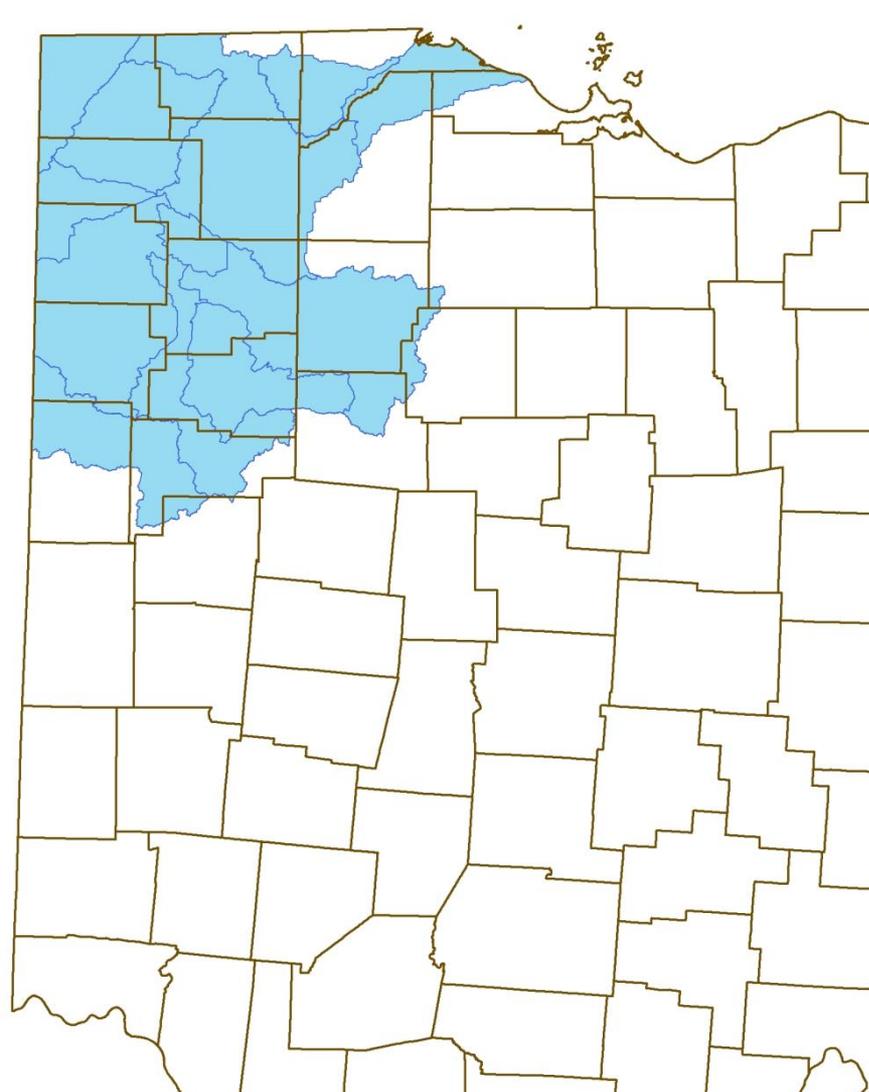


# Hancock County Flood Risk Reduction Program Update

May 24, 2017



# Maumee Watershed Conservancy District

- Represents 15 Counties in Northwest Ohio
- Political subdivision of the State
- Oversees water management, including flood risk reduction
- Established under Ohio Revised Code Chapter 6101

# Agenda

Project Overview

Stantec's Work

- Gap Analysis
- Project Refinements
- Project Alternatives
- Benefits & Impacts Summary
- Opinions of Probable Cost
- Stantec's Recommendation

Path Forward

Questions



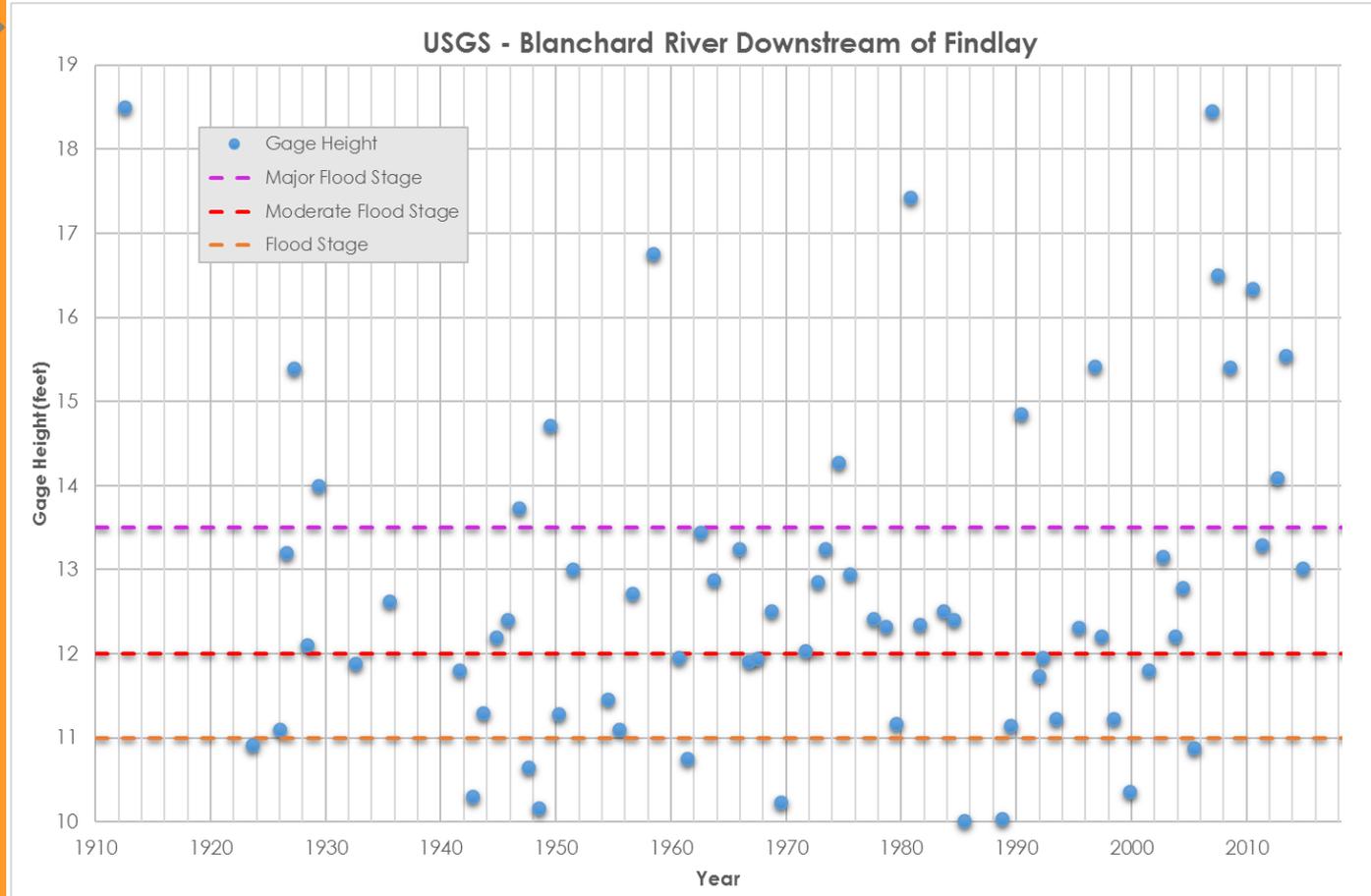
Blanchard St. Bridge

# Project Overview



# Our Challenge

Larger floods have occurred more frequently



# August 2015 Recommended Plan

## USACE Buffalo District



# Western Diversion of Eagle Creek

## USACE Opinion of Probable Cost

Eagle Creek Flows

25-year 3,000 cfs

50-year 3,500 cfs

100-year 4,050 cfs

500-year 5,400 cfs

25-Year Channel Sizing Estimates		
01	Lands & Damages	\$ 6,580,000
02	Relocations	\$ 14,590,000
06	Fish & Wildlife	\$ 1,758,000
08	Roads, Railroads Bridges	\$ 2,657,000
09	Channels and Canals	\$ 34,587,000
15	Floodway Control & Diversion Structure	\$ 8,708,000
18	Cultural Resource Preservation	\$ 692,000
30	Planning, Engineering & Design	\$ 8,182,000
31	Construction Management	\$ 3,149,000
	First Costs	\$ 80,903,000
	Interest during construction	\$ 5,671,000
	<b>Total Cost</b>	<b>\$ 86,574,000</b>

**About \$20 million allocated for new bridges and roads**  
**Includes 27.5% Contingency**

## Preliminary Scope

### **Complete**

- Analyze the USACE Feasibility Report to understand their findings and recommend changes to the Corps' Plan
- Perform surveys and geotechnical explorations
- Determine preferred channel alignment

### ***Not yet Authorized***

- *Prepare property acquisition plan and legal descriptions*
- *Prepare final design and construction plans*
- *Prepare necessary documents to secure regulatory permits*

