

**-- SMITH & SAYLES RESERVOIR DAM --
VISUAL
INSPECTION / EVALUATION REPORT**



Dam Name: *Smith & Sayles Reservoir Dam*

State Dam ID#: *023*

Owner: *Sand Dam Reservoir Association*

Town: *Glocester*

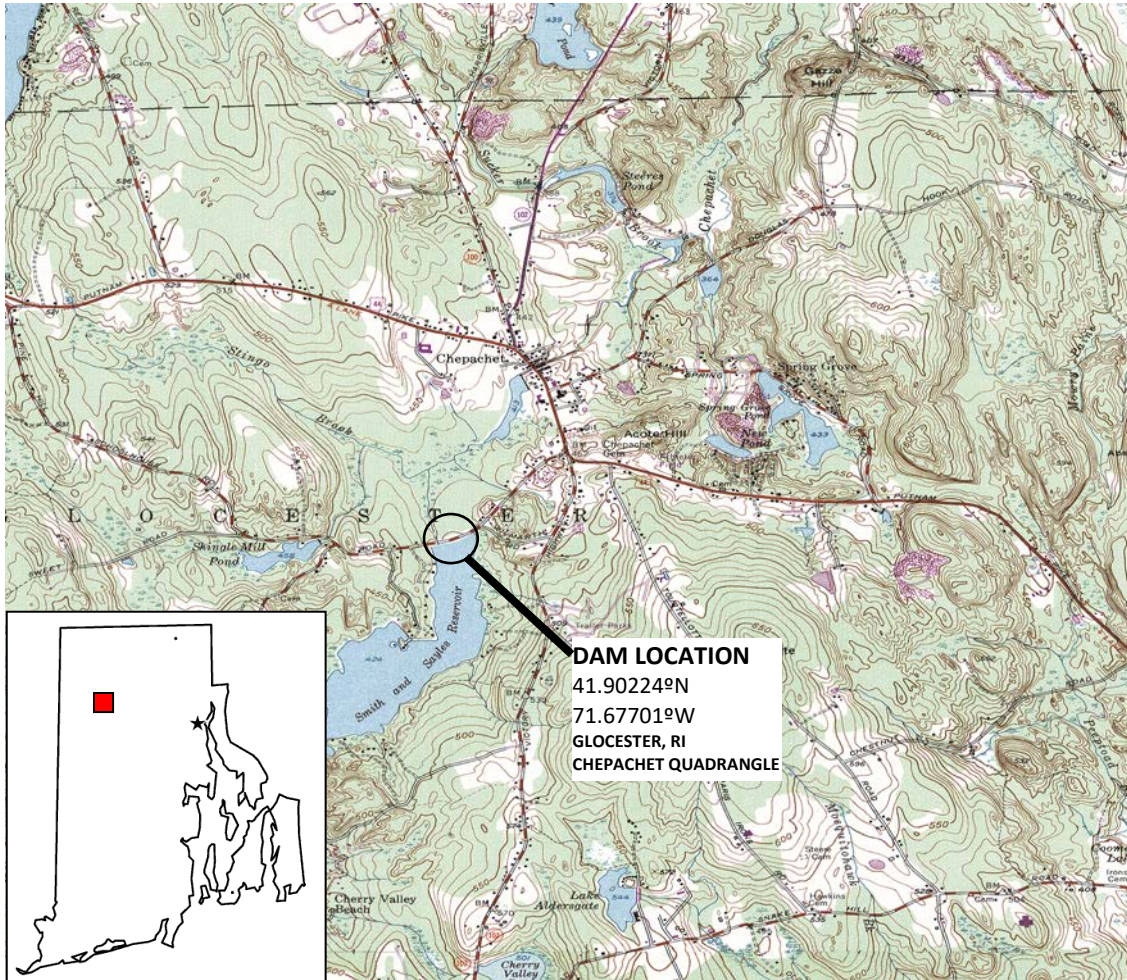
Consultant: *Pare Corporation*

Date of Inspection: *May 20, 2022*

INSPECTION SUMMARY

Dam Name (No): Smith & Sayles Reservoir Dam (023)
Location: Glocester
Hazard Classification: Significant

Inspector: Matthew Dunn, P.E.
Inspection Date: May 20, 2022



When describing the dam, “left” and “right” refer to the respective sides of the dam as viewed when facing downstream (with normal flow of water).

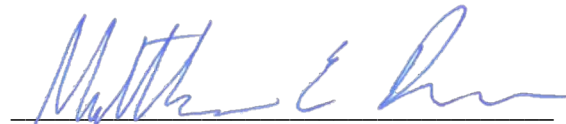


PREFACE

The assessment of the general condition of the dam reported herein was based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations were beyond the scope of this report unless reported otherwise.

