

# Ohio Dam Safety Program & Emergency Action Plans (EAPs)

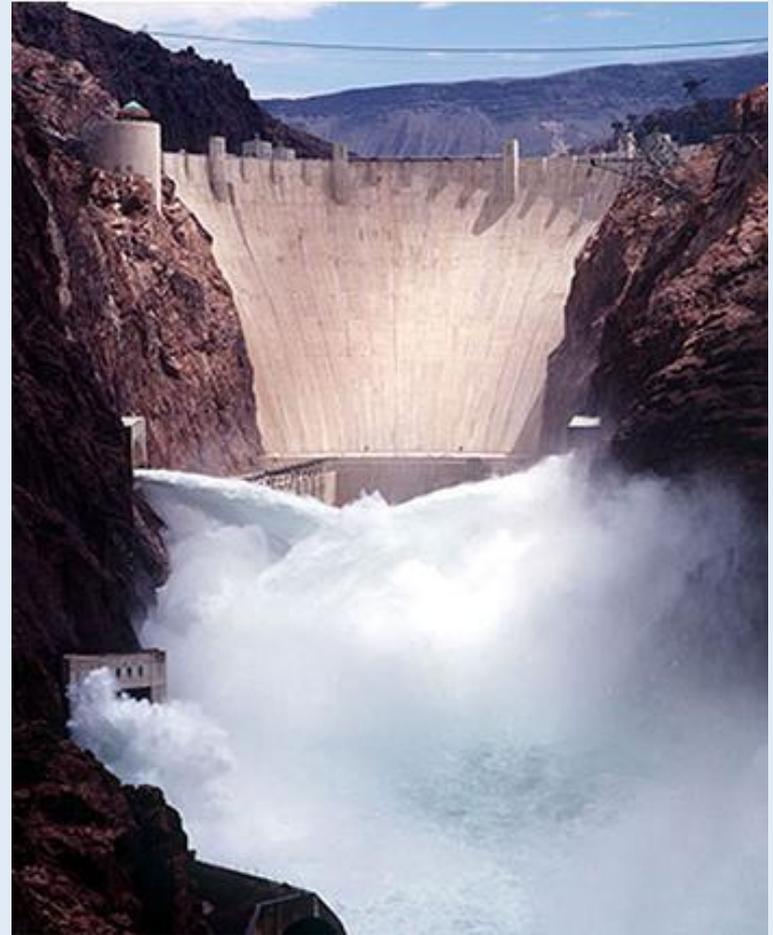
Ohio Emergency Management  
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Division of Water Resources  
Dam Safety Program



# What is a dam?

- A "Dam" is:
  - Artificial barrier together with any appurtenant works,
  - Does or may impound water (or other liquefied material).
  - Upground reservoirs and lagoons are considered to be dams.
  - Fill or **structure** intended **solely for highway or railroad** -not considered a dam.
  - OAC 1501:21-3-01 (f)



<https://www.usbr.gov/lc/hooverdam/>

# What Kind of Dams in Ohio?

- Concrete Gravity Dams
- Earthen with Concrete Spillway
- Upground Reservoirs
- Low-head Dam/  
Channel Dams
- Earthen Dams
- Industrial Waste



# Lakeview Cemetery Flood Control Dam – Concrete Gravity





Miami Conservancy District – Earthen Dam with Concrete Spillway - Flood Control



John R. Douth Upground Reservoir  
Pumped Storage - Water Supply



Low-Head Dam, Channel Dam, Run-of-the-River Dam

# Industrial Waste Pond Dam



# Earthen Dam – Recreation, Flood Control, Sediment Control



# **Ohio Dam Safety Program's Core Purpose:**

**To ensure human life, health &  
property are protected from dam  
failures**

# Ohio Dam Safety Responsibilities

Per Ohio's statutes – dam safety is a shared responsibility between the dam owner & Division of Water Resources (DWR) – Dam Safety Program (DSP).

# Owner Responsibilities

- Per ORC 1521.062 (E), Dam Owner **shall**:
  - Monitor, maintain, & operate the dam safely.

# Maintenance & Monitoring Are Critical



You Need To Be Able To See All Parts Of The Dam  
To Inspect & Monitor Properly



# Owner Responsibilities

- Per ORC 1521.062 (E), Dam Owner **shall**:
  - Monitor, maintain, & operate the dam safely.
  - Notify DSP & other authorities of incidents threatening the safety of the dam.
  - Take action to safeguard life, health, & property.
  - Notify Chief of DWR in writing of a change in ownership.

