ALTERNATIVES ANALYSIS REPORT

CHESTNUT HILL RESERVOIR DAM

VT Dam # 27.08
Town of Brattleboro, Vermont

Prepared for:
Town of Brattleboro, Vermont

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D&K #620464

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1.0 INTRODUCTION

This report summarizes the existing conditions of the Chestnut Hill Reservoir Dam, identifies pertinent regulatory and industry safety requirements for the dam, and documents the evaluation of alternative approaches to managing the reservoir ranging from complete rehabilitation and upgrade to complete removal. The intent of the alternatives analysis is to provide the Town staff and citizens with information assist in making an informed decision about the dam's future of the site.

1.1 Description of Structure

The Chestnut Hill Reservoir Dam (VT Dam #27.08) is located in and owned by the Town of Brattleboro, Vermont. The reservoir is approximately 1 acre and is situated at the top of a hill. There is no contributing drainage area; the only surface inflow to the reservoir is via direct precipitation. A site location map, photographs, and a site plan based on May 2009 field survey are included in Attachment A.

The dam is a constructed of mortared stone blocks with an earthen embankment on the downstream side. The block forms a wall with a vertical face on the interior than surrounds the entire reservoir, a length of approximately 920 feet. The dam is approximately 11 feet tall. The reservoir was dug into the existing ground for a total reservoir depth of 25 feet. At the crest, the reservoir holds 642,000 cubic feet of water. Approximately 25% of the volume is below existing natural grade, and the remaining 75% is above natural grade held back by the dam.

The crest of the dam, formed by the top of the stone wall is at elevation 470.6 at the southern end of the reservoir. The stone wall rises continually along the sides and is approximately 4 feet higher at the northern end.

A mortared stone gatehouse building is located on the south side of the dam. Based on drawings provided by the Town from a previous study, the gatehouse is hydraulically connected to the reservoir and thus the water level is the same in the gatehouse and the reservoir. Manual valves, if operable, allow water to flow from the gatehouse to a valve box approximately 150 feet to the south. This system and portable pumps are the only means of regulating water level.

1.2 Problems with the Dam and Potential Solutions

The Vermont Office of Dam Safety inspected the dam most recently on June 26, 2009 and prepared an inspection report dated July 24, 2009. Another consultants inspected the dam in 2003 and prepared an inspection report. Finally, DuBois & King conducted a limited visual inspection as part of this current effort.

The dam safety issues identified in these various inspections and reports are identified below. Potential solution for each are also provided.

- No Automated Regulation of Water Level. There is no automated way for water to exit the reservoir. Town staff must manually pump water to prevent the dam from

overtopping. This potentially allows the reservoir to fill to elevations that apply unsafe forces on the dam and Gatehouse and could lead to overtopping and erosion of the dam. The simplest option for automatically regulating the water level is to install a vertical standpipe at the desired normal pool elevation into which water drops, and an outlet pipe to convey the water through the dam to a point where it can be safely discharged.

- Leaking and Structural Deficiency of Gate House. The Gatehouse is hydraulically connected to the reservoir, so high water in the reservoir means high water in the Gatehouse. The Town reports that during one high-water event, the downstream wall was leaking and bowed outward. The State inspection reports also noted outward bowing of the downstream Gatehouse wall. This strongly suggests the Gatehouse is not structurally sufficient. Structurally reinforcing the Gatehouse so it can safely hold water without leaking would be difficult and expensive because it would be done from the interior of the Gatehouse to preserve the historic character of the Gatehouse exterior. A better option is to seal the connection between the Gatehouse and the reservoir so that the Gatehouse no longer serves as significant a structural purpose. The Gatehouse exterior should nonetheless be repointed to prevent continued deterioration from the elements.

- No Emergency Action Plan (EAP). An EAP is a written document that describes the expected impacts of a dam breach and details who should do what in the event of an actual or impending dam failure to limit injury, death, and property damage. While there's not a regulatory requirement for a dam owner to prepare and maintain an EAP, it is the industry standard for High Hazard dams and is strongly recommended by the State. The Town should prepare an abbreviated EAP for this dam.

