

# Maryland Dam Safety Update



**Maryland**  
Department of  
the Environment

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*Dams provide many benefits for Maryland's citizens; however, dams can also be a great threat to the safety and well being of downstream property and people if they are not properly constructed or maintained. Maryland has been assuring the safety of dams since 1934.*

## Dams Under Distress: Design, Construction, Inspection, and Maintenance Matters

Dams are complex systems, and the long-term safe performance of a dam embankment depends on careful design, construction, and maintenance by qualified persons. Poor designs, inadequate construction quality control, and lack of regular inspections and preventative maintenance have resulted in an increasing number of dams in Maryland that are under distress.

This distress may manifest as embankment slumping, sloughing or cracking; sinkholes over deteriorated spillway pipes; excessive seepage or wet areas; clogged trash racks; and even failure of the embankment. The intense amount of rainfall

experienced across Maryland in 2018 added another stress to dams, and led to a number of dam incidents and failures. Over the past 20 years there have been over 40 incidents at dams in Maryland that could have resulted in failure, with seven incidents in 2018 alone. These incidents threatened significant environmental damage if swift actions were not taken to intervene and prevent failure; caused distress to citizens as emergency responders closed roads; and presented significant costs to dam owners.

Recent independently calculated estimates of the cost to perform a controlled breach of a typical

earthen dam (15 to 25 feet in height) range from \$250,000 to over \$500,000. Costs to replace deteriorated spillway conduits often equals or exceeds the cost to remove the dam. Even the costs of emergency pumping can reach \$10,000 per day.

The Dam Safety Division will be rolling out new and updated guidance materials over the upcoming year and beyond to assist and engage dam owners, engineers and construction personnel in ensuring the safety of new and existing dams.

The guidance materials will build upon the successful Dam Owner Workshops,

*(Continued)*

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[mde.maryland.gov/damsafety](http://mde.maryland.gov/damsafety)

Guidance for Completing a Dam Breach Analysis document, and training on the use of HEC-RAS and HEC-1 software.

Please review the Dam Safety Division Webpage for periodic updates including an updated Tree Removal Policy, special considerations for dam breach analysis of very small impoundments and impoundments with very wide crests (e.g., roadways), an updated best practices guidance for construction quality control and reporting, and a template Operation, Maintenance and Inspection Manual. These materials will be supplemented by materials developed by others where appropriate.

Please contact the Dam Safety Division if you are in need of technical assistance or would like to propose a topic for further guidance.



*Above: Distressed Small Pond Embankment – Harford County*

*Below Left: Failing concrete chute spillway – Baltimore County. Below Right: Embankment covered in trees and overtopping – Frederick County*



The Dam Safety Division has openings for two senior engineers in the Baltimore office! We are growing our dedicated team of dam safety professionals to assist with our mission of implementing Maryland’s comprehensive dam safety program. In particular, we are hoping to bolster our strength in the H&H, Structural and Geotechnical fields. The application deadline is rapidly approaching. Please review the position details, minimum qualifications, and a description of the benefits package online at [jobapscloud.com/MD/sup/bulpreview.asp?R1=19&R2=004593&R3=0003](http://jobapscloud.com/MD/sup/bulpreview.asp?R1=19&R2=004593&R3=0003)

Questions regarding this recruitment can be directed to Hal van Aller at (410) 537-3538.



## Emergency Action Plan Reminder

Maryland law requires owners of high and significant hazard dams to review your Emergency Action Plan (EAP) annually and perform updates as needed.

Reviews should, at a minimum, consist of checking the contact information for all persons, reviewing the document for missing or outdated information, and checking your danger reach for new development. This is also a good time to check on the condition of the dam and emergency staff gages and to plan for needed maintenance or repairs. Once the review is complete, provide the Dam Safety Division a draft for review and acceptance, then distribute to the remainder of the record holders.

As of April 16, 2019, only 73 of 233 High and Significant hazard dam owners have participated in an EAP tabletop exercise. Exercises are required by law at least once every five (5) years. The Dam Safety Division can assist with facilitating an exercise at no cost. For more information on exercise requirements, please contact John Roche at (410) 537-3552.



### REGISTRATION OPEN NOW!

<https://www.123signup.com/event?id=rtztq>

#### FUNDAMENTALS OF SUCCESS: PAST, PRESENT, AND FUTURE

Better Design → Better Construction → Better Maintenance → Healthier Streams and Bay



**TUESDAY, JUNE 4, 2019**

8:30 a.m - 4:30 p.m.

MARITIME INSTITUTE, LINTHICUM HEIGHTS

#### Fundamentals of Success: Past, Present, and Future

What comes to mind when you think about stormwater management? Is it successful WIP implementation, building better or more resilient BMPs, co-benefits, implementation strategies, or incentives? Or are you thinking about emerging issues and integrating sediment, stormwater, and dam safety for better local and Bay water quality? Join us for a day of comprehensive training embracing stormwater management through *better design → better construction → better maintenance → healthier streams and Bay*.

