



Presentation to:
South Licking Watershed Conservancy District
June 27, 2023

Flood Damage Reduction Planning Study
South Fork Licking River Watershed



Perry County



Commissioners



FAIRFIELD
COUNTY • OHIO



SOIL AND WATER
CONSERVATION DISTRICT



Fairfield
Soil & Water
Conservation
District



PRESENTATION AGENDA

- Project History
- Study Area
- Channel Maintenance Plan
- Flood Damage Reduction Study
- Process



SOUTH LICKING WATERSHED CONSERVANCY DISTRICT

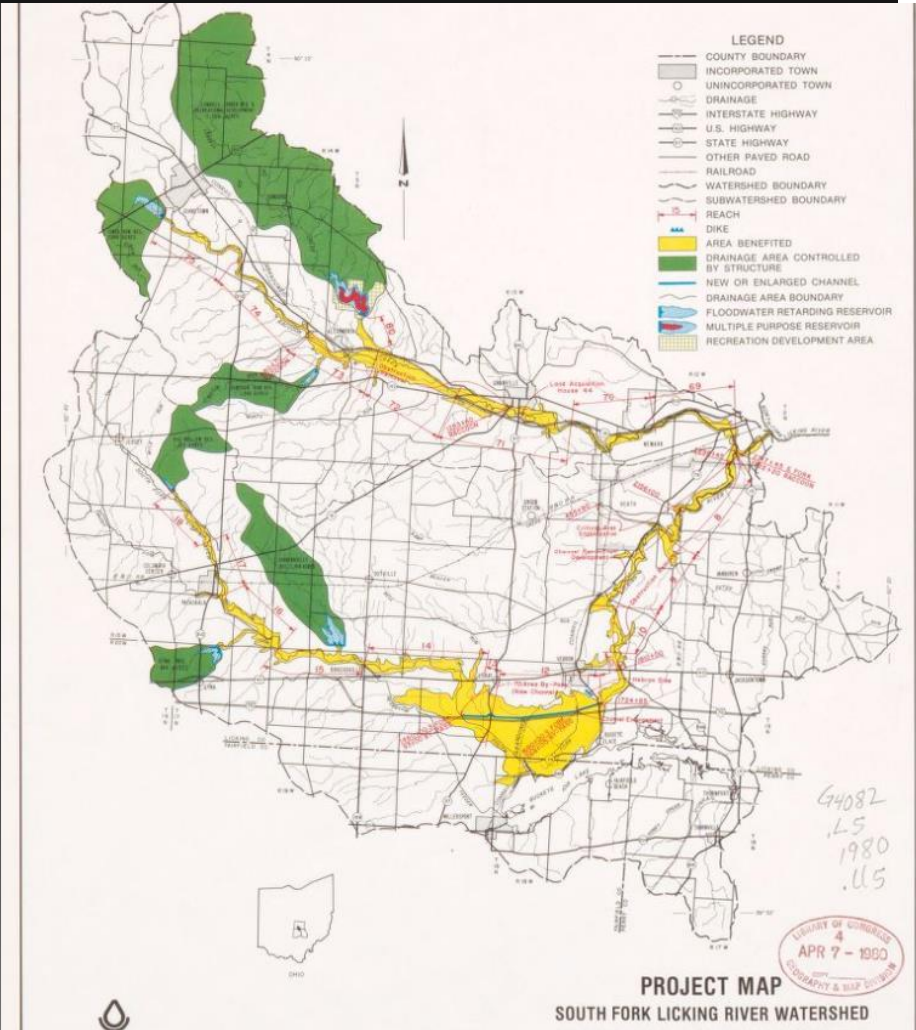
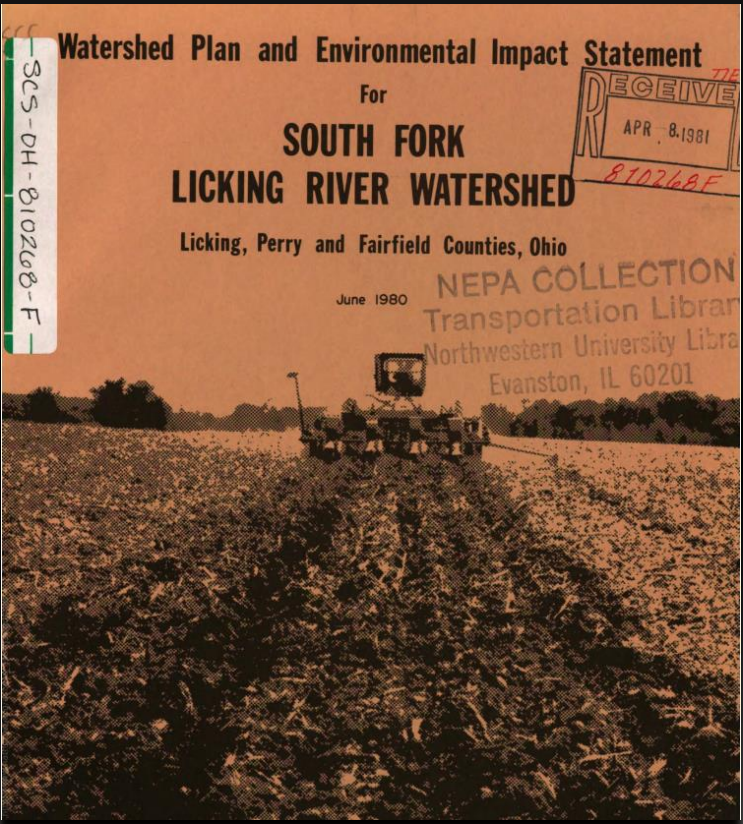
- Conservancy District First Established in 1968; Organized under Section 6101 of the Ohio Revised Code
- Presided over by a Conservancy Court: one judge from Licking, Fairfield and Perry Counties
- Managed by an appointed Board of Directors (3 members)
- Covers the entire South Fork Licking River and Raccoon Creek Watersheds (288 sq. mi.) throughout Licking, Fairfield, Perry Counties.



Interstate 70 Flooding - 1959

SOUTH LICKING WATERSHED CONSERVANCY DISTRICT


1980: Initial Environmental Impact Study and Watershed Work Plan completed by the Soil Conservation Service (SCS)



SOUTH LICKING WATERSHED CONSERVANCY DISTRICT

2009: Updated Watershed Work Plan (Draft) Completed by the Natural Resources Conservation District (NRCS)

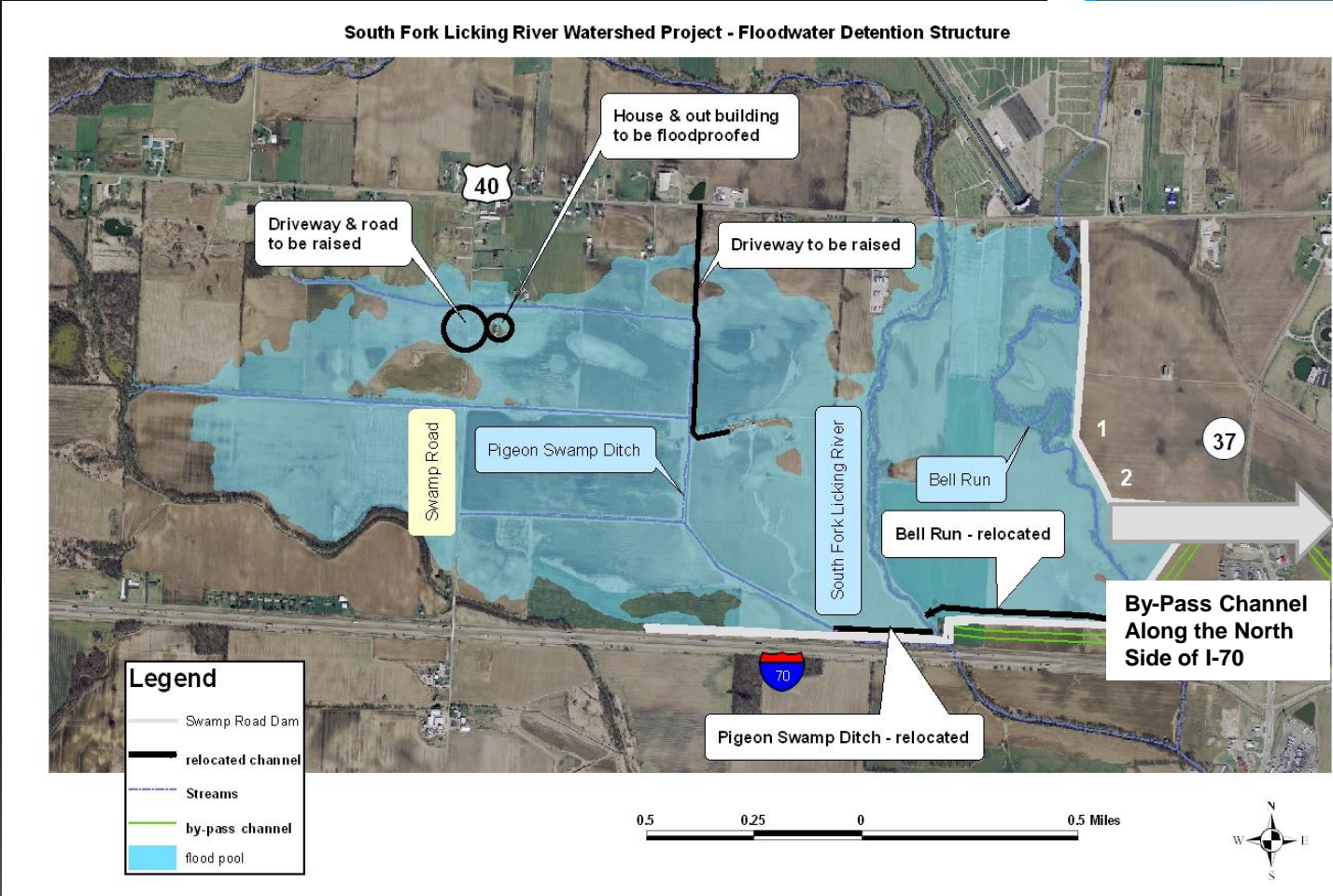
DRAFT
Supplemental Watershed Work Plan
Supplemental Environmental Impact Statement
South Fork Licking River Watershed
 A Supplement to the Watershed Work Plan and Environmental Impact Statement
 Licking, Perry, and Fairfield Counties, Ohio



Local flooding of the South Fork Licking River in the Buckeye Lake area
 July 2009

Prepared by: United States Department of Agriculture,
 Natural Resources Conservation Service