- Growth of Trees on Embankment. Any woody vegetation on dams is undesirable because a) the eventual decay of roots provides conduits to potentially erosive seepage, b) root growth can damage structural aspects of the dam (e.g., concrete and masonry walls), c) tree blow-down can uproot roots causing a sudden and dangerous loss of embankment material, and d) vegetation other than grass prevents effective inspection of the embankment. All woody vegetation should be removed from the dam.

- Deteriorating Concrete. The concrete on the top of the walls and the apron surrounding the pond is cracked and deteriorated in places. This allows water to infiltrate and then freeze which will increase the rate of deterioration. The concrete covering on the interior walls and bottom appears to generally be in better condition. The concrete should be selectively repaired. In addition, the Town should monitor the condition of the interior concrete lining and any increase in seepage through the downstream embankment. If seepage rates increase, the Town should repair or replace the interior concrete.

- Unused Piping. There are two pipes that appear to have at one time connected the reservoir to an adjacent frog pond, and there are pipes running from the Gatehouse to a valve box 150 feet away. Any of these pipes no longer used or needed should be permanently abandoned to eliminate unintended water inputs or outflows from the reservoir.

- Miscellaneous Items. Several miscellaneous items have been identified including:

    - Replace the fence around the reservoir to prevent accidental access. We are aware of no regulatory requirement to prevent access to the reservoir, but there is a generally accepted notion that this reservoir, with it's pool-like vertical walls, represents an attractive hazard, and thus the Town has an obligation to take basic measures to prevent accidental access. A standard fence for a pool is typically 4 feet high.
    - Mark the toe of the embankment to avoid damage by snowplows.

1.3 Concerns of Residents

A Selectboard meeting was held at the reservoir on June 25 to discuss the status and future of the reservoir. Approximately two dozen residents attended. The overwhelming majority arrived on foot suggesting they lived within walking distance. There has also been relatively recent discussion of the fate of the reservoir at earlier Selectboard meetings, in the Brattleboro Reformer, and most recently on iBrattleboro.com.

Collectively, most residents at the June 25 Selectboard meeting expressed the general view that the reservoir was a positive, defining element of the neighborhood and one that they would like to see maintained. These people reported valuing the site for a variety of reasons including (but not limited to):

- The uniqueness of the site.
- The open space.
- The presence of water in the open space.
- The site as a year-round walking destination for Town residents and employees, beyond just the immediate neighbors.
- Historic significance of the reservoir in the development of downtown Brattleboro.
- The peacefulness of the site.
- The sounds of frogs.
- Significant positive impact on property values.

While less common, negative views of the reservoir have also been voiced. They include:

- Concerns that the presence of a reservoir of water is contributing to drainage and groundwater issues at least one property down the hill.
- Concerns that the dam could fail and cause sudden injury or damage to properties down the hill.
- Concern that public funds should not be used to maintain a site that benefits relatively few residents.

In terms of alternate uses for the site, there have been suggestions that the site be converted to a park. Generally, the suggestion has been to convert the site to a dry, open space suitable for informal recreation (e.g., walking around and through the site, playing catch with children) as opposed to active, organized recreation (e.g, basketball courts, skateboard park, etc). At the June 25 meeting, residents who directly abut the reservoir expressed concerns about increased traffic, noise, and mischief. The notion of a usable open space for passive recreational use

appears to be more acceptable, at least to residents of the neighborhood who don't directly abut the reservoir.

2.0 HYDROLOGY AND HYDRAULICS

D&K prepared a rainfall-runoff model for the Chestnut Hill Reservoir Dam using the HydroCad computer program. The only water input to the reservoir is direct precipitation since there is no contributing drainage area. The model was used to calculate the volume and timing of direct precipitation for the 100-year rainfall event and the half and full Probable Maximum Precipitation (PMP) events.

The PMP is the rainfall that may be expected from the most severe combination of critical meteorological conditions that are reasonably possible at a site. In effect, the PMP is the biggest hypothetical rainfall possible for a given site. The PMP for Brattleboro is 30 inches and the 1/2 PMP is 15 inches. For comparison, the 100-year rainfall depth is 6.8 inches.