In reviewing this report, it should be realized that the reported condition of the dam was based on observations of field conditions at the time of inspection, along with data available to the inspection team.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the reported condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.



Matthew Dunn, P.E.
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Senior Project Engineer

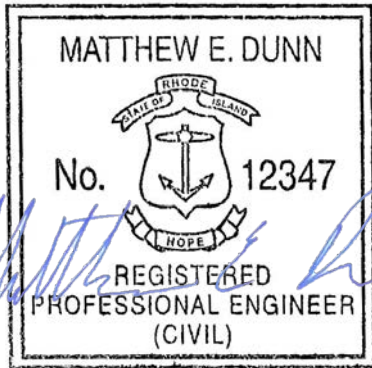


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ATTACHMENTS:

- Common Dam Safety Definitions
- References and Resources
- Visual Dam Inspection Limitations
- Photographs
- Figure 1: Site Sketch



1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Authority

The RIDEM Office of Compliance and Inspection has retained Pare Corporation of Foxboro, Massachusetts and Lincoln, Rhode Island to perform a visual inspection and develop a report of conditions for the Smith & Sayles Reservoir Dam along the Chepachet River in Glocester, Rhode Island. This inspection and report were performed in accordance with current Rhode Island laws.

RIDEM will develop an overall condition rating based upon the data presented herein. It is understood that this rating will consider operational and structural deficiencies and will be presented under separate cover.

1.1.2 Purpose of Work

The purpose of this investigation was to inspect and evaluate the present condition of the dam and appurtenant structures in accordance with current dam safety regulations to provide information that will assist in both prioritizing dam repair needs and planning/conducting maintenance and operation.

The investigation was divided into three parts: 1) obtain and review reports, investigations, and data pertaining to the dam and appurtenant structures available within the Rhode Island Department of Environmental Management files; 2) perform a visual inspection of the site; and; 3) prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions.

1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix B. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) hazard classification; 4) general; and 5) condition rating.

1.2 Description of Project

1.2.1 Location

The Smith & Sayles Reservoir Dam is located in the Town of Glocester. The dam, located approximately 1.1 miles northeast of the center of Glocester, impounds water along the Chepachet River to form the Smith & Sayles Reservoir Pond. The dam is located at the northern end of the impoundment area near coordinates 41.90224°N/71.67701°W. Please refer to the inspection summary for a locus plan depicting the area of the dam and its immediate surroundings.

To reach the dam from I-295, take Exit 12B (formerly Exit 7B) for US-44 West/Putnam Pike toward Smithfield. After 8.8 miles turn left onto Chestnut Hill Road. After roughly 0.7 miles Chestnut Hill Road will traverse the crest of the dam and the impoundment will be on the left.



1.2.2 Owner/Caretaker

The dam is currently owned and operated by The Sand Dam Reservoir Association. Mr. Rico Colaluca and Mrs. Judy Colaluca, the Owner's representatives, can be reached at 603-986-7632. Mr. Colaluca reported that the Association only owns the upstream half of the dam (to the roadway centerline) and that the Town of Gloucester owns most of the downstream half (with the exception of the land left of the centerline of the downstream channel of the spillway that is owned by the abutting residence). This split ownership condition was not independently verified during the preparation of this report.

1.2.3 Purpose of the Dam

The dam currently impounds water for recreational purposes and was reportedly constructed in 1865. No other purposes past or present were identified during the preparation of this report.

1.2.4 Description of the Dam and Appurtenances

The following is based upon information contained within the RIDEM files and observations made during the inspection:

The Smith & Sayles Reservoir Dam consists of a 290-foot long earthen embankment with a maximum height of approximately 13 feet and a hydraulic height of about 10 feet. Appurtenant structures at the dam include a primary spillway system at the left (west) abutment and a low level outlet (LLO) system near the center of the dam. The dam, including the bridge over the primary spillway system, supports Chestnut Hill Road. (Per the 2012 Inspection: *According to RIDEM records, the dam is 980 feet long. However, based on discussions with the Owner's representative and observations during the inspection, the downstream area behind the rightmost 690 feet of the dam has been backfilled at or higher than the height of the dam for a distance of at least 600 feet downstream for the construction of a transfer station; therefore, the area along the waterline in this area was not considered part of the dam for this inspection.*)

The upstream side of the embankment consists of a short stone wall along the upper section of the slope that transitions to an earthen slope into the impoundment. The earthen slope is visible from the LLO to the right abutment but is underwater between the low level outlet and the primary spillway. The exposed section of the earthen slope is covered with irregularly spaced boulders with maintained tree and brush growth.

