Report of the Vermont State Auditor

DOUGLAS R. HOFFER
Vermont State Auditor

# *Department of Environmental Conservation's Dam Safety Program*

## Some High Hazard Dams, Including State-Owned, Linger in Poor Condition for Years, Risking Human Lives

February 11, 2022 Rpt. No. 22-02

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## Mission Statement

The mission of the Auditor's Office is to hold State government accountable by evaluating whether taxpayer funds are being used effectively and identifying strategies to eliminate waste, fraud, and abuse.



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Dear Colleagues,

When Vermonters think about public safety, dams may not come to mind, but a dam failure can result in damaged property and loss of life.

According to the Department of Environmental Conservation's (DEC) Vermont Dam Inventory, Vermont has more than 1,000 known dams (with a median age of 77), and DEC estimates that as many as 1,000 more dams have yet to be recorded in the inventory. In 2019, the American Society of Civil Engineers gave Vermont a grade of "C" for dams, in part due to a large number of deteriorating dams. Their report concluded that Vermont had been fortunate not to experience a recent dam failure.

Vermont laws seek to protect human life, property, and the environment from the effects of a dam failure through the inventory, inspection, and categorization of dams. The Dam Safety Program (DSP) within DEC inspects and regulates non-federal, non-power-generating dams in the state. Dams are categorized by (1) *hazard potential*, which is based on the potential to cause loss of life or damage to property and the environment, and (2) *condition*, which is based on identified deficiencies of the dam and is not related to hazard potential. A dam that has the potential to cause the loss of life is classified as high hazard potential. A dam in poor condition is one that has substantial deficiencies "under normal loading conditions."

In light of the importance of dam safety, I directed my office to conduct an audit of the Dam Safety Program at the Department of Environmental Conservation (DEC) with the objective to determine whether DEC required dams in poor condition that have high or significant hazard potential be improved within a specific timeframe, and whether DEC followed-up to ensure that the dam improvements were implemented.

**We found that the 10 dams in poor condition that we selected for review, which included state-owned dams, lingered in poor condition, some for at least 18 years.** DEC made recommendations to dam owners to improve dams in poor condition, but did not provide timeframes for implementing those recommendations, lacked enforcement authority to require dam owners to implement those recommendations, and only followed-up on recommendations during the next inspection of the dam (which may have been more than five years later).

*To get a better sense of how the 10 dams we selected relate to surrounding residences and property, I encourage you to view our* ***overhead video footage of each dam****. Links to the videos can be found at the end of this report.*

**We also identified other issues, such as DEC not completing inspection reports and providing them to dam owners in a timely manner, and not notifying state agencies and departments that some dams they owned had been inspected. DEC also did not maintain a centralized inventory that includes: (1) complete and accurate condition ratings of dams and (2) accurate hazard potential ratings. Furthermore, DEC has not been inspecting all dams within the**

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**required timeframe and has not recorded all inspections in their inventory database.** DEC staff attributed some of these issues to a lack of staffing within DEC's Dam Safety Program, an assessment echoed by the DEC Commissioner.

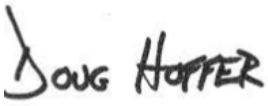
We made several recommendations to DEC to improve the Dam Safety Program, such as adopting new rules, establishing time limits for notifying owners of inspection reports, maintaining accurate information, and assessing staffing levels.

The Public Utility Commission (PUC) plays a role similar to DEC because they regulate some hydroelectric dams in Vermont. While the PUC was not the subject of this audit, we found that they were not using the same hazard potential definitions as DEC, nor did they require dams to be inspected as frequently as DEC. This results in an unjustifiable situation in which a Vermonter's life or property may be more or less protected solely based upon which state agency oversees the dam.

I sent a letter to the PUC Chair informing him of this issue. The PUC Chair responded that they would initiate rulemaking now to align the hazard potential definitions and inspection frequencies in their rules to match DEC's. I appreciate the PUC's swift response and action to address this concern. My letter and the Chair's full response can be found on our website.

I would like to thank the staff at DEC for their cooperation and professionalism during this audit.

Sincerely,



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# Highlights

In March 1996, the Meadow Pond Dam in Alton, New Hampshire failed, sending a wall of water rushing downhill and nearly washing away a small neighborhood. One person died and the failure caused more than $8 million in property damages. Here in Vermont, the Dunklee Pond Dam in Rutland City deteriorated, contributing to episodic flooding that required the evacuation of nearby households eight times in two years. The Department of Environmental Conservation (DEC) worked with the city and others to remove the dam in steps between 2019 and 2021, and, according to a news report, eliminated the risk to 28 downstream houses and a bridge running over U.S. Route 7.

The State of Vermont seeks to protect human life, property, and the environment from events like these through the inventory, inspection, and categorization of dams. This is taking on even greater importance in light of the increases in annual rainfall, river flows, and worsening storms brought on by climate change.

The Dam Safety Program (DSP) within DEC inspects and regulates all dams except those owned by the federal government and those used to generate electricity. DSP also manages and operates 14 state-owned dams, including three Winooski River flood control dams deemed to have high hazard potential.[1] A high hazard potential dam is one that has the potential to cause loss of life should it fail. Hazard classifications do not indicate the structural integrity of the dam itself, but rather the probable effects if the dam were to fail. A separate rating assigned to each dam describes the condition of the dam. For example, DEC may rate a dam in poor condition if they determine that the dam has substantial deficiencies.

In 2019, the American Society of Civil Engineers (ASCE) gave Vermont a grade of "C" for dams in their "Report Card for Vermont's Infrastructure."[2] The ASCE found a large number of deteriorating dams and concluded that Vermont had been fortunate not to experience a recent dam failure. The report notes that the state needs "more dam safety inspections and improved maintenance," to "properly manage dams in the state and maintain public safety."

The State Auditor's Office (SAO) conducted this audit of dam safety with the objective: To determine whether DEC required dams in poor condition that have high or significant hazard potential be improved within a specific timeframe, and whether DEC followed-up to

[1] The flood control dams are the (1) East Barre Dam in Barre Town, (2) Waterbury Dam in Waterbury, and (3) Wrightsville Dam in Middlesex. See DSP's webpage found here for more information about these and other DEC-owned dams.

[2] The Report Card for Vermont's Infrastructure can be found here.

ensure that the dam improvements were implemented.[3]

## What We Found

DEC made recommendations to dam owners to improve dams in poor condition, but did not provide timeframes for implementing those recommendations, lacked enforcement authority to require dam owners to implement those recommendations, and only followed-up on recommendations during the next inspection of the dam (which may have been more than five years later). **As a result, some of the dams we reviewed have lingered in poor condition for at least 18 years.** Some of these poor condition dams, including some owned by the State, are considered high hazard and their poor condition increases the potential to put human lives at risk.

We reviewed the inspection files for ten dams and found that while state law requires that DEC provide dam owners with a copy of inspection reports,[4] DEC has yet to finalize and provide reports to dam owners for several dams they inspected in 2019 and 2020. DEC's Dam Safety Program (the unit that inspects dams) had two full-time employees during this period and, according to one of those employees, workforce capacity challenges are the reason they have not finalized and provided those reports to dam owners (see Appendix IV for other responsibilities of DSP staff). **Until DEC provides dam owners with inspection reports timely that include timeframes for corrective action, and develops procedures to enforce those timeframes, owners may continue to leave dams in poor condition indefinitely, risking property, the environment, and human lives.**

DEC also informed us that if they did not have a point of contact for state-owned dams, they filed inspection reports without providing them to anyone specifically but that if there was a pressing safety concern, they would inform management. DEC was unable to provide evidence that they notified the Department of Fish and Wildlife that inspection reports were available for two dams they own that are in poor condition. When we followed up with a senior official at the Department of Fish and Wildlife, he indicated that he had not personally received the recent inspection reports for these two dams. **Without direct notification that DEC inspected a dam, and that DEC determined the dam to be in poor condition, state agencies and departments cannot be held accountable for failing to undertake repair work. State dams in poor condition will remain in poor condition, placing property, the environment, and human lives at risk and potentially exposing the State to lawsuits should the dam fail.**

We also identified other issues which include DEC not maintaining a centralized inventory that includes (1) complete and accurate condition ratings of dams and (2) accurate hazard potential ratings (which are based on the potential effects that a dam failure would cause and are not tied to the condition rating). Furthermore, DEC

[3] Appendix I details the scope and methodology of this audit. Appendix II contains the list of abbreviations used in this report.

[4] 10 V.S.A. § 1105(c).

has not been inspecting all dams within the appropriate timeframe and has not recorded all inspections in their inventory database. Some of these issues DEC staff attributed to a lack of staffing within DEC's Dam Safety Program, and the DEC Commissioner agreed that the program is understaffed.

**Other Matters**

The Public Utility Commission (PUC) plays a role similar to the DEC with respect to regulating dams in Vermont. The PUC is responsible for the safety of some hydroelectric dams and performs functions similar to DEC, such as maintaining an inventory, defining hazard potential classifications, and requiring safety inspections.[5] We found the PUC does not use the same hazard potential definitions as DEC nor do they require dams to be inspected as frequently as DEC because the PUC's rules, which went into effect in 1990, have not been updated to match DEC's current rules. As a result, dams under the PUC's jurisdiction that have the potential for loss of human life should they fail may go up to ten years without an inspection whereas DEC requires these types of dams to be inspected at least every two years. The State Auditor sent a letter to the PUC Chair informing him of this issue and requesting a response as to how the PUC intends to deal with this issue. The PUC Chair responded that they would initiate rulemaking now to align the hazard potential definitions and inspection frequencies in their rules to match DEC's. The State Auditor's letter and the Chair's full response can be found here.

**Recommendations**

We made a variety of recommendations to DEC intended to improve their ability to identify dams whose failure poses a risk to human lives and to be able to hold dam owners accountable for improving dams in poor condition. For example, we recommended DEC assess the staffing level of the Dam Safety Program, which the Commissioner assesses as too low, and identify what the appropriate staffing levels should be.

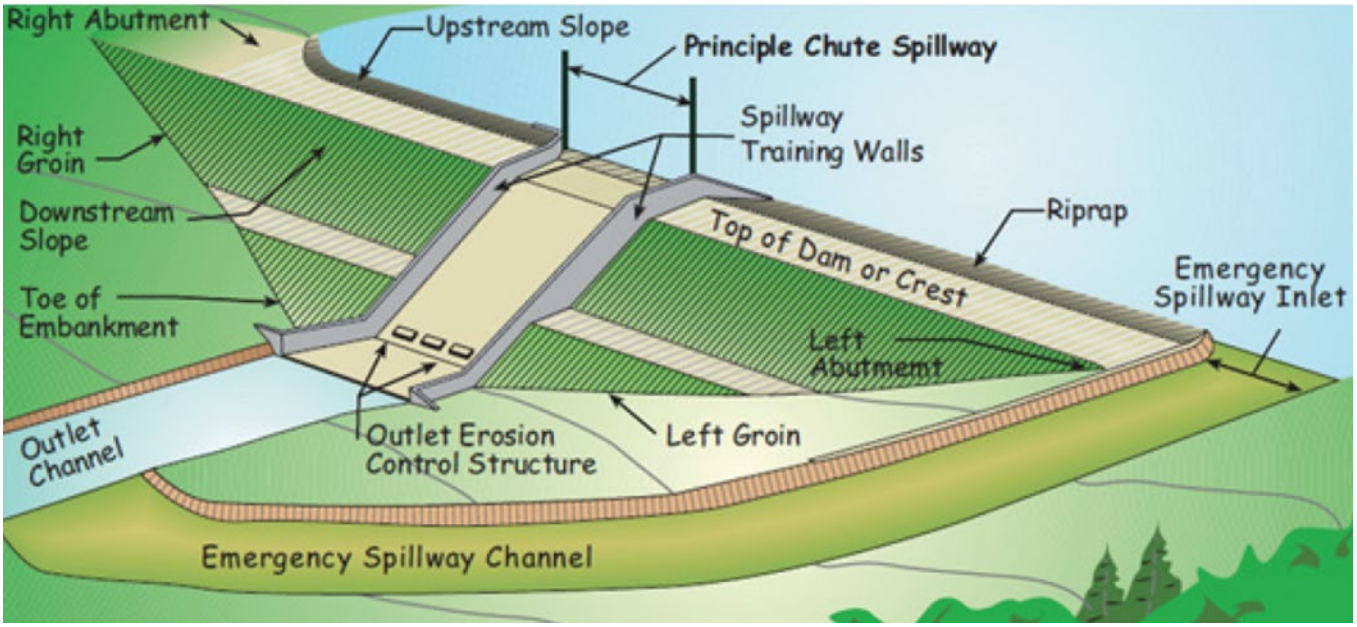
[5] The PUC requires the owner to obtain inspection by an independent consultant; they do not have a dam safety engineer on staff.

