

DOE/EIS-0247-SA-03

Supplement Analysis:
Spallation Neutron Source
Second Target Station
Oak Ridge National Laboratory
Oak Ridge, Tennessee



U.S. DEPARTMENT OF
ENERGY

Office of
Science

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Introduction

The Department of Energy (DOE) has prepared this Supplement Analysis (SA) to evaluate the existing Environmental Impact Statement (EIS) (listed below) considering changes that could have bearing on the potential environmental impacts previously analyzed.

DOE's NEPA regulations state that when it "is unclear whether or not an EIS supplement is required, DOE shall prepare a Supplement Analysis" (10 CFR 1021.314(c)). This SA provides enough information for DOE to determine whether (1) to supplement the existing EIS, (2) to prepare a new EIS, or (3) no further NEPA documentation is required (10 CFR 1021.314(c)(2)(i)–(ii)).

Existing NEPA documentation evaluated in this SA:

- DOE/EIS-0247 Final Environmental Impact Statement Construction and Operation of the Spallation Neutron Source Facility dated April 1999, available using the following URL address: <https://www.energy.gov/nepa/eis-0247-construction-and-operation-spallation-neutron-source>
- DOE/EIS-0247-SA-01 Supplement Analysis Proposed Change to Superconducting Linear Accelerator at the Spallation Neutron source Oak Ridge, Tennessee dated February 2000, available using the following URL address: <https://www.energy.gov/nepa/listings/eis-0247-documents-available-download>
- DOE/EIS-0247-SA-02 Supplement Analysis: Spallation Neutron Source Second Target Station Oak Ridge National Laboratory Oak Ridge, Tennessee dated July 2021, available using the following URL address: <https://www.energy.gov/nepa/listings/eis-0247-documents-available-download>

Background

The Spallation Neutron Source (SNS) Second Target Station (STS) project is an upgrade to the existing SNS wherein a second target station with its own instrumentation and supporting infrastructure is added to the existing accelerator facility. The STS was included in the original SNS EIS as part of the proposed action.

The STS project will provide researchers from a wide range of disciplines with a facility that offers wholly new experimental capabilities for addressing key questions in science, engineering, and human health. This STS project also seeks to keep the United States at the forefront of neutron scattering technology.

The STS will utilize the existing SNS accelerator, storage ring, and infrastructure. The preliminary project scope meets the mission need through construction of the following:

- The STS will include the capability to support 22 new beamlines. Instrument Systems will deliver advanced neutron scattering instruments to multiply the greater than 20x

increase in STS cold neutron brightness relative to the First Target Station (FTS) and capitalize on neutrons with moderate wavelength resolution as a source for reflectometry, medium-resolution spectroscopy, and high-intensity instruments.

- A water cooled rotating solid tungsten target with closely coupled compact moderators.
- A ring to second target (RTST) beam transport line, operating at 15hz pulse, will transport proton pulses to the STS target by separating the beam from the first ring to the target beam transfer line (RTBT) with a septum magnet and then transporting the beam to the second target with standard quadrupole magnets and dipole magnets.
- Integrated Control Systems include the control systems and computing infrastructure for the accelerator, neutron scattering instruments, and target; control systems for technical-systems utilities for conventional facilities; plus, the data acquisition software and hardware for the neutron scattering instruments.
- New building structures to house the second target, instrument halls, beam transport line, secondary facilities, and supporting systems and infrastructure.

The SNS initially included an FTS with a capacity of 24 instrument beamlines. The provision for the STS in the original EIS was included to accommodate growth and expansion of the accelerator facilities, target facilities, instrument buildings, laboratories, offices, and secondary supporting facilities.

The STS project requires substantial site development at the SNS campus, including up to approximately 400,000 gross square feet of new building construction. In addition to the individual building sites, the project includes underground site utilities, roadways and parking areas, storm water management and landscaping. The site design also accommodates temporary construction staging, trailers, parking, and access roads.

DOE completed an initial SA (DOE/EIS-0247-SA-01) for the SNS in February 2000. The original SNS EIS analyzed environmental impacts over the projected life of the facility, both operating at an initial power level of 1 megawatt (MW) and at the maximum potential upgrade power level of 4 MW. SA-01 evaluated a superconducting linear accelerator (linac) proposed as a replacement for a portion of the ambient temperature linac that was included in the Project Baseline.