In our analysis, all events were assumed to be 24-hour duration and follow the NRCS Type II temporal distribution. This latter assumption provides a conservative estimate of the PMP event intensity, but has no significant impact on the results of the analysis. HydroCad model printouts for the proposed alternatives are included in Appendix A.

The results of the existing conditions analysis are summarized in Table 1. Under existing conditions, the 100-year storm causes a 0.6 foot increase in the water depth (corresponding to the depth of the 100-year precipitation), leaving 0.6 feet of freeboard between the water surface and the top of the dam. During the Half PMP event water rises 1.2 feet and essentially equals the top of dam. During the Full PMP event, the dam overtops b y 0.2 feet.

Table 1. Summary of Chestnut Hill Reservoir Dam Hydraulic Results

Condition	Storm Event	Top of Dam Elev. (ft)	Normal Pool Elev. (ft)	Inflow (cfs)	Outflow (cfs) *	Peak WSEL (ft)	Storm Freeboard (ft) *	Normal Pool Freeboard (ft)
Existing	No spillway outlets							
	Q100	570.6	569.4	10.1	0	470.0	0.6	1.2
	½ PMP	570.6	569.4	22.4	0	470.6	0.0	1.2
	PMP	570.6	569.4	44.7	29.6	470.8	-0.2	1.2
* Outflow under existing conditions and negative freeboard represents overtopping of the dam.								

3.0 HAZARD CLASSIFICATION

The State of Vermont has classified the Chestnut Hill Reservoir Dam as a High Hazard structure. The State generally follows the US Army Corps of Engineers guidelines for Hazard Classification, which defines a dam as High Hazard if failure of it would result in "more than a few" loss of lives or "excessive" economic damage. We are aware of no detailed analysis to

document the expected downstream impacts of dam failure, and we presume the State's classification is subjective based on the proximity of homes downstream of the dam. In the absence of a hydraulic analysis of dam failure and the downstream impacts, and given the close proximity of houses downstream, the High Hazard classification is reasonable.

Were a detailed breach analysis to be conducted, we suspect that a lesser Significant Hazard classification could be justified for several reasons. First, 25% of the pond volume is below natural ground which leaves only 75% of the volume of water available to rush downstream. Second, the volume of breach water is small, which means the duration of a downstream breach wave would be very short and thus less likely to cause damages or loss of life. Finally, given the small volume and short breach duration, the size of the breach (which usually grows as water rushes through) would be relatively small and so would the resulting peak discharge.

4.0 DESIGN STORM

The State of Vermont follows the Corps of Engineers guidelines for design storms, which is the storm that the dam must be designed to safely accommodate. For Small High Hazard dams, Corps guidelines recommends design storms ranging from the Half Probable Maximum Flood (PMF) to the Full PMF. The State generally requires that a dam provide at least one foot of freeboard (vertical distance between the water surface elevation and the top of dam) during the design storm and three feet of freeboard above normal pool elevation.

Given that the Chestnut Hill Reservoir volume is actually smaller than the range the Corps specifies for a Small structure, and the collection of factors that suggest the High Hazard classification may be conservative, it is our professional opinion that that the Half PMF (rather than the *Full* PMF) is the appropriate design storm for this dam. Considering the State's freeboard requirement, modifications to the dam to address the hydraulic capacity issue will need to ensure one foot of freeboard between the peak water surface elevation and the top of dam during the Half PMF event and three feet of freeboard above normal pool elevation. As indicated in Table 1, the dam currently has no freeboard during the Half PMF, overtops during larger storms, and has only 1.2 feet of freeboard above normal pool.

5.0 ALTERNATIVES

A number of alternative approaches for bringing the dam up to current dam safety standards were evaluated. A description of each follows and a summary is presented in Table 2. Sketches and Estimates of Probable Cost are included in Appendix B. The alternatives fall into three general categories:

- Full Pond: Alternatives 1 – 2 result in essentially a full pond with water equal to or close to the historic elevation.
- Smaller Pond: Alternatives 3 – 5 result in a smaller pond no longer subject to State jurisdiction.
- No Pond: Alternatives 6 – 8 involve elimination of any standing water.