# Background

A dam's purpose is to retain or store water or other liquid-borne materials for any of several reasons such as human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, and pollution or flood control.

Dams can fulfill a combination of these functions and there are numerous ways to design and construct a dam to achieve its purpose. Figure 1 below shows an example of the design of a small dam with concrete channel spillways.

**Figure 1: Design of Small Dam with Concrete Channel Spillways**




Source: Association of State Dam Safety Officials, Dam Ownership Fact Sheet

A dam safely passes a flood event through a combination of storing water in the pond and passing water through its spillways. Earthen embankments on a dam are not designed to have floodwaters overtop them as this can result in erosion. According to the Association of Dam Safety Officials, once erosion has begun during overtopping it is almost impossible to stop.[6]

## Dams in Vermont

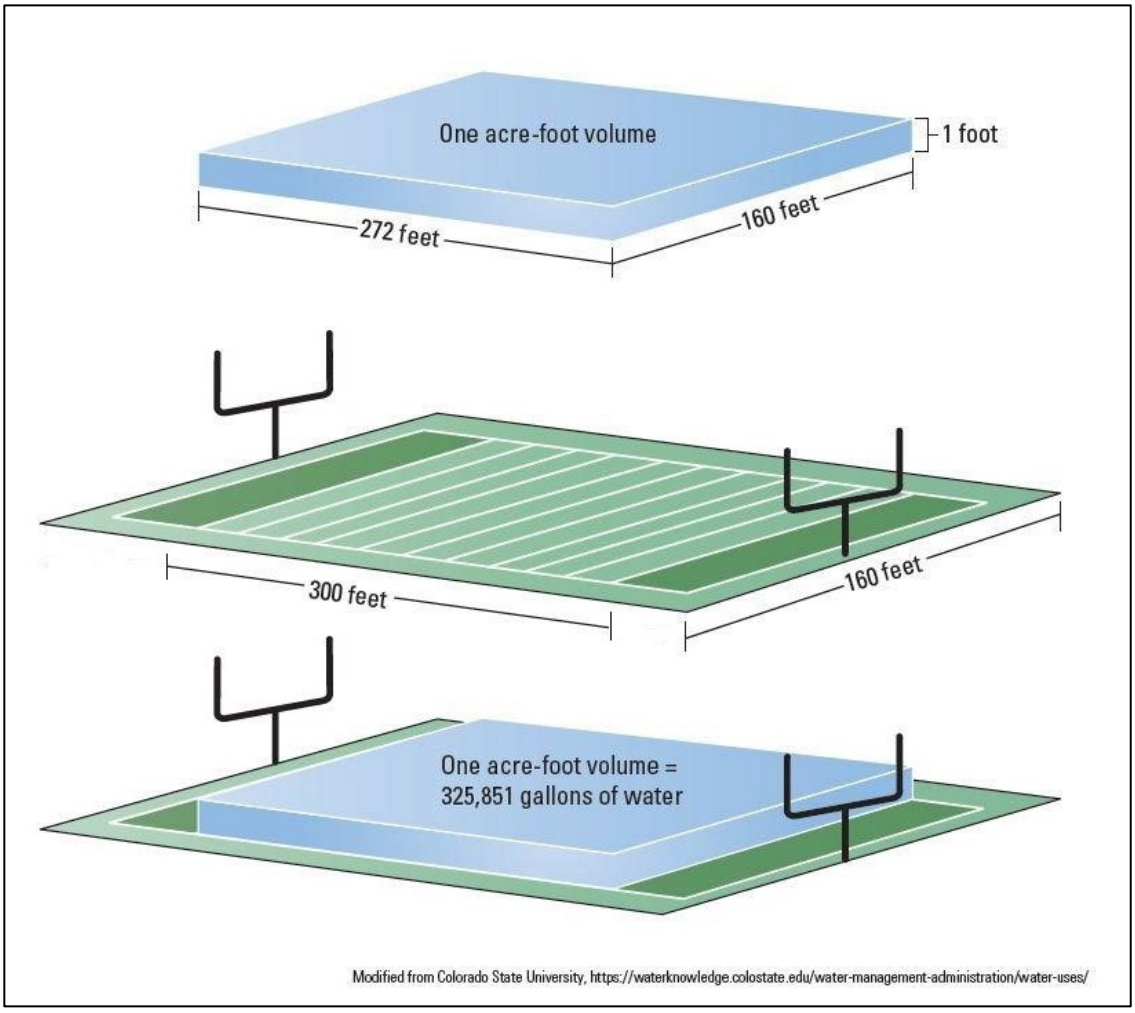
DEC is responsible for maintaining a dam inventory.[7] The inventory shows

6 See the Association of State Dam Safety Officials' video on overtopping failure here for more information.

7 Links to maps showing the location of the majority of the dams in the inventory can be found here.

1,262[8] dams in Vermont, though DEC estimates that there may be up to 1,000 unidentified dams in Vermont that are not in the inventory. The age of the dams in the inventory ranges from 7 years old to 232[9] years old, with a median age of 77. They also range in size from small dams, capable of holding less than 1 acre-foot of water, to the largest dam in Vermont, the Harriman dam in the town of Whitingham, which can hold up to 169,000 acre-feet. An "acre-foot" is the amount of water that covers one acre with one foot of water, as shown in Figure 2 below.

**Figure 2: Visualization of One Acre-Foot of Water**




Source: United States Geological Survey, modified by SAO

8 SAO did not validate the number of dams, nor perform any procedures to validate the accuracy of the dam inventory. The inventory contains incomplete information and also includes 247 dams that may be in the inventory erroneously or no longer exist.

9 Per the dam inventory, Wapanacki Lake dam in Wolcott was built in 1790.

## Regulatory Oversight of Dams

Dams are owned by the federal government, the State, municipalities, or private owners, and are regulated by various entities, depending on the uses of the dam and the owner of the dam.

The federal government regulates federally owned dams. The Federal Energy Regulatory Commission (FERC) regulates some non-federally owned hydroelectric dams.[10] If dams used in hydroelectric projects are not regulated by FERC, they are regulated by the three-member quasi-judicial Vermont Public Utility Commission (PUC).[11] The Dam Safety Program (DSP) within the Department of Environmental Conservation (DEC) regulates all other dams,[12] which accounts for most dams in Vermont. This includes dams owned by other state entities such as the Department of Fish and Wildlife and the Agency of Transportation. Of the 1,262 dams listed in DEC's inventory, DEC is responsible for regulating approximately 892 dams.[13] (See Appendix III for a comparison of DEC, PUC, and FERC.)

## DEC's Dam Safety Program

As of January 6, 2022, DSP was staffed with two full-time engineers. The program is responsible for the operation and management of 14 dams owned by DEC, including three high hazard potential Winooski flood control dams; responsibilities include monitoring and emergency action planning and capital project planning and execution for these dams. (See Appendix IV for other DSP responsibilities and obligations.)

Additionally, DSP performs inspections of the dams they regulate to determine condition and the need for improved operation, maintenance, repairs, or removal. There are several types of dam inspections, but this audit is concerned with periodic inspections, visual inspections performed on a set schedule.

## Dam Hazard Potential Classification

A dam's hazard potential is based on the potential for loss of human life, property, or environmental damage if the dam fails, and provides criteria for DEC's inspection frequency. DEC adopted new hazard potential classifications in August 2020. Table 1 shows the definitions in effect prior to that.

10 16 U.S.C §§ 791a-828c.
11 10 V.S.A. § 1081.
12 Ibid.
13 This is an approximation because information in the inventory is incomplete.

**Table 1: Dam Hazard Potential Classifications, in effect through August 2020**

| Hazard Category | Potential Loss of Life | Potential Economic Loss | Inspection Frequency, years |
|---|---|---|---|
| High Hazard | More than a few | Excessive (extensive community, industry, or agricultural.) | 1 (Annually) |
| Significant Hazard | Few (no urban developments, no more than a small number of habitable structures) | Appreciable (notable agricultural, industry, or structures.) | 3 - 5 |
| Low Hazard | None expected (no permanent structures for human habitation.) | Minimal (undeveloped to occasional structures or agricultural.) | 5 - 10 |

Table 2 shows the hazard potential classifications currently used by DEC.

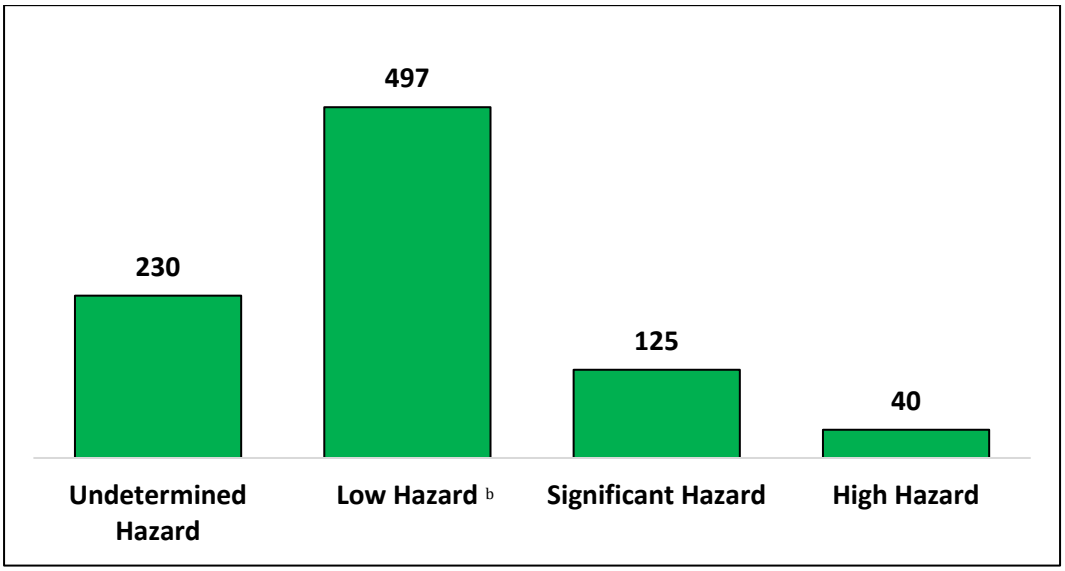
**Table 2: Dam Hazard Potential Classifications, in effect after August 2020**

| Hazard Category | Potential Loss of Life | Property Losses | Lifeline Losses[a] | Environmental Losses | Inspection Frequency, years |
|---|---|---|---|---|---|
| High Hazard | Probable. (one or more) | Not considered. | Not considered. | Not considered. | 2 |
| Significant Hazard | None expected. | Major or extensive public and private facilities. | Disruption of essential or critical facilities and access. | Major or extensive mitigation required or impossible to mitigate. | 5 |
| Low Hazard | None expected. | Private agricultural lands, equipment and isolated non-occupied buildings, non-major roads. | No disruption of services - repairs are cosmetic or rapidly repairable damage. | Minimal incremental damage. | 10 |
| Minimal Hazard[b] | Same as low hazard. | Same as low hazard. | Same as low hazard. | Same as low hazard. | None |

[a] Lifeline means a structure or service indispensable for maintaining or protecting life, including but not limited to key transportation links such as bridges or highways; power supply lines, potable water connection or supply; or sanitary sewer connections.
[b] Minimal dams hold less than 11.48 acre-feet but have the same hazards as low hazard potential dams.

The dam inventory also identifies the hazard potential classification of the dams. Figure 3 below is a breakout of assigned hazard potential for the 892 dams we estimate DEC may be responsible to inspect as part of their regulatory oversight duties.

**Figure 3: Number of Dams That DEC May Be Required to Inspect, By Hazard Rating[a]**




[a] The inventory contains incomplete and possibly inaccurate information, and SAO did not perform any work to validate the accuracy of the information in this chart.

[b] DEC has not updated their inventory to distinguish minimal from low hazard dams. DEC asserts that it is likely approximately 50 percent of these dams are actually minimal hazard per the new definitions, requiring no periodic inspection.

The hazard potential rating of a dam is unrelated to the condition rating of the dam. The condition rating is based on available data and observations of dam conditions at the time of inspection. The condition ratings that DEC used during the date range of the inspection reports we reviewed are shown in Table 3 below. In 2021, DEC adopted new condition rating definitions, which are shown in Appendix V.