The crest of the dam consists of an approximately 20-foot wide paved roadway (Chestnut Hill Road) with roughly 3-foot wide earthen and weed covered shoulders.

The downstream side of the dam is variable in slope and surface coverage. From the right abutment to 10 feet left of the LLO conduit, the slope is generally a 1.5H:1V slope with developing brush and weed vegetation throughout with the exception of within 10 feet of the LLO pipe where it is covered with riprap and weed and brush vegetation. From 10 feet left of the LLO to the spillway, the slope is comprised of large diameter boulders that result in a slope approaching 1H:1V and steeper with significant voids between the boulders that can be probed to as far upstream as the downstream edge of the crest/roadway.

The primary spillway system, located adjacent to the dam's left abutment is about 33 feet long and consists of five (5) bays including four, 5'-9" wide timber stop log controlled bays and one (1) 4'-



6" wide lift gate controlled bay, which is the central bay. The bays are divided by four inner concrete piers and two concrete abutments. The abutments form the downstream channel walls for the primary spillway and also function to support the Chestnut Hill Bridge located downstream of the spillway. A catwalk, consisting of an aluminum grate decking and aluminum handrails, traverses the abutments and piers to provide access. According to existing plans, a cut off wall consisting of steel sheet piling extends from within the bottom of the spillway structure to a depth of 10 feet or to refusal. The stop logs can be removed using dual hooks that are lifted and lowered by chain falls attached to a portable aluminum frame. The lift gate is an aluminum gate manufactured by WHIPPS that is opened and closed by a geared system, operated by a hand wheel.

The low level outlet is a 3.5 foot inside diameter steel riveted pipe on the upstream side transitioning to a recently installed 3.5 foot inside diameter concrete pipe on the downstream side. The gate is located on the upstream side and consists of a steel plate supported and stabilized within a concrete vault/intake structure. The upstream side of the vault is fitted with timber stop logs. Discharge from the reservoir flows over the stop logs and into the vault where the gate is located. The gate has a short steel stem welded onto its downstream side with a square opening at the top to fit a lifting hook of a hand operated jack used for opening and closing this gate. For full operation, the stop logs at the vault are removed with steel hooks to allow water to flow into the vault and below the gate. The discharge end of the low level outlet protrudes out of the base of the rip rap protected downstream slope and into a natural channel.

The primary spillway and the downstream end of the low level outlet pipe were rehabilitated as part of the Chestnut Hill Bridge No. 951 Replacement Project with Plans dated February 2010.

1.2.5 Operations and Maintenance

The Sand Dam Reservoir Association are primarily responsible for operations and maintenance of the upstream half of the dam. Maintenance of the downstream half of the dam would be the responsibility of the Town of Glocester based upon the split-ownership condition that was reported by Mr. Colaluca during this inspection.

1.2.6 Hazard Potential Classification

In accordance with current classification procedures under State of Rhode Island dam safety rules and regulations, Smith & Sayles Reservoir Dam has been classified as a Significant hazard potential dam by RIDEM.



2.0 INSPECTION

2.1 Visual Inspection

Smith & Sayles Reservoir Dam was inspected on May 20, 2022. At the time of the inspection, the weather was near 70°F with clear skies. Photographs to document the current condition of the dam were taken during the inspection and are included in Appendix A. The level of the impoundment appeared to be near normal operating levels. Underwater areas were not inspected as part of the field activity.

For reference purposes, a baseline was established along the crest of the dam embankment. Station 0+00 was located at the left abutment and extended to Station 2+90 at the right abutment. Observations are reported in relation to their location along the baseline as noted herein.

2.1.1 General Findings

In general, Smith & Sayles Reservoir Dam was found to have a section of steep and irregular boulder covered downstream slope with large voids between the boulders as well as areas of unwanted woody vegetation which limited a full viewing/inspection of some areas of the dam. The specific concerns are identified in more detail in the sections below:

2.1.2 Dam Embankment

Upstream Side

- The upstream side consists of a short stone wall along the top of the slope transitioning to a riprap protected slope extending from the toe of the wall sloping into the impoundment. Large boulders also line the top of the slope for vehicular safety.
- Both the wall and the slope appeared irregular, but no apparent signs of movement or instability were noted.
- Maintained weed and brush vegetation is present throughout; the denseness of which limited a full viewing of the slope. Underwater areas were also not accessible.
 - Given these two limitations, it is recommended that the next inspection be completed in late winter / early spring prior to leaf out and while the impoundment is at the winter drawdown elevation.
- The right abutment contact appeared normal with no cracking or unusual movement observed. The left side of the embankment extends to the primary spillway and the interface appeared normal.