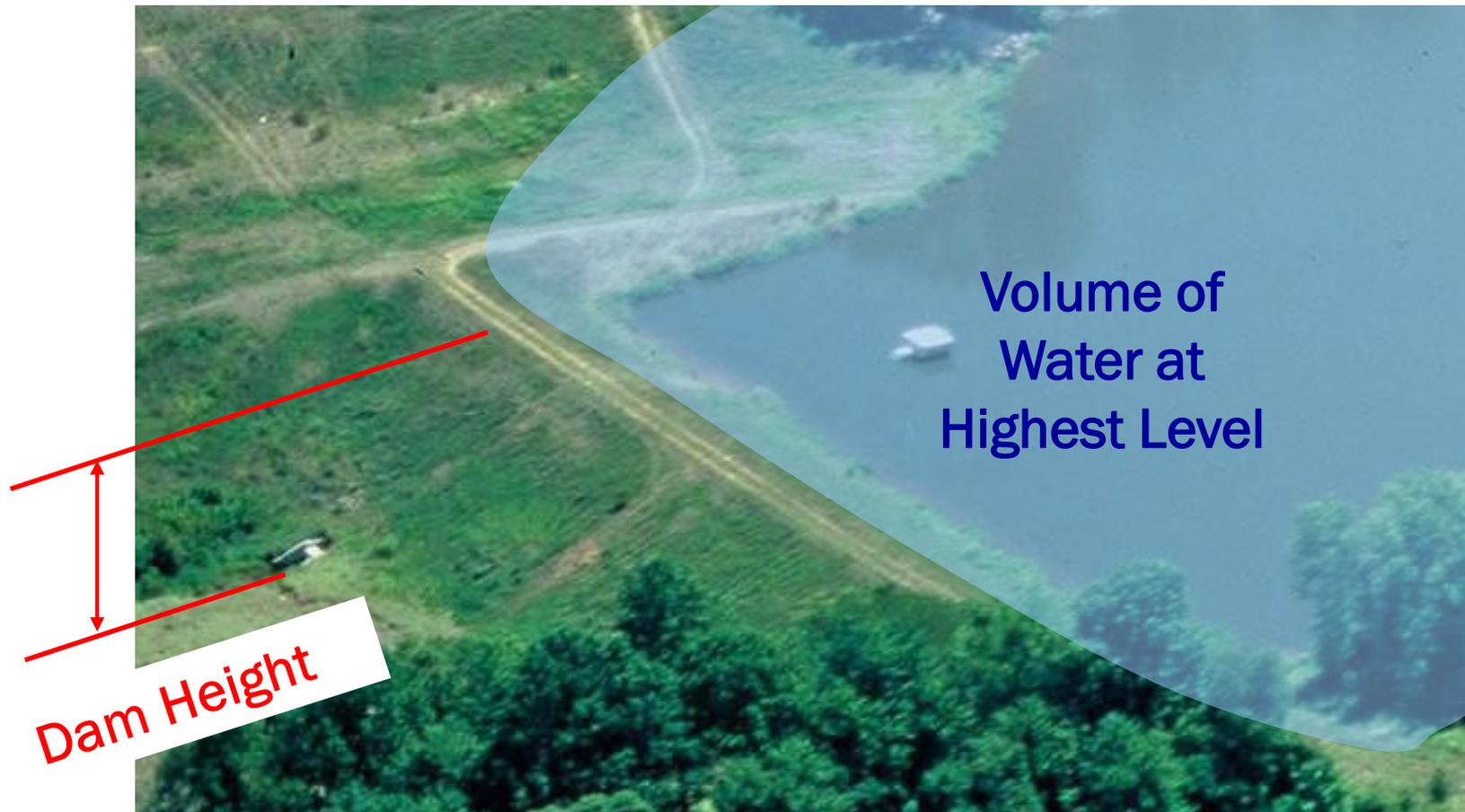
# DWR Responsibilities

- Periodic safety inspections
  - 5-year periodic inspections
  - Evaluate condition, downstream hazard, & owner's safety program
- Repairs and modifications
  - Review and oversight of repairs and modifications
- Construction permits
  - Issue permits for new dams and enlargements
- Enforcement
  - Authority to compel corrective action through the courts
- Emergency response
  - Authority to require and to take immediate action

# Dam Classification

- Dam Safety Program Classifies Dams based on:
  - Height
  - Storage
  - Downstream Hazard
- Not all dams in Ohio are regulated by the Dam Safety Program

# Dams Exempt from ODNR Regulation Based on Size



Height	Volume	Reference
Less than 6 ft.	Unlimited	-
6 to 10 ft.	50 acre-feet	10-ft in height, 10-acre lake
Unlimited	15 acre-feet	15-ft in height, 2.5-acre lake

# Dam Classification

## Class I

- > 60 feet high
- > 5,000 acre-feet storage
- Probable loss of life



# Dam Classification

## Class II

- 40-60 feet high
- 500-5000 acre-feet storage
- Loss of High-Value Property
  - Damage to:
    - Businesses
    - Class I, II, & III dams
    - Homes
    - State & Interstate Roads
    - Water/Wastewater  
/Industrial  
Impoundments



# Dam Classification

## Class III



- 25-40 feet high
- 50-500 acre-feet storage
- Loss of Property:
  - Agricultural structures
  - Garages
  - Exempt dams
  - County, Township, & City Roads

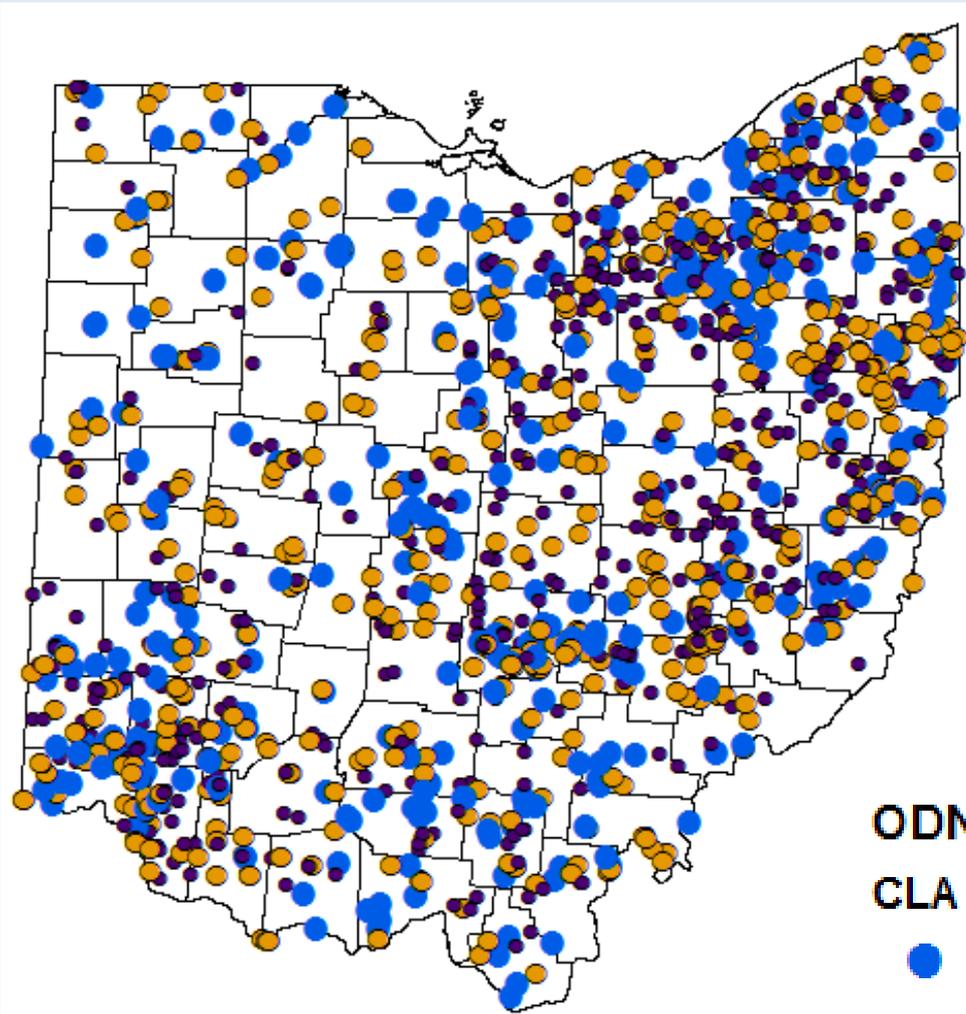
# Dam Classification

## Class IV

- Dam & lake larger than an exempt dam
- 10-25 feet high
- 15-50 acre-feet storage
- No downstream hazard impact to structures



