2-3: SM-1 Site

A perimeter fence surrounds the SM-1 site[1] and the area therein is characterized by terrain that rises from the shore of Gunston Cove to a large terraced area at an elevation of about 35 feet above mean sea level. Most of the site was graded and leveled prior to development of SM-1; to a lesser extent, trees and grassland are present along the periphery. Access to the Deactivated SM-1 Nuclear Reactor Facility is controlled by three gated entry points, two on the eastern side of the site and one on the western side.

SM-1 was a single-loop 10-megawatt thermal (MWt) pressurized water reactor, operating on highly enriched uranium fuel (US Atomic Energy Commission, 1956). The SM-1 reactor consisted of a pressurized water-cooled reactor system (primary system) and a conventional steam turbine system (secondary system). Both were closed systems to minimize the risk of contamination. High-pressure water circulated through the primary system and was used to cool and extract heat from the solid uranium-fueled reactor. The heated primary system water flowed through a steam generator where, in a non-mixing heat exchanger, secondary system water was converted to superheated steam for the operation of the turbine. River water drawn from Gunston Cove was used to cool the condensate exhaust steam from the turbine, with the condensate being returned to the steam generator. The cooling water was discharged through a 16-inch pipeline to the seal pit, located to the south of Building 372. The seal pit was used to avoid excess vacuum on the cooling water discharge line. From the seal pit, water discharged by gravity through a buried 18-inch concrete pipe back into Gunston Cove, approximately 450 feet upstream of the water intake. The seal pit also acted as a mixing chamber for routine liquid effluents that could safely be released into the river after dilution.

The primary system includes the reactor pressure vessel (RPV), primary shield tank (PST), steam generator, pressurizer, and associated piping and is totally contained within the vapor container (VC). The VC is a domed structure with a base diameter of 42 feet and height from ground surface of 46 feet. It was designed to contain all the energy released from the steam generator in an accident scenario or loss-of-coolant accident; contain all airborne radioactivity; and shield the surrounding areas from direct radiation.

1.3 History of the SM-1 Nuclear Reactor Facility

1.3.1 Army Reactor Program

The SM-1 Nuclear Reactor Facility was designed, constructed, and operated as part of the Army Nuclear Power Program (the present day ARP). The Program was established in the 1950s to develop, construct, and operate small nuclear power reactors on select Department of Defense (DOD) lands under authority granted to the DOD by Section 91(b) of the Atomic Energy Act of 1954 (AEA), as amended (42 USC Part 2121). Section 91(b) authorizes DOD to procure and utilize special nuclear material in the interest of national defense and to acquire utilization facilities (i.e., reactors for military purposes). Section 110(b) of the Act excludes such utilization facilities acquired by DOD from any of the licensing requirements therein.

Pursuant to the AEA, the ARO administers this program, including the decommissioning of the Army's deactivated reactor facilities and sites. AR 50-7 sets forth Army program policies consistent with NRC regulations (10 CFR Part 20 Subpart E, and Parts 30, 50, and 51). It is Army policy to comply with the NRC regulations and industry standards such as the recommendations put forth by American National Standards Institute (ANSI) and National Council on Radiation Protection (NCRP). In accordance with AR 50-7, a decommissioning study must be performed by ARO to obtain a decommissioning permit from USANCA (US Army, 2016).

[1] Throughout this EA, "Deactivated SM-1 Nuclear Reactor Facility," "SM-1 site," and "SM-1," and similar terminology refers to the buildings, structures, and site shown on **Figure 1.2-3**.

Decommissioning activities under ARO's purview are also subject to Department of the Army Pamphlet (DA-PAM) 385-24, *The Army Radiation Safety Program*, which outlines radiation safety regulations and protocols applicable to the decommissioning of Army reactor facilities.

1.3.2 Operating History

The SM-1 reactor was a single-loop 10 MWt pressurized water reactor delivering a net 1,750 kilowatts of electrical power. SM-1 was the Army's first nuclear-powered, electricity-generating station and the first pressurized water reactor to be connected to an electrical grid in the US. Construction of the SM-1 Nuclear Reactor Facility at Fort Belvoir was completed in 1957, and it achieved its first criticality in April 1957. SM-1 was used to train hundreds of military personnel in nuclear power plant operations. The reactor last operated on 17 March 1973 and was deactivated from 1973 to 1974 (**Figure 1.3-1**).

1.3.3 Deactivation and Remediation

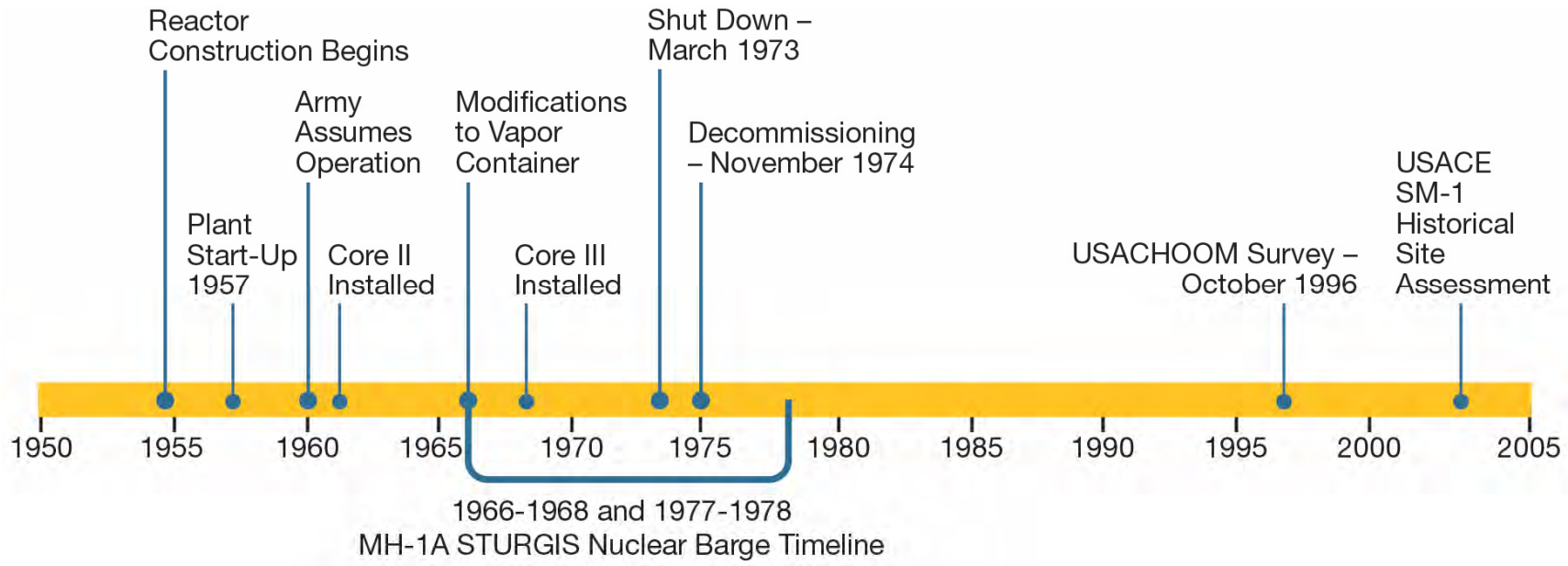
The initial deactivation process for the SM-1 Nuclear Reactor Facility began upon its deactivation and placement in a safe storage (SAFSTOR) configuration in November 1974 (**Figure 1.3-1**). Nuclear facilities in SAFSTOR are maintained and monitored in a condition that allows radioactivity to decay; afterward, the plant is dismantled, and the property is decontaminated (NRC, 1988). Since its placement in SAFSTOR, the Deactivated SM-1 Nuclear Reactor Facility has been subject to regular inspection and monitoring by USACE in accordance with AR 50-7 and the SM-1 Reactor Possession Permit Number SM1-1-19.

Deactivation consisted of removal of the nuclear fuel and control rods, minor decontamination, shipment of necessary radioactive waste, sealing the RPV, and installing appropriate warning signs and monitoring devices. The SM-1 VC, which contains the RPV and primary system components, was also sealed and the facility was placed under a routine monitoring program currently implemented by USACE. Additionally, the guard shack (Building 373), diesel generator area (Building 384), flammable storage area (Building 376), waste retention and processing facilities, and waste tanks were demolished and/or removed from the SM-1 site (USACE 2005).

In 1996, the US Army Center for Health Promotion and Preventive Medicine conducted radiological surveys around the Deactivated SM-1 Nuclear Reactor Facility to determine what changes had taken place over more than 20 years since shutdown. The surveys indicated that there was radioactive contamination inside the restricted areas in Building 372 and in soil at the facility (US Army, 1996). After the 1996 survey was completed, about 30 drums of soil were removed from the land area near the seal pit (USACE, 2013).

In the early 2000s, USACE began developing a management plan for conducting an All Hazards Assessment (AHA) for the Deactivated SM-1 Nuclear Reactor Facility. From 2009 to 2010, following completion of a Historical Site Assessment (HSA) in 2004, characterization surveys were conducted at the SM-1 site. The survey results were documented in a 2013 Characterization Survey Report (CSR). Field surveys were again performed from 2016 to 2017 to validate the CSR findings and address data gaps identified therein. Currently, the decommissioning of SM-1 is in Phase III of the four-phase AHA process. Phase III consists of developing detailed design plans to execute the selected hazards reduction approach, decommissioning, and disposal options.

Figure 1.3-1: SM-1 Operating History and Decommissioning Timeline



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1.3.4 SM-1 Permit History

USACE maintains the Deactivated SM-1 Nuclear Reactor Facility in accordance with Reactor Possession Permit SM1-1-19, initially issued by USANCA to the USACE Environmental Community of Practice in 2009 and renewed in October 2019. The current permit incorporates a 2018 amendment (Amendment 1-18) to allow for storage on the SM-1 site of five shipping containers of tools and equipment (some contaminated with low levels of radiation) that were used during the recent (2015-2018) decommissioning of the Army's Mobile High Power Model 1A (MH-1A) reactor onboard the *STURGIS* in Galveston, Texas. *STURGIS* was a barge-mounted nuclear reactor that underwent initial testing (1967) and was later deactivated (1977-1978) at Fort Belvoir (**Figure 1.3-1**) (USACE, 2014a). USACE intends to use the stored tools and equipment transferred from *STURGIS* to implement the Proposed Action analyzed in this EA.

Accordingly, the current possession permit for SM-1 covers the following materials:

1. Byproduct produced as a result of SM-1 operations.
2. Byproduct present on-site at locations where facility equipment or materials were utilized.
3. Byproduct produced as a result of MH-1A operations in the form of residual contamination on or internal to related equipment being stored on-site.

Prior to the effective date on the current possession permit (2019), the authorizing documents for the radioactivity remaining at the Deactivated SM-1 Nuclear Reactor Facility included Department of the Army Radioactive Materials Authorization Number A 45-63-02 and several other Reactor Possession Permits.

1.4 Purpose and Need

Under USACE's Deactivated Nuclear Power Plant Program, decommissioning a nuclear reactor is required within 60 years of its final shutdown to be consistent with the NRC regulations (as adopted by the ARP in AR 50-7). The Deactivated SM-1 Nuclear Reactor Facility has been in a SAFSTOR condition and subject to regular inspection and monitoring for more than 46 years. Accordingly, the ***purpose*** of the Proposed Action is to safely remove, transport, and dispose of all materials and equipment (M&E) and structures associated with the Deactivated SM-1 Nuclear Reactor Facility such that residual radioactivity levels meet the applicable criteria for unrestricted use. The Proposed Action would accomplish this objective and terminate the ARO Decommissioning Permit for SM-1.

USACE maintenance of the Deactivated SM-1 Nuclear Reactor Facility is costly and not sustainable over the long-term. In its current state, the SM-1 site does not support the military mission on Fort Belvoir, now or in the future. Therefore, the ***need*** for the Proposed Action is to complete the decommissioning of the Deactivated SM-1 Nuclear Reactor Facility within 60 years of its final shutdown in accordance with the NRC regulations as adopted by the ARP in AR 50-7. The Proposed Action would complete Phase IV of the multi-phased AHA by implementing the detailed design and execution plans prepared as part of Phase III. Upon ARO approval of the final, site-specific DP outlining the proposed decommissioning approach for SM-1, decommissioning activities for SM-1 would proceed to completion. Implementing the Proposed Action in this manner would result in a cost savings to USACE as maintenance of the site would no longer be required. Upon its completion, the Proposed Action would return the property to Fort Belvoir. Further, the Proposed Action allows USACE to meet mission objectives to decommission SM-1 and terminate the SM-1 possession permit.

1.5 Scope and Analysis

This EA analyzes the potential direct, indirect, and cumulative physical, environmental, socioeconomic, and cultural effects of the No Action and Proposed Action Alternatives, as follows:

- **No Action Alternative**. Continue to maintain the Deactivated SM-1 Nuclear Reactor Facility in a SAFSTOR condition with regular inspections and monitoring.
- **Proposed Action Alternative**. Complete the decommissioning and dismantlement of SM-1 to a standard that allows for release of the site for unrestricted use and termination of the ARO Reactor Decommissioning Permit.

Three buildings (358, 371, and 380) historically associated with SM-1 operations are located north to northeast of the Deactivated SM-1 Nuclear Reactor Facility within the 300 Area (**Figure 3.8-1**). These were administrative support and training facilities for SM-1 that have since been renovated and are currently occupied by other tenants not associated with SM-1. Studies concluded that none of the buildings, or sites on which they are situated, require any further remediation with respect to radioactive materials associated with former SM-1 reactor operations (USACE 2019a). As such, the scope of this EA does not include these (or any other) buildings located outside the SM-1 site, as shown on **Figure 1.2-3**.

Resources or resource areas subject to detailed analysis in this EA include: radiological and occupational safety and health; transportation and traffic; non-radiological hazardous materials and waste, and non-hazardous solid waste; cultural resources; geology, topography, and soils; water resources, including recreation; biological resources; and air quality.

1.6 Decision to be Made

The intent of this EA is to inform decision-makers and the public of the potential environmental effects of the Proposed Action and its considered alternatives prior to making a federal decision to move forward with any alternative. In doing so, USACE can make a fully informed decision, aware of the potential environmental effects of its Proposed Action. This decision-making process also includes identifying the actions that USACE will commit to undertake to minimize environmental effects, as required by NEPA, CEQ regulations, and Army NEPA regulations.

The decision to be made is whether USACE should implement the Proposed Action and, if necessary, carry out mitigation measures to reduce effects on resources.

1.7 Public Agency Involvement

USACE invites public participation in its decision-making process in accordance with NEPA. Agencies, organizations, and members of the public having a potential interest in the Proposed Action are urged to participate. The following sections summarize public and agency involvement with respect to the Proposed Action.

1.7.1 Public Involvement

USACE outreach regarding the proposed decommissioning of SM-1 is ongoing and will include a six-week public review and comment period for the Draft EA. The availability of the Draft EA for public review will be announced via publication of a Notice of Availability (NOA) in local newspaper(s). Additionally, printed copies of the Draft EA will be made available for public review at the Fort Belvoir Library, Kingstowne Library in Alexandria, Virginia, and Lorton Library in Lorton, Virginia. All substantive comments received during the public review period will be addressed in the Final EA. Additional information about the proposed decommissioning of the Deactivated SM-1 Nuclear Reactor Facility is accessible online at https://www.nab.usace.army.mil/Missions/Environmental/SM-1/.

USACE outreach conducted to date for the Proposed Action is summarized in **Table 1.7-1**. The events and venues were selected to provide multiple opportunities on- and off-post to obtain information about the proposed decommissioning of SM-1. Participants at each event were also encouraged to ask questions and to make known their concerns or issues regarding the Proposed Action, if any. Copies of presentation materials used at these meetings are included in **Appendix A**.

Table 1.7-1: Public Outreach for the Proposed Action

Event	Date	Location
Public Meeting	28 January 2019	Thurman Hall (Building 247), Fort Belvoir
Public Meeting	12 March 2019	Fairfax South County Center
Mason Neck Town Hall	2 April 2019	Lorton, Virginia
12th AV BN Safety Day	23 May 2019	Davison Army Airfield, Fort Belvoir
Garrison Safety Day	12 June 2019	Specker Field House (Building 1182), Fort Belvoir

1.7.2 Agency Coordination

Intergovernmental and Interagency Coordination for Environmental Planning (IICEP) is a federally mandated process for informing and coordinating with other governmental agencies regarding a federal proposed action. USACE coordinated and consulted with the following agencies during the IICEP process for this EA:

- Advisory Council on Historic Preservation (ACHP)
- US Fish and Wildlife Service (USFWS)
- US Environmental Protection Agency (USEPA)
- National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NOAA Fisheries)
- National Capital Planning Commission
- Virginia Department of Game and Inland Fisheries (VDGIF)
- Virginia Department of Conservation and Recreation Natural Heritage Program (VDCR-NH)
- Virginia Department of Environmental Quality (VDEQ)
- Fairfax County Planning Commission
- Virginia Department of Historic Resources (VDHR; the Commonwealth of Virginia's State Historic Preservation Office [SHPO])

Copies of relevant agency correspondence are included in **Appendix B**.

1.7.3 National Historic Preservation Act

The National Historic Preservation Act of 1966 (NHPA), as amended, outlines federal policy to protect historic properties and promote historic preservation in cooperation with other nations, tribal governments, states, and local governments. Section 106 of the NHPA and its implementing regulations (36 CFR 800, *Protection of Historic Properties*) requires federal agencies to consider the potential effects of their proposed actions on historic properties listed or eligible for listing in the National Register of Historic Places (NRHP). Section 106 is a separate process from, but often conducted in parallel with, NEPA.

The SM-1 Nuclear Reactor Facility has been determined to be eligible for listing in the NRHP based on its historical significance. USACE consultation with VDHR regarding the Proposed Action evaluated in this EA is ongoing and is further discussed in **Section 3.8**. Copies of relevant correspondence are provided in **Appendix B**.

1.7.4 Tribal Consultation

DOD Instruction 4710.02, *Interactions with Federally Recognized Tribes*, implements the DOD *American Indian and Alaska Native Policy* (updated January 2012); AR 200-1, *Environmental Protection and Enhancement*; NEPA; NHPA; and Native American Graves and Protection and Repatriation Act (NAGPRA).

By letter dated 25 January 2019, USACE invited the following state and federally recognized Indian tribes with historic and cultural ties to Virginia and/or the Fort Belvoir area to participate as consulting parties in the Section 106 process for the Proposed Action:

- Eastern Band of Cherokee Indians
- Tuscarora Nation of New York
- United Keetoowah Band of Cherokee Indians in Oklahoma
- Catawba Indian Nation
- Pamunkey Indian Tribe
- Chickahominy Indian Tribe
- Chickahominy Indian Tribe – Eastern Division
- Upper Mattaponi Tribe
- Rappahannock Tribe
- Monacan Indian Nation
- Nansemond Indian Nation

Copies of relevant correspondence are included in **Appendix B**. To date, no tribal responses have been received.

The state and federally recognized tribes listed above will be notified of the availability of the Draft EA for review during the six-week public comment period.

1.8 Related Environmental and Other Documents

1.8.1 Programmatic NEPA Review

Pursuant to NEPA, NRC has studied the potential physical, environmental, cultural, and socioeconomic effects of decommissioning a nuclear reactor facility. NRC has completed three program-level NEPA studies that are relevant to the Proposed Action evaluated in this EA:

- **Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities, Supplement 1 (NUREG-0586)** (NRC, 2002). This GEIS analyzes decommissioning activities performed to remove radioactive and non-radioactive (e.g. intake structures and cooling towers) materials from structures, systems, and components from license certification to termination. The GEIS determined that most potential environmental impacts from the decommissioning of nuclear facilities are small.
- **GEIS in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities (NUREG-1496)** (NRC, 1997). This GEIS analyzes regulatory alternatives for establishing radiological criteria for decommissioning licensed nuclear facilities. The GEIS concludes that decommissioning alternatives should consider the future use of the site, provisions for public participation, the minimization of radioactive waste volumes and overall public risk, and other factors.
- **Final Environmental Impact Statement (EIS) on the Transportation of Radioactive Material by Air and Other Modes (NUREG-0170)** (NRC, 1977). This EIS analyzes impacts on human health and safety from the

transport of radioactive material under normal and accident conditions. The EIS determined that risks to workers and the general public from exposure to radioactive material during transport are low.

As applicable, the findings of these studies are incorporated by reference to supplement the analysis presented in this EA.

1.8.2 Decommissioning Planning Documents and Studies

This EA reflects and incorporates information from the following SM-1 decommissioning planning documents and studies:

- **Decommissioning Environmental Assessment** (US Army, 1972)
- **Historical Site Assessment** (USACE, 2005)
- **Characterization Survey Report** (USACE, 2013)
- **Phase 1 Archaeological Survey** (USACE, 2018b)
- **Decommissioning Plan** (USACE, 2019b)
- **Waste Management Plan** (USACE, 2018a)
- **Transportation Assessment Technical Memorandum** (USACE, 2018c)

1.8.3 Other Relevant Documents

Data relevant to the Proposed Action analyzed in this EA were obtained from multiple sources. These data are summarized or cited throughout the document, as appropriate. A complete list of references is provided in **Section 6**.

1.9 Regulatory Framework

This EA has been prepared under the provisions of, and in accordance with, NEPA, CEQ regulations, and Army NEPA regulations. Other laws and regulations applicable to the Proposed Action include, but are not limited to, the following:

- Clean Water Act (CWA; 33 USC Part 1251 *et seq*.)
- Resource Conservation and Recovery Act (RCRA; 42 USC Part 6901 *et seq*.)
- Section 438 of the Energy Independence and Security Act (Public Law 110-140)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 USC Part 9601 *et seq*.)
- Federal Clean Air Act (CAA) of 1990 (42 USC Part 7401 *et seq*., as amended)
- Endangered Species Act (ESA; 16 USC Part 1531 *et seq*.)
- Migratory Bird Treaty Act (MBTA; 16 USC Part 703 *et seq*.)
- NHPA (54 USC Part 300101 *et seq*.)
- NAGPRA (25 USC Part 3001 *et seq*.)
- DOD Instruction 4710.02, *Interactions with Federally Recognized Tribes*
- Toxic Substances Control Act (TSCA; 15 USC Part 2601 *et seq*.)

- EO 11990, *Protection of Wetlands* (1977)
- EO 11988, *Floodplain Management* (1977)
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994)
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (21 April 1997), as amended by EO 13296 (2003)
- EO 13834, *Efficient Federal Operations* (2018)

2 Proposed Action and Alternatives

2.1 Introduction

In accordance with AR 50-7, ARO requires a DP that is consistent with applicable NRC guidelines to proceed with the decommissioning and dismantlement of the Deactivated SM-1 Nuclear Reactor Facility. Upon ARO acceptance of the final DP, ARO will issue a Decommissioning Permit. Successful implementation of the DP in accordance with the permit would result in termination of the permit. Accordingly, the Proposed Action evaluated in this EA is to complete the decommissioning and dismantlement of SM-1 to a standard that allows for release of the site for unrestricted future use (**Section 1.1**).

This section of the EA includes a general description of the proposed decommissioning and dismantlement approach for SM-1. A probable sequence of decommissioning and dismantlement activities is presented in **Section 2.2** (some variability in the sequence of these activities is anticipated). Alternatives considered and evaluated in this EA are discussed in **Section 2.3**.

2.2 Description of the Proposed Action

The Proposed Action would execute the ARO-approved SM-1 DP in a manner that conforms to USACE safety requirements and complies with applicable state and federal laws and regulations. Decommissioning and dismantlement of a facility such as SM-1 generally consists of the following activities:

- Mobilization and site preparation
- Removal of non-radioactive hazards
- Removal of radioactive M&E
- Decontamination
- Removal of non-radioactive M&E
- Dismantlement and debris removal
- Site remediation and restoration
- Demobilization

The Proposed Action would generally be sequenced in the order presented above; however, the final decommissioning and dismantlement approach would organize and conduct these activities based on factors such as scheduling, permitting, and the availability of personnel and specialized equipment. During the course of the Proposed Action, waste characterization and shipping, and material/facility release surveys, would be conducted on a routine basis.

All radioactive and non-radioactive dismantlement debris, including building materials and soils, would be transported from the site by truck and, in some instances, trans-loaded to rail for shipment to a disposal facility. Waste generation, handling, and disposal are discussed further in **Section 2.2.8**.

If implemented, the Proposed Action would commence in 2020 with ARO approval of the DP and the findings of this EA. It would culminate with termination of the SM-1 Decommissioning Permit. The Proposed Action is further described in **Section 2.2.1** through **Section 2.2.8** as common steps associated with the decommissioning and dismantlement process.

2.2.1 Site Preparation

Site preparation is the first step in the decommissioning and dismantlement approach for SM-1. Preparatory activities associated with the Proposed Action would include vegetation management; establishing radiological and security controls; establishing temporary or modified facilities and work support areas; improving infrastructure; and personnel and equipment mobilization. The decommissioning contractor would obtain an excavation permit issued by Fort Belvoir's Directorate of Public Works (DPW) prior to beginning ground-disturbing activities on the SM-1 site.

Vegetation removal would be necessary to provide personnel and equipment with access to work areas. These measures would ensure safe ingress and egress to portions of the site where decommissioning and dismantlement activities would occur. Tree removal under the Proposed Action would generally occur in the upper and lower portions of the SM-1 site as required by activities such as underground utility removal and soil remediation.

The Proposed Action would include site improvements necessary to support decommissioning and dismantlement activities. Site improvements would include the construction of a concrete waste storage pad, installation of new temporary electrical power connections, and upgrades to roads around Building 372. As necessary, improvements may also include upgrading or reconfiguring the site's perimeter security fence and access control points. Additionally, routine repair and maintenance work conducted by Fort Belvoir may also support preparatory activities for the Proposed Action. For example, Fort Belvoir DPW regularly inspects and repairs rill and gully erosion occurring around and under Totten Road (**Figure 2.3-1**). USACE would coordinate specific maintenance requests with DPW in advance and in accordance with DPW's established procedures.

The Proposed Action would require heavy equipment such as cranes, skid loaders, forklifts, boom lifts, excavators, and similar platforms to support dismantlement and earthwork. As space is limited at the SM-1 site, heavy equipment would not be mobilized until needed to support proposed decommissioning activities.

2.2.2 Removal / Disposal of Non-Radiological Hazards

Following site preparation activities, the Proposed Action would address the removal and disposal of non-radiological hazards at SM-1. For example, the disposition of Building 372 would start with asbestos abatement in all accessible areas to include known sources of asbestos-containing materials (ACM) such as insulation and floor, ceiling, and roof materials. In other instances, ACM surveys may be required during decommissioning to ascertain whether abatement is necessary. Survey and abatement activities for other non-radiological hazards would be conducted in a similar manner. These hazards would include:

- microbial contamination (mold)
- lead-based paint (LBP)
- mercury in thermostats and laboratory drains
- polychlorinated biphenyls (PCBs) in paint, dielectric fluid, caulk, and gaskets
- exterior interferences associated with Building 372 such as a distilled water tank, service water tank, and an electrical substation

Additionally, non-radiological hazards are known or suspected in soils present on the SM-1 site. For example, lead was detected in soil samples taken in proximity to Building 372. Contaminated soils under the Proposed Action would either be addressed in relation to dismantlement and removal activities, or once all materials and waste have been segregated and/or prepared for transport and disposal.

2.2.3 Removal of Radioactive M&E

Individual radioactive system components (contaminated and/or activated) would be removed from Building 372 prior to its dismantlement. Employing this approach, the Proposed Action would remove and dispose of M&E from the Building 372 Restricted Area (including the VC) (**Figure 3.6-1**) and the Unrestricted Area (**Figure 3.6-2**). Radiological surveys would be performed on all M&E prior to removal to determine proper waste classification for disposition. With the exception of the RPV, primary system components would likely be classified as Class A low-level radioactive waste (LLRW); the RPV would be managed as Class B LLRW (see **Section 3.6**).

The RPV is the most radioactive element of the deactivated and defueled SM-1 reactor and the most substantial in terms of weight when considering the additional shielding that would be necessary for shipping. The use of a large crane would be required to lift the RPV from the primary shield tank for placement into a US Department of Transportation (USDOT) and NRC-compliant shipping cask for disposition. The total weight of the packaged RPV is anticipated to be in the range of 60,000 to 80,000 pounds.

2.2.3.1 Decontamination

Some areas of Building 372 contain surface contamination above the release criteria described in the DP (USACE, 2019b). Accordingly, the Proposed Action would include decontamination of some surfaces to meet the release criteria prior to dismantlement. Power washing, scabbling, and other methods would be employed to remove contamination from the metal and concrete surfaces. All residual solid and liquid wastes would be captured, containerized, characterized, and, as necessary, treated and disposed of at an appropriate permitted facility. The Proposed Action may also include decontamination to reduce potential worker exposures, even if the release criteria cannot be met as a result.

2.2.4 Removal of Non-Radioactive M&E

When practicable, the Proposed Action would also remove non-radioactive M&E prior to dismantlement. However, most non-radioactive M&E (and some that may have low levels of internal radioactivity) would remain in place during dismantlement. Following dismantlement, this waste would be segregated from other dismantlement debris for proper disposal or recycling.

2.2.5 Dismantlement and Debris Removal

The Proposed Action would dismantle and/or remove the remaining structures on the SM-1 site. These include the storage warehouse (Building 349); water intake pier and pump house (Building 375); an inactive wastewater lift station (Building 7350); all underground utilities and features **(Figure 2.2-1)**[2]; and other minor infrastructure components. Prior to dismantlement or removal activities, material or facility release surveys and additional confirmatory surveys would be conducted in accordance with the DP to verify that applicable release criteria provided in the DP have been met.

[2] With the exception of the electrical connection to Building 372, utility lines within the SM-1 site shown on **Figure 2.2-1** have been abandoned in place and are no longer active. Utility systems formerly serving the SM-1 Reactor Facility have been capped and/or rerouted as necessary to serve other occupied facilities at Fort Belvoir. Also see **Section 3.2.6** for additional discussion of utilities at the SM-1 site.

Figure 2.2-1: Existing Utilities and Infrastructure on the SM-1 Site

Dismantlement would also include the removal of subsurface components such as foundations and footings, some of which extend to 18 feet below ground surface (bgs). As appropriate, dewatering of excavations would occur to maintain the excavation and water control measures would be employed to capture, monitor, and discharge water in accordance with a written plan that ensures compliance with applicable permit requirements. This phase of the Proposed Action would not dismantle or remove other structures previously associated with SM-1 located outside of the SM-1 site fence (i.e., Buildings 358, 371, and 380).

Removal of the water intake pump house and pier, which extends approximately 100 feet from the shoreline into Gunston Cove, would likely require the use of a barge-mounted crane and other vessels to give the dismantlement crew and equipment access to the structure. Superstructures would be removed first, followed by the piles. The piles would be cut at the mudline and the portions below the cut would be left in place (NOAA, 2019b).

Additional information about dismantlement and debris removal is provided in **Section 3**, as related to a specific resource or resource area analyzed in this EA.

2.2.6 Site Remediation and Restoration

The Proposed Action would remove and dispose of contaminated environmental media from the site in accordance with release criteria provided in the DP. There are known and suspected areas around and beneath Building 372 and near the seal pit where radionuclide contamination levels exceed or may exceed the release criteria. For example, the Proposed Action would presume that soils around underground tanks and piping are radiologically contaminated.

In total, the Proposed Action would excavate an estimated 5,500 cubic yards (yd^3) of soils, including overburden and waste soils; approximately 5,000 yd^3 would be disposed of as radioactive waste. These soils would be segregated at the point of excavation. Clean soils would be stockpiled on-site and/or transported off-site for disposal at a permitted off-post facility. Contaminated soils would be packaged for transport off-post for disposal.

During this phase of the Proposed Action, and prior to commencing any site restoration activities, Final Status Surveys (FSS) would be conducted to ensure all exposed areas of the site comply with the 25 mrem per year unrestricted release criteria (**Section 1.1**). Prior to conducting each FSS, an FSS Plan (FSSP) consistent with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and subject to USACE approval would be prepared. Site restoration activities under the Proposed Action would commence once the release criteria are confirmed to be met.

The Proposed Action would restore the SM-1 site via placement of clean fill soils to backfill excavated areas and achieve positive drainage. Grading and earthwork would also be conducted to mimic current topography, to the extent practicable. The amount of clean fill soils that would be imported or transported to the site would be based on a final, agreed upon site profile. Upon satisfying the site profile criteria, a loamy top soil seeded with native grasses and shrubs would be applied across the site to promote revegetation. Restoration under the Proposed Action would also comply with Fort Belvoir's Policy Memorandum #27, *Tree Removal and Protection*, by replanting trees at 2-to-1 replacement ratio, either on-site or elsewhere on post.

2.2.7 Demobilization

Temporary structures or infrastructure components used to support the prior phases of the Proposed Action would be dismantled and removed from the site during demobilization. Additionally, historical markers or displays may be placed as part of the demobilization. Under the Proposed Action, there would be no remnants of the Deactivated SM-1 Nuclear Reactor Facility left on-site. This phase of the Proposed Action would also include road inspection and repair of any damages incurred during decommissioning and dismantlement.

2.2.8 Waste Transport and Disposal

The Proposed Action would generate approximately 11,500 yd^3 of radioactive and clean (non-radioactive) dismantlement debris and waste (USACE, 2019d)). Approximately 64 percent (7,424 yd^3) of this volume would consist of radiological waste, with the remainder (36 percent, or 4,103 yd^3) consisting of clean waste suitable for disposal at permitted, off-post municipal landfills and clean building materials (primarily concrete and steel) that may be suitable for recycling. This estimate is conservative and allows for opportunities to dispose of decontaminated materials as clean waste. To further minimize volumes of clean waste diverted to landfills, opportunities to recycle clean waste would be continuously reviewed and identified throughout the project. Disposal of radioactive and clean waste is further discussed in **Sections 3.6** and **3.10** of this EA, respectively.

Over the course of the Proposed Action, debris and waste generated from decommissioning and dismantlement would be segregated and packaged (i.e., containerized) in accordance with NRC and USDOT standards prior to transport. An estimated 648 25-yd^3 containers would be required to transport the anticipated volume of debris and waste, with each container roughly equivalent to one truck load. Over the approximately 5-year decommissioning period, this would equate to an average of two to three containers of debris being transported from the site per week for disposal or recycling. This would increase to an average of six to seven waste containers transported from the site per week during the middle 12 months (i.e., months 19 through 30) of the project, when approximately 50 percent of the anticipated waste would be generated (USACE, 2018c). Waste packaging and transport is further discussed in **Section 3.9** of this EA.