In Cooperation with: South Licking Watershed Conservancy District



CURRENT PROJECT TIMELINE

SLWCD

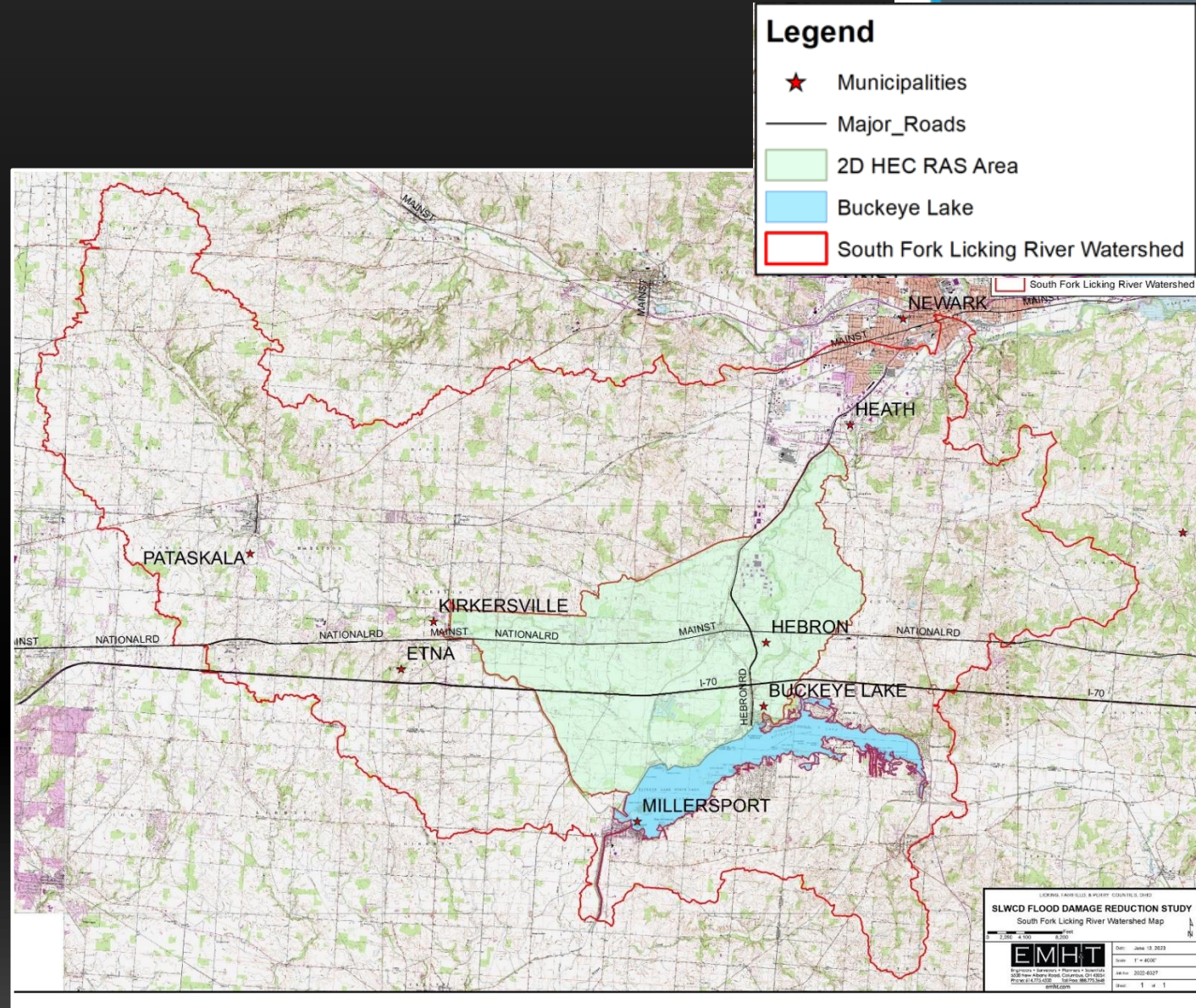
- **January 2022:** MWCD (Partners in Watershed Management) Grant Awarded
- **March 2022:** Authorization to Proceed with Study
- **May 2022:** Watershed Stakeholder Meetings
- **February 2023:** USGS Modeling Workshop
- **June/July 2023:** Study Completion and Report

Licking County Commissioners

- **March 2020:** Data Gap Analysis
- **Nov. 2021:** Completed Initial 2D Model Work
- **Aug. 2022 - May 2023:** 2D Model Refinements and Alternatives Evaluation
- **June 2023:** FEMA Grant Funding

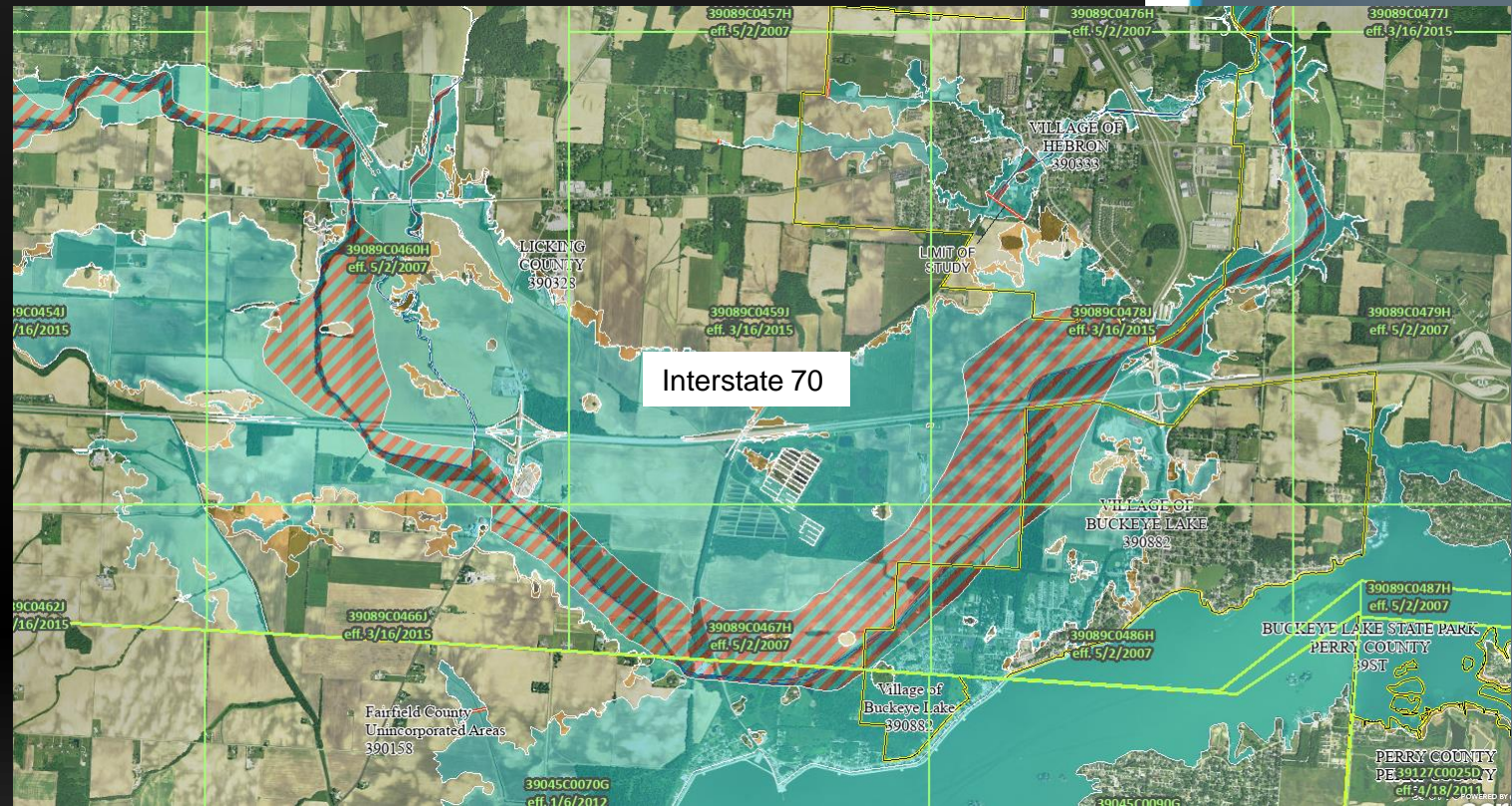
THE WATERSHED

- South Fork Licking River (not including Raccoon Creek): 185 Square Mile Watershed
- Major Sub-watershed: Buckeye Lake at 44 Square Miles
- Flood Warning System has been in Place Since 2012. Stream and Rain Gauges Managed by the U.S. Geological Survey and the National Weather Service



THE WATERSHED

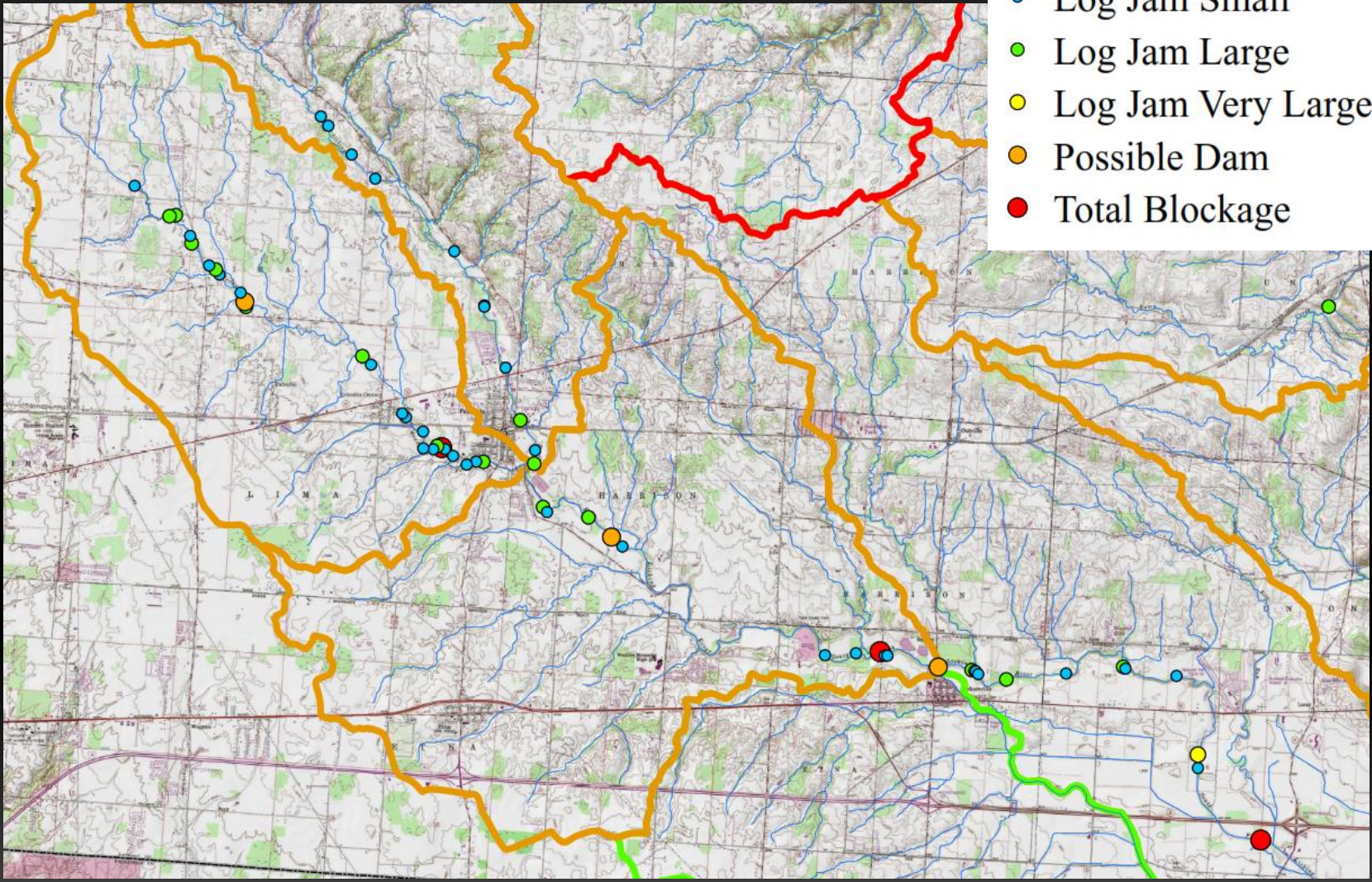
- Flooding of Interstate 70 (I-70) occurs frequently, the most recent being May 5, 2022)
- Flood damages to roadways, bridges, farm land, homes and businesses.
- Log-jams in major and minor watercourses causes local flooding, and channel erosion leading to loss of property



