

Ledyard Up-Down Sawmill Dam Condition Assessment



Dam description and history

- Dam is about 150 feet long and 4.5 feet high (~9 feet from top to bottom of spillway).
- The 16.5 foot wide stone masonry spillway is raised with a 6-inch wood flashboard during sawmill operating season to raise the pond level.
- **Historic dam.** There was a dam in place in the 19th century when there were mills on this site.
- **1970.** Work on the dam was part of the multi-year mill restoration around 1970 which included rebuilding the spillway and head gate and race. The pond was also dredged.
- **Mid-1980s.** There were modifications to the dam in 1983 following a dam overflow in June 1982 which damaged the mill foundation. A buried concrete wall was added to the upstream dam embankment in front of the mill building.
- Stream flow is highly seasonal and responds quickly to rain events. Most summers the brook flow reduces to a trickle. Late fall, winter and spring are highest flow rates.
- **Overflows since 2000.** There have been 8-10 overflows following heavy rain events. Largest overflow event was following the heavy rains which occurred in late March 2010.
 - During the largest overflows since 2000, water has flowed down into and through the dam-side mill foundation into the lower level of the mill, and around north and south sides of mill.
 - Over flows during this period have caused damage to the dam earth embankment and masonry supports, and also results in voids directly in front of the mill building pond-side foundation
- **Apparent changes in the dam.** Since 2000, there has been noticeable settlement and movement of stones in the dam face, settling in the dam crest, and washout along the dam and in front of the mill foundation.

Evaluation of current dam condition and risks

- In spring 2025, the Historic District Commission contracted with GZA GeoEnvironmental, Inc. to evaluate the condition of the dam, provide an overview of risks, and outline options to reconfigure the dam to address risks.

Inspection and report (April/May 2025)

- James Davis, P.E. (GZA GeoEnvironmental, Inc. Glastonbury CT office)

GZA key findings and analysis

- Overall the dam is in good condition (although at risk from floods that lead to overtopping).
- The crest of embankment is uneven with settlement apparent along downstream stone wall (included misplaced stones). Spillway is in good condition.
- Dam is at risk from overtopping which is the most common cause of failure for similar dams.
 - “deficiencies included an uneven crest, erosion at the masonry wall downstream toe, misaligned stones in the wall, and voids in portions of the downstream wall at the sawmill building.” (GZA report page 5)
 - “Overtopping of an earthen and stone masonry dam is a serious dam safety concern that, left unaddressed, is likely to lead to dam failure.” (GZA report page 3)
 - “With a 1 foot of water over the dam, I think the potential for failure is high, at least partial failure.” (J. Davis 6/24/2025 email)

Storm	Inflow to pond (cfs)	Estimated dam overtopping
2-year	80	Overtopping threshold
10-year	190	0.6
50-year	330	1
100-year	400	1.2
500-year	600	1.6

Notes for table:

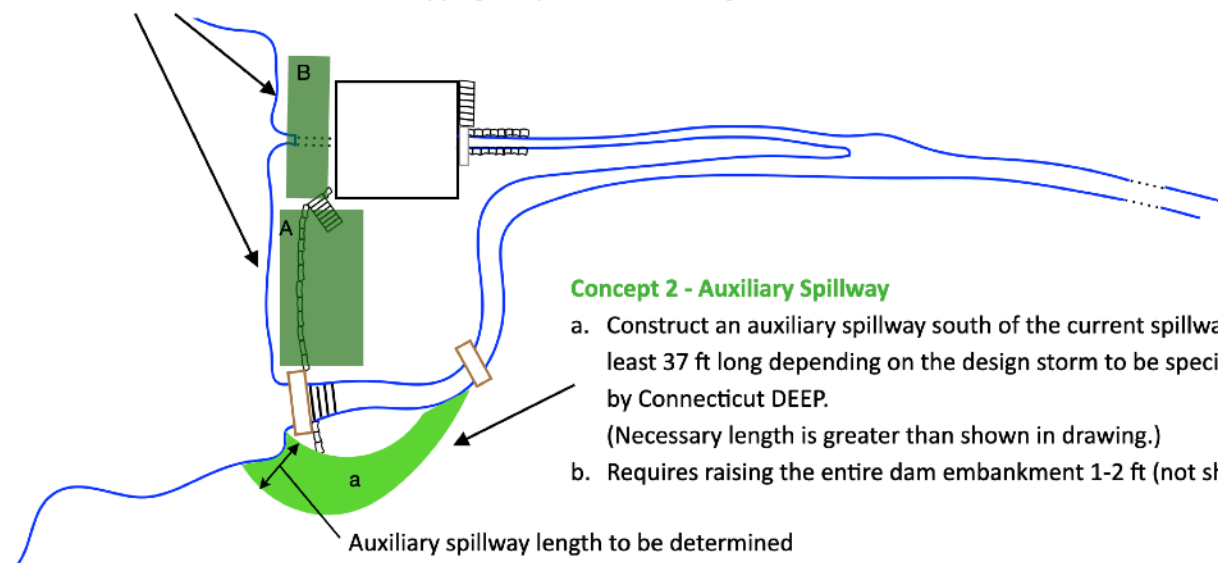
Capacity of current 16.5 ft wide spillway is **63 cfs**.

10- and 50-year estimates from J. Davis 6/24/2025 email.
100- and 500-year estimates from May 2025 GZA report.