**Table 3: Dam Condition Ratings Used in the Inspection Reports We Reviewed**

| Condition rating | Definition |
|---|---|
| Good | No existing or potential deficiencies recognized except for minor operational and maintenance deficiencies. Safe performance is expected under all loading conditions. |
| Fair | Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual or extreme loading conditions. |
| Poor | Significant structural and or operation and maintenance deficiencies are clearly recognized under normal loading conditions. |

If after investigation by an engineer, a dam is determined to be in imminent danger of failure, DEC may hold a hearing, where the engineer's findings are presented. If DEC determines the dam to be unsafe, then DEC may issue an

order directing the owner to make repairs. If the owner does not comply with the order, DEC may petition Superior Court to enforce the order they issued or exercise the right of eminent domain to acquire the rights that may be necessary to protect the public good and human lives. Statute also allows DEC to take immediate action if the dam presents an imminent threat to human life or property and then subsequently hold the DEC hearing to declare the dam unsafe.[14] DEC's take-over of the dam does not relieve the owner of a dam of ownership, or legal liability to the Department or third parties for damages resulting from dam failure.

### Example Deficiencies Identified in DEC Inspection Reports

Dams can be in poor condition for many reasons. We reviewed inspection reports for ten dams DEC classified as being in poor condition.[15] The inspection reports noted various deficiencies such as the dams being unable to handle storm events, water seeping through the dam, or deteriorating concrete.

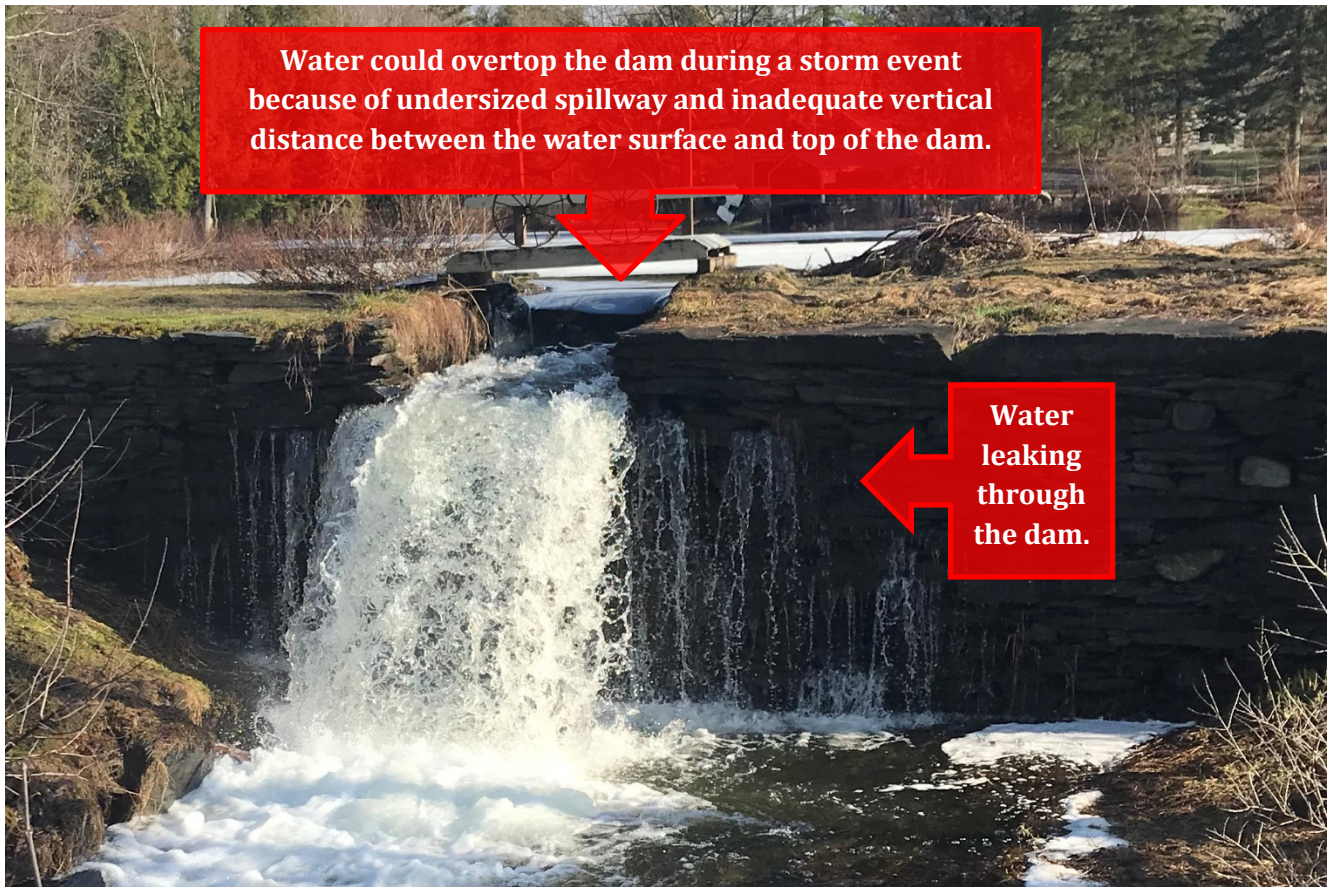
For example, the inspection report from a site visit conducted in 2019 found that Curtis Pond Dam in Calais[16] had numerous deficiencies. DEC noted that water could overtop the dam during a storm event, potentially eroding and damaging the dam, because the dam spillway is undersized and the dam does not have adequate vertical distance between the water surface and the top of the dam (this issue is referred to as "inadequate freeboard"). The dam also has leakage through the stone masonry in multiple places which, if left uncontrolled, will continue to weaken the dam. Figure 4 below highlights some of the deficiencies DEC identified with the Curtis Pond Dam.

[14] 10 V.S.A. § 1095.

[15] We selected five high and five significant hazard potential dams in poor condition that were regulated by DEC based on an internal DEC report from 2019. The five high hazard dams were all of the poor condition dams for that hazard classification regulated by DEC. We selected the significant hazard dams in part by choosing those that had larger maximum storage capacities as listed in DEC's dam inventory.

[16] According to DEC's dam inventory, the maximum storage capacity of this dam is 1,000 acre-feet.

**Figure 4: Examples of Deficiencies with Curtis Pond Dam in Calais, Vermont**




The inspection report from a 2020 site visit at the Thurman W. Dix Reservoir Dam in Orange[17] found deficiencies in the concrete of the dam such as those shown below:[18]

- Figure 5 is a picture of a portion of the spillway with visible concrete degradation, such as cracking. DEC rated the principal spillway as being in fair to poor condition.

- Figure 6 shows a "section of eroded concrete and exposed rebar" on the principal spillway. Rebar is reinforcing steel added to the concrete; exposed rebar indicates serious concrete deterioration and, if left un-remediated, can lead to additional loss of concrete potentially impacting structural stability.

[17] According to DEC's dam inventory, the maximum storage capacity of this dam is 2,280 acre-feet.

[18] DEC has not finalized the inspection report nor provided it to the dam owner.

**Figure 5: Degraded Spillway in the Thurman W. Dix Reservoir Dam in Orange, Vermont**

**Figure 6: Exposed Rebar in the Thurman W. Dix Reservoir Dam in Orange, Vermont**


The inspection report also notes maintenance deficiencies, such as animal burrows and overgrown vegetation. Many of Vermont's dams are made of earth; trees growing into the dam or animals burrowing into the dam are potentially damaging enough to cause the dam to fail.[19]

Vegetation can also obscure problems from DEC's visual inspection. For example, DEC noted in a 2020 inspection report for East Long Pond Dam in

[19] See the Association of Dam Safety Officials' video here for more information on maintenance of dams.

Woodbury[20] that brush and weeds around an area near a spillway prevented thorough inspection of some portions of that area, as shown in Figure 7.[21]

**Figure 7: Brush and Weeds Around a Portion of East Long Pond Dam in Woodbury, Vermont**[a]


[a] DEC said that since their inspection, the dam owner has performed brush clearing and constructed a timber frame to help stabilize the downstream wall as a temporary improvement measure.

[20] According to DEC's dam inventory, the maximum storage capacity of this dam is 3,620 acre-feet.

[21] DEC has not finalized this report nor provided it to the dam owner, but DEC had informed the dam owner of these issues in previous reports.

# Objective: Dams in Poor Condition Not Required To Be Improved Within a Specific Timeframe and Linger in Poor Condition for Years

DEC made recommendations to dam owners of repairs needed to improve dams in poor condition, but did not provide timeframes to implement those recommendations, lacked enforcement authority to require dam owners to implement these recommendations, and only followed-up on recommendations during the next inspection of the dam (which at times was more than five years later). As a result, some of the dams we reviewed have lingered in poor condition for at least 18 years. In addition, DEC: (1) has yet to finalize and provide reports to dam owners for inspections they conducted in 2019 and 2020; (2) reported that they have not always notified state government entities that own dams that DEC inspected those dams; (3) did not inspect some dams within the minimum required inspection frequency and, in recent years, has not been recording inspections in their inventory database; (4) has not been recording condition information in their dam inventory and may also have incorrect hazard classification assigned to dams that have the potential for loss of human loss should they fail.

## DEC Never Provided Timeframes nor Enforced Inspection Recommendations

DEC made recommendations to dam owners in the inspection reports we reviewed, but they did not specify timeframes by which owners should act on those recommendations nor, due to a lack of authority, did they require the dam owners to implement the recommendations.

Prior to August 2020, DEC did not have the regulatory authority to mandate timeframes to implement corrective recommendations nor the regulatory authority to enforce the recommendations. Since then, DEC has adopted rules that require it to provide written notification to owners that they must undertake repair work within a specified timeframe or be subject to enforcement by the Department.

However, according to one dam safety official, until DEC adopts additional rules that dictate timeframes for repairs and outline enforcement procedures, DEC will not provide recommended timeframes nor undertake enforcement actions against dam owners, including state dam owners, for not implementing recommendations. DEC is required to have additional rules adopted by July 2022 that pertain to dam design standards and DEC intends

to have the standards regarding repair timeframes and enforcement procedures included within those rules.[22] As of January 26, 2022, DEC had not started formal development of the rules, and therefore it is unlikely that they will meet the July 2022 due date for adoption. According to the DEC Commissioner, DEC intends to request a one-year extension of this deadline from the legislature.

DEC followed up on recommendations during subsequent inspections. In most cases, the subsequent inspections found that dam owners had taken little or no action to improve the condition of the dam. As shown in Table 4 below, **some of the dams we reviewed have been rated in poor condition for at least 18 years**.

**Table 4: Minimum Years Known in Poor Condition for Dams Reviewed**

| Dam Name | Location | Owner Type | Hazard Potential | Earliest Known Year Classified in Poor Condition | Year of Last Inspection | Years Known to Be in Poor Condition[a] |
|---|---|---|---|---|---|---|
| Curtis Pond Dam[b] [c] | Calais | Private | Significant | 2001 | 2019 | 18 |
| Institute Pond Dam[b] | Lyndon | Private | High | 2002 | 2020 | 18 |
| Chestnut Hill Reservoir Dam[b] [d] | Brattleboro | Local Government | High | 2000 | 2017 | 17 |
| Mirror Lake Dam[b] | Calais | Private | Significant | 2004 | 2015 | 11 |
| East Long Pond Dam[e] | Woodbury | Local Government | High | 2011 | 2020 | 9 |
| Thurman W. Dix Reservoir Dam | Orange | Local Government | High | 2013 | 2020 | 7 |
| Lake Sadawga West Dike | Whitingham | State | High | 2014 | 2020 | 6 |
| Caspian Lake Dam[e] | Greensboro | Local Government | Significant | 2011 | 2017 | 6 |
| Kent Pond Dam | Killington | State | Significant | 2012 | 2015 | 3 |
| Gale Meadows Dam | Londonderry | State | Significant | 2014 | 2017 | 3 |

[a] Until each dam is re-inspected, it is unknown if the dam continues to be in poor condition.
[b] These dams may have been in poor condition longer; the earliest inspection report provided by DEC showed the dam in poor condition, but all dams were in service well before 2000.
[c] DEC has been unable to determine the legal owner of this dam but their inventory lists the dam owner type as private.
[d] DEC inspected this dam in 2021 but has not completed the inspection report. DEC intends to upgrade the condition rating to satisfactory, as it was recently repaired.
[e] This dam is owned by the Hardwick Electric Department, which DEC classifies as "local government" in their inventory.

[22] Act 161 (2018) required DEC to adopt rules to implement the standards of the dam statute by July 2022. These rules will address topics such as the siting, design, construction, or alteration of a dam; operation and maintenance of a dam; inspection, monitoring, record keeping, and reporting; repair, breach, or removal of a dam.

## Inspection Reports Not Completed Timely

State law requires that DEC provide dam owners with a copy of inspection reports.[23] However, in 2019 and 2020 DEC inspected the three dams in Table 5 below, but as of December 13, 2021, they had not finalized reports for those dams nor provided them to the dam owners. During this time, DEC's Dam Safety Program had two full-time employees and, according to a dam safety official, capacity challenges are the reason they have not finalized the reports (see Appendix IV for other program responsibilities and obligations of DEC's Dam Safety Program). DEC intends to send the reports to dam owners once they are finalized.

