

4.3.14 Dam Failure

Dams are manmade structures designed to serve a variety of uses, including; water supply, power generation, creation of recreational areas, and flood protection. They are made of concrete, rock, or earth. Failure of these structures may occur due to overtopping (i.e., the level of the water behind the dam exceeds the dam’s height) and erosion of the base, inadequate design and/or maintenance, internal erosion, saturation (for earthen dams), etc. The Pennsylvania Department of Environmental Protection (PADEP) holds responsibility for dam safety. Hazard Potential Category 1 dams are those “where its failure could result in significant loss of life, excessive economic losses, and significant public inconvenience”. Hazard Potential Category 2 dams are those “where its failure could result in the loss of a few lives, appreciable property damage, and short-duration public inconvenience” (PADEP, 2009). Owners of dams classified as Hazard Categories 1 or 2 (i.e., “high-hazard” dams) are required to create an Emergency Action Plan (EAP) that describes the dam, the inundation area if the dam was to catastrophically fail, and procedures for responding to the dam failure (e.g., notification of the vulnerable population).

4.3.14.1 Location and Extent

There are 101 dams in the Lehigh Valley, shown in Figure 4.3.14-1. The vast majority of these dams pose little risk; however, there are eight Hazard Category 1 “high-hazard” dams (all of them earthen) that require EAPs. See Table 4.3.14-1 for classification definitions. Refer to Table 4.3.14-2 for a complete list of dams in the Lehigh Valley.

Table 4.3.14-1. Dam Classification Definition

Size Category		
Category	Impoundment Storage (Acre feet)	Dam Height (Feet)
A	Equal to or greater than 50,000	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1000	Equal to or less than 40
Hazard Potential Category		
Category	Population at Risk	Economic Loss
1	Substantial (Numerous homes or small businesses or a large business or school).	Excessive such as extensive residential, commercial, or agricultural damage, or substantial public inconvenience.

Hazard Potential Category		
Category	Population at Risk	Economic Loss
2	Few (A small number of homes or small businesses.)	Appreciable such as limited residential, commercial, or agricultural damage, or moderate public inconvenience.
3	None expected (no permanent structures for human habitation or employment.)	Significant damage to private or public property and short duration public inconvenience such as damage to storage facilities or loss of critical stream crossings.
4	None expected (no permanent structures for human habitation or employment.)	Minimal damage to private or public property and no significant public inconvenience.

Source: 025 Pa. Code § 105.91. <http://www.pacode.com/secure/data/025/chapter105/s105.91.html>

The high hazard dams are as follows:

- **Hosensack No. 4**: This dam is permitted by a private resident and is located on the Indian Creek in Lower Milford Township, Lehigh County. Classification: C-1.
- **Leaser Lake**: This dam is permitted by the PA Fish & Boat Commission and is located on the Jacksonville Branch of the Ontelaunee Creek in Lynn Township, Lehigh County. Classification: B-1.
- **Cedar Crest Boulevard**: This dam is permitted by South Whitehall Township and is located on a tributary of the Jordan Creek in South Whitehall Township, Lehigh County. Classification: C-1.
- **Erickson Fish Pond**: This dam is permitted by a private resident and is located on a tributary of Tumble Brook in Upper Saucon Township, Lehigh County. Classification: C-1.
- **Rolling Greens**: This dam is permitted by Bethlehem Township and is located on a tributary of Nancy Run in Bethlehem Township, Northampton County. Classification: C-1.
- **Martin's Creek SES Ash Basin No. 4**: This dam is permitted by PPL Martins Creek, LLC and is located on a tributary of the Oughoughton Creek in Lower Mount Bethel Township, Northampton County. Classification: B-1.
- **West Side Detention**: This dam is permitted by the Borough of Roseto and is located on a tributary of Martins Creek in Roseto Borough, Northampton County. Classification: C-1.
- **Minsi Lake**: This dam is permitted by the PA Fish & Boat Commission and is located on the East Branch Martins Creek in Upper Mount Bethel Township, Northampton County. Classification: B-1.