5.1 Alternative 1: Full Pond A

This alternative is intended to restore the dam to historic condition while meeting most dam safety requirements. The major components of this alternative include the following:

- New 12" diameter vertical riser pipe that automatically maintains normal water level 1.2 feet below crest (elevation 469.4 feet, which is approximately the historic elevation)
- New outlet pipe to reliably convey the water away from the dam
- New manual pond drain for maintenance or emergency operations
- Gatehouse repairs
- Miscellaneous minor repairs and modifications

A sketch of Alternative 1 is included in Attachment B1. Note that the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box. An option is to instead locate the outlet pipe near the southwest corner and route it down to Water Street in order to bypass the valve box and avoid conflicts with the house near which the existing pipes run. This should be investigated further during design. Gatehouse repairs include isolating the Gatehouse from the pond so that the aging structure is not required to hold back water, plus lesser measures such as repointing the exterior stone.

The approximate cost of this alternative is $219,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached.

The major benefits of this alternative are the relatively low cost, maintenance of the historic and visual character of the site, resolution of structural concerns, and significant resolution of hydraulic concerns. A drawback is that the hydraulic issues are not fully addressed because the dam would have less than 1.0 feet of freeboard between the water surface and the top of the dam during the design storm (Half PMP), as required by the State. An argument could be made for an exception to that standard, but it may be more productive to simply pursue Alternative 2 in which the normal water level is lowered several inches so there is the full 1.0 feet of freeboard. An additional drawback is that a fence would need to remain around the pond for safety reasons and thus it is not usable in the traditional sense.

5.2 Alternative 2: Full Pond B

This alternative is intended to restore the dam to nearly its historic condition while meeting dam safety requirements. It is the same as Alternative 1 except that the normal water level is reduced by 1.8 feet. The major components of this alternative include the following:

- New 12" diameter vertical riser pipe that automatically maintains normal water level 3.0 feet below crest (elevation 467.6 feet)
- New outlet pipe to reliably convey the water away from the dam
- New manual pond drain for maintenance or emergency operations

- Gatehouse repairs
- Miscellaneous minor repairs and modifications

A sketch of Alternative 2 is included in Attachment B1. As with Alternative 1, the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box, though other alignments should be investigated during design. Gatehouse repairs include isolating the Gatehouse from the pond so that the aging structure is not required to hold back water, plus lesser measures such as repointing the exterior stone.

The approximate cost of this alternative is $219,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached.

The major benefits of this alternative are the relatively low cost, maintenance of the historic and visual character of the site, resolution of structural concerns, and resolution of hydraulic concerns. Unlike Alternative 1, the reduced normal water surface elevation of Alternative 2 allows for the full 1.0 feet of freeboard during the design storm and 3.0 feet of freeboard above normal pool as required by the State. The significant drawback is that a fence would need to remain around the pond for safety reasons and thus the site would not be usable in the traditional sense.

5.3 Alternative 3: Small Pond A

This alternative is intended to restore the dam to nearly its historic condition while meeting dam safety requirements, and to remove it from State jurisdiction by bringing in fill to reduce the volume below the State's threshold. It is the same as Alternative 2 except the pond bottom is raised. The major components of this alternative include the following:

- New 12" diameter vertical riser pipe that automatically maintains normal water level 3.0 feet below crest (elevation 467.6 feet)
- New outlet pipe to reliably convey the water away from the dam
- New manual pond drain for maintenance or emergency operations
- Gatehouse repairs
- Miscellaneous minor repairs and modifications
- Raise the pond bottom (by trucking in fill material) approximately 8.0 feet to elevation 458.0.

A sketch of Alternative 3 is included in Attachment B1. As with Alternatives 1 and 2, the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box, though other alignments should be investigated during design. Gatehouse repairs include isolating the Gatehouse from the pond so that the aging structure is not required to hold back water, plus lesser measures such as repointing the exterior stone.

The approximate cost of this alternative is $397,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached. Nearly $80,000 of the construction cost would go toward bringing in the 5,300 cubic yards of material needed to raise the pond bottom. Another $36,000 would go toward repaving 900 linear feet of road that would likely be damaged by the nearly 400 truck trips associated with hauling in the fill material.

