US Army Corps of Engineers®
New York District

2022 Annual Dam Inspection
Bailey Dam – Washington County
Montpelier, Vermont

Project Owner / Local Sponsor: State of Vermont
Agency of Natural Resources
Department of Environmental Conservation

Date of Inspection: 5 October 2022
Date of Report: 19 January 2023

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Encer R. Shaffer, PE
Chief Engineering Division

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Brendon Achey, PG
Dam & Levee Safety Program Manager

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A. EXECUTIVE SUMMARY

Hazard Classification: Low

Condition: **FAIR** (ER 1130-2-530, 30 Oct 96, Appendix C)

Dam Basics: Concrete fixed weir dam; 6-10 feet high; 142 feet long; and 8 feet wide at the crest.

NID ID#: N/A

Age: Originally constructed in 1933 as a concrete dam with 6 Tainter gates and a fixed spillway at Elevation of +518.0 feet (NGVD 29). In 1975, the dam was lowered, Tainter gates removed, and concrete capped to form a fixed spillway at Elevation of +514.1 feet.

Recommendations – Continue monitoring dam for signs of distress. Pursue study to determine if this dam is still a viable infrastructure and still serving its intended purposes and functions. The study should assess the applicability of removal if found to be obsolete.

B. PROJECT DESCRIPTION

Authorization

The reconstruction of Bailey Dam at Montpelier, Vermont was authorized by Congress in the Flood Control Act of 1954, Section 208. The Act of 1954 specified that provisions of local cooperation contained in section 3 of the Act approved 22 June 1936 (Public Law 738, 74th Congress) as amended by section 221 of Public Law 9l-6ll (Flood Control Act of 1970) shall apply. Section 3 of the 1936 Flood Control Act prescribes, among other stipulations, general regulations which apply to all local flood protection works. These regulations are contained in the Code of Federal Regulations of the United States of America, Title 33, Chapter II, Part 208, Section 208.10. The Regulations were approved by the Acting Secretary of War on 9 August 1944.

Description

The reconstruction of Bailey Dam involved the removal of the Tainter gates, the piers which support the gates, the galvanized pipe railing and concrete walkway, the hoists, and a portion of the spillway. A dewatering slot adjacent to the left abutment, 8-feet wide by 5-feet high, was constructed for the purpose of removing silt and debris during periods of low flow. The two outer abutments remained unchanged except for a refinishing of the face of the walls. The top elevation of the reconstructed dam is 514.1 feet above mean sea level with a crest width of 8-feet. This elevation includes the top of the spillway, sill, piers, and the top row of timber stop logs in the dewatering slot.

C. INSPECTION SUMMARY

Overall the condition of the dam is **FAIR** based on the following definition in Appendix C of Engineering Regulation *Flood Control Operations and Maintenance Policies*, dated 30 October 1996 (ER 1130-2-530):

> "C-4. FAIR - Major deficiencies that if not corrected immediately may lead to or cause deterioration of the project such that is incapable of providing the maximum flood protection. Little or no evidence of minimum maintenance performed. A greater effort is required to reduce deficiencies."

A full listing of the observations/deficiencies noted during this inspection are noted in Section D.

D. INSPECTION FINDINGS

The dam was inspected on the afternoon of October 5, 2022 by representatives from the U.S. Army Corps of Engineers (USACE) – New York District (NAN), USACE North Atlantic Division (NAD) and the Vermont Department of Environmental Conservation (DEC. Weather was sunny/partly cloudy with temperatures in the high 40s. The reservoir pool elevation was approximately 0.75 to 1-ft below the dam crest elevation (514.1) at the time of inspection. The inspection was conducted in accordance with guidelines set forth in *ER 1110-2-1156: Safety of Dams – Policy and Procedure* and the appropriate Health and Safety guidelines. The inspection team consisted of the following:

- Ben Green, P.E. – Dam Safety Program Manager, Vermont DEC
- Brendon Achey, P.G. –Dam and Levee Safety Program Manager, USACE – NAN
- Stan Sedwick, P.E. – Geotech Engineer/Chief, Design Branch, USACE – NAN
- Christopher Hagerman, E.I.T – Structural Engineer, USACE – NAN
- Scott C. Michalak, P.E. – Geotech Engineer/Levee Safety Program Manager, USACE - NAD

The following observations were made during the inspection of the dam:

Crest

Numerous cracks and spalls were observed on the top of the crest (Photo 1). The cracking appears to be about the same as noted in the previous inspections when the crest was observed in 2012 and 2018 (Photo 2 from 2020 Inspection). It is recommended to monitor the concrete surfaces for additional cracking during lower water levels and to remove the accumulated debris from the dam crest on a regular basis.