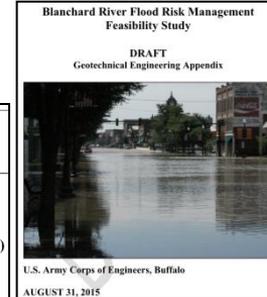
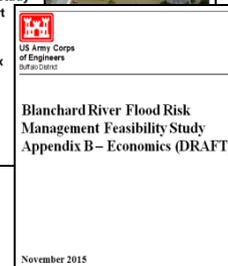
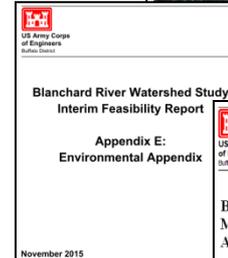
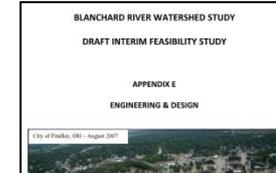
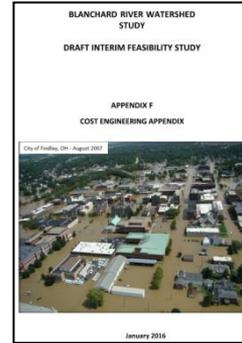
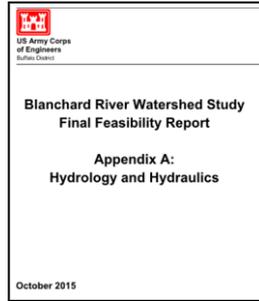
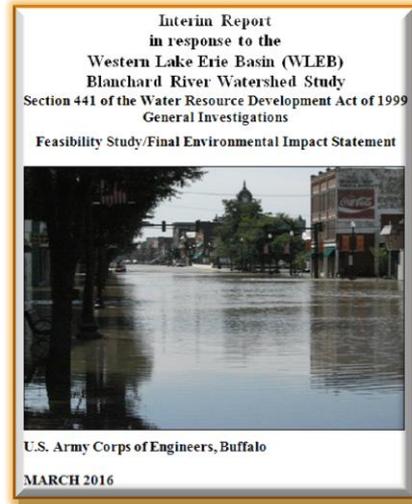
# Gap Analysis

## Data Reviewed

- Reports
- Digital Files: USACE
- Public Data: USGS, ODOT, others

## Project Components

- Hydrology & Hydraulics
- Geotechnical
- Transportation
- Cost
- Economics
- Design
- Environmental



## 4 Key Gaps

### Design and Engineering

Federally driven project objective

### Cost and Economics

BCR less than 1.0

### Hydrology & Hydraulics (H&H)

Risk based evaluation needed

Conflicting results between USACE  
model and report

Revised  
Project  
Objective

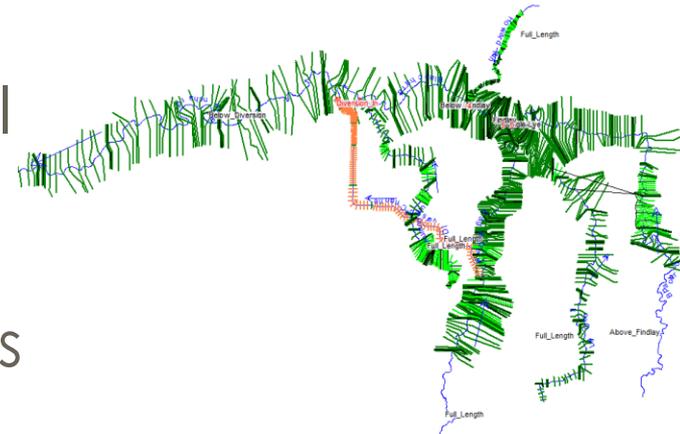
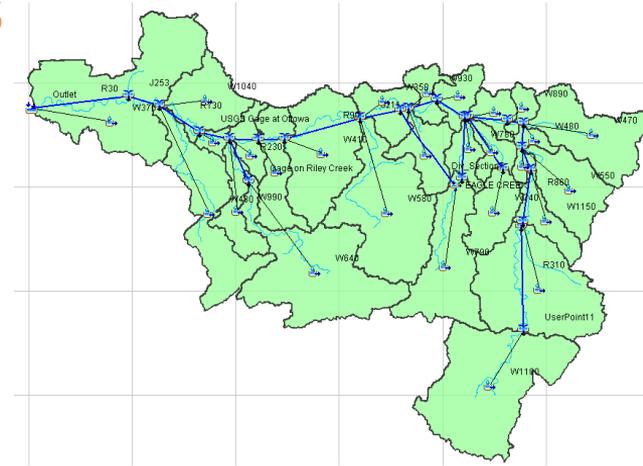
Lower the 1% ACE event water surface elevation at Main Street and other major egress routes to permit passage of emergency response vehicles (6"-9" maximum water depth)

## Costs and Economics (BCR)

- Additional (non-federal) benefits include:
  - Road closures
  - Business losses
  - Lost income/wages
  - Temporary relocation/reoccupation costs
  - Agricultural benefits and losses
  - Others
    - Utility damages, debris removal costs, location benefits, intensification benefits, employment benefits.

## Hydrology & Hydraulics

- 15 Alternatives
- Hydrologic & Hydraulic Models
- Methodology & Model Results
- Reviewed Historical Storms and Additional Hypothetical Events



Concept  
Design Analysis

# Diversion Channel Refinement

Size  
Alignment  
Profile  
Inlet Location

## August 2015 Recommended Plan USACE Buffalo District



## Preliminary Recommendations

- **This Alternative is Feasible**
- Relocate entrance and reduce channel length
- At-grade intersection with Aurand Run
- Refine profile
  - Reduce overall excavation & waste
  - Reduce rock excavation
- Update Capacity from 25-year to 100-year flows



Why  
Alternatives?

## Remaining Problems to Solve

Conflicting Model/Reporting Results

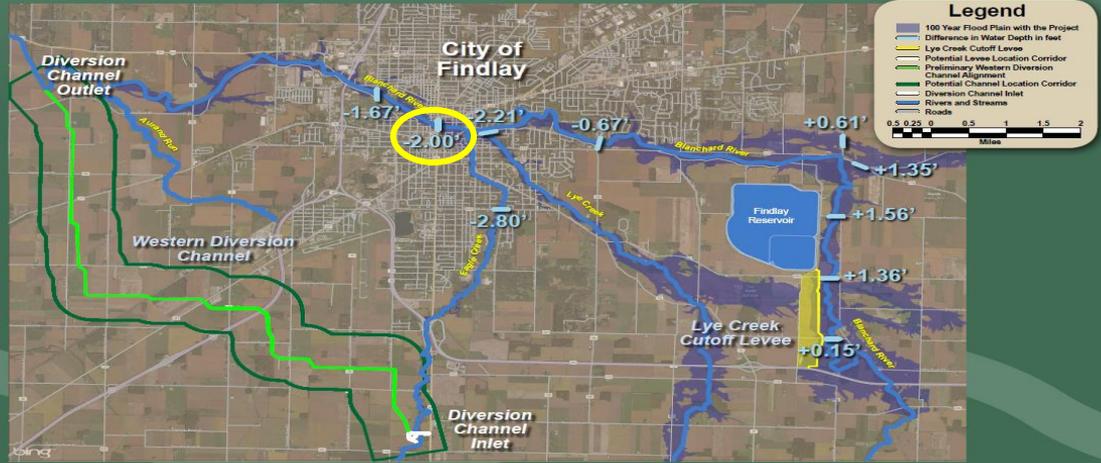
Residual Risk of Project

Double-Peaked Hydrograph

# Conflicting Results

April 2015

## 100 Year Storm Event with Proposed Project



**US Army Corps of Engineers**  
Buffalo District  
**BUILDING STRONG**

The 100 year flood plain is based on the results of the U.S. Army Corps of Engineers (USACE) hydrology and hydraulics model. USACE will coordinate with the Federal Emergency Management Agency (FEMA) and submit the necessary documentation for map revisions for modifications to existing flood insurance maps.

August 2015



## 100 Year Flood Plain:

Existing

VS.