Channel Maintenance Plan

Log Jam Locations

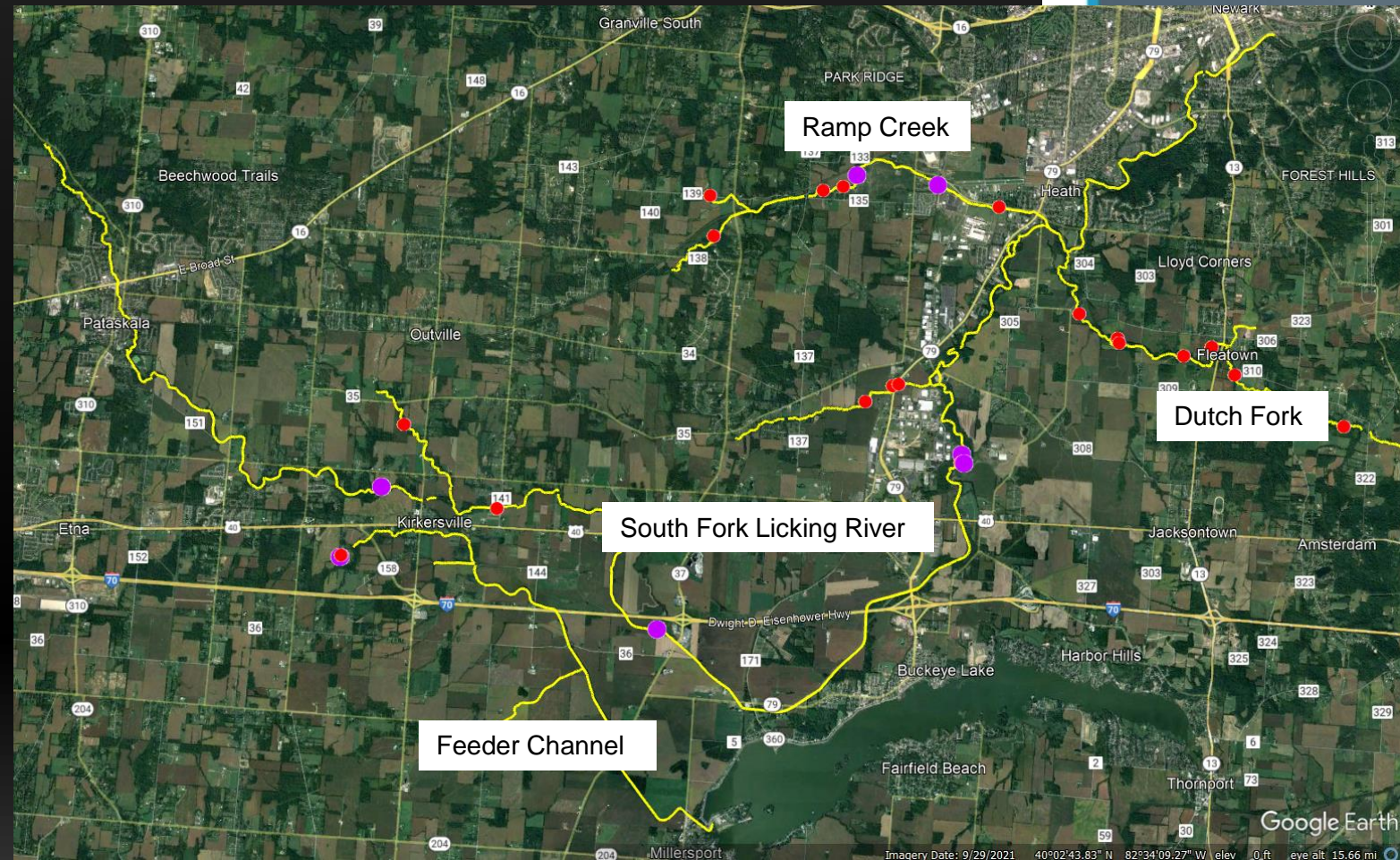
- Log Jam Small
- Log Jam Large
- Log Jam Very Large
- Possible Dam
- Total Blockage



Licking County SWCD – 2020 Debris Jam Study

Channel Maintenance Plan

- Mapping of 3rd, 4th and 5th Order Watercourses
- Desk Top Identification of Log Jam Sites along South Fork Licking River
- Field Assessment and Scoring
- Mapping of Channel Easements for Maintenance and Acquisition Costs

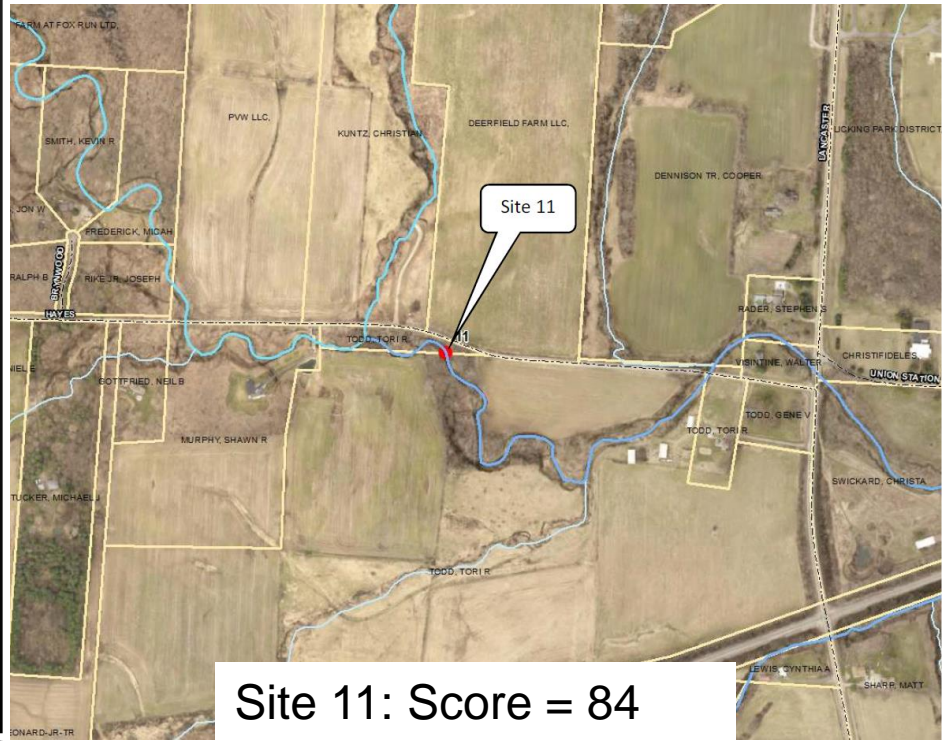


Channel Maintenance Plan



Channel Maintenance Plan

- 31 Total Sites; some eliminated from scoring due to movement of the debris
- Scoring based on multiple factors reflecting the impacts of the log jam on the channel and surrounding land and infrastructure
- Scores ranged from 8 to 92



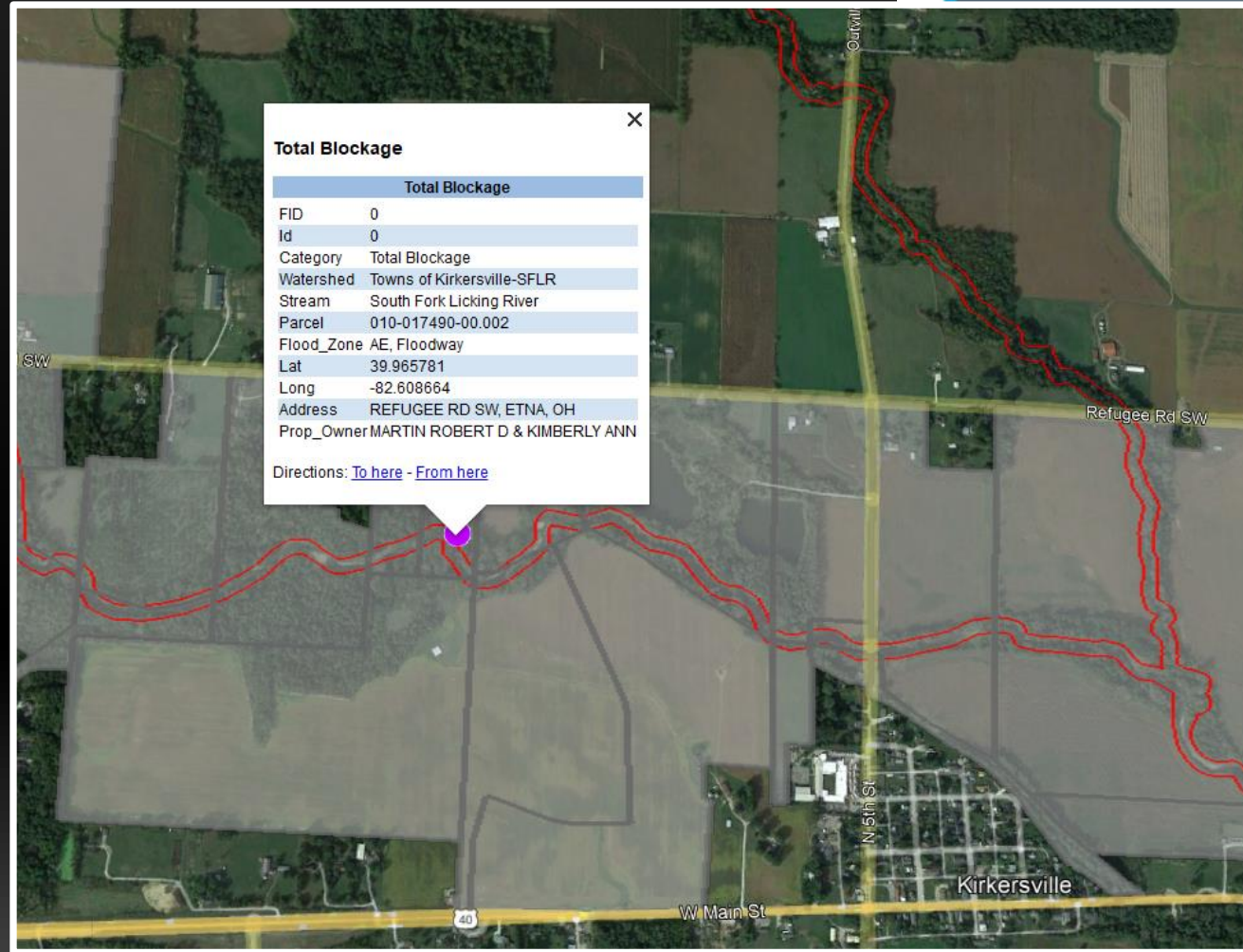
Channel Maintenance Plan

CRITERIA	SCORE
(A) Accessibility	
a - Requires work agreement from multiple property owners	1
b - Requires work agreement from a single property owner	2
c - Accessible from SLWCD's channel easement	3
(B) Constructability	
a - Requires extensive land disturbance/vegetation clearing	1
b - Requires moderate land disturbance/vegetation clearing	2
c - Requires minimal land disturbance/vegetation clearing	3
(C) Channel Stability	
a - Bank erosion area < 1000 square feet	1
b - Bank erosion area between 1000 to 3500 square feet	3
c - Bank erosion area > 3500 square feet	5
(D) Length (Parallel to Flow) of Logjam	
a - Channel blockage < 1x BKF Width	1
b - Channel blockage between 1x and 4x BKF Width	3
c - Channel blockage > 4x BKF Width	5
(E) Width (Perpendicular to Flow) of Logjam	
a - Channel blockage < 1x BKF Width	1
b - Channel blockage between 1x and 5x BKF Width	3
c - Channel blockage > 1x BKF Width	5

CRITERIA	SCORE
(F) Height of Log Jam	
a - Channel Blockage <40% of BKF Depth	1
b - Channel Blockage 40% to 70% of BKF Depth	3
c - Channel blockage > 70% of BKF Depth	5
(G) Density of Log Jam	
a - Coarse (Water Can/Will Flow Through Log Jam)	1
b - Intermediate	3
c - Fine (No or Minimal Flow Through Log Jam)	5
(H) Severity	
a - Bank erosion - no threat anticipated	1
b - Bank erosion - threat anticipated within 2-5 years	5
c - Bank erosion - threat anticipated within 0-2 years	10
d - Blockage - no adverse impacts to flooding	1
e - Blockage - potential future flooding concerns	5
f - Blockage - increased flooding threat to infrastructure	10
(I) Criticality	
a - Railroad	5
b - Highway	5
c - 1-4 Lane Road	4
d - Parking Lot	3
e - Driveway	3
f - Multi-Use Path	2
g - Commercial/Industrial Building	4
h - Single/Mult-Family Home	5
i - Open Space	1
j - Public Utility	4
K - Agricultural Field	3

Channel Maintenance Plan

- Mapping of Channel Maintenance Easements along the 3rd, 4th, and 5th Order Watercourses
- Includes both South Fork Licking River and Raccoon Creek
- 33 miles of South Fork Licking River and 36 miles of tributaries
- 27 Miles of Raccoon Creek and 25 miles of tributaries