# How Many Dams in Ohio?



Class I Dams - 361  
Class II Dams - 549  
Class III Dams - 568

## ODNR-Regulated-Dams

### CLASS

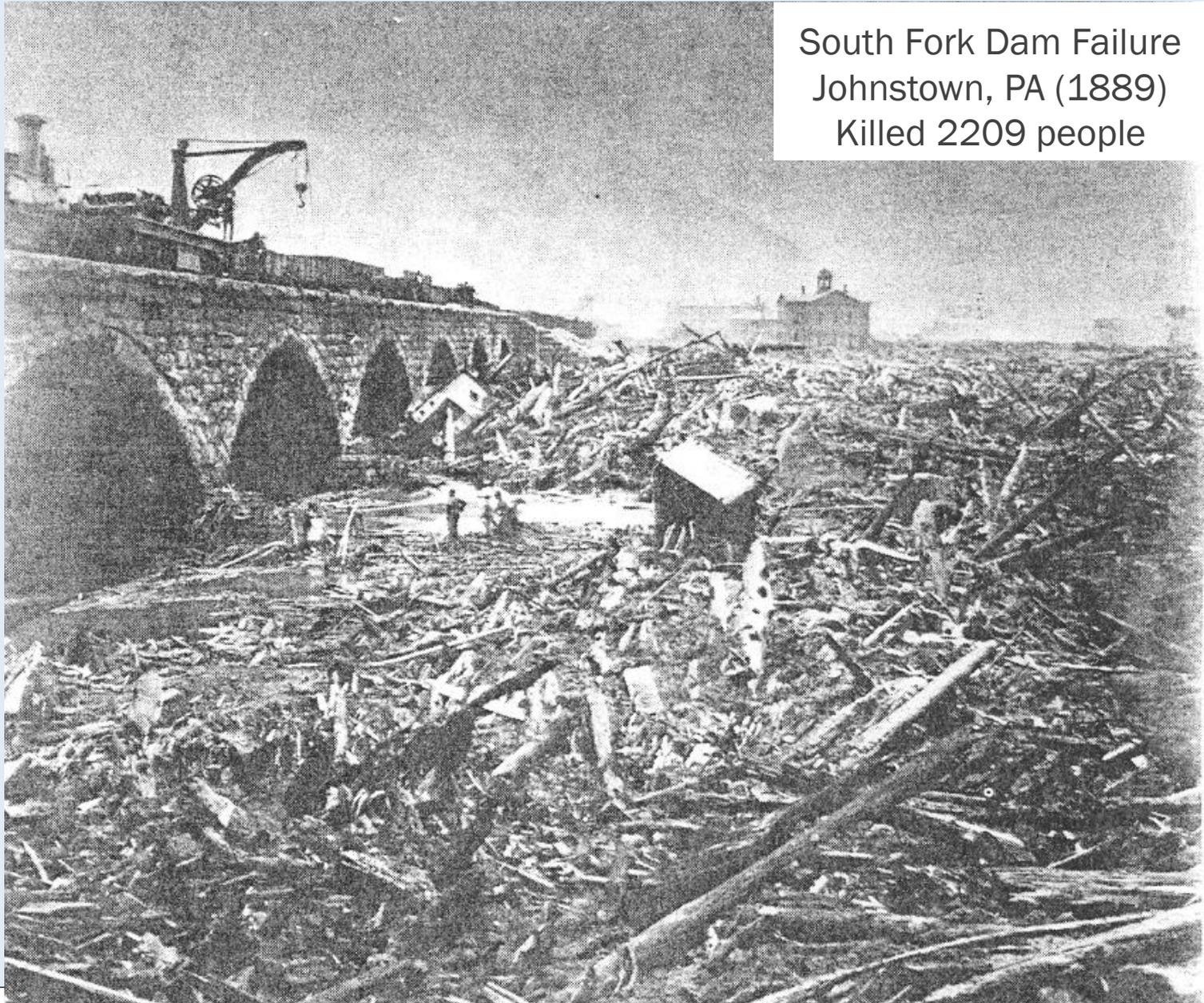
- I
- II
- III

# Dams can and do fail...



Wayne County – Early 1980s

# Dam Failures & Incidents

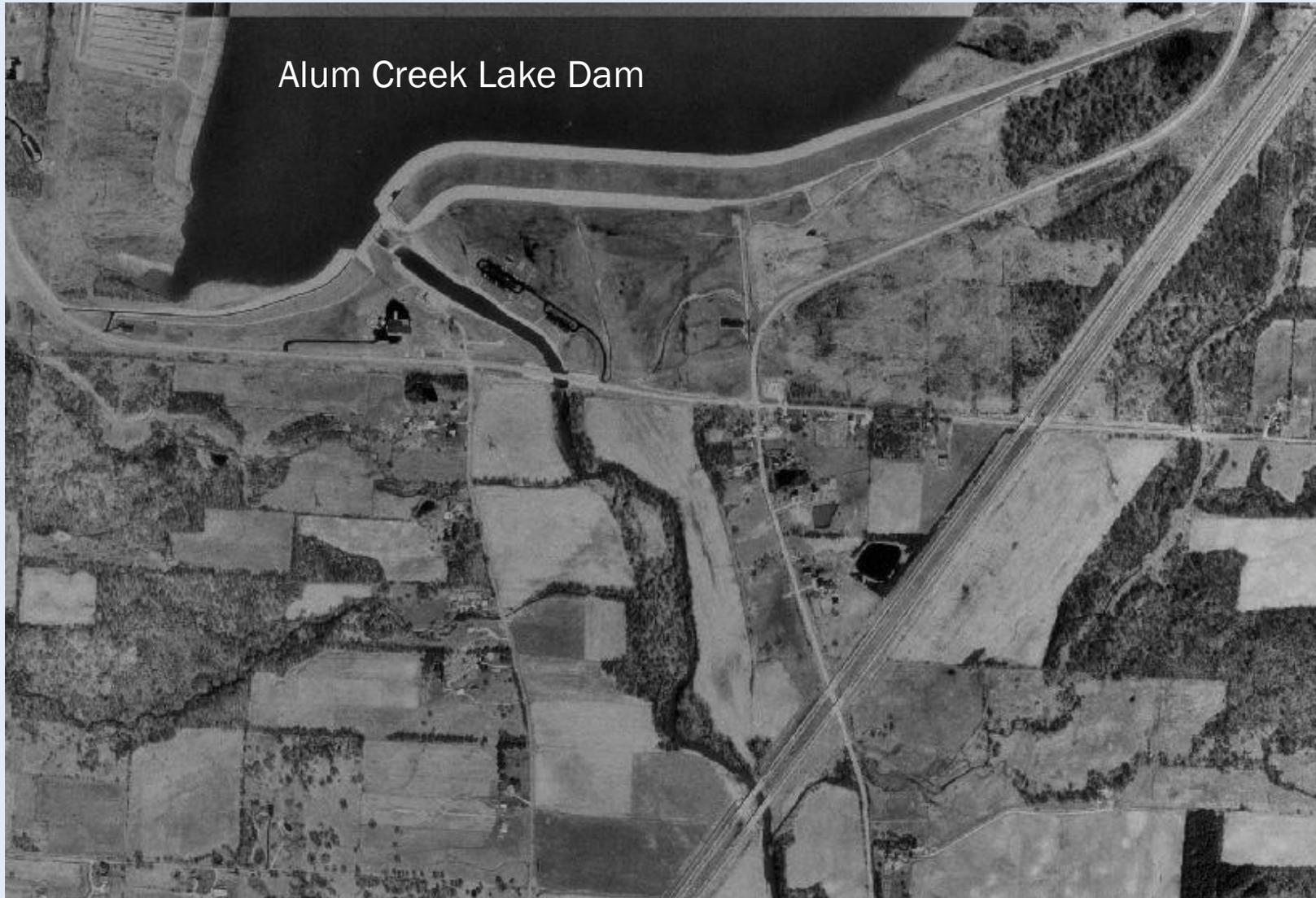


South Fork Dam Failure  
Johnstown, PA (1889)  
Killed 2209 people

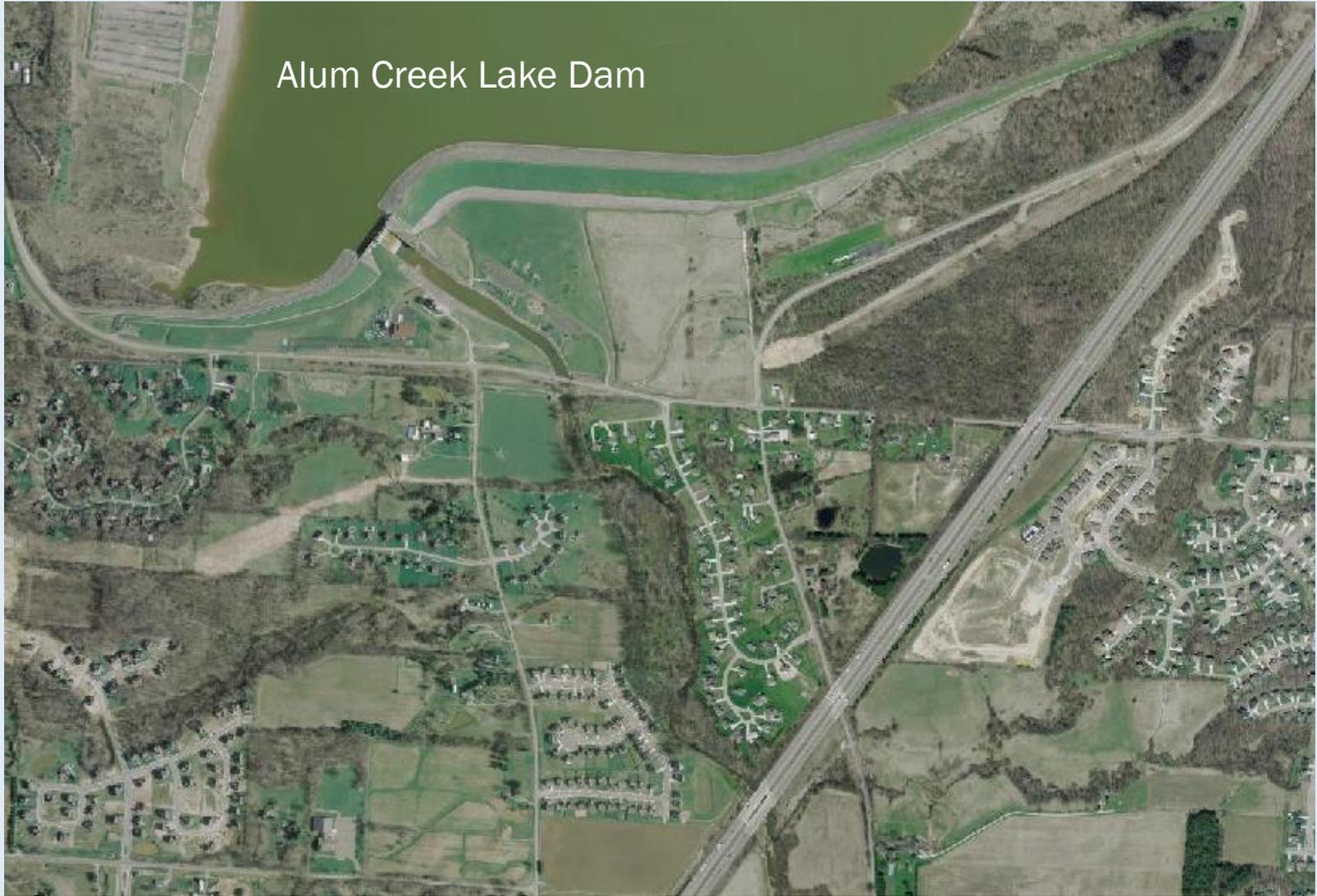
Oroville Dam Incident  
February 2017



# Downstream Development & Hazard



Alum Creek Lake Dam



# Importance of EAPs



# Emergency Action Plan (EAP)

## Ohio Administrative Code Rule 1501:21-21-04

- The owner of a dam shall be responsible for the continued safe operation and use of the dam so that it is not a hazard to life, health, or property.

## Ohio Administrative Code Rule 1501:21-15-07

- An emergency action plan is required for all Class I, II, and III dams.
- The plan for all Class I dams shall include an inundation map.

# DWR - Fillable EAP

- Designed for Class III and some Class II dams
- Includes most sections of standard EAP, but simplified
- Must still be tailored for each individual dam