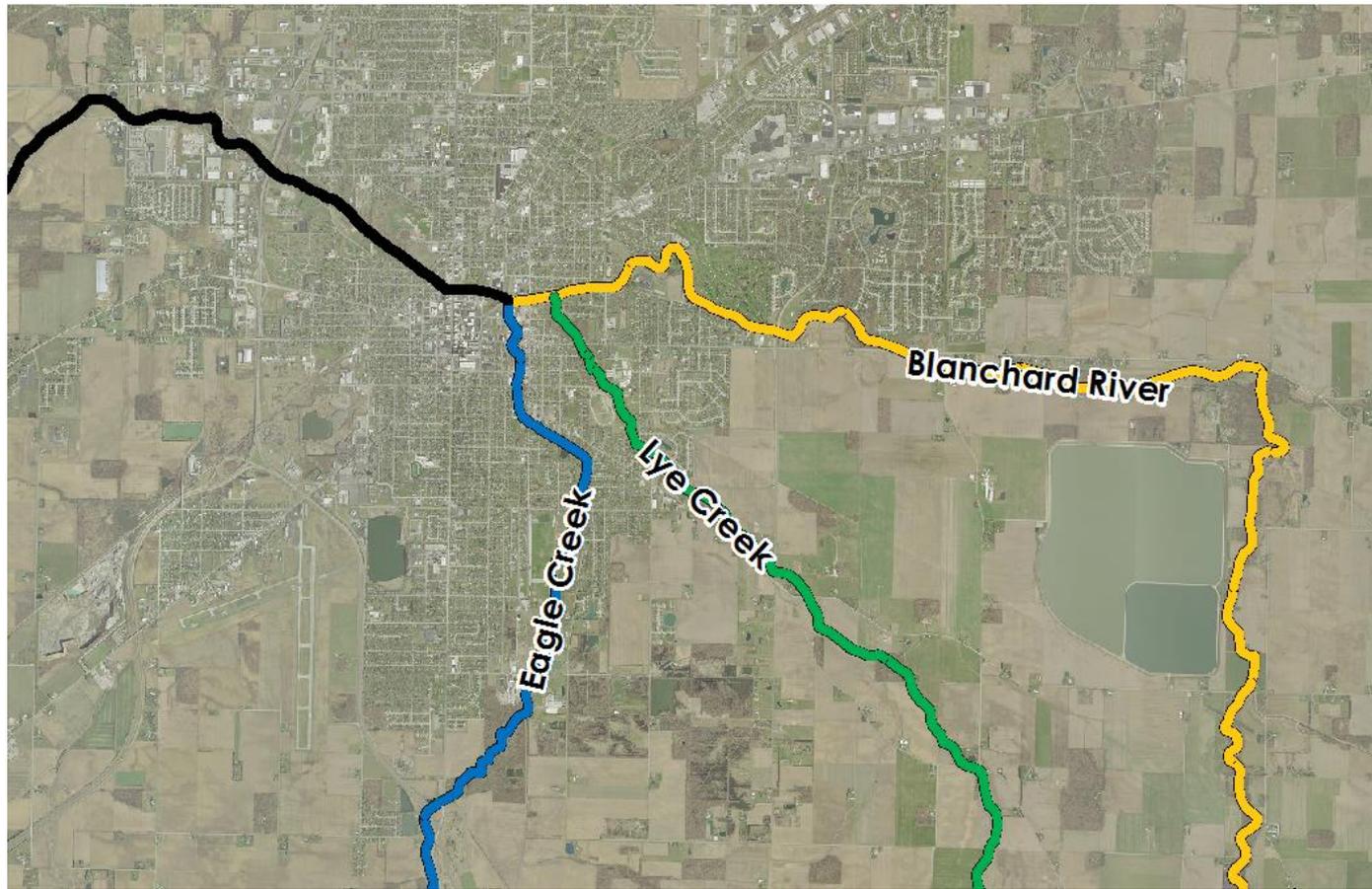
August 2015

Recommended Plan



Where does  
the water  
come from?

# Blanchard River – Eagle Creek – Lye Creek

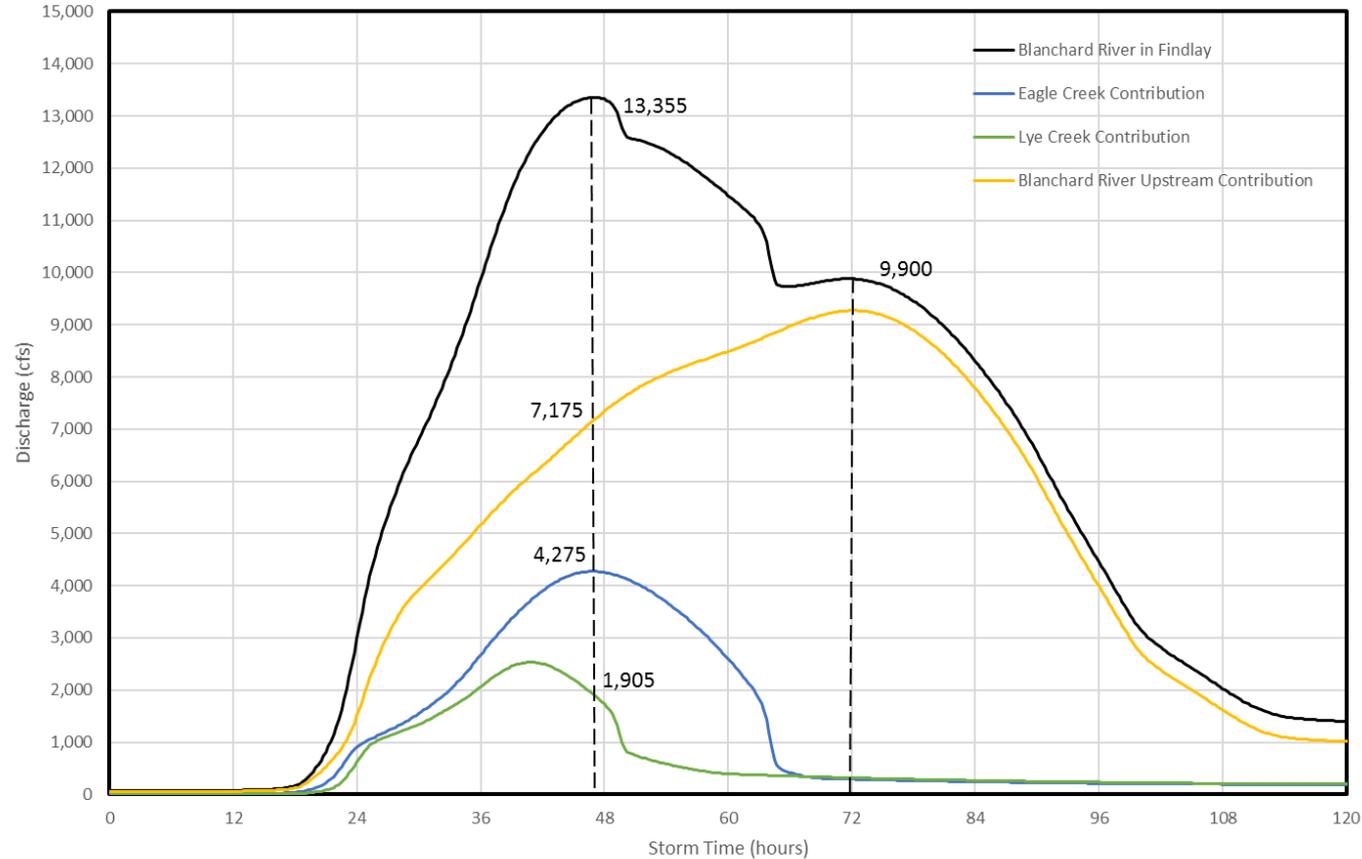


1% ACE

USACE HEC-HMS

- Existing Conditions

HEC-HMS -- Blanchard River in Findlay  
Existing Conditions  
100Yr, 24Hr = 5.26" SCS Type II