Crest

- The crest consists of a paved roadway (Chestnut Hill Road) and is in good condition with no depressions, holes, rutting, or puddling observed.
- The right side of the crest appeared to be lower than the left side which appears to be an as-built condition. The grade across the crest appears slightly sloped from upstream to downstream.



- The right abutment contact appeared normal with no cracking or unusual movement observed. The left side of the embankment extends to the primary spillway and the interface appeared normal.

Downstream Slope

- The following was noted along the portion of the slope from the spillway to within 10 feet of the LLO:
 - The slope is overgrown with large diameter tree and dense brush vegetation.
 - Accessible portions of the slope were observed to consist of very large diameter boulders that were stacked/dumped irregularly that result in a steep slope approaching greater than 1H:1V.
 - Large voids were present within the boulders that extended in the upstream direction as much as 4 feet; which is likely approaching the downstream edge of the roadway/crest.
 - The toe and downstream area of this portion of the slope is saturated and supporting wetland type vegetation growth; there was no apparent evidence to suggest that the wetland and saturation is the result of seepage through the dam and is rather a naturally occurring wetland due to site topography. However, the area should be reassessed during a time of year that permits viewing less obstructed by vegetation.
- The following was noted along the portion of the slope from 10 feet left of the LLO to within 10 feet of the right abutment:
 - The slope is generally 1.5H:1V and is riprap covered within 10 feet of the LLO.
 - This slope is vegetated with tall weeds and brush.
 - A tailwater pool extends to the toe of the slope within 5 feet of the LLO. The pool was measured to be up to 3 feet deep at its apparent deepest point, which is 5 feet downstream of the LLO conduit. The pool is likely the result of backwater from the flow through the spillway channel.
- The slope within 10 feet of the right abutment and the right abutment itself is overgrown with trees and brush. The toe and downstream area is saturated (but firm) with iron oxide stained water flowing slowly to the tailwater pool. It appears that most of this condition is the result of groundwater flow from the right abutment and there was no apparent evidence that suggested it was the result of seepage through the dam. However, the area should be reassessed during a time of year that permits viewing less obstructed by vegetation.

2.1.3 Appurtenant Structures

Primary Spillway

- The primary spillway is near new (approximately 11 years old) and is located under the new bridge (RIDOT No. 951 - Chestnut Hill Road Bridge).
- The primary spillway is in good condition with no cracking or movement observed along the abutment walls, and an operable lift gate.
- Some leakage is likely between the stop logs and the frames; however, the leakage is not a concern.
- About 1/2 inch of water is flowing over the stop logs, which sets the normal pool elevation.
- The approach and discharge areas were clear of debris.
- The discharge area downstream of the bridge/primary spillway is protected with armor stone rip rap that is in good condition. Some of the top stones of the riprap immediately downstream



of the concrete discharge slab appear to have been displaced resulting in a vertical drop between the slab and top of remaining riprap of up to 1 foot. This condition as is does not appear to be a risk to lead to slab undermining; however, should be monitored to assess that additional riprap displacement does not occur to the point where slab undermining would be a concern.

Low Level Outlet

- The low level outlet stop logs appear in good condition with minimal leakage. The Sand Dam Reservoir Association uses hooked bars to takeout and install the stop logs.
- The trash rack is in good condition.
- The concrete at the inlet structure is in fair condition with aged but structurally sound concrete.
- The Owner reported that the gate is operated annually to perform a winter drawdown of the impoundment with the last operation reportedly occurring in April 2022; as such, the outlet was not operated during this inspection. Based on a review of the outlet conditions (i.e. clear pipe conduit, cleared approach and discharge areas) the outlet appears operable.
- The approach and discharge areas appear clear of debris.
- There were no apparent signs of movement/settlement of the embankment along the alignment of the conduit.
- It was reported within the 2012 inspection report that operational procedures are a bit labor intensive and require multiple association personnel to complete; as such, alternate means of operation to facilitate one-person operation may be worthwhile.

2.1.4 Downstream Area

Immediately downstream and right of the dam is a transfer station facility followed by forested land (from 550 to 2,000 feet downstream) before encountering another industrial facility to the north. Directly north, approximately 5,000 feet downstream is Main Street near the center of Chepachet (a village within the Town of Glocester).

