

Notes from Reservoir Alternatives Discussion
October 27, 2025
Henry Horton State Park

Ramboll, The Elevation of Normandy Dam

- Background: 2011 Duck River Agency Study of Water Supply evaluated four structural alternatives included in TVA's 2001 Programmatic Environmental Impact Statement (PEIS): raise Normandy Dam, move intake downstream to Columbia, develop off-channel storage, and expand existing reservoir capacity elsewhere for the purpose of determining a pathway to meet future water needs and address potential environmental concerns.
- Ramboll was hired to re-evaluate two of the four alternatives in TVA's 2001 PEIS. Given the growing focus on regionalization, Ramboll was instructed to examine the feasibility of raising Normandy Dam and the new Duck River intake downstream of Columbia.
- In this effort, Ramboll examined the following:
 - Regional water supply demands since 2013 and has noted that current CBER projections are in line with the 2013 projections. Ramboll used the same demand projections, expanded further out to see an additional 50 years.
 - TDEC has added permit conditions to several water withdrawal ARAPs directing withdrawals to if flows in the Duck River drop below 175 cfs at the Milltown Gage.
 - Release requirement at Normandy Dam:
 - Milltown Gage is upstream of Columbia.
 - Ramboll identified that TDEC could consider changing the permit condition for the 175 cfs target flow at Milltown from an instantaneous target to a weekly average measure.
 - Shelbyville has release requirement to maintain 155cfs in summer months and 120 cfs in winter months.
 - Target flow now met based on weekly average.
- Based on modeling using the OASIS modeling tool, meeting the 175 cfs environmental flows at Milltown nearly all days would require raising dam 4.4 ft. and would increase Shelbyville flow target by 40cfs. From these results, Ramboll believes a 5 ft dam and pool raise is reasonable to meet future flow targets reliably.
- Assumptions/Considerations:
 - Results assume that withdrawals from pool (DRUC) and from Duck River prior to Shelbyville gage will be supplied by the current pool.

- TVA's Optimization efforts
 - Shift in release strategy from instantaneous to weekly average flow targets to hit 155 cfs at the Shelbyville gage. These efforts have allowed TVA to save roughly 280 million gallons in first several months.
- Updated Normandy approach
 - Option 1: Raise winter pool only (2011 approach). This option supports drought/flood resilience but there are no changes in releases
 - Option 2: Raise both winter and summer pools to allow increased releases to maintain 175 cfs at Milltown. Similar approach to TVA's 2001 EIS but this option uses updated water demands and release information to meet environmental flows.
 - Both options require a 5ft dam and pool raise. Typical TVA flood easements extend 5ft. above the flood gate, therefore, some property would need to be acquired for such flood easements.
 - Raising the summer pool from 875 to 880 would require an additional 152.5 acres for the inundation area. The expanded inundation area would impact public access areas, Short Springs hiking trails, wetlands and streams, and residential properties.
- Feasibility of Raising Normandy Dam
 - Raising Normandy Dam would include a number of modifications including:
 - Raise dam crest 5 ft from EL 895 ft to EL 900 ft (concrete gravity and embankment sections)
 - Raise spillway crest 5 ft from EL 840 to EL 845 ft
 - Raise existing spillway gates 5 ft.
 - Stabilization measures for monolith block 3 and 5 (right non-overflow) may be necessary and require future analysis
 - Modify spillway training walls for new radial trunnion anchors
 - New spillway bridge
 - Improvements to the stilling basin and discharge
 - Phased control of water through a cofferdam approach
 - Ramboll estimated cost is \$100 million
 - \$70 million in costs for the dam
 - Around \$30 million for non-dam costs such as raising bridges, roads, inundation, etc.
 - Design and construction are estimated to be about 6 years, understanding that the schedule is variable given environmental issues, investigations,

NEPA, and construction. It is anticipated that some phases could occur simultaneously.

- 2 years for investigations, studies, and NEPA
- Engineering and design would occur concurrently with NEPA
- Approximately Three to three and a half years for construction
- Risks and challenges with potential to delay schedule or block schedule. Ramboll believes this project is technically feasible even with the challenges listed below.
 - Need for more extensive engineering studies such as flood risk assessment and geotechnical investigations to assess the need/cost to grout karst voids that could otherwise cause the reservoir to leak.
 - Delay or block
 - Need for more extensive environmental studies.
 - Delay
 - An adverse determination in the USACE permitting/ NEPA process.
 - Potential to delay or block. A block is possible if another alternative is found more preferable.
 - Cost escalation that exceeds available funding
 - Potential to delay or block
 - A decision by TVA that the project presents unacceptable risks, such as flood risk during construction due to one of the spillway gates being temporarily out of service
 - Potential to block
- Questions and Comments
 - James Evertt, TVA: Did the map/analysis of the proposed inundation area to raise the summer pool take into account impacts to utilities (roads, sewers, power lines)?
 - Ramboll responded that the inundation area considered costs for roads and bridges, but not specifically for other utilities.
 - Any TVA action would prompt the NEPA process. As the likely lead agency, this project would require participation in the NEPA process.

