

FINDING OF NO SIGNIFICANT IMPACT
TENNESSEE VALLEY AUTHORITY
BOONE DAM SEEPAGE REMEDIATION

The Tennessee Valley Authority (TVA) proposes to construct a composite seepage barrier to remediate seepage beneath the Boone Dam in Sullivan County, Tennessee. In October 2014, a small sinkhole and seepage was discovered at the base of the dam that indicates a potential risk to the integrity of a section of the dam’s earthen embankment. TVA responded to the discovery by taking immediate interim risk reduction measures (IRRM) for the protection of public safety. These measures included repairing the small sinkhole, constructing a tailrace filter to minimize further deterioration of the dam, closing the dam reservation (areas managed for the purpose of supporting operation and maintenance of the dam and associated infrastructure) to the public, installing a network of sensors to monitor the dam, and lowering the pool elevation to between 1,350 and 1,355 feet mean sea level (msl), which is approximately 10 feet below normal winter pool levels. As part of the IRRMs, TVA also began Interim Operations at Boone Dam that included lower reservoir levels, limited seasonal reservoir pool fluctuation, modified releases into the tailwater for hydropower generation, 24-hour inspection, and modified flood control operations. After extensive investigation, TVA developed a proposal to remediate the seepage and prepared an environmental assessment (EA) to consider its potential environmental impacts.

Proposed Action

As described in detail in the EA, TVA proposes to remediate the seepage of water and sediment under Boone Dam by constructing a composite seepage barrier from the crest of the dam embankment downward into the foundations soils, weathered bedrock, and underlying bedrock beneath the dam. The seepage barrier would be constructed in stages, with the barrier consisting of an injected grout curtain and an excavated and filled concrete diaphragm wall.

TVA would first install a grout curtain into the dam’s foundation soils, weathered bedrock, and underlying bedrock. Creation of the grouting curtain would entail drilling through the dam’s earthen embankment into the foundation soils and epikarst (in the first stage) and bedrock (in the second stage) to target the weathered rock and soil interface. Grout would be injected into numerous holes drilled on multiple lines along the crest of the embankment to form a vertical curtain beneath and within the dam’s embankment. In the third stage, TVA would construct a concrete diaphragm wall along the same alignment as the grouting by excavating deep trenches into the dam’s embankment into which concrete would be poured. Finally, TVA would restore the dam’s crest and return the reservoir to Normal Operations. Construction activities would begin in early 2016 and could last 5 to 7 years.

Construction activities such as fencing, security, utility relocations, grading, access roadways, and other site improvements associated with this project would be primarily restricted to the Boone TVA reservation locations. The construction activities would occur within the current construction area previously approved for implementation of the IRRMs and additional construction areas adjacent or in close proximity to the current construction area, including two proposed Construction Support Areas on TVA land adjacent to or near the dam reservation

(Construction Support Area 1, also referred to as the Earl Light Tract and Construction Support Area 2, also referred to as Tract 22R).

Also under this proposal, TVA would maintain Interim Operations for the duration of the project, with reservoir water levels remaining drawn down below normal levels. Typical reservoir elevations during Interim Operations would be between 1,350 and 1,355 foot msl, with temporary variations outside the range for special operations and flood control operations.

The purpose of the project is to reduce the risk to the public's safety and welfare posed by seepage flows eroding soils from under Boone Dam and to reduce the potential erosion of the dam's earthen embankment. The project also would allow TVA to return the Boone Dam and Reservoir to Normal Operations in furtherance of TVA's statutory mission to manage the Tennessee River system, its tributaries, and its associated resources. The need for the project arises from the ongoing seepage flows of water and sediment beneath the dam that with time would undermine the foundation of the embankment dam. If left unaddressed, continued internal erosion may lead to enlargement of the network of underground voids, at which time a large influx of water into the voids could rapidly accelerate erosion and eventually breach the dam. Although dam failure is unlikely given the IRRM measures, the continued safety of the communities downstream of Boone Dam is TVA's paramount concern. The project would remediate the seepage and allow TVA to continue normal operation of the dam for flood control, water supply, hydroelectric power, and recreation - both in the reservoir and in the dam's tailwater. The composite seepage barrier would reduce movement of water through the dam's foundation and underlying bedrock, and would make the reoccurrence of seepage connection from the reservoir unlikely.