2.3 Alternatives Screening Criteria

As part of early project planning, USACE identified seven screening criteria to guide the review, evaluation, and selection of decommissioning and dismantlement options for the Deactivated SM-1 Nuclear Reactor Facility. The alternatives considered were limited to those that would allow for termination of the SM-1 Decommissioning Permit and release of the site for unrestricted use in accordance with criteria defined in 10 CFR Part 20.1402 (**Section 1.1**). That is, satisfaction of the screening criteria would select and implement an alternative that would meet the Proposed Action's purpose and need. These criteria are briefly described, as follows:

- **Safety**. Protect public and worker safety, to the maximum extent possible, by reducing the probability of accident or injury in all phases of the decommissioning process.
- **Health**. Reduce risk to public and worker health, to the maximum extent possible, including compliance with the radiological criteria for release of the site for unrestricted use and demonstration of the ALARA objective.
- **Time**. Select and implement a decommissioning and dismantlement approach that results in termination of the Decommissioning Permit prior to expiration of the 60-year post-deactivation threshold in accordance with Army regulations (that implement the NRC requirements) and the program requirements of USACE's Deactivated Nuclear Power Plant Program.
- **Space**. Select and implement a decommissioning and dismantlement option that provides adequate space to safely and efficiently perform all associated work activities.
- **Cost**. The programmatic, technical, and administrative elements of decommissioning the site should be completed at a fair and reasonable cost, within program funding.
- **Land Use**. Result in land use that supports the military mission, now or in the future, and is consistent with Fort Belvoir's Real Property Master Plan (RPMP) for South Post (Fort Belvoir, 2015).

- **Environmental**. Avoid or minimize adverse effects on protected, beneficial, or valued environmental resources as required by law and to the maximum extent possible, consistent with Fort Belvoir's *Integrated Natural Resources Management Plan* (INRMP; 2018a) and other relevant guidance.

NEPA, CEQ regulations, and Army NEPA regulations require a range of reasonable alternatives to be explored and evaluated objectively. USACE considered several alternatives to the Proposed Action to evaluate against the screening criteria. This evaluation determined that only one action alternative, the Proposed Action Alternative, would meet the Proposed Action's purpose and need. **Section 2.3.1** describes the Proposed Action Alternative and No Action Alternative in more detail. **Section 2.3.2** describes the alternatives considered and eliminated from detailed analysis, including a brief discussion of the reasons for their elimination.

2.3.1 Alternatives Selected for Detailed Analysis

2.3.1.1 No Action Alternative

Under the No Action Alternative, USACE would continue to maintain the Deactivated SM-1 Nuclear Reactor Facility in a SAFSTOR condition under Reactor Possession Permit Number SM1-1-19. The ARP's mission to decommission SM-1 and return the property to Fort Belvoir would be delayed or defunct, should decommissioning not take place within 60 years of its deactivation. Under the No Action Alternative, USACE would continue to bear the cost of maintaining SM-1, including regular inspection and monitoring. The site would not be restored or allowed to return to a natural state under this Alternative. While the No Action Alternative would not meet the Proposed Action's purpose and need, it is analyzed in the EA to provide a comparative baseline in accordance with 40 CFR Part 1502.14.

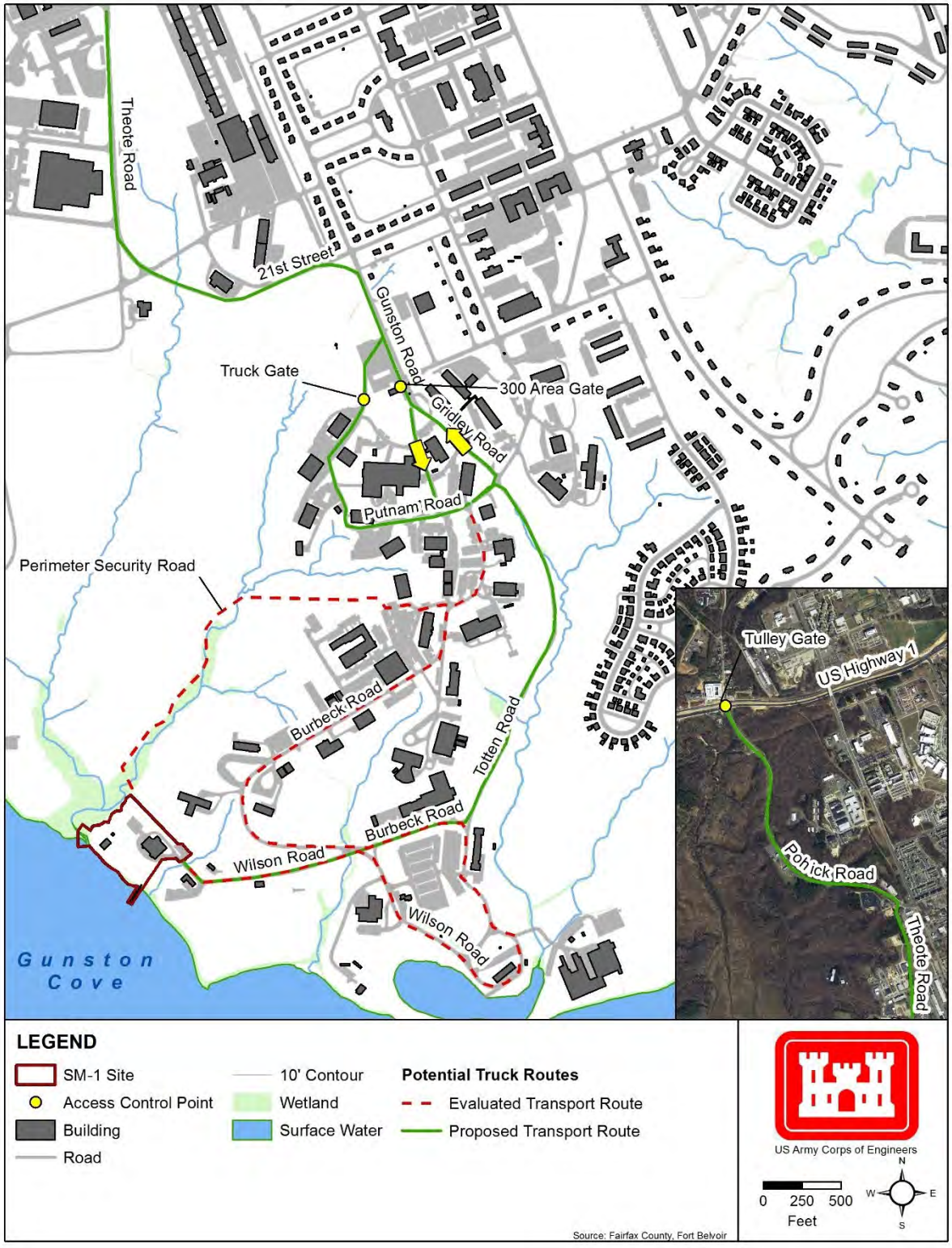
2.3.1.2 Proposed Action Alternative

The Proposed Action Alternative would execute the Deactivated SM-1 Nuclear Reactor Facility DP and terminate the Decommissioning Permit as described in **Section 2.2.** Under the Proposed Action Alternative, all radioactive and non-radioactive materials and waste associated with the SM-1 site would be removed for transport to an appropriate disposal or recycling facility. To the extent practicable, hazardous materials and radioactive M&E would be selectively dismantled and removed intact for disposition prior to dismantlement of site structures. Conversely, M&E verified as uncontaminated would likely be left in place for dismantlement and segregated on-site for disposal or recycling thereafter. Employing a similar approach, the Proposed Action Alternative would also excavate and remove subsurface infrastructure and any contaminated media from the SM-1 site (e.g., soils). The resultant materials and waste would also be segregated on-site for transport and disposal in compliance with applicable laws and regulations.

Under the Proposed Action Alternative, Fort Belvoir's existing road network would be used to access the SM-1 site (e.g. personnel and equipment), as well as to transport materials and waste for disposal or recycling off-post. As shown on **Figure 2.3-1**, the primary routes designated for this purpose include Wilson Road, Totten Road, and Grindley Road within and exiting the 300 Area. Gunston Road, 21st Street, Theote Road and Pohick Road would be used for movement between the 300 Area and US Highway 1/Richmond Highway (off post). From the intersection of Pohick Road and US Highway 1, Interstate 95 (I-95) is accessible via Fairfax County Parkway approximately 3.5 miles to the west-southwest.

Other installation roadways may also support the Proposed Action Alternative. These include an unpaved perimeter security patrol road as a potential inbound route for full or empty dump trucks hauling fill materials during site restoration activities. The truck gate also provides an alternate means for inbound and outbound access to the SM-1 site. The truck gate (accessible from Putnam Road) would support limited movements of oversized equipment such as large cranes and other oversize shipments.

Figure 2.3-1: Transportation Route Options on Fort Belvoir



Under the Proposed Action Alternative, the latter stages of decommissioning and dismantlement of SM-1 would include site remediation, as necessary to comply with the unrestricted use criteria. Such a finding would be validated by the FSS process in accordance with AR 50-7 prior to site restoration activities. Demobilization and termination of the Decommissioning Permit would conclude the Proposed Action Alternative and return the property to Fort Belvoir in a natural state for future use.

Adherence to the DP under the Proposed Action Alternative would reduce safety and health risks, to the maximum extent possible, through careful planning and executing work tasks to minimize hazardous work conditions. Waste transport under the Proposed Action Alternative would generally avoid areas on post where residents, staff, or visitors are often present. Trucks transporting waste would exit the 300 Area via Gridley Road through the 300 Area gate or via Putnam Road through an optional truck gate located to the west of the 300 Area gate. The use of these primary routes under the Proposed Action Alternative would reduce potential interactions with other vehicles or pedestrians to the maximum extent possible.

Completion of the implementation of the Proposed Action Alternative by approximately 2025 would result in permit termination within 60 years of SM-1's initial deactivation as required by USACE's Deactivated Nuclear Power Plant Program. Accordingly, the Proposed Action Alternative would accomplish USACE's mission, to implement the Deactivated Nuclear Power Plant Program. Adequate space is available to conduct the Proposed Action Alternative safely and efficiently, and work sequencing would further minimize the space required to decommission and dismantle SM-1. The Proposed Action Alternative would also provide operational flexibility for more efficient access to and from the SM-1 site. For example, on the one-way Totten Road, traffic could be reversed as necessary to accommodate either southbound or northbound trucks during peak periods of waste shipments.

The Proposed Action Alternative could be implemented at a fair and reasonable cost to USACE, returning the SM-1 site to Fort Belvoir for future use. Whether maintained for conservation or re-purposed for another use, as an additional, vacant parcel of land, the site would directly support the military mission on post. It would also retain consistency with Fort Belvoir's future land use plans for this area of the post, as designated in the RPMP (see **Section 3.2.1**).

As described in this EA, the Proposed Action Alternative would avoid, minimize, or mitigate for any potential adverse environmental impacts of decommissioning SM-1 to the maximum extent possible. The Proposed Action Alternative would also result in the removal of all structures (above and below ground) from the SM-1 site, including their associated radioactive or hazardous materials and wastes. That is, site cleanup and restoration under the Proposed Action Alternative would produce a net environmental benefit.

Therefore, the Proposed Action Alternative is carried forward for detailed analysis in this EA.

2.3.2 Alternatives Considered and Dismissed

USACE considered several alternatives for implementing the Proposed Action. These alternatives were evaluated against screening criteria (see **Section 2.3**) for consistency with the Proposed Action's purpose and need. These alternatives failed to meet the screening criteria and were dismissed from further analysis. This section provides a brief discussion on the rationale for their dismissal.

2.3.2.1 Decommission and Leave-In-Place

The decommission and leave-in-place alternative would allow portions of the Deactivated SM-1 Nuclear Reactor Facility to remain intact in the long term, but still meet the standard of unrestricted release per 10 CFR 20.1402 and allow termination of the reactor permit within 60 years of SM-1's deactivation. This option would require removal of radioactive material and equipment, including the primary reactor system components inside the VC.

Equipment with low levels of interior or exterior contamination could be decontaminated to preserve the equipment for historical purposes. With an intent to leave the building and VC in place, special care would be taken to minimize damage to the structures while removing radioactive materials. Building surfaces would be decontaminated to levels that would meet pre-determined criteria based on the potential dose to future site occupants. Additionally, residual soil contamination would be remediated to meet dose-based release criteria. Following decontamination of remaining building components, the facility and site would be suitable for unrestricted use in accordance with criteria defined in 10 CFR Part 20.1402; additional monitoring and/or land use controls would not be required.

Relative to the Proposed Action Alternative (**Section 2.3.1.2**), work under this alternative to extract key components of the reactor, while leaving Building 372 largely intact and decontaminating remaining reactor and building components, would require extensive engineering to temporarily stabilize the building and structure. Factors impacting the complexity of this alternative could include:

- Removing large components from the VC while attempting to preserve the structure.
- Decontaminating the interior of contaminated equipment and verifying that criteria have been met.
- Demonstrating that administrative areas, operational areas, and VC meet the unrestricted release criteria.

Correspondingly, the alternative would also increase the potential for accidents (e.g., entrapment, crushing, collapse, laceration/puncture/severing injuries, exposure to residual radioactivity), thereby posing a substantially higher risk to worker safety and health and failing to meet USACE's **Safety** and **Health** screening criteria (**Section 2.3**). The additional engineering and safety measures that would be required under this alternative, would also contribute to substantially greater costs incurred by USACE to decommission the Deactivated SM-1 Nuclear Reactor Facility relative to the Proposed Action Alternative, thereby failing to meet the **Cost** screening criterion.

Building 372 has been vacant for more than 30 years and has experienced substantial interior and exterior deterioration during that time. Its current condition, combined with modifications to remove key reactor and components as part of this alternative, would necessitate extensive retrofitting and modernization to meet current building codes and make Building 372 suitable for future human occupancy. Removal of existing ACM, LBP, and other non-radiological hazards would also be required. Improvements would likely include, but would not be limited to, new doors, windows, electrical and data wiring, plumbing, drywall, interior and exterior paint, and roofing materials. Modernization of the facility would also be required to meet the requirements of the Americans with Disabilities Act (42 USC 126 Parts 12101 et seq.; 28 CFR Parts 35 and 36). These upgrades would further contribute to a substantially greater cost for this alternative relative to the Proposed Action Alternative; thus, the alternative would fail to meet the **Cost** screening criterion.

Existing interior space condition in Building 372.

The potentially adverse perception by future tenants of occupying a former nuclear reactor facility could result in their unwillingness to occupy the building, thereby failing to use the site in a manner that supports the current and future military mission. Leaving any decontaminated reactor systems in place (e.g., for historic preservation) would also fail to directly support the military mission at Fort Belvoir, and would result in a land use that is inconsistent

with Fort Belvoir's future land use plans as designated in the RPMP (see **Section 3.2.1**). These factors would contribute to this alternative's failure to satisfy the **Land Use** criterion.

The decommission and leave-in-place alternative would meet the **Time**, **Space**, and **Environmental** screening criteria for the following reasons, respectively:

- Despite the longer implementation period that would be required relative to the Proposed Action Alternative to conduct the additional engineering and facility modernization discussed above, decommissioning of the Deactivated SM-1 Nuclear Reactor Facility would still be completed within the 60-year post-deactivation timeframe in accordance with Army regulations (that implement the NRC requirements) and the program requirements of USACE's Deactivated Nuclear Power Plant Program.
- While space on the SM-1 site would be more constrained under this alternative relative to the need to preserve the structure of Building 372, sufficient space would still be available on the site to safely and efficiently implement the alternative. However, additional safety precautions would likely be needed relative to the Proposed Action Alternative to ensure the safety and health of workers during decommissioning and building modernization activities.
- The alternative would result in somewhat less environmental disturbance relative to the Proposed Action Alternative because Building 372 would largely remain intact. Much of the surrounding site would be disturbed to remove contaminated soils, resulting in vegetation clearing and the temporary displacement of wildlife, followed by the application of clean fill soils and re-planting of vegetation during site restoration. However, the extent of such disturbance on the site relative to the Proposed Action would be less. The modernization and reuse of Building 372 would have a long-term beneficial impact on this NHRP-eligible resource.

However, as discussed above, the decommission and leave-in-place alternative would fail to meet four (**Safety**, **Health**, **Cost**, and **Land Use**) of the seven screening criteria developed by USACE. Therefore, the alternative would fail to meet the Proposed Action's purpose and need and was eliminated from detailed analysis in this EA.

2.3.2.2 Alternate Transportation Routes (Fort Belvoir)

Multiple alternate transport routes within Fort Belvoir were considered to provide access to and from the SM-1 site to conduct decommissioning and dismantlement activities (**Figure 2.3-1**). Factors evaluated for this purpose included public safety, traffic, roadway grades and truck turning radii, and posted speed limits (USACE, 2018c). The alternate routes were considered inferior to the proposed route to meet the varied requirements necessary to support the Proposed Action. Therefore, alternate transport routes on Fort Belvoir were eliminated from detailed analysis in this EA.

2.3.2.3 Barge Transport Option

The barge transport option for waste shipments would utilize a loading area in Ponton Basin, a lagoon approximately 0.3 mile east of the SM-1 site, for staging and eventual transport of materials and waste via barge. Under this option, waste containers would be trucked east on Wilson Road to a staging/transfer point along the existing seawall on the north side of Ponton Basin. A land- or barge-based crane would then load the containers onto a moored barge for transport via the Potomac River and Chesapeake Bay to a transfer facility in Norfolk, Virginia.

Although a viable option logistically, the selection of the barge transport option would require dredging in Ponton Basin and portions of Gunston Cove. A minimum channel depth of nine feet at low tide would be required to accommodate tug boat delivery and retrieval of barges. This equates to an average dredge depth of five feet

across a lagoon of approximately 28,000 square feet, not including its entry channel. As such, the barge transport option would likely require the removal of more than 10,000 yd^3 of dredge spoils. Due to these environmental factors, this option would substantially increase the time, cost, and impact of decommissioning and dismantling the Deactivated SM-1 Nuclear Reactor Facility. Therefore, the barge transport option was eliminated from detailed analysis in this EA.

3 Affected Environment and Environmental Consequences

3.1 Introduction

Section 3 describes the existing physical, environmental, and cultural conditions on and around the Deactivated SM-1 Nuclear Reactor Facility (i.e., the affected environment), and the Proposed Action's potential direct and indirect impacts on those resources (i.e., environmental consequences). The potentially affected environment for this EA is defined at the individual resource level. That is, depending on the resource considered, potential adverse effects may accrue to the site, its immediate surroundings, or all or parts of Fort Belvoir, Fairfax County, and the Washington, D.C. area. Information on resources analyzed in this EA was obtained through the review of existing environmental documents, including those provided by USACE and Fort Belvoir. Additional information was obtained from other credible sources, such as regulatory agencies and the scientific community.

Resources dismissed from detailed analysis in this EA in accordance with 40 CFR Part 1500 are discussed in **Section 3.2**. The discussions of resources potentially affected by the No Action and Proposed Action Alternatives are subsequently organized in **Section 3** as follows:

- **Section 3.3**, Water Resources, including Water-based Recreation
- **Section 3.4**, Air Quality
- **Section 3.5**, Biological Resources
- **Section 3.6**, Radiological Safety and Health
- **Section 3.7**, Occupational Safety and Health
- **Section 3.8**, Cultural Resources
- **Section 3.9**, Transportation and Traffic
- **Section 3.10**, Non-Radiological Hazardous Materials and Waste, and Non-Hazardous Solid Waste
- **Section 3.11**, Geology, Topography, and Soils

Thresholds for determining the significance of an adverse impact are provided in the corresponding Environmental Consequences section for each resource listed above (the terms "impact" and "effect" are used synonymously throughout this EA). Generally, adverse impacts that are determined to be less than significant do not meet the conditions requiring preparation of an EIS as defined at 32 CFR Part 651.41. Actions not having a significant impact on the environment do not normally require the preparation of an EIS, as defined at 32 CFR Part 651.42.

For all resources evaluated in this EA, a beneficial impact would occur if the Alternative results in the improvement of the resource's condition in, adjacent to, or near the SM-1 site.

The potential cumulative impacts on these resources are described in **Section 4**.

3.2 Resources Dismissed from Further Analysis

In compliance with NEPA, CEQ regulations, and Army NEPA regulations, the description of the affected environment focuses on those resources and conditions potentially subject to effects. Those resources that are dismissed from detailed analysis are discussed briefly, providing additional detail as to why the resource was not subjected to further analysis (40 CFR Part 1500.1[b] and Part 1500.4[b]).

3.2.1 Land Use

The Deactivated SM-1 Nuclear Reactor Facility is situated within an area of Fort Belvoir designated as a professional/institutional land use zone. This land use designation generally includes non-tactical administrative functions, as well as some areas on post where research and development activities are concentrated (Fort Belvoir, 2015). The Proposed Action would decontaminate, dismantle, and remove all facilities and infrastructure from the SM-1 site; contaminated soils would also be excavated and removed. The site would then be restored to a natural state under the Proposed Action. The resultant land use would be consistent with Fort Belvoir's professional/institutional zone and no change to the site's current land use designation would be required. Therefore, land use was dismissed from further analysis in this EA.

3.2.2 Aesthetics and Visual Resources

The Deactivated SM-1 Nuclear Reactor Facility is visible from areas on Fort Belvoir's South Post, within Gunston Cove itself, and the shoreline opposite the site (e.g., Fort Belvoir's Travel Camp is about 0.2-mile east-northeast across Gunston Cove). Decommissioning and dismantlement activities under the Proposed Action would be similar in nature to a construction site. Construction activity on Fort Belvoir and within the NCR occurs regularly, and is a common component of viewsheds therein. As such, no significant adverse effects are anticipated to result from the Proposed Action, which would occur on an intermittent and temporary basis. In the long-term, a minor, beneficial impact on local aesthetics and visual resources would be likely to result from the Proposed Action as the site is returned to a natural state. Therefore, aesthetics and visual resources were dismissed from further analysis in this EA.

SM-1 Site View from Gunston Cove (USACE, 2019c)

Section 3.8, *Cultural Resources* addresses the aesthetic or visual appeal of SM-1 as a historic property.

3.2.3 Noise

On Fort Belvoir, the existing noise environment is characterized by local road traffic, aircraft overflights, construction and maintenance activities, and sounds typical of any mixed use urban environment. Most noise generated on post is intermittent with effects dependent on factors such as weather, time of day, and the location of sensitive receptors. Whether a noise is considered a nuisance often depends on the type of noise and how it is perceived by a receptor.

The use of heavy equipment during certain phases of the Proposed Action would generate short-term, intermittent, temporary noise. Noise levels would depend on equipment usage and whether such activities take place individually or concurrently. Vehicles and trucks used to move personnel, M&E, and waste to and from the SM-1 site would also generate noise along segments of local and regional roads. Noise under the Proposed Action would be comparable to that of a typical construction or building demolition site. No residential land use is found

within 0.5-mile of the SM-1 site and many areas in between are forested. The implementation of standard best management practices (BMPs) would further reduce noise levels associated with decommissioning activities. Additionally, work activities would generally be limited to weekdays and primarily take place during normal business hours.

Short-term noise associated with the Proposed Action would not substantially alter the noise environment from the *status quo*. In the long-term, background noise would be comparable to other open space areas or transport routes on and in the vicinity of Fort Belvoir. Therefore, noise impacts on residential land use were dismissed from further analysis in this EA.

Section 3.3.2.6 evaluates potential noise impacts on community land use in the context of water-dependent recreation. **Section 3.7** evaluates noise exposure risk for on-site workers directly involved in decommissioning SM-1.

3.2.4 Socioeconomics, Including Protection of Children

The Proposed Action would not increase the number of personnel stationed on Fort Belvoir now or in the future. A short-term, temporary increase in the civilian working population on post would result from decommissioning and dismantlement activities. This change would be negligible in the context of current and planned development activities on Fort Belvoir. Overall, changes to population, demographics, income, community services and facilities, or housing are anticipated to be minimal.

The decommissioning and dismantlement of SM-1 would create local jobs and induced effects such as local expenditures from workers. These jobs would be temporary and hired workers would not be likely to change their place of residence. In the context of the regional economy, the Proposed Action would have a minor, short-term, beneficial effect as economic stimulus. These effects would generally coincide with the duration of the Proposed Action. As analyzed in this EA, potential adverse impacts on socioeconomics from noise, air, or water pollution associated with the Proposed Action would be minimal. Therefore, socioeconomics was dismissed from detailed analysis in this EA.

Since children may suffer disproportionately from environmental health risks and safety risks, the intent of EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, is to ensure that federal agencies prioritize and address this concern. Although children are present on Fort Belvoir both as residents and visitors, the Proposed Action would occur within a secured area of South Post bounded to the south by Gunston Cove. Children are not authorized to access this area of the post and access to the SM-1 site would be strictly controlled due to the nature of the Proposed Action. Further, secondary effects associated with the Proposed Action (e.g., noise, air quality, and traffic) would not be anticipated to disproportionately affect children's health or safety. Therefore, protection of children was dismissed from detailed analysis in this EA.

3.2.5 Environmental Justice

The purpose of EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, is to avoid the disproportionate placement of adverse environmental, economic, social, or health effects from federal proposed actions and policies on minority and low-income populations. Due to the location of the Deactivated SM-1 Nuclear Reactor Facility, the Proposed Action would not result in disproportionate adverse human health or environmental effects on minority or low-income communities, either on or off post. A minor, short-term beneficial effect on disadvantaged, minority communities within the NCR would likely result from the hiring of temporary workers to support decommissioning activities. Therefore, environmental justice was dismissed from detailed analysis in this EA.

3.2.6 Utility Systems

The SM-1 site contains various underground utility lines (**Figure 2.2-1**), all of which are inactive except for Building 372's electrical connection to the on-post grid. The Proposed Action would deactivate and remove the current electrical lines that service the reactor facility. All other legacy utility systems and infrastructure on the site would also be removed as part of decommissioning. The decommissioning contractor would obtain excavation permits from Fort Belvoir DPW and verify the locations of buried infrastructure prior to beginning ground-disturbing activities on the SM-1 site.

The Proposed Action would install and operate temporary utilities for power and water necessary to support decommissioning activities; however, this demand would be accommodated under existing private sector contracts held by Fort Belvoir. Additionally, increases in demand would fluctuate and occur intermittently over the duration of the Proposed Action. No local service disruptions are anticipated to result from the Proposed Action. Additionally, there is sufficient regional disposal capacity for municipal solid waste (MSW) generated by the Proposed Action. The quantity of MSW would also be reduced by the segregation of waste and debris at the site prior to disposition, including recyclable materials. Therefore, utilities were dismissed from further analysis in this EA.

3.3 Water Resources, including Water-Dependent Recreation

This section describes water resources that could be affected by the Proposed Action. Water resources consist of surface water and groundwater, as follows:

- Surface water includes rivers and creeks, streams, lakes, bays and estuaries, stormwater runoff, wetlands, and floodplains.
- Groundwater is water contained under the earth's surface in soil or in pores and crevices in rock.

Water quality describes the chemical and physical composition of surface and groundwater resources. The region of influence (ROI) for water resources and water quality includes the SM-1 site and downstream receiving water bodies.

Water-based recreation is a frequent activity in the vicinity of Fort Belvoir and the SM-1 site. These activities include fishing, boating, waterskiing, swimming, kayaking, rafting, canoeing, sailing, and waterfowl hunting. The ROI for water-based recreation is Gunston Cove and upstream surface water bodies.

3.3.1 Regulatory Setting

Table 3.3-1 summarizes federal and state regulations and Army and Fort Belvoir policies that are applicable to water resources in the vicinity of the Deactivated SM-1 Nuclear Reactor Facility and Fort Belvoir.

Table 3.3-1: Water Resources – Applicable Regulations and Guidance

Regulation	Description
Federal	
Clean Water Act, as amended (33 USC Part 1251 *et seq.*)	Authorizes the USEPA to regulate activities resulting in a discharge to navigable waters, including dredged and fill materials and stormwater runoff. Section 404 of the CWA requires that a permit be obtained from USACE before discharging dredge or fill material into waters of the US (WOUS), their tributaries, and associated wetlands. Section 303 requires states to identify waters where current pollution control technologies alone cannot meet the established water quality standards. It further requires development of total maximum daily loads (TMDLs) for pollutants in waters identified as "impaired" for their designated uses.
Coastal Zone Management Act (16 USC Part 1451 *et seq.*)	Establishes a national coastal management program that comprehensively manages and balances competing uses of and impacts on coastal areas and resources. The Coastal Zone Management Act (CZMA) includes a consistency determination requirement that federal activities potentially affecting a state's coastal resources must be consistent to the maximum extent practicable with that state's federally approved coastal management program.
EO 11990, *Protection of Wetlands*	Requires federal agencies to take actions to minimize or avoid the destruction, loss, or degradation of wetlands and to preserve and enhance their natural and beneficial values. Federal agencies are to avoid new construction in wetlands. If it is determined that there is no practicable alternative to building in a wetland, the proposed construction must incorporate all possible measures to limit harm to the wetland.
EO 11988, *Floodplain Management*	Requires federal agencies to avoid, to the extent possible, adverse impacts associated with the occupation and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.
State	
Chesapeake Bay Preservation Act (Code of Virginia Part 62.1-44.2)	Protects lands designated as Chesapeake Bay Preservation Areas. Projects that occur on lands that are protected under the Act must be consistent with the Act and may be subject to the performance criteria to reduce for preservation areas. Under the Chesapeake Bay Preservation Act (CBPA), Fairfax County adopted an Ordinance that designates resource protection areas (RPAs) and management areas within the county.
Virginia Water Control Law (Code of Virginia Part 62.1-44.2)	Mandates the protection of existing high quality state waters and the restoration of all other state waters to such quality as to permit reasonable public uses and to support aquatic life.
Virginia Water Protection Permit Program (9 Virginia Administrative Code [VAC] 25-210-10 *et seq.*)	Serves as Virginia's Section 401 Water Quality Certification Program to regulate discharges of dredged material into waterways or wetlands, or for other instream activities under the federal Section 404 permit program.

Table 3.3-1: Water Resources – Applicable Regulations and Guidance

Regulation	Description
Code of Virginia Part 28.2-1200 through Part 28.2-1420	Authorizes the Virginia Marine Resources Commission to regulate activities affecting subaqueous bottomlands, marine fisheries, and coastal resources (e.g., tidal wetlands, coastal sand dunes/beaches).

3.3.2 Affected Environment

3.3.2.1 Groundwater

Fort Belvoir is underlain by two aquifer systems associated with the Lower (hereafter, the "lower Potomac aquifer") and Middle Potomac (hereafter, the "middle Potomac aquifer") Formations. The lower Potomac aquifer is situated within the bottom portion of the Potomac Formation approximately 500 to 600 feet bgs. Groundwater in this aquifer flows to the southeast; recharge occurs via precipitation along the western portion of Fort Belvoir and areas farther north and west of the post (Fort Belvoir, 2018a). The lower Potomac aquifer provides drinking water for some private wells in off-post areas of northern Virginia.

The middle Potomac aquifer, situated above the lower Potomac aquifer, is an unconfined system or perched (water table) aquifer. Groundwater in this aquifer system is locally influenced by topography and drains towards nearby surface water features. Aquifer recharge occurs directly and indirectly via precipitation as either surface discharge or percolation through soil media (Fort Belvoir, 2018a).

Depth to the water table across Fort Belvoir is seasonally and geographically variable, ranging from approximately 10 to 35 feet bgs in most areas on post. In proximity to streams and other surface water features, however, the water table may occur at or near the surface as part of the unconfined aquifer system. In such areas, depth to water is typically less than 10 feet bgs. There are no active potable water wells on the installation; all abandoned wells have been filled and received regulatory closure (Fort Belvoir, 2015).

Depth to groundwater on the SM-1 site is approximately 30 feet bgs, and 10 to 15 feet bgs in areas downslope of Building 372 (USACE, 2019b). It is likely that groundwater underlying the SM-1 site flows generally toward Gunston Cove (USACE, 2013).

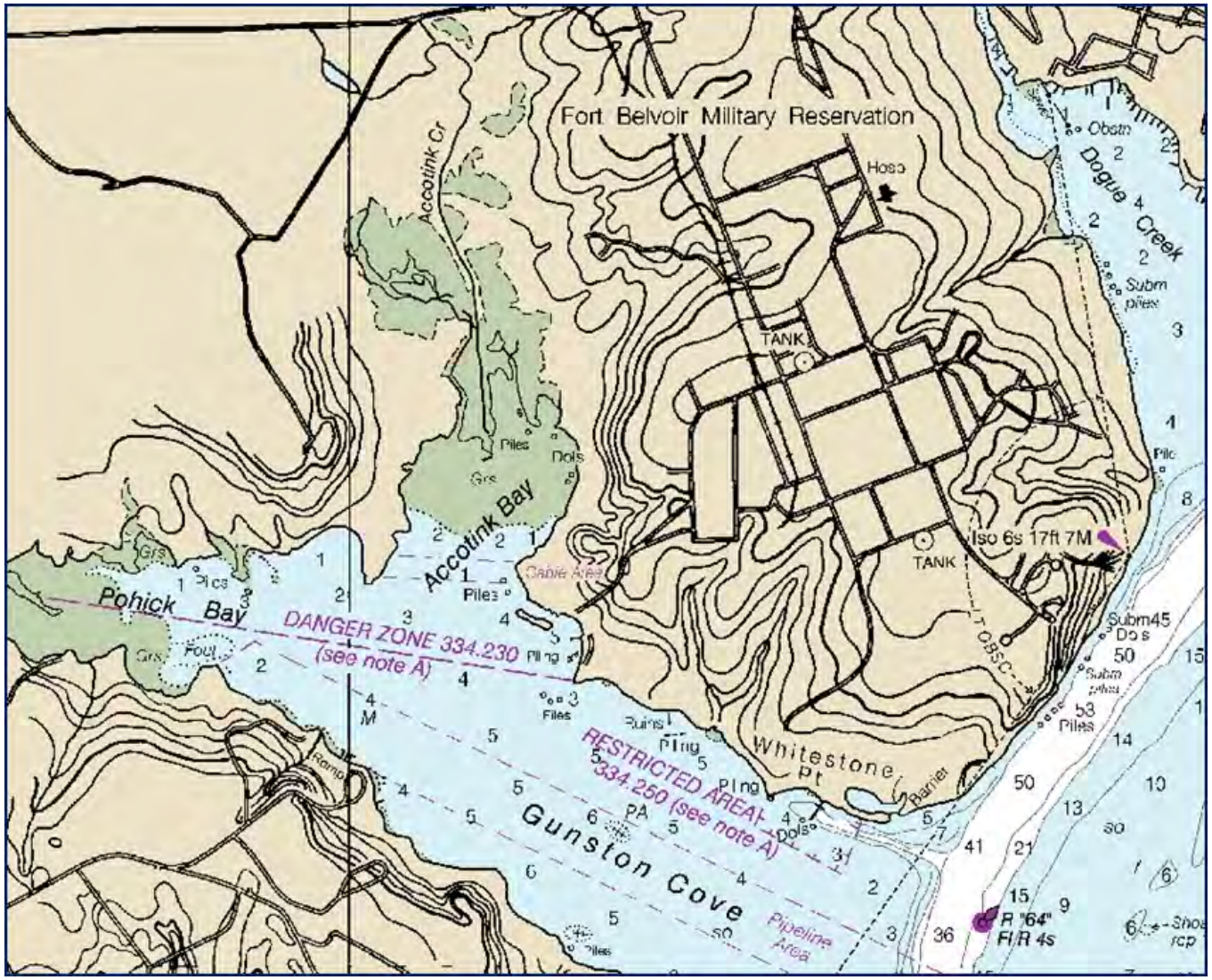
3.3.2.2 Surface Water and Water Quality

There are no naturally occurring or human-made bodies of surface water within the perimeter of the SM-1 site. Surface water bodies near the SM-1 site include three unnamed streams: a perennial (i.e., having year-round flow) stream fed by an intermittent (i.e., seasonally influenced flow) stream to the northwest-west, and an intermittent stream to the east-northeast of the site. Other nearby surface water bodies include Gunston Cove, Pohick Creek and Bay, Accotink Creek and Bay, and the Potomac River.