1% ACE

USACE HEC-HMS

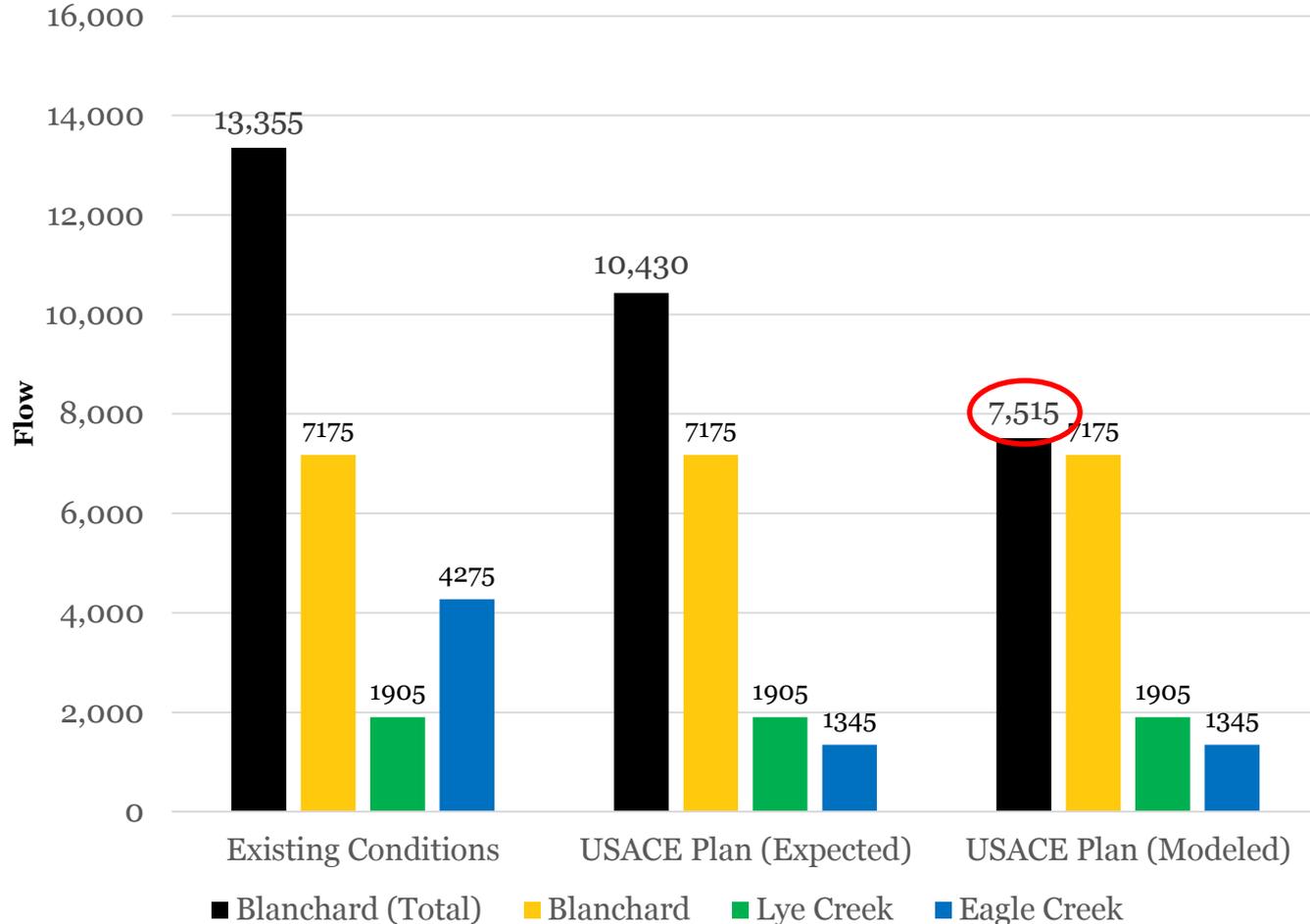
- Existing Conditions
- USACE Plan (Expected)

USACE HEC-RAS

- USACE Plan (Modeled)

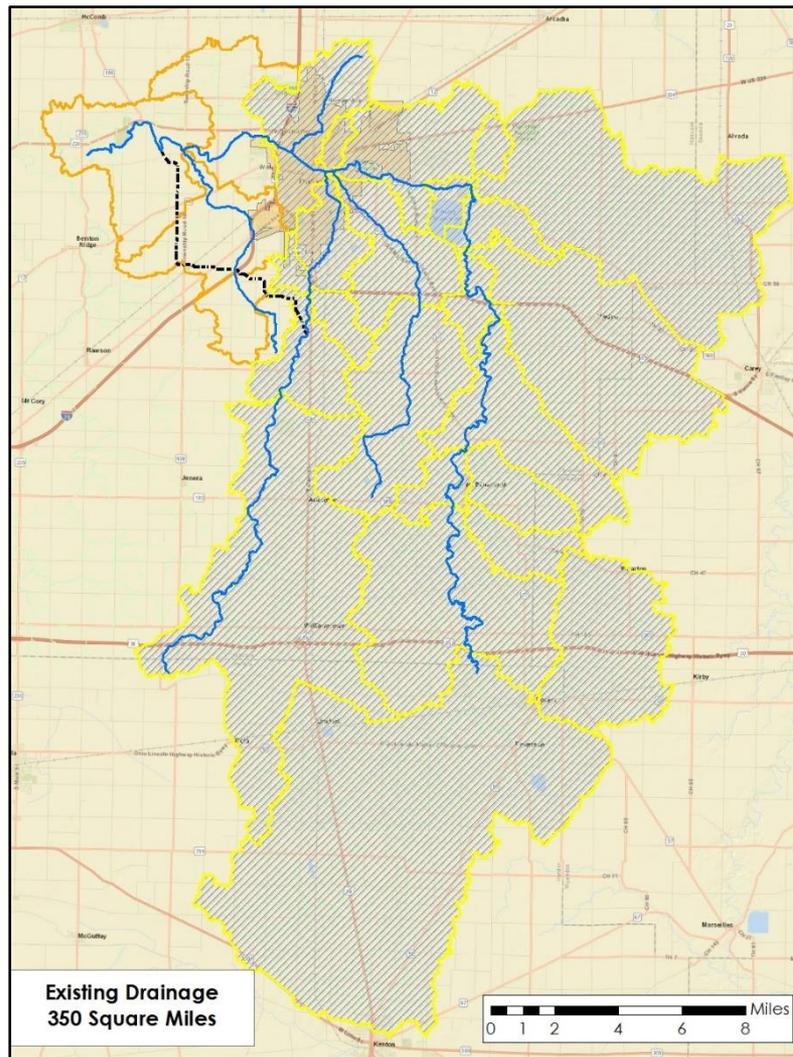
“The 4.6’ drop in WSE in downtown Findlay is based on a model run where the flow optimization feature did not properly converge on an internally consistent result.” - USACE