**Table 5: Inspection Reports from 2019 and 2020 Not Finalized and Not Provided to Dam Owners**

| Dam Name | Hazard Potential | Location | Year Inspected but No Evidence Report Provided | Has Been in Poor Condition Since |
|---|---|---|---|---|
| Institute Pond Dam[a] | High | Lyndon | 2019 & 2020 | 2002 |
| East Long Pond Dam[b] | High | Woodbury | 2020 | 2011 |
| Thurman W. Dix Reservoir Dam | High | Orange | 2019 & 2020 | 2013 |

[a] This dam may have been in poor condition before 2002. The earliest inspection report we received from DEC was in 2002, and that inspection report noted that the dam was in poor condition.
[b] DEC inspected this dam in 2019 and provided the owner with the report for that inspection.

Under DEC's rules, should dam owners hire an engineer to inspect their dams the owners are required to furnish a copy of the dam inspection report to DEC within 45 days of completion of that inspection.[24] However, DEC's rules are silent about the timeframe by which DEC is required to provide inspection reports to dam owners for the inspections that DEC performs.

**Until DEC provides dam owners with inspection reports timely that include timeframes for corrective action and develops procedures to enforce those timeframes, owners may continue to leave dams in poor condition indefinitely, risking property, the environment, and human lives. Failing to provide an inspection report for more than a year means that at least half the time available for a high hazard dam owner to make improvements recommended in the report will have already passed before the next inspection.**

[23] 10 V.S.A. § 1105(c).
[24] Vermont Dam Safety Rule §37-110.

## State Government Entities that Own Dams Have Not Been Notified of Inspection Reports Even If Dam Potentially Poses Risk to Human Lives and Is in Poor Condition

DEC also informed us that if they did not have a point of contact for state-owned dams, they filed the report without providing it to anyone specifically, but if there was a pressing safety concern, they would inform management. Some reports are maintained on a shared network drive that is accessible to other departments within DEC's parent agency, the Agency of Natural Resources. DEC was unable to provide evidence that they notified the Department of Fish and Wildlife, which falls under the same parent agency as DEC, that inspection reports were available for two poor condition dams they own, listed in Table 6 below. When we followed up with a senior official at the Department of Fish and Wildlife, he indicated that he had not personally received the recent inspection reports for these two dams, but that the reports were available on the shared network drive.

**Table 6: Inspection Reports DEC Did Not Provide to the Department of Fish and Wildlife**

| Dam Name | Hazard Potential | Location | Year Inspected but No Evidence Report Provided | Has Been in Poor Condition Since |
|---|---|---|---|---|
| Lake Sadawga West Dike | High | Whitingham | 2020 | 2014 |
| Gale Meadows Dam | Significant | Londonderry | 2017 | 2014 |

**Without direct notification that DEC inspected a dam, and that DEC determined the dam to be in poor condition, state agencies and departments cannot be held accountable for failing to undertake repair work. State dams in poor condition will remain in poor condition, placing property, the environment, and human lives at risk and potentially exposing the State to lawsuits should the dam fail.**

## Condition Information of Dams Is Incomplete and Inaccurate for Some

The Model State Dam Safety Program, created by the Federal Emergency Management Agency (FEMA) and the Association of State Dam Safety Officials, recommends that inspection results, including dam condition, should be maintained in a computerized inventory.

The database DEC used for their dam inventory had fields to record inspection information, including the condition of the dam. However, while DEC could have recorded the condition of a dam in this database, they did not. According to a dam safety official, **recording condition information in their database was not a priority and therefore not done consistently.**

Instead, DEC stored condition information in various spreadsheets and in the files of inspection reports for individual dams.

One of the spreadsheets DEC used to store condition information was created to update information for the Federal National Inventory of Dams (NID), which is a congressionally authorized database that documents more than 91,000 dams across the U.S. and its territories.[25] This information is public and is used by various stakeholders such as dam owners; regulatory programs; emergency management agencies; and people who live, work or own property downstream of dams. Therefore, accuracy of the information in the NID is vital.

In the most recent (April 2021) spreadsheet DEC sent for the NID, we found that DEC had condition ratings in the spreadsheet for some dams that did not match the rating listed in the inspection report for that dam. DEC attributed this to manual input errors into the spreadsheet.[26]

DEC also used the percentage of dams in poor condition as one of its performance measures during its fiscal year 2022 budget submission. Without an up-to-date and accurate repository of dam condition information, DEC has no assurance that they are accurately calculating and correctly reporting the percentage of dams in poor condition to those who review the performance measure reports and use them to assess DEC's performance, including DEC management, the Legislature, or citizens of the state.

Furthermore, DEC risks being unable to use the condition as a factor in determining which dams may need more frequent inspections than the minimum required by the periodic inspection frequency.

DEC recently developed two new information technology systems, one for preparing inspection reports and one for maintaining dam inventory information. These two systems do not currently communicate and therefore condition information changes from the inspection reports do not automatically update in the inventory system. If DEC does not focus on updating the dam inventory system, it is unlikely that DEC will have complete, accurate, and up-to-date condition information.

[25] The National Inventory of Dams is maintained and published by the U.S. Army Corps of Engineers, in cooperation with the Association of State Dam Safety Officials, the states, territories, and federal agencies. It consists of dams where downstream flooding would likely result in loss of human life or disruption of access to critical facilities, damage to public and private facilities, and require difficult mitigation efforts. The NID also contains dams that do not pose the same level of life or economic risk previous but meet certain size requirements.

[26] Starting November 2021, states have the ability to input data directly into the NID in real-time.

## DEC's Hazard Potential Classification for Some Dams May Be Inaccurate

Prior to 2020, the definition of significant hazard potential projected the loss of a few lives in the event of a failure. The new definition for significant hazard potential no longer includes the projected loss of life. Any dam that can cause a loss of life is now classified as *high* hazard potential.

According to a dam safety official, DEC has not gone through their dam inventory and reclassified dams based on the hazard potential classifications currently in use. It is possible that dams that were previously classified as "significant hazard" potential are considered "high hazard" potential under the new definition.

Of the ten dams we reviewed, we identified at least one that may be classified inaccurately as significant hazard instead of high hazard potential, based on information DEC provided.

- Gale Meadows Dam in Londonderry- A 1980 report by the U.S. Army Corps of Engineers notes that the failure of the dam "could result in the loss of a few lives."

If DEC confirms that the failure of Gale Meadows Dam would cause loss of life, they will need to reclassify that dam as high hazard.

It is unknown how many dams have an incorrect hazard potential classification. DEC intends to review the hazard potential classification for significant and low hazard potential dams during upcoming inspections, using FEMA software to develop dam failure flood inundation maps to determine whether the dams have the proper classification (see Appendix VI for information regarding dam failure flood inundation maps and examples). If DEC's analysis identifies that a dam may have high hazard potential, DEC intends to have the dam owner perform further analysis at the owner's expense.[27]

Until DEC updates their inventory, it is possible that high hazard potential dams may go five years between inspections instead of two because they are incorrectly classified as significant hazard potential, which would be a violation of rule.[28]

[27] Under Vermont Dam Safety Rule §37-106, dam owners are responsible for the cost of engineering studies and design.

[28] Vermont Dam Safety Rule §37-110.

Misclassified hazard potential also may affect the ability of owners to undertake repairs. Dam owners are solely responsible for what can be significant financial obligations and are responsible for maintaining the dam in a safe condition. There is a federal program[29] that will provide funds to remediate high hazard potential dams whose owners meet certain criteria[30] and provide some matching funds. DEC applied to this program and received approval in 2019 to perform a risk assessment on ten of Vermont's high hazard potential dams, including four that we had selected for review, with the potential of future funding for construction activities. While dam safety should not be contingent on federal financial assistance, without accurate classification of dam hazard potentials, the State and other dam owners may be missing an opportunity to use this program and maximize available federal assistance.

## DEC Did Not Inspect Dams Within Appropriate Timeframe and Did Not Record All Inspections in Dam Inventory

In 2019, the American Society of Civil Engineers recommended that DEC increase the staffing of the Dam Safety Program from two full-time-equivalents to four[31] so that the program could meet statutory and program obligations.[32] We used reports from the state's time keeping system to confirm that from January 2019 through August 31, 2021, the DSP had two full-time employees and as of January 6, 2022, DSP had two employees on staff. The American Society of Civil Engineers noted that the Dam Safety Program was not inspecting significant and low-hazard potential dams within an appropriate timeframe due to staff limitations.

During our file review of ten dams, we also found that the following two dams had not received an inspection within the five-year timeframe for significant hazard potential dams as required by rule:[33]

- Kent Pond Dam in Killington - Last inspected in 2015 and therefore should have been inspected by 2020.

[29] The Federal Emergency Management Agency's Rehabilitation of High Hazard Potential Dam Grant Program provides grants to rehabilitate eligible high hazard potential dams.

[30] Only states with a dam safety program can apply for these funds. States can pass these awards to eligible subrecipients defined as non-federal governmental organizations and nonprofit organizations that have taxing authority or another means of guaranteeing future operations and maintenance, such as fees, escrow accounts, or bonds, etc.

[31] DEC has recently hired two staff for three-year limited service to assist with dam ownership duties, to start first quarter 2022.

[32] American Society of Civil Engineers Vermont Section, 2019 Report Card for Vermont's Infrastructure.

[33] Vermont Dam Safety Rule §37-110.

- Mirror Lake Dam in Calais - Last inspected in 2015 and therefore should have been inspected by 2020.

According to a state dam safety official, these dams were not inspected due to staffing limitations and other program responsibilities. The DEC Commissioner also agreed that the Dam Safety Program is understaffed. If DEC does not adhere to the inspection frequency,[34] they may miss changes that could lead to dam failure and thereby place the environment, property, and human lives at risk.

We also found that DEC had not updated their dam inventory with the dates of their inspections in recent years. For example, within our selection of dams, we found that DEC had not recorded 14 of the 92 inspections we reviewed (15 percent). All of the unrecorded inspections were from 2017 through 2020, as shown in Table 7 below. DEC confirmed they have not been recording them consistently as this was not a priority for them.

**Table 7: List of Dams for which DEC Did Not Record Inspection Between 2017 and 2020**

| Dam Name | Hazard Potential | Location | Number of Unrecorded Inspections |
|---|---|---|---|
| Lake Sadawga West Dike | High | Whitingham | 4 |
| East Long Pond Dam | High | Woodbury | 3 |
| Institute Pond Dam | High | Lyndon | 3 |
| Thurman W. Dix Reservoir Dam | High | Orange | 3 |
| Curtis Pond Dam | Significant | Calais | 1 |
| **Total** | | | **14** |

Any updates DEC makes to hazard potential classification changes the inspection frequency for those dams. For example, significant hazard dams that DEC reclassifies to high hazard potential must be inspected every two years instead of every five years.

Until DEC updates the hazard classification of dams in their inventory and records dates of inspections, it is unclear how DEC can determine whether they are inspecting dams within the appropriate timeframes and what the appropriate staffing level for their Dam Safety Program should be.

One of DEC's guiding principles is to apply environmental laws and standards consistently and fairly. Under the recently adopted rule,[35] if DEC is unable to perform a periodic inspection (which are at no cost to the owner), they are

34 Vermont Dam Safety Rule §37-110.
35 Ibid.

authorized to require the dam owner to hire an engineer, at the owner's expense, to perform the inspection. If some dam owners are required to pay for these inspections and others are not because DEC does not have enough staff to conduct all inspections, this could potentially raise a fairness issue.

# Other Matters

The Public Utility Commission (PUC) plays a role similar to the Dam Safety Program with respect to regulating dams in Vermont. The PUC is responsible for the safety of some hydroelectric dams and performs functions similar to DSP such as maintaining an inventory, assigning hazard potential classifications, and requiring safety inspections.[36] However, while the functions are similar, there are important differences in the way the PUC performs these functions.

The PUC's definition for significant hazard potential still includes the potential for the loss of a few lives in disagreement with DEC's definition which mandates that the probable loss of any life must be classified as high hazard potential. DEC adopted their definitions in August 2020, but the PUC's rules went into effect in 1990 and their definitions have not been updated. With two such different definitions, it is difficult to determine how many state-regulated dams in Vermont pose a threat to human life in the event of a dam failure.

The hazard potential classification of a PUC dam, similar to DEC, informs how often each dam is inspected. However, the PUC rules dictate that high hazard potential dams be inspected every five years and significant hazard potential dams be inspected every ten years, as opposed to DEC rules requiring inspection every two and five years, respectively. The PUC's inspection schedule provides less opportunity to observe maintenance and safety issues between inspections. In addition, because of the misalignment of hazard potential definitions, a PUC significant hazard dam that DEC would classify as high hazard may go ten years without an inspection, whereas DEC would inspect the same dam every two years.