The SM-1 site is adjacent to Gunston Cove, a tidal embayment of the Potomac River (**Figure 1.2-2**). Gunston Cove converges with the Potomac River less than one mile downstream (southeast) of the SM-1 site. The Potomac River discharges to the Chesapeake Bay approximately 64 miles (in a straight line) downstream from Fort Belvoir and is one of the Bay's major tributaries.

Water depths in Gunston Cove vary from approximately 3.3 feet in the northern portion to approximately 7.4 feet in the center (**Figure 3.3-1**). The mean tidal range is approximately 2.1 feet (Tide Forecast, 2019). Streams in the vicinity of the SM-1 site discharge to Gunston Cove.

Figure 3.3-1: Gunston Cove Depth Sounding Chart



Source: (NOAA, 2019a)

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It is likely that water quality in Gunston Cove is primarily influenced by discharges from Accotink Creek and Pohick Creek, its two primary drainages. Accotink and Pohick Creeks discharge to their respective bays, which subsequently converge with Gunston Cove approximately one mile upstream of the SM-1 site. Both creeks are listed as "impaired" by the Commonwealth of Virginia in accordance with Section 303(d) of the CWA due to degraded water quality that does not fully support designated uses, as established by state water quality standards. Degraded water quality conditions are primarily due to pollutants and sediment conveyed in stormwater generated by impervious surfaces (e.g., buildings, concrete) within the creeks' intensively developed watersheds. Total Maximum Daily Loads (TMDLs) have been implemented to address pollutants such as fecal coliform, *Escherichia coli* (*E. coli*), chlorides, sediments, and PCBs in Accotink and Pohick Creeks.

Urban development and agriculture within the watersheds of the Potomac River and Chesapeake Bay have impacted these water bodies in a similar manner. As such, TMDLs developed jointly between Maryland, Washington, D.C., and Virginia have been implemented to improve water quality in the vicinity of Fort Belvoir to address PCBs in fish tissue and nitrogen and phosphorus (as part of the 2010 Chesapeake Bay TMDL) (MDE, 2019). USEPA implemented the Chesapeake Bay TMDL in 2010 to regulate annual discharges of nitrogen, phosphorus, and sediment from major sources within the Bay's approximately 64,000-square-mile watershed.

The six states within the Bay's watershed and Washington, D.C. are required to adopt watershed implementation plans in accordance with the Chesapeake Bay TMDL to meet annual thresholds for discharges of these pollutants within their boundaries.

The sediments in Gunston Cove were classified as radiological due to the known discharges of diluted liquid wastes from SM-1, as well as the potential for sediment to be impacted from deactivation activities of the MH-1A on the *STURGIS* (USACE, 2005). However, radiological characterization efforts did not identify any radionuclides of potential concern (ROPC) that exceeded the screening levels (USACE, 2013). The sediments in shoreline/cove work areas would require additional sampling at the completion of the activities described in the Proposed Action (see **Section 2.2.6**).

3.3.2.3 Wetlands and Resource Protection Areas

3.3.2.3.1 Wetlands

There are no jurisdictional wetlands or streams within the landward perimeter of the SM-1 site (AECOM-Tidewater, 2016). A query of the USFWS National Wetlands Inventory mapper revealed several unnamed streams and a palustrine forested wetland in the vicinity of the site (**Figure 3.3-2**). The unnamed streams to the west-northwest are identified as perennial and intermittent streams; another unnamed intermittent stream is present to the east-northeast of the SM-1 site (USFWS, 2019b).

3.3.2.3.2 Resource Protection Areas

The Chesapeake Bay Preservation Act (CBPA), enacted by the Virginia General Assembly in 1988, sets limits on development within Chesapeake Bay Resource Protection Areas (RPAs). An RPA is defined in the CBPA as a vegetated buffer no less than 100 feet wide located adjacent to and landward of all tidal shores, tidal wetlands, and non-tidal wetlands connected by surface flow, and contiguous to tidal wetlands along water bodies with perennial flow. The purpose of an RPA is to maintain or restore a vegetated buffer between development and tributaries to the Chesapeake Bay, with the assumption that such a buffer traps pollutants in runoff before they reach the Bay. Development in RPAs is restricted to water dependent activities, maintenance of public facilities, passive recreation, water wells, and historic preservation; redevelopment of existing uses is also allowed in RPAs.

Figure 3.3-2: Water Resources at the SM-1 Site

Fort Belvoir recognizes Chesapeake Bay RPAs on the post. In addition to the 100-foot vegetated buffers, as described above, RPAs on Fort Belvoir also include 100-year floodplains. That is, RPA boundaries extend landward from the tidal shore for 100 feet or to the 100-year floodplain boundary, whichever is greater (**Section 3.3.2.5**). Approximately 2,700 acres of Chesapeake Bay RPAs have been identified on Fort Belvoir based on planning-level assessments of perennial streams and their contiguous floodplains and wetlands. Site-specific RPA delineations (or the perennial flow determinations and wetland delineations that support an RPA delineation) have not been conducted on Fort Belvoir, except for mature projects in an advanced stage of site planning or permitting (Fort Belvoir, 2016). In accordance with Policy Memorandum #27, *Tree Removal and Protection,* Fort Belvoir requires the planting of two new trees between 1.5 and 2.5 inches diameter at breast height (dbh) for every tree or sapling 4 inches dbh or greater removed from RPAs during project-related activities. At minimum, the number of trees replanted in the RPA must equal those removed from the RPA during the project; additional trees may be planted outside the RPA to meet this replanting requirement (Fort Belvoir, 2018b). Additionally, trees and shrubs less than 4 inches dbh that are removed from the RPA during the project must be replaced one-for-one within the RPA in accordance with VDCR's *Riparian Buffers Modification and Mitigation Guidance Manual* (VDCR, 2003).

RPAs on the SM-1 site are associated with the Gunston Cove shoreline, 100-year floodplain, and the unnamed perennial and intermittent streams to the northwest and southeast, respectively (**Figure 3.3-2**). Due to the proximity of these surface water features, RPAs cover approximately 45 percent (2.2 acres) of the SM-1 site (Fairfax County, 2019).

3.3.2.4 Stormwater

Stormwater generated on Fort Belvoir is collected and conveyed through a network of inlets, management basins, ditches, culverts, and underground pipes. Fort Belvoir discharges stormwater to receiving water bodies in accordance with a Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4) (Permit No. VAR040093). Fort Belvoir's MS4 permit is issued by VDEQ under the Virginia Pollutant Discharge Elimination System program. Portions of Fort Belvoir are also covered by an Industrial Stormwater (ISW) Permit (VA0097221) issued by VDEQ. Monitoring, sampling, and reporting of discharges from outfalls on post is periodically conducted to ensure stormwater meets water quality regulatory criteria set forth in these permits. Although SM-1 is not within areas covered by the ISW Permit, portions of the waste transportation route options drain to ISW Outfalls 007 (west of the 300 Area truck gate); 019, 020, and 021 (along Totten Road); 022 (west of Ponton Basin); and 015 (west of Theote Road between Pohick Road and 16th Street).

Under Fort Belvoir's MS4 permit, projects disturbing 2,500 square feet or more of land must prepare and adhere to an erosion and sediment control (E&SC) plan in accordance with the Virginia Erosion and Sediment Control regulations (9 Virginia Administrative Code [VAC] 25-840-40); a stormwater management plan (SWMP) in accordance with the Virginia Stormwater Management Program regulations (9 VAC 25-870-55) is also required. For projects that disturb one acre or more of land, coverage under Virginia's General Permit for Discharges of Stormwater from Construction Activities (Construction General Permit [CGP]) must be obtained. The CGP codifies a requirement to prepare and implement a more detailed, site-specific stormwater pollution prevention plan (SWPPP) for projects that exceed this disturbance threshold.

Stormwater collection and conveyance infrastructure on the SM-1 site is limited. It is likely that stormwater flows by gravity following existing topography away from buildings and structures. Stormwater that does not infiltrate through the soil media may initially drain towards the unnamed streams west or east of the site. Ultimately, stormwater drains to Gunston Cove and, further downstream, the Potomac River.

3.3.2.5 Floodplains

Floodplains are low-lying areas adjacent to streams, rivers, and other water bodies that are subject to periodic inundation by flood waters. The 100-year flood, or base flood, is the flood that has a one percent or greater chance of being equaled or exceeded in any given year. The Base Flood Elevation (BFE) is the water-surface elevation of the base flood.

SM-1 Intake Pier and Pump House (USACE, 2019c)

Approximately 0.5-acre of the SM-1 site is situated within the 100-year floodplain associated with Gunston Cove and the unnamed streams to the west and east, respectively (**Figure 3.3-2**). The intake pier/pump house, concrete discharge pipe, and outfall structure associated with SM-1 are located within the 100-year floodplain. The 100-year floodplain in the vicinity of the SM-1 site is designated as *Zone AE*. The BFE in this area is 10 feet (FEMA, 2019). The majority of the SM-1 site, including Building 372, is located outside the 100-year floodplain.

3.3.2.6 Water-Dependent Recreation

Surface waters in the vicinity of the SM-1 site support a number of water-dependent private and public recreational activities and facilities. Within Gunston Cove, Fort Belvoir's Family, Morale, Welfare, and Recreation office operates and maintains docks at the Outdoor Recreation Center and Travel Camp approximately 0.6-mile and 0.2-mile, respectively, upstream from the SM-1 site. Small boats suitable for use in nearshore waters can be rented at the Outdoor Recreation Center. A duck-hunting blind, accessible only by boat, is located just offshore from and to the west of the SM-1 site (Google Earth, 2019).

Less than one mile across Pohick Bay, a public boat launch, small boat rentals, and guided boat tours of nearshore waters are offered at Pohick Bay Regional Park, operated by the Northern Virginia Regional Park Authority. Multiple private docks extend from private properties along the Gunston Cove shoreline south of Pohick Bay Regional Park.

Recreational fishermen, waterfowl hunters, boaters, and other water recreation enthusiasts are often observed in Gunston Cove and adjacent waters. It is likely that Gunston Cove is frequently accessed by users via the facilities noted above. Recreational boaters observed in Gunston Cove may also originate from the Fort Belvoir Marina along Dogue Creek, approximately two miles (in a straight line) northeast of the SM-1 site; private docks along the Potomac River shoreline east of Fort Belvoir; or marinas, docks, and public boat launches in Maryland across the Potomac River from Fort Belvoir (Google Earth, 2019).

3.3.2.7 Coastal Zone Management

The Coastal Zone Management Act (CZMA) of 1972 (16 USC Part 1451, *et seq.*, as amended) provides assistance to the states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Section 307(c)(1) of the Coastal Zone Management Act Reauthorization Amendment stipulates that federal projects that affect land uses, water uses, or coastal resources of a state's coastal zone must be consistent, to the maximum extent practicable, with the enforceable policies of that state's federally approved coastal zone management plan.

The Commonwealth of Virginia has developed and implemented a federally approved Coastal Zone Management (CZM) Program. The Virginia CZM Program is administered by VDEQ and consists of a network of state agencies and local governments that regulate Virginia's coastal zone lands and resources. Virginia's CZM Program encompasses nine enforceable policies for the coastal area pertaining to:

- Fisheries management
- Subaqueous lands management
- Wetlands management
- Dunes management
- Non-point source pollution control
- Point source pollution control
- Shoreline sanitation
- Air pollution control
- Coastal lands management

Virginia's coastal zone includes all of Fairfax County. As a federally owned military installation, Fort Belvoir is statutorily excluded from the state's coastal zone. However, federal actions occurring at Fort Belvoir that have the potential to affect coastal zone resources must be consistent, to the maximum extent practicable, with the state's enforceable policies. Therefore, the Army is required to determine the consistency of proposed activities potentially affecting Virginia's coastal zone resources with the enforceable policies of the Virginia CZM program.

3.3.3 Evaluation of Environmental Consequences

3.3.3.1 Approach to the Analysis

Impacts on water use and water quality from the decommissioning of nuclear facilities are neither detectable nor destabilizing (NRC, 2002). However, this section addresses site-specific water resources that could be affected by the Proposed Action. This section discusses short-term (decommissioning) and long-term (post-decommissioning) impacts on water resources and water-dependent recreation potentially resulting from the No Action and Proposed Action Alternatives. Significance thresholds for adverse impacts on water resources and water-dependent recreation are presented in **Table 3.3-2**.

Table 3.3-2: Water Resources Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	The Alternative[1] would have temporary or permanent impacts on water resources or water-dependent recreation; however, such impacts could be avoided, compensated for, or minimized through adherence to applicable BMPs, minimization or protection measures, or permitting requirements.
	Indirect Impacts	The Alternative would create or contribute to the creation of conditions independent of the Proposed Action that result in temporary or permanent impacts on water resources or water-dependent recreation; however, such impacts could be avoided, compensated for, or minimized through adherence to applicable BMPs, minimization or protection measures, or permitting requirements.
Potentially Significant Adverse Effect	Direct Impacts	The Alternative would have permanent impacts on water resources that could not be avoided, compensated for or minimized through adherence to applicable BMPs, minimization or protection measures, or permitting requirements; and/or would permanently prohibit recreational user access to all or portions of water bodies in the vicinity of the SM-1 site.
	Indirect Impacts	The Alternative would create conditions independent of the Proposed Action that would have permanent impacts on water resources that could not be avoided, compensated for, or minimized through adherence to applicable BMPs, minimization or protection measures, or permitting requirements; and/or would permanently prohibit recreational user access to all or portions of water bodies in the vicinity of the SM-1 site.

Note:

1. As used in each of the Impact Significance Threshold tables presented in **Section 3** (i.e., **Tables 3.3-2**, **3.4-3**, **3.5-2**, **3.6-4**, **3.7-3**, **3.8-1**, **3.9-2**, **3.10-2**, and **3.11-2**), "Alternative" refers to the alternatives analyzed in this EA; that is, the No Action Alternative and the Proposed Action Alternative.

3.3.3.2 No Action Alternative

Under the No Action Alternative, USACE would continue to maintain the Deactivated SM-1 Nuclear Reactor Facility in its current SAFSTOR condition. This would have no impacts on water resources, water quality, or water-based recreation.

3.3.3.3 Proposed Action Alternative

3.3.3.3.1 Groundwater

The Proposed Action Alternative would not require temporary or permanent withdrawals of groundwater (with the possible exception of dewatering during decommissioning-related excavations on the SM-1 site), nor would it include the temporary or permanent installation of wastewater injection wells. Liquid wastes would be captured, containerized, characterized, transported from the site by licensed contractors, and disposed of at permitted off-post facilities. Spill kits would be provided in conspicuous locations on the site throughout the proposed decommissioning process in the event that containment and cleanup of accidental spills is needed.

All existing above-ground and sub-grade impervious surfaces, including building foundations, utilities, and other components would be removed from the site during the proposed decommissioning. No new or additional

impervious surface would be created on the site by the Proposed Action Alternative and restoration activities would result in a permeable, vegetated site.

Therefore, the Proposed Action Alternative would have short- and long-term, less than significant impacts on groundwater. Beneficial impacts on groundwater would be likely in the long term.

3.3.3.3.2 Surface Water and Water Quality

Sediments and pollutants conveyed in stormwater discharged from the SM-1 site during decommissioning and dismantlement activities would have the potential to degrade water quality in receiving water bodies. Adherence to applicable plan or permitting requirements would manage the quality and quantity of stormwater discharged from the site, thereby preventing or minimizing adverse impacts on water quality. Soil disturbance would be distributed throughout the proposed decommissioning and would vary in intensity and extent. This would minimize the quantity of soils that would be exposed at any given time and corresponding concentrations of sediment in stormwater discharged from the site to receiving water bodies.

Containment booms and sediment curtains would be used during in-water and nearshore work associated with removal of the intake pier/pump house, concrete discharge pipe, and outfall structure to contain debris that could inadvertently enter the water column, prevent the migration of disturbed sediment into the water column, minimize turbidity, and ensure disturbed sediments settle near their original location. Disturbance of subaqueous bottomlands during in-water activities would also be minimized to the extent practicable. Spill kits would be kept nearby during all in-water and nearshore work to prevent or reduce risk from the migration of hazardous substances into receiving water bodies in the event that an accidental spill occurs.

Following the completion of restoration activities, the site would be a permeable, vegetated site. Maintenance of the site in a permeable, vegetated condition would facilitate localized infiltration of precipitation into underlying soils and aquifers and aid in minimizing the quantity and improving the quality of stormwater runoff from the site. For these reasons, the Proposed Action Alternative would have short- and long-term, less than significant impacts on surface water and water quality. Beneficial impacts on surface water and water quality would be likely in the long term.

3.3.3.3.3 Wetlands and Resource Protection Areas

Wetlands

It is anticipated that removal of the intake pier/pump house, concrete discharge pipe, and outfall structure would disturb approximately 1.4 acres of tidal wetlands in Gunston Cove, and 0.6-acre of freshwater wetlands immediately inland of Gunston Cove. Prior to conducting in-water work associated with the Proposed Action Alternative, the decommissioning contractor would obtain authorization from applicable federal and state regulatory agencies to temporarily impact wetlands. As necessary, the decommissioning contractor would delineate wetlands that would be potentially disturbed, obtain a jurisdictional determination from USACE, and submit a joint permit application (JPA) identifying avoidance, minimization, and/or compensatory mitigation measures to receive applicable permit coverage.

Adherence to applicable permitting requirements would minimize temporary impacts on wetlands to the extent practicable. Following the completion of the proposed decommissioning activities, wetlands in the vicinity of the site would be allowed to return to a pre-disturbance condition. No new activities or conditions would be established by the Proposed Action Alternative that would involve ongoing or permanent disturbance of wetlands. Thus, impacts on wetlands resulting from the Proposed Action Alternative would be temporary and less than significant. Beneficial impacts on wetlands would be likely in the long term.

Resource Protection Areas

Vegetation clearing and/or soil disturbance to facilitate the removal of existing structures and abandoned utility lines, provide maneuvering and operational space for decommissioning vehicles and equipment, and storage and staging space for materials and containerized waste would disturb an estimated 2.1 acres of RPAs within the SM-1 site. While this would be an adverse effect, it would be temporary and would be mitigated through the planting of two new trees for the removal of every tree four inches dbh or greater in accordance with Fort Belvoir Policy Memorandum #27, *Tree Removal and Protection*. Vegetation replacement in the RPA would also adhere to the requirements of VDCR's *Riparian Buffers Modification and Mitigation Guidance Manual* (VDCR 2003). No ongoing or permanent activities with potential to disturb RPAs would be established by the Proposed Action Alternative. Following the completion of restoration activities, the site would be maintained in a vegetated condition by Fort Belvoir and would be integrated into the RPA associated with Gunston Cove.

Therefore, the Proposed Action Alternative would have short-term, less than significant impacts on RPAs. Beneficial impacts on RPAs would be likely in the long term.

3.3.3.3.4 Stormwater

Because the Proposed Action Alternative involves more than one acre of land disturbance, the decommissioning contractor would obtain coverage under the CGP, including preparation and implementation of a site-specific SWPPP. Adherence to the requirements of the CGP during land-disturbing activities would ensure that short-term impacts on surface water quality from stormwater discharged from the SM-1 site remain minimal. Soil disturbance would be distributed throughout implementation of the Proposed Action Alternative and would vary in intensity and extent, thereby minimizing the quantity of soils that would be exposed at any given time and corresponding concentrations of sediment in stormwater discharged from the site to receiving water bodies. Dismantlement waste temporarily staged on and transported from the SM-1 site would be packaged in accordance with applicable NRC and USDOT requirements to prevent inadvertent releases of radioactive and non-radioactive wastes to Fort Belvoir's stormwater management system.

In the long term, no new permanent point sources of stormwater discharge would be established by the Proposed Action Alternative. Following restoration activities, the site would be maintained by Fort Belvoir in a vegetated, permeable condition. This would facilitate the infiltration of precipitation while minimizing the quantity and improving the quality of stormwater runoff from the site.

For these reasons, the Proposed Action Alternative would have short-term, less-than-significant impacts on stormwater. Beneficial impacts on stormwater would be likely in the long term.

3.3.3.3.5 Floodplains

By necessity of their location, removal of the intake pier/pump house, concrete discharge pipe, and outfall structure would involve work in the 100-year floodplain. The removal of all structures and equipment associated with the reactor's operation, including those in the 100-year floodplain, is necessary to decommission the Deactivated SM-1 Nuclear Reactor Facility.

The area that would be occupied by the equipment needed to remove structures in the floodplain would be an exceedingly small fraction of the 100-year floodplain associated with downstream stretches of Gunston Cove and the Potomac River. Therefore, activities in the Proposed Action Alternative occurring in the 100-year floodplain would not noticeably impair the floodplain's capacity to absorb or convey floodwaters, nor would they noticeably displace floodwaters further downstream. Because there would be no noticeable displacement of floodwaters, the

proposed activities would have no potential in the short term to threaten human life or property downstream of the SM-1 site.

Thus, the Proposed Action Alternative would have short-term, less than significant impacts on the 100-year floodplain. In the long term, removal of the pier/pump house, concrete discharge pipe, and outfall structure would have beneficial impacts on the 100-year floodplain and associated functions and values by promoting the return of the Gunston Cove shoreline and subaqueous bottom to conditions resembling those that existed prior to the development of SM-1.

The Draft FONPA (**Section 3.3.3.3**; **Appendix C**) addresses USACE's decision to implement the Proposed Action in the 100-year floodplain, in accordance with EO 11988.

3.3.3.3.6 Water-Dependent Recreation

In the short term, work associated with the removal of the intake pier/pump house, concrete discharge pipe, and outfall structure could represent a safety risk to public recreation in Gunston Cove. However, access to off-shore areas in the vicinity of the SM-1 site would continue to be strictly controlled by the military (**Figure 3.3-1**). If deemed necessary, signage would be posted conspicuously around these work areas (on- and off-shore) to inform boaters and ensure they maintain a safe distance. Additional notification could also be provided through the posting of notices at local marinas and boat launch facilities and/or publication in local newspapers. With such measures in place, public safety risks from the in-water removal of structures would be negligible. In the long term, the removal of terrestrial and in-water SM-1 components would enhance the aesthetic value of Gunston Cove and remove a hazard from the waterway.

Noise generated from the decommissioning and dismantlement of SM-1 could be perceived as a public nuisance by recreational users of Gunston Cove, particularly in relation to the Outdoor Recreation Center and Travel Camp located upstream. Noise from proposed decommissioning activities would likely be audible in the off-shore waters associated with these facilities. Therefore, noise generated under the Proposed Action Alternative would result in minor, short-term, intermittent adverse impacts on water-dependent recreation in Gunston Cove. To minimize these potential impacts, the decommissioning contractor would implement standard construction-related BMPs for noise control. The geographic orientation of the SM-1 site in relation to the Outdoor Recreation Center and Travel Camp would also be likely to reduce noise levels from source to potential receptors upstream.

As such, the Proposed Action Alternative would have short-term, less than significant impacts on water-dependent recreation in Gunston Cove. Beneficial impacts on water-dependent recreation in Gunston Cove would result in the long term (i.e., improved aesthetics and hazard reduction).

3.3.3.3.7 Coastal Zone Management

USACE has determined that the Proposed Action Alternative would be consistent, to the maximum extent practicable, with the enforceable policies of Virginia's CZM Program. A Federal Consistency Determination analyzing the effects of the Proposed Action on Virginia's coastal zone resources is provided as **Appendix D** and will be submitted to VDEQ for review as part of this EA.

3.3.3.4 Management and/or Mitigation Measures

USACE would implement the measures listed below to ensure that potential impacts on water resources remain less-than-significant under the Proposed Action Alternative. Additional details regarding these measures are provided in the DP (USACE, 2019b).

- Waste fluids generated during dismantlement activities (e.g., washing or saw cutting byproducts) would be captured, containerized, characterized, transported from the site by licensed contractors, and disposed of at permitted off-post facilities.
- Spill kits would be provided in conspicuous locations on the site throughout the proposed decommissioning process in the event that containment and cleanup of accidental spills is needed.
- Activities with the potential to release residual or waste fluids would be planned, reviewed, and evaluated by decommissioning personnel prior to execution to identify best practices and procedures to contain the fluids and prevent accidental releases.
- During removal of the intake pier/pump house structure in Gunston Cove, support piles would be cut below the mudline and the portions below the mudline would be left in place to minimize sediment and subaqueous bottom disturbance.
- Containment booms, turbidity curtains, and/or similar measures would be used during in-water work as applicable to prevent the downstream migration of floating debris and disturbed sediments, and ensure that disturbed sediments re-settle near their original location.
- As necessary, the decommissioning contractor would delineate wetlands, obtain a jurisdictional determination from USACE, and submit a JPA identifying avoidance, minimization, and/or compensatory mitigation measures to receive permit coverage pursuant to Sections 401/404 of the CWA.
- Tree removal in the RPA would be mitigated through the planting of two new trees for the removal of every tree four inches dbh or greater in accordance with Fort Belvoir Policy Memorandum #27, *Tree Removal and Protection*.
- The decommissioning contractor would obtain coverage under the CGP, including preparation and implementation of a site-specific SWPPP.
- Signage would be posted conspicuously in the vicinity of the intake pier/pump house, concrete discharge pipe, and outfall structure, and equipment associated with their removal (on- and off-shore) to inform boaters and ensure they maintain a safe distance. Additional notification may be provided as determined necessary through the posting of notices at local marinas and boat launch facilities and/or publication in local newspapers.

3.4 Air Quality

The CAA of 1970, as amended, requires the USEPA to establish National Ambient Air Quality Standards (NAAQS) for ambient air pollutants considered harmful to public health and the environment. These pollutants, known as "criteria pollutants," include: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and two types of particulate matter: particulate matter that is 10 micrometers or less in diameter (PM_{10}) and particulate matter that is 2.5 micrometers or less in diameter ($PM_{2.5}$). Ground-level O_3 is a strong photochemical oxidant that results from a chemical reaction of volatile organic compounds (air toxics), nitrogen oxides (NO_x), and oxygen in the presence of sunlight (USEPA, 2018b). O_3 is considered a secondary pollutant because it is not directly emitted from pollution sources but is formed in the ambient air. Therefore, the emissions of the precursors (NO_x and volatile organic compounds [VOCs]) are used to estimate the amount of O_3 emissions.

The CAA established two types of NAAQS: primary standards to protect public health (physical effects, such as difficulty breathing or disease, including on sensitive asthmatics, children, and elderly) and secondary standards to protect public welfare (non-physical effects, such as visibility impairment and damage to food sources) (40 CFR Part 50). The NAAQS are expressed as concentration of a criteria pollutant in air and the duration of exposure.

Exposure duration can be further defined as either short-term (e.g., 1-hour, 8-hour, 24-hour) or long-term (e.g., annual average).

USEPA uses regional, contiguous areas to determine an area's NAAQS compliance. These areas may be a county or a group of neighboring counties, a city or a group of regionally connected cities, or other neighboring or regionally connected areas. An area with air pollutants that meet or are below the NAAQS is an attainment area; an area that exceeds one or more NAAQS is a non-attainment area for the exceeded pollutant(s). An area that was historically in non-attainment, but later achieved consistent attainment, is designated as a maintenance area (USEPA, 2019b).

USEPA and local governments also regulate toxic and hazardous air pollutants (HAPs), such as benzene, asbestos, naphthalene, toluene, and xylenes. HAPs are usually present in minimal quantities in the ambient air; however, their high toxicity may pose a threat to public health even at low concentrations (USEPA, 2018a). Pursuant to CAA Section 112, radionuclides such as radon, cesium–137, plutonium, and uranium are categorized as HAPs (USEPA, 2017d). Existing radiological conditions are discussed in **Section 3.6** and will not be further discussed in this section.

Greenhouse gas (GHG)-emitting human activities alter the chemical composition of the Earth's atmosphere and cause shifts in the global climate (i.e., global warming and climate change). GHGs include carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated gases (hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride). CO_2 and other GHGs are emitted from fuel-burning stationary sources (e.g., boilers, generators, plants, and factories), fuel-burning mobile sources (e.g., cars, buses, airplanes, trains, and construction equipment), and certain manufacturing industries and activities (USEPA, 2017c).

3.4.1 Regulatory Setting

Table 3.4-1 outlines other federal regulations that are applicable to air quality and relevant to the Proposed Action.

Table 3.4-1: Air Quality – Applicable Regulations and Guidance

Guidance	Description/Applicability
Clean Air Act (CAA) of 1970, as amended	Established National Ambient Air Quality Standards (NAAQS) for six air pollutants known as criteria pollutants (40 CFR 50): carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM10 [particulate matter with a diameter ≤ 10 micrometers], and PM2.5 [particulate matter with a diameter ≤ 2.5 micrometers]), lead (Pb), and sulfur dioxide (SO2).
Clean Air Act Amendments (CAAA) of 1990	Expands the scope and content of the act's conformity provisions in terms of their relationship to a State Implementation Plan (SIP). Under Section 176(c) of CAAA, a project is in "conformity" if it corresponds to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving their expeditious attainment.

Table 3.4-1: Air Quality – Applicable Regulations and Guidance

Guidance	Description/Applicability
State Implementation Plans (42 USC Subpart 7407)	Requires that each state submit a SIP to USEPA that demonstrates how the NAAQS will be attained (i.e., air pollution at or below NAAQS levels), maintained, and enforced; includes regulations, permitting guidance, emission inventories, and other related documentation or enforceable requirements, as well as air quality standards that can be stricter than Federal standards; authorized under Section 107 of the CAA. USEPA reviews and approves all SIPs, and the SIP is enforced by the state. Virginia's SIP was first submitted to and approved by USEPA in 1972. The state has submitted multiple revisions to USEPA since then for approval and incorporation into the SIP (VDEQ, 2019).
The General Conformity Rule (40 CFR Parts 51 and 93)	Requires federal actions or federally funded actions planned to occur in a non-attainment or maintenance area to be reviewed prior to their implementation to ensure that the actions would not interfere with a State's plans to meet or maintain the NAAQS; considers the total direct and indirect emissions of a proposed action under a General Conformity Analysis; requires a General Conformity Determination if the total air emissions are not exempt or below *de minimis* levels (i.e., minimum thresholds for criteria pollutants in non-attainment and maintenance areas) specified in 40 CFR Part 93.153.
Ozone Transport Region (42 USC Part 7511c)	Designates the region from Northern Virginia to Maine as an ozone transport region, whereby there may be stricter ozone standards; 40 CFR Part 93.153 of the General Conformity Rule establishes *de minimis* levels for ozone precursors (i.e., VOCs and NO_x) that may be more restrictive.
List of Hazardous Air Pollutants (42 USC Part 7412)	Lists 187 HAPs regulated by the USEPA (USEPA, 2018a); authorized under Section 112 of the CAA.
New Source Performance Standards (40 CFR Part 60)	Establishes standards to minimize emissions of criteria pollutants and HAPs from specific types of man-made, stationary emission sources; applies to sources that are new, reconstructed, or modified; authorized under Section 111 of the CAA.
National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61)	Establishes standards for various HAPs and source categories; includes a National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos demolition and renovation (40 CFR Part 61.145) and for radionuclide emissions from federal facilities that are not NRC Licensees or Department of Energy facilities (such as Fort Belvoir) (40 CFR Part 61, Subpart I); authorized under Section 112 of the CAA.
Title V Permit Program (40 CFR Part 71)	Requires major sources (i.e., stationary sources, or groups of stationary sources, with the potential to emit more than 100 tons per year [tpy] of any criteria pollutant, 10 tpy of any HAP, or 25 tpy of any combination of HAPs) to obtain a federal Title V operating permit (as specified in Title V of the CAA and in VDEQ's Title V Facility Permit regulations at 9 VAC5-80); includes requirements for reporting GHGs emitted from major sources (area sources are not considered to be major) (USEPA, 2017a); authorized under Section 112 of the CAA.

Table 3.4-1: Air Quality – Applicable Regulations and Guidance

Guidance	Description/Applicability
Mobile Emission Standards (42 USC Subpart 7521-7590)	Establishes USEPA emission standards for manufacturers and operators of mobile sources; includes engine and fuel requirements to reduce mobile source pollution; includes limits on GHGs emitted from mobile sources (USEPA, 2017b); authorized under Section 202 of the CAA.

3.4.2 Affected Environment

Fairfax County was previously designated a moderate non-attainment area for the 1997 8-hour O_3 NAAQS and the 1997 $PM_{2.5}$ NAAQS. In November 2014, Fairfax County was designated as a maintenance area for the 1997 $PM_{2.5}$ NAAQS. However, the NAAQS for the 1997 8-hour O_3 and the 1997 $PM_{2.5}$ were revoked in April 2015 and October 2016, respectively (80 *Federal Register* [FR] 12264, 81 FR 58010). While revoked standards are no longer in effect, anti-backsliding rules may still apply. Such rules ensure that areas previously designated as non-attainment do not reverse air quality improvement progress by removing certain emission controls and standards in place, even after a non-attainment status or NAAQS standard is revoked (80 FR 12264, 81 FR 58010).

Fairfax County, including Fort Belvoir and the SM-1 site, is designated by the USEPA as a marginal non-attainment area for the 2008 8-hour O_3 NAAQS and is located in the ozone transport region where *de minimis* levels of VOC and NO_x are 50 and 100 tpy, respectively (40 CFR Part 93.153). Fairfax County is currently in attainment for all other criteria pollutants (i.e., CO, SO_2, $PM_{2.5}$, PM_{10}, NO_2, and Pb) (USEPA, 2019b).

Under the CAAA, a project is in "conformity" if it corresponds to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving their expeditious attainment. In accordance with the General Conformity Rule (40 CFR Parts 51 and 93), federal actions planned to occur in a non-attainment or maintenance area must be reviewed prior to their implementation to ensure that emissions from these actions would not:

- Cause or contribute to any new violations of any standards in any area.
- Increase the frequency or severity of any existing violation of any standards in any area.
- Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The Proposed Action would occur in Fairfax County, a marginal non-attainment area for the 2008 8-hour O_3 NAAQS. Therefore, analysis of potential emissions from the Proposed Action is required in accordance with the General Conformity Rule to determine if such emissions would contribute to the further degradation of air quality in Fairfax County and delay or prevent the attainment of the applicable SIP's objectives.

In accordance with 40 CFR Part 71, Fort Belvoir is classified as a "major source" of air emissions (i.e., it has the potential to emit more than 100 tpy of any criteria pollutant, 10 tpy of any HAP, or 25 tpy of any combination of HAPs). As such, the installation maintains a Title V operating permit (Number NVRO70550). This permit regulates stationary source emissions for the installation as a whole and includes requirements for emission monitoring, testing, recordkeeping, reporting, and inventorying on an annual basis. HAPs at Fort Belvoir are primarily associated with permanent, stationary sources (e.g., fueling stations, fuel storage tanks, and paint booths). As a major source, Fort Belvoir also reports annual installation-wide GHG emissions as part of the USEPA's Greenhouse

Gas Reporting Program (USEPA, 2019a). None of the buildings on the SM-1 site (i.e., Buildings 372, 7350, 349, and 375) contain stationary sources that are regulated by Fort Belvoir's Title V permit.