TVA's proposed action is the subject of an environmental assessment (EA) prepared by TVA that is incorporated by reference herein. TVA analyzed two alternatives in the EA: the Proposed Action as summarized above and the No Action alternative, under which TVA would not construct a composite seepage barrier and would continue to maintain the reservoir water levels of Boone Reservoir at Interim Operations levels indefinitely. Because of the continuing risk and potential impact to the public of taking no action, the No Action alternative is not considered reasonable. In the EA, TVA also listed and summarized 13 other remediation alternatives that were considered by TVA engineers and external experts but were ultimately dismissed from further consideration.

Related Actions to Address Impacts

As described in the EA, TVA is implementing a number of associated and related actions to address the near-term and long-term needs resulting from the reservoir drawdown. In 2015, TVA proposed several actions to address immediate reservoir access concerns. These were reviewed before TVA developed its Proposed Action and it was determined that a long-term drawdown would be required. Related actions to address near-term needs include TVA's construction of a new recreation and beach area near the dam, boat ramp improvements at Pickens Bridge and Devault Bridge, and allowances to shoreline owners for expedited and no-fee changes to permits under Section 26a of the TVA Act. To address long-term needs resulting from the reservoir drawdown, TVA is also implementing a loan program to affected marina owners. These activities reduce and mitigate the potential impacts to recreation and socioeconomics from the extended reservoir drawdown.

Environmental Assessment

In the EA, TVA analyzed potential impacts in relation to 17 environmental and socioeconomic resource areas:

- Geologic Resources
- Water Resources
- Floodplains and Flood Risk
- Wetlands
- Terrestrial Ecology (Vegetation and Wildlife)
- Aquatic Ecology
- Threatened and Endangered Species
- Historic and Cultural Resources
- Air Quality
- Socioeconomics
- Recreation
- Visual Resources
- Noise
- Public and Occupational Health and Safety
- Waste Management
- Transportation
- Land Use

Generally, TVA's analysis found that impacts to most environmental resources from the proposed activities would be minor to moderate and would be temporary, extending primarily through the life of the construction activities and reservoir drawdown for most environmental resources, and beyond for 2 to 3 years for fish and some wildlife resources. Impacts to water resources would also be minor, and the hydrology of the reservoir is expected to remain largely unchanged during the drawdown. Impacts to cultural resources may occur, as the extended drawdown increases the potential for looting and erosion of archaeological sites within the drawdown area. The proposed action was found to be in compliance with Executive Order 11988 on floodplain management and Executive Order 11990 on wetlands. The extended drawdown of the reservoir would have significant impacts to marinas and other recreation-based businesses near the reservoir, as well as to individuals who use and enjoy the reservoir.

Public Involvement and Intergovernmental Review

On October 28, 2015, TVA issued a draft of the EA for a 33-day review and comment period. A public meeting was held on November 5, 2015, in Johnson City, Tennessee. Comments were received from nine individuals and the State of Tennessee. TVA responded to substantive comments in the final EA. Appropriate recognized Native American tribes were consulted concerning the proposed undertaking, and TVA received no objection from any of the tribes. TVA consulted with the State of Tennessee Historic Preservation Office (SHPO) and, in December 2015, signed a Programmatic Agreement addressing how potential effects to archaeological sites in the reservoir drawdown area will be addressed.

Mitigation

TVA would implement the following mitigation measures to avoid, minimize, or mitigate adverse impacts on the environment. In addition, all applicable permits would be acquired and permit-related mitigation measures and best management practices would be implemented to further minimize impacts.

Mitigation Measures Associated with Construction Activities

- TVA would return disturbed areas, at the dam location and at the Construction Support Areas, to their previous or improved condition and uses. Disturbed areas would be revegetated and regraded, and fill would be placed in areas that were previously disturbed in the past (e.g., borrow pit areas) to an improved condition.

- Fill materials (including sand, rock, and gravel) would be clean and free of contaminants.
- To reduce the potential noise impact, TVA would require the use of modern, well-maintained equipment and vehicles and will screen the equipment for noise emissions, when practicable.
- Berms would be constructed using the least amount of fill possible, while achieving project objectives. Where possible, materials and equipment subject to flood damage would not be stored below elevation 1385.0 msl.
- To reduce potential visual impacts associated with lighting at the dam, TVA would position and adjust lighting as needed to reduce or minimize their visibility from nearby residences. TVA would work with private landowners to address concerns, to the extent practicable.
- Water quality near the construction and reservoir releases will be monitored to document temporary changes associated with construction and grouting activities and with the deep drawdown, maintenance of the deep drawdown, and refill of Boone Reservoir. Monitored water quality parameters include, but are not be limited to: pH, conductivity, dissolved oxygen, temperature, and turbidity. If monitoring indicates a need during the project (and if practicable given available water, dam safety constraints, minimum flow requirements, power system requirements, and downstream water supply needs), TVA would generate at Boone Dam with the objective of cooling the downstream trout fishery. TVA or contract personnel would conduct routine visual inspections of waters to identify potential runoff or discharge issues.
- TVA would avoid impacts on potentially suitable habitat for Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) identified in the Construction Zone and along the existing utility right-of-way of Construction Support Area 2.
- TVA is completing a Historic American Building Survey and Historic American Engineering Record documentation for the Boone hydroelectric project to record the historic dam's features and architectural character, as part of consultation with the State Historic Preservation Officer.