The mismatch between the PUC and DEC hazard potential classifications and inspection frequency was noted in the 2019 Report Card for Vermont's Infrastructure (see page 24 of the report found here) which gave Vermont a grade of "C". The American Society of Civil Engineers Vermont Section recommended in that report that the PUC should coordinate with DEC to have similar hazard potential classification definitions and inspection schedules. State statute requires both the PUC and DEC to protect public

[36] The PUC requires the owner to obtain inspection by an independent consultant; they do not have a dam safety engineer on staff.

safety; alignment between these two state dam safety entities is likely to improve the safety of the state's dams and increase protection of human lives.

The State Auditor sent a letter to the PUC Chair informing the PUC of this issue and requesting a response as to how the PUC intends to deal with the mismatch between the PUC's rules and DEC's rules. The PUC Chair responded that the PUC would initiate rulemaking now to align the hazard potential definitions and inspection frequencies in their rules to match DEC's. The State Auditor's letter and the Chair's full response can be found in Appendix VII.

The PUC is required by statute to keep an inventory of dams and provide that inventory to DEC annually, which the PUC provided. DEC had not asked the PUC to provide condition rating in these reports, though they plan to request it for the most recent inspections. Without this information, DEC cannot provide complete information to the NID, and a review of the NID shows that none of the PUC dams are assigned a condition assessment. In addition, DEC's own inventory will continue to be incomplete without condition information.

# Conclusions

The safety of the citizens of Vermont is dependent on the State inspecting and evaluating the state's dams and compelling dam owners to make repairs to keep the dams from failing, including those dams owned by the State. However, some of the dams we reviewed have been in poor condition for at least 18 years. In 2020, DEC acquired the authority to compel dam owners to undertake repairs but has not done so yet because DEC asserts that they need to adopt additional rules before they can require dam owners to make repairs. Until DEC assigns timeframes for dam owners to undertake repairs and enforces those timeframes, the owners may continue to leave dams in poor condition indefinitely, risking property, the environment, and, most importantly, human lives.

# Recommendations

We make the recommendations in Table 8 to the Commissioner of the Department of Environmental Conservation.

**Table 8: Recommendations and Related Issues**

| Recommendation | Report Pages | Issue |
|---|---|---|
| 1. Adopt rules the Department deems essential, using the emergency rulemaking process if necessary, to compel dam owners, including state dam owners, whose dams are in poor condition to undertake repair work within a specified timeframe and the procedures needed to enforce those rules. | 14-15 | Inspection reports contain recommendations, but DEC never specified a timeframe, nor did they require dam owners to act on recommendations. Without assigned timeframes or enforcement, owners may continue to leave dams in poor condition indefinitely, risking property, the environment, and human lives. |
| 2. Establish and implement a time limit for finalizing and providing DEC inspection reports to dam owners. | 16 | DEC inspected dams in 2019 and 2020 but as of December 2021 they still had not finalized their inspection reports nor provided them to the dam owners. |
| 3. Maintain points of contact for state-owned dams. For state-owned dams the DEC determines to be in poor condition, the Commissioner should immediately notify the Agency Secretary or Department Commissioner who is responsible for the dam. | 17 | DEC reported that they had not always notified state agencies and departments that they had inspected dams and that the inspection reports were available. |
| 4. Direct DSP staff to maintain a dam inventory that includes complete, up-to-date, and accurate condition information. | 17-18 | DEC does not maintain a complete and accurate repository of dam condition information. Without this, DEC risks being unable to provide correct information to stakeholders or to prioritize which dams need attention. |
| 5. Update the dam inventory to ensure that dams have the correct hazard classification with priority given to dams currently classified as significant hazard potential. | 19-20 | The definitions for hazard potential classifications have changed, but DEC has not updated their inventory. It is possible that significant hazard potential dams are high hazard under the new definitions. Therefore, high hazard potential dams may go up to five years before DEC inspects them because they are incorrectly classified. Until the classifications are updated, state and other dam owners may miss out on federal funding for high hazard potential dam remediation. |
| 6. Record inspection dates in the inventory as they occur and assess whether dams are being inspected timely. | 20-21 | The American Society of Civil Engineers recommended an increase in staffing for the Dam Safety Program. DEC has not inspected two dams within the five-year timeframe, nor have they updated the dam inventory with dates of inspection. DEC acknowledged that their Dam Safety Program in understaffed. Until DEC updates hazard classification and records dates of inspection, it is unclear how DEC can determine whether they are inspecting dams withing the appropriate timeframes and what the appropriate staffing level should be. |
| 7. Assess the staffing levels of the Dam Safety Program and identify what the appropriate staffing levels should be. | | |

| Recommendation | Report Pages | Issue |
|---|---|---|
| 8. Develop a process to ensure that requiring dam owners to pay for periodic inspections is done in a fair and consistent manner. | 21-22 | Under the recently adopted rule, if DEC is unable to perform a periodic inspection (which are at no cost to the owner), they are authorized to require the dam owner to hire an engineer, at the owner's expense, to perform the inspection. If some dam owners are required to pay for these inspections and others are not because DEC does not have enough staff to conduct all inspections, this could potentially raise a fairness issue. |
| 9. Obtain dam condition information annually from the PUC. | 23 | DEC did not request dam condition information from the PUC for the dams that the PUC regulates. |

# Management's Comments and Our Evaluation

On February 9, 2022, the Commissioner of the Department of Environmental Conservation provided comments on a draft of this report, which are reprinted in Appendix IX. Our evaluation of these comments is in Appendix X.

# Appendix I
# Scope and Methodology

To address our audit objective, we reviewed state statutes and program rules; interviewed DSP staff; reviewed the Model Dam Safety Program; FEMA Guidelines; U.S. Army Corp of Engineers regulations on dam safety; Vermont climate assessments and climate change information; and reports on the condition of Vermont's infrastructure and the dam safety program.

We obtained a copy of DEC's dam inventory. This inventory did not contain condition ratings nor were the dates of inspections recorded completely. For the condition ratings, we obtained two inventories: (1) a 2021 report DEC provided to the U.S. Army Corps of Engineers for the National Inventory of Dams (NID), and (2) a 2019 report prepared for the then-Commissioner of DEC. We compared the NID report to actual inspection reports and found the NID contained errors, therefore we used the 2019 report as the source for condition information.

We combined the original inventory, which contained dam names, locations, owners, and hazard potential, with the 2019 report containing condition information. From this combined list, we judgmentally selected 10 dams in poor condition, five with high hazard potential and five with significant hazard potential.

We obtained the inspection reports for each of the selected dams and determined for how many years DEC had rated these dams as being in poor condition. We determined whether DEC had assigned a timeframe for remediation; whether DEC had taken actions to effect a change in the condition; and whether DEC had followed-up on recommendations. We reviewed dam engineering reports, as available, to determine if hazard potential classifications needed to be updated.

We had discussions with DSP staff regarding the program's responsibilities. We reviewed documents provided to the Legislature and to DEC management. We obtained a report from the State of Vermont's VTHR Human Resource information system showing the hours recorded for the various tasks which DSP staff worked on from 2019 – August 31, 2021. We analyzed these hours to determine how many employees worked in the program.

We performed the following to assess internal controls significant to our audit objective: (1) assessed whether DEC had procedures for specifying timeframes, recording recommendation follow-up, and recording dam condition; (2) determining whether DEC followed-up on recommendations within specified timeframes; and (3) assessing whether DEC had provided dam owners with copies of their inspection reports.

# Appendix I
# Scope and Methodology

We reviewed the PUC's Rule 4.500 - Safety of Hydroelectric Dams and compared the PUC's hazard potential classification definitions to those in DEC's Vermont Dam Safety Rule. We compared the PUC's periodic inspection frequency requirements to DEC's. We interviewed a PUC staff attorney. We obtained and reviewed the files from one case of the PUC's regulatory oversight; the files included an inspection report, plans for repairs, and orders issued by the Commission. We obtained and reviewed the PUC dam inventories provided to DEC for 2018 through 2020.

We reviewed FERC inspection requirements and hazard potential definitions and compared them to DEC's and the PUC's requirements.

We conducted this performance audit in accordance with Generally Accepted Government Auditing Standards (GAGAS), which requires that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on the audit objective. We believe the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

## Appendix II
## Abbreviations

| | |
|---|---|
| ASCE | American Society of Civil Engineers |
| DEC | Department of Environmental Conservation |
| DSP | Dam Safety Program |
| FEMA | Federal Emergency Management Agency |
| FERC | Federal Energy Regulatory Commission |
| NID | National Inventory of Dams |
| PUC | Public Utility Commission |
| SAO | State Auditor's Office |
| V.S.A. | Vermont Statutes Annotated |

# Appendix III
# Comparison of DEC, PUC, and FERC

Table 9 below provides a comparison of DEC, PUC, and FERC dam inspection requirements.

**Table 9: DEC, PUC, and FERC Inspection Requirements Comparison**

| | DEC Dam Safety Program | Public Utility Commission | Federal Energy Regulatory Commission |
|---|---|---|---|
| Overview | Section within DEC's Water Investment Division that regulates non-power generating, nonfederal dams. Also acts as the owner and operator at 14 state-owned dams. | A three member, independent, state quasi-judicial board that regulates the siting of electric and natural gas infrastructure and supervises the rates, quality of service, and overall financial management of Vermont's public utilities: electric, gas, energy efficiency, telecommunications, cable television (terms of service only, not rates), water, and large wastewater companies. | An independent federal agency that regulates the interstate transmission of natural gas, oil, and electricity, as well as natural gas and hydropower projects. |
| Has Staff that Performs Dam Inspections | Yes | No, requires dam owners to obtain an independent consultant to perform inspection. | Yes |
| Owns Dams | Yes | No | No |
| Definition Used to Classify Dams as High Hazard Potential | Dams where failure or mis-operation will probably cause loss of human life. | Dams where failure could result in more than a few lives are lost or excessive economic loss. | Dams where failure would probably cause loss of human life. |
| High Hazard Inspection Schedule | Every two years | Every five years | Every year |
| Significant Hazard Inspection Schedule | Every five years | Every ten years | Every year |
| Low Hazard Inspection Schedule | Every ten years | No inspection requirement | Every three years |

As of January 6, 2022, the Dam Safety Program has two full time staff.[37] In addition to performing inspections, DSP is responsible for the following obligations:

- Manage and operate 14 state-owned dams including three high hazard potential Winooski flood control dams; tasks include operation and maintenance, flood control monitoring, contracting of required maintenance, emergency action planning, capital project planning and execution, and community outreach.
- Regulation of dams statewide including rulemaking, inspections, and development of related reports.
- FEMA High Hazard Potential Dam Grant Program – risk assessment on ten grant eligible dams; future grant cycles will allow for pre-construction and construction activities.
- Annual Registration Program – notification to owners whose dams are capable of impounding more than 500,000 cubic feet (11.48 acre-feet) of water of the requirement to pay a fee.[38]
- Permitting Program – processing applications to make changes to an existing dam or build a new one.
- Unsafe Dam Proceedings – when necessary to have a dam declared "unsafe" through administrative hearing.
- Property and recreational management of Shady Rill Picnic Area and Wrightsville Reservoir boat ramp, and leases with Wrightsville Beach District, the Vermont Modeler's Club, Town of Orange, Town of Concord, and a dairy farmer.

While Act 161 gave DEC new authority, it imposed additional responsibilities:

- Increased inventorying.
- Re-assessment of existing hazard classifications to meet new standards
- Recording in land records – includes identifying of owners who are required to record dams in land records.
- Emergency Action Plan updates for all high and significant hazard potential dams.
- Creating new Fact Sheet/Guidance documents to detail policies and procedures for new rules.
- Enforcement using new tools provided by act and statutes.
- Submission of a report to the Legislature by January 1, 2023, detailing, (1) an evaluation of the dam registration program, (2) a recommendation on

[37] DSP has recently hired two new engineers-in-training to assist with dam ownership responsibilities, on a three-year term to start first quarter of 2022.

[38] The fee structure is $1,000 for high hazard potential dams, $350 for significant hazard potential dams, and $200 for low hazard potential dams.

the dam registration fee structure, (3) a summary of registered dams, including amount of water impounded and hazard potential classification, and (4) an evaluation of any other dam safety concerns related to registration.

# Appendix V
# Condition Assessment Rating and Definitions DEC Started Using in 2021

According to a dam safety official, in 2021 DEC started using the condition ratings that are also used in the National Inventory of Dams. Table 10 below contains those condition assessment rating and definitions.