3.4.3 Evaluation of Environmental Consequences

3.4.3.1 Approach to the Analysis

Impacts on air quality from the decommissioning of nuclear facilities are neither detectable nor destabilizing (NRC, 2002). However, this section addresses potential site-specific effects from the No Action and Proposed Action Alternatives, and the methodologies to determine those impacts. **Table 3.4-2** identifies the adverse impact significance thresholds for air quality. Direct impacts would occur on the SM-1 site and would result from the proposed activities under either Alternative. Indirect impacts would have the potential to migrate off the SM-1 site, such as an increase in off-site emissions or off-site visibility impacts from fugitive dust.

Table 3.4-2: Air Quality Impact Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	• The Alternative would result in negligible emissions of criteria pollutants within an attainment area and/or negligible emissions of HAPs. • The Alternative would not violate the conditions of the Title V permit. • The Alternative would result in minimal amounts of fugitive dust emissions and emissions of GHGs that are not noticeable on a regional level.
	Indirect Impacts	• The Alternative would induce emissions outside of the site that would not exceed *de minimis* levels or change the attainment status. • The Alternative would induce emissions of HAPs outside of the site that would not exceed major source thresholds.
Potentially Significant Adverse Effect	Direct Impacts	• The Alternative would result in criteria pollutant emission levels exceeding *de minimis* levels and/or HAP emissions exceeding major source thresholds. Emissions would change attainment status. • The Alternative would result in the violation of Title V permit conditions. • The Alternative would generate fugitive dust emissions that would cause visibility issues and GHG emissions that would be noticeable on a regional or global level.
	Indirect Impacts	• The Alternative would induce emissions outside of the site that would exceed NAAQS or *de minimis* levels or change the attainment status. • The Alternative would induce emissions of HAPs outside of the site that would exceed major source thresholds.

Appropriate minimization measures that could be implemented to reduce the severity of an impact are included in **Section 3.4.3.4**. The detailed calculations and methodologies for estimating the Proposed Action's air emissions are provided in **Appendix E**. The calculations include:

- Calculation of criteria pollutant emissions to determine the applicability of the General Conformity regulations (based on the attainment status designation for Fairfax County)

- Calculation of GHG emissions in carbon dioxide equivalent ($CO_{2e)}$ units and comparison to the annual state-wide and Fort Belvoir GHG emissions to determine the Proposed Action's level of contribution to regional GHG emissions.

The calculation of HAP emissions from permanent, stationary sources was not necessary for this analysis as all emissions from the Proposed Action would be mobile and temporary.

3.4.3.2 No Action Alternative

Under the No Action Alternative, there would be no dismantlement of buildings or structures at the SM-1 site and existing conditions would continue for the foreseeable future. Therefore, implementation of the No Action Alternative would not result in any changes to existing air quality. Fort Belvoir's contribution to regional air quality would not change. Ambient air quality trends and regional emissions would continue as described in **Section 3.4.2.**

3.4.3.3 Proposed Action Alternative

Temporary activities under the Proposed Action Alternative that would generate pollutant emissions include, but are not limited to:

- Handling and transport of excavated and imported materials (i.e., soil and concrete) during construction;
- Operations of heavy-duty, diesel-powered trucks and equipment at the site during dismantlement;
- Operations of heavy-duty, diesel-powered trucks traveling to and from the site to dispose of or deliver materials during dismantlement;
- Operation of workers' commuter vehicles, commuting to and from the SM-1 site;
- Storage of excavated and imported materials in stockpiles;
- Use of unpaved areas/roads; and
- Site preparation activities (e.g., clearing, grubbing, tree removal).

3.4.3.3.1 Criteria Pollutants

The Proposed Action Alternative would generate criteria pollutant emissions. All emissions generated would be temporary (i.e., only occurring during construction) and there would be no emission sources at the SM-1 site after completion of the Proposed Action Alternative. Further details on the emission sources, such as the types and sizes of construction equipment, are provided in **Appendix E**.

Table 3.4-3 shows the criteria pollutant emissions estimates for each year of the Proposed Action Alternative and compares them to applicable *de minimis* levels or major source thresholds. The PM_{10} and $PM_{2.5}$ values in **Table 3.4-3** include calculated fugitive emission values. Because criteria pollutant calculations only include the temporary, mobile sources associated with the Proposed Action Alternative, a comparison to Fort Belvoir's installation-wide permanent, stationary source emissions is not necessary.

As shown in **Table 3.4-3**, temporary construction emissions would not exceed the annual *de minimis* levels or major source thresholds for any criteria pollutants. Therefore, a General Conformity Determination is not required. Detailed methodologies for estimating air emissions and a Record of Non-Applicability (RONA) are provided in **Appendix E**.

Table 3.4-3: Proposed Action Alternative Criteria Pollutant Emissions Compared to Fort Belvoir Emissions, *De Minimis* Levels, and Major Source Thresholds

Pollutant	2021 Proposed Action Alternative Emissions (tpy)	2022 Proposed Action Alternative Emissions (tpy)	2023 Proposed Action Alternative Emissions (tpy)	2024 Proposed Action Alternative Emissions (tpy)	2025 Proposed Action Alternative Emissions (tpy)	2017 Fort Belvoir Annual Emissions (tpy)[1]	*De minimis* Level (tpy)[2]	Major Source Threshold (tpy)[3]
VOCs	0.24	0.43	0.50	0.67	0.27	1.95	50	--
NO_x	2.39	6.48	6.73	7.69	1.74	31.85	100	--
SO_2	0.17	0.48	0.50	0.58	0.12	0.12	--	100
CO	1.24	2.22	2.48	3.31	1.11	14.86	--	100
PM_{10}	1.18	0.37	0.44	0.59	0.23	1.37	--	100
$PM_{2.5}$	1.18	0.36	0.40	0.53	0.18	1.35	--	100

Notes:

1. Source: (VDEQ, 2013)
2. *De minimis* levels for an O_3 non-attainment area in the ozone transport region.
3. Major source threshold for criteria pollutants.

Emission limits and conditions in the Title V permit are primarily relevant to stationary sources at the installation; no limit exceedances or noncompliance with Fort Belvoir's Title V permit would occur under the Proposed Action Alternative. Based on the temporary nature of the emissions and the non-effect on Fort Belvoir's Title V permit, the Proposed Action Alternative would have a temporary, less than significant impact on air quality.

3.4.3.3.2 HAP Emissions

Most HAPs emitted in Virginia and at Fort Belvoir are primarily associated with permanent, stationary sources and are typically measured at very low concentrations. Temporary HAP emissions associated with the Proposed Action Alternative could occur, but would be negligible when compared to Fort Belvoir and regional HAP emissions and would not meet or exceed major source thresholds (10 tpy of any HAP or 25 tpy of any combination of HAPs). Therefore, HAP emissions from the Proposed Action Alternative would have a temporary, less than significant impact on air quality.

3.4.3.3.3 GHG Emissions

Potential GHG emissions were calculated for each year of the Proposed Action Alternative. **Table 3.4-4** shows the estimated GHG emissions for each year of the Proposed Action Alternative and compares them to the 2017 Fort Belvoir installation-wide GHG emissions and the Virginia 2015 state-wide GHG emissions. The relative annual contribution of GHG emissions from the Proposed Action Alternative would be negligible on a regional level. Therefore, GHG emissions from the Proposed Action Alternative would have a temporary, less-than-significant impact on air quality.

3.4.3.4 Management and/or Mitigation Measures

No potentially significant adverse effects on air quality were identified by analysis; therefore, no mitigation measures would be required. The following management measures and/or BMPs would be implemented to further reduce the anticipated less-than-significant, adverse effects:

- Truck beds would be covered while in transit to limit fugitive dust emissions.
- Water would be sprayed on any unpaved roads or stockpiles to limit fugitive dust emissions.
- Ultra-low sulfur diesel would be used as a fuel source where appropriate to minimize oxides of sulfur emissions.
- Clean diesel would be used in construction equipment and vehicles through the implementation of add-on control technologies such as diesel particulate filters and diesel oxidation catalysts, repowers, and/or newer and cleaner equipment. When feasible, electric-powered equipment would be used in lieu of diesel-powered equipment.
- Control measures for heavy construction equipment and vehicles, such as minimizing operating and idling time, would be implemented to limit criteria pollutant emissions.
- Air quality permits would be obtained for the Proposed Action Alternative, as necessary, in compliance with federal, state, and local standards.

Table 3.4-4: Proposed Action Alternative GHG Emissions Compared to Fort Belvoir and State-wide GHG Emissions

GHG	2021 Proposed Action Alternative Emissions (metric tpy)	2022 Proposed Action Alternative Emissions (metric tpy)	2023 Proposed Action Alternative Emissions (metric tpy)	2024 Proposed Action Alternative Emissions (metric tpy)	2025 Proposed Action Alternative Emissions (metric tpy)	2017 Fort Belvoir Annual Emissions (metric tpy)[1]	2015 State-wide Emissions (metric tpy)[2]
CO_2e	231.34	632.41	651.93	757.36	158.40	24,585	103,000,000
Percentage (%) of Fort Belvoir Emissions	*0.94*	*2.57*	*2.65*	*3.08*	*0.64*	--	--
Percentage (%) of State-wide Emissions	*0.0002*	*0.0006*	*0.0006*	*0.0007*	*0.0002*	--	--

Notes:

1. Source: (USEPA, 2019a)
2. Source: (EIA, 2019)

3.5 Biological Resources

Biological resources include native or naturalized plants (flora) and animals (fauna); their habitats; and the larger ecosystems in which they occur. This section discusses vegetation and plant communities, wildlife (including protected species), and the habitats in which they are found, and designated Special Natural Areas.

The ROI generally includes Fort Belvoir and Gunston Cove, as well as any adjacent areas that provide important habitat connectivity for special status species. For the purpose of analysis, the SM-1 site and its immediate vicinity are used to determine the relevance of this broader ROI for individual species, if any. Biological resources present on and around the SM-1 site are discussed in this section, including special status species with federal, state, or local protection.

3.5.1 Regulatory Setting

Table 3.5-1 outlines federal and state regulations and Fort Belvoir policies that are applicable to biological resources present on and in the vicinity of the SM-1 site.

Table 3.5-1: Biological Resources – Applicable Regulations and Guidance

Guidance	Description/Applicability
Endangered Species Act of 1973 (16 USC Subpart 1531 et. seq.)	Provides conservation of threatened and endangered species and the habitats in which they are found. Under Section 7, agencies that may affect an endangered or threatened species must consult with USFWS and/or National Marine Fisheries Service so that federal actions will not jeopardize a listed species or result in destruction or adverse modification of its habitat.
Anadromous Fish Conservation Act (16 USC 757a-757g)	Authorizes the Secretaries of the Interior and Commerce to enter into cooperative agreements with the states and other non-federal interests for conservation, development, and enhancement of anadromous fish.
Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC Part 1801 et seq.)	Provides conservation and management of fisheries, including the identification and protection of Essential Fish Habitat (EFH).
Migratory Bird Treaty Act of 1918 (16 USC Section 703 et. seq.)	Establishes protections for bird species that migrate between the US and other countries. Makes it unlawful to pursue, hunt, take, capture, wound, or kill a migratory bird by any means including any part, egg, or nest unless otherwise authorized, such as within legal hunting seasons. Administered by USFWS.
Bald and Golden Eagle Protection Act of 1940 (BGEPA) (16 USC 668)	Prohibits the taking of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) or their nests and eggs. Taking is defined as: "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."
Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*	Establishes a Memorandum of Understanding (*Promote the Conservation of Migratory Birds*) between DOD and USFWS to identify activities where cooperation between DOD and USFWS will contribute substantially to the conservation of migratory birds and their habitats.

Table 3.5-1: Biological Resources – Applicable Regulations and Guidance

Guidance	Description/Applicability
DOD Instruction 4715.03, *Natural Resources Conservation Program*	Authorizes installations to designate Special Natural Areas that have ecological, scenic, recreational, and educational value warranting of special conservation efforts and habitat management, consistent with the military mission.
Virginia Department of Game and Inland Fisheries *Removal or Relocation of Osprey Nests in Virginia: A Guideline for Landowners* (VDGIF, 2010).	Provides landowner guidance for the relocation of osprey (*Pandion haliaetus*) nests.
VDGIF *Management of Bald Eagle Nests, Concentration Areas, and Communal Roosts in Virginia: A Guide for Landowners* (VDGIF, 2012)	Provides landowner guidance on the management of transient and nesting bald eagles.
Fort Belvoir *Integrated Natural Resources Management Plan* (INRMP) (Fort Belvoir, 2018a)	Establishes that Fort Belvoir actions must be implemented in accordance with policies and procedures that promote overall biological diversity while also supporting Fort Belvoir's missions. Fort Belvoir has established an ecosystem-based natural resources management program that focuses on the retention of large intact areas of natural habitat, maintenance and improvement of ecological connectivity between habitat areas, and the reduction or correction of habitat degradation.
Fort Belvoir *Bald Eagle Management Plan*	Emphasizes conservation of all bald eagle habitats, which includes such requirements or restrictions as a 750-foot buffer around active nests, prohibition of clear-cutting or construction 750 feet inland of a shoreline, a prohibitory flight-zone 500 feet above nest sites during nesting season, and the protection of nest sites for up to five years of inactivity.
Fort Belvoir *Memorandum of Instruction – Northern Long-eared Bat Protection on Fort Belvoir*	Outlines an installation-wide time of year restriction on tree clearing between 15 April and 15 September to minimize impacts on northern long-eared bat (*Myotis septentrionalis*) habitat. Provides guidelines to protect and conserve the tricolored bat (*Perimyotis subflavus*) and little brown bat (*Myotis lucifugus*).
Fort Belvoir Policy Memorandum #27, *Tree Removal and Protection*	Requires trees greater than 4 inches in diameter at dbh lost to land disturbance at Fort Belvoir to be replaced at a 2:1 ratio elsewhere on Fort Belvoir property. Allows the implementation of alternative mitigation methods, such as stream or riparian area restoration, when a 2:1 ratio replacement is not achievable.

Table 3.5-1: Biological Resources – Applicable Regulations and Guidance

Guidance	Description/Applicability
Fort Belvoir Policy Memorandum #78, *Conservation of Migratory Birds*	Provides guidance on activities that may impact the nesting season of migratory birds, such as tree removals, chimney maintenance, demolition, and mowing. Some of the restrictions and requirements include, but are not limited to: avoidance of tree clearing between 1 April – 15 July, avoidance of osprey nest removal between 16 April – 15 September (or written consent from VDGIF must be obtained), and coordination of activities within 750 feet of a bald eagle nests with Fort Belvoir's Environmental Division.

3.5.2 Affected Environment

3.5.2.1 Vegetation and Plant Communities

3.5.2.1.1 Terrestrial

Fort Belvoir's Integrated Natural Resources Management Plan (INRMP) identifies 16 plant community types on Fort Belvoir's Main Post. The dominant plant community type at Fort Belvoir is "Urban," which primarily consists of impervious surfaces, maintained lawns, and landscaped areas (Fort Belvoir, 2018a). The SM-1 site is included within the Urban plant community type.

Vegetation on the site includes maintained lawn, landscape trees and shrubs, and mature pine and hardwood trees. Vegetation is denser on the southeastern and northeastern sides of the site and along the Gunston Cove shoreline. The SM-1 site is bounded to the north by land within the Oak Submesic-Ericad Forest plant community, which is dominated by chestnut oak (*Quercus prinus*), with a mixture of northern red oak (*Quercus rubra*) and scarlet oak (*Quercus coccinea*) (Fort Belvoir, 2018a).

No invasive plant species with significant occurrence have been identified on the SM-1 site (Fort Belvoir, 2018b).

3.5.2.1.1 Aquatic

Gunston Cove borders the SM-1 site. This cove contains shallow water with various types of submerged aquatic vegetation (SAV). SAV contributes to the health of estuary systems by providing habitat for many fish and shellfish species, food for waterfowl, erosion control, and excess nutrient absorption. Mapped SAV species in Gunston Cove include hydrilla (*Hydrilla verticillata*) and common reed (*Phragmites australis*), which are both invasive species, water stargrass (*Heteranthera dubia*), spiny naiad (*Najas marina*), coontail (*Ceratophyllum demersum*), wild celery (*Vallisneria americana*), and southern naiad (*Najas guadalupensis*) (MDNR, 2018; VIMS, 2019; Fort Belvoir, 2018a).

3.5.2.2 Wildlife and Habitat

3.5.2.2.1 Terrestrial

Birds

Two hundred seventy-eight (278) bird species have been documented at Fort Belvoir. Vegetation on the SM-1 site could provide habitat for any number of Fort Belvoir's resident and migrant bird species, particularly those that prefer forested and wooded areas, such as the resident red-bellied woodpecker (*Melanerpes carolinus*) and migratory American redstart (*Setophaga ruticilla*), or riparian/shoreline areas, such as the resident great blue heron (*Ardea herodias*) and migratory spotted sandpiper (*Actitis macularius*). Additionally, active osprey (*Pandion*

haliaetus) nests exist on Building 372, on the intake pier, and in other areas of the SM-1 site (Fort Belvoir, 2018a). Ospreys typically mate for life and return to the same nesting area each year (USFWS, n.d.). The picture below shows osprey nests on the Building 372 stack and on the intake pier adjacent to the pump house.

Mammals

Forty-three (43) mammal species have been documented at Fort Belvoir. Vegetation on the SM-1 site could provide habitat for any number of Fort Belvoir's mammal species, particularly those that prefer forested and edge habitats, such as the eastern gray squirrel (*Sciurus carolinensis*) and eastern cottontail rabbit (*Sylvilagus floridanus*), or those that are malleable in their habitat preferences and can successfully inhabit urban areas, such as the white tail deer (*Odocoileus virginiana*) and raccoon (*Procyon lotor*) (Fort Belvoir, 2018a).

Osprey Nests at the Deactivated SM-1 Nuclear Reactor Facility (USACE, 2019c)

Reptiles, Amphibians, and Invertebrates

Fort Belvoir has identified 34 species of reptiles and 27 species of amphibians within its boundaries. The majority of the reptiles and amphibian species at Fort Belvoir live in or near water, or spend at least part of their life-cycle in water. This includes the northern water snake (*Nerodia sipedon*), snapping turtle (*Chelydra serpentina*), bullfrog (*Rana catesbeiana*), and spotted salamander (*Ambystoma maculatum*) (Fort Belvoir, 2001; Fort Belvoir, 2018a). Vegetation on the SM-1 site could provide habitat for any number of Fort Belvoir's amphibian, reptile, or terrestrial invertebrate species, including those that live in association with water, since the SM-1 site includes a portion of Gunston Cove and is bordered by tributaries and a wetland area.

3.5.2.2.2 Aquatic

Macroinvertebrates

Aquatic habitats at Fort Belvoir generally consist of warm water, low baseline flow, silty/sandy substrate, and in-stream organic debris. Erosion and run-off from developed watersheds may impact the water quality of aquatic habitats. Some 197 species of aquatic benthic macroinvertebrates have been identified in Fort Belvoir waterways. Dominant benthic macroinvertebrates are pollutant-tolerant aquatic midges (*Chironomidae*) and worms (*Oligochaete*) (Fort Belvoir, 2001; Fort Belvoir, 2018a).

Fish

Sixty-five (65) resident fish species have been identified at Fort Belvoir, which predominantly includes freshwater minnow (*Cyprinidae*) and sunfish (*Centrarchidae*) species (Fort Belvoir, 2018a). The dominant fish species in Gunston Cove is the white perch (*Morone americana*). Anadromous species from Gunston Cove that may be found in the cove's tributaries during spawning season include the alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), and gizzard shad (*Dorosoma cepedianum*) (Fort Belvoir, 2018a).

Essential Fish Habitat

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH is regulated by NOAA Fisheries. EFH is present in Gunston Cove for at least one life stage for the little skate (*Leucoraja erinacea)*, Atlantic herring (*Clupea harengus*), red hake (*Urophycis chuss)*, winter skate (*Leucoraja ocellata*), clearnose skate (*Raja eglanteria)*, and windowpane flounder (*Scophthalmus aquosus*) (NOAA Fisheries, 2019).

Given the low salinity of the Potomac River near the SM-1 site, adult and juvenile EFH species are not expected to occur, or would occur in low densities, as these species prefer high salinity zones (greater than 10 parts per thousand [ppt]) of the Chesapeake Bay and low water temperatures (below 10 ^{0}C) (New England Fishery Management Council & NMFS, 2017). Water temperatures and salinity levels in Gunston Cove are also anticipated to be outside of ideal conditions for spawning and larval stages (below 10 ^{0}C and above 0.5 ppt).

USACE has consulted with NOAA Fisheries regarding the Proposed Action's potential effects on EFH in accordance with the MSA. Copies of correspondence supporting this consultation are included in **Appendix B**.

3.5.2.3 Protected Species and Habitat

3.5.2.3.1 Terrestrial

A query of USFWS's Information, Planning, and Consultation (IPaC) database identified one federally listed species with potential to occur at or near the SM-1 site: the northern long-eared bat (*Myotis septentrionalis*) (NLEB). No other federally listed species or critical habitat was identified in the IPaC query (USFWS, 2019a). However, Fort Belvoir has either documented, or manages for the potential presence of, eight federally listed or state-listed threatened and endangered species based on available habitat. Fort Belvoir has also documented, or manages for the potential presence of, four "species of concern" that are not federally or state-listed: the spotted turtle (*Clemmys quttata*), Northern Virginia well amphipod (*Stygobromus phreaticus*), Tidewater amphipod (*Stygobromus indentatus*), and the monarch butterfly (*Danaus plexippus*) (Fort Belvoir, 2018a).

USACE has consulted with USFWS in accordance with Section 7 of the ESA regarding federally listed species under its jurisdiction that would be potentially affected by the Proposed Action. Copies of correspondence supporting this consultation are included in **Appendix B**.

Vegetation

The federally and state-threatened small whorled pogonia (*Isotria medeoloides*) is a flowering plant that prefers forested understory habitat (USFWS, 2018f). Identification of the species and determination of its presence in a particular area is difficult due to its unusual life cycle, which includes dormancy periods of up to five years (Fort Belvoir, 2018a). Suitable habitat for the small whorled pogonia was identified on the installation during field surveys conducted in 2011 and 2012; however, the species' presence has not been documented on Fort Belvoir and it is not expected to occur on the SM-1 site (Fort Belvoir, 2015).

Birds

The bald eagle (*Haliaeetus leucocephalus*) is a bird-of-prey that prefers habitats near water. After a significant population recovery due to the banning of dichlorodiphenyltrichloroethane (DDT) and implemented ESA protections, the bald eagle was federally delisted from the threatened and endangered species list in 2007 and delisted by the State of Virginia in 2013. However, bald eagles continue to be protected under the MBTA and the BGEPA (USFWS, 2017). The installation provides roosting, foraging, and nesting habitat for both resident and migratory bald eagles. As of 2018, there were eight active bald eagle nests at Fort Belvoir (Fort Belvoir, 2018a). None of the eight active bald eagle nests at Fort Belvoir are located within 750 feet of the SM-1 site (The Center for Conservation Biology, 2018).

The American peregrine falcon (*Falco peregrinus anatum*) is a bird-of-prey that can utilize a number of habitats, including urban areas. The peregrine falcon is a state-listed threatened species (USFWS, 2018a). Fort Belvoir does not consider the peregrine falcon to be a resident species; it does not breed or nest on the installation and typically only occurs along the Accotink Creek/Accotink Bay stream corridor and the Jackson Miles Abbott Wetland Refuge during its fall migration (Fort Belvoir, 2001). Based on peregrine falcon habitat preferences and transient occurrences, it is unlikely that the peregrine falcon would be encountered at the SM-1 site (Fort Belvoir, 2001).

USFWS Birds of Conservation Concern species with the potential to occur at the SM-1 site include the following (USFWS, 2019a):

- Bald eagle
- Bobolink (*Dolichonyx oryzivorus*)
- Canada warbler (*Cardellina canadensis*)
- Dunlin (*Calidris alpina*)
- Kentucky warbler (*Oporornis formosus*)
- King rail (*Rallus elegans*)
- Lesser yellowlegs (*Tringa flavipes*)
- Prairie warbler (*Dendroica discolor*)
- Prothonotary warbler (*Protonotaria citrea*)
- Red-headed woodpecker (*Melanerpes erythrocephalus*)
- Rusty blackbird (*Euphagus carolinus*)
- Semipalmated sandpiper (*Calidris pusilla*)
- Short-billed dowitcher (*Limnodromus griseus*)
- Wood thrush (*Hylocichla mustelina*)

Mammals

Three protected bat species occur at Fort Belvoir: NLEB, tricolored bat (*Perimyotis subflavus*), and little brown bat (*Myotis lucifugus*). White nose syndrome, a fast-spreading fungal disease, is the main threat to these species and the principal reason for their listings (USFWS, 2018c; Hamlin, 2004; Havens, 2006). The NLEB is federally listed as threatened. During the winter, this species hibernates in caves or mines with stable temperatures, high humidity, and no air currents. During the summer, the NLEB primarily roosts individually or in colonies underneath tree bark,

or in the cavities or crevices of live trees or snags. The NLEB typically forages in the understory of forested areas or over water (USFWS, 2018c).

The tricolored bat is a state-listed endangered species. As with the NLEB, the tricolored bat hibernates in caves or mines with stable temperatures and high humidity. Summer roosting habitat includes rock crevices, caves, tree foliage, and structures such as barns. They forage in riparian areas, open woods, forest edges, and over open water (NYNHP, 2014b).

The little brown bat is a state-listed endangered species. During the winter, the little brown bat hibernates in caves or mines. Summer roosting habitat includes human and natural structures, such as tree crevices, under rocks, wood piles, and in barns. The species' preferred foraging habitat is over wetlands and open water (NYNHP, 2014a).

VDGIF restricts construction near hibernacula and maternity roosts of protected bat species. According to the VDGIF online mapper of these buffer areas, there are no documented hibernacula or roost trees on Fort Belvoir property (VDGIF, 2018b; VDGIF, 2018a). Thus, there are no documented hibernacula on or within 0.25-mile of the SM-1 site and no documented roosts on or within 150 feet of the site. Fort Belvoir conducts regular surveying to monitor bat presence at the installation.

Reptiles, Amphibians, and Invertebrates

The wood turtle (*Glyptemys insculpta*) is a state-listed threatened aquatic turtle that primarily lives in and along permanent freshwater streams and respective terrestrial buffers (NatureServe, 2016; Fort Belvoir, 2018a). Historically, the wood turtle was found on Fort Belvoir at the Jackson Miles Abbott Wetland Refuge, Dogue Creek, Accotink Creek, and the Accotink Bay Wildlife Refuge. No wood turtles have been found at Fort Belvoir since their last sighting in 1999 (Fort Belvoir, 2001).The species is not expected to occur at the SM-1 site.

The rusty patched bumble bee (*Bombus affinis*) was federally listed as endangered in 2017 (USFWS, 2018d). Fort Belvoir has not yet conducted surveys specifically for the rusty patched bumble bee; however, based on a review of the bumble bees' range and potential zones of presence, Fort Belvoir is located in the species' historic range (Fort Belvoir, 2018a; USFWS, 2018e). The species has not been recently observed or collected on Fort Belvoir and is not likely to be present at the SM-1 site.

3.5.2.3.2 Aquatic

Two federally and state-listed endangered fish species, the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and the shortnose sturgeon (*Acipenser brevirostrum*), have been identified as potentially occurring in the surrounding regional waterways of Fort Belvoir. Critical habitat for the Atlantic sturgeon has also been designated in the Potomac River adjacent to Fort Belvoir. These species and critical habitat are discussed below.

USACE has consulted with NOAA Fisheries regarding the Proposed Action's potential effects on federally listed species and critical habitat under its jurisdiction. Copies of correspondence supporting this consultation is provided in **Appendix B**.

Atlantic Sturgeon and Atlantic Sturgeon Critical Habitat

The Atlantic sturgeon is an anadromous fish that is federally and state-listed as endangered. The Chesapeake Bay Distinct Population Segment (DPS) spawn in the rivers of the Chesapeake Bay during the late summer and fall (NOAA Fisheries, 2018). Atlantic sturgeon of the Chesapeake Bay DPS could potentially be present in the Potomac River during spawning, anywhere from the mouth up to Little Falls Dam (upriver from Fort Belvoir). Current spawning populations have not been discovered. Water quality is considered less than ideal, due to low dissolved oxygen (DO) during the summer and poor sediment quality (NOAA Fisheries, 2018b). Clean, hard substrate necessary for the attachment of demersal adhesive eggs is also limited within this system (NOAA Fisheries, 2007).

In 2017, NOAA Fisheries issued a final rule designating critical habitat for the Atlantic sturgeon (82 FR 39160). Critical habitat for the Chesapeake Bay DPS of Atlantic sturgeon consists of approximately 480 miles of non-marine aquatic habitat in Maryland, Virginia, and the District of Columbia, including the main stem of the Potomac River. Some of the bays and tributaries branching from the Potomac River, including Gunston Cove, are within the critical habitat boundary (50 CFR 226.225). However, Atlantic sturgeon has not been observed in the Potomac River in recent decades and there is no existing evidence of current spawning in Gunston Cove.

Due to the absence of ideal habitat and a lack of confirmed and documented current spawning populations within Gunston Cove, the occurrence potential of Atlantic sturgeon adjacent to the SM-1 site is low.

Shortnose Sturgeon

The shortnose sturgeon is a federally and state-listed endangered fish that occurs in rivers and coastal waters from Canada to Florida. Twelve shortnose sturgeon were captured in the Potomac River between 1996 and 2008, between the river mouth and Indian Head (downriver from Fort Belvoir) (NOAA Fisheries, 2010). In 2005, one shortnose sturgeon was captured three kilometers downstream of Gunston Cove at Indian Head. These captures and observations confirm a historical spawning population of shortnose sturgeon in the Potomac River; however, current spawning populations have not been discovered. No shortnose sturgeon have been sighted or captured within Gunston Cove (NOAA Fisheries, 2010; Fort Belvoir, 2018a).

Due to the absence of ideal habitat and a lack of confirmed and documented current spawning populations within Gunston Cove, the potential occurrence of shortnose sturgeon adjacent to the SM-1 site is low.

Other Protected Aquatic Species

None of the fish identified within Fort Belvoir waterways are federally or state-listed as threatened or endangered. Rare fish species at Fort Belvoir that are on the VDCR-NH Watchlist include the least brook lamprey (*Lampetra aepyptera*) and bridle shiner (*Notropis bifrenatus*). The bridle shiner, which has been identified on the installation in Accotink and Dogue Creeks, is also a state species of conservation concern (Fort Belvoir, 2001; Fort Belvoir, 2018a).

The Northern Virginia well amphipod is a Federal Species of Concern and is listed by the State of Virginia as extremely rare. This species is a tiny, unpigmented, eyeless crustacean, in the group commonly known as shrimp, scuds, or sideswimmers (72 FR 51766). The T-17 Refuge borders the SM-1 site to the north and west; however, groundwater at the SM-1 site does not provide the Northern Virginia well amphipod's preferred habitat conditions (MACTEC, 2003; Denton & Scott, 2013). Therefore, the species' presence at the SM-1 site is unlikely.

During consultation in accordance with ESA Section 7, USFWS identified the Northern Virginia well amphipod as a "species of concern." Although not federally protected, USFWS expressed concern about this species relative to excavation associated with the Proposed Action. That is, since the Northern Virginia well amphipod occurs in groundwater-related habitat adjacent to the SM-1 site, excavation down to the groundwater aquifer could potentially affect this species (**Appendix B**).

3.5.2.3.3 Special Natural Areas

Fort Belvoir has established five Special Natural Areas throughout the installation in accordance with DOD Instruction 4715.03. Fort Belvoir established these areas because of the presence of listed or rare species, exemplary biodiversity or natural communities, or other notable ecological or valuable use, such as educational, recreational, or scientific purposes. One of these areas is the ravine seep at the T-17 training area; it has been designated as a wildlife refuge and a Special Natural Area in order to protect the Northern Virginia well amphipod (Fort Belvoir, 2018a). The T-17 Refuge borders the SM-1 site to the north and west.

Although not designated as a Special Natural Area, a portion of the Fort Belvoir shoreline is in USFWS's Potomac River Eagle Concentration Area (previously known as the Mason Neck Bald Eagle Concentration Area). It is one of only three such designated eagle concentration areas in Virginia (Fort Belvoir, 2018b; USFWS, 2018f; Fort Belvoir, 2015). The Gunston Cove shoreline, including the SM-1 site, is part of the Potomac River Eagle Concentration Area. It is classified as an "Occasional Use Forage Area" for bald eagles and has time of year restrictions between 15 May to 31 August and 15 December to 15 March (Fort Belvoir, 2018a; USFWS, 2018b; Fort Belvoir, 2015). Time of year restrictions are implemented to minimize impacts of human activity on eagles, particularly during sensitive life stages.

3.5.3 Evaluation of Environmental Consequences

3.5.3.1 Approach to the Analysis

Potential effects on biological resources from the Proposed Action would be associated with dismantlement and site restoration activities on the SM-1 site, and in-water work associated with the removal of structures in Gunston Cove. **Table 3.5-2** identifies the adverse impact thresholds for biological resources. Impacts on aquatic and terrestrial resources from the decommissioning of nuclear facilities are neither detectable nor destabilizing (NRC, 2002). Activities within operational areas, including the removal of shoreline or in-water structures, have minimal impact on aquatic resources provided all applicable BMPs are employed and required permits are obtained (NRC, 2002). Impacts on threatened and endangered species are not a generic issue and should receive a site-specific evaluation (NRC, 2002).

Table 3.5-2: Biological Resources Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than significant Adverse Effect	Direct Impacts	• The Alternative would result in minor or temporary vegetation removal and loss of vegetation communities; minor loss of native plant or animal species or community diversity; or minor loss or short-term disruption to a major wildlife or migratory movement corridor. • The Alternative would result in minor, short-term impediments to flow or aquatic organism movements in waterways; minor or temporary alterations to terrestrial or aquatic habitats; or minor displacement or degradation of aquatic resources, including EFH or benthic communities. • The Alternative would have no adverse effects on protected species and their habitats. Any loss in habitat would be less than 5 percent of undisturbed habitats within a biogeographic region, such as that found in a single valley, mountain range, or coastline
	Indirect Impacts	• The Alternative would result in the limited proliferation of invasive species that would be managed by existing plans and procedures. • The Alternative would result in minimal downstream impacts in waterways and minimal impacts on off-site Special Natural Areas. Any impacts would result only in minimal changes to biological resources

Table 3.5-2: Biological Resources Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Potentially Significant Adverse Effect	Direct Impacts	• The Alternative would result in the substantial, irreplaceable loss of vegetation and natural vegetation communities; or the substantial loss or long-term disruption to a major wildlife or migratory movement corridor. • The Alternative would result in substantial alterations to terrestrial or aquatic habitats, including any fill or alteration of wetland or WOUS; substantial, long-term impediments to flow or aquatic organism movements in waterways; or substantial displacement or degradation of aquatic resources, including EFH or benthic communities. • The Alternative would result in the substantial, permanent loss of native plant or animal species or community diversity, individuals, populations, or habitat of a protected species, including any loss of critical habitat and/or declining wildlife habitat that is sensitive or rare. • The Alternative would result in the substantial loss of populations or habitat of a protected species that could jeopardize the continued existence of that species. A loss of at least 5 percent of undisturbed habitats within a biogeographic region is considered to be substantial.
	Indirect Impacts	The Alternative would result in the substantial introduction or proliferation of invasive species; notable downstream impacts in waterways; a substantial increase in dust, noise, and vibration in off-site Special Natural Areas; or further changes that would result in moderate to substantial changes to biological resources.