Training for local government staff from Phase I, Phase II, and non-MS4 jurisdictions.

## Dam Safety Training Opportunities

ASDSO Webinar: Relearning How to Look at Piezometric Data for Seepage Evaluation  
[May 14 damsafety.org](#)

FEMA National Dam Safety Program: Rapid Dam Break, Flood and Consequence Assessment  
[May 15-16 Washington, D.C.](#)

ASDSO Seminar: Seepage Through Earthen Dams  
[May 21-23 Austin, TX](#)

Maryland Emergency Management Association 2019 Symposium  
[May 28-31 Ocean City, MD](#)

ASDSO Seminar: Basic Soil Mechanics Related to Earth Dams  
[June 4-6 Lexington, KY](#)

MDE Stormwater Conference – Back to the Basics & Beyond  
[June 4 Linthicum Heights, MD](#)

ASDSO Webinar: Waterstops  
[June 11 damsafety.org](#)

ASDSO Seminar: HEC-HMS for Dam Safety  
[June 18-20 Indianapolis, IN](#)

ASCE Seminar: Dam Breach Analysis Using HEC-RAS  
[July 24-26 Pittsburgh, PA](#)

ASDSO Dam Safety 2019  
[Sept. 8-12 Orlando, FL](#)

Association of Engineering Geologists Annual Meeting  
[Sept. 17-22 Asheville, NC](#)

## Record Breaking Rains Define 2018

The Washington Post recently reported that Catonsville broke the State record for annual precipitation in 2018, with a recorded 84.56 inches. This mark bests the previous State record, set in 1903 of 78.32 inches. Several other locations reportedly topped 80 inches of precipitation in 2018, including Thurmont and Mechanicsville.

This year of extreme rain events produced flooding in Ellicott City, and in Carroll, Calvert, Frederick, Washington and Wicomico Counties, among others. Few areas within the State were spared. The rain led to numerous high water or high flow events at dams, some resulting in near failures.

It is clear that the frequency and intensity of extreme weather events is increasing in Maryland and around the Country. These events lead to significant costs, threaten property, health and safety. Dams and stormwater infrastructure play an important role in managing the risks and lessening the impacts of extreme weather events. Ensuring that this critical infrastructure is resilient in the face of new or increased threats is essential. From an owner's perspective, this can be as simple as frequent inspections, developing standard maintenance schedules and keeping a "rainy day" fund available for repairs, retrofits or upgrades. Dam and stormwater designers should strive for flexible and adaptable designs that can meet current and future needs and protect vulnerable locations or resources. The Dam Safety Division continues to explore ways to assist in these efforts through technical assistance, permit development, legislation and other initiatives.

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## NRCS Updates TR-60

The Natural Resources Conservation Service (NRCS) recently updated Technical Release 210-60 "Earth Dams and Reservoirs". This update of an important guidance document for dam design has significant changes in many key areas of dam design including hydrology, geologic and geotechnical considerations and spillways. All designers are encouraged to review the updated document, which is available on the NRCS website and can be easily found in a search engine using the search term "NRCS 210-60".

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## Outlet Works Rehabilitation Guide Online

The Small Embankment Dam Outlet Works Rehabilitation Guide uses short stories and photos to illustrate considerations that dam owners, engineers and regulators must take into account when outlet rehabilitation is on the horizon. This online guide highlights past experiences and lessons learned from others.

The guide was funded with National Dam Safety Program Assistance Grants funds administered through FEMA. The states of Montana, Oregon, North Dakota, Wyoming, Wisconsin and Maryland provided materials and review. Check it out at [damoutletworks.org](http://damoutletworks.org)

## Lessons Learned from Cascade Lake Dam Incident and Controlled Breach

The Cascade Lake dam, a 20-foot high earth and masonry dam with a nearly six (6) acre surface area at normal pool was originally constructed in association with a sawmill, and is believed to date to the mid- to late-1800s. While the dam and mill experienced many changes over the years and eventually became a regional recreational asset, everything changed after an intense five (5) to six (6) inch rainfall event overnight on July 25, 2018 resulted in overtopping and partial failure of the dam.

The dam owner, recognizing the severity of the situation contacted the Dam Safety Division early on the 26<sup>th</sup>, and a team was dispatched to Carroll County. Immediately upon arrival, the Dam Safety Division determined that the dam was in imminent danger of failing and directed the owner to immediately activate the Emergency Action Plan (Level 3), lower the water levels, and hire an engineer to coordinate a controlled breach of the dam. This set in motion a number of emergency actions and required close coordination, communication and relationship building among the owner, the owner's engineer CSLI, the Dam Safety Division, Carroll County Department of Public Safety (DPS), Carroll County Sheriff's Office, Carroll County Department of Public Works, Maryland State Highway Administration, Maryland State Police, and a host of others to ensure the safety of persons within the danger reach and to remove the dam in a safe and controlled manner.