**Table 10: Condition Assessment Ratings DEC Reported They Started Using in 2021**

| Condition Rating | Definition |
|---|---|
| Satisfactory | No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines. |
| Fair | No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action. |
| Poor | A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary. |
| Unsatisfactory | A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. |
| Not Rated | The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated. |

A dam failure flood inundation map shows the geographic area downstream of a dam or dike that would be flooded by a breach of the dam and/or dike or other large discharge, as shown in Figures 8 and 9.

**Figure 8: Dam Failure Flood Inundation Map for Lake Sadawga West Dike and Dam in Whitingham**

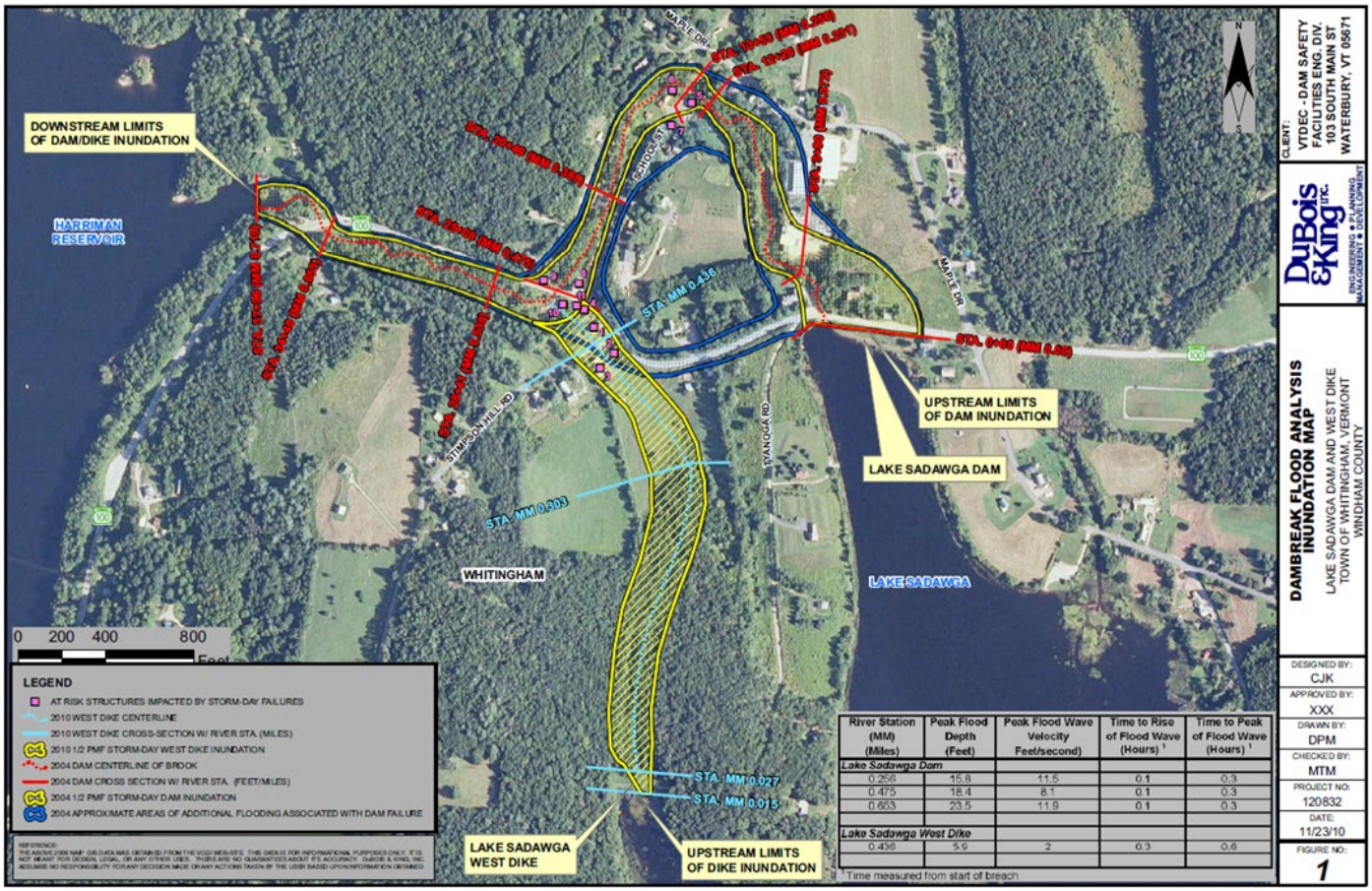
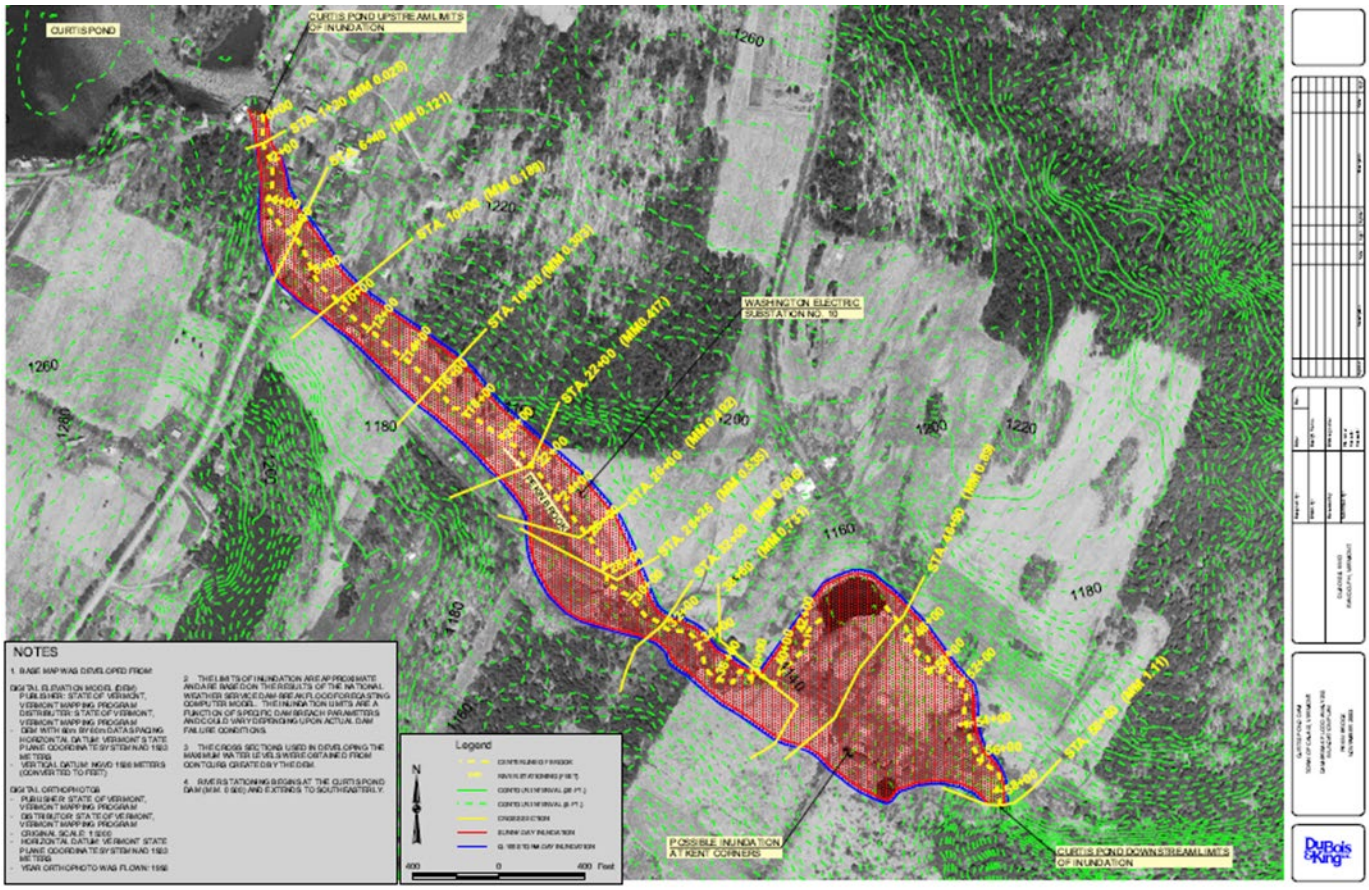


**Figure 9: Dam Failure Flood Inundation Map for Curtis Pond Dam in Calais**



# Appendix VII
# SAO Letter to the PUC and Their Response

The following is a reprint of SAO's letter to the PUC Chair informing him of the mismatch between the PUC's and DEC's rules regarding the definitions for hazard potential and inspection frequencies and the Chair's response.

DOUGLAS R. HOFFER
STATE AUDITOR

**STATE OF VERMONT**
**OFFICE OF THE STATE AUDITOR**

January 14, 2022

Anthony Z. Roisman, Chair
Public Utility Commission
112 State Street
Montpelier, VT 05620

Dear Chair Roisman,

My office is conducting an audit pertaining to the Department of Environmental Conservation's (DEC's) Dam Safety Program. During the course of this audit, it has come to my attention that the Public Utility Commission (PUC) does not utilize the same hazard potential definitions and inspection frequencies in its oversight of dams as DEC.

DEC defines a high hazard potential dam as any dam whose failure could result in the loss of a single life. DEC's classification of a high hazard potential is in line with the Association of State Dam Safety Officials' definition found here and the federal hazard potential classification system for dams found here.

However, the PUC defines a significant hazard potential dam as one whose failure could result in the loss of a few lives and a high hazard potential dam as one where more than a few lives may be lost. Consequently, the PUC requires dams to be inspected considerably less often than DEC, even when lives are at risk, as shown in the table below:

| Hazard Classification | PUC Inspection Frequency | DEC Inspection Frequency |
|---|---|---|
| High Hazard Potential | Every 5 Years | Every 2 Years |
| Significant Hazard Potential | Every 10 Years | Every 5 Years |

The PUC's inspection schedule provides less opportunity to observe maintenance and safety issues between inspections. In addition, because of the misalignment of hazard potential definitions, a PUC significant hazard potential dam whose failure may cause the loss of a few lives (which DEC would classify as high hazard) may go ten years without an inspection.

I understand that the PUC is aware of this situation and has contemplated updating their rules to align its hazard potential classifications and inspection frequency to those DEC has adopted.[1]

[1] Vermont Dam Safety Rule, adopted August 2020.

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DOUGLAS R. HOFFER
STATE AUDITOR

**STATE OF VERMONT**
**OFFICE OF THE STATE AUDITOR**

I encourage the PUC to expeditiously update their hazard potential definitions and inspection frequencies for dams in order to correct the unintended but unjustifiable situation where inconsistent rules provide more protection for one Vermonter's life over another's based upon which state agency oversees the dam.

Please let me know if the PUC plans to align the two classification and inspection regimes to inform our audit follow-up activities.

Sincerely,

Doug Hoffer

Douglas R. Hoffer
Vermont State Auditor

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**State of Vermont**
**Public Utility Commission**
January 20, 2022

Office of the State Auditor
Douglas R. Hoffer, Vermont State Auditor
132 State Street
Montpelier, Vermont 05633-5101

Dear Mr. Hoffer:

Thank you for your recent correspondence regarding the Public Utility Commission's dam safety rule. I agree with your conclusion that the Commission's dam safety rule should be updated, and I have directed Commission staff to begin work on this immediately.

The Commission has been following the Department of Environmental Conservation's rulemaking proceeding regarding its Administrative and Standard Dam Safety Rules. Act 161 of 2018 directed the Department of Environmental Conservation to develop its dam safety rules in two parts, with the second part to be completed in the summer of 2022. To avoid duplicative proceedings, the Commission had planned to wait until the Department of Environmental Conservation completed the second part of its rulemaking before initiating a PUC rulemaking and then to revise Commission Rule 4.500.

After discussing the concerns raised in your correspondence, however, the Commission has determined that the better course of action is to initiate a rulemaking now with the narrow focus of aligning the hazard potential definitions and inspection frequencies in Commission Rule 4.500 with the definitions and classifications contained in the Department of Environmental Conservation's rule, state statutes, and other federal and state organizations. The Commission will take up any additional revisions to Commission Rule 4.500, if needed, after the Department of Environmental Conservation completes the second part of its rulemaking this summer.

The Commission will initiate the rulemaking proceeding discussed above immediately and will move through the rulemaking process as expeditiously as possible.

Thank you again for bringing this matter to our attention. I hope that this addresses your concerns. Please contact me anytime if you would like to discuss the issue further.

Sincerely,

Anthony Roisman

Anthony Z. Roisman
Chair

VERMONT

## Appendix VIII
## Pictures of Dams in SAO's Selection

The following are pictures of the ten dams we reviewed the inspection reports for. These pictures may not show the entirety of the dam.