2.1.5 Reservoir Area

The dam is located at the northern edge of the Smith & Sayles Reservoir and the impoundment consists of two main portions. The northern portion, where the dam impounds the water along the northern edge, is approximately 3,000 feet north to south and 1,100 feet east to west. The southern portion of the impoundment is approximately 4,000 feet northeast to southwest and approximately 1,600 feet northwest to southeast. The southwest corner of the reservoir abuts Keech Pond. The perimeter of the reservoir is a wooded area with intermittent residential properties, which are more densely located towards the south. Flow enters the impoundment from Keech Pond via Keech Pond Dam (RI #022).

2.2 Caretaker Interview

Mr. Rico Colaluca and Mrs. Judy Colaluca, representatives of the Sand Dam Reservoir Association, were present during the inspection; information provided by the Colaluca's has been incorporated into this report.



2.3 Operation and Maintenance Procedures

There was no formal operations and maintenance manual for the dam available at the time of the inspection.

2.3.1 Operational Procedures

Operable components at the dam include the stop logs and lift gate at the primary spillway and the stop logs and lift gate at the low level outlet. No operational plan was indicated to exist at the time of the inspection. The Association completes an annual winter drawdown of the impoundment up to 4 feet below normal pool via operations of the LLO gate.

2.3.2 Maintenance of Dam and Operating Facilities

There was no maintenance manual for the dam available at the time of the inspection. However, it is evident that routine maintenance is completed along the upstream slope and crest of the dam as well as at the spillway and low level outlet systems. It does not appear that maintenance is performed along the downstream side of the dam. The caretaker routinely completes informal inspections to check the condition of the dam. In general, the caretaker was knowledgeable of current conditions at the dam.



3.0 ASSESSMENTS AND RECOMMENDATIONS

3.1 Assessments

The Smith & Sayles Reservoir Dam was found to have the following deficiencies:

1. A section of the downstream slope that is steep and irregular with large voids between large and irregularly stacked boulders.
2. Areas of unwanted vegetation, which limited access and inspection of some areas of the dam.
3. Portions of the downstream side of the dam that do not appear to be regularly maintained.
Note this portion of the dam is reportedly owned by the Town of Gloucester.

The last RIDEM inspection for the dam was completed by Pare Corporation on July 26, 2012. Based upon a comparison to reported conditions, the conditions appear similar to the same as those noted during the 2012 inspection.

<i>Previously Identified Deficiency/Recommendation</i>	<i>Resolution or Current Condition</i>
Clear unwanted vegetation	No apparent change / Similar recommendation
Complete a follow up inspection to view the areas that were inaccessible due to vegetation.	Similar recommendation to complete the next inspection during a time of year that allows for a full viewing of the dam (i.e. late fall – early spring)
Complete a slope stability analyses of the embankment to assess the apparent probable need to regrade the downstream slope; regrade the slope per the analyses	No apparent change / Similar recommendation to address the steep and irregular downstream slope
Install riprap protection along the upstream slope right of the spillway	No apparent change / Similar recommendation to be completed following the inspection to be completed during leaf off and winter drawdown condition
Repoint the upstream walls and reset shifted stones	No apparent change / Similar recommendation to be completed following the inspection to be completed during leaf off and winter drawdown condition
Assess the need to improve the ease of operation of the LLO gate	No apparent change / Similar recommendation
Evaluate the wetland areas within the downstream area to assess if there is seepage through the dam	No apparent change / Similar recommendation
Remove sand deposits within the tailwater pool of the LLO.	No sand observed during the current inspection
Develop a formal Operation and Maintenance Manual	No apparent change / Similar recommendation
Implement regular inspection of the dam	Ongoing
Complete an H&H analysis	No apparent change / Similar recommendation

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of RIDEM or other regulatory agencies.



3.2 Recommendations

The following present additional studies, routine and recurrent operations and maintenance activities, and repairs recommended to address deficiencies noted during the inspection and the completion of this report. The recommendations provided below should be implemented in accordance with general dam safety practice. Further, if left unaddressed, many of the conditions identified above will continue to deteriorate and could compromise the future safety of the dam and appurtenant structures.