Table 4.3.14-2. Dams in Lehigh Valley

Dam Name	County	Municipality	Stream	Type	Class	Permittee
Leaser Lake	Lehigh	Lynn Township	Jacksonville Br Ontelaunee Creek	Earth	B-1	PA Fish & Boat Commission
Hosensack No 4	Lehigh	Lower Milford Township	Indian Creek	Earth; Stone; Masonry	C-1	Frank Lunney
Errickson Fish Pond	Lehigh	Upper Saucon Township	Tr Tumble Brook	Earth	C-1	Paul A Bouis
Cedar Crest Boulevard	Lehigh	South Whitehall Township	Tr Jordan Creek	Earth	C-1	South Whitehall Township
Macarthur Towne Centre	Lehigh	Whitehall Township	Tr Lehigh River	Earth	C-3	Mark Development Company
Fogelsville Pond	Lehigh	Upper Macungie Township	Hassen Creek	Masonry	C-3	Upper Macungie Township
Hensingersville	Lehigh	Macungie Borough	East Branch Swope Creek	Earth; Concrete	C-4	Alburtis Borough Authority
Locust Valley Country Club	Lehigh	Upper Saucon Township	Tr Saucon Creek	Unpopulated	C-4	Locust Valley Country Club
Lake Muhlenberg	Lehigh	Allentown City	Cedar Creek	Unpopulated	C-4	City of Allentown
Schmidt	Lehigh	North Whitehall Township	Unnamed	Concrete; Earth	C-4	Paul Schmidt
Paul Krauss	Lehigh	Lynn Township	Tr Switzer Creek	Unpopulated	C-4	Paul Krauss
Detention Pond	Lehigh	Hanover Township	Tr Lehigh River	Earth	C-4	Ms. Deanna L. Brandt
Green Hills Section 5	Lehigh	Upper Macungie Township	Tr Iron Run	Earth	C-4	Fred J. Jandl
West Detention Basin	Lehigh	Upper Macungie Township	Tr Iron Run	Earth	C-4	Jandl Land Company
Coplay Creek	Lehigh	Whitehall Township	Coplay Creek	Concrete; Run of River	C-4	Giant Portland Cement Company
Stabler Basin A	Lehigh	Upper Saucon Township	Tr Saucon Creek	Earth	C-4	Valley Green At Stabler Center Homeowners Associa
Ernst	Lehigh	Washington Township	Unnamed	Earth	C-4	Thomas Ernst
Stabler Basin 1	Lehigh	Upper Saucon Township	Tr Saucon Creek	Earth	C-4	Valley Green At Stabler Center Homeowners Associa
Trexler Park Pond	Lehigh	Allentown City	Little Cedar Creek	Concrete; Earth	C-4	City of Allentown
Furnace Street	Lehigh	Emmaus Borough	Tr Leibert Creek	Earth	C-4	Borough of Emmaus
School Creek	Lehigh	Lynn Township	School Creek	Unpopulated	C-4	James & Pat Hoffman
Giacobbe	Lehigh	Washington Township	Tr Mill Creek	Unpopulated	C-4	F. J. Giacobbe