- [http://water.ohiodnr.gov/portals/soilwater/data/doc/Blank\\_Fillable\\_EAP\\_Master\\_Rev\\_11-23-2015.doc](http://water.ohiodnr.gov/portals/soilwater/data/doc/Blank_Fillable_EAP_Master_Rev_11-23-2015.doc)

## EMERGENCY ACTION PLAN

FOR

\_\_\_\_\_  
*(Insert name of dam)*

\_\_\_\_\_  
\_\_\_\_\_  
COUNTY  
TOWNSHIP

ODNR-DSWR FILE NUMBER: \_\_\_\_\_

## CLASS III STRUCTURE

DAM OWNER

\_\_\_\_\_  
*(Insert name and address)*

\_\_\_\_\_  
*(Insert date that EAP created or modified)*

## ICODS FORMAT

### I. Notification Flowchart

### II. Statement of Purpose

### III. Project Description

### IV. Emergency Detection, Evaluation, and Classification

### V. General Responsibilities

A. Dam Owner

B. Notification

C. Evacuation

D. Termination and follow-up

E. EAP coordination

### VI. Preparedness

### VII. Inundation Maps

### VIII. Appendices

Appendix A: Investigation and Analyses of Dam Break Floods

Appendix B: Plans for Training, Exercising, Updating, and Posting EAP

Appendix C: Site-Specific Concerns

Appendix D: Approval of the EAP

# EAP Parts/Sections

## Section I - Notification Flowchart

- One of the most important parts of the plan
- List of “Who” to notify in the event of a dam emergency
- Contains phone numbers and alternative contacts
  - ODNR
  - County EMA
  - National Weather Service