Figure 10 below is a picture of the Curtis Pond Dam in Calais. In DEC's dam inventory, this dam is classified as significant hazard potential, has a maximum storage capacity of 1,000 acre-feet, and in 2022 is 122 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 10 Curtis Pond Dam in Calais**

**Click the picture for aerial video of this dam.**

Figure 11 below is a picture of the Institute Pond Dam in Lyndon. In DEC's dam inventory, this dam is classified as high hazard potential, has a maximum storage capacity of 41 acre-feet, and in 2022 is 111 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 11: Institute Pond Dam in Lyndon**

**Click the picture for aerial video of this dam.**

Figure 12 below is a picture of the Chestnut Hill Reservoir Dam in Brattleboro. In DEC's dam inventory, this dam is classified as high hazard potential, has a maximum storage capacity of 15 acre-feet, and in 2022 is 138 years old. DEC intends to change the condition rating of this dam to satisfactory as it was recently repaired, according to one dam safety engineer. **Click the picture below for a brief aerial video of this dam.**

**Figure 12: Chestnut Hill Reservoir Dam in Brattleboro**

**Click the picture for aerial video of this dam.**

# Appendix VIII
# Pictures of Dams in SAO's Selection

Figure 13 below is a picture of the Mirror Lake Dam in Calais. In DEC's dam inventory, this dam is classified as significant hazard potential, has a maximum storage capacity of 540 acre-feet, and in 2022 is 202 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 13: Mirror Lake Dam in Calais**

**Click the picture for aerial video of this dam.**

Figure 14 below is a picture of the East Long Pond Dam in Woodbury. In DEC's dam inventory, this dam is classified as high hazard potential, has a maximum storage capacity of 3,620 acre-feet, and in 2022 is 92 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 14: East Long Pond Dam in Woodbury**

**Click the picture for aerial video of this dam.**

Figure 15 below is a picture of the Lake Sadawga West Dike in Whitingham. In DEC's dam inventory, this dam is classified as high hazard potential, has a maximum storage capacity of 1,500 acre-feet, and in 2022 is 142 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 15: Lake Sadawga West Dike in Whitingham**

**Click the picture for aerial video of this dam.**

Figure 16 below is a picture of the Thurman W. Dix Reservoir Dam in Orange. In DEC's dam inventory, this dam is classified as high hazard potential, has a maximum storage capacity of 2,280 acre-feet, and in 2022 is 72 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 16: Thurman W. Dix Reservoir Dam in Orange**

**Click the picture for aerial video of this dam.**

Figure 17 below is a picture of the Caspian Lake Dam in Greensboro. In DEC's dam inventory, this dam is classified as significant hazard potential, has a maximum storage capacity of 4,300 acre-feet, and in 2022 is 93 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 17: Caspian Lake Dam in Greensboro**

**Click the picture for aerial video of this dam.**

Figure 18 below is a picture of the Kent Pond Dam in Killington. In DEC's dam inventory, this dam is classified as significant hazard potential, has a maximum storage capacity of 1,160 acre-feet, and in 2022 is 57 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 18: Kent Pond Dam in Killington**

**Click the picture for aerial video of this dam.**

Figure 19 below is a picture of the Gale Meadows Dam in Londonderry. In DEC's dam inventory, this dam is classified as significant hazard potential, has a maximum storage capacity of 2,942 acre-feet, and in 2022 is 57 years old. **Click the picture below for a brief aerial video of this dam.**

**Figure 19: Gale Meadows Dam in Londonderry**

**Click the picture for aerial video of this dam.**

# Appendix IX
# Reprint of Management's Comments

The following is a reprint of management's response to a draft of this report.

VERMONT

**Vermont Department of Environmental Conservation**
Commissioner's Office
One National Life Drive, Davis 3 [phone] 802-828-1556
Montpelier, VT 05620-3520

*Agency of Natural Resources*

February 9, 2022

Douglas R. Hoffer
Vermont State Auditor
VIA Email: doug.hoffer@vermont.gov

Dear Douglas R. Hoffer,

The VTDEC would like to thank the Auditor's Office for performing this Audit of the Dam Safety Program (DSP) that focused on our regulatory purview and performance relative to HIGH and SIGNIFICANT hazard potential dams. In Dam Safety, public safety is paramount, and the mission of this program is critically important in the attempt to limit risks to public safety, property, and the environment associated with dams. Vermont has been fortunate to not suffer a major dam failure that resulted in loss of life nor appreciable levels of property damage in some time. The DSP recognizes that when compared to more publicly visible infrastructure such as roads, bridges, and utilities, dams can be a secondary consideration. This is further exacerbated by the fact that in the United States and in Vermont, many dams are privately owned, including dams on major waterways and dams with notable public benefits. If is far too often that dam safety shortcomings are left unaddressed until a major dam failure or incident serves as a difficult reminder. With our aging and deteriorating dams and more frequent and severe loading conditions brought on by climate change, now is the time for an increased commitment to this cause.

The DSP would like to offer the following main response points:

- The timing of the audit finds the DSP in transition from having limited authority under the pre-existing statute to having an updated statute (10 VSA Chapter 43: Dams) and a full set of implemented rules, an updated record keeping and inventory system, and an electronic platform for periodic dam inspections. The audit is timely in its highlight for the existing need for additional permanent personnel, a need that will only increase as we move towards increased regulation and dam ownership responsibilities. The DSP is committed to a trajectory that aligns with the recommendations in the Audit Report and also brings the DSP into compliance with Federal Dam Safety Standards.

- The Audit Report identifies DSP shortcomings, particularly relative to dam inventory and inspection procedures. The DSP agrees that improvements to these elements are needed and will work to address them through internal processes and rulemaking. The DSP does want to note that despite limited authorities and insufficient staffing, the DSP has been effective in focusing on dams that are potentially unsafe (10 VSA §1095) and taken actions to protect lives, property, and the environment from incidents and failures. A list of such instances in recent memory includes for HIGH hazard potential dams: Nichols Pond Dam in Woodbury and Sweet Pond Dam in Guilford, and for SIGNIFICANT hazard potential dams: Wright Reservoir Dam in Hartford, Shashoua Pond Dam in Warren, Dunklee Pond Dam in Rutland, Amherst Lake Dam in Plymouth, Connolly Pond Dam in Shrewsbury, and Dow Pond Dam in

See our comment 1 on page 55

Middlebury. The DSP recognizes that ongoing rulemaking will result in the more proactive regulation of dams and looks forward to rule completion and implementation.

- The Audit Report alludes several times that the DSP is understaffed and cites the 2019 ASCE Report Card report which states, "the state needs additional resources to increase staffing levels in the VTDEC Dam Safety Program and River Management Program to properly manage dams in the state and maintain public safety." The DSP concurs that there is a direct link between the shortcomings of dams in the State and lack of investment of the State in dam safety programming. The DSP and Department plan to develop a staffing plan and use it and the Audit Report to continue to leverage for additional resources necessary to meet our mission.

- While outside of the scope of the Audit, an anticipated impediment to addressing and reducing dam safety risks in Vermont is the general lack of funding to undertake these often technically rigorous and expensive projects that often provide public benefit such as water supply, flood control, and recreation. The development of a state sponsored dam repair/rehabilitation grant/loan program would be helpful for owners to comply with upcoming dam safety rules, reducing public safety risks while safely providing the benefits noted above.

The DSP has provided specific responses to the Audit Report recommendations in the table in ***Appendix A***, below. In addition, some additional responses to the Audit Report are included in ***Appendix B***. The DSP would again like to thank the State Auditor's Office for bringing this focus to dam safety. We are confident that the DSP will be able to address the recommendations in the Audit Report and continue on the path of continual improvement for the benefit of all Vermonters.

Please reach out to Ben Green, Chief Dam Safety Engineer, with any questions. Ben can be reached at 802-622-4093 or benjamin.green@vermont.gov.

Sincerely,

Peter Walke
Commissioner

Cc: Benjamin Green, Chief Dam Safety Engineer
Neil Kamman, Director, Water Investment Division

*To preserve, enhance, restore, and conserve Vermont's natural resources, and protect human health, for the benefit of this and future generations.*

***APPENDIX A – DSP RESPONSES TO AUDIT REPORT RECOMEMENDATIONS***

| **Audit Recommendation** | **Identified Issue** | ***VTDEC Response*** |
|---|---|---|
| 1. Adopt rules the Department deems essential, using the emergency rulemaking process, if necessary, to compel dam owners, including state dam owners, whose dams are in poor condition to undertake repair work within a specified timeframe and the procedures needed to enforce those rules. | Inspection reports contain recommendations, but DEC never specified a timeframe, nor did they require dam owners to act on recommendations. Without assigned timeframes or enforcement, owners may continue to leave dams in poor condition indefinitely, risking property, the environment, and human lives. | *The Department will continue with the Rulemaking currently underway as it is the most expeditious path forward to enact first of its kind dam regulations in Vermont. The Department plans to continue to work through a transparent rule development process, engaging with the rulemaking interest group, holding public meetings with the regulated base (dam owners), consultants, and others involved in dam safety in the State. Continuing along this path will provide the best transition to sound dam safety regulation.*<br><br>*The Dam Safety Rules will include the authority for the DSP to require Dam Owners to comply with the results of periodic inspection reports, which will include the ability to require compliance with recommendations in the report within a specified timeframe as well as enforcement authority should dam owners fail to comply. In addition to these improvements to the Periodic Inspection process, the rules will include requirements for Comprehensive Inspections for HIGH and SIGNIFICANT hazard potential dams at 10 and 15-year intervals, respectively. Comprehensive Inspections are in-depth assessments that will go beyond visual inspection and include original design review and updated assessment of the dam.*<br><br>*The DSP would like to note that prior to the Statute change and rulemaking, the inclusion of timeframes or requiring actions through periodic inspection were not enforceable and were therefore discouraged. If action was warranted due to an unable or unwilling dam owner, Unsafe Dam Proceedings (§1095) were pursued. The DSP offers that until the rules are completed and implemented, we plan to add a standard paragraph to periodic inspection reports alerting dam owners to the upcoming "compliance with inspection reports" requirement.* |
| 2. Establish and implement a time limit for finalizing and providing DEC inspection reports to dam owners. | DEC inspected dams in 2019 and 2020 but as of December 2021 they still had not finalized their inspection reports nor provided them to the dam owners. | *With the implementation and use of the iPad-based periodic inspection application in the Summer 2022 inspection season, inspection reports should be able to be completed more efficiently. The DSP will target to complete and provide inspection reports to dam owners within 45 days after the field inspection was completed. This will match the timeframe contemplated in the rule for periodic inspections performed by engineering consultants on the dam owner's behalf.* |
| 3. Maintain points of contact for state-owned dams. For state-owned dams the DEC determines to be in poor condition, the Commissioner should immediately notify the Agency Secretary or Department Commissioner who is responsible for the dam. | DEC reported that they had not always notified state agencies and departments that they had inspected dams and that the inspection reports were available. | *The DSP will reach out to the Agency Secretary and Department Commissioners regarding their preference for receiving periodic inspection reports and other correspondence and develop a consistent process to ensure the proper positions are notified. This issue also highlights the need for the State to consider the development and implementation of a coordinated state dam asset management and dam safety compliance strategy.* |