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Dam Name	County	Municipality	Stream	Type	Class	Permittee
Pfeiffer Pond	Lehigh	Heidelberg Township	Tr Jordan Creek	Earth	C-4	Karen Pfeiffer
Essroc	Lehigh	Whitehall Township	Coplay Creek		C-4	Essroc Italcementi Group
Spring Mill	Lehigh	Whitehall Township	Spring Creek	Earth; Masonry; Rockfill	C-4	Northampton Borough Municipal Water Authority
Builders Square	Lehigh	South Whitehall Township	Tr Cedar Creek	Earth	C-4	Powerline Associates, L.P.
Mill - Dorney Park	Lehigh	South Whitehall Township	Cedar Creek	Gravity	C-4	Dorney Park/Wildwater Kingdom
Hamilton Street	Lehigh	Allentown City	Lehigh River	Concrete; Gravity	C-4	City of Allentown
Trout Creek Reservoir	Lehigh	Heidelberg Township	Trout Creek	Stone; Masonry; Earth	C-4	Heidelberg Game Protective Association
Mill	Lehigh	Allentown City	Little Lehigh Creek	Concrete	C-4	City of Allentown
Mill	Lehigh	Lower Macungie Township	Little Lehigh Creek	Concrete	C-4	Cordesw & Kimberly K. Snyder Iii
Mill	Lehigh	Lower Macungie Township	Little Lehigh Creek	Concrete	C-4	Mark P. & Ellyn G. Elstein
Mill	Lehigh	Lower Macungie Township	Little Lehigh Creek	Concrete	C-4	John Gallagher And Deana Zosky
Ice	Lehigh	Upper Milford Township	Leibert Creek	Concrete; Gravity	C-4	David & Barbara Bollinger
Jordan Park	Lehigh	Allentown City	Jordan Creek	Stone; Masonry; Run of River	C-4	City of Allentown
Little Lehigh	Lehigh	Allentown City	Little Lehigh Creek	Concrete	C-4	City of Allentown
Mill	Lehigh	Weisenberg Township	Schaefer Run	Earth	C-4	Sue Ubben
Big Bed Slate	Lehigh	Washington Township	Trout Creek	Concrete; Gravity	C-4	Penn Big Bed Slate Co.
Kemmerling	Lehigh	Lynn Township	Ontelaunee Creek	Concrete; Run of River	C-4	Nevin & Helen Kemmerling
Crowley	Lehigh	Weisenberg Township	Lyon Creek	Concrete; Gravity	C-4	Patrick Crowley, Jr.
Kerns	Lehigh	North Whitehall Township	Jordan Creek	Concrete	C-4	Fred Jaendl
Northampton	Lehigh	Whitehall Township	Lehigh River	Concrete	C-4	Whitehall Cement Manufacturing Company
Mill	Lehigh	North Whitehall Township	Coplay Creek	Concrete	C-4	Terry Muth
Wehrs	Lehigh	South Whitehall Township	Jordan Creek	Concrete	C-4	South Whitehall Township
Minsi Lake	Northampton	Upper Mt Bethel Township	East Branch Martins Creek	Earth	B-1	PA Fish & Boat Commission



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Dam Name	County	Municipality	Stream	Type	Class	Permittee
Martins Creek Ses Ash Basin No 4	Northampton	Lower Mount Bethel Township	Tr Oughoughton Creek	Earth	B-1	Ppl Martins Creek, Llc
Chain	Northampton	Palmer Township	Lehigh River	Stone; Masonry	B-4	Dep
Rolling Greens (Bethlehem Twp Det)	Northampton	Bethlehem Township	Tr Nancy Run	Earth	C-1	Bethlehem Township
West Side Detention	Northampton	Roseto Borough	Tr Martins Creek	Earth	C-1	Borough of Roseto
Palmer Park Mall	Northampton	Palmer Township	Tr Bushkill Creek	Earth	C-3	Palmer Park Mall Venture
Quail Hollow Detention Basin	Northampton	Bethlehem Township	Tr Lehigh River	Earth	C-3	4-L Housing Associates
Echo Lake	Northampton	Upper Mt Bethel Township	Tr Jacoby Creek	Earth; Rockfill	C-3	Echo Lake Development Co Inc
Kings Crossing	Northampton	Bethlehem Township	Tr Lehigh River	Earth	C-3	Bethlehem Township
Upper	Northampton	Easton City	Bushkill Creek	Concrete	C-4	Specialty Minerals, Inc
Emery	Northampton	Portland Borough	Jacoby Creek	Masonry	C-4	M.C. Emery
Wagner Farms Detention Basin	Northampton	Bethlehem Township	Tr Lehigh River	Earth	C-4	Wagner Enterprises, Ltd.
Water Power	Northampton	Palmer Township	Bushkill Creek	Concrete	C-4	Upper Mill LP
Hemlock Brook	Northampton	Upper Mt Bethel Township	Hemlock Brook	Earth	C-4	Garafalo Realty
Lappawinzo	Northampton	Allen Township	Hokendauqua Creek	Stone; Masonry; Run of River	C-4	Lappawinzo Rod And Gun Club
Grays Pond	Northampton	Hellertown Borough	Reservoir Creek	Earth	C-4	Hellertown Borough Authority
Inter-Club	Northampton	Freemansburg Borough	Nancy Run	Unpopulated	C-4	Inter-Club Canal Commission, Inc.
Jacoby Creek	Northampton	Upper Mt Bethel Township	Jacoby Creek	Earth	C-4	Upper Mount Bethel Development Group, Inc.
Ratcliffe	Northampton	Washington Township	Tr Oughoughton Creek	Earth	C-4	Ms. Sheri Lobb
Stephen Demshock	Northampton	Lower Nazareth Township	Tr East Monocacy Creek	Earth	C-4	Stephen Demshock
Penns Farm Detention Basin	Northampton	Bethlehem Township	Tr Nancy Run	Earth	C-4	PennS Farms Condominium Association
Cole	Northampton	Upper Mt Bethel Township	Tr Allegheny Creek	Earth	C-4	Charles Cole
Pond No 2	Northampton	Hanover Township	Tr Monocacy Creek	Earth	C-4	Pointe Associates
Lake Je-Ba-Ru	Northampton	Upper Mt Bethel Township	Jacoby Creek	Earth	C-4	Stabler Development Co.