The major benefits of this alternative are the maintenance of the historic and visual character of the site, resolution of structural concerns, resolution of hydraulic concerns, and elimination of State jurisdiction. Drawbacks include the need to maintain a fence around the pond for safety reasons, which prevents the site from being "used" in the traditional sense, the potential for declining water quality due to the reduction in pond depth from 19 feet to 11 feet, and the relatively high cost.

5.4 Alternative 4: Small Pond B

This alternative is intended to restore the dam to nearly its historic condition while meeting dam safety requirements, and to remove it from State jurisdiction by reducing the pond volume below the State's threshold, this time by lowering a portion of the wall (instead of raising the bottom) to reduce the maximum volume of water that can potentially be stored. Since a portion of the wall is removed, the normal water level has to be lowered so that there's still room to hold the design storm with the required 1.0 feet of freeboard. The major components of this alternative include the following:

- New 12" diameter vertical riser pipe that automatically maintains normal water level 4.9 feet below crest (elevation 465.7 feet)
- New outlet pipe to reliably convey the water away from the dam
- New manual pond drain for maintenance or emergency operations
- Gatehouse repairs
- Miscellaneous minor repairs and modifications
- Cut a 40' notch in the wall of the dam at elevation 467.3 (3.3 feet below current crest) to reduce the maximum potential storage of water below the 500,000 cubic feet State threshold.

A sketch of Alternative 4 is included in Attachment B1. As with previous alternatives, the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box, though other alignments should be investigated during design. Similarly, the 40' notch is shown in the southwest corner, though other locations would be acceptable. Gatehouse repairs include isolating the Gatehouse from the pond so that the aging structure is not required to hold back water, plus lesser measures such as repointing the exterior stone.

The approximate cost of this alternative is $221,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached.

The major benefits of this alternative are the maintenance of the historic character of the site, resolution of structural concerns, resolution of hydraulic concerns, and elimination of State jurisdiction. Drawbacks include the need to maintain a fence around the pond for safety reasons, which prevents the site from being "used" in the traditional sense, the potential for declining water quality due to the reduction in pond depth from 19 feet to 15.7 feet, and lowering of the normal water surface which may conceal the pond surface from some vantage points thereby impacting the visual character of the site.

5.5 Alternative 5: Small Pond C

This alternative is intended to restore the dam to nearly its historic condition while meeting dam safety requirements, and to remove it from State jurisdiction by reducing the pond volume below the State's threshold, this time by both partially filling the bottom and also lowering a portion of the wall. This is a hybrid of Alternatives 3 and 4. The major components of this alternative include the following:

- New 12" diameter vertical riser pipe that automatically maintains normal water level 3.2 feet below crest (elevation 467.4 feet)
- New outlet pipe to reliably convey the water away from the dam
- New manual pond drain for maintenance or emergency operations
- Gatehouse repairs
- Miscellaneous minor repairs and modifications
- Cut a 300' notch in the wall of the dam at elevation 469.0 (1.6 feet below current crest) to reduce the maximum potential storage of water and provide some material to fill pond
- Raise the pond bottom (by trucking in fill material) approximately 5.5 feet to elevation 455.5

A sketch of Alternative 5 is included in Attachment B1. As with previous alternatives, the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box, though other alignments should be investigated during design. Similarly, the 300' notch is shown centered on the downstream crest, though other locations would be acceptable. Gatehouse repairs include isolating the Gatehouse from the pond so that the aging structure is not required to hold back water, plus lesser measures such as repointing the exterior stone.

The approximate cost of this alternative is $342,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached. The cost is reduced relative to Alternative 3 because the amount of imported fill is roughly halved.

The major benefits of this alternative are the maintenance of the historic character of the site, resolution of structural concerns, resolution of hydraulic concerns, and elimination of State jurisdiction. Drawbacks include the need to maintain a fence around the pond for safety reasons, which prevents the site from being "used" in the traditional sense, the potential for declining water quality due to the reduction in pond depth from 19 feet to 11.9 feet, lowering of the normal

water surface which may conceal the pond surface from some vantage points thereby impacting the visual character of the site, and relatively high cost.