1. Clear the upstream and downstream embankment of all trees, vegetation, and deadfall to a distance of 15 feet beyond the downstream earthen toe/bottom of walls. Remove stumps and root systems from the dam embankment and along the downstream toe of the embankment. Fill resulting voids with compacted engineered fill. **Impacts to the embankment should be evaluated by an engineer prior to grubbing roots from the dam. Given the location of the stumps along the downstream wall, and the conditions prevalent at the time of the work, instability, seepage or piping conditions could develop if not undertaken in a controlled manner.**
2. After the slopes have been cleared of vegetation, perform a follow-up inspection of these areas. Alternatively, if full slope clearing is not feasible at this time, complete an inspection during leaf-off and while the impoundment is at its winter drawdown elevation. Following the inspection, identify deficiencies that exist and develop recommendations for addressing those deficiencies.
3. Complete a seepage and slope stability analyses for the embankment. Following the analyses develop seepage and slope stability improvements at the dam; particularly the steep and irregular stacked boulder section of the downstream slope.
4. Evaluate means to improve the operating of the low level outlet gate. Alternatives include replacing the existing gate with a new gate that can be operated by one person with a hand wheel. This would be beneficial at times when immediate emergency drawdown is required and coordination time of personnel is limited.
5. A formalized Operations and Maintenance Manual should be developed for this structure. This manual should include procedures for maintaining the level of the impoundment, including adjusting the level of the impoundment in anticipation of rain events to provide additional free board during the wetter months. Additionally, the manual should include periodic inspection schedules and operational and maintenance procedures required to ensure satisfactory operation and minimize deterioration of the facility. The manual should also provide record keeping procedures for ongoing inspection and monitoring, including the periodic inspection of the spillway, monitoring of the observed seepage, the leaning telephone poles, and other areas of potential movement and deterioration.

The manual should include a schedule for regular maintenance activities to be continued to control and prevent growth of unwanted vegetation.

6. Implement a program of regular inspection and monitoring of the dam. As the dam is currently classified as a significant hazard potential dam, the completion of a formal visual inspection by a RI registered professional engineer familiar with dam engineering is recommended every 5 years.



7. Complete detailed hydrologic and hydraulic (H&H) analyses to evaluate the capacity of the structure to accommodate various storm events that would be typical for the watershed. It is recommended that the analyses consider flows associated with the 100-year through the one half probable maximum flood (1/2 PMF) storm events. The analysis should account for the routed inflow that utilizes the full storage capacity within the impoundment and drainage area. A structure that cannot discharge the inflow associated with normal storm events will be overtopped in an uncontrolled manner that could damage the structure and threaten downstream areas.

3.3 Alternatives

The following alternatives are presented based upon a conceptual review of the concerns. Additional studies and or considerations may indicate that some or all of the options presented below are not suitable for the conditions specific to this dam and dam site. In addition to the general activities, appropriate environmental permits will be required to complete many of the alternatives presented below.

Dam Removal/Breaching: As an alternative to implementing any of the repairs noted above, breaching of the dam is a viable alternative for addressing safety and stability concerns at the dam. While this alternative will address the safety concerns at the dam, it will result in the loss of the recreational and environmental resource and reduce any potential flood control capacity provided by the dam and impoundment. Additionally, while this will result in elimination of yearly operating and maintenance expenses, permitting activities and construction costs associated with dam removal may exceed those of rehabilitation and operations and maintenance. *Considering the presence of the roadway as an access way to nearby residences, dam removal/breaching may not be feasible.*

Lower the Dam: Complete modifications to the dam to reduce the dam height, thereby reducing the maximum height and volume of water that may be impounded by the dam. Evaluate the impact of the lowered dam upon the hazard potential. While this alternative may result in reducing the hazard potential, recommendations listed above remain valid and should be implemented in accordance to general dam safety practice. *Considering the presence of the roadway as an access way to nearby residences, reducing the height of the dam may not be feasible.*



COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to State of Rhode Island Rules and Regulations for Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – means any barrier made by humans, including appurtenant works, that impounds or diverts water.

Embankment – means the fill material, including but not limited to rock or earth, placed to provide a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – means any ancillary feature of a dam including such structures as dikes, training walls, spillways, either in the dam or separate there from, low level outlet works, and water conduits such as tunnels, channels, pipelines or penstocks, either through the dam or its abutments.

Spillway – means a structure, a low area in natural grade or any part of the dam which has been designed or relied upon to allow normal flow or major flood flow to pass over or through while being discharged from a reservoir.

Hazard Classification

High Hazard – means a dam where failure or misoperation will result in probable loss of human life.

Significant Hazard – means a dam where failure or misoperation results in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare. Examples of major economic loss include but are not limited to washout of a state or federal highway, washout of two or more municipal roads, loss of vehicular access to residences, (e.g. a dead end road whereby emergency personnel could no longer access residences beyond the washout area) or damage to a few structures.

Low Hazard – means a dam where failure or misoperation results in no probable loss of human life and low economic losses.