# USACE Model Flow Error



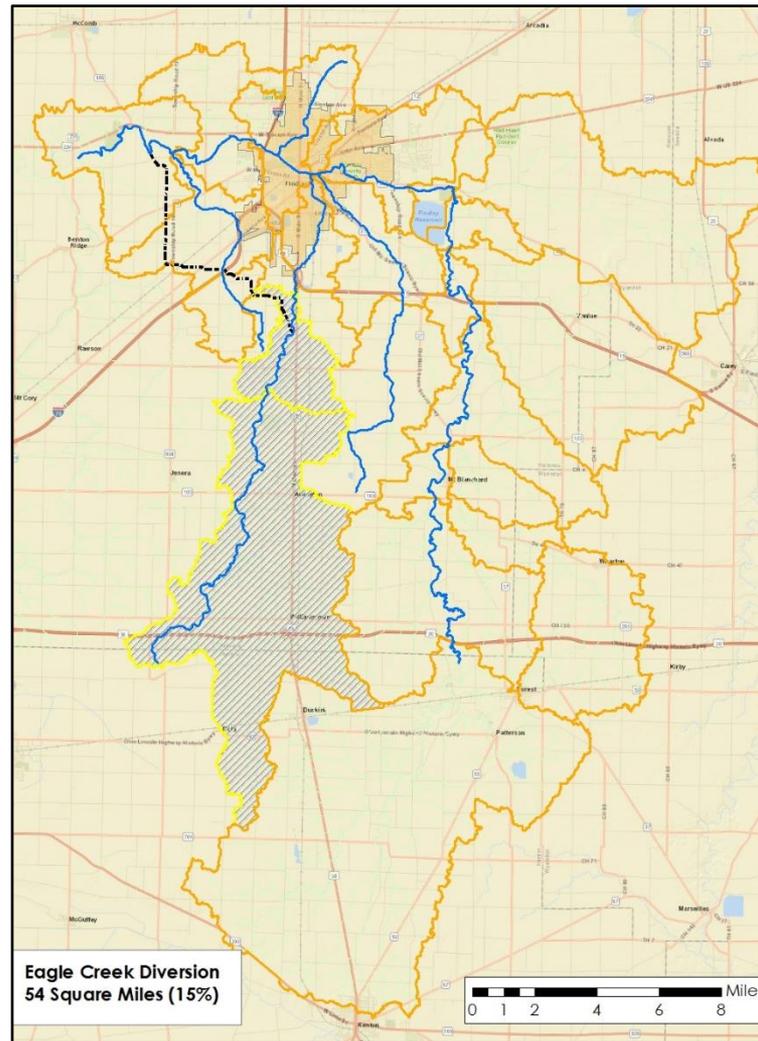
# Residual Risk

## The Blanchard River Watershed



# Residual Risk

15% of  
Watershed  
Influenced







# Alternatives

Concept  
Designs  
Reviewed

# Hydraulic Improvements

Remove Inline  
Riffles/Dams

Floodplain  
Bench Widening

Bridge  
Modifications