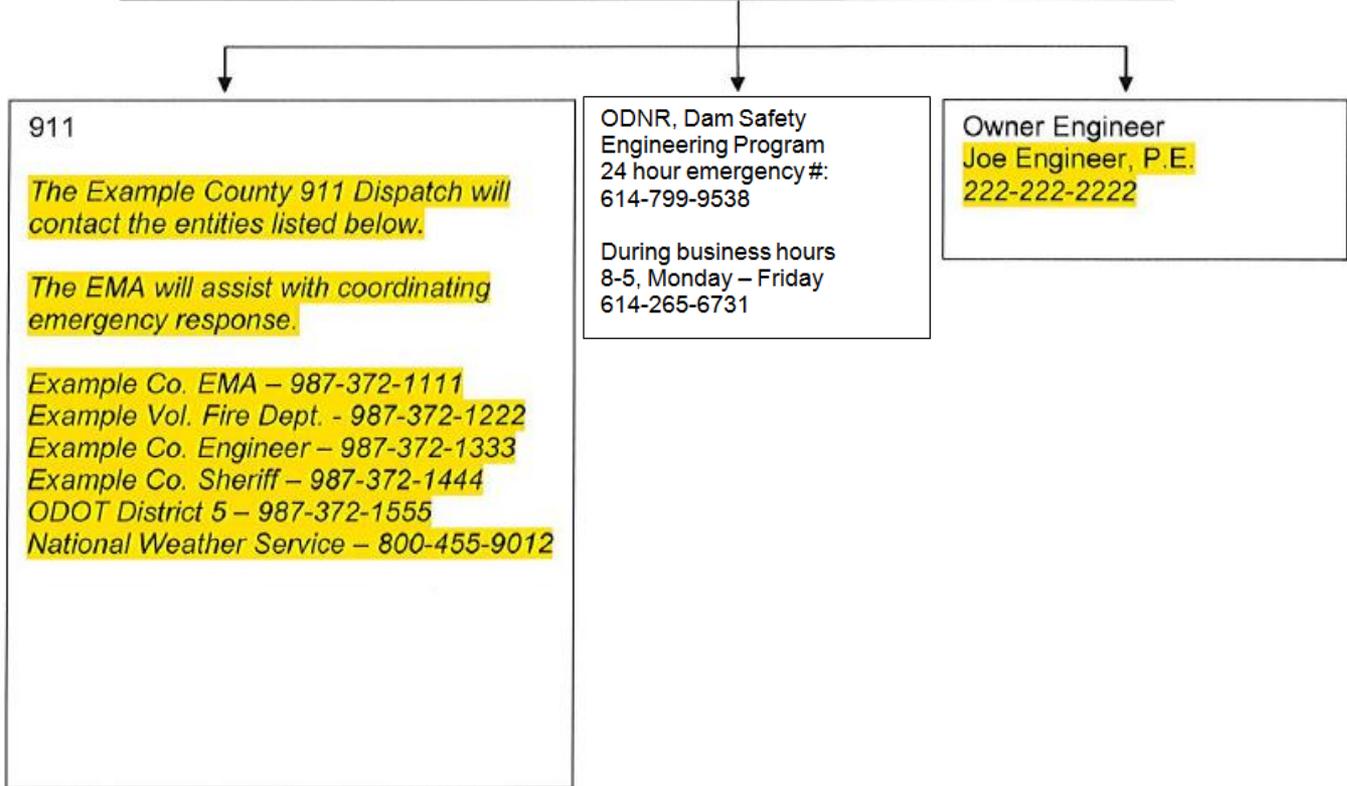
# I. Notification Flowchart

Dam Owner Representative #1 Name: <b>John Damowner</b> Phone number: <b>111-111-1111</b> Cell phone number: <b>111-111-1112</b>	Dam Owner Representative #2 Name: <b>Jane Damowner</b> Phone number: <b>111-111-1111</b> Cell phone number: <b>111-111-1113</b>
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The dam owner representatives will determine the alert level at the dam according to Section IV of this EAP and notify 911, ODNR, and the owner's engineer.

For a Watch Alert Level, notify the parties below that there is a potential dam failure situation developing.

For a Warning Alert Level, notify the parties below that a dam failure is in progress or is imminent. Evacuations and/or road closures are needed.

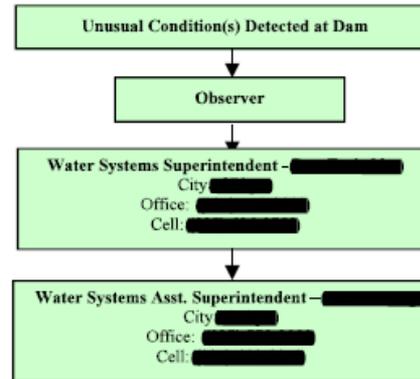


1. NOTIFICATION FLOWCHART

DETECTION, EVALUATION & CLASSIFICATION

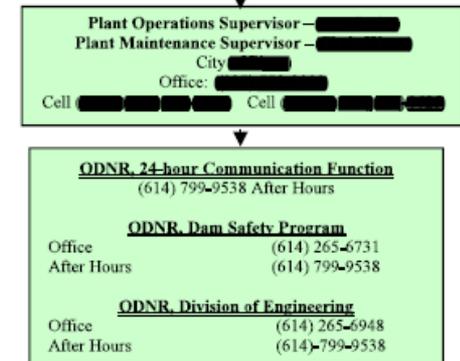
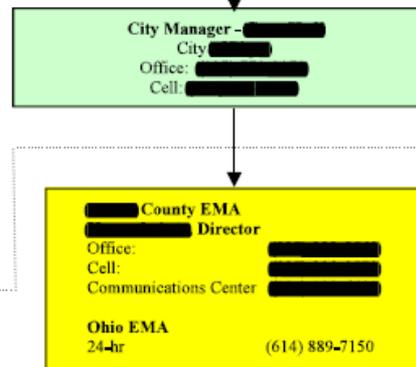
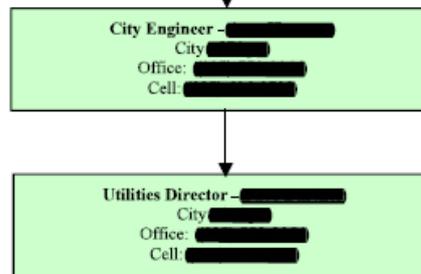
(See Table 4.1 & 4.2 and Figure 4.1)

If the severity of the problem is uncertain, maintain continuous observation then notify the ODNR, 24-hour Communication Center promptly. If the failure of and Dams & appears to be imminent, notifications for Evacuation should be made.



MONITOR

This is an event or a developing condition that is not normally encountered in the routine operation of the structures, or necessitates a variation from the operating procedures. The event may be a slowly developing situation that may endanger the structural integrity of the structures. The situation should be closely monitored. There is no need to contact other organizations.

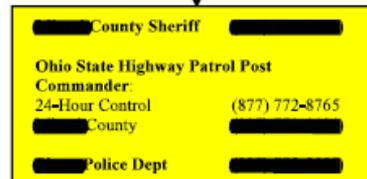


WATCH

This is an emergency event that is developing and could lead to failure of the structures and flooding downstream. Emergency responders should be notified (see prescribed message) and make preparations to evacuate downstream of the structures.

Prescribed Message

"This is the City notifying you that a Watch alert has been issued for the Dams & the. We are performing constant surveillance according to the Emergency Action Plan. We will inform you if a decision to evacuate or to cancel the Watch alert has been made."