Channel Maintenance Plan

South Fork Licking River Channel Maintenance Easements - Acquisition Costs

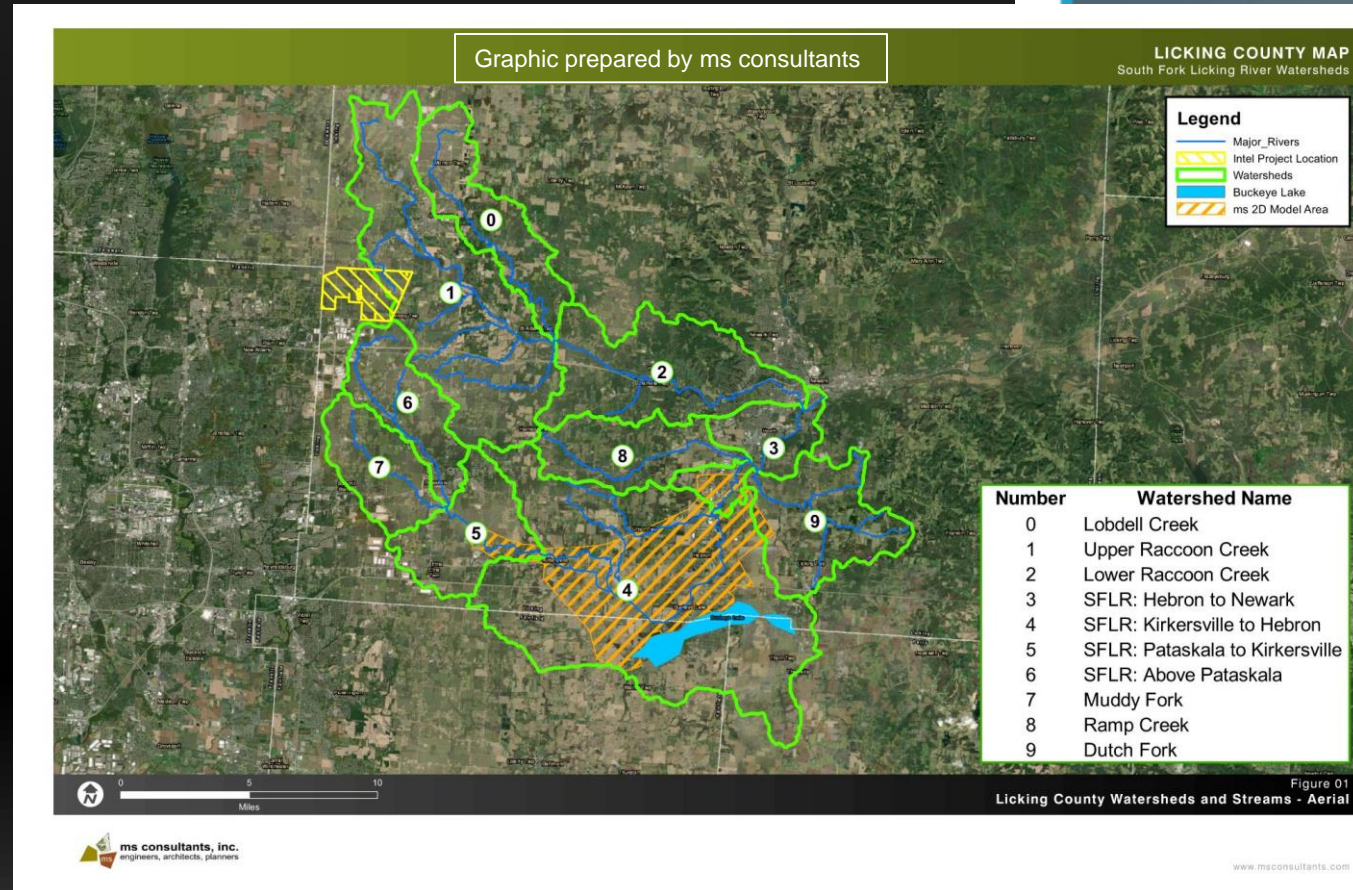
	Stream Length	Acreage	Land	Administrative	Total Cost
Total 5th Order =	30,308.00	51.13	\$167,000.00	\$50,100.00	\$217,100.00
Total 4th Order =	188,668.00	412.35	\$2,262,400.00	\$678,720.00	\$2,941,120.00
Total 3rd Order =	145,754.00	252.89	\$1,416,100.00	\$424,830.00	\$1,840,930.00
TOTALS =	364,730.00	716.37	\$3,845,500.00	\$1,153,650.00	\$4,999,150.00



FLOOD DAMAGE REDUCTION STUDY

Goals

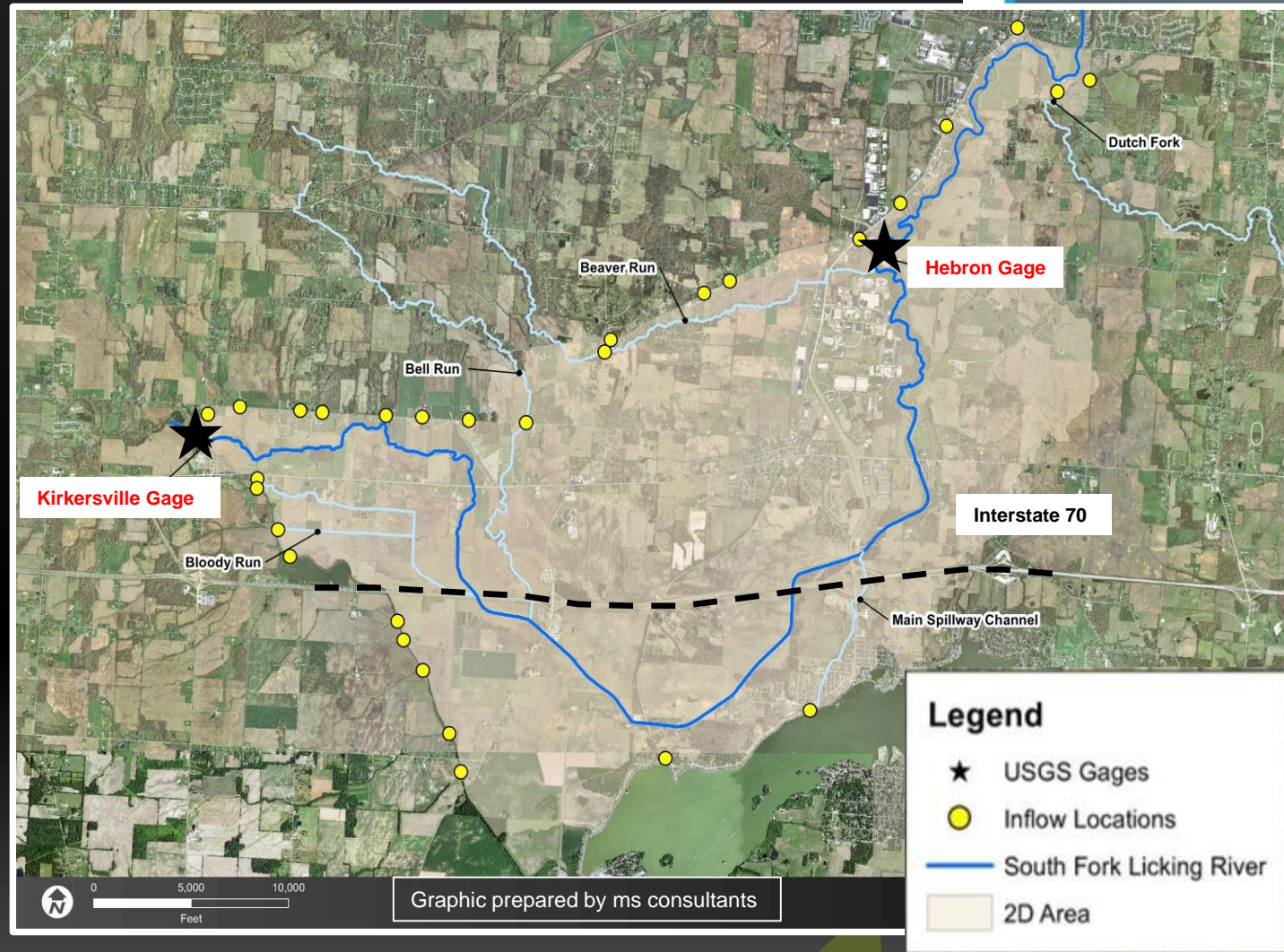
- Better Understand the Watershed Factors Causing Flooding
- Identify Potential Solutions
- Determine Benefits and Costs of those Solutions
- Support a Future Update of the Original (1980) Watershed Work Plan



FLOOD DAMAGE REDUCTION STUDY

HYDROLOGIC MODELING:

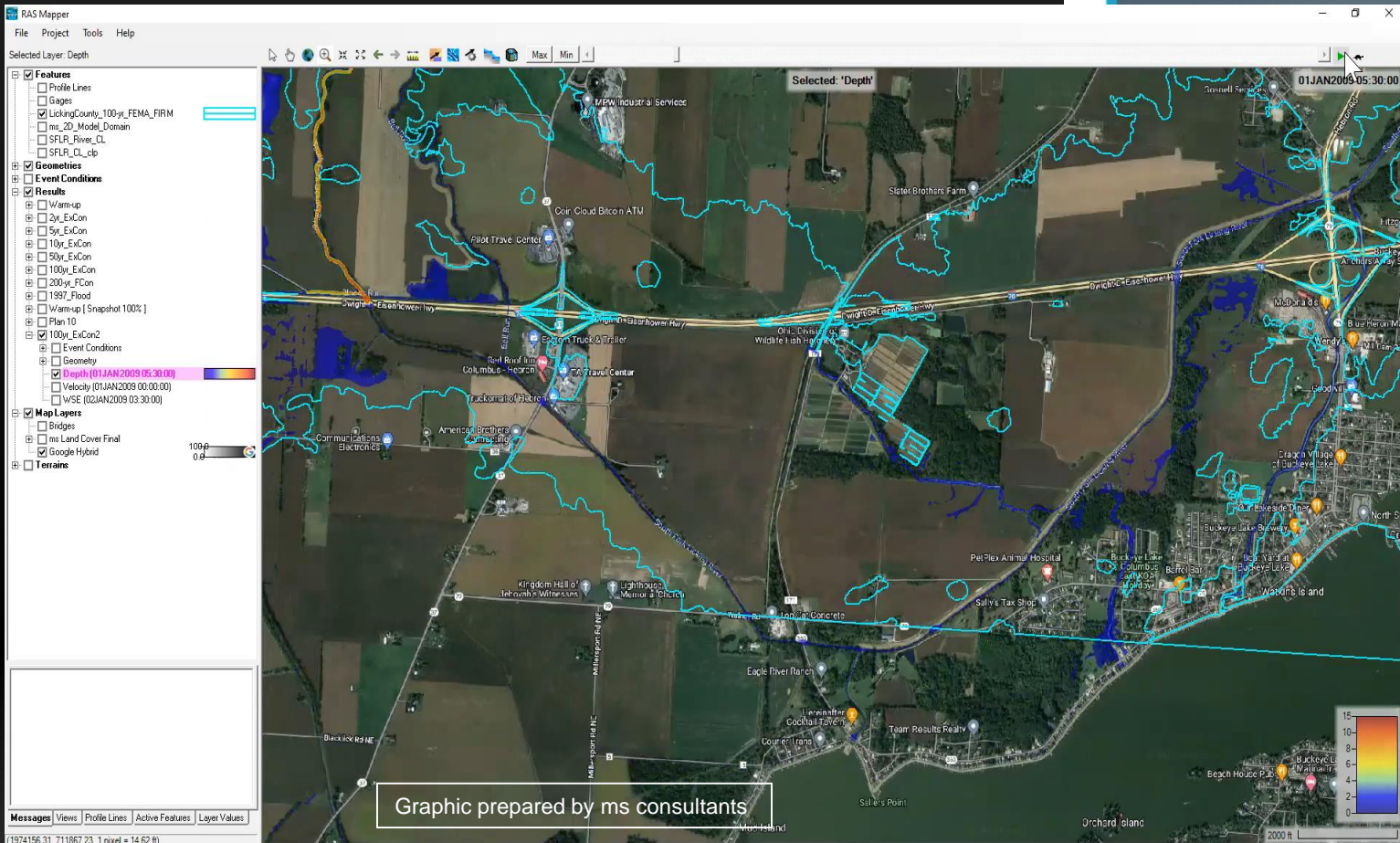
- HEC-HMS Model of the SFLR Watershed Outside of the 2D Model Area
- Except: SSA Model of the Watershed Area to Buckeye Lake
- Calibrated to the USGS Gage at Kirkersville for the March 2020 Event