TVA, Normandy Dam Considerations.

- Overview of Normandy Operations and Hydrology
 - In the winter months, the reservoir is drawn down. The runoff period in spring is subsequently used to fill the reservoir and provide sufficient water levels for the drier summer period. Normandy plays a significant role in attenuating and storing flows to enable release during times when they're needed most downstream.

- This past summer (2025) normal precipitation levels were observed in the Duck River Watershed. Additionally, TVA was able to enter the drawdown period about 1 full month earlier than 2024.
- Contrary to 2024, the entirety of the upper Duck is completely free of any drought designation.
- TVA's Optimization EA approved in 2025 has Shelbyville targets now being met on a weekly basis. These efforts:
 - Are saving 1 cfs over a period of 38 hours yields a volume of 1 million gallons.
 - Have already conserved an estimated 285 million gallons in Normandy Reservoir from July 26, 2025, to October 23, 2025.
 - Have allowed additional storage in the reservoir that has bought TVA more time in drought weather, storage is already higher now than it was last year.
- Requirements for modification at a TVA dam
 - Raising a dam and the modification of a spillway would be considered a major modification and project.
 - Modifying a dam has very high level of complexity compared to general construction world. Standards of care for dams are much higher.
 - TVA's Dam Safety Program ensures that project sites meet federal guidelines for dam safety and requires thorough and careful analysis of any modification to a dam in the interest of public safety. Considerations during proposed modification study include:
 - TVA oversight and direction of engineering studies and designs
 - TVA's intuitional knowledge associated with the operational history for a system of dams during hydrological extremes
 - Scope, Needs Analysis, and Feasibility
 - There continue to be unknowns with flow requirements at locations downstream of Shelby that have TDEC permit implications.
 - Considerations of ongoing activities that support drought resiliency (optimization, intake upgrades at Normandy)
 - If raising Normandy Dam is pursued, TVA encourages further consideration of how to leverage TVA's operational history and knowledge to reach the end goal.
 - TVA is interested in further understanding what the overarching/end goal is. Is it to yield more water to increase releases or provide more drought resiliency in the reservoir? What is the ultimate flow target requirement? Is that Milltown? Is that Shelby? It is important to know this information up front.

- As you layer in non-structural alternatives, such as optimization or intake alternatives, how does these impact the need for water in the system long term?
 - Hydrological feasibility
 - Complete a downstream and comprehensive needs analysis. This will be driven through the HCP process. How do the measures implemented through the HCP process impact the level of water that is actually needed in the reservoir?
 - It is further important to determine the hydrological yield available in the upper duck river system above Normandy to determine probability of realized increased yields annually.
 - Lastly, there is a need to better understand the karst and losing reaches of flow downstream of Normandy. Would sending more water downstream just send water into the ground through the losing reaches?
 - The higher you hold a pool, the higher risk of leakage through embankment.
 - Holding more water in reservoir will impact temperature and oxygen content of water, which could impact environmental quality of releases. Would need to be investigated.
 - Dam safety risk assessment
 - A dam safety risk assessment would consider changes to dam safety risk under new loading conditions. It would also entail geotechnical investigations including impacts of leakage due to karst near the foundation and in the rim. It would also examine the impacts of flood risk and downstream consequences
 - Impacts to public and privately owned land and infrastructure around the reservoir would include roads, structures, bridges. The project would require land and easement acquisition.
- TVA estimates that the schedule for a potential raise of Normandy Dam would be close to the 6 years anticipated by Ramboll.

TVA, Dam Safety Modification Process (Conceptual)

- The first step in any TVA dam modification process is to conduct project scoping which entails the following actions:
 - Define objectives, problems, and opportunities
 - Identify any constraints (do no harm constraint, regulatory compliance, environmental stewardship, and cannot increase downstream flood risk)