WARNING

Dam failure or flooding downstream of the dam is imminent. Emergency responders should immediately evacuate downstream of and Dams & the (see prescribed message).

Prescribed Message

"This is the City notifying you that a Warning alert has been issued for Dams &. Please evacuate people downstream of the structures according to the County Emergency Operations Plan."

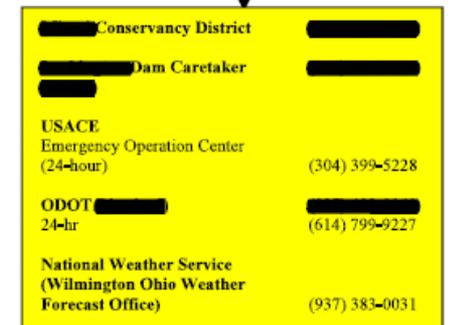


Figure 1.1 Notification Flowchart for and Dams &

## ICODS FORMAT

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A. Dam Owner

B. Notification

C. Evacuation

D. Termination and follow-up

E. EAP coordination

### VI. Preparedness

### VII. Inundation Maps

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Appendix C: Site-Specific Concerns

Appendix D: Approval of the EAP

# EAP Parts/Sections (cont.)

## Section IV - Emergency Detection, Evaluation, and Classification

- Section I & IV Notification relates to the alert levels

### Typically 3 ALERT LEVELS

1. Non-failure (unusual) condition noted – “Monitoring”
2. Potential failure situation developing – **“Watch”**
3. Failure is imminent or has occurred – “WARNING”

# Non-Failure Condition “Monitoring”

- Flood conditions with no threat to the integrity of the dam
- Example...Large spillway releases

# Potential Failure Situation Developing

*“Watch”*

- Failure could occur, but pre-planned actions may prevent or mitigate *failure...still time to do something.*
- Assess situation & alert agencies
  - Provide periodic updates
  - Agencies decide their course of action
- Example...large earth slide on the external slope

# FAILURE IS IMMINENT OR HAS OCCURRED “WARNING”

- Issued when no time is available to attempt corrective measures
- Dam is **FAILING** or is very likely to **FAIL**
- Responsible agencies will evacuate downstream
- Example...overtopping

# EAP Parts/Sections (cont.)

## Section VII. Inundation Maps

- Typically Class III Dams only require a downstream hazard map.
- Some Class II Dams require inundation maps & study, others merely a downstream hazard map.
- Class I Dams must have inundation maps & study.

# EAP Parts/Sections (cont.)

## Section VII. Inundation Maps

- Identifies area impacted by dam failure
  - endangered buildings & roads
  - evacuation routes
  - alternative routes to dam site

# EAP Parts/Sections (cont.)

## Section VII. Inundation Maps

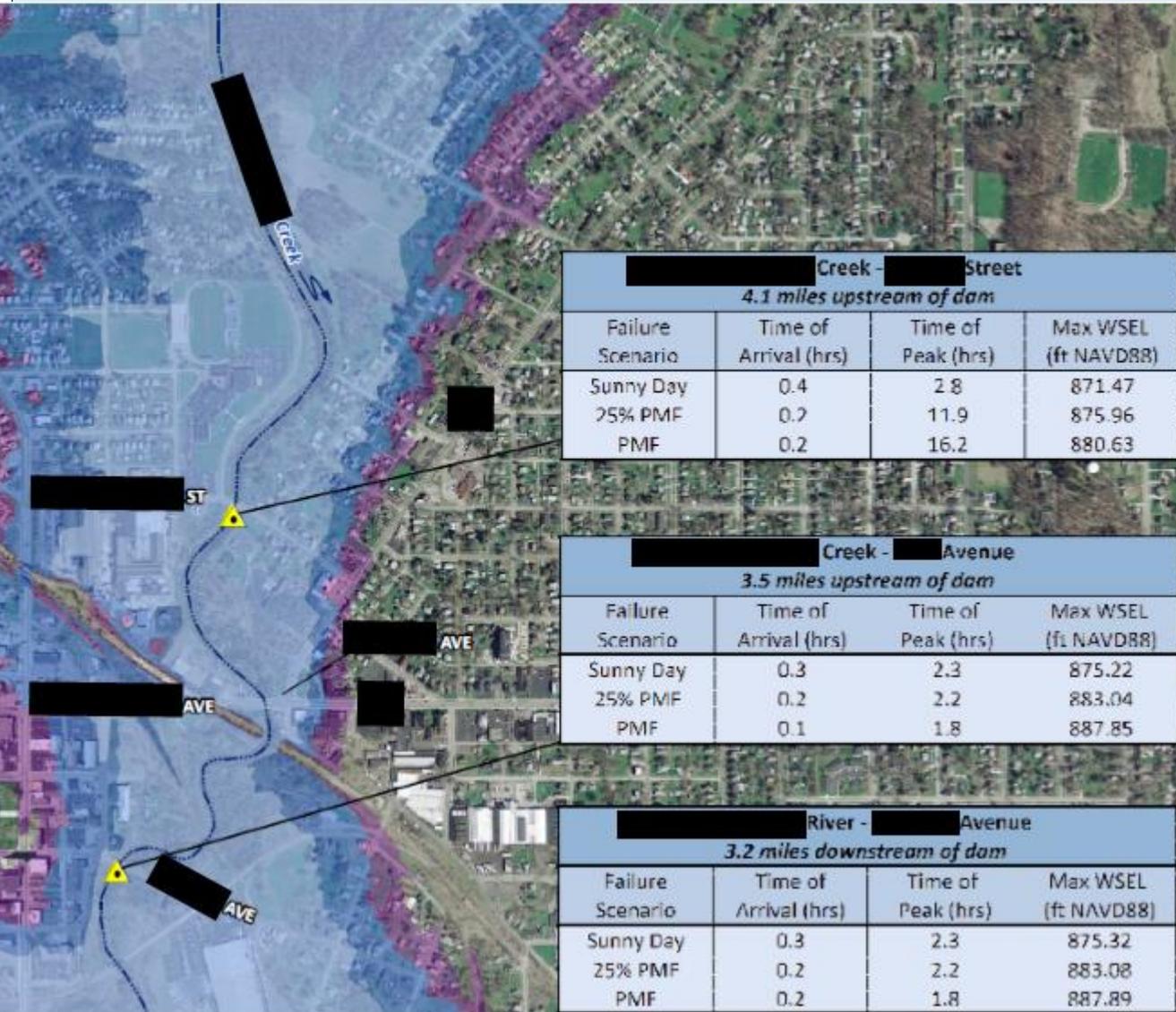
- How high will water get?
- How long will it take water to arrive?
- Keep maps simple (while still being effective)!
- Summarize water height/ arrival time at key cross sections.
- Include brief statement about inundation parameters.