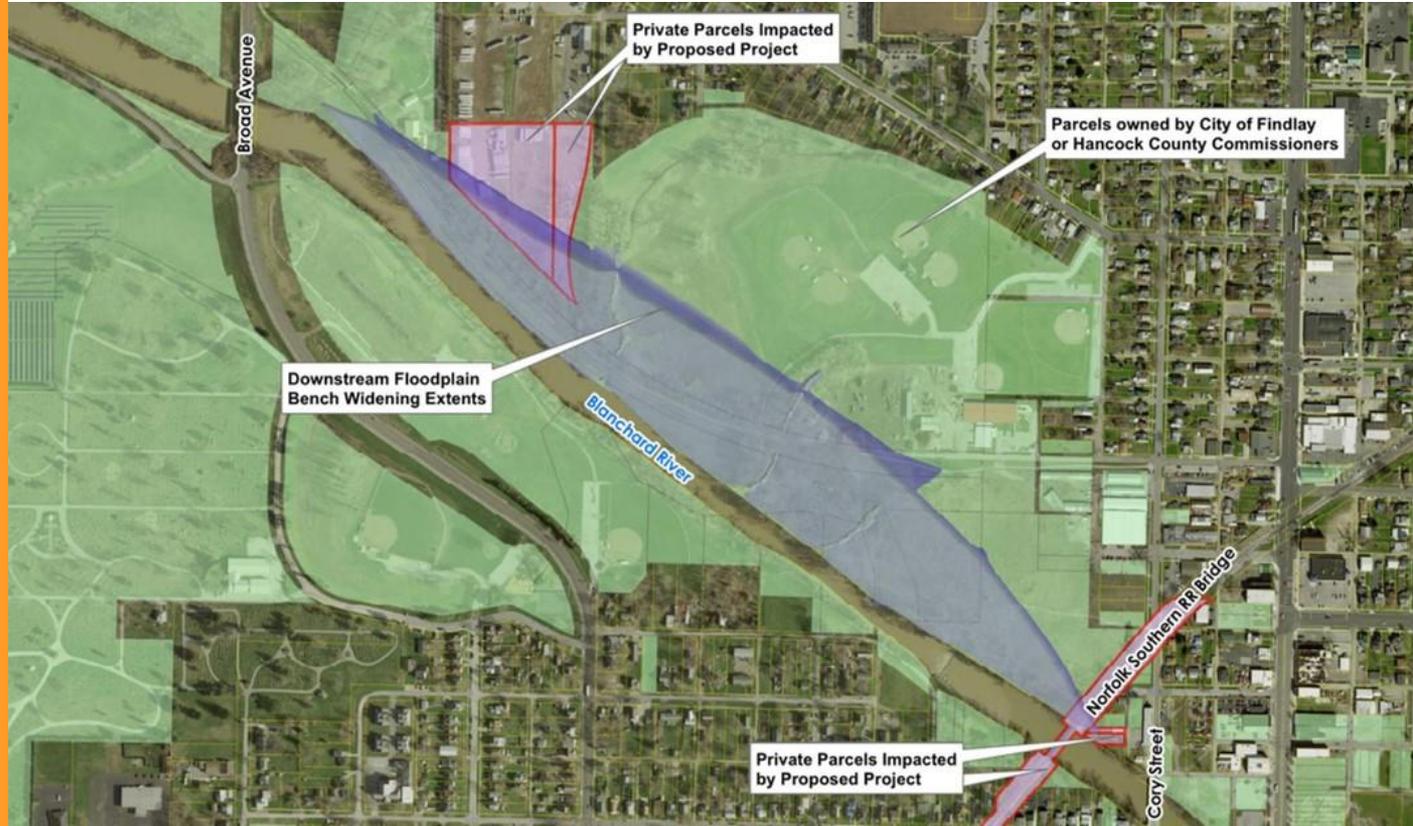
Concept  
Designs  
Reviewed

# Hydraulic Improvements

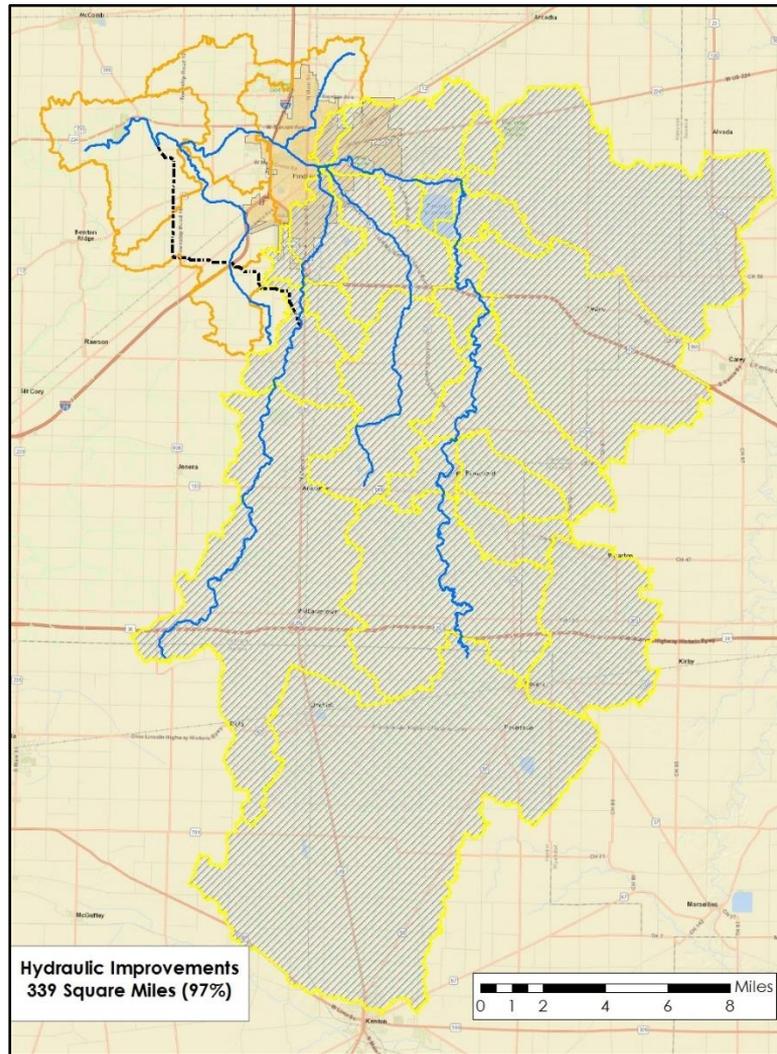
Remove Inline  
Riffles/Dams

Floodplain  
Bench Widening

Bridge  
Modifications



# Percent of Watershed Influenced



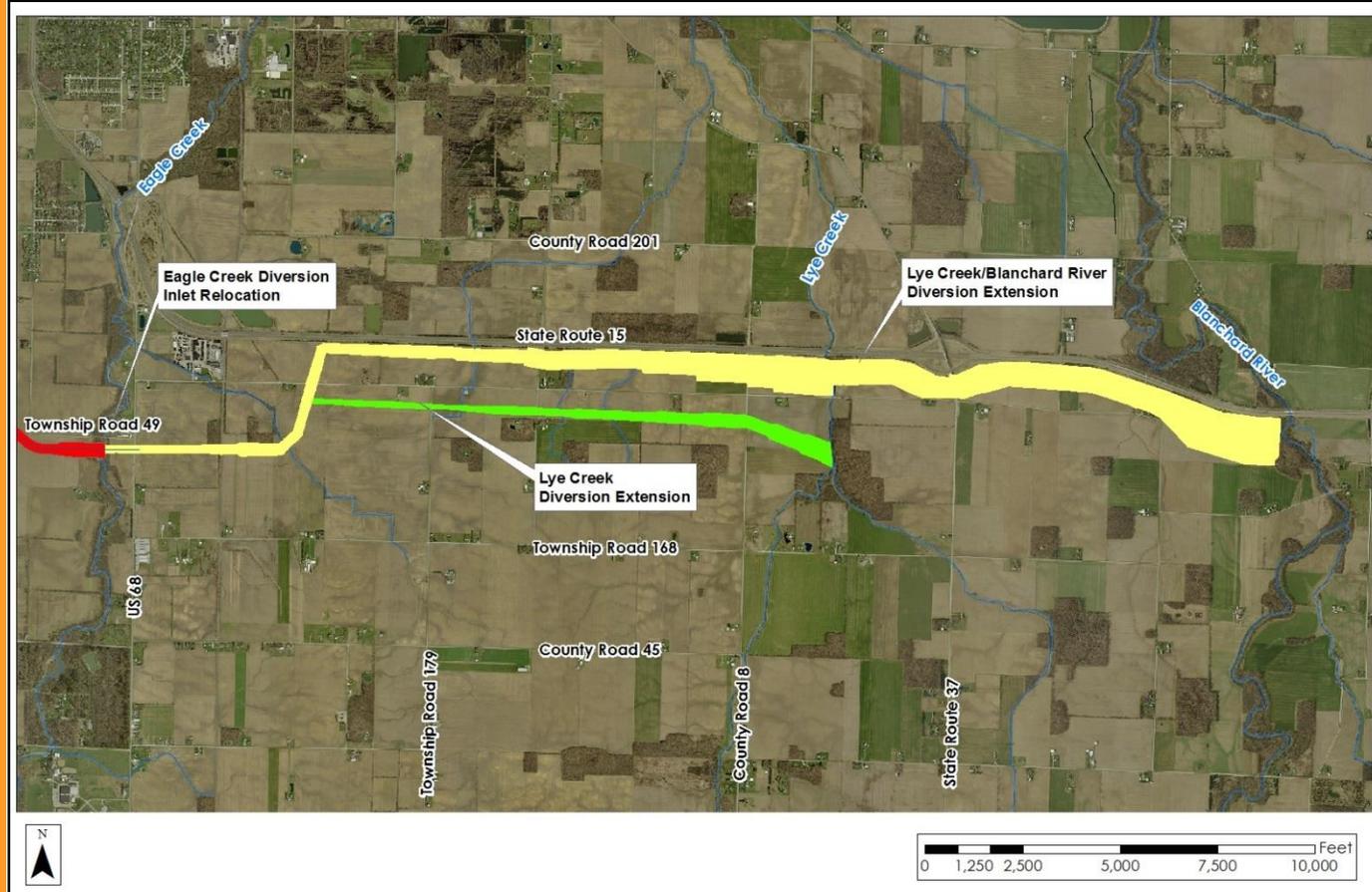
Diversion  
Extension

# Eagle to Lye to Blanchard

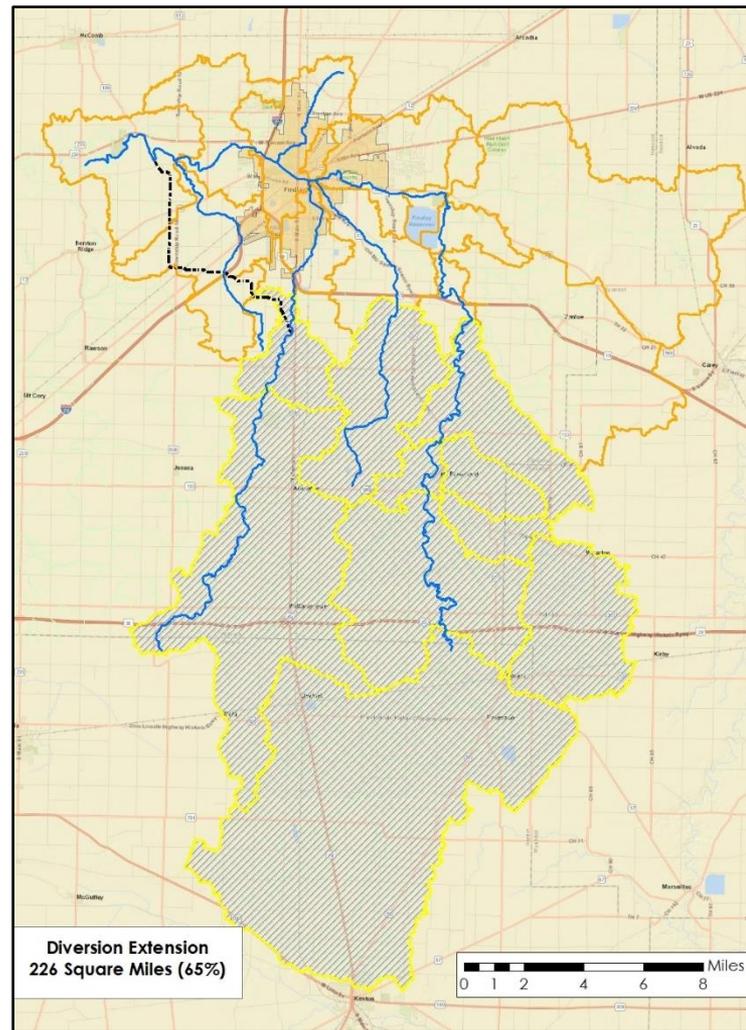