- Understand how to evaluate and compare alternatives
 - Strategize collaboration with all stakeholders
- After foundational information is identified during the project scoping phase, alternatives are formulated and evaluated.
- From the alternatives brainstorming phase, there are three work streams that take place: risk-informed decision making, design, and the NEPA process. These streams can take place concurrently and are often complementary. Risk-informed decision-making and design often work together to shape one another while the NEPA process serves as official documentation of the effort and a touchpoint with relevant stakeholders and agencies.
- Risk-informed decision making will consider questions such as:
 - What does project risk look like in 50 years?
 - What does risk look like under all alternatives considered?
 - *For Normandy Dam, there are significant concerns pertaining to the likelihood of karst features and the cost needed to address losing reaches. Could potential be around \$500 to remediate.*
 - *Additionally, there have been a number of sinkholes that have cropped up above Normandy Dam. With a 152 acres added to the inundation area, there is a risk of finding new karst features. Tim's Ford experienced significant rim leakage, causing the water to bypass the discharge for the dam. In this instance, TVA was able to find the primary source of leakage but there is a chance that these studies do not find the main source of leakage.*
 - What does project risk look like during the construction phase of any and all of the alternatives?
 - *For Normandy Dam, the ability to manage the pool and consequences of tearing up the embankment during construction would need to be evaluated. The risks posed during the construction phase make TVA nervous.*
- The design phase would include the production of all initial alternatives, project costs, and cost/value engineering. The alternatives developed through this stream will be further refined with the information from the risk-informed decision-making process. For the preferred alternative that is chosen for the EA or EIS, the design and risk-informed decision-making streams will intersect to determine if the alternative could be improved in terms of cost, risk, schedule, etc.
- Questions
 - Is there any current rim leakage at Normandy Dam?
 - TVA replied that there is no severe leakage.

Columbia Dam Concept

- The 1968 Duck River Planning Report which detailed the need for regional water supply infrastructure and most notably held that both Normandy Dam and Columbia Dam were viable projects. Columbia Dam Now advocates that the Columbia Dam project is possible and should be built.
- Columbia Dam Now members would like a long-term solution that meets three core criteria:
 - Provide most adequate source of water for next 75 years
 - Be most affordable option for recipients of water
 - Be least damaging alternative
- Claims karst concerns can be mitigated based on known technologies.
 - Grout curtains, blanket grouting, geotechnical barriers
- From an environmental perspective, Jason Gilliam with Columbia Dam Now proposes to mitigate threats to endangered species through mussel translocation. The group further proposes addressing land acquisition concerns by reducing the acreage needed from 27,000 to 12,600 acres.
- Columbia Dam Now is working to get a feasibility study attached to a bill to congress, carried by Rep. Andy Ogles. Unclear when this could go forward given government shutdown.
- David Crouch believes the Columbia Dam project is a mechanism to stimulate the local economy, achieve economic independence, and promote resilience. He further shared his hesitation with a pipeline from the Tennessee River, stating that there would be no lasting local benefit, no tourism/recreation, would require permanent infrastructure maintenance, and would make the community dependent on outside purveyors of water.
- Rick Williamson suggests that the Partnership recommend a feasibility study for Columbia Dam to Governor Lee.
- Questions and Comments
 - David Salyers, TDEC Commissioner: We need to know the land acquisition burden in terms of acreage and cost. Additional land acquisition presents a heavy political lift.
 - What's the summer pool, max pool, and acreage of easement?
 - Original project plan had elevation of 630ft elevation. Not clear of flood control zone.
 - Columbia Dam Now got engineering firm to study inundation of 640 ft on parcels. Claims it would impact 4,000 additional acres.

- 200 parcels, 1,600 acres of which are farmland and there will be additional impacts to homes
- *TWRA has done some initial modeling for inundation and determined inundation would reach up to Henry Horton.*

TVA, Columbia Dam Considerations

- TVA's records of decision in 2001 documenting transfer of land condemned for the dam to the State of Tennessee. Two independent EISs were developed, one for transfer of land and the other for other sources of water.
- Additional land acquisition would be needed to complete the project. Would also need a better understanding of flood easements required.
- Unknowns around infrastructure that has been built in the previously acquired and unacquired land
- Cost/benefit analysis was challenged several decades ago, estimates have not been updated in many decades, and construction costs (and project benefits) could show a similar picture today.
 - What is the balance between project costs and potential stimulation from recreation? Building new dams is a very costly endeavor.
 - Additionally, there would need to be a comprehensive understanding of the karst features, losing reaches, pool levels, and stability of the terrain through geotechnical studies.
- Habitat and Threatened and Endangered species considerations
- Lack of Hydropower potential and cost challenges
- Karst could be a concern and added complexity adds cost
- Questions
 - What percentage was being bled off around Columbia?
 - By the time flow got to Columbia, there was approximately a 20-30 cfs loss from losing reaches. USGS would be a good source to understand impacts.