Spillway / Stop Log Slot

There is an 8-foot wide by 5-foot high stop log slot located adjacent to the left abutment. Most of the wooden stop logs have deteriorated and are no longer present. This results in a lower upstream pool, and concentrated flows with high velocities, even during periods of

low flow as experienced during the 2022 inspection (Photo 3). Due to kayaking and canoeing activity upstream of the dam, this is seen as a potential safety hazard to individuals utilizing the river for recreation. It is recommended, from a public safety perspective, that warning buoys and/or signage be added to alert people of the hazard.

Right Abutment

The right abutment is a 3-foot wide by 22.5-foot tall concrete retaining wall reportedly founded on bedrock which formerly supported the framework for the Tainter gates, which were removed in 1975. It now serves the purpose of retaining the existing grade of the adjacent commercial land use (currently a supermarket) parking lot. The wall is backfilled with concrete debris. The 3.5 foot by 4-foot diameter sinkhole directly behind the abutment caused by migration of soil through the large concrete backfill has been filled since the 2019 inspection (Photo 4). The concrete surfaces of the abutment contain cracking, efflorescence, and spalling (Photos 5 and 6). There is some erosion along the abutment moving downstream. The likely cause is from surface sheet flow coming from the adjacent parking lot. The sinkhole was the major safety concern from previous inspections, but this had been repaired prior to the 2020 inspection, and appears stable. No settlement was noted during this inspection, but this area should be monitored in future inspections. The concrete surfaces should be monitored for further deterioration.

Left Abutment

The left abutment is of similar construction to that of the right abutment with the addition of steel embedded parts for the former Tainter gates. Displacement of the upstream corner of the abutment was observed (Photo 7 from the 2019 inspection) is still present and has not increased in size. This displacement is located in a joint upstream of the dam abutment. Cracking, spalling, and efflorescence of the riverside concrete surface is present (Photo 8 and 9). It is recommended to monitor the concrete condition for further deterioration or displacement.

E. RECOMMENDATIONS

The overall condition of the entire structure is considered to be ***FAIR*****.** The following recommendations are offered for action based upon this inspection process:

1. Provide warning signs and/or buoys upstream of the dam.
2. Monitor concrete abutments and dam crest for displacement and deterioration.
3. Pursue study to determine if this dam is still a viable infrastructure and still serving its intended purposes and functions. The study should assess the applicability of removal if found to be obsolete.

Attachment 1 – Modified FEMA Inspection Checklist

BAILEY DAM
DAM SAFETY INSPECTION CHECKLIST

INSPECTORS:	Stan Sedwick, Chris Hagerman, Brendon Achey, Scott Michalak	AGENCY: USACE	POOL ELEV: Elev. 514.1 Ft Dam Crest. Flow through low flow about 1-ft lower than crest (NGVD 29)
INSPECTORS:	Ben Green	AGENCY: Vermont DEC	DATE: 10/5/2022

	Item	Yes	No	N/A	Recommendations) Comment on any Abnormalities	(M)onitor (I)nvestigate (R)epair?
1	**General Condition of Dam**					
A	Alterations to the dam since last inspection?		X			
B	Other?			X		
2	**Dam Crest**					
A	Erosion, cracks, ruts, or low areas?	X			Cracking observed.	M
B	Horizontal or Vertical Misalignment?		X		No issues visually observed.	
C	Unwanted Vegetation?		X		No issues visually observed.	
D	Other?	X			Debris (shopping carts) in sediment near right abutment.	R
3	**Upstream Slope**					
A	Wet areas, or seepage?			X	No issues visually observed.	
B	Slides, sloughs, scarps, sinkholes, animal burrows?			X	No issues visually observed.	
C	Slope Protection issues?			X	No issues visually observed.	
D	Evidence of erosion?			X	No issues visually observed.	
E	Unwanted Vegetation?	X			Vegetation growth around right and left abutment walls	R
F	Issues at Embankment - Abutment interface?		X		No significant issues visually observed. Sediment build up along abutment granite walls and spillway.	M
G	Other?			X		

BAILEY DAM DAM SAFETY INSPECTION CHECKLIST						
INSPECTORS:	Stan Sedwick, Chris Hagerman, Brendon Achey, Scott Michalak	AGENCY:	USACE	POOL ELEV:	Elev. 514.1 Ft Dam Crest. Flow through low flow about 1-ft lower than crest (NGVD 29)	
INSPECTORS:	Ben Green	AGENCY:	Vermont DEC	DATE:	10/5/2022	

