Introduction

In June of 1993 Dufresne-Henry, Inc. was retained by the Weston Community Club, Inc. to evaluate the condition of three dams owned by the Club in the Town of Weston, Vermont. This report presents the findings of a field inspection of Upper Cold Brook Dam. Due to the size of the impoundment the structure does not fall under the jurisdiction of 10 VSA, Chapter 43.

Description Of Site

Upper Cold Brook Dam is located on Cold Spring Brook in Weston Vermont. The impoundment is part of a park maintained by the Weston Community Club. The history of the dam is not known. Evidence suggests it was once part of a mill operation. The structure may be in excess of 100 years old. It currently serves no use other than aesthetics. The drainage area to the pond is approximately 1,668 acres (2.61 square miles). The only upstream impoundment is Wantastiquet Lake. Lower Cold Brook Dam is downstream approximately 450 feet. The stream enters the West River about 1150 feet downstream. The area of the pond at normal pool elevation is estimated to be about .1 acres. Storage volume is not known. The pond is contained between a stonewall along Lawrence Hill Road to the north and a high bank to the south. Downstream of the dam is a stone masonry training wall on the left side of the stream. The channel contains extensive shrubby growth. The pond has been extensively silted in over time allowing the establishment of wetland plant species. The impoundment is under the 500,000 cubic foot threshold for 10 VSA, Chapter 43 jurisdiction.

Dam

The dam is a dry stone masonry structure approximately 63 feet long with a maximum height of about 9 feet. The left abutment is a grouted stone wall at the edge of Lawrence Hill Road. The right abutment is a bank at the edge of the brook. The impoundment is contained between stone walls on both sides. The dam appears to be founded on bedrock, particularly on the right (south) side. The downstream face is vertical. Construction details of the upstream face are not known as the structure is completely silted in to within an inch or so of the spillway crest. The crest width is 3 feet.

The spillway consists of a 46 foot long section on the right side of the dam. The spillway portion of the dam has a concrete cap. Approximately 13 feet from the left abutment is a low level pond drain. The outlet is an 18 inch CMP about 6 feet below the spillway crest. The drain gate is located on the upstream end of the pipe and is actuated by metal crank bolted to the upstream face. The chain to operate the drain was not seen. There is no emergency spillway.

Inspection

The dam was inspected on July 8, 1993 by Bruce H. Cox, PE and Gerald R. Vezina, P.E. of Dufresne-Henry. The inspection was limited to visual observations of the dam, spillway, and immediately adjacent land. Weather at the time of the inspection was sunny. A trace of precipitation had been received the week prior to the inspection. Flow depth over the spillway was 1 inch± with an even pattern across the full length of the spillway.

Horizontal alignment of the crest is good. Vertical alignment of the downstream face is good except for the section from the left abutment to the drain which has a slight displacement downstream. The concrete spillway cap has exposed aggregate for its full length, several exposed sections of reinforcement steel, and several hairline cracks.

Leakage through the dam was difficult to observe because of flow over the spillway. Flow patterns suggest that leakage is occurring under the spillway cap and from various places in the downstream face. There is also leakage from the downstream face to the left of the spillway and from the toe of the stone wall on the left side of the spillway. The ground in the left abutment (between the stone wall and the road) is slightly damp. No settlement or erosion was observed. Minor seepage was observed coming around the right abutment.

A large void (approximately 8 foot long x 1 foot high x 4 foot deep exists at the toe of the dam below the left end of the spillway. Several stones were noted in the channel downstream of the void. Oxidation staining was also observed in the void. Water flowing over the spillway made observations in this area difficult.

No observations could be made of the upstream dam face due to excessive sedimentation. The length of the low level drain pipe indicates the dam to be thicker at the bottom than at the crest.

The condition of the low level drain is not known due to siltation. The outlet appears to be unobstructed. Some oxidation staining was observed at the outfall. The operator crank is rusty and not robust in nature

Hydrology and Spillway Capacity

The drainage area to the dam as determined from the 1986 Weston, Vermont USGS 1:24,000 quadrangle is about 2.61 square miles. The steep wooded basin drains the eastern slopes of Peabody Hill and Holt Mountain.

Hydrologic analyses were carried out to estimate peak flood discharges for storms of various return frequency. The calculations were made using four common regional methods. The calculations will be found in Appendix A. As storage in the pond is minimal no attempt was made to attenuate the peak discharges. Also ignored is the routing of flood flows from the Wantastiquet Lake emergency spillway to a different drainage basin. That factor could have a pronounced effect at Upper Cold Brook Dam during rare storm events, thus the calculated discharges are judged to be on the high side. The discharges presented below are arithmetic averages of the four methods.