Best Management Practices Associated with Construction Activities

- Appropriate BMPs for erosion control and stabilization of disturbed areas would be used. Construction activities would be conducted in a manner to ensure that waste materials are contained, and that introduction of polluting materials into receiving waters is minimized.
- Appropriate construction BMPs would be used to reduce stormwater runoff. Mitigation measures and BMPs for soil erosion would be developed as part of the legally required Stormwater Pollution Prevention Plan. All erosion and sediment controls would be installed, placed, implemented, or constructed in accordance with the provisions of the Tennessee Erosion and Sediment Control Handbook.
- TVA would implement construction BMPs to address air emissions from open construction areas and unpaved roads. Areas would be sprayed with water as needed to reduce fugitive dust emissions.
- Proper management of hazardous materials/wastes would be conducted in accordance with established TVA procedures. TVA would comply with all Tennessee Department of Environment and Conservation regulations regarding disposal of waste materials.
- TVA would attempt to limit deliveries of crushed stone, riprap, and other materials during normal operation hours. However, to meet construction completion milestones, this may not be possible.

Mitigation Measures Associated with Impacts of the Reservoir Drawdown

In addition to activities that TVA has already initiated to address the impacts of the reservoir drawdown (e.g., increasing access to the reservoir), TVA proposes to implement a suite of activities to mitigate the impacts associated with the long-term drawdown of the reservoir, including the following:

- TVA proposes to implement a Vegetation Management Plan to manage the successional vegetation on much of the exposed reservoir bottom. TVA would work with private landowners to manage this growth with annual or periodic mowing or bushwacking. When approved by the landowner, TVA would use mechanical means, including tractors with bush hog attachments, extendable hydraulic arms, and other equipment to ensure safety. Mowing may occur from small barges along the reservation where access may be too hazardous. Mowing vegetation on the exposed reservoir bottom would not be intended to eliminate the vegetation. TVA's primary objectives are to remove tree species from the newly exposed reservoir bottom areas that normally do not establish due to season pool levels and to avoid having trees mature during the drawdown period to heights that would create navigation and public safety problems once the waters are returned to normal levels. TVA would provide guidance to landowners to enhance revegetation along exposed reservoir bottom with appropriate native plant species.
- In a portion of the drawdown area, TVA proposes to collaborate with TWRA and interested private landowners to plant or seed native and desirable vegetation. The primary objective is to enhance fish habitat when the reservoir returns to normal water levels, though the project will provide wildlife habitat and improve erosion control and aesthetics during the drawdown period. Between 400 and 500 acres would be identified, and planting would begin in February 2016. TVA estimates that seeding/planting activities would take up to 4 years to complete (about 100 acres annually).
- Under the terms of the Programmatic Agreement signed by TVA and the SHPO signed in December 2015, TVA would provide temporary stabilization of a significant archaeological site on TVA land by seeding the exposed reservoir bottom with grass or other vegetation to reduce erosion. TVA would implement law enforcement patrols to prevent looting and vandalism to protect important archaeological sites. TVA also proposes to establish a volunteer monitoring program to obtain assistance from members of the public in monitoring previously recorded archaeological sites around the reservoir, and to conduct outreach to the public and to property owners adjacent to the reservoir about laws protecting archaeological sites on TVA-owned and private property. Additionally, under the terms of the PA, TVA would fund archaeological research and education within the reservoir.
- TVA would work closely with TWRA to mark any additional hazards in the reservoir that pose a threat to the health and safety of boaters. These buoys would be in addition to those placed by TVA in early 2015.
- TVA would monitor caves in the reservoir drawdown zones periodically to determine if listed bat species utilize these caves and will consult with U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act should listed bat species be observed.

Conclusion and Findings

Based on the findings of the EA and consistent with 40 CFR 1508.14, TVA concludes that the proposed construction of a composite seepage barrier to remediate Boone Dam and the associated long-term reservoir drawdown would not be a major federal action significantly affecting the environment. Accordingly, an environmental impact statement is not required.



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Date Signed