Up to 1,200 ft wide

Between 2 and  
7 ft deep

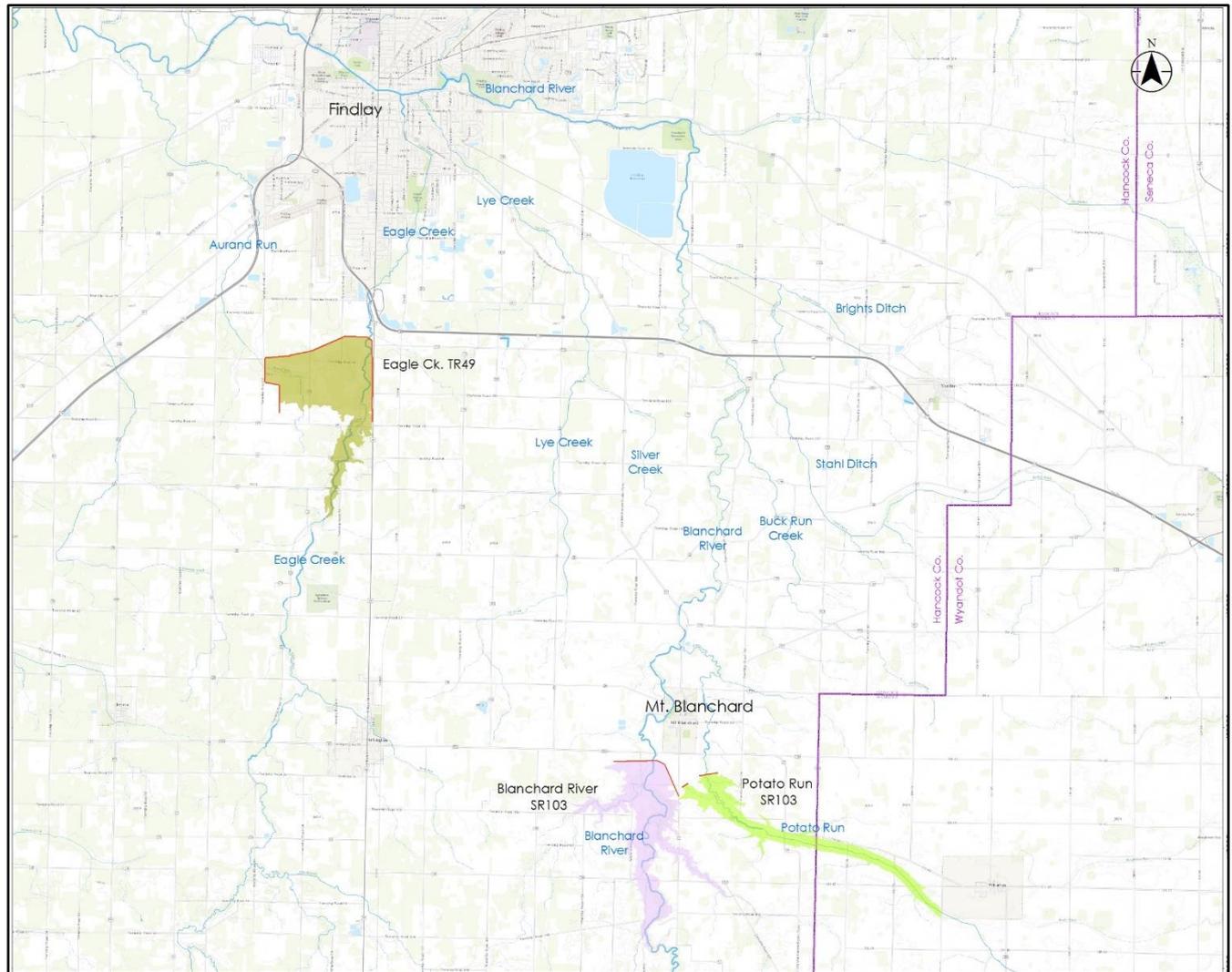
14 New Bridges  
and 5 Cul-de-sacs



# Percent of Watershed Influenced

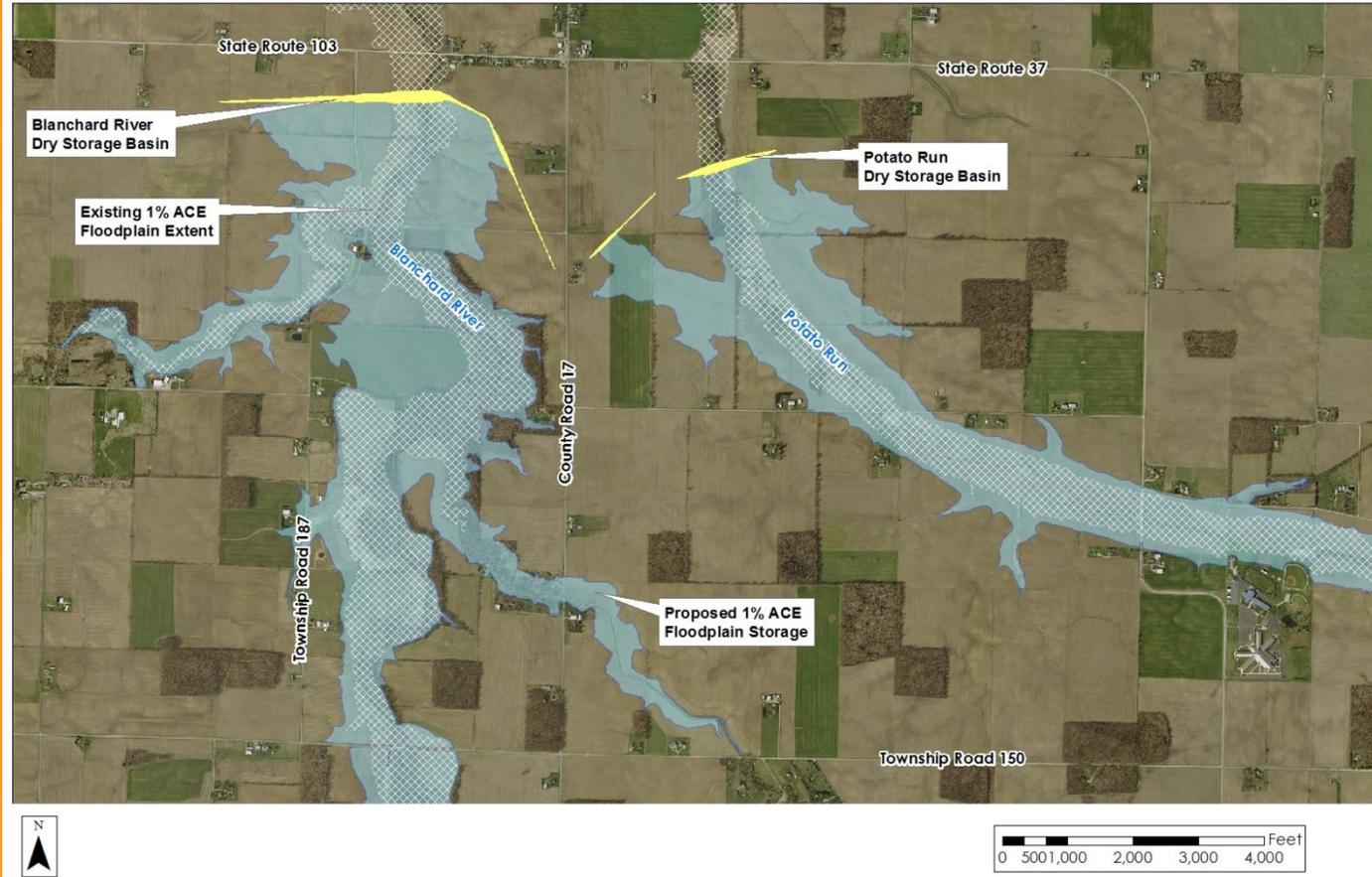


# Storage



# Storage

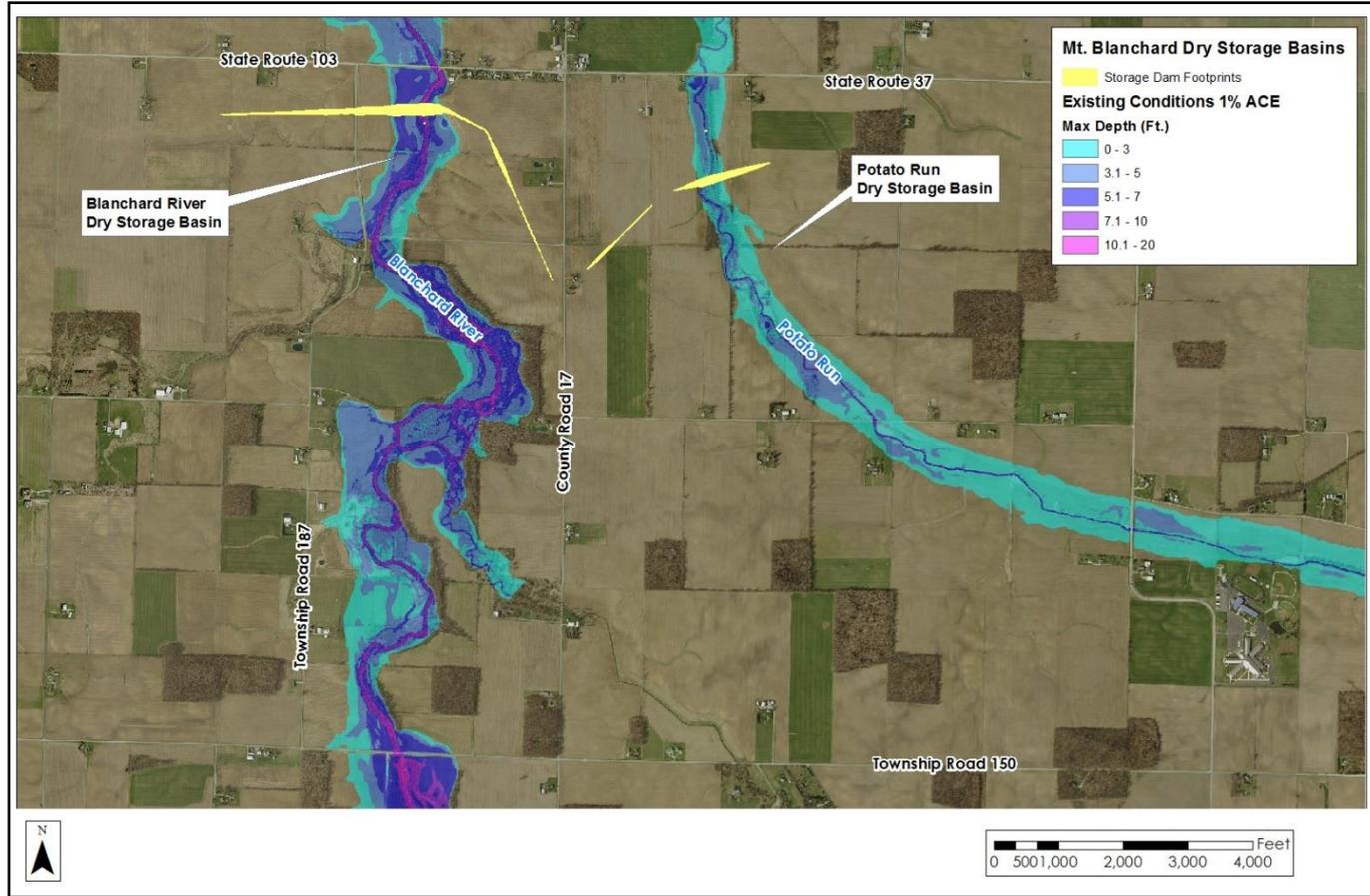
# Blanchard River & Potato Run at Mt. Blanchard