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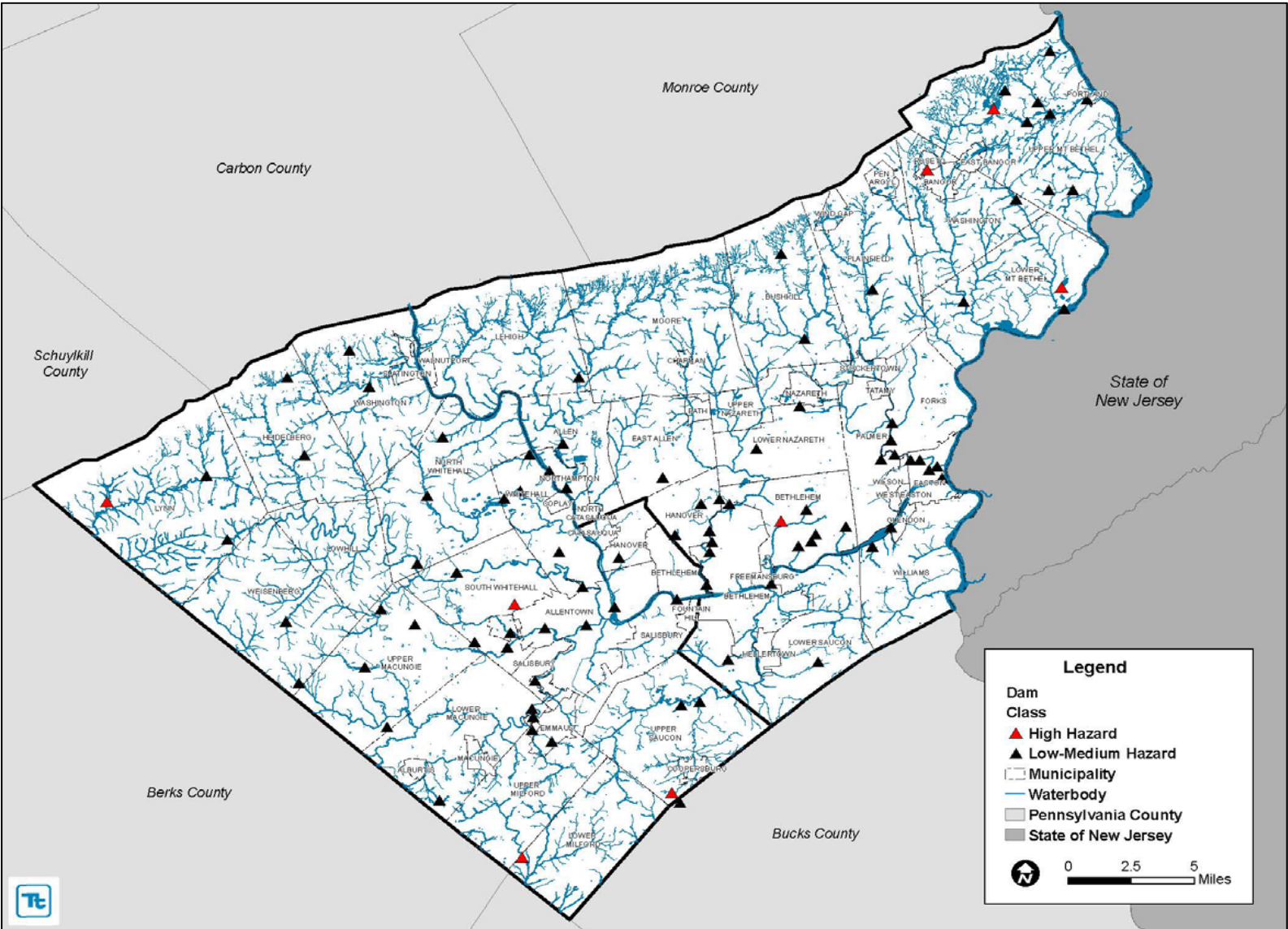
Dam Name	County	Municipality	Stream	Type	Class	Permittee
Rouse And Associates Sdb #1	Northampton	Hanover Township	Tr Monocacy Creek	Earth	C-4	Rouse & Associates
Rouse Detention Basin No. 2	Northampton	Hanover Township	Tr Monocacy Creek	Earth	C-4	Liberty Property Limited Partnership
Lehigh Valley Industrial Park #3	Northampton	Hanover Township	Tr Monocacy Creek	Earth	C-4	Micro Speciality System
Lehigh Valley Industrial Park #4	Northampton	Hanover Township	Tr Monocacy Creek	Earth	C-4	Lehigh Valley Industrial Park
Walnut Hills Detention	Northampton	Bethlehem Township	Tr Lehigh River	Earth	C-4	Sam Calatoni
Delaware Trace Detention Basin	Northampton	East Allen Township	Tr Lehigh River	Earth	C-4	Ronald And Marilyn Bauer
Laneco Plaza Detention Basin	Northampton	Lower Nazareth Township	Tr Shoeneck Creek	Unpopulated	C-4	Laneco Pad Lp
Chrin Brothers	Northampton	Williams Township	Tumble Creek	Earth	C-4	Chrin Brothers, Inc.
Lehigh Canal Lock 41	Northampton	Bethlehem City	Lehigh River Canal	Masonry; Timber Crib	C-4	City of Bethlehem
Schiavone	Northampton	Plainfield Township	Tr Bushkill Creek	Rockfill	C-4	Allen Flory
Water Supply	Northampton	Northampton Borough	Hokendauqua Creek	Gravity	C-4	Horwith Leasing Co. Inc.