Project planning in 2021 identified a need to expand the existing SNS construction area for the STS by clearing and developing nearby greenfield space for a construction support area and alternative construction access road from Bethel Valley Road. DOE prepared a second SA (DOE/EIS-0247-SA-02) to address the potential environmental impacts of the proposed construction support area and new access route. SA-02 also included a brief comparison of actual radiological impacts since SNS operations commenced and potential radiological impacts identified in the original EIS.

The selected construction support area is located to the east of the existing SNS (Figure 1). Construction support area access alternatives from Bethel Valley Road included the existing Walker Branch roadway and the unimproved Hawks Nest roadway. The Hawks Nest access was the preferred option to eliminate construction impacts to the Walker Branch environmental

study area (Figure 1). The Hawks Nest alignment was also preferred because it would have limited construction traffic through the existing roadway network to avoid potential conflicts between SNS personnel, visitors, and existing facilities operations.

Proposed Change or New Information

After the completion of SA-02, subsequent planning and design phase activities further evaluated proposed STS site civil improvements, including the proposed construction access road to the construction support area. The evaluation identified the need for an additional 11.5 acres of greenfield located adjacent to the previously evaluated construction support area to be used for disposition of excavated soil spoils (Figure 2). It also revealed conflicts of the Hawks Nest alignment with an existing scrap wood burn area and the negative impacts of adding an additional intersection and traffic light on Bethel Valley Road. This prompted identification of two additional alternative access road alignments for evaluation. DOE evaluated each alignment based on a series of site planning decision factors including impacts to SNS traffic flow and pedestrians. The construction access road selected includes use of Spallation Drive and a spur road to the northeast that would connect with the upper portion of the previously proposed Hawks Nest alignment. Use of Spallation Drive would include a proposed deceleration lane to facilitate construction traffic turning onto the spur road. The spur road from Spallation Drive would be located just south of the ORNL Guest House (Figure 2). The current construction access road and associated deceleration lane require an additional 0.5 acre of greenfield to accommodate the proposed alignment.

Including the area evaluated in SA-02, the total area to be cleared for the construction of the STS (beyond the original EIS project area) is approximately 85 acres. This includes the approximately 73-acre construction support area from SA-02, the additional 11.5-acre area for the construction soil spoils area, and the additional 0.5 acres needed for the new construction access road from Spallation Drive (Figure 2). DOE prepared this SA to evaluate the potential environmental impact of these new changes.