## Dam Breach Inundation Map



### Legend

-  Sunny Day Breach
-  25% PMF Breach
-  PMF Breach
-  Cross Section Location
-  Stream Centerline



<b>█ Creek - █ Street</b> <i>4.1 miles upstream of dam</i>			
Failure Scenario	Time of Arrival (hrs)	Time of Peak (hrs)	Max WSEL (ft NAVD88)
Sunny Day	0.4	2.8	871.47
25% PMF	0.2	11.9	875.96
PMF	0.2	16.2	880.63

<b>█ Creek - █ Avenue</b> <i>3.5 miles upstream of dam</i>			
Failure Scenario	Time of Arrival (hrs)	Time of Peak (hrs)	Max WSEL (ft NAVD88)
Sunny Day	0.3	2.3	875.22
25% PMF	0.2	2.2	883.04
PMF	0.1	1.8	887.85

<b>█ River - █ Avenue</b> <i>3.2 miles downstream of dam</i>			
Failure Scenario	Time of Arrival (hrs)	Time of Peak (hrs)	Max WSEL (ft NAVD88)
Sunny Day	0.3	2.3	875.32
25% PMF	0.2	2.2	883.08
PMF	0.2	1.8	887.89

SOURCE: BASE MAP ORTHOPHOTOGRAPHY OBTAINED FROM OHIO AND PENNSYLVANIA STATEWIDE IMAGERY PROGRAMS. ROAD NAMES OBTAINED FROM ODOT, █ COUNTY GIS DEPARTMENTS.

MAPS COMPILED AND PRINTED IN OHIO STATE PLANE COORDINATE SYSTEM WITH UNITS OF FEET AND HORIZONTAL DATUM OF NAD83. THE FLOOD ELEVATIONS ARE REFERENCED TO THE NAVD88 VERTICAL DATUM. TIME OF ARRIVAL AND TIME TO PEAK ARE CALCULATED FROM THE BEGINNING OF DAM BREACH FORMATION.

FLOODING LIMITS WERE DETERMINED USING THE HEC-RAS COMPUTER MODEL FOR THE PROBABLE MAXIMUM FLOOD (PMF) DAM FAILURE HYDROGRAPH, 25% OF THE PROBABLE MAXIMUM FLOOD (25% PMF) DAM FAILURE HYDROGRAPH, AND A "SUNNY DAY" DAM FAILURE HYDROGRAPH. THE FAILURE OF A DAM IS A COMPLEX HYDRAULIC OCCURRENCE WHICH CAN RESULT IN UNEXPECTEDLY HIGH DEPTHS OF FLOW. DEBRIS AND THE EFFECT OF ENCROACHMENTS CAN RAISE THE WATER SURFACE SIGNIFICANTLY. THESE LOCAL EFFECTS WERE NOT MODELED IN DETAIL WHEN COMPUTING THE FLOODED AREAS SHOWN ON THE INUNDATION MAPS. BECAUSE OF THE LIMITATIONS OF THE METHODS AND PROCEDURES USED TO DEVELOP THE FLOODED AREAS, THE USER OF THIS MAP IS ADVISED THAT THE LIMITS OF FLOODING SHOWN ARE APPROXIMATE AND SHOULD BE USED SOLELY AS GUIDELINES FOR THE ESTABLISHMENT OF EVACUATION ZONES.