Walters Mill Pond	Northampton	Palmer Township	Bushkill Creek	Concrete	C-4	Palmer Township
Upper	Northampton	Easton City	Bushkill Creek	Concrete	C-4	Excalibur Realty Company
Martins Creek Ash Basin No. 1	Northampton	Lower Mount Bethel Township	Oughoughton Creek	Other; Earth	C-4	Ppl Martins Creek, Llc
Dewalt	Northampton	Easton City	Bushkill Creek	Unpopulated	C-4	Scott Dewalt
Lower	Northampton	Easton City	Bushkill Creek	Concrete	C-4	Easton Municipal Authority
Lafayette College	Northampton	Easton City	Bushkill Creek	Unpopulated	C-4	Lafayette College
Mill	Northampton	Lower Saucon Township	Saucon Creek	Unpopulated	C-4	G.A. Keck
Mill	Northampton	Hanover Township	Monocacy Creek	Concrete	C-4	Lee & Sally Snyder
Mill	Northampton	Hanover Township	Monocacy Creek	Concrete	C-4	St. Francis Retreat
Cohen	Northampton	Lower Saucon Township	Black Creek	Earth	C-4	Martin & Susan Cohen
Mill	Northampton	Hanover Township	Monocacy Creek	Concrete	C-4	Leon A.C. & Beverly Isaac
Easton	Northampton	Easton City	Lehigh River	Stone; Masonry	C-4	Dcnr
Field	Northampton	Palmer Township	Bushkill Creek	Concrete	C-4	Richard L. Field
Mill	Northampton	Bushkill Township	Bushkill Creek	Concrete	C-4	Mary Ann Orsinger
Mill	Northampton	Lower Mount Bethel Township	Martins Creek	Concrete; Masonry	C-4	Dina Plebani