3.5.3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented. As such, biological resources on and in the vicinity of the SM-1 site would not be affected by the proposed decommissioning activities, including dismantlement and restoration, associated with the Proposed Action. There would be no impacts on plant communities, terrestrial habitats and wildlife, aquatic habitats and wildlife, protected species and their habitats, or Special Natural Areas.

3.5.3.3 Proposed Action Alternative

3.5.3.3.1 Vegetation and Plant Communities

Terrestrial

Activities included in the Proposed Action Alternative, including site preparation, dismantlement, and remediation, would have the potential to disturb and/or remove vegetation on the SM-1 site. Tree clearing would be limited to those areas necessitating clearing. During the site restoration, trees would be replanted on the SM-1 site to comply with Fort Belvoir Policy Memorandum #27, *Tree Removal and Protection*, (i.e., two to one replacement of trees larger than four inches dbh) where determined suitable. Other disturbed areas would be reseeded with native grasses and/or shrubs to promote revegetation of the site. Therefore, impacts on terrestrial vegetation and plant communities would be short-term and less than significant. Restoration of the site following dismantlement

of the Deactivated SM-1 Nuclear Reactor Facility would likely have beneficial impacts on these communities in the long term.

Aquatic

Removal of the water intake pier/pump house, which extends from the shoreline to approximately 100 feet into Gunston Cove, would likely require the use of a small barge-mounted crane and other vessels to give the dismantlement crew and equipment access to those structures. Navigating and docking the barge mounted cranes and other heavy equipment could disturb areas of aquatic vegetative community in Gunston Cove. SAV adjacent to the concrete discharge pipe, outfall structure, and pier/pump house could be damaged or destroyed during the proposed in-water activities. These removal/dismantlement operations would take approximately 45 days.

Following in-water activities, the impacted area would be allowed to recover naturally. Recovered habitat would expand into locations formerly occupied by the concrete discharge pipe, outfall, and pier/pump house structures. With adherence to applicable protections under Fort Belvoir's INRMP, impacts on aquatic vegetation and plant communities would be short-term and less than significant. Beneficial impacts on these communities would be likely in the long term.

3.5.3.3.2 Wildlife and Habitat

Terrestrial

The Proposed Action Alternative would alter existing wildlife habitat at the SM-1 site from proposed site preparation, dismantlement, and restoration activities. Wildlife at and near the SM-1 site would likely be disturbed by construction related noise. Wildlife species that occupy the SM-1 site are those generally tolerant of human activities and presence (i.e., common urban and suburban species). These species would be expected to avoid the SM-1 site during decommissioning activities and relocate to undisturbed habitat areas in the vicinity.

To prevent or minimize impacts on migratory birds known or having potential to occur on or near the SM-1 site, vegetation clearing would be prohibited between 1 April and 15 July of any year in accordance with Fort Belvoir Policy Memorandum #78, *Conservation of Migratory Birds*. Surveys for birds and/or active nests would be conducted prior to vegetation clearing if such activities cannot be avoided during that time period.

During site restoration, disturbed areas on the SM-1 site would be restored to their existing or similar condition. In addition, the entire site would be vegetated, including the footprint of the removed structures, potentially creating new habitat for terrestrial species. Terrestrial wildlife would be expected to recolonize the area shortly following the completion of the Proposed Action Alternative.

Active osprey nests (e.g., on Building 372 and the intake pier) would be relocated according to VDGIF's *Removal or Relocation of Osprey Nests in Virginia: A Guideline for Landowners* (VDGIF, 2010). In accordance with Fort Belvoir's Policy Memorandum #78, *Conservation of Migratory Birds*, the nest would be relocated during the period between 15 September and 16 April. Relocation of these nests could cause potentially adverse impacts on an active osprey breeding pair. However, coordination with appropriate agencies and implementation of management or protection measures would minimize adverse impacts and ensure they remain less-than-significant.

The Proposed Action Alternative would result in temporary, less than significant adverse effects on terrestrial wildlife and habitat. While disturbance would occur, disrupting and displacing flora and fauna, this would be temporary. In the long-term, beneficial impacts would be expected from the creation of new habitat.

Aquatic

Infaunal and epifaunal invertebrates (e.g., mollusks and crustaceans) and their habitats would be disturbed during the proposed removal of the in-water structures. Mobile invertebrate organisms, such as crabs and shrimp, would be temporarily displaced during the 45 days of in-water removal/dismantlement activities. Injury or inadvertent destruction of sessile or slow-moving invertebrate organisms, such as benthic macroinvertebrates and bivalves, could occur during the Proposed Action Alternative. Pollutant-tolerant benthic macroinvertebrates that are not injured would be expected to survive disturbed, turbid conditions during the Proposed Action Alternative.

The physical movement of in-water equipment and materials and the noise generated during dismantlement and removal activities could cause behavioral and physical impairment in Gunston Cove fish. The removal of piles and other in-water structures would create a localized sediment plume. Localized turbidity increases and sediment plumes could disrupt fish foraging and movement. However, the resulting sediment plume would be expected to settle out of the water column within a few hours and the Total Suspended Solid (TSS) levels expected for pile removal (5.0 to 10.0 milligram/liter [mg/L]) are below those shown to have adverse effects on fish (580.0 mg/L for the most sensitive species) (NOAA Fisheries, 2017). As sediment plumes are expected to rapidly disperse, turbidity effects would be temporary and any resulting indirect impacts on baseline DO and water temperature would be ephemeral. Indirect impacts from construction equipment leaks or accidental fuel spill and runoff from upland areas could also potentially impact water quality and aquatic habitats as well. Such impacts would be prevented or minimized through the use of applicable BMPs.

Aquatic invertebrate species and the fish community would be expected to recolonize the area in the months following the completion of the Proposed Action Alternative; therefore, impacts on aquatic wildlife and habitat would be short-term and less-than-significant.

In accordance with the MSA, USACE has determined that the Proposed Action Alternative *may affect, but is unlikely to adversely affect* EFH, particularly with the implementation of BMPs during in-water activities. NOAA Fisheries concurred with this determination in a letter dated April 19, 2019. In the same letter, NOAA Fisheries also recommended that piles be cut below the mudline during removal of the water intake pier, and requested that consultation be re-initiated if other pile removal methods become necessary. Copies of this correspondence are included in **Appendix B**.

3.5.3.3.3 Protected Species and Habitat

Terrestrial

None of the eight active bald eagle nests at Fort Belvoir are located within 750 feet of the SM-1 site; the buffer around active nests is not applicable to the Proposed Action Alternative. However, construction of the Proposed Action Alternative, including tree clearing, would occur within 750 feet of the shoreline and within the Potomac River Eagle Concentration Area. Impacts on bald eagles could be potentially adverse. Adherence to applicable protections under the BGEPA, VDGIF's *Bald Eagle Management Plan*, and Fort Belvoir's *Bald Eagle Management Plan*, would minimize adverse impacts on bald eagles and ensure that they remain less than significant. Implementation of measures such as replacing cleared trees would further minimize or avoid adverse impacts.

The NLEB, tricolored bat, and little brown bat could be present in the area during the summer. These bat species could be indirectly impacted by noise, vibration, dust, and disturbances associated with proposed decommissioning activities. The proposed tree clearing could also impact summer roosting habitat. Consistent with Fort Belvoir's *Memorandum of Instruction – Northern Long-eared Bat Protection on Fort Belvoir*, the clearing of trees larger than three inches dbh would take place between 15 September and 15 April only. Impacts on bats and their habitat could be adverse due to the potential habitat disturbances and tree clearing; however, impacts would

be minimized through the implementation of management or protection measures and adherence to applicable regulations, ensuring they remain less than significant.

Similarly, proposed decommissioning and dismantlement activities would be conducted in a manner to avoid adverse effects on migratory birds to the extent practicable. Any construction disturbance would be short-term. In addition, birds are expected to move to more favorable areas during dismantlement activities; therefore, impacts on migratory birds and their habitat would be less than significant. Following restoration activities, the site would be maintained by Fort Belvoir in a vegetated, permeable condition, potentially creating new habitat for protected species. Migratory birds would be expected to utilize the area shortly following the completion of the Proposed Action Alternative. In the long-term, beneficial impacts would be expected from the creation of new habitat.

Other protected terrestrial species (i.e., small whorled pogonia, peregrine falcon, wood turtle, and rusty patched bumble bee) are not anticipated to occur on or near the SM-1 site due to a lack of suitable habitat. As such, the Proposed Action Alternative would have no or negligible impacts on these species and their habitats.

In accordance with ESA Section 7, USACE has determined that the Proposed Action Alternative is *not likely to adversely affect* the federally threatened NLEB and would have *no effect* on critical habitat for any species. Accordingly, USACE submitted a self-certification letter to USFWS on 20 August 2019. A copy of the self-certification package is included in **Appendix B**.

Aquatic

As previously described, sediment plumes associated with in-water work of the Proposed Action Alternative would be small and expected to settle out of the water column within a few hours. The TSS levels expected for pile removal are below those shown to have adverse effects on the most sensitive species of fish. These small sediment plumes would be unlikely to affect Atlantic and shortnose sturgeon, should they be present in Gunston Cove or the vicinity of SM-1, as they would rapidly disperse. Turbidity resulting from the proposed in-water work would also not be expected to reach the water depths required for Atlantic sturgeon's critical habitat; therefore, direct and indirect turbidity effects on Atlantic sturgeon critical habitat would be temporary and ephemeral. In addition, vessel traffic increases above baseline levels would not cause a measurable or detectable increase in the risk of vessel strikes.

Due to the absence of ideal habitat and the lack of confirmed and documented current spawning populations within Gunston Cove, the potential occurrence of Atlantic and shortnose sturgeon adjacent to the SM-1 site is low. For the reasons above, impacts on Atlantic and shortnose sturgeon and applicable critical habitat would be short-term and less-than-significant.

As other protected aquatic species (e.g., brook lamprey, bridle shiner, and the Northern Virginia well amphipod) are not likely to occur in Gunston Cove and on or near the SM-1 site, the Proposed Action Alternative would have no or negligible impacts on these species and their habitats.

In accordance with ESA Section 7, USACE has determined that the Proposed Action Alternative *may affect, but is unlikely to adversely affect* ESA-listed fish species, and would have *no effect* on critical habitat. NOAA Fisheries' concurrence with USACE's determination is pending. Copies of correspondence supporting this consultation are included in **Appendix B**.

3.5.3.4 Management and/or Mitigation Measures

The Proposed Action Alternative would adhere to applicable protections in Fort Belvoir's INRMP to minimize adverse impacts on biological resources. No potentially significant adverse effects on biological resources have

been identified. However, the following management measures or BMPs would be implemented to minimize potential adverse effects:

- In accordance with Fort Belvoir policy, cleared trees would be replanted on-site where deemed suitable; other disturbed areas would be reseeded with native grasses and/or shrubs to promote revegetation.
- Active osprey nests (e.g., on Building 372 and the intake pier) would be relocated according to VDGIF's *Removal or Relocation of Osprey Nests in Virginia: A Guideline for Landowners* (VDGIF, 2010) and Fort Belvoir's Policy Memorandum #78, *Conservation of Migratory Birds*.
- During removal of the intake pier/pump house structure in Gunston Cove, support piles would be cut below the mudline and the portions below the mudline would be left in place to minimize sediment and subaqueous bottom disturbance.
- Containment booms, turbidity curtains, and/or similar measures would be used during in-water work as applicable to prevent the downstream migration of floating debris and disturbed sediments, and ensure that disturbed sediments re-settle near their original location.
- Workers and personnel on the SM-1 site would be informed and aware of the bald eagle's active nesting season (15 November to 15 June). Adherence to these time of year restrictions would minimize or avoid impacts on bald eagle habitat. Additional coordination with Fort Belvoir's Environmental Division, USFWS, and/or VDGIF would be conducted as necessary.
- No tree clearing would occur between April 15 and September 15 to protect special status bat species.
- Prior to implementing decommissioning activities, USACE and/or the decommissioning contractor would update protected species queries and re-initiate consultation with applicable regulatory agencies if it is determined that the Proposed Action would potentially affect new or additional protected species not addressed in this EA.
- Dust levels would be mitigated with water sprays and covers over dust-creating stockpiles and truck transports (e.g., soils).

3.6 Radiological Safety and Health

This section describes the radiological conditions within the Deactivated SM-1 Nuclear Reactor Facility, including existing contamination, potential sources of radioactive waste, and the potential for accidental release of radioactive materials from the SM-1 site.

The ROI for radiological safety, contamination, waste, and disposal is the SM-1 site and adjacent or nearby areas that could be subject to radiation exposure via one or more environmental pathways (i.e., air, water, or land). As possible, the ROI is further defined to account for the distance at which a reasonable likelihood of exposure could result from decommissioning activities or accidents.

3.6.1 Regulatory Setting

The Proposed Action is within the authorities granted to the DOD by the AEA, specifically Sections 91(b) and 110(b) which gives DOD the authority to regulate radioactive materials at the Deactivated SM-1 Nuclear Reactor Facility. The Army's policy set forth in AR 50-7 is to follow NRC guidelines, as well as the recommendations of the NCRP and ANSI. Policies and requirements set forth in DA-PAM 385-24 and Engineering Manual (EM) 385-1-80 are applicable to personnel and visitors at USACE work sites where radioactive material may be present. The Army does not regulate the transportation of radioactive materials or the disposal of radioactive materials. Transportation is regulated jointly by the USDOT and the NRC. Disposal of licensed radioactive materials is regulated by the NRC.

Under the RCRA, the USEPA regulates the disposal of some wastes containing low levels of radioactivity that is exempt from NRC regulation. Relevant federal laws and requirements relating to radiological materials are summarized in **Table 3.6-1**.

Table 3.6-1: Radiological Safety and Health – Applicable Regulations and Guidance

Guidance	Description/Applicability
Atomic Energy Act of 1954 (42 USC Part 2011 et seq.)	Fundamental federal law regulating civilian and military uses of nuclear materials. Sections 91(b) and 110(b) give DOD the authority to regulate radioactive materials, consistent with relevant guidance identified in 10 CFR 20.1402, *Radiological Criteria for Unrestricted Use*.
Army Regulation 50-7, *Army Reactor Program*	Establishes policies, responsibilities, and procedures for implementing the ARP to ensure that Army reactors are operated in a safe, secure, and reliable manner.
Department of the Army Pamphlet 385-24, *The Army Radiation Safety Program*	Establishes Army safety procedures for the use, licensing, transportation, disposal, dosimetry, accident reporting, safety design, accountability of, and radiation exposure standards for ionizing and non-ionizing radiation sources.
USACE Engineering Manual 385-1-80, *Radiation Protection*	Describes policies and procedures for the use and/or handling of radioactive material and radiation generating devices at all USACE sites.
10 CFR 20, *Standards for Protection Against Radiation*	Establishes protection standards resulting from activities conducted under NRC-issued licenses. Also establishes the allowance for accepting wastes containing low levels of radioactivity for disposal at non-NRC licensed facilities
10 CFR 37, *Physical Protection of Category 1 and 2 Quantities of Radioactive Material*	Provides requirements for the physical protection and security of Category 1 or 2 materials.
10 CFR 61, *Licensing Requirements for Land Disposal of Radioactive Waste*	Establishes the procedures, criteria, and terms and conditions upon which the NRC issues licenses for the disposal of radioactive wastes.
49 CFR 172.310, *Class 7 (Radioactive) Materials*	Specifies requirements for marking radioactive materials for transportation.
42 USC Part 6901 *et seq., RCRA*	Establishes criteria for disposal of NRC-exempt wastes containing low levels of radioactivity.

3.6.2 Affected Environment

3.6.2.1 Current Radiological Conditions

Operation of the SM-1 reactor impacted materials and structures from either direct activation or by contamination from activation and fission products within cooling water and liquid waste. The majority of radioactive material inventory at the Deactivated SM-1 Nuclear Reactor Facility (estimated from activation analysis) is found in the VC. The remaining residual contamination is contained in various secondary and waste system components and outside soils. Internal contamination in secondary system components was verified through in situ gamma spectroscopy and material sampling. Surface contamination was identified on building surfaces though direct and removable contamination surveys. Soil contamination has been verified through radiation surveys and soil

sampling and analysis. The current radiological status of the Deactivated SM-1 Nuclear Reactor Facility is provided in the DP (USACE, 2019b).

Radionuclides of concern (ROCs) at the Deactivated SM-1 Nuclear Reactor Facility are summarized in **Table 3.6-2.**

Table 3.6-2: Deactivated SM-1 Nuclear Reactor Facility ROCs

ROC	Half-life	Source	Location(s)
Tritium	12.3 years	Fission	Soil Structure - Inside VC Structure - Outside VC
Cobalt-60	5.3 years	Activation	Structure - Inside VC Structure - Outside VC
Nickel-63	93 years	Activation	Structure - Inside VC Structure - Outside VC
Strontium-90	28.6 years	Fission	Soil Structure - Inside VC Structure - Outside VC
Technetium-99	2.1 E+5 years	Fission	Soil[1] Structure - Inside VC Structure - Outside VC
Cesium-137	30 years	Fission	Soil Structure - Inside VC Structure - Outside VC
Europium-152	13.6 years	Activation	Structure - Inside VC
Europium-154	8.8 years	Activation	Structure - Inside VC
Uranium-234	2.44E+5 years	Fuel	Structure - Inside VC
Uranium-235	7.04E+8 years	Fuel	Structure - Inside VC
Plutonium-238	87.7 years	Fuel	Structure - Inside VC
Plutonium-239/240	2.4 E+4 years/ 6,500 years	Fuel	Structure - Inside VC
Plutonium-241	14.4 years	Fuel	Structure - Inside VC

Note:
1. Not detected at significant levels in soil outside the footprint of Building 372; may be present below the building and VC slabs.

Figures 3.6-1 and **3.6-2** depict the MARSSIM classifications for the ground floor and upper floor of Building 372, respectively, as described following previous site characterization efforts. The ground floor elevation is 33 feet with the VC floor at 24.25 feet. The elevation of the upper floor is 45 feet. **Figure 3.6-3** depicts the MARSSIM classifications applicable to exterior areas of the Deactivated SM-1 Nuclear Reactor Facility and shows locations of soil samples that exceed screening levels of soil ROCs (Strontium-90 and Cesium-137).

Figure 3.6-1 Categorization of Spaces in Building 372-Ground Floor

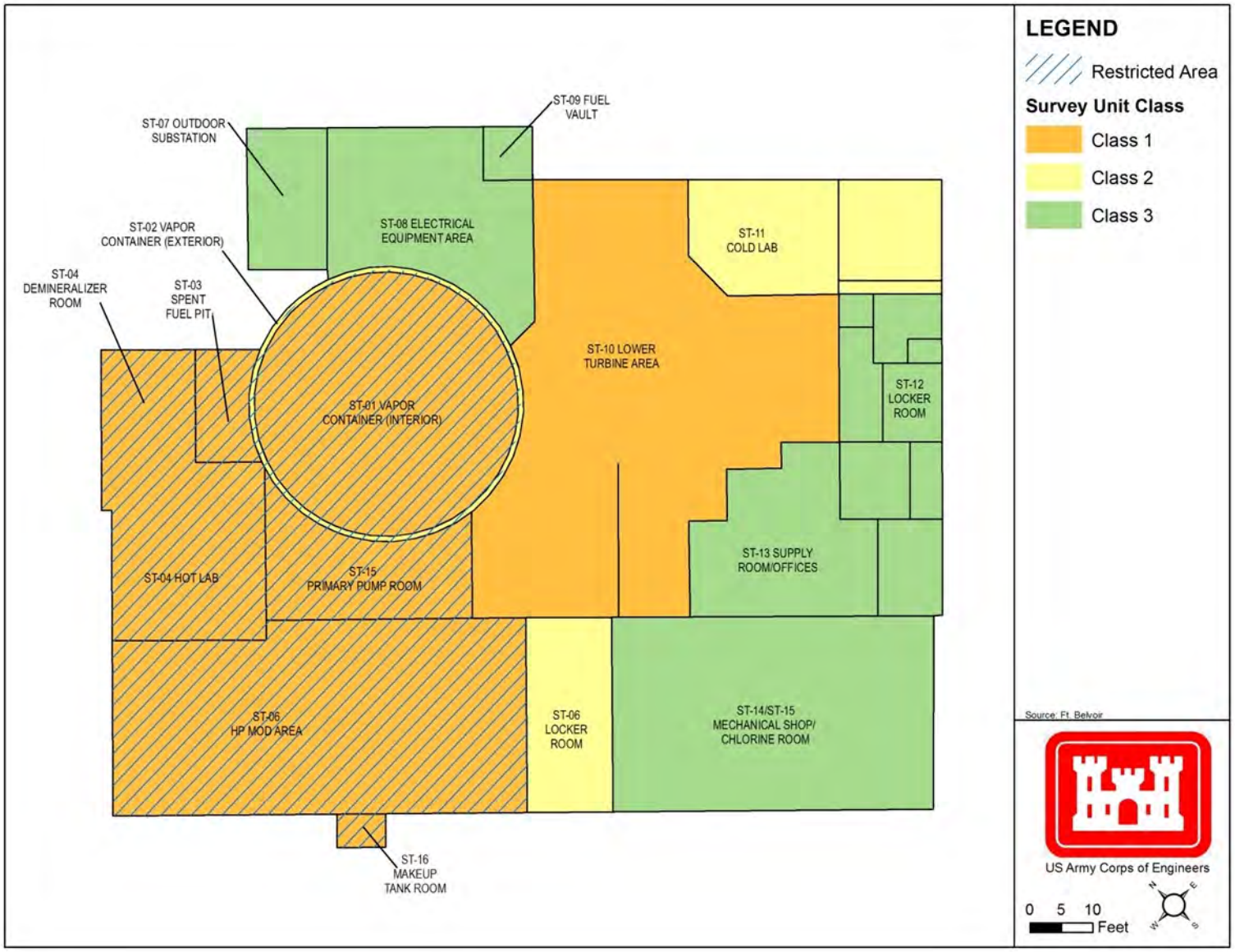

Figure 3.6-2 Categorization of Spaces in Building 372 - Upper Floor

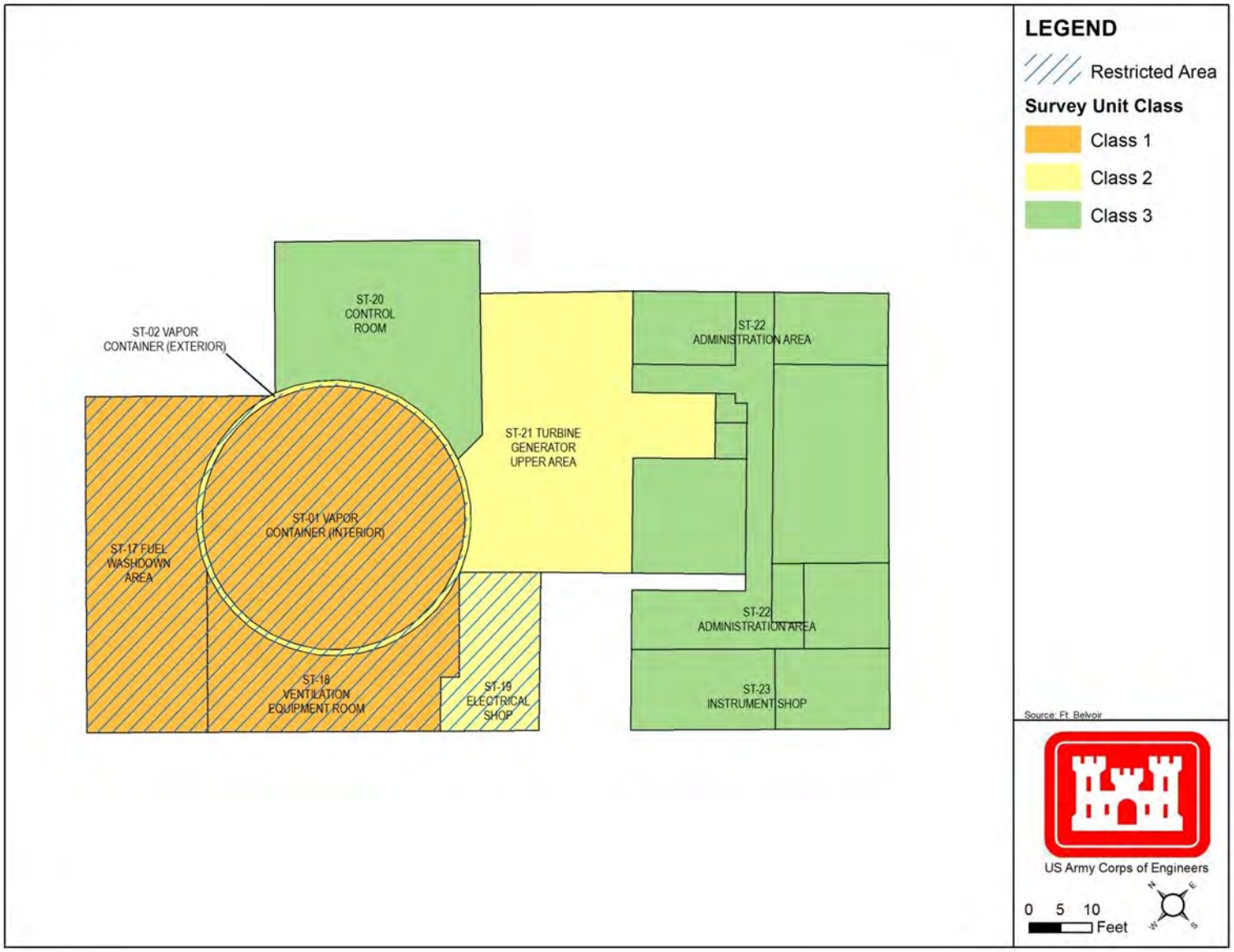

Figure 3.6-3: Contaminated Areas of Concern on SM-1 Site

MARSSIM defines three classes from most to least contaminated, as follows:

- ***Class 1*** – areas that have or had, prior to remediation, potential or known radioactive contamination above the applicable screening levels;
- ***Class 2*** – areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the screening levels; and,
- ***Class 3*** – areas that are not expected to contain any residual radioactivity or only levels at a small fraction of the screening levels.

3.6.2.2 Radioactive Waste

The highly radioactive spent nuclear fuel was removed from SM-1 during initial deactivation activities conducted from 1973 to 1974. As such, radioactive waste that would be generated from the Proposed Action would be classified as LLRW or low-level waste (LLW). LLRW is radioactive waste not classified as high-level, spent fuel, transuranic or byproduct material such as uranium mill tailings regulated by the NRC under 10 CFR 61. US Department of Energy (DOE) disposal facilities use the term LLW for waste regulated under DOE Order 435.1. LLW is radioactive waste not classified as high-level waste, spent nuclear fuel, transuranic waste, or byproduct material such as uranium mill tailings. For discussions in this EA, LLRW is assumed synonymous to LLW.

LLRW is classified as Class A, B, C, or Greater than Class C waste according to the requirements of 10 CFR Part 20, Subpart K, *Waste Disposal,* and 10 CFR 61.55 and 10 CFR 61.56. Class A LLRW contains the lowest levels of radioactivity for those radionuclides that drive waste classification. Class A LLRW generated during proposed decommissioning and dismantlement activities would include elements of the VC, such as the pressurizer, primary coolant pumps, and steam generator (parts of the primary system); contaminated materials such as pipes and structural concrete; and soil. The RPV will be removed as a single component and, as a whole, qualifies as Class B LLRW. The higher waste class is driven by the total Nickel-63 activity in the activated metals. It is expected that no Class C or Greater Than Class C LLRW would be generated by the proposed decommissioning.

For certain licensed or permitted LLRW containing very low levels of radioactivity, disposition at alternative non-LLRW disposal facilities may be authorized by the licensing or permitting authority. For SM-1, the authorizing agency would be the ARO. An application to the ARO consistent with the requirements of 10 CFR 20.2002, *Methods for Obtaining Approval of Proposed Disposal Procedures,* would be required for such authorization and disposal at a RCRA disposal facility.

Mixed waste (i.e., waste containing both RCRA hazardous and radioactive constituents) generated as part of the Proposed Action may include radiologically contaminated elemental lead formerly used for shielding, as well as LBP. Other hazardous materials regulated under TSCA, such as ACM and PCB-contaminated materials and paint, may also be radiologically contaminated and require special waste management considerations.

Table 3.6-3 presents estimates of the total volume of contaminated building debris, concrete debris, soil, and M&E anticipated for disposal as either exempt radioactive waste or LLRW that would be generated by the Proposed Action. The LLRW volumes in **Table 3.6-3** include a small percentage of mixed hazardous and radioactive waste.

Table 3.6-3: LLRW Volume Estimates

Waste Type	Building / Site Area	Type / Material	Estimated LLRW Volume (yd^3)
Building Debris	Unrestricted Area	Walls, Floors, and Roof	Limited[1]
	Restricted Area	Walls, Floors, and Roof	452

Table 3.6-3: LLRW Volume Estimates

Waste Type	Building / Site Area	Type / Material	Estimated LLRW Volume (yd^3)
	Lower Site	Structures / Debris	590
Sub-total - Building Debris			***1,042***
Concrete Debris	Unrestricted Area	Slabs and Foundation	10
	Restricted Area	Slab and foundation	875
	VC	Walls and Slab	
Sub-total - Concrete Debris			***885***
Waste Soil	Upper Site around Building 372	Soil	4,835
	Lower Site	Soil and Pipes	209
	Building 372 – sub-slab	Soil and Pipes	10
Sub-total - Waste Soil			***5,054***
M&E Waste	Unrestricted Area Municipal Waste	M&E	84
	Restricted Area	M&E	183
	VC	M&E and RPV	176
Sub-total - M&E Waste			***443***
Total Estimated LLRW Volume			**7,424**

Note:

1. Small volumes generated from targeted decontamination efforts.

Source: USACE 2019c

Estimated volumes of non-radioactive waste that would be generated during the Proposed Action are presented in **Section 3.10**.

Radioactive waste generated during the Proposed Action would likely be disposed of at one or more of the facilities listed below.

1. Waste Control Specialists (WCS), LLC (Class A, B, and exempt waste)
   9998 West State Hwy 176
   Andrews, Texas 79714
2. US Ecology Idaho (Exempt waste only)
   P.O. Box 400
   20400 Lemley Road
   Grand View, Idaho 83624
3. Energy Solutions (Class A waste only)
   Interstate 80, Exit 49

Grantsville, UT 84029

4. US Department of Energy Nevada National Security Site (LLW)
   Nevada Field Office
   National Nuclear Security Administration
   P.O. Box 98518
   Las Vegas, NV 89193-8518

3.6.2.3 Potential for Accidental Releases

An accidental release of radiological material that impacts public health (i.e., one that exceeds applicable regulatory thresholds) is considerably more likely to occur at an operating reactor rather than one that has permanently ceased operations, such as SM-1. Accidents that are likely to exceed applicable radiological regulatory thresholds can be categorized into 1) fuel-related accidents that generally involve the maintenance, storage, or movement of fuel, and 2) radioactive material-related (non-fuel) accidents, such as the management of high-activity waste such as water treatment/demineralizer resins (NRC, 2002). All nuclear fuel and demineralizer resins were removed from SM-1 during initial deactivation activities completed in 1974.

Accidental releases that could occur during the proposed decommissioning and dismantlement activities include the release of contaminated liquids currently contained in the hot waste tank, VC sump, or laboratory waste tanks, as well as the release of airborne dust, particulates, or other small debris generated during decontamination or dismantlement. The primary ROC inside and outside Building 372, and the most likely to be released in an accident scenario, is Cesium-137. Accidental releases of contaminated water or airborne substances could potentially result in incidental inhalation, ingestion, short-term dermal contact, and/or external exposures.

The DP analyzed several radiological accidents that could occur during execution of the Proposed Action (USACE, 2019b). These included a release of contaminated liquid, a release of airborne contamination, unexpected exposures to “hot particles,” and transportation accidents.

3.6.3 Evaluation of Environmental Consequences

3.6.3.1 Approach to the Analysis

The analysis of radiological impacts focuses on the potential for the Proposed Action to cause detectable radiological effects outside of regulatory limits. “Detectable” effects include those causing exposure above regulatory thresholds (e.g., 10 mrem to a member of the public from airborne releases, 100 mrem to a member of the public from all exposure pathways; 5,000 mrem for occupational exposures), increasing radioactivity levels above ALARA levels, increasing the probability of a severe radiological accident, and requiring disposal of radioactive waste outside of standard regulatory procedures. **Table 3.6-4** identifies the adverse impact significance thresholds for radiological contamination or exposure.

Table 3.6-4: Radiological Safety and Health Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	• The Alternative would result in occupational and public exposure levels below regulatory thresholds. • The Alternative would increase the probability of an accidental radiological release on- or off-site; however, any resulting exposure would remain at undetectable levels and would be minimized through safe work procedures and emergency plans. • The Alternative would increase the amount of radioactive materials and waste requiring disposal, but the total amount would remain manageable under existing permits and procedures.
	Indirect Impacts	• The Alternative would result in negligible human or environmental health risks that could be further minimized or avoided through safe work procedures and monitoring.
Potentially Significant Adverse Effect	Direct Impacts	• The Alternative would result in occupational and public exposure levels above regulatory thresholds. • The Alternative would increase the probability of a radiological accident that could result in detectable levels of on- or off-site release. • The Alternative would increase the amount of radioactive materials and waste requiring disposal and the total amount would exceed current or future facility capacity.
	Indirect Impacts	The Alternative would create substantial human or environmental health risks.

3.6.3.2 No Action Alternative

Under the No Action Alternative, the Deactivated SM-1 Nuclear Reactor Facility would not be decommissioned and would remain in a SAFSTOR condition for the foreseeable future. Radioactive materials and waste would not reach a level low enough for the release of the facility and termination of the permit under natural decay conditions within the allotted 60-year regulatory threshold, as required by 10 CFR 50.82(a)(3). In the short term, there would be no impacts on occupational and public exposure or potential for decommissioning accidents; environmental monitoring and security protocols would remain in effect in accordance with the *status quo*. However, the risk of an exposure or accident occurrence in the future would remain possible under the No Action Alternative.

3.6.3.3 Proposed Action Alternative

3.6.3.3.1 Radiological Contamination

The probability of a radiological accident that would involve the release of contamination is minimized by the fact that only minimal quantities of loose (removable) radioactive contamination exist within the Deactivated SM-1 Nuclear Reactor Facility, therefore all but eliminating a dispersion concern. Additionally, the vast majority of radiological activity that remains within the reactor components is contained within the matrix of building construction materials (i.e., activated components), and in this non-dispsersable form is unable to result in a severe environmental impact.