FLOOD DAMAGE REDUCTION STUDY

HYDRAULIC MODELING:

- 2D HEC-RAS Model of a 28.0 Square Mile Area Surrounding SFLR between Kirkersville and Heath
- Hydrology Input from other Models + Rainfall-on-Grid within the 2D Model Area
- Model Calibrated to the USGS Gage at Hebron



FLOOD DAMAGE REDUCTION STUDY

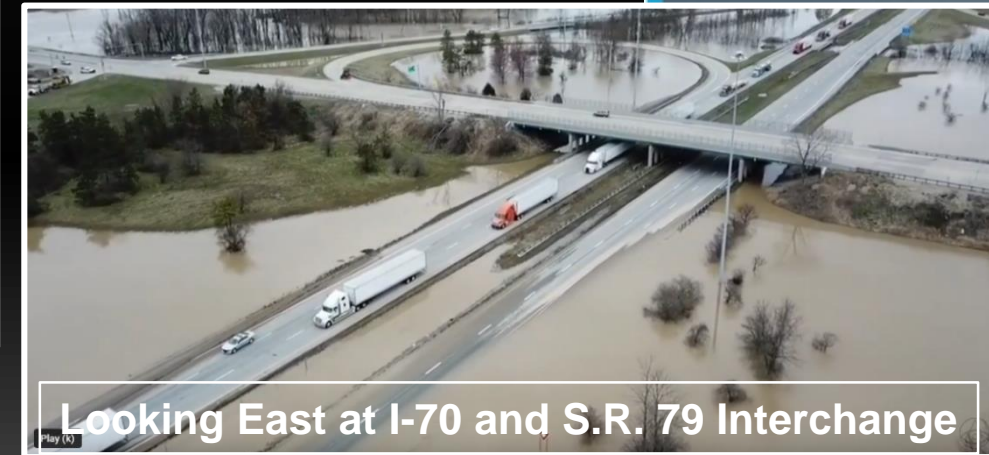
2D Model Calibration from the March 2020 Event:



Images from Drone Video of March 2020 Event:



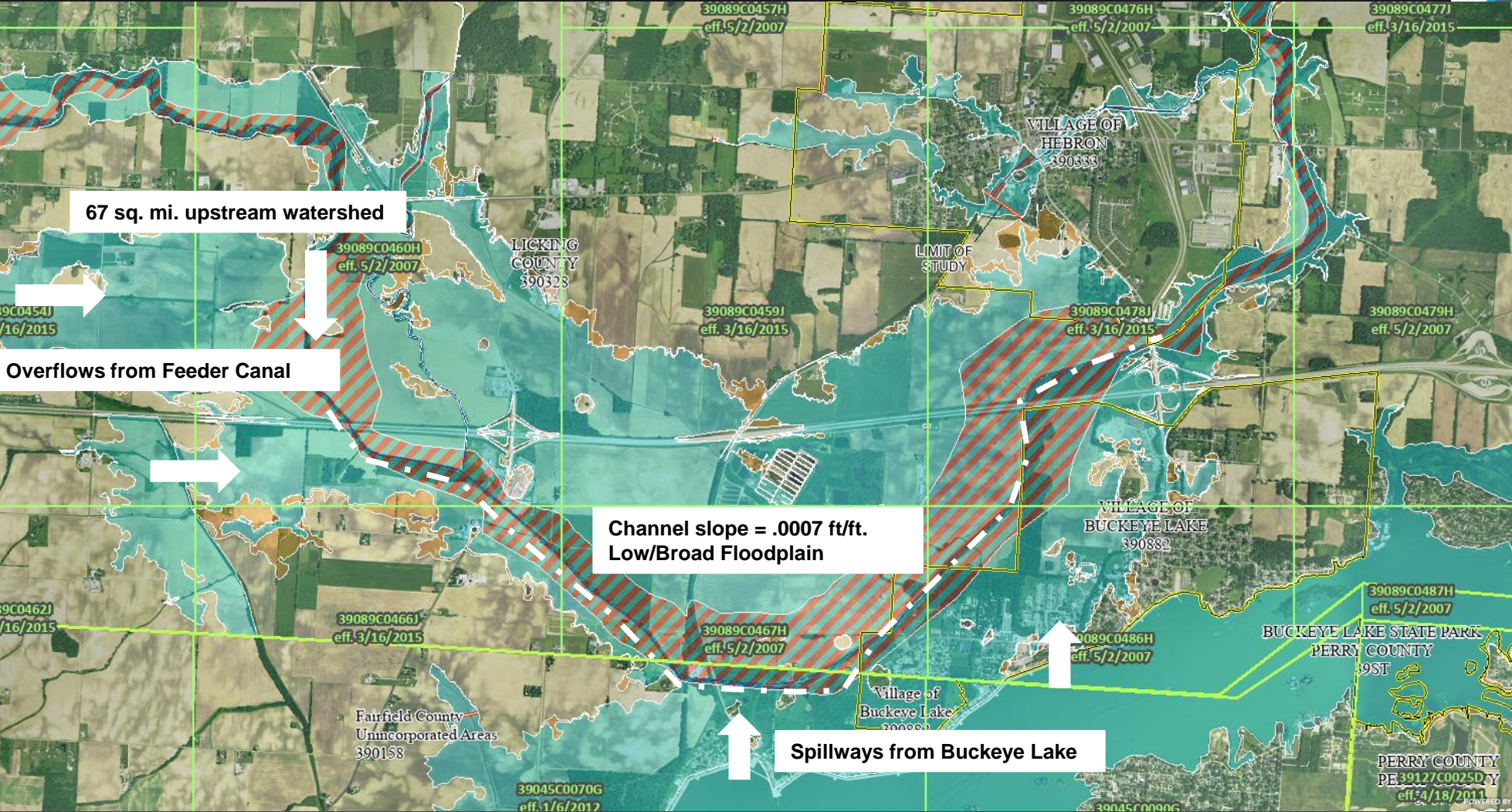
Looking West Along I-70 from near S.R. 79



Looking East at I-70 and S.R. 79 Interchange

FLOOD DAMAGE REDUCTION STUDY

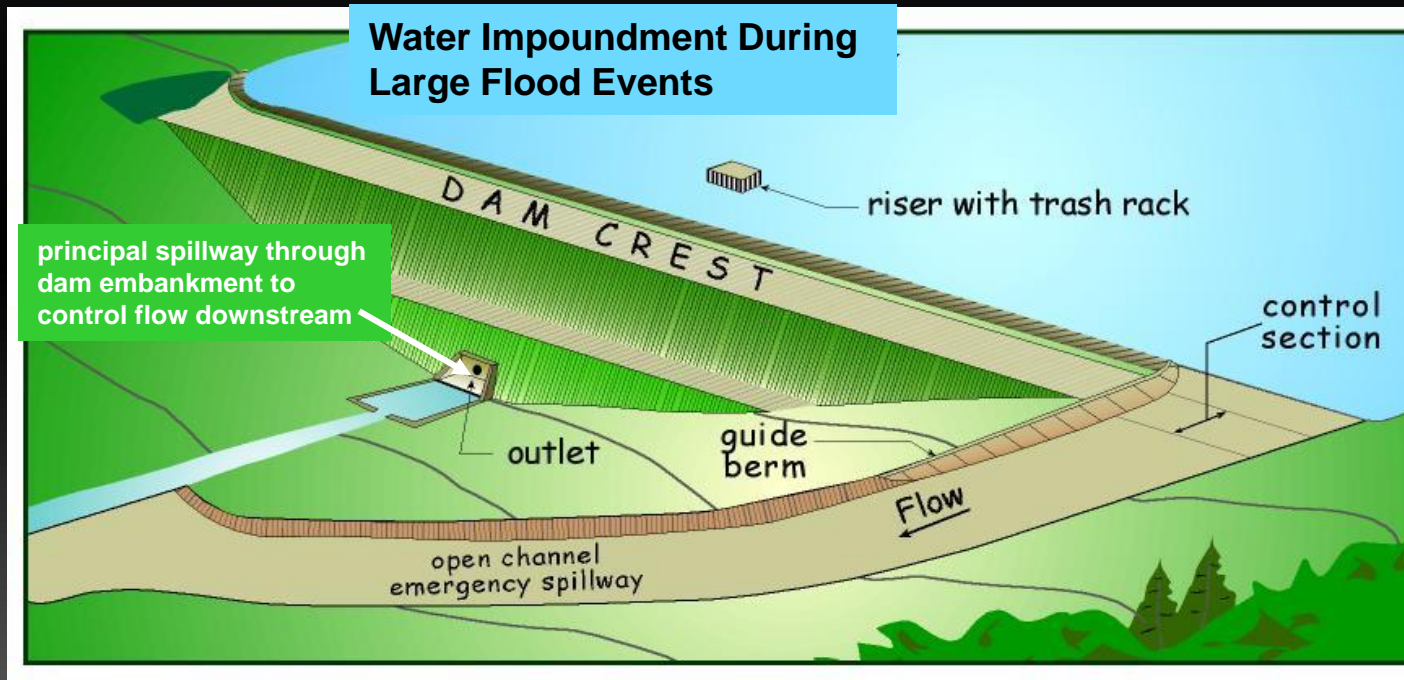
Causes of Flooding:



FLOOD DAMAGE REDUCTION STUDY

Regional Detention Basins (Dry Dams)

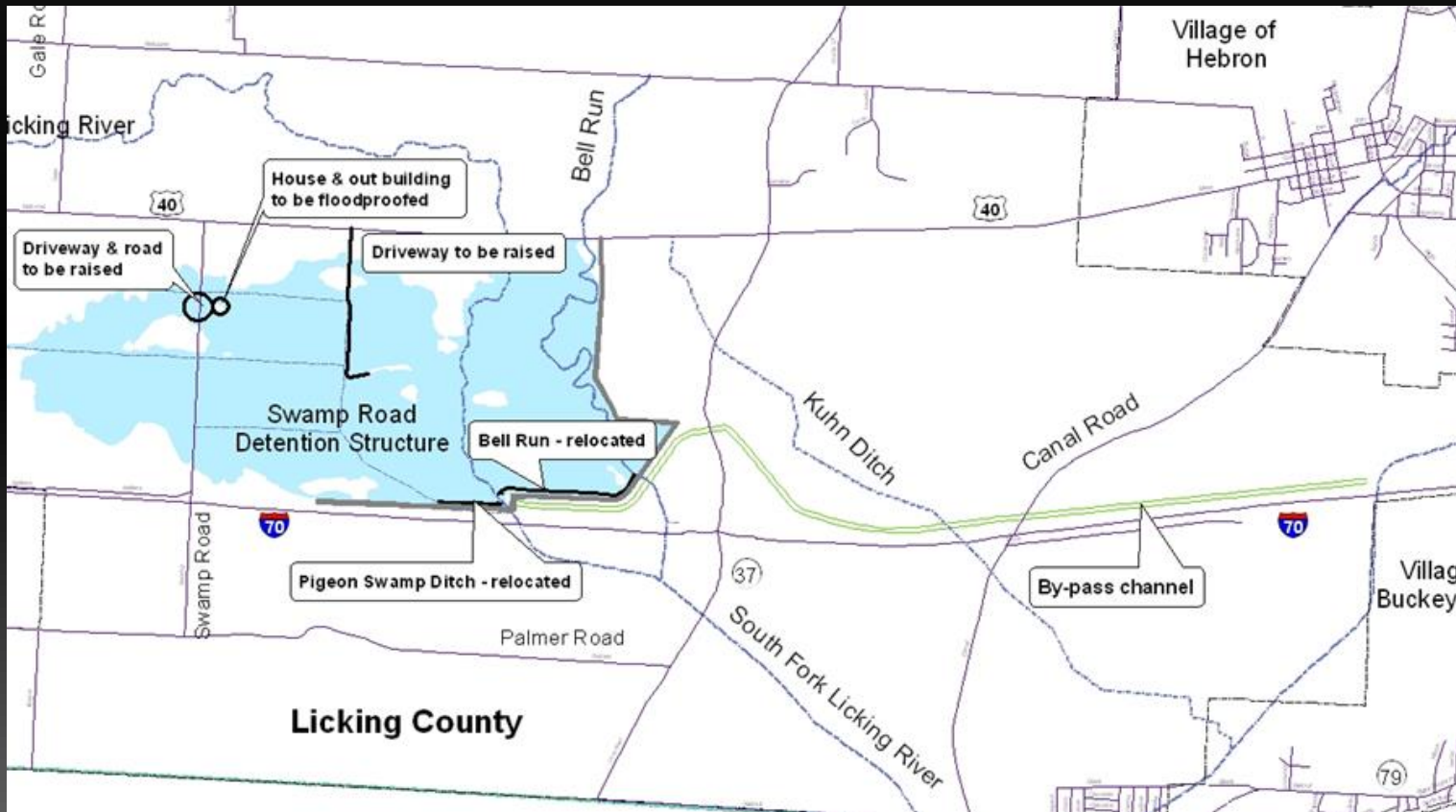
- On-line with existing channels
- Earthen embankment creates storage of flood waters
- No permanent pool (not a lake or reservoir)