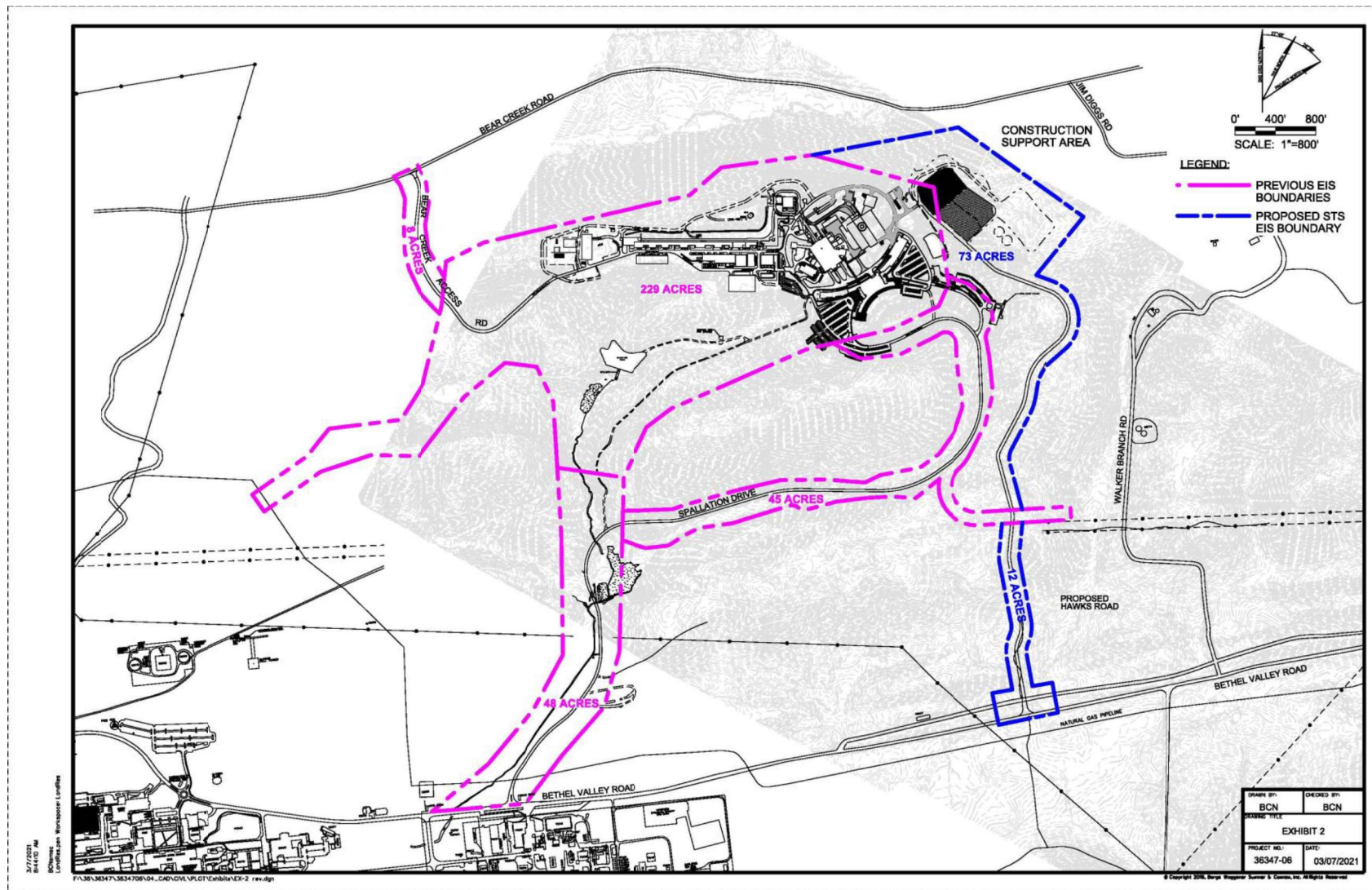


Figure 1 (SA-02)