Controls will be required in the Decommissioning Permit to prevent the spread of contamination beyond the radiological exclusion zone. Therefore, no significant release of airborne or liquid contamination is anticipated during decommissioning or dismantlement activities. The Decommissioning Permit will also require environmental monitoring to ensure controls are adequate to protect human health and the environment. Worker radiation exposures would be limited in accordance with the USACE *Safety and Health Requirements Manual*, EM 385-1-1.

Exposure to occupational workers for decommissioning work completed by trained workers is considered minor (NRC, 2002). Public exposure to radiation would be significantly less than that of workers and meet requirements identified in the Decommissioning Permit. The NRC's decommissioning GEIS also indicates that the radiological impacts of decommissioning would remain within regulatory limits for worker and public exposures and that the radiological impacts of decommissioning much larger facilities would be small (NRC, 2002). Therefore, direct and indirect radiological impacts on occupational exposure to workers under the Proposed Action Alternative would be less than significant.

3.6.3.3.2 Radiological Waste and Disposal

Waste material generated during the Proposed Action Alternative would be managed to minimize disposal volumes and to maintain proper containment of hazardous materials. The decommissioning and dismantlement work would be completed by trained workers who will ensure that all waste is contained to prevent release to the off-site environment. Characterization of waste for radiological and non-radiological hazardous constituents would assure waste is acceptable for off-site disposal. All wastes generated would be disposed of according to federal regulations at approved regulated/permitted facilities.

The Proposed Action Alternative would result in the generation of LLRW from decommissioning and dismantlement activities. Such waste would include contaminated concrete, steel, tile, utility pipes, plastic, M&E, soils, and mixed waste. A total of approximately 7,424 yd^3 of radioactive waste would be generated under the Proposed Action Alternative (**Table 3.6-3**). This amount would represent less than 1 percent of WCS's licensed disposal capacity of 2.1 million yd^3 of LLRW and less than 1 percent of Energy Solutions' disposal capacity of 5 million yd^3 (Energy Solutions, 2008; WCS, 2015). Therefore, the amount of generated waste would not have a noticeable effect on the disposal capacity at available disposal sites. Further, these estimates are conservative and allow for opportunities to dispose of additional materials as clean waste.

In the short term, the Proposed Action Alternative would have less than significant adverse impacts from the generation of radiological waste. In the long term, the removal and disposal of LLRW would have beneficial impacts by allowing unrestricted future use of the SM-1 site. The disposal of LLRW at a licensed off-post facility would safeguard the public as the radioactivity decays in a carefully monitored and licensed facility, resulting in additional beneficial impacts.

3.6.3.3.3 Accidental Releases

The Proposed Action Alternative has the potential to increase the probability of radiological accidents involving the release of contaminated liquids and airborne contamination as well as increased vulnerability to external events (e.g., natural disasters). With mitigation procedures in place the impacts of non-spent fuel-related radiological accidents are neither detectable nor destabilizing (NRC, 2002). Further, adherence to safe work procedures and emergency plans would minimize the likelihood of a radiological accident and resulting consequences; therefore, the Proposed Action Alternative would result in less-than-significant adverse impacts on the likelihood of radiological accidents. Following restoration activities, the site would be maintained by Fort Belvoir in a vegetated, permeable condition; therefore, no potential for accidental release under the Proposed Action Alternative would occur in the long term.

3.6.3.3.4 Management Measures

USACE is committed to ensuring that potential radiological risks to the health and safety of the public, workers, and Garrison personnel and residents are eliminated or minimized to the greatest extent practicable throughout the duration of the Proposed Action Alternative. Therefore, decommissioning would occur in a controlled manner to minimize both public and occupational radiation exposure. In support of the project, the decommissioning contractor would implement a Radiation Safety Program, an Environmental Monitoring and Control Program, and a Waste Management Program to ensure the safe removal of activated and/or contaminated components in an effort to reduce the risk of potential release to the environment. The requirements of these programs would include routine measurement of the quantity of direct radiation and radioactive material releases.

The contractor would also provide appropriate monitoring of occupational radiation exposure to staff entering and working in the restricted area. USACE follows guidance limits in EM 385-1-1 to provide assurance that individuals do not exceed the federal limits specified in 10 CFR 20. These guidance limits are 10 percent of the 10 CFR 20 limits (USACE, 2014b). EM 385-1-1 also provides ALARA dose limits less than the federal threshold. As an individual approaches the exposure dose limit, the individual's access to radiation areas will be restricted to minimize further occupational exposure and to ensure regulatory limits are not exceeded.

For safe handling and management of LLRW, the Proposed Action Alternative would implement a Waste Management Plan (WMP) during the decommissioning process. The WMP establishes the framework for programmatic strategies for managing generated waste, including pollution prevention, segregation, and waste minimization methods; staging and storage requirements; treatment and disposal requirements; and required safety training. Sorting, segregation, and decontamination would be performed to the extent practical to minimize the amount of radioactive waste requiring treatment and disposal. All appropriate authorities would be notified, and all regulatory requirements satisfied prior to off-site shipment of any radioactive material.

3.7 Occupational Safety and Health

USACE is committed to creating a safe working environment to ensure that potential risks to the health and safety of the public, workers, and Garrison personnel and residents are eliminated or minimized to the greatest extent practicable throughout the duration of the Proposed Action. A safe environment is one in which there is no, or an optimally reduced, potential for death, serious bodily injury or illness, or property damage. Occupational Safety and Health (OSH) programs address the health and safety of people at work. These programs impose regulatory requirements for the benefit of employees and the public, including implementation of engineering and administrative practices that aim to reduce risks of illness, injury, death, and property damage.

This section discusses occupational safety and health applicable to the Proposed Action. The ROI for the safety and health discussion presented in this EA encompasses the SM-1 site and adjacent or nearby areas that would be used for the staging or storage of materials and equipment.

3.7.1 Regulatory Setting

The Occupational Safety and Health Administration (OSHA) is the primary regulatory agency overseeing worker safety, protection, and health. OSHA establishes worker protection standards that must be followed to prevent and minimize potential safety and health risks. In Virginia, the OSH Safety Compliance Division enforces state and federal laws and regulations pertaining to worker health and safety (Virginia Department of Labor and Industry, 2016). OSH regulations cover potential exposure to a wide range of chemical, physical, and biological hazards and ergonomic stressors. The regulations are designed to control these hazards by eliminating exposure via administrative or engineering controls, substitution, or use of personal protective equipment (PPE).

On a USACE project, EM 385-1-1 (US Army, 2014) is the governing document for site safety. EM 385-1-1 references the applicable regulations summarized in **Table 3.7-1**.

Table 3.7-1: Occupational Safety and Health – Applicable Regulations and Guidance

Guidance / Regulation	Description
Occupational Safety and Health Act (29 USC Part 651 et seq.)	The Act is the primary federal statute for regulating the safety and health of workers in the US.
29 CFR 1910, *Occupational Safety and Health Standards for General Industry*	Primary federal regulation that governs day-to-day workplace, or "general industry," safety and applies to the extent that specific standards of the agricultural, construction, and maritime industries do not apply.
29 CFR 1926, *Occupational Safety and Health Standards for Construction*	Primary federal regulation that governs workplace safety for the construction industry.
29 CFR 1960, *Basic Program Elements for Federal Employees, OSHA*	Contains special provisions to assure safe and healthful working conditions for federal employees.
EO 12196, *Occupational Safety and Health Programs for Federal Employees, 26 Feb, 1980*	Contains additional provisions to assure safe and healthful working conditions for federal employees.
Department of Defense Instruction 6055.1, *DOD Safety and Occupational Health Program, 14 Oct 2014*	Encompasses all DOD personnel and operations worldwide during peacetime and military deployments. Does not apply to DOD contractor personnel or contractor operations.
AR 385-10, Army Safety Program	Prescribes Department of the Army policy, responsibilities, and procedures to safeguard and preserve Army resources worldwide.

3.7.2 Affected Environment

Health and safety hazards can often be identified and reduced or eliminated before an activity begins. Hazards at the SM-1 site could potentially occur from earthwork (e.g., excavation, filling, grading), decontamination, dismantlement, dismantlement, staging and loading, and confined space activities, as well as the creation of a noisy environment or fire hazards on or near the site. Any facility or human-use area with a potential explosive or rapid oxidation process would create unsafe environments for nearby populations. Noisy environments could also mask verbal or mechanical warning signals such as sirens, bells, or horns. The operation, maintenance, and repair of vehicles and equipment also present additional safety implications.

Physical, chemical, ergonomic, and biological hazards pose potential safety risks to workers involved in nuclear facility decommissioning activities. Examples of these hazards are discussed below. Based on current conditions at the SM-1 site as described in this EA and to varying degrees, all of these occupational hazards would be present or have potential to occur during the Proposed Action.

Unless otherwise noted, information in the following sub-sections is drawn from the NRC's decommissioning GEIS (NRC, 2002).

3.7.2.1 Physical Hazards

Slips, trips, and falls are some of the most common types of physical occupational hazards. Such incidents can occur when walking surfaces are slippery or uneven, when climbing or working on stairs and ladders, or when a worker's vision is obstructed due to dim lighting. Additional physical hazards could result from accidents involving vehicles and equipment; accidental ignition of flammable or combustible materials; excessive noise conditions; adverse reactions to temperature (heat or cold); and/or exposure to electricity (e.g., burns, electrocution).

Worker exposure to noise is regulated by a legally-enforceable permissible exposure limit (PEL) of 90 A-weighted decibels (dBA) over the course of an 8-hour day. This PEL is a time-weighted average, meaning that the average noise exposure experienced by a worker calculated over an 8-hour day cannot exceed 90 dBA. For comparison, a conversational human speaking voice is approximately 60 dBA heard from three feet away (CDC, 2018; US Department of Labor, 2019).

Table 3.7-2 presents noise ranges for common types of construction/demolition vehicles and equipment that would potentially be used at the SM-1 site during the proposed decommissioning.

Table 3.7-2: Predicted Noise Ranges from Selected Types of Construction/Demolition Equipment

Equipment	Typical Noise Level (dBA) 50 Feet from Source
Air Compressor	81
Backhoe	80
Mobile Crane	83
Bulldozer	85
Grader	85
Jackhammer	88
Front-end Loader	85
Pneumatic Tool	85
Rail Saw	90
Saw	76
Truck	88

Source: (Federal Highway Administration, 2017)

3.7.2.2 Chemical Hazards

Chemicals and hazardous substances in Building 372 and on the SM-1 site would pose a potential hazard to workers through incidental or accidental inhalation, dermal contact, or ingestion. Solvents and particulates would also pose a risk to worker health. Chemicals and substances in and around Building 372 could include ACM, PCBs and mercury. In reactor facilities, these commonly occur in building materials, paints, light bulbs, light fixtures, switches, electrical components, and high-voltage cables. Other chemical hazards could include low levels of potassium, sodium chromate, and nickel, as well as quartz and cristobalite silica generated during concrete demolition. Fumes containing lead and arsenic, and smoke from flame cutting and welding are also sources of chemical exposure during decommissioning.

3.7.2.3 Ergonomic Hazards

Ergonomic hazards can result from the physiological and psychological demands of decommissioning work. Common indicators of ergonomic stress include discomfort and fatigue. These conditions can result in decreased performance, decreased safety, and increased chance of injury. Sources of ergonomic stress during decommissioning activities could include mechanical vibrations, lifting, and static work.

3.7.2.4 Biological Hazards

Biological hazards include any virus, bacteria, fungus, parasite, or living organism that can cause a disease in human beings. Such hazards on the SM-1 site could include mold, vermin and their droppings, mosquitoes, ticks carrying Lyme's disease, and/or poison ivy. There would potentially be an increased risk of exposure to mosquitoes, ticks, and poison ivy in areas of dense vegetation that would require clearing.

3.7.2.5 Fire and Emergency Services

Fire, emergency, and health services are available on- and off-post. Fort Belvoir's Directorate of Emergency Services (DES) provides continuous law enforcement, access control, and fire and emergency services to the installation. DES operates four fire stations on Fort Belvoir: one each on Fort Belvoir North Area, Davison Army Airfield, North Post, and South Post. Fire Station 465 on South Post is at 9701 Gunston Road, approximately 1.6 miles north of the SM-1 site. The Fort Belvoir Fire Department maintains capabilities to address a range of emergency situations on the installation, including fires, confined space incidents, and hazardous material response. The Fire Department also issues permits for confined space entry and provides associated stand-by emergency response services.

Fort Belvoir and the Fairfax County Fire and Rescue Department have entered into a Memorandum of Agreement (MOA) to provide mutual emergency response aid when requested for incidents occurring on- or off-post. Fort Belvoir is bounded by areas of Fairfax County served by Fire and Rescue Battalions 405 and 406, which serve a combined population of approximately 288,000 people covering 93 square miles. In fiscal year (FY) 2018, the battalions responded to more than 22,000 emergency medical service calls and 4,700 fire incidents with average response times of 5 and 6 minutes, respectively (Fairfax County Fire and Rescue, 2018)

The Fort Belvoir Community Hospital is located at 9300 DeWitt Loop on South Post approximately 2.8 miles north of the SM-1 site. Encompassing 1.2 million square feet, the hospital has 120 inpatient rooms and an intensive care unit, operating rooms, and emergency medical services. The hospital's emergency department is open 24 hours a day.

Off-post, the Inova Mount Vernon Hospital is located approximately 7.8 miles northeast of the SM-1 site and is the nearest off-post hospital to South Post that includes a 24-hour emergency room. The Inova Trauma Center, located approximately 15 road miles north of Fort Belvoir, is the only Level 1 trauma center in the Northern Virginia area. Level 1 trauma centers are capable of providing total care for every aspect of human injury and are staffed 24 hours a day by general surgeons. They also provide prompt availability of care in specialties such as orthopedic surgery, neurosurgery, anesthesiology, emergency medicine, radiology, internal medicine, and critical care.

3.7.3 Evaluation of Environmental Consequences

3.7.3.1 Approach to the Analysis

This section discusses short-term (decommissioning) and long-term (post-decommissioning) impacts on occupational health and safety and fire and emergency services potentially resulting from the No Action and Proposed Action Alternatives. Impact significance thresholds for these resources are presented in **Table 3.7-3**.

Table 3.7-3: Occupational Safety and Health Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	• The Alternative would result in a lost-time injury or an injury requiring prescribed medicine (i.e., a reportable injury), but the injured person would fully recover in time. • The Alternative would result in an accident or emergency requiring response or treatment from on- or off-post fire and emergency services or emergency health care providers but is within their capacity to address.
	Indirect Impacts	• The Alternative would create conditions that increase the risk of non-fatal injuries to workers on or near the SM-1 site. • The Alternative would create conditions that increase demand for on- or off-post fire and emergency services and/or emergency health care services, but such demand would not exceed those services' capabilities.
Potentially Significant Adverse Effect	Direct Impacts	• The Alternative would result in a fatal human injury or permanent disability. • The Alternative would result in an accident or emergency requiring response or treatment from on- or off-post fire and emergency services or emergency health care providers that would exceed their existing or future capabilities.
	Indirect Impacts	• The Alternative would create conditions that would cause a worker on or near the SM-1 site to experience a fatal injury or develop a permanent disability or terminal illness. • The Alternative would create conditions that would increase the demand for on- or off-post fire and emergency services that would exceed the capabilities of those services.

3.7.3.2 No Action Alternative

Under the No Action Alternative, the SM-1 site would continue to be maintained in a SAFSTOR condition. Access to the facility would be restricted to authorized personnel. Workers performing periodic maintenance and upkeep tasks at the facility and site would risk exposure to physical, chemical, ergonomic, and biological hazards present on the site; however, any such work would be conducted in accordance with applicable OSH plans and regulatory requirements. Any accident potentially resulting from such work would likely be small in scale and within the capacity of Fort Belvoir DES and/or hospital to address.

Prior to conducting particularly hazardous activities, such as confined space entry, additional planning would be conducted between contractors and fire and emergency services providers. As needed, fire and emergency service providers would be present on the SM-1 site during such activities to provide oversight and immediate response if needed.

For these reasons, adverse impacts on occupational safety and health and fire and emergency services resulting from the No Action Alternative would be less than significant.

3.7.3.3 Proposed Action Alternative

3.7.3.3.1 Occupational Safety and Health

In addition to radiological hazards (**Section 3.6**) and to varying degrees, conditions in Building 372 and on the SM-1 site would pose an increased risk of worker exposure to physical, chemical, ergonomic, and biological hazards during decommissioning and dismantlement activities. Such risks would be minimized through the decommissioning contractor's implementation and adherence to an OSH program and an Accident Prevention Plan (APP) to protect the health and safety of personnel working at the site. It is important to note that historic injury and fatality rates reported at nuclear reactor facilities are lower than the average US industrial rates at non-nuclear reactor sites (NRC, 2002).

At minimum, the APP would require the use of applicable and appropriate PPE to protect workers from occupational hazards on the site; direct workers to identify and isolate hazards before beginning work; emphasize the importance for workers to maintain awareness of their surroundings and consider the implications of their actions prior to executing tasks; designate appropriate areas for worker breaks and smoking; establish procedures for preventing or minimizing exposure to hazardous materials, substances, and conditions; and provide contact information for fire and emergency services responders. All workers on the site would be required to review the APP before performing work, and periodic briefings would be conducted to inform workers of potential hazards and safety procedures.

The APP would be periodically reviewed and updated as the project progresses and/or as conditions on the SM-1 site change. Each subcontractor would be responsible for adhering to the overall APP and would prepare and adhere to trade-specific OSH plans as applicable. As appropriate, work would be conducted throughout the decommissioning process in accordance with trade-specific best practices.

For these reasons, the Proposed Action Alternative would have less than significant adverse short- and long-term direct impacts, and no short- or long-term indirect impacts, on occupational safety and health.

3.7.3.3.2 Fire and Emergency Services

Adherence to applicable OSH plans and procedures as well as trade-specific best practices would, at minimum, minimize the scale or severity of any potential occupational accidents occurring on the site and the proportionate response required by fire and emergency services or emergency health care provided at on- or off-post medical facilities. Prior to particularly hazardous tasks, such as confined space entry, additional coordination would be conducted between the contractor, on-post and/or off-post fire and emergency services, and other relevant organizations to identify potential risks and develop specific work and emergency response procedures. As needed, fire and emergency services would be present on the SM-1 site during particularly hazardous activities (e.g., confined space entry, heavy crane lifts) to provide oversight and immediate response if required. Adherence to OSH plans and procedures and prior planning and coordination between the contractor and emergency services providers would ensure that incidents potentially occurring during the Proposed Action Alternative remain within the capabilities of available emergency service providers.

Following the completion of decommissioning activities, the SM-1 site would be maintained in a vegetated or otherwise undeveloped condition for the foreseeable future as the site is not included in Fort Belvoir future land use plans. While occupational hazards could occur during long-term maintenance of the site, adherence to OSH plans and procedures would ensure that any incidents are minimized and/or avoided to the extent practicable.

For these reasons, the Proposed Action Alternative would have less than significant adverse short- and long-term direct impacts, and no short- or long-term indirect impacts, on fire and emergency services.

3.7.3.4 Management and/or Mitigation Measures

The contractor would prepare, implement, and adhere to an APP in accordance with applicable regulatory requirements. All workers on the site would be required to review the APP before performing work. The APP would be reviewed and updated throughout the Proposed Action Alternative as project phases and/or conditions change, and would be subject to continuous USACE oversight.

USACE would also enter into one or more MOAs with on- and off-post fire and emergency response services and/or emergency health care providers to define roles and responsibilities and establish conditions for response, oversight, and monitoring.

3.8 Cultural Resources

Cultural resources are defined as prehistoric or historic sites, buildings, structures, objects, or other physical evidence of human activity that are considered important to a culture or community for scientific, traditional, or religious reasons.

3.8.1 Regulatory Setting

The NHPA of 1966, as amended, outlines federal policy to protect historic properties and promote historic preservation in cooperation with other nations, tribal governments, states, and local governments. Section 106 of the NHPA requires federal agencies to consider the effects of their proposed actions on historic properties before undertaking a project, and allows the ACHP an opportunity to comment on such undertakings. Under Section 106, federal agencies are responsible for delineating the Area of Potential Effects (APE) within which impacts from a proposed action may occur; identifying historic properties present within the APE; assessing the potential effects of the undertaking on those historic properties; and considering ways to avoid, minimize, and mitigate any adverse effects. Federal agencies are further required to initiate consultation with the SHPO for actions that may impact historic properties. VDHR serves as the SHPO in Virginia.

Sections 106 and 110 of the NHPA require federal agencies to identify, evaluate, inventory, and protect historic properties (that are eligible for listing in or are already listed in the NRHP) that are under their jurisdiction and control. The NHPA imposes no absolute preservation requirements; however, USACE must follow and document mandated procedures for any USACE decision regarding undertakings that may affect cultural resources.

The ROI for cultural resources corresponds to the APEs, as defined below for above-ground (architectural) and archaeological resources, respectively.

3.8.2 Affected Environment

The Proposed Action includes the dismantlement and removal of buildings and infrastructure, the removal of contaminated soils, and site restoration; therefore, it has the potential to affect historic properties (defined as listed in or eligible for listing in the NRHP). In accordance with Section 106, USACE initiated consultation with the SHPO by letter dated October 29, 2015 in which USACE defined the federal undertaking (i.e., the Proposed Action) and the APE for above-ground (architectural) and archaeological resources (**Appendix B**). For above-ground resources, the APE is coterminous with the 10.76-acre area surrounding the SM-1 site and Buildings 371 and 380 (Building 358, formerly used as a training/administrative facility for SM-1, was excluded from the APE due to its relative distance from the Deactivated SM-1 Nuclear Reactor Facility). The archaeological APE is coterminous with the boundaries of ground disturbance related to dismantlement, site cleanup, and staging activities (**Figure 3.8-1**).

Figure 3.8-1: APE for the Proposed Action

Historical documents related to SM-1 are maintained and stored at the Humphreys Engineering Center in Alexandria, Virginia, and the USACE Baltimore and Philadelphia District offices. Historical documents include blueprints, plans, photographs, surveys, design documents and drawings, as well as operational manuals. The USACE initiated archiving efforts to digitize the SM-1 historical documents and to create a historical document repository.

3.8.2.1 Archaeological Resources

One archaeological site, 44FX1331, was identified within the SM-1 APE in 1987 during a pedestrian survey of the area by former Fairfax County Archaeologist Michael Johnson. In February 2018, AECOM-Tidewater Joint Venture conducted a Phase I archaeological survey at the SM-1 site and its 4.54-acre (1.84-hectare) archaeological APE to determine if other potentially significant archaeological resources were present. The survey determined that extensive ground disturbance associated with construction of SM-1 severely impacted the landform and may have destroyed much of the site's subsurface integrity. As a result, the site was determined not eligible for listing in the NRHP and no further archaeological study of the SM-1 site was recommended. The results of the survey were reported in *Phase I Archaeological Survey of the SM-1 Reactor Facility, US Army Garrison Fort Belvoir, Fairfax County, VA* (USACE, 2018b), submitted to the SHPO in February 2018. By letter dated March 21, 2018, the SHPO concurred with the findings and recommendations of the Phase I archaeological survey that no further archaeology work at the SM-1 site was required (VDHR File No. 2015-1247) (**Appendix B**).

3.8.2.2 Architectural Resources

In 1996, the SM-1 Reactor Facility (US Army Package Power Reactor; VDHR ID# 029-0193) was determined eligible for listing in the NRHP under Criterion A on the national level, with a period of significance between 1955 and 1973. Because it was less than 50 years old at the time, NRHP Criterion Consideration G (for resources less than 50 years old) applied, as the facility met the threshold for "exceptional importance" according to this criterion. The SM-1 Reactor Facility was the Army's first nuclear-powered electricity-generating station and the first water-pressurized reactor brought online in the US. The SM-1 Reactor Facility was also the first nuclear power reactor to provide electricity to a commercial power grid in the US. It was used to train military nuclear power plant operators and to perform nuclear research and development tasks. As the Army's first prototype nuclear power generating plant, the SM-1 Reactor Facility represented an important step in the use of atomic power (Friedlander, Hack, & Rosentel, 1992; Fort Belvoir, 2014).

At the time of the 1996 NRHP eligibility determination, the facility consisted of Building 372, Building 349 (warehouse), Building 350 (now Building 7350), and Building 375 (intake pier), all still standing. Additionally, the NRHP-eligible boundaries included four buildings/structures since demolished: Building 373 (sentry station), Building 376 (waste retention building), Building 384 (electronic equipment facility), and an emergency siren. A 2008 architectural survey of Fort Belvoir's 300 Area identified two additional buildings historically associated with SM-1, although not located within the NRHP-eligible boundaries: Building 371 (Lab/Test Building, built in 1957) and Building 380 (Lab/Test Building, built in 1965) (John Milner Associates, 2008). Building 371 and Building 380 are currently occupied by other Fort Belvoir tenants and neither is proposed for dismantlement as part of the Proposed Action. Facilities currently comprising the historic property are shown on **Figure 3.8-1**. The six buildings located within the SM-1 Reactor Facility APE are listed in **Table 3.8-1**.

Table 3.8-1: Buildings/Structures in the Proposed Action APE

Building No.	Name	VDHR ID #	Construction Date	Description	NRHP Status
349	Warehouse/Storage	029-0193	Unknown, possibly ca. 1969	The construction date is based on analysis of historic aerial photography. The building is located within the SM-1 Reactor Facility's fenced area.	Non-contributing resource in NRHP-eligible US Army Package Power Reactor (1996)
350/7350	Sewage Lift Station	029-0193	1962	The structure is a one-story brick utility building with a flat roof and concrete base. It is located northwest of Building 372.	Contributing resource in NRHP-eligible US Army Package Power Reactor (1996)
371	Lab/Test Building	Not assigned	1957	Building 371 was documented and evaluated as part of the 2008 architectural survey of Fort Belvoir's 300 Area. It was recommended NRHP-eligible for its association with the SM-1 Reactor Facility; however, the SM-1 NRHP boundaries have not been expanded to include this building.	NRHP Eligible (John Milner Associates, 2008)
372	SM-1 Reactor Building	029-0193	1957	The two-story domed rectangular SM-1 plant is built of steel-frame construction, covered with corrugated metal, and sits on a concrete foundation. The building measures approximately 90 feet by 93 feet and has a flat concrete roof. A tall cylindrical vented dome extends above the roofline. The building houses electrical circuitry and reactor-related piping on the first level, with classrooms, offices, a control room, and support facilities on the second floor. The core containment unit, which is now encased in cement, extends through both levels.	Contributing resource in NRHP-eligible US Army Package Power Reactor (1996)

Table 3.8-1: Buildings/Structures in the Proposed Action APE

Building No.	Name	VDHR ID #	Construction Date	Description	NRHP Status
375	Pump House	029-0193	1962	This one-story, rectangular 12-foot by 8-foot metal structure with a large metal boom and wood planked walkway is located along the Gunston Cove shoreline adjacent to the SM-1 Reactor Facility. It is no longer in use.	Contributing resource in NRHP-eligible US Army Package Power Reactor (1996)
380	Lab/Test Building	Not assigned	1965	Building 380 is a simple brick structure originally built as a Nuclear Power Simulator Building. The building was documented and evaluated as part of the 2008 architectural survey of Fort Belvoir's 300 Area and was recommended NRHP-eligible for its association with the SM-1 Reactor Facility; however, the SM-1 Reactor Facility NRHP boundaries have not been expanded to include this building.	NRHP Eligible (John Milner Associates, 2008)

3.8.2.3 Traditional Cultural Properties

No traditional cultural properties have been documented or are otherwise known to exist within the SM-1 APE. In accordance with Section 106, USACE is consulting with federally recognized Native American tribes that may have an interest in or knowledge of traditional cultural properties at Fort Belvoir.

3.8.3 Evaluation of Environmental Consequences

3.8.3.1 Approach to the Analysis

Impact significance thresholds for cultural resources are presented in **Table 3.8-2**.

Table 3.8-2: Cultural Resources Impact Signficance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	The Alternative would have a measurable effect on an NRHP-listed or eligible archaeological or architectural resource in the APE. However, the effect would be resolvable through the Section 106 consultation process.
	Indirect Impacts	The Alternative would have a measurable effect on an NRHP-listed or eligible archaeological or architectural resource outside the APE. However, the effect would be resolvable through the Section 106 consultation process.
Potentially Significant Adverse Effect	Direct Impacts	The Alternative would have a measurable effect on an NRHP-listed or eligible archaeological or architectural resource in the APE that is not resolvable through the Section 106 consultation process.
	Indirect Impacts	The Alternative would have a measurable effect on an NRHP-listed or eligible archaeological or architectural resource outside the APE that is not resolvable through the Section 106 consultation process.

3.8.3.2 No Action Alternative

Under the No Action Alternative, the Deactivated SM-1 Nuclear Reactor Facility would not be decommissioned and USACE would maintain the site in a SAFSTOR condition for the foreseeable future. The natural decay of the residual radioactivity would not reach a level low enough for the release of the facility and termination of the permit within the allotted 60-year regulatory threshold. Building 372, as well as Buildings 349, 350/7350, and 375, would continue to deteriorate over time. In the long term, the eventual dismantlement of the Deactivated SM-1 Nuclear Reactor Facility and its associated on-site structures would have a direct adverse effect on these NRHP-eligible buildings.

3.8.3.3 Proposed Action Alternative

The Proposed Action Alternative consists of the removal of all radiologically contaminated structures, equipment, and media from the SM-1 site, as needed to allow for the termination of the Decommissioning Permit and the release of the site for unrestricted use. It involves removal of M&E from Building 372, dismantlement of Building 372, and the dismantlement and removal of the other three buildings (Buildings 349, 350, and 375) on the SM-1 site.

USACE has consulted with the SHPO in accordance with Section 106 of the NHPA with respect to its efforts to avoid or minimize an adverse effect on historic properties within the APE. USACE has determined that the Proposed Action Alternative would have an *Adverse Effect* on the NRHP-eligible SM-1 Reactor Facility (Buildings 372, 350/7350, and 375) and the two associated NRHP-eligible buildings (Buildings 371 and 380). Measures to mitigate and minimize the adverse effect and ensure it remains less than significant would be developed by USACE in consultation with the SHPO, the ACHP, and other consulting parties and will be memorialized in the form of a MOA. In a letter dated September 8, 2017, the SHPO concurred with the USACE's determination. Copies of correspondence relevant to Section 106 consultation for the Proposed Action Alternative are included in **Appendix B**.

The Proposed Action Alternative would not affect any known NRHP-eligible archaeological properties within the archaeological APE (limits of disturbance). In addition, no traditional cultural resources are documented or otherwise known to exist on the SM-1 site. Thus, it is anticipated that the Proposed Action Alternative would have no effects on traditional cultural resources.

3.8.3.4 Management and/or Mitigation Measures

While no known archaeological resources exist within the APE, if such a resource is discovered during the Proposed Action Alternative, USACE would adhere to the policies and procedures for such discoveries per 36 CFR. Part 800.13, *Post-review Discoveries*. Upon discovery of materials or remains during ground disturbance activities under the Alternatives, the Army would:

- immediately cease work and notify the SHPO, consulting tribes, and ACHP, as well as the Fairfax County sheriff's department if human remains are uncovered;
- ensure no unauthorized personnel access the site and no further damage to the suspected materials or remains is incurred; and,
- comply with applicable laws and regulations prior to conducting any further activity on the site.

A MOA with the SHPO will establish responsibilities for USACE to complete prior to moving forward with the Proposed Action Alternative. In accordance with NHPA Section 106, USACE has proposed the following mitigation measures to VDHR as part of the MOA:

- USACE will produce a modified Historic American Engineering Record (HAER) for the SM-1 Reactor Facility. The goal of the HAER is to create public awareness of the SM-1 Reactor Facility and document the facility's operations within its historical context as a nationally significant nuclear energy resource. The written documentation will include information such as location and address, owner, operational and decommissioning narratives, and architectural details, supported by a complete bibliography and electronic repository, including motion picture film, photographs, and documents, as appropriate. Due to the loss of original as-built drawings, the HAER documentation will include a 3-dimensional rendering of the facility using Light Detection and Ranging (LIDAR) scans (NPS, 2017).
- For inclusion in the HAER, USACE will conduct interviews with personnel closely associated with the construction, operation, and initial closure of SM-1. Interviews will be conducted, recorded, and transcribed in accordance with applicable standards. In addition, research will be conducted at Fort Belvoir, and at repositories elsewhere in Virginia and Washington, DC, including review of historic photographs, training videos, aerials, maps, documents, plans, newspapers, and scientific journals. Digital images will be saved and labeled in accordance with VDHR standards for architectural surveys (VDHR, 2016).

- All field work, photography, and research necessary to produce the HAER of the SM-1 Reactor Facility will be carried out by or under the direct supervision of architectural historians who meet the appropriate *Secretary of the Interior's Professional Qualification Standards* (SOI Standards; 48 FR 44738-9, Sept. 29, 1983). All work will be conducted in accordance with *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (36 CFR Part 61); and *Secretary of the Interior's Standards for the Treatment of Historic Properties* (36 CFR Part 68).
- VDHR will be provided with a thirty (30)-day opportunity to review and comment on the HAER document.
- USACE will carefully remove the commemorative plaque currently affixed to Building 372 and move it to a facility to be restored and displayed at a yet-to-be-determined facility in Virginia.
- In consultation with Fort Belvoir, USACE will develop and erect a historical marker commemorating the SM-1 Reactor Facility and its national significance at a yet-to-be determined location at Fort Belvoir.
- Where possible, USACE will salvage historical items from the SM-1 Reactor Facility to be placed on loan to appropriate repositories for traveling exhibits. The salvaged items may include, but are not limited to, the educational control panel, a historic scale model, and other items remaining from Building 372 operated as a museum.
- The HAER and other identified mitigation measures, such as installation of a commemorative marker and salvage of historic materials, will be completed within six months after completion of the decommissioning and dismantlement of the SM-1 Reactor Facility.

3.9 Transportation and Traffic

This section discusses the local and regional vehicular transportation network on and near Fort Belvoir's South Post that would potentially be affected by the Proposed Action. The ROI for the transportation and traffic analysis consists of South Post roads between the SM-1 site and the Tulley Gate access control point (ACP) and off-post roads from Tulley Gate to Interstate 95 (I-95) approximately 2.7 miles north-northwest of South Post. These are the components of the vehicular transportation network that would most likely be used by decommissioning personnel to access the SM-1 site, and to transport debris generated by the proposed decommissioning.

3.9.1 Regulatory Setting

As applicable, waste transportation and other aspects of the proposed decommissioning would be conducted in accordance with NRC and the USDOT regulations. Federal and state regulatory requirements relevant to transportation are summarized in **Table 3.9-1**.

Table 3.9-1: Transportation – Applicable Regulations and Guidance

Guidance	Description
10 CFR Part 71	Establishes requirements for packaging, preparation for shipment, and transportation of licensed material and procedures and standards for shipping fissile material.
49 CFR Parts 171 - 177	Establishes USDOT regulations for the packaging and shipment of hazardous materials by public highway, rail, and air.
49 CFR Part 172.310, *Class 7 (Radioactive) Materials*	Specifies requirements for marking radioactive materials for transportation.
49 CFR Part 383	Establishes commercial motor vehicle driver's license requirements.