FLOOD DAMAGE REDUCTION STUDY

Findings from NRCS Study (2009)

- Existing Soils not Suitable as a Foundation for the Swamp Road Detention Basin Dam Embankment
- Existing Soils Would Adversely Impact Constructability and Cost of the By-pass Channel at I-70



FLOOD DAMAGE REDUCTION STUDY

Findings from ms consultants Flood Mitigation Study (2023)

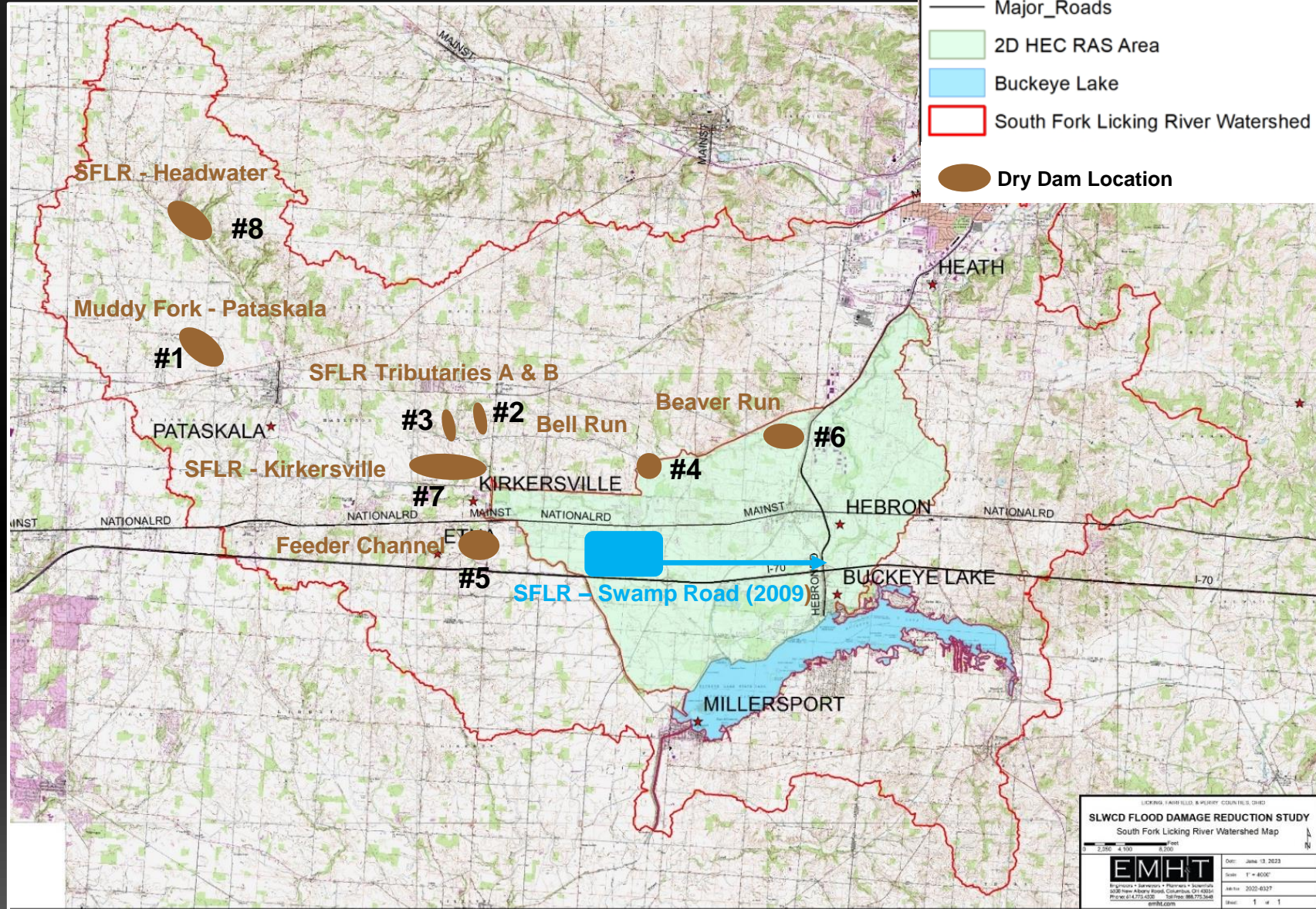
- Isolated bridge and channel improvements resulted in minimal reductions in 100-year flood elevation (less than 0.5 foot.
- Removing the log jam at Hebron by applying a run-around channel had minimal reduction in the 100-year flood elevation.
- Individual detention basins on SFLR tributaries did not reduce downstream flooding.
- Combinations of multiple detention basins would reduce flood elevations (2 feet +/-).

Table 5.2-24: Required Storage for Hydrologic Alternatives

Storage Name	Required Storage (acre-feet)
Storage Alternative 1	2135
Storage Alternative 2	788
Storage Alternative 3	879
Storage Alternative 4	355
Storage Alternative 5	160
Storage Alternative 6	N/A
Storage Alternative 7	4397
Storage Alternative 8	6576
Storage Alternative 9	4315
Storage Alternative 10	6110
Storage Alternative 11	3058

FLOOD DAMAGE REDUCTION STUDY

- Eight Dry Dam Locations Identified
- Eliminated Beaver Run (#6) through Model Iterations
- 7,486 acre-feet of Detention Storage Volume
- Swamp Road Basin Storage Volume (NRCS - 2009) = 5,548 acre feet



FLOOD DAMAGE REDUCTION STUDY

- Dam Safety Classification Indicates Required Emergency Spillway Capacity
- Storage Volume at 100-Year Pool Elevation
- Dry Dam Outlet Sized to Pass the 200-Year Flood Event (Future Conditions)

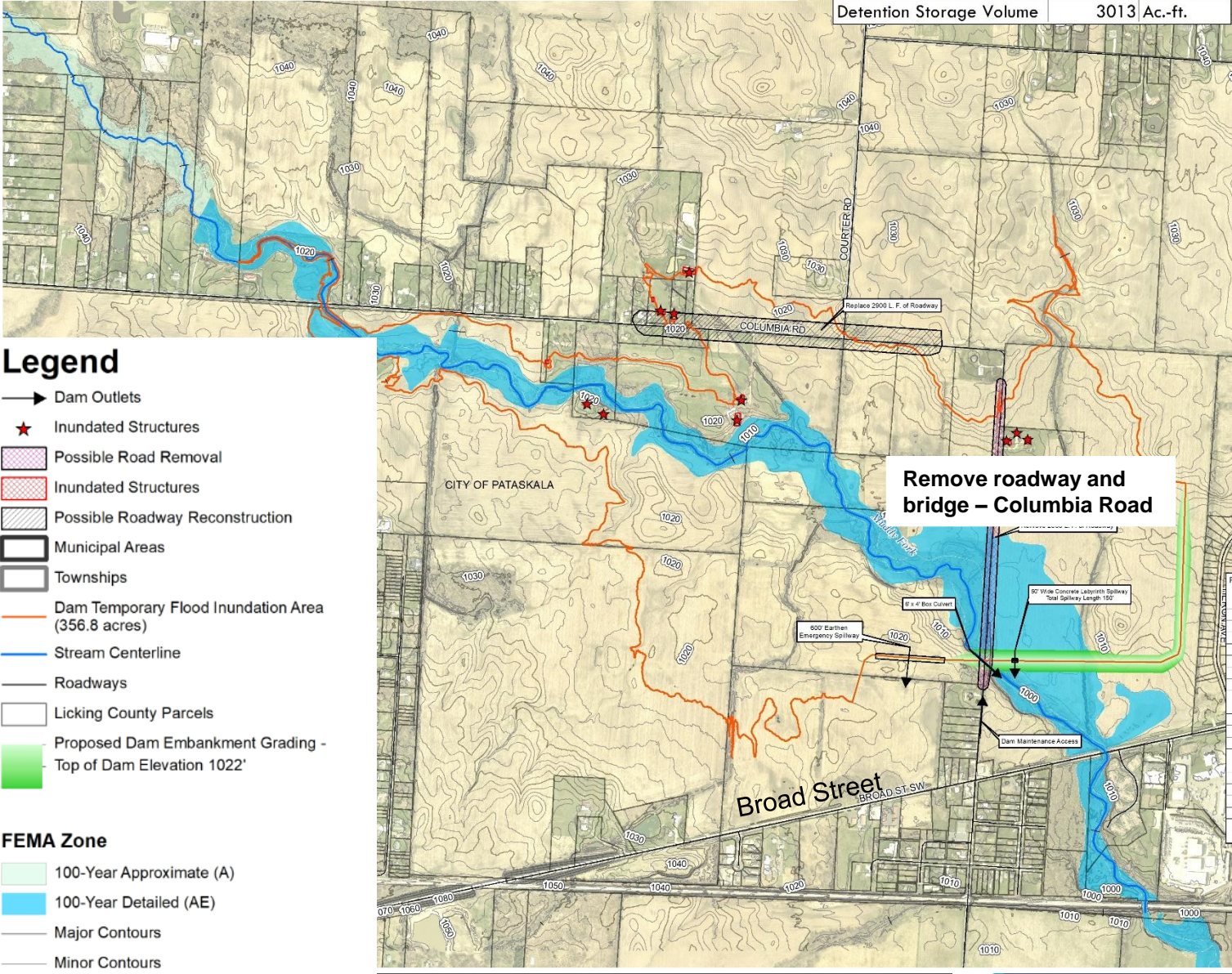
Map Symbol	Dam	Drainage Area (sq. mi.)	Dam Height (ft)	Storage Volume (ac-ft) ²	ODNR Dam Safety Classification		
					Height	Volume	Downstream Hazard
1	Muddy Fork	10.67	22	1,356	4	2	1
2	SFLR – Trib. A	5.22	34	376	3	2	2
3	SFLR – Trib. B	3.17	27	191	3	2	1
4	Bell Run	2.70	19	337	4	2	2
5	Feeder Channel	5.85	14	658	4	2	2
7	SFLR - Kirkersville	47.2	36	4,040	3	1	1
8	SFLR - Headwaters	7.25	23	506	4	2	1

FLOOD DAMAGE REDUCTION STUDY

- Earthen Dams with Principal and Emergency Spillways
- Impacts to Roads and Driveways
- Acquisition of Land and Residential Buildings
- Flowage Easements Encompass the Delineated Temporary Flood Inundation Area