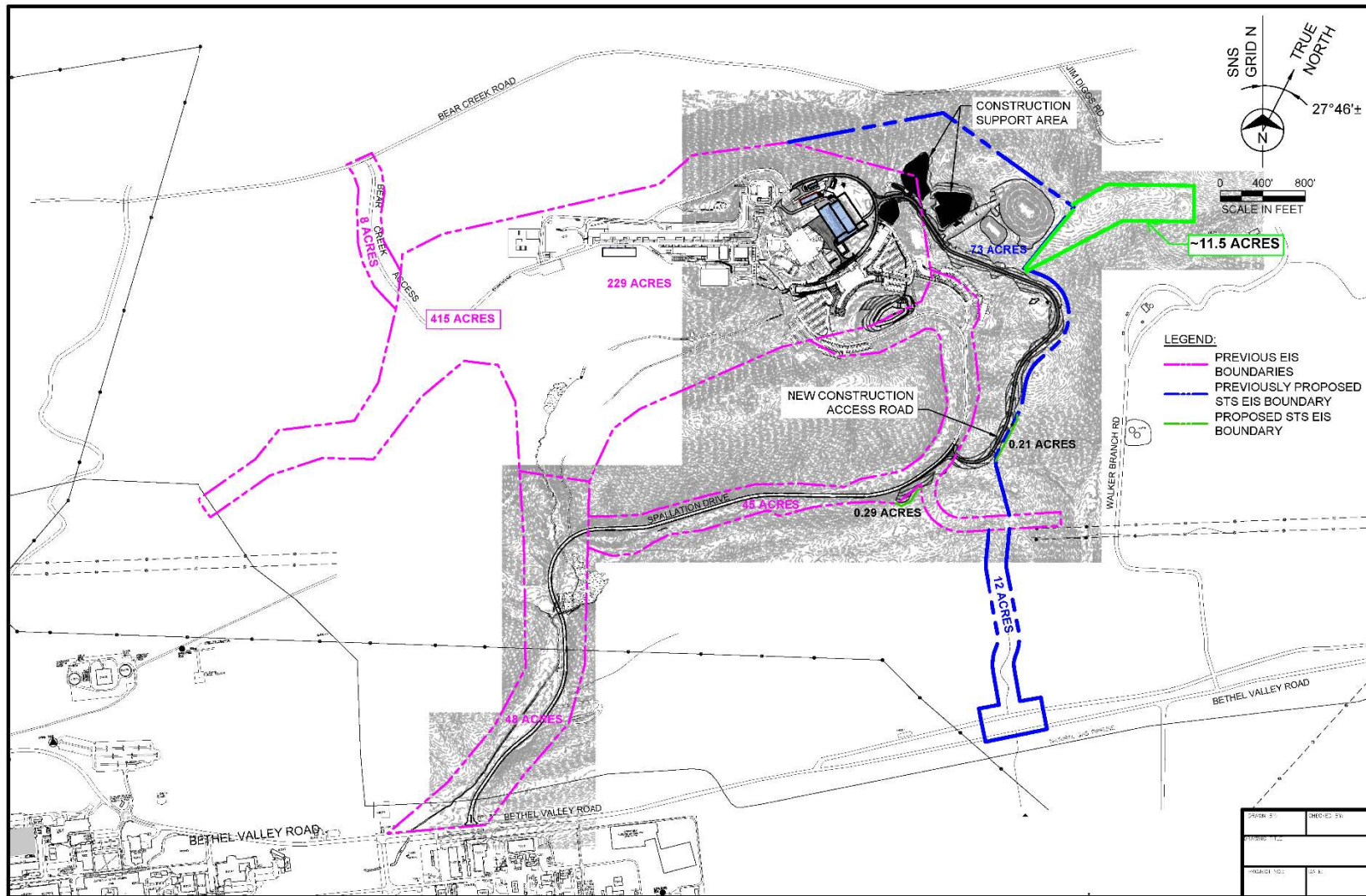


Figure 2 (SA-03)

Resource Areas Considered but Not Analyzed in this SA Document

Water Resources – Construction of the existing SNS had no effect on floodplains. Implementation of best management practices (BMPs) for erosion and siltation control minimized any potential increase in run-off from disturbed areas. The STS project area overlaps the drainage area of White Oak Creek and a minor portion of the drainage area for Bear Creek. White Oak Creek is part of ORNL's Natural Resources program and National Pollutant Discharge Elimination System (NPDES) regulatory compliance and sampling program.

Changes in the topography of the White Oak Creek drainage area during construction of the STS could have potential downstream hydrologic effects impacting stormwater runoff flows to the creek. During construction BMPs such as erosion and siltation controls will be utilized to avoid adverse impacts associated with soil disturbance. Disturbed areas post construction will be properly stabilized in accordance with NPDES stormwater construction permit requirements minimizing any potential adverse impacts. ORNL will monitor White Oak Creek for hydrologic impacts because of the STS project. Downstream hydrologic impacts to Bear Creek are expected to be negligible.

The addition of the STS construction support area and new information associated with the addition of the long-term stockpile storage area for excavated soils and new construction access road does not affect the analysis and conclusions in the EIS. Wet weather conveyances, and portions of stream and wetland within the STS project construction area are discussed in the Ecological Resources section of SA-02.

Air Quality – Construction of the existing SNS produced temporary increases in suspended particulates (primarily fugitive dust) from clearing, excavation, and land contouring. Combustion of natural gas during operations primarily emits carbon dioxide, carbon monoxide, nitrogen dioxide, and particulate matter (less than 10 microns in diameter). Off-site levels of all pollutants were estimated to be less than 20 percent of the National Ambient Air Quality Standards. The addition of the STS construction support area and new information does not affect the analysis and conclusions in the EIS.

Noise – Noise sources associated with SNS operations are relatively minor and consistent with ongoing activities in the surrounding ORNL area. The addition of the proposed STS construction support area and new information does not affect the analysis and conclusions in the EIS.