General

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.



Height of Dam– means the vertical distance from the elevation of the uppermost surface of a dam to the lowest point of natural ground, including any stream channel, along the downstream toe of the dam.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

Condition Rating

Unsafe – Means the condition of a regulated dam, as determined by the Director, is such that an unreasonable risk of failure exists that will result in a probable loss of human life or major economic loss. Among the conditions that would result in this determination are: excessive vegetation that does not allow the Director to perform a complete visual inspection of a dam, excessive seepage or piping, significant erosion problems, inadequate spillway capacity, inadequate capacity and/or condition of control structure(s) or serious structural deficiencies, including movement of the structure or major cracking.*

Poor – A component that has deteriorated beyond a maintenance issue and requires repair.; the component no longer functions as it was originally intended.

Fair – Means a component that requires maintenance

Good – Meeting minimum guidelines where no irregularities are observed and the component appears to be maintained properly.

* Structural deficiencies include but are not limited to the following:

- Excessive uncontrolled seepage (e.g., upwelling of water, evidence of fines movement, flowing water, erosion, etc.)
- Missing riprap with resulting erosion of slope
- Sinkholes, particularly behind retaining walls and above outlet pipes, possibly indicating loss of soil due to piping, rather than animal burrows
- Excessive vegetation and tree growth, particularly if it obscures features of the dam and the dam cannot be fully inspected
- Deterioration of concrete structures (e.g., exposed rebar, tilted walls, large cracks with or without seepage, excessive spalling, etc.)
- Inoperable outlets (gates and valves that have not been operated for many years or are broken)

REFERENCES AND RESOURCES

The following reports were located during the file review completed at RIDEM Offices in Providence, Rhode Island:

1. “Smith & Sayles Reservoir Dam RI Dam #023: Response to DEM NOV”. Prepared by Fairbanks Engineering Corporation. June 6, 2014.
2. “Smith and Sayles Reservoir Dam RIDEM Visual Inspection”. Prepared by Pare Corporation, date of inspection: July 26, 2012.
3. “Smith and Sayles Plan No. B-23”, Prepared by: Rhode Island Department of Public Works Division of Harbors and Rivers Works Projects Administration, December 17, 1940.
4. “Special Inspection Report, Smith and Sayles”, Rhode Island Department of Public Works Division of Harbors and Rivers, July 1, 1947.
5. “Dam Inspection Report, Smith and Sayles Dam”, State of Rhode Island and Providence Plantations Department of Environmental Management, March 1, 1983.
6. “Dam Inspection Report, Smith and Sayles Dam”, State of Rhode Island and Providence Plantations Department of Environmental Management, January 31, 1987.
7. “Replacement of Chestnut Hill Road Bridge No. 951: Low-Level Outlet Pipe Resetting Plan”, Prepared by: Pare Corporation, February 23, 2010.

The following were referenced during the completion of the visual inspection and preparation of this report and the development of the recommendations presented herein:

1. “Design of Small Dams”, United States Department of the Interior Bureau of Reclamation, 1987
2. “ER 110-2-106 - Recommended Guidelines for Safety Inspection of Dams”, Department of the Army, September 26, 1979.
3. “Guidelines for Reporting the Performance of Dams” National Performance of Dams Program, August 1994.

The following provides an abbreviated list of resources for dam owners to locate additional information pertaining to dam safety, regulations, maintenance, operations, and other information relevant to the ownership responsibilities associated with their dam.

1. RIDEM Office of Compliance and Inspection Website:
<http://www.dem.ri.gov/programs/benviron/compinsp/>
2. “Dam Owner’s Guide To Plant Impact On Earthen Dams” *FEMA L-263, September 2005*
3. “Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams” *FEMA 534, September 2005*
4. “Dam Safety: An Owners Guidance Manual” *FEMA 145, December 1986*
5. Association of Dam Safety Officials – Website: www.asdso.org/
6. “Dam Ownership – Responsibility and Liability”, ASDSO



VISUAL DAM INSPECTION LIMITATIONS

Visual Inspection

1. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.
2. In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team.
3. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.
4. It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Use of Report

1. The applicability of environmental permits needs to be determined prior to undertaking maintenance activities that may occur within resource areas under the jurisdiction of any regulatory agency.
2. This report has been prepared for the exclusive use of the RIDEM for specific application to the reference dam site in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made
3. This report has been prepared for this project by Pare. This report is for preliminary evaluation purposes only and is not necessarily sufficient to support design of repairs or recommendations or to prepare an accurate bid.