Table 1 - Summary of Flood Discharges

Storm Event	Peak Discharge
2 - Year	125 CFS
5 - Year	240 CFS
10 - Year	375 CFS
25 - Year	470 CFS
50 - Year	650 CFS
100 - Year	800 CFS

A spillway rating table and curve were prepared and will be found in Appendix B. The analysis shows the Upper Cold Brook Dam spillway has the capacity to pass a storm between the estimated 5-year and 10-year events without overtopping the dam. The age

of the structure would indicate that it has withstood floods of this magnitude and larger numerous times.

Downstream Hazard Analysis

The National Weather Service Simplified Dam Break model was used to estimate the peak discharge which might occur if the dam failed. Two failure scenarios were considered; the failure of the dam during normal flow and during the estimated 50-year storm. In both cases failure of the dam was assumed to be instantaneous. Given the limited storage volume and the amount occupied by sediment, the calculated breach discharges are probably high. Copies of the breach calculations will be found in Appendix C. Peak breach discharges will be found in Table 2 below.

Table 2 - Summary of Breach Discharges

Failure Scenario	Peak Discharge
Failure at normal flow	2,180 CFS
Failure during the 50-year storm	3,900 CFS

Downstream impacts resulting from a failure of Upper Cold Brook Dam during either scenario are expected to be minimal. There is no development immediately adjacent to the brook in the reach between the dam and the West River with the exception of Lower Cold Brook Dam. The brook enters the West River approximately 1150 feet downstream of the dam. The floodplain of the West River in this area is relatively wide and would be expected to greatly attenuate the floodwave. Some property damage would probably result including destruction of the driveway bridge just downstream of Lower Cold Brook Dam as well as shallow flooding and sedimentation. Failure of Lower Cold Brook Dam could be possible depending on conditions.

Under the State of Vermont system the dam would be classified as a Class 3 (low hazard) structure.

Discussion

In order to evaluate the overall condition of the dam several of the findings must be viewed in a historical perspective. The most recent basis of comparison is a dam safety inspection made by the State in October 1989.

Based on the findings of the State report, the condition of the dam does not appear to have worsened perceptibly. All items of concern previously noted were observed during this inspection. Specifically, these include the vertical misalignment on the left side of the dam, probable leakage under the spillway cap and through the downstream spillway face, leakage near the left abutment, and the large void under the left end of the spillway.

Causes of the misalignment of the downstream face are not obvious but could be related to the void at the toe. It is probable that leakage is occurring through the upstream face of the dam. Construction and foundation details in this area are completely unknown. The size of the void and its location at the toe of the dam are cause for some concern regarding future stability of the dam. It appears that the situation has probably existed for some time and is not getting perceptibly worse.

While desilting the impoundment would be advantageous from a safety and operations point of view, it would be expensive and present regulatory problems. Although the dam does not fall under the jurisdiction of 10 VSA, Chapter 43, desilting would be reviewed by other divisions within the Agency of Natural Resources. It is anticipated that serious objections would be raised concerning fisheries and water

quality. Contact with the Agency Facilities Division indicated that they have no State funds are available for the repair or restoration of dams. The State Historical Preservation Division has funded dam repairs in the past. To qualify, a structure must be eligible for inclusion in the National Historical Register, although actual inclusion is not necessary. Funding is on a matching basis with a maximum ceiling.

Summary and Recommendations

The dam is judged to be in fair condition. Findings of the study are summarized below:

1. The dam does not fall under the jurisdiction of 10 VSA, Chapter 43.
2. There is some leakage in the spillway area and near the left abutment. Minor leakage is occurring in the right abutment.
3. A large void exists at the toe of the dam below the left end of the spillway.
4. The dam has limited spillway capacity but has withstood some major flood events.
5. There is significant sediment accumulation in the impoundment.
6. The condition of the pond drain is unknown but is assumed inoperable without renovation.
7. There are minor maintenance problems.

Specific recommendations are as follows:

1. The void and leakage in the abutment areas should be periodically monitored for changes.
2. Clear and maintain the vegetation in the abutments and the downstream training wall to provide physical and visual access for monitoring leakage and alignment.
3. A visual inspection of the dam by an engineer should be performed every three years. Pictures of all relevant features should be taken to provide a comparison of conditions over time.