Cultural Resources – Construction and operation of the existing SNS did not have any effects on prehistoric or historic resources or traditional cultural properties. The addition of the proposed STS construction support area and new information does not affect the analysis and conclusions in the EIS. A walkover survey and records search did not identify the presence of any cultural resources (archaeological remains or artifacts) and consultation with the Tennessee State Historic Preservation Office will not be required. The proposed action falls under Level One: Programmatic Exclusions of the ORNL Historic Preservation Plan (ORNL/TM-2004/62, April 2004) at "m" (Non-Contributing Properties). No objects of historical significance would be disturbed, and there would not be adverse effects to any structure eligible for inclusion in the National Register of Historic Places.

Land Use – Construction and operation of the existing SNS raised concerns about the impacts on the National Oceanic and Atmospheric Administration/Atmospheric Turbulence and Diffusion Division (NOAA/ATDD) Temperate Deciduous Forest Continuous Monitoring Program (TDFCMP) in the Walker Branch Watershed and other long-term ORNL ecological research projects in the area. To mitigate the potential adverse effects on the TDFCMP, the NOAA/ATDD meteorological monitoring tower was replicated atop Chestnut Ridge, west of the SNS. There have been no adverse impacts to the TDFCMP and other ecological research projects from operation of the SNS. The NOAA/ATDD also determined that increases in water vapor emissions with the addition of the SNS would not impact the ongoing research in the Walker Branch Watershed. The addition of the proposed STS construction support area and new information does not affect the analysis and conclusions in the EIS and no protected land use areas would be disturbed.

Human Health – A brief comparison of actual radiological impacts since SNS operations commenced and potential radiological impacts identified in the original EIS was included in SA-02. Total estimated radiological emissions from the SNS including the STS would contribute approximately 0.11 mrem/year to the maximally exposed individual, or approximately 1% of the 10-mrem limit. Considering population density and proximity, these estimated emissions were determined to have minimal effects on the health of workers and the public and further analysis is not required. Changes to the proposed action would have no effect on radiological emissions and new information does not affect the analysis and conclusions in the EIS and SA-02.

Support Facilities and Infrastructure – During construction and operation of the SNS, increased general congestion over current traffic levels were predicted for existing access roads. Although some utility infrastructure construction was required, there was and is adequate capacity to supply the SNS. The addition of the proposed STS construction support area and new information does not affect the analysis and conclusions in the EIS and SA-02.

Waste Management – No environmental impacts were anticipated for sanitary, hazardous, low-level radioactive (LLW), and mixed wastes. DOE has contracts in place for disposal of wastes as generated, as per the standard DOE practice of off-site disposal in licensed facilities. ORNL has waste certification processes in place to assure LLW and mixed wastes sent to off-site disposal facilities meet the waste acceptance criteria of the facility. The proposed action would generate minimal amounts of sanitary waste and use existing waste storage and disposal facilities. New generation of hazardous waste is not expected. The project will not require any special waste reduction activities. The proposed action is not expected to disturb hazardous substances in the environment. Existing waste management contracts will cover the addition of the proposed STS construction support area and new information does not affect the analysis and conclusions in the EIS.

Resource Areas Analyzed in this SA

Geology and Soils – Erosion and siltation during construction of the existing SNS had negligible effects on soils or site stability and were minimized by the implementation of best management practices. During operation of the SNS it was determined that leaching of neutron-activated soil in the shielding berm for the linac tunnel could result in localized contamination of groundwater with radionuclides. However, it was concluded that radioactive decay would eliminate any

significant effects to human or ecological receptors because of the slow movement by the groundwater.

There is also a potential for soil leaching and activation of the groundwater with operation of the STS. Following a 2-year (2004-2006) baseline period, DOE implemented an operational groundwater program for the SNS. This groundwater monitoring program will be continued for the STS. Additionally, engineering control measures have been implemented to further reduce activation of the groundwater.

ORNL solicited a geotechnical assessment from a third party to address concerns regarding sinkholes in the proposed construction soil spoil area and construction support area. Eight closed topographic depressions are located east of the planned STS facility within or adjacent to the construction support and stockpile areas. The area is currently wooded but will be cleared and utilized as construction support laydown yards and long-term stockpile areas for planned excavation spoils as part of the STS development. Based on United States Geological Survey topographic and geologic mapping for the Bethel Valley Quadrangle, the area is underlain to the north by the Copper Ridge Dolomite and to the south by the Chepultepec Dolomite formations. Soluble rock in these formations puts the area at a greater risk for sinkhole development due to seasonal groundwater fluctuations.