Photo No. 1.: Overview of the impoundment from the low level outlet (LLO) intake structure looking upstream.



Photo No. 2.: Upstream slope from the left abutment looking right.



Photo No. 3.: Upstream slope from the LLO intake structure looking left.



Photo No. 4.: Upstream slope from the LLO intake structure looking right.



Photo No. 5.: Crest from the left abutment looking right.



Photo No. 6.: Crest from right of the bridge over the spillway channel looking left.



Photo No. 7.: Crest from the right abutment looking left.



Photo No. 8.: Crest of the right abutment looking right.



Photo No. 9.: Downstream slope from the spillway channel looking right. Note growth of woody vegetation within riprap and along the slope further right.



Photo No. 10.: View of the large and irregularly stacked boulders of the downstream slope looking left.



Photo No. 11.: View of the large and irregularly stacked boulders of the downstream slope looking left.



Photo No. 12.: View of one of the many voids within the large boulders that extend as far as 4 feet in the upstream direction.



Photo No. 13.: View of the downstream slope from the right edge of the tailwater pool looking left and upstream. Note location of the LLO pipe (red arrow). Note the tall tree growth along the left (photo right) half of the slope and smaller height weed and brush growth along the right half (photo left)



Photo No. 14.: View of the saturated downstream area with iron oxide staining and low flow along the toe of the right abutment slope.



Photo No. 15.: Photo showing the ground surface within the saturated area shown in Photo #14. Note that the ground is firm and the boot is generally not sinking in below the surface when traversed.



Photo No. 16.: Approach and upstream side of the controls of the spillway system.



Photo No. 17.: Spillway approach and controls section from the right end looking left.



Photo No. 18.: Discharge area of the spillway looking upstream.



Photo No. 19.: View of the five control bays of the spillway; all bays are stop log controlled except for the upward operating slide gate within the center bay.



Photo No. 20.: Left training wall of the spillway discharge channel.



Photo No. 21.: Right training wall of the spillway discharge channel.



Photo No. 22.: View of the discharge channel of the spillway.



Photo No. 23.: Downstream channel of the spillway.



Photo No. 24.: View of the LLO intake structure (red arrow).



Photo No. 25.: Trash rack at the upstream end of the intake structure.



Photo No. 26.: Outlet end of the LLO outlet pipe.



Photo No. 27.: View within the outlet pipe from the outlet end of the pipe looking upstream.

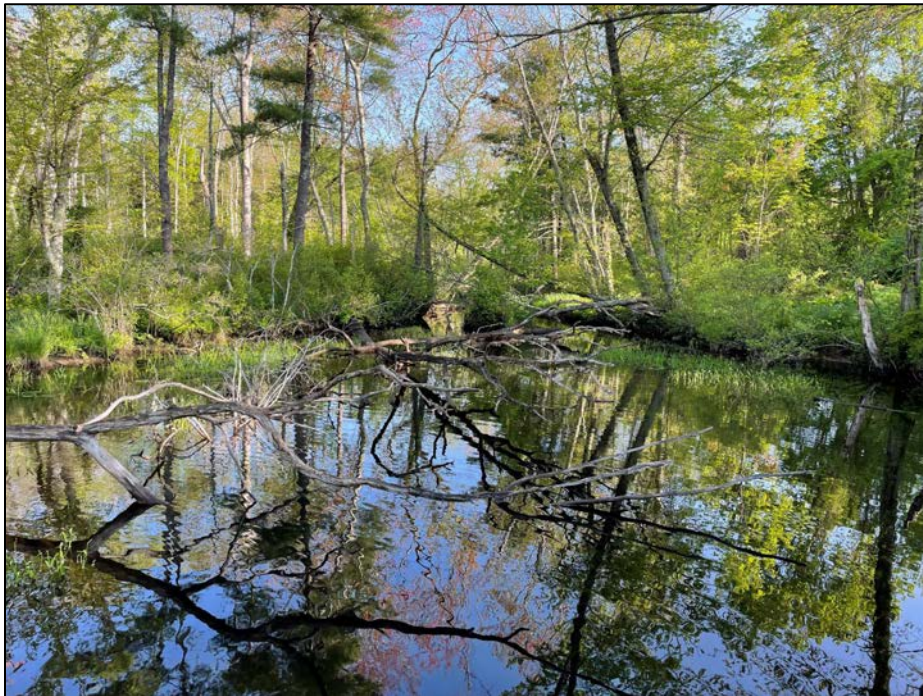


Photo No. 28.: View of the discharge area and tailwater pool downstream of the LLO pipe from the outlet end of the pipe looking downstream.