Dam Name	County	Municipality	Stream	Type	Class	Permittee
Ice-Fish	Northampton	Upper Mt Bethel Township	Martins Creek	Earth	C-4	Barbara Paul
Illicks Mill	Northampton	Hanover Township	Monocacy Creek	Earth; Stone; Masonry	C-4	City of Bethlehem
Monocacy Creek	Northampton	Bethlehem City	Monocacy Creek	Stone; Masonry	C-4	City of Bethlehem
Minch Spring Run	Northampton	Upper Mt Bethel Township	Minch Spring Run	Stone; Masonry	C-4	Portland Borough Authority
Beersville Grove	Northampton	Moore Township	Tr Hokendauqua Creek	Concrete; Gravity	C-4	Beersville Grove, Inc.
Peppell	Northampton	Bushkill Township	Tr Bushkill Creek	Earth	C-4	James & Virginia Peppell
Mill	Northampton	Hanover Township	Monocacy Creek	Concrete	C-4	Eastlake Montessori Education Center, Inc.

Source: PA DEP Dam Safety

Figure 4.3.14-1. Dams in the Lehigh Valley



Source: PA DEP Dam Safety



4.3.14.2 Range of Magnitude

The impact of dam failures varies by the amount of water being held by the dam. Failures of small dams, such as those created to form a pond or other small water body, may result in a flood of only a few hundred gallons of water, and may not impact any structures or other property. Failures of large dams, such as those created to form large water supply reservoirs or recreational lakes, may result in millions of gallons of water destroying hundreds of structures and potentially killing large numbers of people.

4.3.14.3 Past Occurrence

There have been no recorded dam failures in the Lehigh Valley.

4.3.14.4 Future Occurrence

The likelihood of a dam failure in the Lehigh Valley is extremely difficult to predict. However, the risk of such an event increases for each dam as the dam's age increases and/or frequency of maintenance decreases. Based upon the Risk Factor Methodology Probability Criteria and providing that regular maintenance and inspections of the dams in the Lehigh Valley are performed, dam failures are considered *unlikely* (see Section 4.4 for definition).

4.3.14.5 Vulnerability Assessment

The dam failure hazard is of significance to the Lehigh Valley because there are 101 dams across Lehigh and Northampton Counties, 8 of which are classified as high hazard by the PADEP. The direct and indirect losses associated with dam failures include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources.

All population in a dam failure inundation zone is considered exposed and vulnerable. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also highly vulnerable because they are more likely to seek or need medical attention which may not be available due to isolation during a flood event and they may have more difficulty evacuating.

There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard.

All buildings and infrastructure located in the dam failure inundation zone are considered exposed and vulnerable. Property located closest to the dam inundation zone has the greatest potential to experience the largest, most destructive surge of water. All transportation infrastructure in the dam failure inundation zone is vulnerable to damage. Damage to this infrastructure could cut off evacuation routes, limit emergency access, and create isolation issues. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation zones.