Table 3.9-1: Transportation – Applicable Regulations and Guidance

Guidance	Description
49 CFR Part 397, Subpart D	Establishes requirements for the routing of Class 7 (radioactive) material for motor carriers and drivers and State routing designations.
Department of the Army Pamphlet (DA-PAM) 385-24, *The Army Radiation Safety Program*	Establishes Army safety procedures for the use, licensing, transportation, disposal, dosimetry, accident reporting, safety design, accountability of, and radiation exposure standards for ionizing and non-ionizing radiation sources.
23 CFR Part 658.17	Limits the gross vehicle weight of federal shipments to 80,000 pounds.
Virginia Regulations Governing the Transportation of Hazardous Materials (9 VAC 20-110-121)	Requires all shippers of hazardous radioactive materials to register with the Department of Emergency Management at least 30 days prior to transportation of such materials.
Virginia Regulations Governing the Transportation of Hazardous Materials (9 VAC 20-110-122)	Requires all shippers to coordinate with local law enforcement agencies, local emergency services, local fire departments, and other local officials as requested by county or municipal authorities.

3.9.2 Existing Conditions

It is anticipated that the majority of decommissioning personnel would travel to and from the site by privately operated vehicles. Therefore, no measurable impacts on local and regional mass transit services (e.g., Metrorail, bus) or pedestrian and bicycle infrastructure would be anticipated to occur. Due to limited parking at the SM-1 site, it is anticipated that the majority of project personnel would park at the 300 Area Visitor Center located on Gunston Road just north of the 300 Area gate. From here, personnel will be shuttled to and from the project site in large vans or small busses.

3.9.2.1 On-Post Vehicular Transportation Network

Traffic volumes at ACPs and on main roads on South Post are heaviest Monday through Friday during the morning and afternoon rush hours. Backups occur frequently at Tulley Gate during the morning traffic peak due to vehicles queuing for required security identification checks and vehicle searches. At other times, however, traffic on South Post roads is relatively moderate throughout the workday and light on weekends. Heavy trucks and contractor vehicles are a frequent presence on Fort Belvoir's roads as a result of construction, demolition, and renovation projects occurring nearly continuously on the installation. Roads on Fort Belvoir are maintained by a private contractor at the direction of DPW.

Vehicular traffic accesses the 300 Area through two ACPs on Gridley Road and Putnam Road at their intersections with 23rd Street. Burbeck Road and Totten Road provide the primary means of north-south vehicular circulation through the 300 Area. Wilson Road provides access to the SM-1 site which is approximately 0.2-mile west and east of the Wilson Road-Burbeck Road intersection. All roads in the 300 Area are two lanes wide, paved and, with the exception of Totten Road, striped. Most roads have a curb and gutter. Portions of the shoulder along Totten Road are embanked with gravel or rip-rap. None of the intersections in the 300 Area have traffic signals; although, some intersections have stop signs.

USACE evaluated road pavement conditions in the 300 Area in December 2017 to determine the suitability of the roads to support anticipated traffic that would be associated with the Proposed Action. The evaluation included analysis of the thickness of the pavement and gravel base as well as the extent of observable deterioration (e.g., cracking and potholes). Asphalt thickness was determined to vary from four to 16 inches and gravel base thickness

from zero to six inches. Cracks, potholes, and other forms of degradation were identified during visual inspection of the roadways (USACE, 2018c).

3.9.2.2 Off-Post Vehicular Transportation Network

Fort Belvoir is served by a robust regional road network. However, a number of these highways and roads currently operate above design capacity, particularly during the morning and afternoon peak commuting periods. Congestion on these facilities is a daily occurrence, although not unusual when considered in a regional context. Primary roads near Fort Belvoir that would likely handle the majority of traffic associated with the Proposed Action are described below.

I-95, located northwest of Main Post, serves region-wide commuter traffic from predominantly residential counties to the south, to major employment centers in Washington, DC and Arlington County. In 2016, the northbound and southbound lanes of I-95 in the vicinity of its interchange with Fairfax County Parkway handled an annual average daily traffic (AADT) volume of 216,000 vehicles (VDOT, 2018).

US Route 1 primarily serves local trips but can serve as an alternate route to I-95 because it runs parallel to the interstate (i.e., north-south). US Route 1 provides access to I-95 approximately 5.6 miles (driving distance) southwest of Fort Belvoir. In 2016, AADT volumes on the segment of US Route 1 between Fairfax County Parkway and Mount Vernon Memorial Highway exceeded 30,000 vehicles (VDOT, 2018).

Fairfax County Parkway is a limited-access, predominantly four-lane roadway that begins at US Route 1 just west of Pohick Road and proceeds to the northwest across much of Fairfax County to terminate at Leesburg Pike (VA Route 7). It serves Fort Belvoir as the primary access to I-95. In 2016, AADT volumes on Fairfax County Parkway between US Route 1 and its interchange with I-95 ranged between 18,000 and 39,000 vehicles (VDOT, 2018).

3.9.3 Evaluation of Environmental Consequences

This section discusses short-term (decommissioning-related) and long-term (post-decommissioning) impacts on the on- and off-post vehicular transportation networks that would result from the Proposed Action. Potential effects from the transportation of waste generated by the Proposed Action are also discussed.

3.9.3.1 Approach to Analysis

Impacts on transportation and traffic are primarily addressed qualitatively and incorporate estimates of anticipated vehicle trips associated with the Proposed Action relative to baseline conditions. The analysis of impacts from transportation of LLRW generated by the decommissioning nuclear reactor facilities as presented in the NRC's decommissioning GEIS (NRC, 2002) is also incorporated by reference. Impact significance thresholds for transportation and traffic are presented in **Table 3.9-2**.

Table 3.9-2: Transportation and Traffic Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	• The Alternative would result in a small temporary increase in peak hour traffic that could cause additional delays; however, the functionality of existing roadways would not change. • The Alternative would result in minor damages to pavement; however, the damage would be localized and could be repaired easily. • The Alternative would expose individuals along the transport route to radiation; however, the dose would be negligible and within regulatory thresholds. • The Alternative would result in a negligible risk of a traffic accident fatality.
	Indirect Impacts	• The Alternative would create conditions that result in some or all of the effects described above.
Potentially Significant Adverse Effect	Direct Impacts	• The Alternative would result in a large temporary increase in peak hour traffic that would cause additional delays and decrease the functionality of existing roadways. • The Alternative would result in severely damaged pavement requiring extensive repairs. • The Alternative would expose individuals along the transport route to enough radiation to cause health problems. • The Alternative would substantially increase the risk of a traffic accident fatality occurring as a result of the project.
	Indirect Impacts	The Alternative would create conditions that result in some or all of the effects described above.

3.9.3.2 No Action Alternative

Under the No Action Alternative, the proposed decommissioning would not be implemented, and the Deactivated SM-1 Nuclear Reactor Facility would continue to be maintained in SAFSTOR condition for the foreseeable future. This would have no impacts on transportation and traffic on or in the vicinity of Fort Belvoir.

3.9.3.3 Proposed Action Alternative

3.9.3.3.1 Transportation Network

The Proposed Action Alternative would generate additional vehicle trips on and in the vicinity of Fort Belvoir. Such vehicle trips would include workers' commuting vehicles as well as heavy trucks hauling materials and equipment needed during decommissioning activities, transporting waste from the SM-1 site, and bringing fill soils to the site during restoration activities. The number of additional trips generated by workers' commuting vehicles on Fort Belvoir roads during the Proposed Action Alternative is anticipated to remain low. It is estimated that the proposed decommissioning would generate 1,150 heavy truck trips, comprising approximately 650 waste shipments from the site and 500 trips to the site to deliver clean fill soils during restoration activities.

While the total number of truck trips that would potentially be generated by the Proposed Action Alternative would be substantial, they would be distributed over the Alternative's multi-year implementation period and thus, would be relatively small in the context of existing traffic volumes handled by Fort Belvoir's road network. The transport of waste from the site would be distributed over the 5-year on-site decommissioning period, although it is anticipated that approximately 50 percent of waste shipments would occur during the middle 12 months (i.e., months 19 through 30) of the project. This would equate to an average of six to seven containers shipped from the site per week during that 12-month period. Site restoration activities are anticipated to occur over an approximately seven-month span near the end of the Alternative's implementation period.

Traffic generated by the Alternative, particularly heavy truck traffic, would have the potential to damage Fort Belvoir road surfaces and shoulders. Periodically throughout the decommissioning process and upon its completion, USACE would conduct limited road maintenance and improvements at selected locations along the designated transportation route to repair damage resulting from the increased truck traffic. Such repairs would consist of pothole filling, limited asphalt resurfacing, or similar activities that would be relatively limited in scale.

For these reasons, the Proposed Action Alternative would have short-term, less than significant impacts on the Fort Belvoir transportation network. Furthermore, no appreciable increase in traffic volumes off-post (regional) would be anticipated to occur. No long-term transportation and traffic impacts would result from the Proposed Action Alternative.

3.9.3.3.2 Waste Transportation

All waste generated by the Proposed Action Alternative would be packaged in accordance with applicable NRC and USDOT regulatory requirements and transported by licensed contractors to licensed or permitted off-post facilities for disposal or to local or regional truck-to-rail transfer locations for shipping to the ultimate disposal facility.

The transport of any commodity involves a potential for risk to transportation personnel as well as the general public. Such risk is primarily associated with transportation-related accidents (e.g., injuries or fatalities from vehicle crashes) regardless of the cargo. The transport of certain materials, such as hazardous or radioactive waste, can pose an additional risk due to the unique nature of the material itself (e.g., exposure to radiation emitted from a shipping container).

Shipping packages containing radioactive materials must contain and shield their contents during normal transport conditions in accordance with USDOT regulations (49 CFR Parts 171-177). Shipments of radioactive materials must also be below the federal gross vehicle weight limit of 80,000 pounds (40 tons); as such, packages containing radioactive materials are typically limited to approximately 48,000 pounds (24 tons) (23 CFR 658.17).

Because packages containing radioactive waste have the potential to emit radiation even when properly shielded, individuals encountering shipments of radioactive waste generated by the proposed decommissioning would have the potential to be exposed to radiation in addition to normal background radiation; such exposure, depending on duration and intensity, could increase the risk of associated health problems, including cancer. These individuals would include the transportation crew, residents living along the transport route, other drivers and passengers, and other individuals that come into contact with the package during transport (e.g., inspectors at weigh stations).

The GIES on Decommissioning of Nuclear Facilities, Supplement 1 (NUREG-0586) determined that the potential impacts from transportation activities associated with the decommissioning of much larger nuclear facilities are neither detectable nor destabilizing when conducted in compliance with applicable regulations (NRC, 2002). The transportation of LLRW and other waste generated by the Proposed Action Alternative would occur in a manner consistent with that analyzed by NRC. As such, short-term impacts on public and worker health from the transport of LLRW and other waste from the SM-1 site during the Proposed Action Alternative would be less-than-significant.

No LLRW or other waste would be generated on the SM-1 site following the implementation of the Proposed Action Alternative. Thus, there would be no long-term health impacts from waste transportation.

3.9.3.4 Management and/or Mitigation Measures

The following management measures would be implemented during the Proposed Action Alternative by USACE or the decommissioning contractor to minimize impacts on the transportation network and/or from the transport of LLRW and other waste:

- A project-specific transportation management plan would be implemented identifying approved travel routes to and from the site for decommissioning personnel and heavy trucks transporting materials, equipment, and debris.
- During spill and emergency response planning for the Proposed Action Alternative, the decommissioning contractor would notify on- and off-post emergency responders of the types of shipments that would be transported to support preparation for potential transportation-related accidents.
- In coordination with Fort Belvoir and other affected organizations, decommissioning-related traffic would be scheduled for off-peak hours to minimize roadway congestion.
- All radioactive waste and other debris generated at the SM-1 site would be packaged and shipped in accordance with a written Waste Management Plan that is consistent with NRC and USDOT regulatory requirements.

3.10 Non-Radiological Hazardous Materials and Waste, and Non-Hazardous Solid Waste

This section discusses non-radioactive hazardous materials and non-hazardous solid waste that would be generated by the Proposed Action (radioactive waste that would be generated by the Proposed Action is discussed in **Section 3.6**). The ROI for the discussion in this section is the SM-1 site and local and regional off-post disposal facilities.

3.10.1 Regulatory Setting

Hazardous materials are defined in 49 CFR 171.8 as “hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions” in 49 CFR 173. Transportation of hazardous materials is regulated by USDOT regulations within 49 CFR Parts 105-180.

Hazardous wastes are defined by RCRA in 42 USC Part 6903(5), as amended by the Hazardous and Solid Waste Amendments, as “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (a) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.”

Regulatory requirements addressing the generation, handling, management, and disposal of non-radioactive hazardous materials and non-hazardous solid waste are presented in **Table 3.10-1**.

Table 3.10-1: Non-Radiological Hazardous Material and Solid Waste – Applicable Regulations and Guidance

Guidance/Regulation	Description
Federal	
Clean Air Act of 1970 (CAA) (42 U.S.C. Part 7401 et seq.)	Establishes NAAQS for criteria pollutants. Radionuclides associated with dismantlement of SM-1 would also be regulated under the CAA.
Resource Conservation and Recovery Act of 1976 (42 USC Part 6901 et seq.; 40 CFR Part 260-268 and 270)	Establishes "cradle-to-grave" requirements for hazardous waste from its generation through transportation, treatment, storage, and disposal.
Toxic Substances Control Act of 1978 (15 USC Part 2601 et seq.)	Addresses the production, importation, use, and disposal of specific chemicals, such as polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint.
USEPA Asbestos Regulations (40 CFR Part 61, Subpart M; 40 CFR Part 763)	Regulations governing the use and emissions of asbestos.
40 CFR Part 273, Standards for Universal Waste Management	Establishes regulations for the management and disposal of universal waste.
OSHA Permissible Exposure Limit for mercury	Establishes a PEL for worker exposure to mercury vapor of 0.1 milligram per cubic meter (mg/m^3).
OSHA Regulations (29 CFR Part 1910)	Standards to protect workers engaged in hazardous waste operations and emergency-response activities.
US Department of Transportation Regulations (49 CFR Subchapter C – *Hazardous Material Regulations* Parts 171-180)	Regulations governing the transport of hazardous materials.
EO 13101, *Greening the Government through Waste Prevention, Recycling, and Federal Acquisition*	Strengthens and expands the Federal government's commitment to recycling and buying recycled-content and environmentally preferable products.
Commonwealth of Virginia	
Code of Virginia Section 10.1-1400 et seq.	Virginia Waste Management Act
9 VAC 20-60	Virginia Hazardous Waste Management Regulations
9 VAC 20-81	Virginia Solid Waste Management Regulations
9 VAC 20-110	Virginia Regulations for the Transportation of Hazardous Materials
9 VAC 20-81-620	Virginia Asbestos-Containing Waste Materials Regulations
9 VAC 20-81-630	Virginia Wastes Containing Polychlorinated Biphenyls (PCBs) Regulations
US Army / Fort Belvoir	
AR 200-1, *Environmental Protection and Enhancement*	Implements federal, state, and local environmental laws and DOD policies for preserving, protecting, conserving, and restoring the quality of the environment.

Table 3.10-1: Non-Radiological Hazardous Material and Solid Waste – Applicable Regulations and Guidance

Guidance/Regulation	Description
AR 420-1, *Army Facilities Management*	Provides policies and responsibilities for conduct and management of facilities engineering, housing, fire and emergency services, and environmental support.
Sustainable Management of Waste in Military Construction, Renovation, and Demolition Activities, 15 August 2008	Army policy requiring that all military construction, renovation, and demolition projects include contract performance requirements for the diversion of a minimum of 50 percent of construction and demolition waste, by weight, from landfill disposal.
Fort Belvoir *Hazardous Waste Management and Minimization Plan*	Establishes policies and procedures for the storage, prevention, containment, disposal, and response to discharges of hazardous materials at Fort Belvoir.
Fort Belvoir *Integrated Solid Waste Management Plan*	Establishes policies and procedures for the collection, handling, management, and recycling or disposal of non-hazardous solid waste generated on the installation.
USACE SM-1 Reactor Facility Waste Management Plan	Establishes procedures for the handling, management, and disposal/recycling of the various forms of waste that would be generated during the Proposed Action.

3.10.2 Affected Environment

ACM, LBP, mercury, PCBs, universal waste, and microbial contaminants (i.e., mold) are present in interior and exterior building materials, equipment, and components of Building 372. Surveys of these materials were conducted to support preparation of the SM-1 *Characterization Survey Report* (USACE, 2013).

3.10.3 Evaluation of Environmental Consequences

3.10.3.1 Approach to the Analysis

This section discusses short- and long-term impacts from non-radioactive hazardous waste and non-hazardous solid waste (i.e., MSW and dismantlement wastes) that would be generated during the Proposed Action. As used throughout this section, "waste" refers to non-radioactive regulated hazardous waste that would be generated from hazardous materials present in Building 372 and on the SM-1 site; regulated hazardous waste that would be generated from hazardous materials used during decommissioning activities; and non-hazardous MSW and dismantlement waste. These types of waste are differentiated as necessary in this section. Applicable impact significance thresholds are summarized in **Table 3.10-2**.

Impacts from radioactive waste, including LLRW, are discussed in **Section 3.6.** Impacts from the transport of radioactive and non-radioactive waste (including hazardous and non-hazardous waste) generated by the Proposed Action are discussed in **Section 3.9.**

Table 3.10-2: Hazardous and Non-Hazardous Waste Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	• The Alternative would delay or inhibit the removal of non-radioactive hazardous materials and waste from the Deactivated SM-1 Nuclear Reactor Facility; however, release of the site for unrestricted use *would not exceed* five years from issuance of a decommissioning permit. • The Alternative would generate non-radioactive hazardous waste and non-hazardous solid waste; however, conditions or quantities of these substances *would not exceed* the capacity of Fort Belvoir or USACE to manage them.
	Indirect Impacts	• The Alternative would generate non-radioactive hazardous waste and non-hazardous solid waste in quantities that *would not exceed* the current or future capacities of receiving landfills and/or processing facilities.
Potentially Significant Adverse Effect	Direct Impacts	• The Alternative would delay or inhibit the removal of non-radioactive hazardous materials and waste from the Deactivated SM-1 Nuclear Reactor Facility such that release of the site for unrestricted use *would exceed* five years from issuance of a decommissioning permit. • The Alternative would generate non-radioactive hazardous waste and non-hazardous solid waste such that conditions or quantities of these substances *would exceed* the capacity of Fort Belvoir or USACE to manage them.
	Indirect Impacts	The Alternative would generate non-radioactive hazardous waste and non-hazardous solid waste in quantities that *would exceed* the current or future capacities of receiving landfills and/or processing facilities.

3.10.3.2 No Action Alternative

Under the No Action Alternative, the proposed decommissioning would not be implemented, and the Deactivated SM-1 Nuclear Reactor Facility would continue to be maintained in SAFSTOR condition for the foreseeable future. Non-radioactive hazardous materials (e.g., ACM, LBP) would remain in Building 372. No hazardous or non-hazardous solid waste would be generated from the facility.

3.10.3.3 Proposed Action Alternative

Sorting, segregation, and decontamination of waste would be performed to the extent practicable to minimize the amount of radioactive waste, universal waste, and regulated hazardous wastes requiring treatment and disposal. All wastes would be evaluated against the following hierarchy for the best technical and most cost-effective disposition path:

- Reuse/recycle (e.g., clean steel, M&E, and concrete);
- Commercial disposal at local landfill (e.g., clean dismantlement debris and M&E); or

- Commercial treatment, storage, or disposal facility for treatment and/or disposal for hazardous and/or universal wastes.

Under the Proposed Action Alternative, hazardous waste (e.g., RCRA waste or TSCA waste) would be properly packaged, removed and transported to the final disposal location in accordance with federal, state and local regulations. BMPs would be implemented to ensure none of the dismantled or removed materials are placed in areas that could impact the surrounding environment (e.g., wetland or other coastal resources). Possible hazardous materials that may be removed include PCBs (mainly in electrical cables, gaskets, grout/caulking, other electrical components, and paint), ACM (insulation materials and wallboard), LBP, mercury in electrical switches and other components, fuels, oils, lubricants, and some ozone depleting substances in refrigerants.

Additional details regarding how waste would be removed from the Deactivated SM-1 Nuclear Reactor Facility, segregated and packaged according to waste type, and shipped to a licensed disposal site are contained in the WMP (USACE, 2019c) and the DP (USACE, 2019b).

The Proposed Action Alternative would generate an estimated 4,103 yd^3 of non-radioactive waste (**Table 3.10-3**). This volume would include hazardous waste debris, hazardous waste soils, and non-hazardous dismantlement waste that would be generated directly by the dismantlement of Building 372 and associated structures on the SM-1 site.

Table 3.10-3: Non-Radioactive Waste Volume Estimates

Waste Type	Building / Site Area	Type / Material	Estimated Non-Radioactive Waste Volume (yd^3)
Building Debris	Unrestricted Area	Walls, Floors, and Roof	494
	Lower Site	Structures / Debris	389
Sub-total - Building Debris			***883***
Concrete Debris	Unrestricted Area	Slabs and Foundation	1,172
	Restricted Area	Slab and foundation	
	VC	Walls and Slab	1,194[1]
Sub-total - Concrete Debris			***2,366***
Waste Soil	Upper Site around Building 372	Soil	500
Sub-total - Waste Soil			***500***
M&E Waste	Unrestricted Area Municipal Waste	M&E	323
	Restricted Area	M&E	31
Sub-total - M&E Waste			***354***
Total Non-Radioactive Waste Volume			**4,103**
Sub-total – Estimated LLRW Volume (Table 3.6-3)			***7,424***

Table 3.10-3: Non-Radioactive Waste Volume Estimates

Waste Type	Building / Site Area	Type / Material	Estimated Non-Radioactive Waste Volume (yd^3)
Total Estimated Waste Volume from Proposed Action Alternative (LLRW + Non-Radioactive)			**11,527**

Note:

1. Includes steel liner.

Source: USACE 2019c

The quantities presented in **Table 3.10-3** are estimates of waste that would be generated by the Proposed Action Alternative. These estimates are based on surveys of *in situ* materials and conditions in Building 372 and on the SM-1 site, professional knowledge and judgment of USACE and its consultants, and prior experience with similar decommissioning and dismantlement projects. Although the exact volume of waste generated under the Proposed Action Alternative would be determined during decommissioning, based on these conservative estimates, hazardous and non-hazardous waste conditions or quantities would not be anticipated to exceed the management or disposal capacities of the involved personnel and facilities. The Proposed Action Alternative would result in minor, short- and long-term, less than significant impacts from the generation of non-radiological hazardous materials and waste and non-hazardous wastes.

3.10.3.4 Management and/or Mitigation Measures

To ensure that impacts from non-radioactive hazardous materials and waste and non-hazardous waste remain less-than-significant, USACE would generate, handle, manage, store, package, characterize, transport, and dispose of all waste generated during the Alternative in accordance with written procedures and requirements set forth in applicable management plans (e.g., the WMP and DP).

3.11 Geology, Topography, and Soils

This section discusses the following geomorphological resources on and near the SM-1 site that could be affected by the Proposed Action: terrestrial geology, topography, and soils on the SM-1 site, and bathymetry and sediments in Gunston Cove where the intake pier/pump house, concrete discharge pipe, and outfall structure would be removed.

3.11.1 Regulatory Setting

Regulations and guidance applicable to geology, topography, and soils resources are summarized in **Table 3.11-1**.

Table 3.11-1: Geomorphological Resources – Applicable Regulations and Guidance

Regulation	Description
Farmland Policy and Protection Act (7 USC 4201 et seq.)	Intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses.

3.11.2 Existing Conditions

3.11.2.1 Geology

Fort Belvoir spans the eastern part of the Piedmont Province and the upper part of the Coastal Plain Province (from west to east). The Fall Line, which runs north to south through Virginia, crossing Fairfax County at approximately the I-95 corridor, forms the transition zone between the resistant, igneous and metamorphic rock of the Piedmont and the softer, sedimentary rocks of the Coastal Plain (Fort Belvoir, 2018a).

A finger of Piedmont Upland Province bedrock extends from north to south along Accotink Creek. Piedmont Upland bedrock outcrops form the bed and adjacent slopes of the creek. Most of the more gently sloping areas to the east and west of the creek consist of unconsolidated deposits from the Coastal Plain Province (USATHAMA, 1990 in US Army Garrison Fort Belvoir, 2015).

The southern and central portions of Fort Belvoir are situated on the Coastal Plain Physiographic Province, which comprises several geologic formations including the Potomac Formation, Bacons Castle Formation, Shirley Formation, and Alluvium and Pliocene sand and gravel. These formations are characterized by unconsolidated sand, silt, and clay underlain by residual soil and weathered crystalline rocks. The Potomac Group, which makes up the majority of the Coastal Plain Physiographic Province under Fort Belvoir, is characterized by lens-shaped deposits of interbedded sand, silt, clay, and gravel, primarily of non-marine origin (USATHAMA, 1990 in US Army Garrison Fort Belvoir, 2015).

3.11.2.2 Topography

The topography of Fort Belvoir's Main Post is characterized by uplands and plateaus, lowlands, and steeply sloped terrain (Fort Belvoir, 2015). Elevations range from sea level along the Potomac River to approximately 230 feet above mean sea level near the intersection of Beulah Street and Woodlawn Road on North Post. Uplands and plateaus comprise about 40 percent of Main Post. South Post and the Southwest Area include nearly level plateaus. Lowlands on Fort Belvoir are mostly associated with the floodplains of Accotink, Pohick, and Dogue creeks and the Potomac River. Additional lowland areas are present between the shoreline and the steeply sloped terrain that surrounds the plateaus of South Post and the Southwest Area. Lowland topography is gently sloped from about 10 percent along upland fringes to almost zero adjacent to active floodplains (Fort Belvoir, 2015).

The area within the perimeter fence of the SM-1 site is characterized by terrain that rises steeply from the Gunston Cove shoreline up to terraced areas in the north central part of the site (USACE, 2019b). These areas were created through grading at the time of construction to provide level building sites. Building 372 and adjacent graded areas of the site are approximately 30 to 40 feet above sea level (USGS, 2019).

3.11.2.3 Soils

Soils characterized as "urban land" by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) are the predominant soils on the SM-1 site and are present in much of the site's central and southern areas (USDA NRCS, 2019). The urban land soil unit consists of soils that have been disturbed by excavation, deposition, compaction, and other human activities to such a degree that identification of individual soil layers or parent material is not possible. Soils classified as Codorus and Hatboro soils, 0 to 2 percent slopes, occasionally flooded and Sassafras-Marumsco complex, 25 to 45 percent slopes comprise the remainder of soils on the SM-1 site and occur along the western, northern, and eastern edges.

None of the soils underlying the site are considered prime or unique farmland, or farmland of statewide importance. Soils underlying the SM-1 site are moderately susceptible to erosion and their suitability to supporting the development of roads and shallow excavations are very limited. The Hatboro component of the Codorus and

Hatboro soil unit is considered hydric, which is consistent with its location in the northwestern corner of the site near the Gunston Cove shoreline.

Fort Belvoir DPW issues excavation permits prior to ground-disturbing activities occurring on the installation.

3.11.2.4 Bathymetry and Sediments

Gunston Cove is a relatively shallow tidal embayment of the Potomac River. Water depths range from approximately 3.3 feet in the northern portion to approximately 7.4 feet in the center (**Figure 3.3-1**). The mean tidal range is approximately 2.1 feet (Tide Forecast, 2019). A narrow small-boat navigation channel is maintained between the dock at Whitestone Point, approximately 0.25 mile southeast of the SM-1 intake pier, and the main Potomac River navigation channel.

Substrates in Gunston Cove consist of unconsolidated bottom that is silty or sandy in character. The composition of Gunston Cove bottomlands is likely influenced primarily by sediments in discharges from Accotink and Pohick Creeks, smaller unnamed tributaries draining South Post, the Southwest Area, and Mason Neck, and overland runoff.

3.11.3 Evaluation of Environmental Consequences

3.11.3.1 Approach to the Analysis

This section discusses impacts on geology, topography, and soils resources that would potentially result from the Alternatives. Impact significance thresholds for these resources are presented in **Table 3.11-2**.

Table 3.11-2: Geomorphological Resources Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
Less than Significant Adverse Effect	Direct Impacts	The Alternative would penetrate underlying geologic strata; alter topography; and/or disturb soils or sediments. However, such effects would be temporary, would achieve positive drainage once the Alternative has ended (in the case of topography), would not result in the damage, loss, or destruction of unique, noteworthy, or pristine geomorphological features, and/or would not result in increased sedimentation of receiving water bodies.
	Indirect Impacts	The Alternative would create conditions independent of the Proposed Action that involve the penetration of underlying geologic strata; alteration of topography; and/or disturbance of soils or sediments. However, such effects would be temporary, would achieve positive drainage (in the case of topography), would not result in the damage, loss, or destruction of unique, noteworthy, or pristine geomorphological features, and/or would not result in increased sedimentation of receiving water bodies.
Potentially Significant Adverse Effect	Direct Impacts	The Alternative would result in the permanent damage, loss, or destruction of unique, noteworthy, or pristine geomorphological features; would increase sedimentation of receiving water bodies; and/or would not achieve positive drainage (in the case of topography).

Table 3.11-2: Geomorphological Resources Impact Significance Thresholds

Impact Significance Threshold	Type of Impact	Impact Significance Threshold Definition
	Indirect Impacts	The Alternative would create conditions independent of the Proposed Action that would result in the permanent damage, loss, or destruction of unique, noteworthy, or pristine geomorphological features; would increase sedimentation of receiving water bodies; and/or would not achieve positive drainage (in the case of topography).

3.11.3.2 No Action Alternative

Under the No Action Alternative, USACE would continue to maintain the Deactivated SM-1 Nuclear Reactor Facility in SAFSTOR condition as it currently is. Soils with levels of radioactivity exceeding applicable regulatory thresholds would not be removed from the site. While this would be an adverse impact, no human exposure would occur because the facility would remain vacant and the site would not be redeveloped or occupied by other uses.

Impacts from radiologically contaminated soils on the site under the No Action Alternative would be less than significant. There would be no other impacts on geomorphological resources on or in the vicinity of the SM-1 site under the No Action Alternative.

3.11.3.3 Proposed Action Alternative

3.11.3.3.1 Geology

None of the activities in the Proposed Action Alternative would involve the temporary or permanent alteration or penetration of geologic strata underlying the SM-1 site. Thus, the Proposed Action Alternative would have no impacts on geology.

3.11.3.3.2 Topography

Except for the removal of above-ground buildings, structures, and pavements, it is likely that deviations in topographic conditions on the site following completion of the Proposed Action Alternative would be small relative to existing conditions. However, the final site grading and topography has not yet been determined. But the site would be maintained by Fort Belvoir in a permeable, vegetated condition following completion of the Proposed Action Alternative and this would not involve ongoing alterations to site topography.

For these reasons, the Proposed Action Alternative would have short-term, less than significant impacts and no long-term impacts on topography.

3.11.3.3.3 Soils

Throughout the implementation of the Proposed Action Alternative, it is anticipated that temporary soil disturbance would occur across the majority of the 3.6-acre SM-1 site. Soil disturbances would include initial grading and site preparation, excavations of subgrade infrastructure and facility components such as building foundations, pipes, and tanks; removal of soils containing low levels of residual radiation and/or other contaminants; removal of paving materials; and grading and compacting backfilled soils during the project's restoration phase. The decommissioning contractor would obtain an excavation permit from Fort Belvoir DPW prior to beginning ground-disturbing activities on the SM-1 site.

Assuming an average excavation depth of six feet, an estimated 34,848 yd^3 of soils would be disturbed during the Proposed Action Alternative. Actual excavation depths would vary considerably at particular locations on the site during the implementation of the Proposed Action Alternative. For example, the VC in Building 372 extends 18 feet below grade, while some abandoned utility lines may be six feet or less in depth. It is estimated that 6,200 yd^3 of impacted soils would be removed from the site and disposed of at permitted or licensed off-post facilities, requiring an equal or greater volume of fill soils to be applied to the site.

Because the Proposed Action Alternative would disturb more than one acre of soils, the decommissioning contractor would obtain coverage under the CGP and prepare a site-specific SWPPP, E&SC plan, and SWMP in accordance with the requirements of Fort Belvoir's MS4 permit. Adherence to these plans and the CGP would minimize the erosion of exposed soils and minimize concentrations of sediments and other pollutants in stormwater generated on the site.

Restoration activities would return the site to a maintained permeable, vegetated condition and no continued or ongoing soil disturbance would occur. Therefore, the Proposed Action Alternative would have short-term, less than significant impacts and no long-term impacts on soils. In the long term, the removal and disposal of soils containing low levels of residual radiological contaminants (**Section 3.6.2**) would represent a beneficial impact.

3.11.3.3.4 Bathymetry and Sediments

In the short term, the removal of the intake pier, concrete discharge pipe, and outfall structure would temporarily disturb sediments in Gunston Cove in the vicinity of those structures. USACE and its contractors would minimize disturbance of subaqueous bottomlands during in-water activities to the extent practicable. Sediment disturbance would be limited to localized areas immediately around the structures to be removed. Containment booms and sediment curtains would be used during in-water and nearshore work to prevent the migration of disturbed sediment into the water column, minimize turbidity, and ensure disturbed sediments settle near their original location. Sediment plumes generated by the proposed removals would quickly settle back to the bottom and are not anticipated to extend beyond an estimated five-acre area of Gunston Cove adjacent to the pier, pump house, concrete discharge pipe, and outfall structure. The extent and intensity of sediment disturbance would vary over the estimated 45-day period to remove the structures, ensuring that not all disturbances would occur simultaneously and further minimizing temporary impacts. Adherence to the SWPPP, E&SC plan and SWMP requirements would minimize the deposition of sediments and pollutants in Gunston Cove from runoff generated on the site.

Once the proposed work is completed, subaqueous bottomlands in the vicinity of the structures to be removed would be allowed to naturally return to a pre-disturbance condition. No additional re-contouring of bottom substrates or placement of subsurface fill is included in the Proposed Action Alternative. Thus, the Proposed Action Alternative would have short-term, less than significant impacts and no long-term impacts on bathymetry and sediments.

3.11.3.4 Management and/or Mitigation Measures

The following minimization measures would be implemented during the Proposed Action Alternative to reduce impacts on geomorphological resources:

- The decommissioning contractor would obtain an excavation permit from Fort Belvoir DPW prior to beginning ground-disturbing activities on the SM-1 site.
- The decommissioning contractor would obtain coverage under the CGP and adhere to the requirements of a site-specific SWPPP, E&SC plan, and SWMP to minimize the erosion of exposed soils and

corresponding concentrations of sediments and pollutants in stormwater generated on the project site and discharged to receiving water bodies.

- Containment booms and sediment curtains would be used during in-water and nearshore work to prevent the migration of disturbed sediment into the water column, minimize turbidity, and ensure disturbed sediments settle near their original location.
- The SM-1 site would be restored to a permeable, vegetated condition to minimize or prevent continued soil erosion and corresponding sedimentation of receiving water bodies.