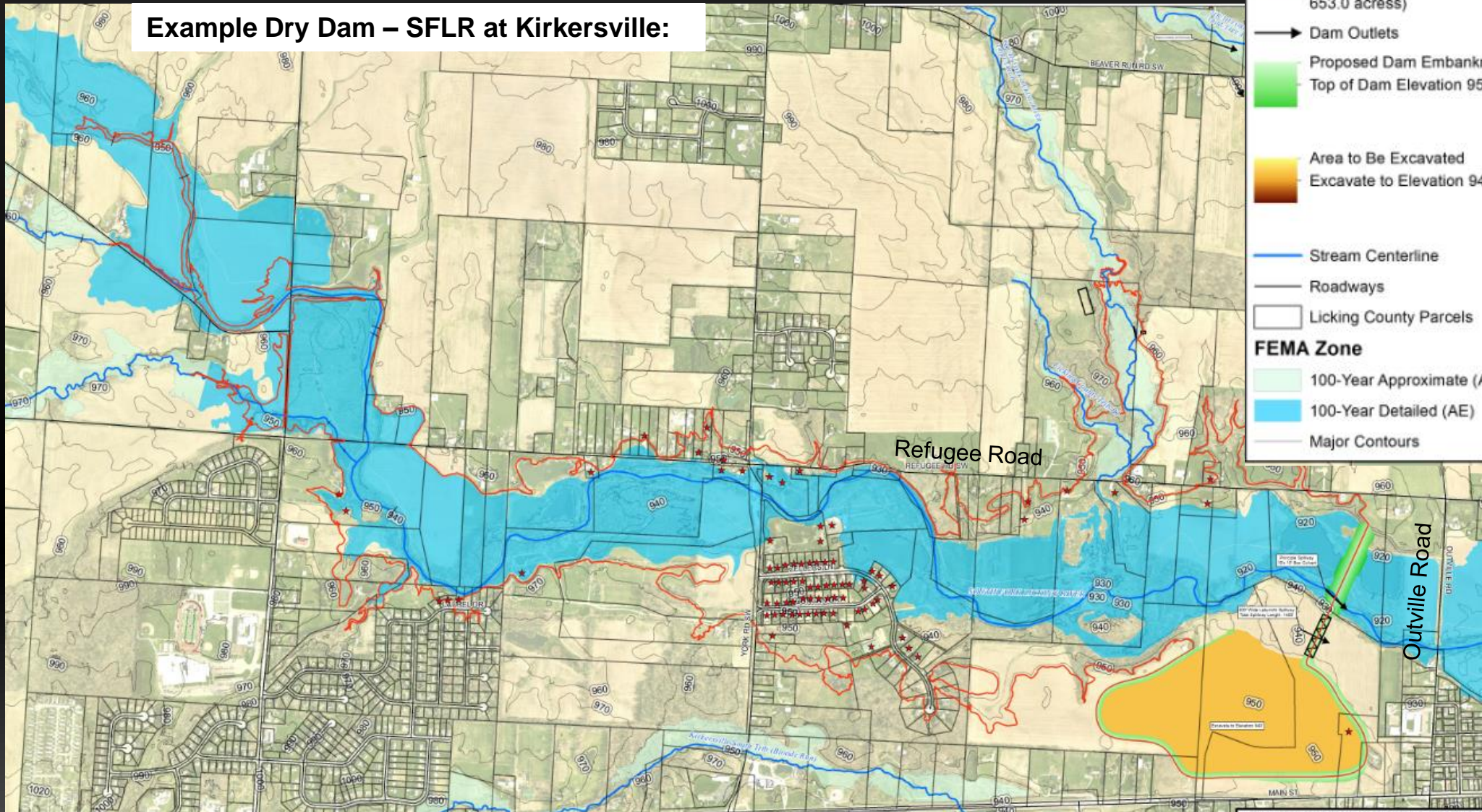
Example Dry Dam – Along Muddy Fork at Pataskala:

Intercepted Watershed	10.67	sq. mi.
Dam Height	22	ft
Detention Storage Volume	3013	Ac.-ft.



FLOOD DAMAGE REDUCTION STUDY

Example Dry Dam – SFLR at Kirkersville:



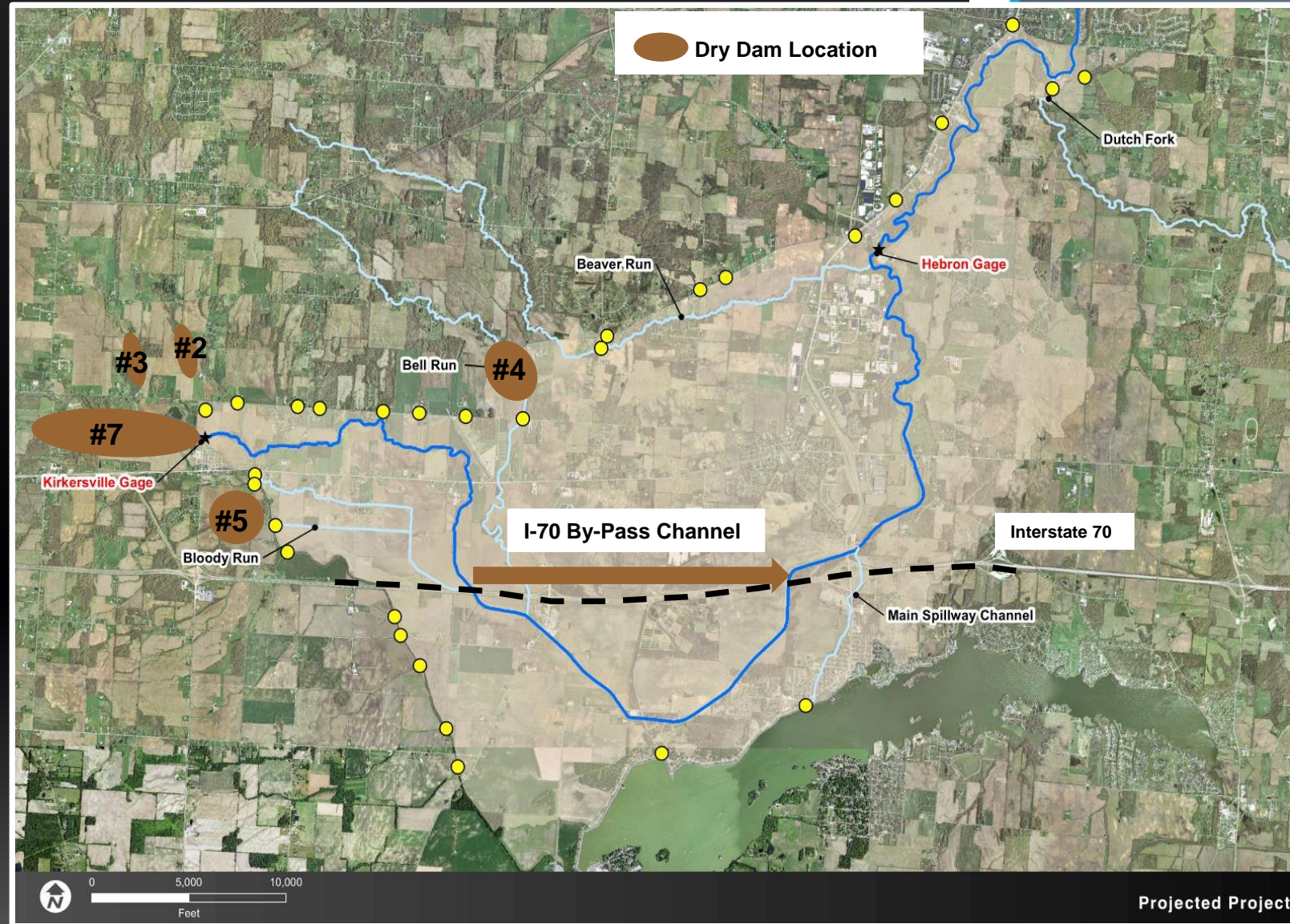
Legend

- ★ Inundated Structures
- Dam Temporary Inundation Area
653.0 acres)
- Dam Outlets
- Proposed Dam Embankment Grading
Top of Dam Elevation 952'
- Area to Be Excavated
Excavate to Elevation 940'
- Stream Centerline
- Roadways
- Licking County Parcels
- FEMA Zone**
- 100-Year Approximate (A)
- 100-Year Detailed (AE)
- Major Contours

FLOOD DAMAGE REDUCTION STUDY

I-70 By-Pass Channel

- Added to 2D HEC-RAS Model with 7 Dry Dams
- Decreased Flooding Downstream of I-70 but Increased Flood Elevations near I-70/ S.R. 79 Interchange
- Construction Logistics Cited in NRCS Study are a Potential Deterrent

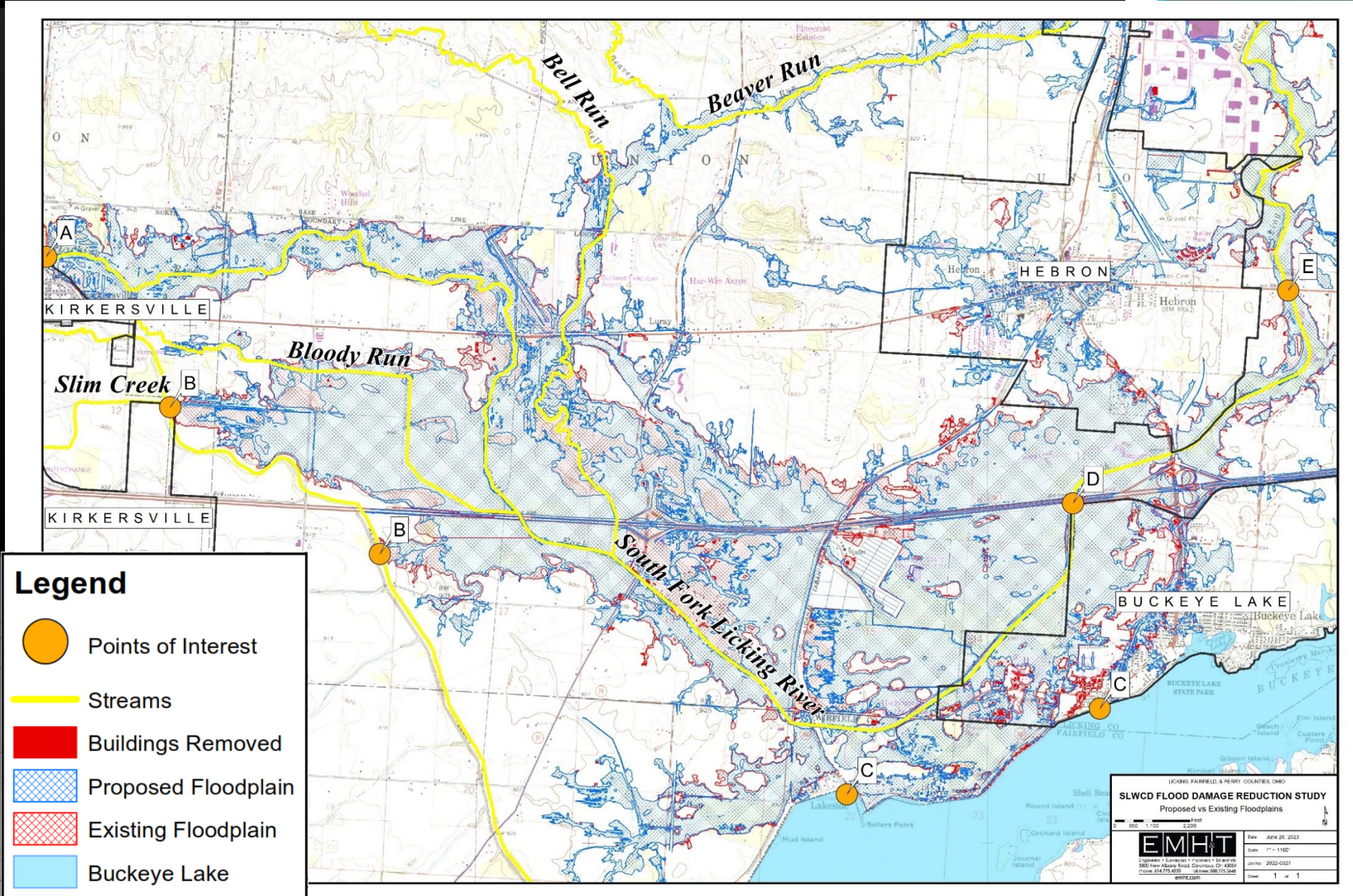


FLOOD DAMAGE REDUCTION STUDY

Model Results (for 7 Dry Dams):