During the stressful 14 days that followed the lake was pumped dry, only to be refilled and nearly overtopped by a second storm before the removal was completed without loss of life or additional property damage. The work could not have been accomplished without extraordinary efforts of Dam Safety Division staff, Valerie Hawkins of Carroll County DPS, Brian Wagner, P.E of CSLI, Jacob Kibler of White Pine Construction Corp., and many others. For nearly all persons involved, this would be their first dam failure incident. Throughout the coordinated response, the importance of understanding individual roles, responsibilities and capabilities within an incident command framework



### Spring/Summer Maintenance

Now is a good time to perform regular maintenance and repairs at your dam. In particular, the Dam Safety Division recommends that:

- Grass is mowed and woody vegetation is removed before significant new growth appears
- Embankments are checked for unusual conditions such as seepage, slumps, unusually lush vegetation, erosion or animal burrows
- Concrete structures are checked for cracks, leaks or movement
- Trash racks are kept clear of debris that may have accumulated during high spring flows
- Valves are exercised and lubricated as needed to ensure proper working order
- Emergency Action Plans are updated

Rigorous maintenance programs are often necessary to ensure that conditions at a dam do not deteriorate over time. If you find a condition that needs attention, the Dam Safety Division is available to provide advice on next-steps. Contact us with any questions by calling (410) 537-3538

was highlighted. Following the incident an after action report was established that identified many strengths, and also led to many opportunities for organizational improvements within Carroll County and the Dam Safety Division. This included an EAP tabletop exercise in April 2019 and updates to standard policies and procedures for incident response.



## Our Aging Infrastructure

*“My dam has been here for (insert years)!” “It survived (name a storm)!”*

It is a human tendency to justify action, or in some cases inaction, based on our observations. Why would a well performing dam suddenly develop issues? Unfortunately this attitude can result in disaster, such as experienced at Oroville Dam in 2017 or at the Notre Dame Cathedral in Paris just last month. We must constantly remind ourselves that past performance is not an indicator of future outcomes.

The dam pictured below is located in Montgomery County and had performed successfully for nearly 30 years until a chance inspection spotted a large slope failure. With the average age of dams in Maryland over 60 years, it is important to inspect your dams frequently. Try a helpful reminder like making an inspection every time you change your vehicle’s oil.



## “Killer in Our River”: Understanding Safety Around Dams

Each year, dozens of lives are lost on America’s waterways at structures called low-head or “run of-the-river” dams. Among the victims are boaters, kayakers, swimmers, anglers and emergency responders.

Low-head dams are characterized by their low height — usually with a one foot to 15 foot drop off — which allows water to flow over the top of the dam. Below the surface, the water falling over the dam creates highly aerated, circulating currents that trap people and objects underwater against the face of the dam. These forces are a practically inescapable trap for even the strongest, life-jacket-clad swimmer or boats and kayaks.

It is important to be aware of the location of these structures, so you are ready to exit the water if you are approaching one. As you go out, make sure you follow these tips:

- Study a map beforehand to locate potential dams and hazard locations or ask a local for more information about dam locations.
- Always be alert for potentially dangerous situations.
- Always portage around the structure or turn around well before reaching the dam when kayaking, canoeing or boating.
- Obey all posted signage and barriers in the area.
- Let someone know when and where you are heading out and when to expect your return.
- Never enter the water to try to help someone. Instead, call 911 and use a remote assistive device, such as a rope or throw bag, to try to pull them back to safety.

## National Dam Safety Awareness Day: Dam Safety is a Shared Responsibility

On May 31st, Maryland's Dam Safety Division recognizes National Dam Safety Awareness Day. We encourage all dam owners, operators and the engineering community to remember the lessons learned from past dam failures, continue to push for strong dam safety programs, and to keep investing in Maryland's critical infrastructure. Together we can work to keep Maryland's dams safe, operational and resilient.

As we observe the 130th anniversary of the failure of the South Fork Dam near Johnstown, Pennsylvania, a tragedy that claimed more than 2,200 lives, the Dam Safety Division encourages you to know the benefits of dams, your risk, and your role; and, act. Dam safety is a shared responsibility.

*"I heard a roar like thunder, one crash after another in quick succession, and on looking out of the window I beheld the most horrible sight I ever saw, and I hope I never may be called upon to witness such a scene again.*

*The wall of water which came rushing toward me carrying everything before it seemed to be thirty feet in height, and in an instant, crash! and our building was raised aloft and whirled away by mad, rushing, bounding and boiling waters of the Little Conemaugh. Eight men were on this roof, and all around us were screaming hundreds of men, women and children. Many of them were swept into eternity; some were praying, some weeping and wailing and some cursing."*

*- Account of Johnstown Flood Survivor Mr. W.B. Tice*



**Bloede Dam Removal**



**Martin Dam Removal**