5.6 Alternative 6: No Pond A

This alternative is intended to eliminate all ponded water at the site (thereby eliminating any structural or hydraulic concerns) for the least cost, and to remove it from State jurisdiction by reducing the pond volume below the State's threshold by lowering a portion of the wall to reduce the maximum volume of water that can potentially be stored. The major components of this alternative include the following:

- New outlet pipe to reliably convey the water away from the dam
- Minor Gatehouse repairs
- Miscellaneous minor repairs and modifications
- Cut a 40' notch in the wall of the dam at elevation 467.3 (3.3 feet below current crest) to reduce the maximum potential storage of water below the 500,000 cubic feet State threshold.

A sketch of Alternative 6 is included in Attachment B1. As with previous alternatives, the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box, though other alignments should be investigated during design. Similarly, the 40' notch is shown in the southwest corner, though other locations would be acceptable. Gatehouse repairs for this alternative do not include isolating the Gatehouse from the pond; only the lesser measures such as repointing the exterior stone are included.

The approximate cost of this alternative is $135,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. This is the least costly of all the alternatives considered. A conceptual-level cost estimate is attached.

The major benefits of this alternative are the relatively low cost and the elimination of structural and hydraulic concerns. Drawbacks include the need to maintain a fence around the site (now an empty hole) for safety reasons, which prevents the site from being "used" in the traditional sense, and the loss of the visual character of the site from most vantage points; the walls and gatehouse would remain, but the interior would be a hole rather than a pond.

5.7 Alternative 7: No Pond B

This alternative is intended to eliminate all ponded water at the site (thereby eliminating any structural or hydraulic concerns) and create a usable field at elevation 453', which is about ten feet below the road elevation at the downstream end. Essentially, this alternative results in a 1-acre field surrounded by ledge and walls with a ramp from the road down to the field. The major components of this alternative include the following:

- New outlet pipe to reliably convey groundwater and stormwater away from the site

- Minor Gatehouse repairs
- Miscellaneous minor repairs and modifications
- Cut a 40’ notch in the wall of the dam at elevation 463.0 (7.3 feet below current crest) to provide access into the interior.
- Raise the pond bottom (by trucking in fill material) approximately 3.0 feet to elevation 453.0.
- Construct earthen ramp from notch down to field elevation.
- Basic landscaping of interior field.

A sketch of Alternative 7 is included in Attachment B1. As with previous alternatives, the proposed location of the new outlet pipe on the sketch follows the alignment of the existing pipes from the Gatehouse to the downstream valve box, though other alignments should be investigated during design. Similarly, the 40’ notch for access to the interior is shown in the southwest corner, though other locations would be acceptable. Gatehouse repairs for this alternative do not include isolating the Gatehouse from the pond; only the lesser measures such as repointing the exterior stone are included.

The approximate cost of this alternative is $263,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached.

The major benefit of this alternative is the elimination of structural and hydraulic concerns since potential for impounding water is eliminated, and while the walls and embankment would remain, they would no longer be considered a dam by any reasonable definition. The historic features and much of the visual character would be preserved. An additional benefit, and one that sets this alternative apart from the others, is that the site would be transformed in a way that allows for active use of the area. The unique and historic aspects of the site would remain largely unchanged, but the site becomes usable for the community. Drawbacks include the loss of the aesthetic quality provided by the ponded water, and the potential for increased traffic and noise associated with expanded uses.

5.8 Alternative 8: No Pond C

This alternative is intended to eliminate all ponded water at the site by filling in the pond. Unlike Alternative 7, the walls and earthen embankment would be demolished and used to offset some of the needed fill material. The major components of this alternative include the following:

- Demolition of walls, gatehouse, and embankment
- Raise the pond bottom (by trucking in fill material) approximately 13.0 feet to elevation 463.0
- Basic landscaping of new field.

A sketch of Alternative 8 is included in Attachment B1. No outlet pipe system is needed because ground and surface water will not be “trapped” at the site since the surrounding walls will be demolished.

The approximate cost of this alternative is $629,000, of which approximately 70% is for construction and the remaining 30% is for engineering, geotechnical investigations, permitting, and construction inspection. A conceptual-level cost estimate is attached. Nearly $170,000 of the construction cost would go toward bringing in the material needed to raise the pond bottom. Another $68,000 would go toward repaving 1700 linear feet of road that would likely be damaged by the nearly 800 truck trips associated with hauling in the fill material and by the heavy equipment used to push the existing walls into the pond.