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|---|---|---|
| 4. Direct DSP staff to maintain a dam inventory that includes complete, up-to-date, and accurate condition information. | DEC does not maintain a complete and accurate repository of dam condition information. Without this, DEC risks being unable to provide correct information to stakeholders or to prioritize which dams need attention. | *The continuing update to the dam inventory database and inspection module will incorporate enhanced recordkeeping and inspection documentation to accomplish this and eliminate the need for manual entry.* |
| 5. Update the dam inventory to ensure that dams have the correct hazard classification with priority given to dams currently classified as significant hazard potential. | The definitions for hazard potential classifications have changed, but DEC has not updated their inventory. It is possible that significant hazard potential dams are high hazard under the new definitions. Therefore, high hazard potential dams may go up to five years before DEC inspects them because they are incorrectly classified. Until the classifications are updated, state and other dam owners may miss out on federal funding for high hazard potential dam remediation. | *The DSP currently has plans to either conduct or contract hazard potential assessments targeting currently classified SIGNIFICANT hazard potential dams. Similar assessment of LOW hazard potential dams will follow. The Periodic and Comprehensive Inspection programs contemplated in the rule will require that hazard potential classifications of all dams are reviewed with some regularity so that the potential occurrence of hazard creep (i.e. the change in hazard potential of a dam due to changes to downstream development) can be identified and assigned hazard potential classifications and understanding of dam risk and potential consequences are understood and up to date.* |
| 6. Record inspection dates in the inventory as they occur and assess whether dams are being inspected timely.<br>7. Assess the staffing levels of the Dam Safety Program and identify what the appropriate staffing levels should be. | The American Society of Civil Engineers recommended an increase in staffing for the Dam Safety Program. DEC has not inspected two dams within the five-year timeframe, nor have they updated the dam inventory with dates of inspection. DEC acknowledged that their Dam Safety Program in understaffed. Until DEC updates hazard classification and records dates of inspection, it is unclear how DEC can determine whether | *The continuing update to the dam inventory database and inspection module will ensure the recording of inspection dates. An annual review of completed inspections will allow for the assessment and assist with planning dam inspection programming for the next year.*<br><br>*The Department acknowledges that the DSP does not have sufficient staffing to meet the charge and objectives of its mission. To address this, the Department plans the following actions:*<br>• *The immediate effort will be to make two limited-service positions within the DSP permanent to retain the two highly qualified engineers currently in those positions.*<br>• *Next, the Department will develop a detailed staffing plan that identifies all DSP responsibilities including those associated with dam regulation and dam ownership and determines appropriate staffing levels and capabilities to adequately cover program mission objectives. For example, it has been identified that additional staffing needs include positions focused on electronic infrastructure and data management, dam compliance enforcement management, dam inspection, and State dam asset management. Once the plan is developed, the Department will work to identify funding and support to bring the plan to fruition.* |

| | | |
|---|---|---|
| | they are inspecting dams withing the appropriate timeframes and what the appropriate staffing level should be. | |
| 8. Develop a process to ensure that requiring dam owners to pay for periodic inspections is done in a fair and consistent manner. | Under the recently adopted rule, if DEC is unable to perform a periodic inspection (which are at no cost to the owner), they are authorized to require the dam owner to hire an engineer, at the owner's expense, to perform the inspection. If some dam owners are required to pay for these inspections and others are not because DEC does not have enough staff to conduct all inspections, this could potentially raise a fairness issue. | *During development of the Administrative Dam Safety Rules, this issue was brought up as a concern by various stakeholders. The DSP will work to develop a policy to ensure that DSP performed Periodic Dam Inspections are offered to dam owners equitably compared to requiring dam owners to hire an engineering consultant to complete Periodic inspections. The following are some guidelines that will be worked into the policy:*<br>• *Dam owners that deny access to their property and/or permission to perform the inspection to the DSP will be required to hire a consulting engineer.*<br>• *Dam owners that are not responsive to DSP communications will be required to hire a consulting engineer.*<br>• *Dam owners that, despite reasonable attempts by the DSP, are unable to agree upon an inspection time and date will be required to hire a consulting engineer.*<br>• *State and Municipal Dam owners (owned/maintained by public entities) will be prioritized to receive inspections by the DSP.*<br>• *Dams that impound wastewater lagoons will be inspected by a consulting engineer as part of typical facility inspections.*<br>• *Dam owners that are required to hire a consulting engineer will be tracked and the DSP will cycle this requirement through the inventory to ensure it is applied to dam owners equitably.* |
| 9. Obtain dam condition information annually from the PUC. | DEC did not request dam condition information from the PUC for the dams that the PUC regulates. | *While the DSP has been receiving information from the PUC at or around the new year, the DSP will make a formal and specific request to the PUC annually.* |

## *APPENDIX B – ADDITIONAL DSP RESPONSES TO THE AUDIT REPORT*

**Audit Comment - Bottom of Page 4, Top of Page 5 reads**: DEC is responsible for maintaining a dam inventory. The inventory shows 1,262 dams in Vermont, though DEC estimates that there may be up to 1,000 unidentified dams in Vermont that are not in the inventory.

***Response:*** *The DEC contends that it is unlikely that many SIGNIFICANT and HIGH Hazard potential dams remain in the State that are not in the inventory, but acknowledges that there are many small, MINIMAL hazard potential dams in the State that have not been inventoried. From a risk prioritization standpoint, identifying and inventorying these small dams, many of which are essentially backyard ponds impounded by a small dam, is a low priority.*

**Audit Comment - The first paragraph on Page 6 reads**: Dams are owned by the federal government, the State, municipalities, or private owners, and are regulated by various entities, depending on the uses of the dam and the owner of the dam.

***Response:*** *One detail that is worth mentioning when it comes to dam ownership is dams for which ownership is unknown. Determining dam ownership can be challenging, time consuming, and require legal assistance. Within the category of unknown, there are sub-categories that should be mentioned:*

- *Unidentified Dam Owner: The owner has not been identified, which may be determined through review of tax maps and communication with Town Clerks, etc., or may require more research.*
- *Orphaned/Abandoned Dam: In these cases, extensive legal and lands research is necessary to attempt to determine the owner of the dam. At times, even these efforts can fail to identify an owner and essentially leave the dam ownerless. This is an industry wide issue plaguing all States, well beyond just Vermont.*

**Audit Comment - The third paragraph on page 6 reads**: As of January 6, 2022, DSP is staffed with two full-time engineers. The program is responsible for operation and management of 14 dams owned by DEC, including three high hazard potential Winooski flood control dams; responsibilities include monitoring and emergency action planning, and capital project planning and execution for these dams. According to a dam safety official, this is DSP's primary responsibility. (See Appendix IV for other DSP responsibilities and obligations.)

See our comment 2 on page 55

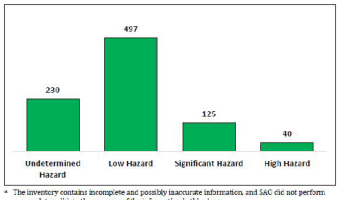
***Response:*** *For clarification, the DSP's responsibilities are split between regulation and ownership, both of which are important to our mission.*

**Audit Comment - The bottom of page 7 and top of page 8**: The dam inventory also identifies the hazard potential classification of dams. Figure 3 below is a breakout of assigned hazard potential for the 892 dams we estimate DEC may be responsible to inspect as part of their regulatory oversight duties.

See our comment 3 on page 55

***Response:*** *This table provides dam hazard potential as recorded in the inventory. It should be noted that, based on inventory review, approximately 50 percent of the 497 LOW hazard potential dams impound less than 500,000 cubic feet and are therefore MINIMAL hazard potential dams by definition. MINIMAL hazard potential dams have no periodic inspection requirement.*

Figure 3: Number of Dams That DEC May Be Required to Inspect, By Hazard Rating*




* The inventory contains incomplete and possibly inaccurate information, and SAO did not perform any work to validate the accuracy of the information in this chart.

**Audit Comment - The bottom of page 8, top of page 9 reads**: If a dam is in imminent danger of failure, DEC may hold a hearing to declare the dam unsafe and after the hearing issue an order directing the owner to make repairs. If the owner does not comply with the order, DEC may petition Superior Court to enforce the order they issued or exercise the right of eminent domain to acquire the rights that may be necessary to protect the public good and human lives. Statute also allows DEC to take immediate action if the dam presents an imminent threat to human life or property and then subsequently hold the DEC hearing to declare the dam unsafe. DEC's take-over of the dam does not relieve the owner of a dam of ownership, or legal liability to the Department or third parties for damages resulting from dam failure.

See our comment 4 on page 55

***Response:*** *It should be noted that the DSP (or an appointed engineer) must perform an investigation of the dam and report the findings at the hearing, not just "hold" a hearing.*

**Audit Comment - The bottom of page 14, top of page 15 reads**: However, according to one dam safety official, until DEC adopts additional rules that dictate timeframes for repairs and outline enforcement procedures, DEC will not provide recommended timeframes nor undertake enforcement actions against dam owners, including state dam owners, for not implementing recommendations. DEC is required to have additional rules adopted by July 2022 that pertain to dam design standards and DEC intends to have the standards regarding repair timeframes and enforcement procedures included within those rules. As of January 26, 2022, DEC had not started formal development of the rules, and therefore it is unlikely that they will meet the July 2022 due date for adoption. According to the DEC Commissioner, DEC intends to request a one-year extension of this deadline from the legislature.

***Response:*** *It should be noted that if a concerning dam safety deficiency was discovered or developed at a dam prior to the completion of the rules, the DSP would act by either working with the dam owner if they are willing, use the Unsafe Dam Proceedings, or pursue enforcement (if applicable). Also, in preparation of requesting a one-year extension on the rule due date, the DSP and DEC management worked with and received buy-in from the original drafters of Act 161 and the Vermont Dam Task Force, a group related to the legislation.*

**Audit Comment - Page 15, second paragraph and table**: DEC followed up on recommendations during subsequent inspections. In most cases, the subsequent inspections found that dam owners had taken little or no action to improve the condition of the dam. As shown in Table 4 below, some of the dams we reviewed have been rated in poor condition for at least 18 years.

***Response:*** *Please note, the DSP historically lacked the authority to take regulatory action until conditions at a dam became potentially unsafe. Several minor updates to the table include:*

- *Curtis Pond Dam – Owner-type – Unknown (orphan/abandoned dam)*
- *East Long Pond Dam – Owner-type – Local government (Hardwick Electric Department)*
- *Caspian Lake Dam – Owner type – Local government (Hardwick Electric Department)*

See our comment 5 on page 55

**Table 4: Minimum Years Known in Poor Condition for Dams Reviewed**

| Dam Name | Location | Owner Type | Hazard Potential | Earliest Known Year Classified in Poor Condition | Year of Last Inspection | Years Known to Be in Poor Condition[a] |
|---|---|---|---|---|---|---|
| Curtis Pond Dam[b] | Calais | Private | Significant | 2001 | 2019 | 18 |
| Institute Pond Dam[b] | Lyndon | Private | High | 2002 | 2020 | 18 |
| Chestnut Hill Reservoir Dam[b,c] | Brattleboro | Local Government | High | 2000 | 2017 | 17 |
| Mirror Lake Dam[b] | Calais | Private | Significant | 2004 | 2015 | 11 |
| East Long Pond Dam | Woodbury | Private | High | 2011 | 2020 | 9 |
| Thurman W. Dix Reservoir Dam | Orange | Local Government | High | 2013 | 2020 | 7 |
| Lake Sadawga West Dike | Whitingham | State | High | 2014 | 2020 | 6 |
| Caspian Lake Dam | Greensboro | Private | Significant | 2011 | 2017 | 6 |
| Kent Pond Dam | Killington | State | Significant | 2012 | 2015 | 3 |
| Gale Meadows Dam | Londonderry | State | Significant | 2014 | 2017 | 3 |

[a] Until each dam is re-inspected, it is unknown if the dam continues to be in poor condition.
[b] These dams may have been in poor condition longer, the earliest inspection report provided by DEC showed the dam in poor condition, but all dams were in service well before 2000.
[c] DEC inspected this dam in 2021 but has not completed the inspection report. DEC intends to upgrade the condition rating to satisfactory, as it was recently repaired.

**Audit Comment: Page 18, third paragraph** reads: DEC also used the percentage of dams in poor condition as one of its performance measures during its fiscal year 2022 budget submission. Without an up-to-date and accurate repository of dam condition information, DEC has no assurance that they are accurately calculating and correctly reporting the percentage of dams in poor condition to those who review the performance measure reports and use them to assess DEC's performance, including DEC management, the Legislature, or citizens of the state.

***Response:*** *The DSP endeavors to provide accurate responses and reports in a timely manner when requested (such as for this Audit) within the limitations of existing tools and staffing availability. We are confident that the new Dams Inventory and other improved tools and processes will be helpful in addressing this concern.*

# Appendix X
# SAO Evaluation of Management's Comments

The following table contains our evaluation of management's comments.

| Comment # | Management's Comments | SAO Evaluation |
|---|---|---|
| 1 | The Audit Report alludes several times that the DSP is understaffed. | SAO makes no assertion as to the appropriate staffing level. We reported what the Commissioner, DSP staff, and the American Society of Civil Engineers asserted. |
| 2 | For clarification, the DSP's responsibilities are split between regulation and ownership, both of which are important to our mission. | SAO deleted the sentence that referred to a dam safety official statement that 14 dams owned by DEC are DSP's primary responsibility. |
| 3 | It should be noted that, based on inventory review, approximately 50 percent of the 497 LOW hazard potential dams impound less than 500,000 cubic feet and are therefore MINIMAL hazard potential dams by definition. | SAO added a footnote to table, "DEC has not updated their inventory to distinguish minimal from low hazard dams. DEC asserts that it is likely approximately 50 percent of these dams are actually minimal hazard per the new definitions, requiring no periodic inspection." |
| 4 | It should be noted that the DSP (or an appointed engineer) must perform an investigation of the dam and report the findings at the hearing, not just "hold" a hearing. | SAO changed verbiage to, "If after investigation by an engineer, a dam is determined to be in imminent danger of failure, DEC may hold a hearing, where the engineer's findings are presented. If DEC determines the dam to be unsafe, then DEC may issue an order…" |
| 5 | Several minor updates to the table. | SAO added a footnote regarding the ownership of the Curtis Pond Dam and changed East Long Pond Dam and Caspian Lake Dam to "local government" with an explanatory footnote. |