Engineering and administrative measures put in place for the long-term stockpile areas will reduce and/or prevent the risk of sinkhole development and adverse impacts on the existing geology. These controls may include placement of impervious geomembrane liners, removal of unsuitable soft soils, cleaning and grouting of open voids, cap and compaction grouting, drainage controls, and a regular monitoring and maintenance program.

Ecological Resources – Analysis of clearing and development of the proposed construction support area and construction access road beyond the bounds of the original EIS project footprint has determined that the proposed action will result in additional loss of habitat for several protected animal species and requires consultation between DOE and the United States Fish and Wildlife Service (USFWS).

The ORNL Natural Resources Management Program completed a natural resources assessment for the STS project (ORNL 2020¹). The evaluation focused on the proposed location for the construction support area, the Hawk Nest roadway alignment, and alternative spur from Spallation Drive. The review area is located primarily within forested natural areas of the ORR with minor development in the form of power-line rights-of-way and secondary/graveled roads.

The STS natural resources assessment report includes a compilation of new and existing data regarding sensitive flora and fauna, forest condition, and cultural and historical resources that might be impacted by the proposed STS project. In total, 151 species of wildlife were documented within the survey area. Of these, at least 10 species are afforded special legal protection under state or federal law, and in addition, 59 bird species are afforded protection

¹ Oak Ridge National Laboratory (ORNL) 2020. Natural Resources Assessment for the Spallation Neutron Source Second Target Station, Oak Ridge, Tennessee. ORNL/TM-2020/1698. September

under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§703-711). Few special status plant species occur within the STS project area.

Five federal listed threatened, endangered, or candidate/proposed species are known to occur or with high potential to occur within the STS construction project area and which were the focus of consultation efforts with USFWS. These include federally and state endangered Indiana bats (*Myotis sodalis*), federally endangered gray bats (*Myotis grisescens*), federally endangered and state threatened northern long-eared bats (*Myotis septentrionalis*), state threatened little brown bats (*Myotis lucifugus*) [under consideration for federal listing], and state threatened tricolored bats (*Perimyotis subflavus*) [proposed federally endangered].

In its Biological Assessment (BA) submitted to the USFWS, DOE considered a worst-case scenario for disturbance. The 97-acre BA review area includes the proposed STS construction support area beyond the original EIS project area (approximately 73 acres) and the additional 12 acres of forest habitat for the proposed construction soil spoils area and access road from Spallation Drive to the construction support area. It also includes the 12-acre alternative access road (Hawks Nest alignment) because at the time the BA was submitted, the preferred construction access road had not yet been selected.

This area contains abundant potential roost trees for Federally listed bat species, with the remaining acreage suitable for bat foraging. Construction activities will include tree removal, vegetation clearing, grading and paving, stormwater discharge, temporary lighting, and earthmoving.

Short-term environmental effects that may directly or indirectly impact listed bats include noise, lighting, vibration, increased CO₂ emissions, and airborne dust from construction of roads and earthmoving activities, which will abate after completion. These short-term effects are likely to negatively affect normal behavior of listed bat species beyond the boundaries of project construction, construction support, soil spoils areas, and access road. Consultation between DOE and the USFWS determined the amount of additional acreage likely to be impacted. Noise, lighting, and vibration may cause stress to adults and young and may cause bats to avoid roosting within this additional acreage, further decreasing available roosting habitat during the construction phase of this project. Other effects on species of concern were discussed in the original EIS.

The largest effect to the protected bat species will be the permanent loss of up to 97 acres of habitat. The loss of this habitat may result in increased stress on adults and young, as well as altered invertebrate prey abundance and quality. Stress from habitat loss or other environmental effects may exacerbate health impacts to young or individuals with White Nose Syndrome, which has impacted the area.

Permanent lighting and noise need to be considered post construction, given that these indirect effects extend beyond the direct project disturbance boundaries. Long-term effects of lighting and possible mitigation measures such as down-facing lights will need to be discussed with STS project managers and DOE.

Acceptable mitigation measures for many species, notably bats, depend on the type of habitat (e.g., foraging, roosting, hibernacula). Given that the primary planned construction area of the

STS site contains extensive roost habitat for federally listed bats, and federally listed bats were detected via acoustic survey, informal consultation with the USFWS was initiated on December 8, 2021.