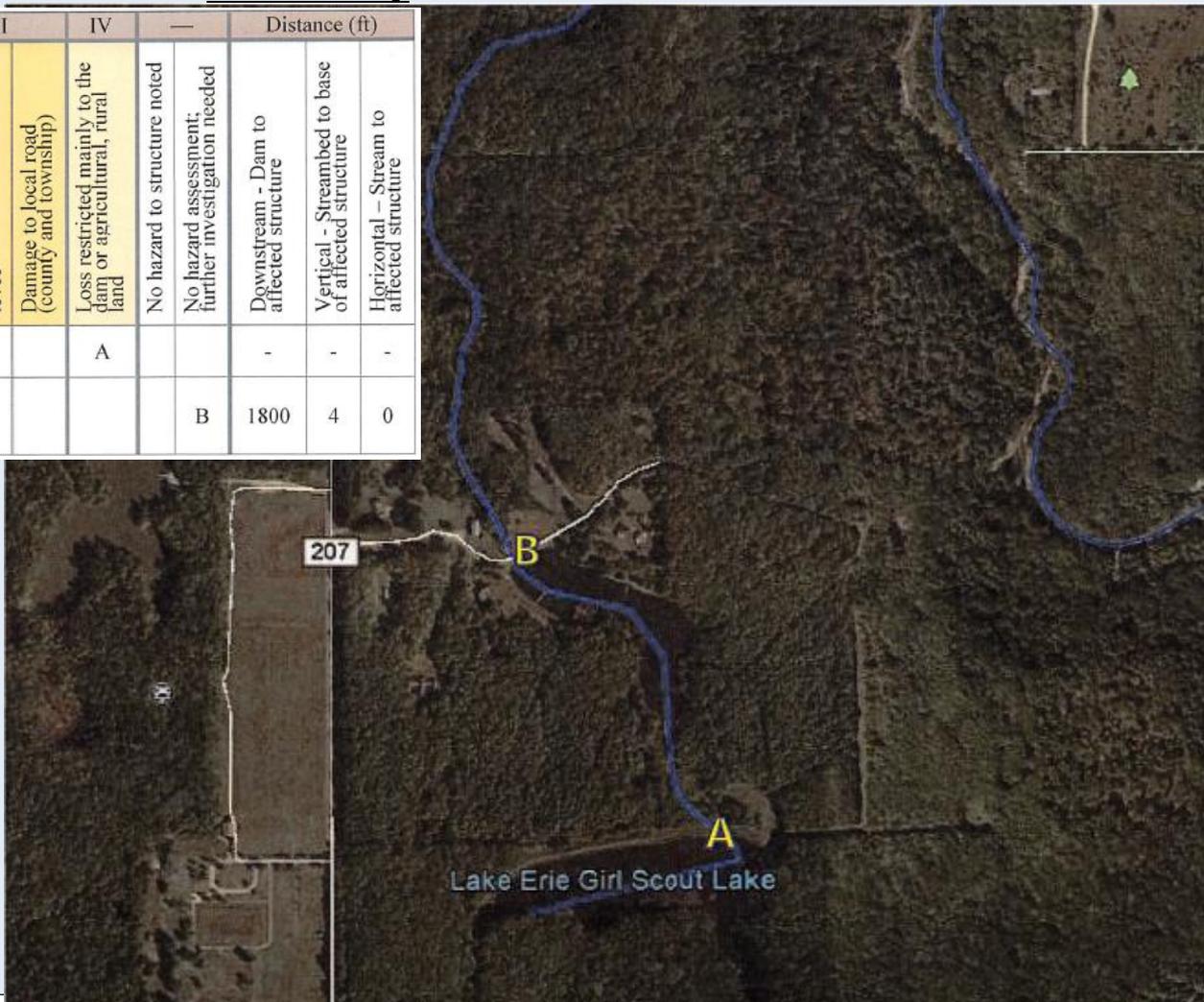
THE INFORMATION CONTAINED IN THIS MAP IS PREPARED FOR USE IN NOTIFICATION OF



# EAP Parts/Sections (cont.)

## Section VII. Downstream Hazard Maps (Fillable Form)

Hazard Class:	I	II			III	IV	—	Distance (ft)						
Potential Hazard	Probable loss of human life.	Loss of public water supply or wastewater treatment facility, release of health hazardous waste	Flooding of structure or high-value property	Damage to high-value or Class I, II, III dam or levee	Damage to major road (US or state route), disruption of only access to residential or critical facility area	Damage to railroad or public utility	Damage to rural building, not otherwise high-valued property, or Class IV dam or levee	Damage to local road (county and township)	Loss restricted mainly to the dam or agricultural, rural land	No hazard to structure noted	No hazard assessment; further investigation needed	Downstream - Dam to affected structure	Vertical - Streambed to base of affected structure	Horizontal - Stream to affected structure
Cam Lejnar Lake Dam									A			-	-	-
Girl Scouts Lake Dam (1511-007)										B		1800	4	0



# Dam Safety Resources

- Ohio Dam Safety Program Webpage
  - <http://water.ohio.dnr.gov/safety/dam-safety#ABO>
- Dam Locator

Ohio.gov Agencies | Online Services

ODNR Division of WATER RESOURCES

OHIO DNR | I WANT TO... | RECREATION | REGULATION | LANDOWNERS | PROGRAMS | MEDIA & NEWS | CONTACT

Safety > Dam Safety

Dam Safety >

Flood Safety

## Ohio Dam Safety Program

About | Dam/Levee Repair | Permitting | Lowhead Dam Location/Removal | EAPs/Forms/Pubs

### Program Overview

Dams and levees provide the citizens of Ohio with essential benefits such as water supply, flood control, recreation and irrigation. While dams have multiple benefits, they also represent a risk to public safety and economic infrastructure if they are not properly maintained. Over the past three years, the Ohio Department of Natural Resources has made reducing this risk and improving dam safety a top priority. Each year Dam Safety engineers and staff conduct more than 350 detailed inspections of dams on a five-year schedule. These inspections are completed along major watersheds to gain field efficiencies and to inter-relate hydrology of dams in a watershed. Reports detailing necessary repair and maintenance are then provided to the owner. Dam Safety then seeks compliance as necessary for any deficiencies noted.

Launch Ohio Interactive Dam Locator




## Legend & Layers




## Legend & Layers

### County Bookmarks

### Other Tools

### Print

### Search

Select query:

Search for:

Find exact matches only

Clear

Search

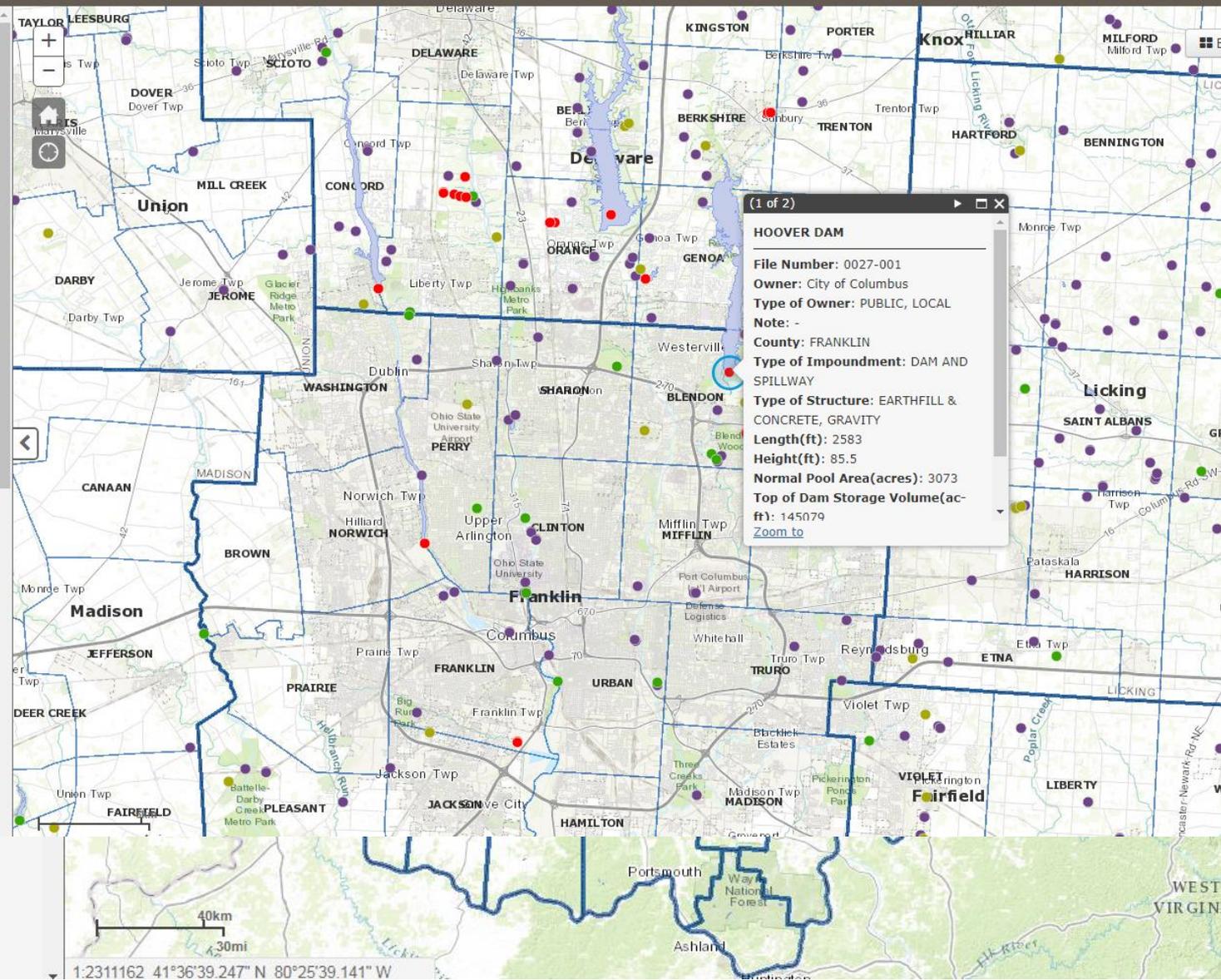
2 Results found

Layer	Result
Class I Dams	HOOVER DAM
Other Dams	HOOVER PARK LAKE DAM



Division of Water Resources

Other Dams



1.2311162 41°36'39.247" N 80°25'39.141" W

# In the near future...

- ODNR Dam Safety Program will be reaching out with a survey to County EMAs
- Questions regarding:
  - How can the Dam Safety Program Improve the EAP distribution process?
  - Would an update yearly on approved EAPs in your county assist you?
  - Preference on Digital vs. Paper EAPs?

# Questions?

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