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4 Cumulative Impacts

This section analyzes the potential cumulative effects of the Proposed Action in combination with other past, present, and reasonably foreseeable actions within the same ROI. A cumulative effects analysis determines if a proposed action would be likely to result in adverse impacts when combined with other projects in the study area.

4.1 Applicable Guidance

In accordance with 40 CFR Part 1508.7, and as detailed in CEQ guidance entitled *Considering Cumulative Effects Under the National Environmental Policy Act (1997)* and *Memorandum: Guidance on the Considerations of Past Actions in Cumulative Effects Analysis (24 June 2005)*, the Army must analyze the potential cumulative effects that may occur when considering a proposed action "when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." Each of these actions has the potential to affect resources in the same time and space as a proposed action; as such, these potential combined effects need to be analyzed.

Cumulative effects may be accrued over time and/or in conjunction with other pre-existing effects from other activities in the ROI (40 CFR Part 1508.25). Therefore, previous impacts and multiple smaller impacts should also be considered. Overall, assessing cumulative effects involves defining the scope of the other actions and their interrelationship with a proposed action to determine if they overlap in space and time.

The NEPA, CEQ Regulations, and the Army NEPA Regulations require the analysis of cumulative environmental effects of a proposed action on resources that may often be manifested only at the cumulative level, such as traffic congestion, air quality, noise, biological resources, cultural resources, socioeconomic conditions, utility system capacities, and others. Cumulative effects can result from individually minor, but collectively significant, actions occurring at the same location, over time.

4.2 Region of Influence

The ROI for the cumulative analysis primarily encompasses the SM-1 site and immediate surrounding vicinity; specifically, past, present, and reasonably foreseeable future actions within Fort Belvoir's South Post, as Proposed Action impacts would be localized and occur primarily from dismantlement activities. For certain resources, the cumulative effects analysis examines impacts that could occur in areas outside of South Post, such as the regional airshed for air quality effects, adjacent waterways for runoff effects, and major roadways for traffic congestion on or near the installation. The temporal scope spans the five-year timeline of the Proposed Action (2020 to 2025) to encompass all decommissioning activities (site preparation, material removal, dismantlement, remediation, waste disposal and transportation, and site restoration). By 2025, the site would be fully restored and available for unrestricted use.

4.3 Past, Present, and Reasonably Foreseeable Future Projects

The cumulative analysis identifies projects likely to have the potential for contributing to cumulative effects or the Proposed Action's incremental impact when combined with the potential impact of a past, present, or future project. These projects occur within the ROI and may affect the same resources that would be affected by the Proposed Action.

All past, present, and reasonably foreseeable future projects considered in this cumulative analysis are Army actions. Projects were identified through Army consultation and review of the previously completed Fort Belvoir RPMP EIS (June 2015).

This section presents the past, present, and reasonably foreseeable future projects considered in the cumulative analysis and their anticipated impacts on resource areas analyzed in the EA. As past projects have been assessed in the environmental baseline and are already considered in the impact analysis (**Section 3**), this cumulative analysis focuses on present and reasonably foreseeable future projects. Past projects are only considered if their long-term and operational impacts would occur to similar resource areas at the same time as the Proposed Action, contributing to cumulative impacts. Accordingly, a total of 30 present and reasonably foreseeable future projects on Fort Belvoir are considered in this cumulative analysis. These locations of these projects are shown on **Figure 4.3-1**. They are briefly summarized in **Table 4.3-1**. While detailed timeframes for most of these projects are unknown, these projects are anticipated to occur within the next ten years (2030).

4.3.1 Impacts of Present and Reasonably Foreseeable Future Projects

This section discusses the anticipated impacts of present and reasonably foreseeable future projects on the resource areas analyzed in this EA. This cumulative analysis assumes that proponents of present and reasonably foreseeable future projects are responsible for adherence to federal, state, and local regulations, and would minimize project-specific impacts to the greatest extent practicable through implementation of mitigation and/or minimization measures as well as adherence to construction BMPs and safety standards.

4.3.1.1 Water Resources

Present and reasonably foreseeable future projects are anticipated to increase impervious surface area in the ROI. At least 16 acres of new impervious surface would be developed from the proposed projects. Increased impervious surface area would increase localized storm surge flooding and alter downstream water quality. Construction sites would also be sources of soil and sediment disturbance, causing runoff into nearby waterbodies. Developers, however, are expected to implement stormwater management controls to reduce erosion and sediment transport, as well as incorporate construction BMPs and low impact development measures to reduce the potential for long-term adverse impacts on areas downstream.

Construction of future projects would also result in short-term, minor adverse impacts on groundwater. For example, deep excavations for large-scale development projects would be likely to disrupt groundwater flow. With regard to wetland impacts, the US Route 1 Intersections project could potentially impact wetlands associated with tributaries to Accotink Creek, depending on the scope of the improvements, and the actual extent of wetlands that would be determined through field delineations. Project proponents are expected to obtain coverage under applicable permits issued by USACE in accordance with the CWA and would adhere to avoidance, minimization, and compensatory mitigation to ensure that impacts on Waters of the US (WOUS) would remain minor. None of the projects considered in this cumulative analysis would be located within the 100-year floodplain.

Figure 4.3-1: Cumulative Analysis Projects

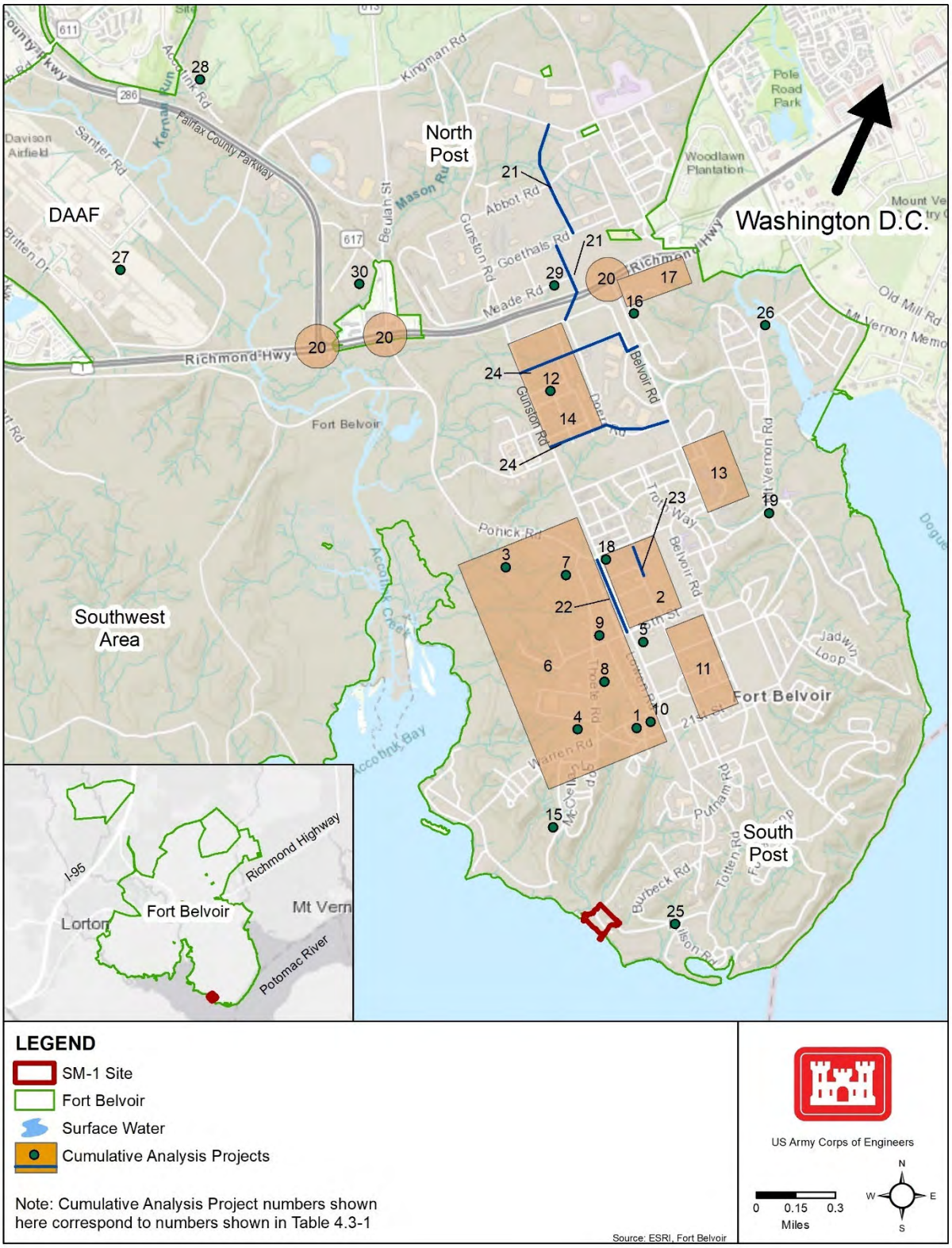

Table 4.3-1: Past, Present, and Reasonably Foreseeable Future Projects

Project No.	Name	Type	Status	Description
1	Pet Care Center	Commercial	Proposed	A 5,200-square-feet (sf) pet care center is planned near the intersection of 21st Street and Warren Road (on a disturbed triangle of land adjacent to Buildings 629 and 630). Associated site improvements include new sidewalks, service and access roads, a parking lot, exterior lighting, and stormwater management devices. This project would result in 0.2 acres of new impervious surface.
2	Town Center District	Commercial	Proposed	The Town Center District (a mixed-use district comprised of administrative, civic, retail and residential space) would be redeveloped to support higher density development and function as a community hub. The updated Town Center District would encompass 80,000 sf of space and decrease the amount of impervious surface in the area. Approximately 400 personnel would be employed following the completion of this project.
3	Regional Stormwater Management Facility	Industrial	Proposed	A regional stormwater management facility is planned on an approximately 2.9-acre site along the east side of Theote Road, north of 16th Street. The facility would provide stormwater detention/retention capacity for runoff from nearby existing and new facilities. Based on previously completed engineering and soils testing, remediation would be required before the site can be developed.
4	Retail Fuel Point	Industrial	Proposed	An unattended vehicle fueling station for military and other federal vehicles is planned near the intersection of Theote and Warren Roads. The proposed 2.78-acre site is currently wooded. Approximately 0.8 acres of new impervious surface would result from development of this project.
5	Vehicle Maintenance Shop	Industrial	Proposed	A new, general-purpose vehicle maintenance facility is planned for a site along the south side of 16th Street and east of Gunston Road. The facility would include drive-through maintenance bays, small arms maintenance areas, storage rooms, administrative space, and loading docks. The 25,565-sf facility would connect to existing utility systems serving South Post and require additional piping for potable water and a sanitary sewer line. The project would create pervious surfaces.

Table 4.3-1: Past, Present, and Reasonably Foreseeable Future Projects

Project No.	Name	Type	Status	Description
6	Industrial Area District	Industrial	Proposed	The Industrial Area District is located between the western post boundary and Gunston Road, south of Pohick Road and north of 21st Street. The district would be redeveloped as a more modern, functional, and efficient warehouse and storage district to create transition zones between heavy and light industrial uses and office and community support uses. The redeveloped area would comprise approximately 20,000 sf of space and up to 100 additional personnel would be employed after the site is redeveloped.
7	Outfall 15	Industrial	Proposed	Industrial Stormwater Outfall #0015 would be repaired and restored in order to properly discharge at a lower velocity. An updated conveyance and outfall structure would be installed to maintain or enhance watershed health, species recovery, and diversity.
8	249th Battalion HQ	Institutional	Under Construction	A new HQ complex is planned for the site of an existing recreational vehicle parking area near the intersection of Theote Road and 16th Street. Site preparations and improvements would include demolishing three buildings totaling 22,000 sf, extending utility connections, and constructing parking areas, access roads, sidewalks, site lighting, security fencing, and gates.
9	INSCOM Controlled Humidity Warehouse	Institutional	Proposed	The project, near the intersection of Theote Road and 16th Street, would provide a warehouse with a climate-controlled environment for Fort Belvoir tenants engaged in intelligence-gathering activities. The 57,116-sf facility would be built on a previously disturbed site that is primarily characterized by paved areas, small areas of maintained lawn, scattered shrubs and trees, and portions of Buildings 1144 and 1145.
10	Information Systems Facility for the Network Enterprise Center (NEC)	Institutional	Proposed	A new 75,000-sf data center is planned on a site along the north side of Warren Road and west of Gunston Road. The site is previously disturbed. Approximately 0.3 acres of impervious surface would result from this project.

Table 4.3-1: Past, Present, and Reasonably Foreseeable Future Projects

Project No.	Name	Type	Status	Description
11	Historic Core District	Institutional	Proposed	The Historic Core district is the oldest developed area on post and would be updated with new structured parking (between 16th and 18th Streets) and a new administrative building (south of 19th Street). The new facilities would total approximately 40,000 sf. Up to 300 additional personnel may be employed at the new administrative building.
12	Secure Administrative Facility	Institutional	Proposed	A 107,193-sf administrative facility is planned on a parcel east of Gunston Road, between 3rd and 5th Streets. The project consists of two separate sites, primarily comprising paved areas and office buildings. Approximately 0.35 acres of additional impervious surface would be created.
13	Administrative Campus District	Institutional	Proposed	An approximately 10-acre site in the Administrative Campus District would be redeveloped to create a high-density administrative campus. Up to 800 additional personnel may be employed on the site after construction has finished. The project would result in 1.8 acres of additional impervious surface.
14	1400 East District	Institutional	Proposed	The 1400 East District is an administrative center comprised of single and multi-tenant office buildings. Redevelopment efforts include demolition of existing buildings and parking lots, and construction of new office buildings with more parking structures. Approximately 1,330 additional personnel would work in this area.
15	Family Travel Camp Phase 2	Recreation	Proposed	A family travel camp is planned for a cleared, previously disturbed site along the west side of Morrow Road. The facility would include 15 pre-fabricated rustic cabins, a picnic shelter, and a campfire pit. Each cabin would have two bedrooms, a bathroom, kitchen space, and a living room, as well as water, sanitary sewer, electrical utilities, and vehicle parking.
16	Fisher House 2	Residential	Proposed	Fisher Houses provide free or low cost lodging to veterans and military families receiving treatment at military medical centers. Fisher House 2 will be the second facility, built directly north of Fisher House 1. The house will be approximately 10,000 sf.

Table 4.3-1: Past, Present, and Reasonably Foreseeable Future Projects

Project No.	Name	Type	Status	Description
17	South Post Community Support District	Residential	Proposed	An approximately 12-acre site in the South Post Community Support District would be developed for medical-related and community support use. Up to 300 additional personnel would be employed in this area and approximately 3.5 acres of impervious surface would be created.
18	Transit Hub	Transportation	Proposed	A new transit transfer center would be constructed at either Pence Gate (to connect the Medical District to US Route 1) or at 12th Street and Gunston Road (to connect the Town Center to existing public transit services). The final location would be determined based on demand. Approximately 2.2 acres of impervious surface would be developed.
19	On-Post Intersection and Road Improvements	Transportation	Proposed	A variety of improvements will be implemented to reduce traffic impacts. Improvements may include new traffic signals, adjustments to existing traffic signal timing, and the addition of new entry turn lanes.
20	US Route 1 Intersections	Transportation	Proposed	Following the widening of Route 1, monitoring work would be conducted at intersections along US Route 1 at Fairfax County Parkway, Pohick Road, and Belvoir Road to determine needs for future improvements. Improvements may include adding turning lanes, extending existing lanes, or re-striping lanes.
21	US Route 1 Overpass	Transportation	Proposed	A new overpass would be constructed on US Route 1, in addition to a two-lane road connecting 1st Street and Gorgas Road. This addition would improve connections between North Post and South Post, as well as alleviate the traffic congestion concentrated on Gunston Road.
22	Gunston Road from 12th Street to 16th Street	Transportation	Proposed	Street expansion would occur for Gunston Road, from 12th Street to 16th Street. The roadway would be widened to four lanes.
23	13th Street Improvements	Transportation	Proposed	13th Street would be converted from one-way to two-way traffic and connect to 12th Street as part of the future Town Center redevelopment.

Table 4.3-1: Past, Present, and Reasonably Foreseeable Future Projects

Project No.	Name	Type	Status	Description
24	Internal Cross Streets	Transportation	Proposed	3rd Street and 6th Street would be extended to connect with north-south roads. These streets would be connected to Gunston Road on the west and Belvoir Road on the east to offer more routes for traffic. Approximately 1.7 acres of impervious surface will be created.
25	Road Repairs	Transportation	Proposed	Routine road repairs and maintenance (e.g., paving) to roads in the 300 Area are proposed to occur in FY2019.
26	Dogue Creek Bridge Renovation	Infrastructure	Proposed	The existing bridge superstructure crossing Dogue Creek, near Walker Gate, is proposed for renovation. A final EA has been prepared along with a draft FNSI.
27	Davison Army Airfield (DAAF) Area Development Plan (ADP)	Institutional	Proposed	The DAAF ADP proposes to upgrade and replace an aging, undersized, inadequate, and inefficiently laid out physical infrastructure to allow DAAF to fully support its tenants' ongoing missions and eliminate the temporary waivers under which the airfield is currently operating.
28	National Museum of the US Army (NMUSA)	Commercial	Under Construction	The NMUSA facility would include: the main museum building (3.6-acre multi-story building with exhibit halls, a theater, food and retail areas, and administrative spaces); an armored tank simulator on a 2,000-square foot pad; 1.3-acre memorial garden; 4-acre parade ground and grandstand; a 6,700-square foot amphitheater; a 3,000 feet long educational trail; and a 2,000-square-foot powder storage building. Roads, parking lots, and infrastructure improvements are also proposed for the NMUSA project.
29	Lieber Gate	Institutional	Under Construction	A new access control point, including a new gate and roadway connecting Richmond Highway to Gunston Road would provide direct access from Richmond Highway to North Post. The facility would replace the former Lieber Gate.

Table 4.3-1: Past, Present, and Reasonably Foreseeable Future Projects

Project No.	Name	Type	Status	Description
30	911th Engineering Complex	Institutional	Proposed	A new consolidated complex for the 911th Engineering Company is proposed. The 39,810-square foot building would comprise a tactical equipment maintenance facility, an administrative facility, an equipment and oil storage facility, vehicle parking, and a vehicle storage facility. The new complex would be built on an 8.5-acre site between the Fairfax County Parkway and Accotink Village. Approximately 110 added personnel are anticipated.

4.3.1.2 Air Quality

Construction of present and future projects would result in less than significant adverse impacts on air quality from the handling and transport of excavated materials that would generate direct and indirect criteria pollutant emissions, as would use of heavy-duty, diesel-powered trucks and equipment on site and traveling to and from the site. Construction activities would produce fugitive dust, while stationary equipment would generate HAP emissions. Anticipated emissions are generally typical of construction sites and would not exceed threshold levels. In the long term, commercial and industrial projects, such as the redeveloped Town Center District, NMUSA, and Vehicle Maintenance Shop, may generate emissions from building operations. Proposed road improvements may also contribute to an increase in anticipated emissions from changes in traffic patterns, although impacts would be minimized from the staggered and intermittent phasing of transportation projects as they would not all occur at the same time.

An increase in emissions during operation of present and reasonably foreseeable future projects is not expected to contribute to adverse effect on overall air quality in the regional airshed as VDEQ requires permits for stationary sources of air pollution, including major and minor sources. All projects must certify compliance with applicable requirements of VDEQ standards. Actions that require air permits would be in compliance with state air quality standards, while actions that do not require air permits would not contribute significantly to adverse air quality impacts. Project proponents would be responsible for complying with local and regional air quality standards.

4.3.1.3 Biological Resources

Present and reasonably foreseeable future projects in the ROI would disturb biological resources. Construction activities would require vegetation clearing and tree removal, resulting in loss of plant communities and vegetation resources. In areas of temporary disturbance (e.g., construction staging areas and access roads), trees and vegetation would be replaced after construction activities cease. Permanent removal of vegetation would adhere to the Fort Belvoir Tree Removal and Protection Policy, ensuring replacement of trees on the installation. The conversion of pervious to impervious surfaces for commercial development would also reduce the amount of shrubs, trees, and cover available to wildlife, as would clearing for site access and equipment staging. The majority of present and reasonably foreseeable future projects, however, take place on previously disturbed and/or already developed land.

Wildlife may be temporarily displaced by construction efforts, although the consequence would be negligible to species accustomed to changes in urban and suburban environments. To further minimize and avoid impacts, any disturbance toward sensitive species would require adherence to construction BMPs and permit conditions (e.g., seasonal restrictions and buffers).

4.3.1.4 Radiological

Present and reasonably foreseeable future projects would not produce, manage, or dispose of any radiological materials or wastes. Therefore, no adverse cumulative radiological impacts from potential contaminants, exposures, or accidents would occur.

4.3.1.5 Occupational Safety and Health

Potential adverse impacts of present and reasonably foreseeable future projects on health and safety would occur during construction. Construction activities can be sources of accidents and safety hazards, contributing to the potential for a physical injury or fatality or an exposure to a hazardous substance. In the long term, projects requiring operational maintenance, such as transportation projects requiring routine repairs, would pose an occupational risk to maintenance workers. With the adherence to standard construction BMPs, safety protocol,

and hazardous waste management plans, however, contractors would minimize any potential significant health and safety risks. Further, construction sites would be fenced and only accessible to contractors; thus, any risks to the safety of passers-by would be unlikely. Any injuries that occur from present and reasonably foreseeable future projects would not exceed the existing or future capabilities of nearby emergency services and health care centers.

4.3.1.6 Cultural Resources

Minor adverse impacts on cultural resources from ongoing and proposed projects would be anticipated from construction activities. Construction activities would potentially present visual impacts while producing residual dust, noise, and vibrations, which may affect the physical and acoustic environment of nearby historic properties during the construction periods. Construction activities, such as development of the new parking structure in the Historic Core District, could potentially present visual impacts while producing residual dust, noise, and vibrations, which may affect the physical and acoustic environment of nearby NRHP-eligible properties during the construction periods. Potential minor adverse impacts could also occur from development and excavation activities that could affect archaeological resources and unanticipated cultural discoveries. However, these activities would occur in already developed and disturbed areas and any potential historic impacts would cease once construction has ended. Potential minor adverse impacts could also occur from development and excavation activities that could affect archaeological resources and unanticipated cultural discoveries.

Per Section 106 requirements, consultation on any federal action is required to determine: (1) historic resources in the APE prior to approval; and (2) a resolution or avoidance of any potential adverse impacts. Therefore, activities that are required to comply with Section 106 would include a construction monitoring plan and other mitigation measures designed to avoid or minimize impacts on archaeological and historic resources. In addition, if impacts are unavoidable, recovery of the resources would occur prior to construction; coordination with the SHPO would be expected to mitigate adverse effects.

4.3.1.7 Transportation

Construction of planned and ongoing projects would have short-term adverse impacts on transportation and traffic in the ROI. There would be an increase in construction vehicles on the road that would add to existing traffic. Construction workforces commuting to and from construction sites would potentially cause traffic delays and interference with parking availability, as well as increase the risk for traffic-related accidents, particularly those projects requiring larger workforces such as the DAAF ADP and NMUSA projects. In addition, transportation improvements, such as Dogue Creek Bridge renovations and new roads developed as part of the NMUSA, would exacerbate congestion by requiring road closures and street realignments during widening, resurfacing, and repair efforts. As other project actions on Fort Belvoir would not occur at the same time, adverse impacts on transportation would be temporary and cease once construction efforts have ended.

Conversely, proposed transportation improvements would benefit traffic conditions in the long term by increasing roadway capacity and alleviating congestion. The Internal Cross Streets project would connect east-west roads to north-south roads in an effort to offer more routes for traffic, while the new US Route 1 Overpass would increase connectivity between North and South Posts and also minimize localized traffic concentrations. Similarly, the new Lieber Gate access control point would provide direct access from Richmond Highway to North Post. It is assumed that current and future capacity of the transportation network would be able to accommodate any increases in personnel. A variety of intersection and road improvements, such as new traffic signals, additional turn lanes, and wider roads, would improve circulation and road conditions in the ROI in the long term.

4.3.1.8 Non-Radioactive Hazardous Materials and Non-Hazardous Solid Waste

The primary adverse impact of present and reasonably foreseeable future projects on non-radioactive hazardous materials and waste include discharge, spills, and potential contamination during construction efforts, as well as encounters with unexpected hazardous materials. Any construction activities requiring ground intrusion would potentially cause subsurface disturbance of hazardous materials and contribute to the spread of contaminants (if present) into the environment, leading to runoff of contaminated soil and groundwater. Adverse impacts may also occur from the operation of several institutional and commercial projects that may generate hazardous waste (e.g., Retail Fuel Point and Vehicle Maintenance Shop). To minimize adverse impacts, it is expected that appropriate controls, as well as proper permitting and compliance, would be in place to prevent exposure and the spread of contamination; thus, short-term adverse impacts would be less-than-significant. In addition, any non-hazardous waste would be disposed of appropriately in available landfills.

4.3.1.9 Geomorphological Resources

Construction of ongoing and future projects would disturb soils, as installation of foundation piles would require extensive excavation and fill work. The process of excavating native soils for development typically results in a loss of soil structure and a mixing of horizons. While clean soils are often placed back into the excavated areas as fill, the mixing of the soils results in a long-term loss of productivity. Construction activities would also cause increased erosion and sediment runoff. Present and future projects are not anticipated to involve in-water work; thus, subaqueous bottomlands and sediment within Gunston Cove would not be affected. Site-specific E&SC plans would minimize impacts on soils. As construction would be temporary and mostly occur in previously disturbed areas, impacts from construction of present and reasonably foreseeable future projects would be minor. In the long term, there could be potential benefits from removal of contaminated soil. The Regional Stormwater Management Facility project would require remediation efforts prior to site development. Clean-up efforts from present and future projects would contribute toward cleaner and healthier soils in the ROI.

4.4 Assessment of Cumulative Impacts

The thresholds for significance of cumulative effects take into account the thresholds for significance of each resource area, as described throughout **Section 3**. Cumulative impacts are considered to be potentially significant if the Proposed Action's additional impact on the effects of past, present, and reasonably foreseeable future projects is substantial enough to measurably affect the resource area. The term "measurably" is defined as being noticeable or detectable to a reasonable person.

4.4.1 Cumulative Effects under the No Action Alternative

Under the No Action Alternative, decommissioning of the Deactivated SM-1 Nuclear Reactor Facility would not occur. SM-1 would remain in the current SAFSTOR condition for the foreseeable future. Overall site conditions would remain unchanged as no decommissioning or dismantlement activities would take place; therefore, the No Action Alternative would not result in any significant incremental effects. In conjunction with past, present, and reasonably foreseeable future projects, the No Action Alternative would result in no cumulative impacts.

4.4.2 Cumulative Effects under the Proposed Action Alternative

Based on the assessed potential incremental impacts of the Proposed Action Alternative (**Section 3**) and the anticipated effects of the present and reasonably foreseeable future activities considered in this cumulative analysis, there would be no significant adverse cumulative impacts from the Proposed Action Alternative. In general, both the Proposed Action Alternative and present and reasonably foreseeable future projects would result in similar less than significant adverse effects on all resource areas, with the exception of radiological

impacts. Minor overlapping impacts would occur primarily from construction and demolition activities, particularly affecting air quality from construction equipment use, traffic congestion from movement of construction workforces on and around Fort Belvoir, and stormwater runoff from ground disturbance; these impacts would be temporary and short-term. Potential adverse impacts would be minimized by adhering to federal, state, and local regulations; construction BMPs; permit conditions; and environmental monitoring and safety plans. When combined, the resulting cumulative impact would not be significant.

There would be no cumulative radiological impacts as the present and future projects are not anticipated to handle radiological materials, generate radiological waste, or emit radiological discharges. Thus, there would be no potential for radiological exposure or accidental release. The less-than-significant adverse radiological impacts of the Proposed Action Alternative when combined with no radiological impacts of present and future projects would result in no cumulative effect.

While the Proposed Action Alternative would result in a potentially adverse effect on cultural resources from the dismantlement and disturbance of historical properties, it would not result in potentially significant cumulative impacts when combined with present and reasonably foreseeable future projects. Decommissioning and dismantlement activities at SM-1 would have no potential to contribute to cumulative visual or acoustic impacts in the Historic Core District; cultural impacts from the Proposed Action Alternative would remain in portions of the 300 Area adjacent to or near the SM-1 site and would not interact with past, present, or reasonably foreseeable future projects. Anticipated effects of the present or future projects would not significantly affect cultural resources, especially with implementation of construction BMPs and minimization measures. In addition, the Proposed Action Alternative would minimize potentially significant effects on cultural resources to less-than-significant levels with adherence to federal and state regulations, in compliance with Section 106.

Once decommissioning and dismantlement is complete, the site would be restored to a vegetated, permeable condition. Fort Belvoir would then maintain and manage the site for the foreseeable future. Although the long-term future use of the site is not discernable, no long-term adverse cumulative impacts would be expected. Cumulative benefits to the transportation network in the ROI may result from roadway improvements and repairs. Overall, the Proposed Action Alternative would result in negligible or less-than-significant adverse cumulative impact, and minor beneficial impacts, when taken into consideration with the effects of other past, present, and future actions in the ROI.

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5 Conclusion

This EA has evaluated the potential environmental effects of USACE's proposed decommissioning and dismantlement of the Deactivated SM-1 Nuclear Reactor Facility. The Proposed Action includes site preparation; removal of facility components, on-site structures, and radiological and non-radiological materials; waste transport and disposal; site restoration, and termination of the facility's Decommissioning Permit. The Proposed Action Alternative was evaluated in addition to the No Action Alternative. Based on the analysis conducted in this EA, the Proposed Action would have no significant adverse impact, either individually or cumulatively, on the environment with adherence to mitigation and minimization measures. Implementation of minimization measures and construction BMPs would further reduce or avoid any other adverse impacts. While potentially significant adverse impacts on cultural resources could occur, mitigation and agency coordination would ensure such impacts remain less than significant. The SM-1 Reactor Facility is eligible for listing in the NRHP; however, consultation between USACE and the SHPO has resulted in a MOA to address the mitigation efforts. Furthermore, the Proposed Action would comply with all federal and state regulations, guidelines, and agreements.

For these reasons, adverse impacts on resources analyzed in this EA would not meet the conditions requiring preparation of an EIS listed 32 CFR Part 651.41. The Army has determined that the Proposed Action is not an action normally requiring preparation of an EIS as defined at 32 CFR Part 651.42. A FNSI is the appropriate decision document for the Proposed Action.

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7 Distribution of the Draft EA

The individuals and organizations listed in **Table 7-1** will be notified of the availability of the Draft EA for review during the six-week public comment period.

Table 7-1: Distribution of the Draft EA

Name	Title/Role	Affiliation	Mailing Address
Elected Officials - Federal			
Donald S. Beyer, Jr.	Representative in Congress	US House of Representatives	1119 Longworth House Office Building Washington, DC 20515
Mark R. Warner	Senator of Virginia	US Senate	703 Hart Senate office Building Washington, DC 20510
Timothy M. Kaine	Senator of Virginia	US Senate	231 Russell Senate Office Building Washington, D.C. 20510
Gerald E. Connolly	Representative in Congress	US House of Representatives	424 Cannon House Office Building Washington, DC 20515
Elected Officials - State			
Ralph Northam	Governor of Virginia	Office of the Governor	P.O. Box 1475 Richmond, VA 23218
Mark D. Sickles	State Representative	Virginia House of Delegates	P.O. Box 10628 Franconia, VA 22310
Scott A. Surovell	State Senator	Virginia Senate	P.O. Box 289 Mount Vernon, VA 22121
Elected Officials - County			
Sharon Bulova	Chairman	Fairfax County Board of Supervisors	Fairfax County Government Center 12000 Government Center Parkway, Suite 530 Fairfax, VA 22035
Dan Storck	Mount Vernon District Supervisor	Fairfax County Board of Supervisors	Mount Vernon Governmental Center 2511 Parkers Lane Mt. Vernon, VA 22306
Federal Agencies			
Rob Tomiak	Director	US Environmental Protection Agency Office of Federal Activities	Ariel Rios Building 1200 Pennsylvania Avenue, NW Mail code: 2251A Washington, DC 20460
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Table 7-1: Distribution of the Draft EA

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Frank Smigelski	Senior Environmental Specialist	Federal Aviation Administration Airport Planning and Environmental Division (APP-400)	800 Independence Avenue, SW Washington, DC 20591
Jeffrey Breeden	Community Planner	Federal Aviation Administration Washington Airports District Office	23723 Air Freight Lane, Suite 210 Dulles, VA 20166
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Genevieve LaRouche	Supervisor	US Fish and Wildlife Service Chesapeake Bay Field Office	117 Admiral Cochrane Drive Annapolis, MD 21401-7307
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Caitlin Totherow	Tribal Historic Preservation Officer	Catawba Indian Nation Tribal Historic Preservation Office	1536 Tom Steven Road Rock Hill, SC 29730
Russell Townsend	Tribal Historic Preservation Officer	Eastern Band of Cherokee Indians	Qualla Boundary P.O. Box 455 Cherokee, NC 28719
Robert Gray	Chief	Pamunkey Indian Tribe	Pamunkey Indian Reservation 191 Lay Landing Road King William, VA 23086
Stephen R. Adkins	Chief	Chickahominy Indian Tribe	8200 Lott Cary Road Providence Forge, VA 23140
Gerald Stewart	Assistant Chief	Chickahominy Indian Tribe, Eastern Division	2895 Mount Pleasant Rd Providence Forge, Virginia
Frank Adams	Chief	Upper Mattaponi Tribe	P.O. Box 184 King William, VA 23086

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Samuel Bass	Chief	Nansemond Indian Nation	1001 Pembroke Lane Suffolk, VA 23434
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Name	Title/Role	Affiliation	Mailing Address
Regional Agencies			
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Jim Corcoran	President & CEO	Northern Virginia Chamber of Commerce	7900 Westpark Drive, Suite A550 Tysons, VA 22102-3853
Kanathur Srikanth	Director	Metropolitan Washington Council of Governments Department of Transportation Planning	777 North Capitol Street, NE, Suite 300 Washington, DC 20002
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Richard R. Bowers, Jr.	Chief	Fairfax County Fire and Rescue Department	4100 Chain Bridge Road, 7th Floor Fairfax, VA 22030
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Gerald L. Gordon, Ph.D.	President and CEO	Fairfax County Economic Development Authority	8300 Boone Boulevard, Suite 450 Tysons Corner, Virginia 22182
Elizabeth Crowell	Branch Manager	Fairfax County Cultural Resources Management and Protection Branch	James Lee Center 2855 Annandale Road Fairfax, VA 22042
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Ken Gaffey	President	Inlet Cove Board of Directors	7035 Regional Inlet Drive Fort Belvoir, VA 22060
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Patricia Soriano	Chapter Delegate, Political Chair, Parks and Public Lands	Mount Vernon Group, Sierra Club	5405 Barrister Place Alexandria, VA 22304
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Name	Title/Role	Affiliation	Mailing Address
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Kingstowne Library	N/A	Fairfax County Public Library	6500 Landsdowne Centre Alexandria, VA 22315-5011
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