DOE submitted its BA to the USFWS in August 2024 and on January 30, 2025, DOE received a Biological Opinion (BO) from the USFWS regarding impacts of the STS project on the Indiana bat, gray bat, and northern long-eared bat. The BO was combined with a Conference Opinion (CO) specific to the tricolored bat, which has been proposed for federal listing. The CO will be adopted as a BO if the tricolored bat is officially listed under the Endangered Species Act (ESA), at which point all mitigation requirements and avoidance measures for tricolored bat will also become binding. The combined BO/CO concludes that the project may affect but is not likely to jeopardize the continued existence of these species if DOE meets provisions identified in the BO. These provisions include an Incidental Take State that allows take in up to 144 acres of suitable bat habitat, as delineated in the BO/CO, but which must occur outside the period of May 15–July 31 (flightless period for juvenile bats). To offset the allowed take, DOE has agreed to establish a Mitigation Area and implement additional mandatory Reasonable and Prudent Measures (RPMs) and adhere to Terms and Conditions (T&Cs) to further minimize impacts to federally listed bats (see below).

Mitigation

Consultation with appropriate agencies (i.e., USFWS and Tennessee Department of Environment) has been undertaken to determine the scope of required mitigations for water and biological resources. Avoidance of sensitive resources is the preferred first approach, however the incremental loss of Greenfield is understood as contributing to a cumulative impact upon habitat for sensitive animal species.

To offset the allowed take of bat habitat, DOE has agreed to establish a 338-acre Mitigation Area within the Three Bends Scenic and Wildlife Management Refuge Area. The Mitigation Area will be permanently conserved, with a conservation easement and long-term management plan specific to federally listed bats. In addition to tree clearing restrictions (prohibited from May 15–July 31) during STS construction, STS lighting will incorporate downward-facing, cut-off lens lights to minimize artificial light impacts on bat foraging and roosting. DOE will conduct post-construction monitoring (and reporting to the Tennessee Ecological Services Field Office) on both the affected 144-acre project area and the 338-acre MA to assess habitat conditions and the effectiveness of mitigation measures. Beyond direct mitigation and avoidance measures, DOE has agreed to support ongoing conservation research focused on bat population monitoring, habitat condition assessments, and cave surveys on the ORR, the results of which will be shared with the Tennessee Ecological Services Field Office and uploaded to the North American Bat Monitoring Program. DOE will remain responsible for long-term compliance with the RPMs and T&Cs identified in the BO and agrees to reinstate consultation with USFWS if incidental take exceeds (or is expected to exceed) authorized levels, or if new information suggests additional impacts to listed species.

To reduce the possibility of new sinkhole formation, site preparation will be designed to create positive and maintainable drainage channels, and increase stabilization of soils, possibly by removal of topsoil and re-compaction of exposed soil. To achieve design grades, approximately five feet of fill will be needed in the construction laydown storage yard area, and up to 40 feet

will be placed in the stockpile areas above existing grade. Proper grading will provide positive drainage for surface water away from mapped depressions. Sediment traps or impervious geomembrane liners may be installed to avoid closed topographic depressions and prevent migration of ponding water into the subsurface. A monitoring program to identify suspect areas post-construction would also be implemented to mitigate and repair stockpile embankments.

Wetlands and streams would be avoided as much as practicable via minimal changes to the site design, reducing or eliminating the need for permitting and potential aquatic resource mitigations. In preparation for the permitting process, DOE has worked with the ORNL Natural Resources Management Program to perform surveys and flagging of the proposed construction access road to avoid and/or minimize stream and wetland disturbance.

Determination

In accordance with the National Environmental Policy Act (NEPA) and DOE's implementing NEPA regulations, DOE prepared this supplement analysis to evaluate whether changes to the STS project at the SNS requires supplementing the existing EIS or preparing a new EIS. DOE concludes that the changes to the proposed action relevant to environmental concerns are not significant and therefore do not require a supplement to DOE/EIS-0247, consistent with 10 CFR 1021.314(c). No further NEPA documentation is required.

Approved in Oak Ridge, TN, on this 27 day of March 2025



William W. Wheeler, Manager
Oak Ridge National Laboratory Site Office