The major benefit of this alternative is the elimination of structural and hydraulic concerns associated with the dam since it would be completely eliminated. An additional benefit is that the dam site would be available for other uses. Drawbacks include the relatively high cost, loss of the historic features, loss of the visual character of the site, and the potential for increased traffic and noise associated with expanded uses.

5.9 Summary Table

A summary of the alternatives including the primary components and a comparison to significant evaluation criteria is presented in Table 2.

5.10 Ownership Options

In conjunction with evaluating the engineering alternatives presented above, ownership options should be considered. The reservoir no longer serves a functional purpose for the Town, and it may be in the Town's interest to sell or otherwise surrender ownership. This could be done prior to or after one of the engineering alternatives is completed. Potential buyers include adjoining property owners interested in either preserving or removing the reservoir and developers interested in new construction on the site.

From the Town's perspective, selling the reservoir has several potential benefits:

- Elimination of future operations and maintenance obligations. This includes semi-regular activities such as mowing the grass, occasional unplanned repairs such as repairing a damaged fence, and planned long-term maintenance such as replacing the concrete coating of the reservoir interior to prevent excessive and potentially dangerous leakage through the embankment.

- Elimination of real or perceived liability for the dam. This might include additional insurance premiums, though the Town reports that the dam is not currently a factor in the Town's premiums. It would also include elimination of Town liability for perceived hazards or damages associated with the dam and reservoir.

Table 2. Alternatives Analysis Summary Table

Alternative		Components					Evaluation		
#	Description	New Pipe System to Regulate Water Level?	Normal Water Elev below Current Wall Crest?	Structural Gatehouse Repairs?	Minor Safety / Site Improvements and Repairs?	Reduce Total Pond Volume below State Threshold?	Meets Dam Safety Standards?	Cost	Overall Quality / Character / Usability of Site
1	FULL POND A: Install pipe system to regulate water level at historic elevation (1.2' below current crest) and perform necessary structural repairs	Y	1.2	Y	Y	N	N (water too high during design storm)	$219,000	Excellent
2	FULL POND B: Install pipe system to regulate water level at reduced elevation (3.0' below current crest) and perform necessary structural repairs	Y	3.0	Y	Y	N	Y	$219,000	Excellent
3	SMALL POND A: Install pipe system to regulate water level at reduced elevation (3.0' below current crest), perform necessary structural repairs, and bring in fill to reduce the total volume below State threshold.	Y	3.0	Y	Y	Y (bring in 8’ of fill)	Y	$397,000	Fair (reduced water depth may be effect quality)
4	SMALL POND B: Install pipe system to regulate water level at reduced elevation (4.9' below current crest), perform necessary structural repairs, and cut a notch in wall to reduce the total volume below State threshold.	Y	4.9	Y	Y	Y (cut notch in wall 3.3’ below crest)	Y	$221,000	Fair (reduced water depth may be effect quality)
5	SMALL POND C: Install pipe system to regulate water level at reduced elevation (3.2' below current crest), perform necessary structural repairs, partially fill the pond and cut a notch in wall to reduce the total volume below State threshold.	Y	3.2	Y	Y	Y (bring in 5.5’ of fill *and* notch in wall 1.6’ below crest)	Y	$342,000	Fair (reduced water depth may be effect quality)
6	NO POND A: Install pipe system to keep the pond empty (20.6' below current crest) and perform only minimal safety-related site improvements	Y	20.6	N	Y	Y (cut notch in wall 3.3’ below crest)	Y	$135,000	Poor (just a hole in the ground)
7	NO POND B: Partially fill pond and create flat park/field at elevation 453.0 with notch cut in wall and ramp down for access	Y (for groundwater)	N/A	N	Y	Y	N/A (No longer a dam)	$263,000	Excellent (accessible, usable, unique open space)
8	NO POND C: Demolish dam and walls and fill pond to match adjacent roadway elevation all around.	N	N/A	N	N	Y	N/A (No longer a dam)	$629,000	Fair (usable site, but unique character lost)