Points of Interest	100-Year Peak Flood Discharge (cfs.)			100-Year Flood Elevation (ft., NAVD 1988)				
	Location	Existing	With Dry Dams	Location	FEMA-Published	Existing	With Dry Dams	Reduction (ft.)
A	SFLR at Kirkersville	13,205	2,404	Outville Road Bridge	925.0	923.4	920.7	-2.7
B	From Bloody Run Weir (to SFLR)	1,883	221	I-70 Bridge Near S.R. 37	897.0	897.0	894.3	-2.7
C	From Buckeye Lake (both spillways)	3,021	3,017	At Sellers Point Spillway Channel to SFLR	888.0	886.1	885.2	-0.9
D	At I-70 near S.R. 79	9,023	4,246	I-70 Bridge	884.5	884.3	882.2	-2.1
E	At Hebron	7,862	5,669	Upstream of U.S. 40	879.0	879.6	877.4	-2.2

FLOOD DAMAGE REDUCTION STUDY



Legend

-  Points of Interest
-  Streams
-  Buildings Removed
-  Proposed Floodplain
-  Existing Floodplain
-  Buckeye Lake

LICKING, FAIRFIELD & PERRY COUNTIES, OHIO

SLWCD FLOOD DAMAGE REDUCTION STUDY
Proposed vs Existing Floodplains

Scale: 1" = 1100'

EMHT

Prepared by: Engineers + Planners + Scientists
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www.emht.com

Date: June 28, 2023
Scale: 1" = 1100'
Day No: 2022-0327
Sheet: 1 of 1

FLOOD DAMAGE REDUCTION STUDY

Benefits Summary (for 7 Dry Dams): \$51.5 Million

- Flood Damage for Land = 25% of Value of Flooded Land
- Flood Damage for Buildings = 50% of Value of Flooded Buildings

Flooded Land (Acres)			Number of Flooded Buildings		
Existing Conditions	Proposed Conditions	Reduction	Existing Conditions	Proposed Conditions	Reduction
6835	5511	1,324	1195	734	461

20% Reduction (Land)

39% Reduction (Buildings)

County	Estimated Building Flood Damages (50%)			Estimated Land Flood Damages (25%)		
	Existing Conditions	Proposed Conditions	Reduced Flood Damages	Existing Conditions	Proposed Conditions	Reduced Flood Damages
Licking County	\$69,820,725.00	\$34,236,300.00	\$ 35,584,425.00	\$ 29,252,388.98	\$ 18,909,907.20	\$ 10,342,481.78
Fairfield County	\$27,171,337.50	\$25,168,867.50	\$ 2,002,470.00	\$ 17,968,000.05	\$ 14,342,006.52	\$ 3,625,993.53
SUB-TOTALS =			\$ 37,586,895.00			\$ 13,968,475.31
TOTAL =	\$51,555,370.31					



FLOOD DAMAGE REDUCTION STUDY

Cost Summary (for 7 Dry Dams):

- Includes Acquisition & Demolition of Existing Homes in the Flowage Easement Area
- Assumes Dam Embankment Material is Excavated from Adjacent Land
- Excludes Cost of Road & Driveway Replacements

Dry Dam	Construction Costs(1)	Pre-Constuction Costs (2)	Land Acquisition Costs (3)	Total Costs
DD-01 (Muddy Fork)	\$14,269,658	\$1,568,093	\$4,270,385	\$20,108,135
DD-02 (SFLR Trib. A)	\$14,897,982	\$1,637,138	\$628,973	\$17,164,093
DD-03 (SFLR Trib. B)	\$4,701,113	\$516,608	\$784,596	\$6,002,316
DD-04 (Bell Run)	\$13,804,567	\$1,516,981	\$724,463	\$16,046,011
DD-05 (Feeder Channel)	\$21,266,419	\$2,336,975	\$3,607,399	\$27,210,792
DD-07 (SFLR @ Kirkersville)	\$66,009,038	\$7,253,738	\$56,712,702	\$129,975,477
DD-08 (SFLR Headwaters)	\$11,526,639	\$1,266,668	\$7,838,261	\$20,631,567

(1) - Includes 30% Contingency + Construction Management

(2) - Engineering, Design, Permitting

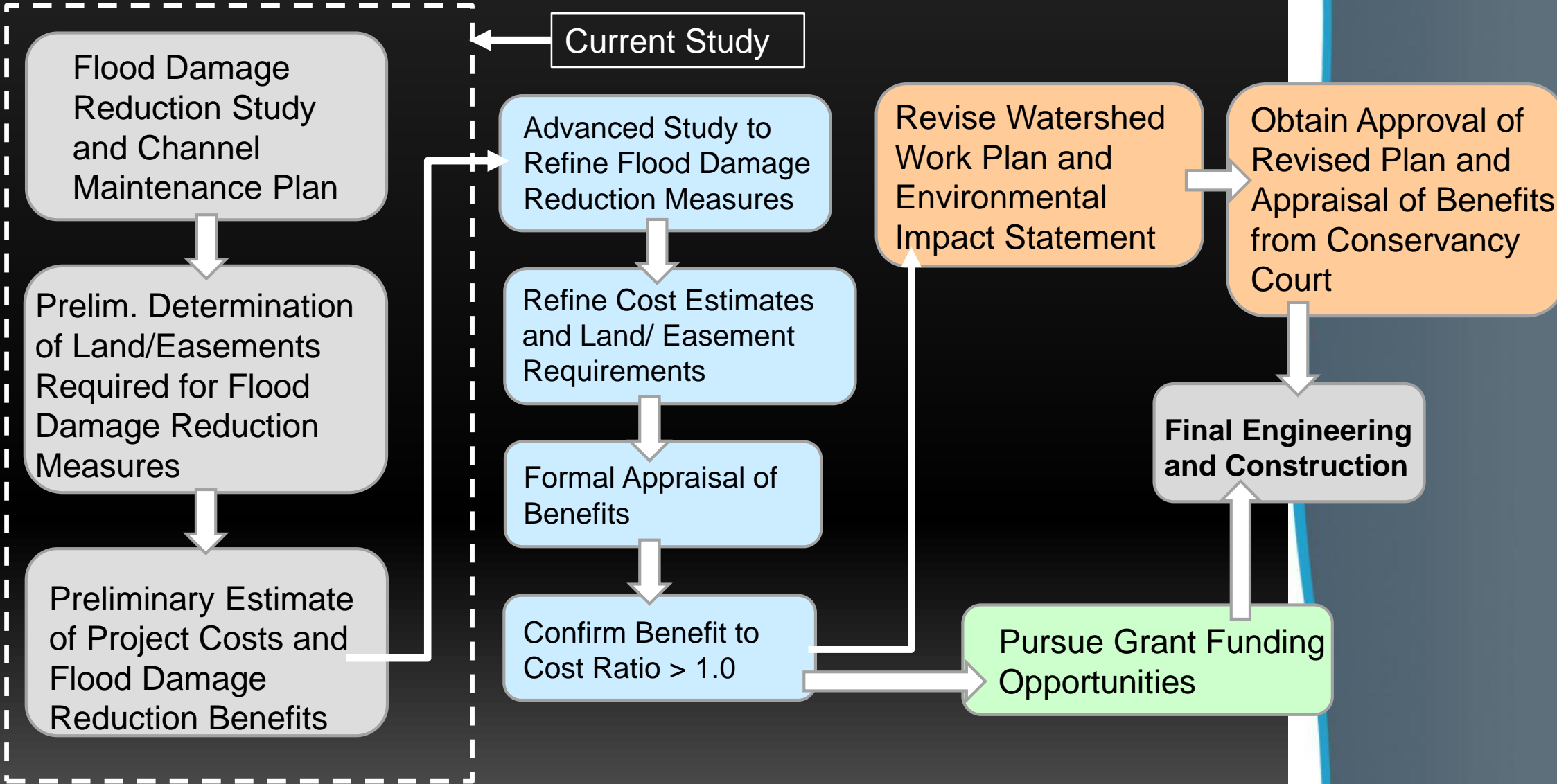
(3) - Fee Simple Acquisition + Easements

FLOOD DAMAGE REDUCTION STUDY

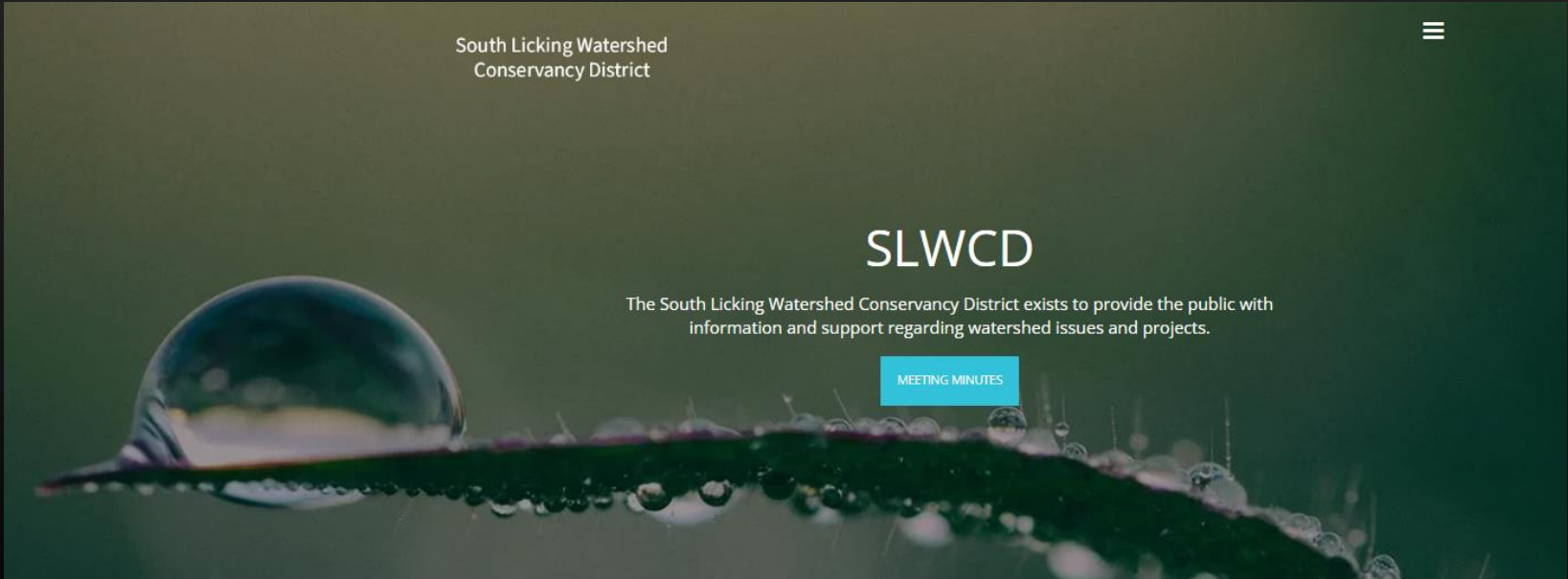
- Individual and Combinations of Dry Dams on SFLR Tributaries do not Achieve a Reduction in Downstream Flood Hazards
- The Addition of the SFLR @ Kirkersville Dry Dam Achieves the Reduction in 100-Year Flood Elevations Exceeding 2.0 feet
- Optimize to Eliminate some of the Dry Dams with Smaller Drainage Areas

Dry Dam	Total Costs	Drainage Area (mi ²)	Storage Volume (ac-ft.) at spillway crest	% Flow Reduction (100- year Flood Event)
DD-01 (Muddy Fork)	\$20,108,135	10.70	1,356	83%
DD-02 (SFLR Trib. A)	\$17,164,093	5.20	376	60%
DD-03 (SFLR Trib. B)	\$6,002,316	3.20	191	47%
DD-04 (Bell Run)	\$16,046,011	2.70	337	81%
DD-05 (Feeder Channel)	\$27,210,792	5.90	658	72%
DD-07 (SFLR @ Kirkersville)	\$129,975,477	47.20	4,040	74%
DD-08 (SFLR Headwaters)	\$20,631,567	7.30	506	55%

THE PROCESS



QUESTIONS



The South Licking Watershed Conservancy District is a political subdivision under state of Ohio law. Conservancy districts form at the initiative of local landowners or communities for various purposes including, solving water management problems, usually flooding and conserving and developing water supplies.

Watershed Stakeholder Meetings Scheduled

The South Licking Watershed Conservancy District (SLWCD) invites property owners and other interested parties within the South Fork Licking River watershed to learn about the current efforts to complete a Flood Damage Reduction Planning Study.

www.slwcd.org

