Background

The Pickpocket Dam is located on the Exeter River on the boundary between the towns of Exeter and Brentwood in New Hampshire. The first recorded structure at Pickpocket Falls dates back to 1652, and the current dam was built in 1920 and generated power for mills. The dam forms a 3.5-mile impoundment, impacting the river flow to just downstream of Haigh Road in Brentwood, NH.

This dam is a 'run-of-river' dam, meaning that it allows all of the natural river flow to pass over the dam spillway at roughly the same rate as the natural flow of the river.

The Breach Analysis completed in 2016 resulted in the dam being reclassified as a "High-Hazard" structure. The dam does not meet the current NHDES safety standards which require "High-Hazard" dams to pass 2.5 x the 100-year storm event with one foot of freeboard between the water surface and the top of the dam abutments without manual operations.

The Feasibility Study evaluates various alternatives to modify or remove the dam to bring the dam into compliance with the NHDES safety standards. NHDES issued a Letter of Deficiency for the dam in July 2019. The letter included a Request for Action with a strong recommendation to reconstruct or remove the dam to ensure compliance with New Hampshire's current dam safety standards.

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Alternatives for Addressing the Pickpocket Dam Safety Issue

Six alternatives were considered to address the dam safety issue, as listed below. The bolded alternatives are the three alternatives which were determined to have merit and were therefore advanced for detailed study:

- **Alternative 1 – Raise Top of Dam** includes raising the top of the dam, and the left and right training walls, while maintaining the existing spillway discharge structure.
- Alternative 2 – Spillway Replacement (Labyrinth) includes replacing the spillway with a labyrinth spillway, which is a nonlinear arrangement of the spillway weir control structure so that the total flow length available is increased while maintaining a similar spillway footprint width.
- **Alternative 3 – Auxiliary Spillway** includes constructing an auxiliary spillway through the left abutment at the height of the existing dam elevation.
- **Alternative 4 – Dam Removal** includes the complete removal of the dam and its appurtenances including the low-level gate, fish ladder and fish weir, and reconstructing the river channel.
- Alternative 5 – No Action / Hazard Reduction includes maintaining the dam as it is today and taking necessary actions to reduce the potential hazards and re-classify the dam.
- Alternative 6 – Lower Normal Pool Elevation includes selective demolition of the spillway weir to an elevation that would meet regulatory design requirements without other dam modifications.

Cost Considerations

The tables below display costs for Alternatives 1, 3, and 4.

The cost estimates included evaluating the cost to construct the alternative under both the current and future rainfall conditions. Given the changes in weather patterns in recent years, it is recommended for future rainfall events to be taken into consideration to safeguard the public and reduce the need for a potential costly secondary modification in the future. The projected extreme precipitation estimate recommended is a 15% increase from the best available rainfall data.

Additionally, regulations periodically go through rulemaking process to ensure they reflect current information. During the preparation of this document NHDES started the process of rulemaking for proposed changes to Env-Wr 100-700. With the proposed rule change the "high-hazard" dams shall pass the 1000-year design event with one foot of freeboard and without manual operations.

Alt 1: Raise Dam		
	Current	**Future**
Initial Capital Cost	$1,964,100	$2,322,800
Capital Replacement Costs	$809,200	$957,000
Operations and Maintenance	$266,800	$294,300
Total Present Cost	**$3,041,100**	**$3,575,100**

Alt 3: Auxiliary Spillway		
	Current	**Future**
Initial Capital Cost	$2,289,100	$2,434,800
Capital Replacement Costs	$943,100	$1,003,100
Operations and Maintenance	$376,800	$411,200
Total Present Cost	**$3,609,000**	**$3,849,100**

Alt 4: Dam Removal	
Initial Capital Cost	$1,468,000
Capital Replacement Costs	$0
Operations and Maintenance	$45,000
Total Present Cost	**$1,513,000**

Pickpocket Dam Feasibility Study

Alternatives 1 and 4 Visual Simulations

A current view of Pickpocket Dam, looking upstream.

An oblique current view of Pickpocket Dam primary spillway, looking from the right bank

A view of Pickpocket Dam with Alternative 1, looking upstream.

An oblique view of Pickpocket Dam primary spillway with Alternative 1, looking from the right bank.

A view of Pickpocket Dam removed (Alternative 4), looking upstream.

An oblique view of Pickpocket Dam removed (Alternative 4), looking from the right bank.

Impacts and Benefits

Changes in Flooding and Hydraulics

- There are no changes to river depth, width, or velocities downstream of the dam with any alternative.
- The dam modification alternatives would not result in much change to the existing river depths, widths, or velocities upstream of the dam.
- The dam removal alternative would lower water levels upstream of the dam under normal flow conditions.
- Dam removal would reduce the depth of flooding upstream, as the area subject to flooding would decrease.

Sediment Transport and Potential Erosion

- Dam removal would restore the sediment transport function, which is a naturally occurring continuous process in all rivers.
- Due to accumulated sediment within the impoundment, some amount of initial sediment migration would occur under the dam removal alternative. This could be mitigated through partial channel regrading and excess sediment excavation with bank stabilization.
- The dam modification alternatives would not initiate sediment transport.
- Sediment sampling identified low levels of PAHs and arsenic both upstream and downstream of the dam.

Infrastructure

- Reducing the impoundment elevation would improve soil resistance and stability within the adjacent slopes through the reduction in groundwater influence.
- Flow alterations upstream of the dam could increase scour potential at the base of slopes. This could be mitigated through vegetation establishment.

Cultural Resources

- The Pickpocket Dam is eligible for listing in the National Register of Historic Places. Its modification or removal would represent an adverse impact to the historic structure.
- Two archaeologically sensitive areas were identified in the vicinity of the dam. Although these resources could be impacted by some of the alternatives (such as exposure of submerged sites), these impacts could be mitigated.

Recreation

- The dam modification alternatives would not result in a change to the existing recreational activities within the impoundment.
- Dam removal would alter the recreational experience on the river through water surface elevation reductions. However, opportunities would still be plentiful, and some opportunities may be enhanced.

Natural Communities and Resources

- The dam modification alternatives would have a negligible impact on existing wetlands and surrounding habitat.
- Dam removal would lead to changes in habitat, wetlands, and natural communities, including:
  - Improved fish passage;
  - Restored natural flow regime and riparian habitat to support more ecological diversity;
  - Could affect wetlands and floodplain forests that border the impoundment, and;
  - Improved water quality.