	Item	Yes	No	N/A	Recommendations) Comment on any Abnormalities	(M)onitor (I)nvestigate (R)epair?
4	**Downstream Slope**					
A	Wet areas, or seepage?			X		
B	Slides, sloughs, scarps, sinkholes, animal burrows, or unusual movement?			X		
C	Slope Protection issues?			X	DS of left abutment, rock wall has sloughing at drainage discharge. DS Right abutment has sloughing with larger rock/concrete debris.	M
D	Evidence of erosion?		X		No issues visually observed.	
E	Unwanted Vegetation?		X		Vegetation growth around right and left downtstream abutment walls.	R
F	Issues at Embankment - Abutment interface?		X		No issues observed.	
G	Other?					
5	**Spillway**	**Observed Conditions**				**M, I, R?**
A	Stop Log Slot	Stop logs missing/deteriorated, causing concentrated flow with high velocity. Replace stop logs and install warning bouys/signage				R
G	Right training wall	Large sinkhole behind right abutment has been filled. The concrete face contains cracking, efflorescence, and spalling.				M/R
H	Left training wall	Displacement of upstream corner of wall. The concrete face contains cracking, efflorescence, and spalling.				M
K	Approach Channel	No issues observed.				
L	Discharge Channel	No issues observed.				
M	Other?					

Attachment 2 – Selected Photos and Photo Log

PHOTOGRAPHIC LOG

Owner:	State of Vermont	ID#:	N/A
Site Name:	Bailey Dam	Location:	Montpelier, VT

Orientation: NE

Description:

Dam overview, viewed from left abutment.

Date: 10/05/22

Photo Number: 1

Photographer: S. Sedwick

Orientation: SW

Description:

Cracking on spillway crest: 2012, 2018, and 2022.

Date: 10/05/2022

Photo Number: 2

Photographer: S Sedwick

PHOTOGRAPHIC LOG

Owner:	State of Vermont	ID#:	N/A
Site Name:	Bailey Dam	Location:	Montpelier, VT

Orientation:
Looking Down

Description:

Stop log slot during 2022 inspection. Upper stop logs have deteriorated and are no longer present.

Date:
10/05/2022

Photo Number:
3

Photographer:
S Sedwick

Orientation:
Looking down

Description:

Repair of sinkhole adjacent to right abutment.

Date:
10/13/2020

Photo Number:
4

Photographer:
C Hagerman

PHOTOGRAPHIC LOG

Owner:	State of Vermont	ID#:	N/A
Site Name:	Bailey Dam	Location:	Montpelier, VT

Orientation: D/S (E)

Description:

Cracking, spalling, and efflorescence on right abutment

Date: 10/13/2020

Photo Number: 5

Photographer: C Hagerman

Orientation: E to Right Abutment

Description:

Cracking, spalling, and efflorescence on right abutment

Date: 10/05/2022

Photo Number: 6

Photographer: S. Sedwick

PHOTOGRAPHIC LOG

Owner:	State of Vermont	ID#:	N/A
Site Name:	Bailey Dam	Location:	Montpelier, VT

Orientation: Looking NE

Description: Displacement of the left abutment corner

Date: 10/9/2019

Photo Number: 7

Photographer: J Gross

Orientation: Looking D/S

Description: Cracking, spalling, and efflorescence on left abutment. Downstream rock wall deteriorating at drainage structure (non-project appurtenance)

Date: 10/05/22

Photo Number: 8

Photographer: S Sedwick

PHOTOGRAPHIC LOG

Owner:	State of Vermont	ID#:	N/A
Site Name:	Bailey Dam	Location:	Montpelier, VT

Orientation: Looking D/S

Description:

Cracking and spalling on left abutment.

Top of Left Abutment showing cracking

DS Side of Left Abutment showing vertical Crack

Date: 10/05/22

Photo Number: 9

Photographer: S Sedwick

Attachment 3 – Condition Rating Description Excerpt from ER 1130-2-530

APPENDIX C

OVERALL PROJECT RATING

C-1. EXCELLENT - No major deficiencies. None or few minor new deficiencies. All old deficiencies noted in the last inspection have been corrected.

C-2. VERY GOOD - No major deficiencies. Several new minor deficiencies. Most old deficiencies noted in the last inspection have been corrected.

C-3. GOOD - Few or no new major deficiencies. Numerous new minor deficiencies and/or several old minor deficiencies noted in the last inspection have not been corrected. Annual maintenance performed, but additional effort is needed.

C-4. FAIR - Major deficiencies that if not corrected immediately may lead to or cause deterioration of the project such that is incapable of providing the maximum flood protection. Little or no evidence of minimum maintenance performed. A greater effort is required to reduce deficiencies.

C-5. POOR - Major deficiencies such the structural integrity or the flood control project will probably not withstand a major flood event. Little or no evidence of maintenance performed