GZA - Two dam repair alternatives to reduce risk to dam and building from overtopping

Concept 1 - Overtopping Protection

A. Add grouted riprap or concrete blocks to top of embankment crest and 10-15 feet downstream of the masonry wall. B. Raise embankment at the mill building and add berm added around the sawmill to divert overtopping away from the building



Concept 2 - Auxiliary Spillway

- Construct an auxiliary spillway south of the current spillway at least 37 ft long depending on the design storm to be specified by Connecticut DEEP. (Necessary length is greater than shown in drawing.)
- Requires raising the entire dam embankment 1-2 ft (not shown)

Discussion

Initial brief discussion of the GZA report was held at the sawmill 6/30/2025

- Attendees were commission members V. Godino and K. Geer, mill volunteers A. Ganong and D. Wright, and former volunteer and timber framer/builder J. Kelley.
- General discussion of report finds and next steps
- There was agreement to focus on reducing risk from 100-year storm events. (Addressing 500-year storm risk requires extreme changes to dam and likely much greater cost.)
- Jim Davis estimates 1.5-2 years to obtain the required permit(s) and prepare the bid documents.

Cost estimates

- Jim Davis of GZA reluctantly provided rough cost estimates
 - GZA engineer Jim Davis has 15 years experience in dam engineering and dam construction oversight

Engineering and permitting rough estimated cost: \$75,000

Dam construction rough estimated cost : \$300,000 - \$400,000

- Construction estimator Michael Godino provided itemized construction costs for both concepts
 - Michael Godino has 40 years of construction management and cost estimating experience and currently the Chief Estimator for Loureiro Contractors Inc (a \$100 million/year engineering and construction company. He has been Program Manager for construction and repairs of three dams.
(Michael is Historic District Commission member Vin Godino's son.)
 - See additional detail for estimates in Appendix
 - Both estimates include a contingency cost of \$50,000 since we do not yet have any plans, only rough concepts.
 - Michael considers these estimates to be conservative (using upper estimates for wage rates and profit margins).

Concept 1 (overtopping protection) construction cost: \$439,000

Concept 2 (auxiliary spillway) construction cost: \$372,000

Funding sources

- The total cost estimate cost likely necessitates funding sources outside of typical Historic District Commission operating/capital budgeting.
- Is there a need to look at procuring outside funding? The commission might benefit by working with an experienced grant writer.

Next steps

1. Discussion with Historic District Commission to include these topics:
 - Report findings and recommendations
 - Cost estimates
 - Risk of dam collapse and building severe damage to the historic mill in the short- and long-term if dam issues are not mitigated.
 - Hiring a dam engineering consultant to assist in planning next steps and choosing repair option
 - Identifying additional funding sources
 - Working with a grant writer
 - Planning for preparation of a capital fund request
2. Inform town officials about report findings, estimated costs, and Historic District Commission recommendations to move forward
3. Develop specific goals for a dam engineering consultant which might include:
 - Clarify and further develop the two conceptual repair options outlined in the GZA report.
 - Address questions raised by the GZA report:
 - ◆ Can the effective embankment level in front of the mill be raised by adding to the existing concrete buried wall?
 - ◆ Can raising the dam in front of the mill be done in conjunction with the existing need to add a ramp to improve accessibility to sawmill building visitor door?
 - ◆ Would a deep auxiliary spillway with an operable gate (or removable flashboards) reduce the necessary width of a new auxiliary spillway?
 - ◆ Are there near-term minor changes that can be done to reduce risk of overtopping and fit in the Connecticut DEEP category of changes that do not require a permit (GP-014, Non-Filing Categories)? Examples might be addition of small quantities of riprap, minor changes to embankment, etc.)
 - Clarify potential costs and specific changes to dam for 100- vs. 500-year storm risk reduction
 - Permitting process advice and assistance in obtaining Connecticut DEEP dam design requirements.
4. Identify potential funding sources
 - As starting point, Jim Davis from GZA GeoEnvironmental suggested three potential sources for grants (FJ Brotherton Charitable Trust, National Trust for Historic Preservation, Threatened Properties Fund).

Appendix 1. Estimated costs for planning and dam construction

Dam engineer consultant estimated cost \$5,000-\$10,000

Dam engineering and permitting rough estimated cost \$75,000

(Source of estimate: Jim Davis)

Concept 1 (Overtopping protection) estimated construction cost

Mobilization and Site Logistics	\$105,000
Erosion control	\$11,000
Site demolition	\$28,000
Strip topsoil	\$15,000
Regrade top of dam	\$14,000
Grouted rip rap dam crest	\$72,000
Grouted Rip Rap at toe of dam	\$74,000
Topsoil and cleanup	\$36,000
Knee Wall For Building Overflow Protection	\$34,000
Contingency	\$50,000
Total Construction Costs (Concept 1. Overtopping protection)	\$439,000

(Source of estimate: Michael Godino)

Concept 2 (auxiliary spillway) estimated construction cost

Mobilization and Site Logistics	\$77,000
Erosion Control	\$11,000
Site demolition	\$45,000
Regrade top of dam	\$11,000
Grouted rip rap spill way	\$70,000
Reset stones front face of dam	\$47,000
Two concrete abutments	\$15,000
Add bridge	\$10,000
Topsoil and cleanup	\$36,000
Contingency	\$50,000
Total Construction Costs (Concept 2. Auxiliary spillway)	\$372,000

(Source of estimate: Michael Godino)