U.S. Army Corps of Engineers, Permitting Considerations

- The U.S. Army Corps of Engineers (USACE) is tasked with protecting the Nation's aquatic resources and navigation capacity, while allowing reasonable development through fair and balanced decisions.
- Permits issued by the USACE must:
 - Comply with the River and Harbors Act of 1899 and the Clean Water Act,
 - Have a clear, demonstrated purpose and need,

- Align with public interest review factors, and
 - Demonstrate that the proposed action is the least environmentally damaging practicable alternative. Under the Clean Water Act, only the least environmentally damaging practicable alternative can be permitted.
- USACE analyzed the Columbia Dam concept using information available within its records as the project existed in 1983. In 1983, the project was about 45% complete and 13,000 of the 27,500 acres of land had been acquired. However, the following major activities remained:
 - Completion of the earth embankment
 - Acquisition of remaining 14,500 acres
 - Replacing two upstream I-65 bridges
 - Relocating about 22 additional miles of roads and relocating utilities
 - Clearing the basin
- The summer pool elevation of 630' would inundate Vulcan Quarry, Highway 50 over Fountain Creek, and the I-65 bridges and approaches over the Duck River. At flood pool elevation of 635', I-65 would be inundated at Nancy Branch and Derryberry Branch.
- The Columbia Dam concept would need to clearly demonstrate that this project is the least environmentally damaging practicable alternative. The concept would further need to prove that it aligns with public interest and that there is a clearly-defined purpose and need.
- Under the Endangered Species Act, there are a number of threatened and endangered species in the Columbia Dam area. This location on the Duck River is home to 12 endangered and 2 threatened mussel species, 2 endangered and 1 threatened plant species, and 1 endangered mammal species. The footprint of the dam has been designated as critical habitat for 2 endangered mussel species. The majority of the Duck River, including the area within the footprint of the dam, is critical habitat for 2 additional endangered mussel species and 2 threatened mussel species.
- Loss of aquatic resources and function must be avoided and minimized to the maximum extent practicable. Unavoidable loss requires compensatory mitigation.
- Compensatory mitigation is used to offset unavoidable losses of aquatic resources and function.
- Questions
 - Senator Hensley: If USACE issued a permit for the Columbia Dam project while it was active, would that approval extend to any permit submitted now?

- USACE would be looking at significantly different information given developments from various court cases and advances in knowledge pertaining to the watershed
- Permitting the Columbia Dam project
 - Foremost, USACE would still need to find that the Columbia Dam project is the least environmentally damaging practicable alternative.
 - The dam would require an individual permit from the Corps and a 401-water quality certification from TDEC.
 - Cost of mitigation. The current price of mitigation is \$3,000-\$4,000 per stream foot. Hypothetically, replacing the loss of riverine function for the 52 miles of the Duck River plus several miles of tributaries, would likely require more than 360,000 stream credits for the Columbia Dam project. However, there aren't sufficient credits available in the region from mitigation providers (mitigation banks), nor will there be for the foreseeable future. The permittee would need to develop a permittee-responsible compensatory mitigation plan for replacement of lost aquatic resources and function.
 - The Corps must also consider:
 - Whether any compensatory mitigation is adequate to replace the loss of riverine function in the Duck River.

TWRA, Comments

- The Columbia Dam project would need additional land and acreage. If a WMA gets inundated, those acres would have to be offset elsewhere. The loss of hunting land would need to be replaced within 12 months, which can be an expensive endeavor.
- Mr. Campbell hastens oversimplifying freshwater mussel conservation. If you dam the Duck River, the one thing you cannot replace is the valuable habitat it creates. This habitat is the reason why we have diverse and significant mussel beds, contributing to the Duck River's value and designation as the most biologically diverse river in North America.
- Propagating mussels is a very complex process and is not able to be done to an extent great enough to offset the loss of their habitat. Compensatory mitigation is currently \$500 an animal.
- Relocation faces great challenges and will still result in population decline. You cannot re-create the habitat in the project footprint downstream or upstream.
- Comments

- Grace Stranch: Mussels in hatcheries require different technical expertise and approaches depending on the type of mussel. There are limitations to expanding those operations, including cost.

TDEC, Comments

- Peter Murrey: Under federal Endangered Species Act, it is illegal for a federal agency to adversely modify or destroy critical habitat for listed species. The out for this provision involves convening a group colloquially titled the “God Squad” that has almost never taken place.
- April Grippo: TDEC shares the same water quality and mitigation concern (over 90% of dams in Tennessee impact water quality downstream). Additionally, any action must meet the anti-degradation burden, identify any socioeconomic benefits, and demonstrate that is it the most practicable alternative.

General Discussion

- What would the timeline for a project like this be?
 - Normandy Dam was estimated around 6 years, however, there would be additional time requirements for the Columbia Dam concept. If the project made it through the permitting process, additional time for litigation would need to be factored in.
- Would permits need to be obtained on the front end?
- Is it permissible to put an impoundment on a class 2 waterway?
 - TDEC council will have to review and provide an answer to the Partnership and General Assembly members.