# Blanchard River & Potato Run at Mt. Blanchard

Existing  
Conditions

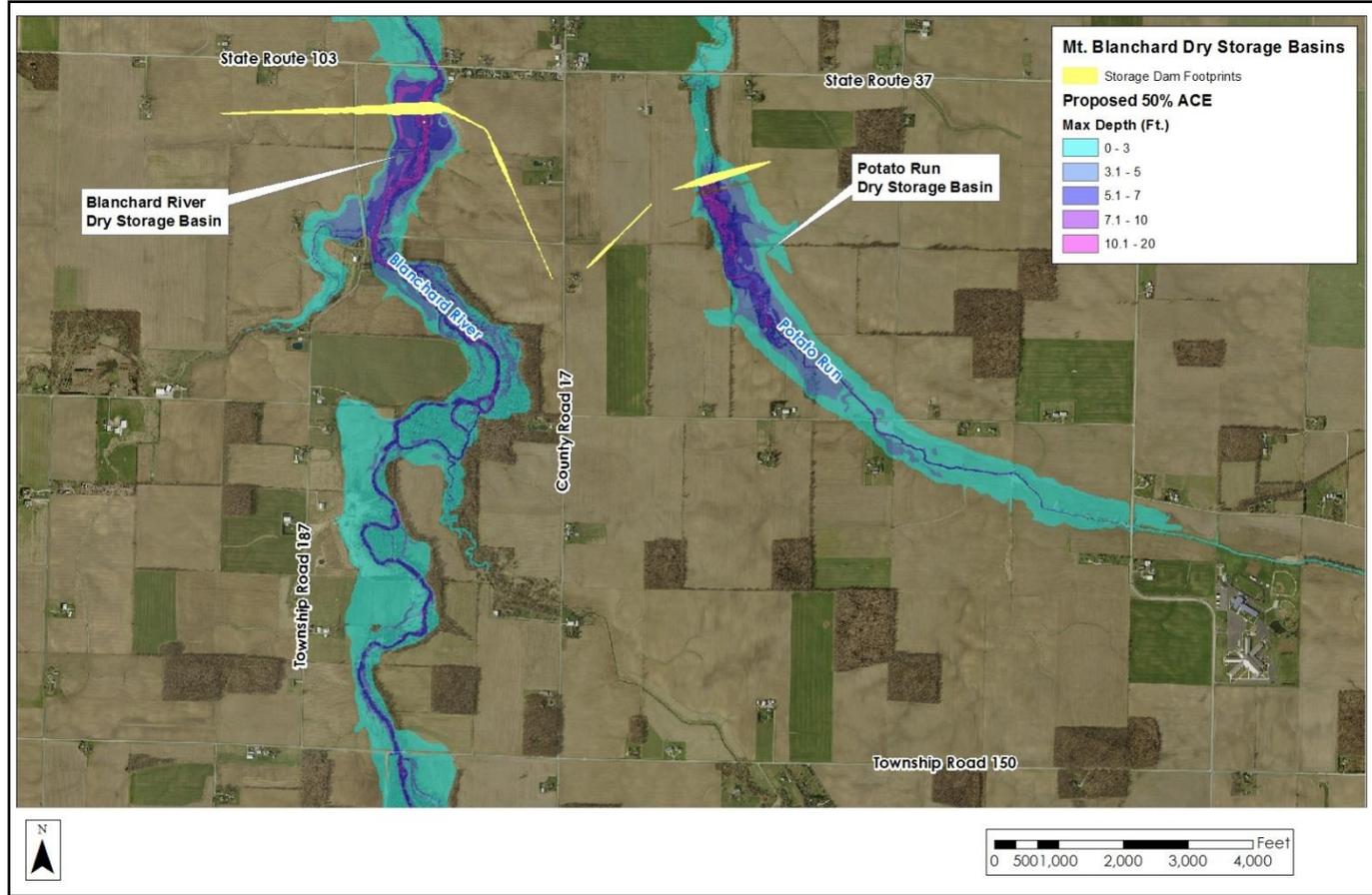
1% ACE event



# Blanchard River & Potato Run at Mt. Blanchard

Proposed  
Conditions

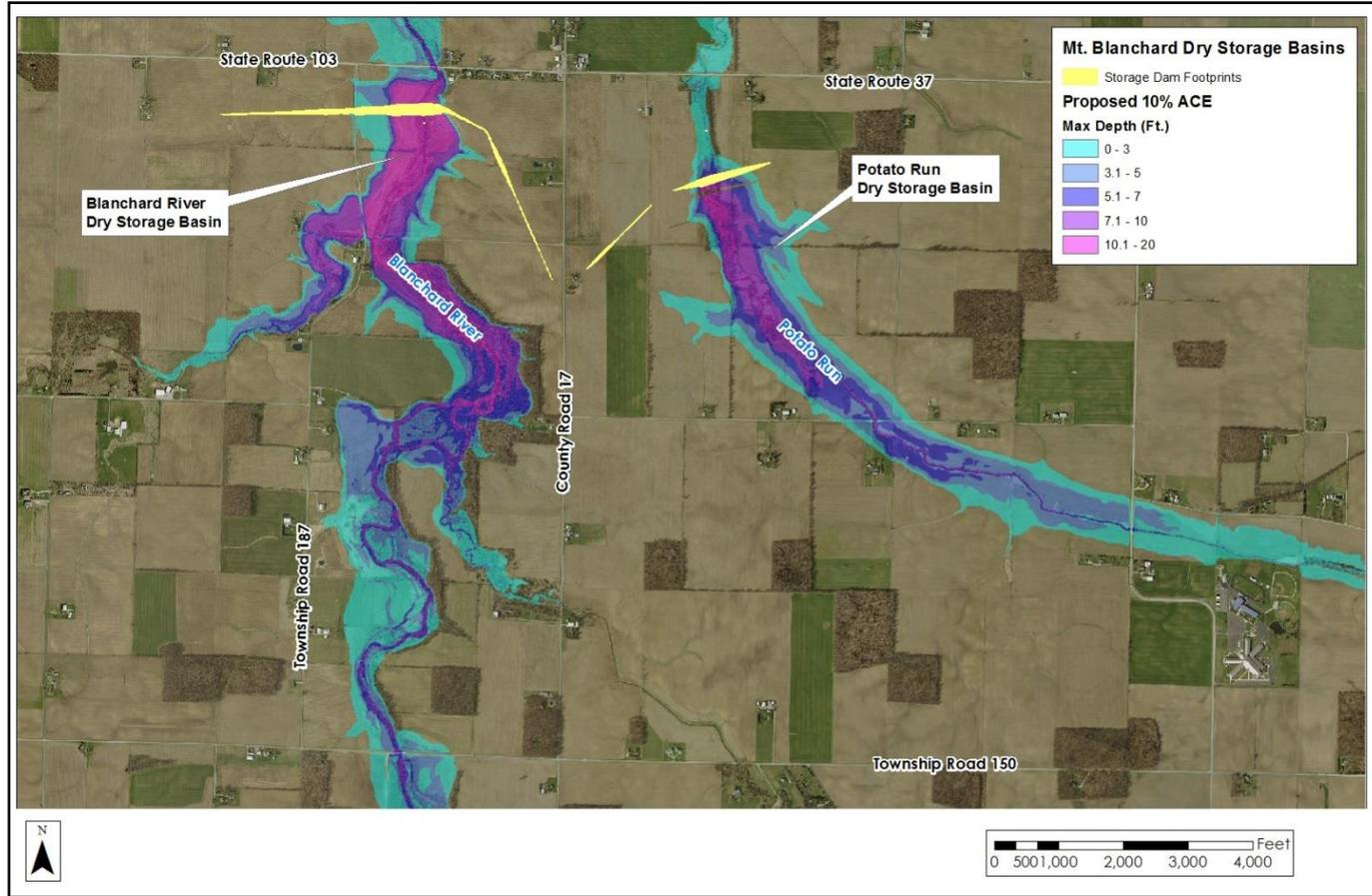
50% ACE event



# Blanchard River & Potato Run at Mt. Blanchard

Proposed  
Conditions

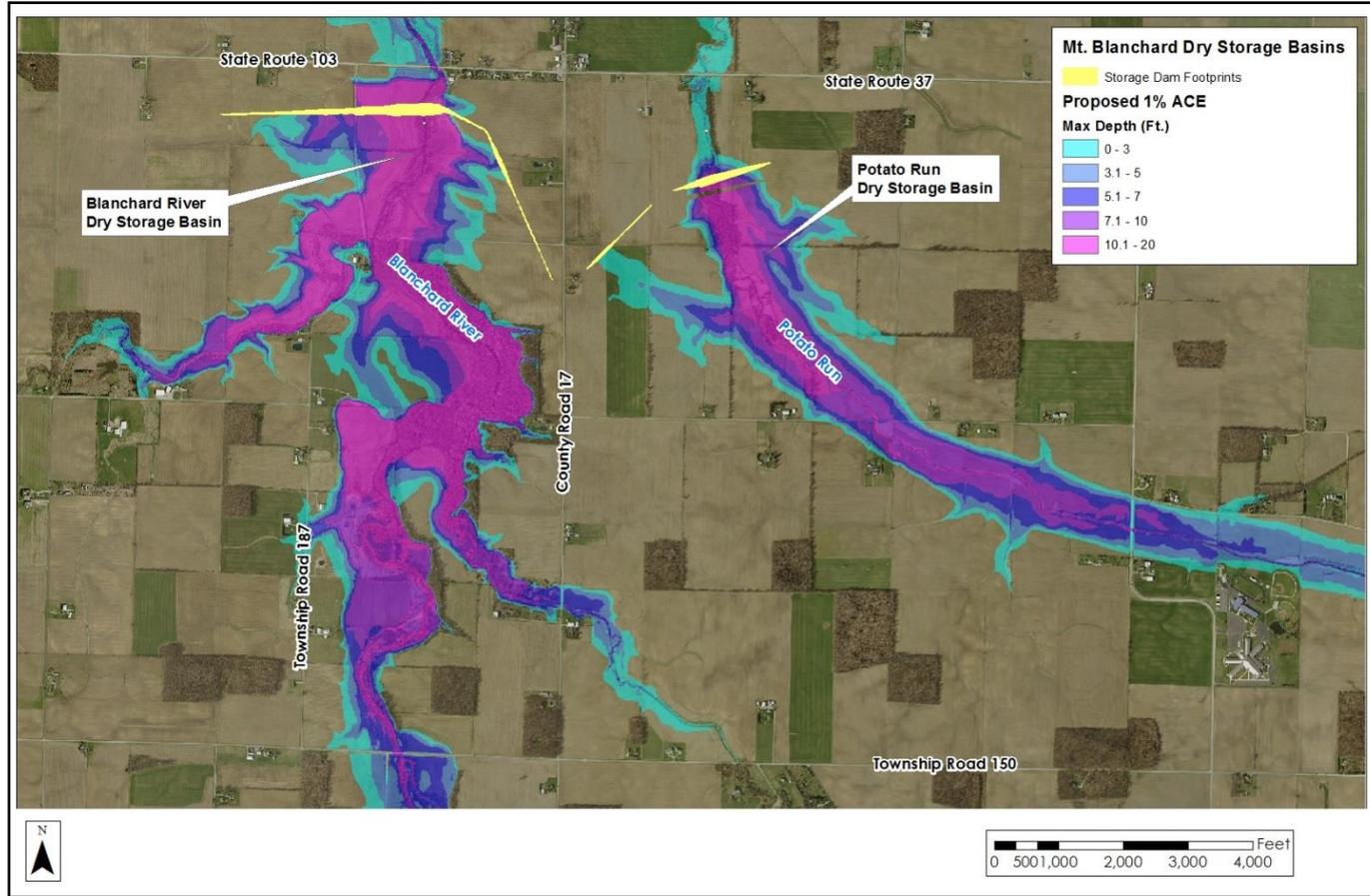
10% ACE event



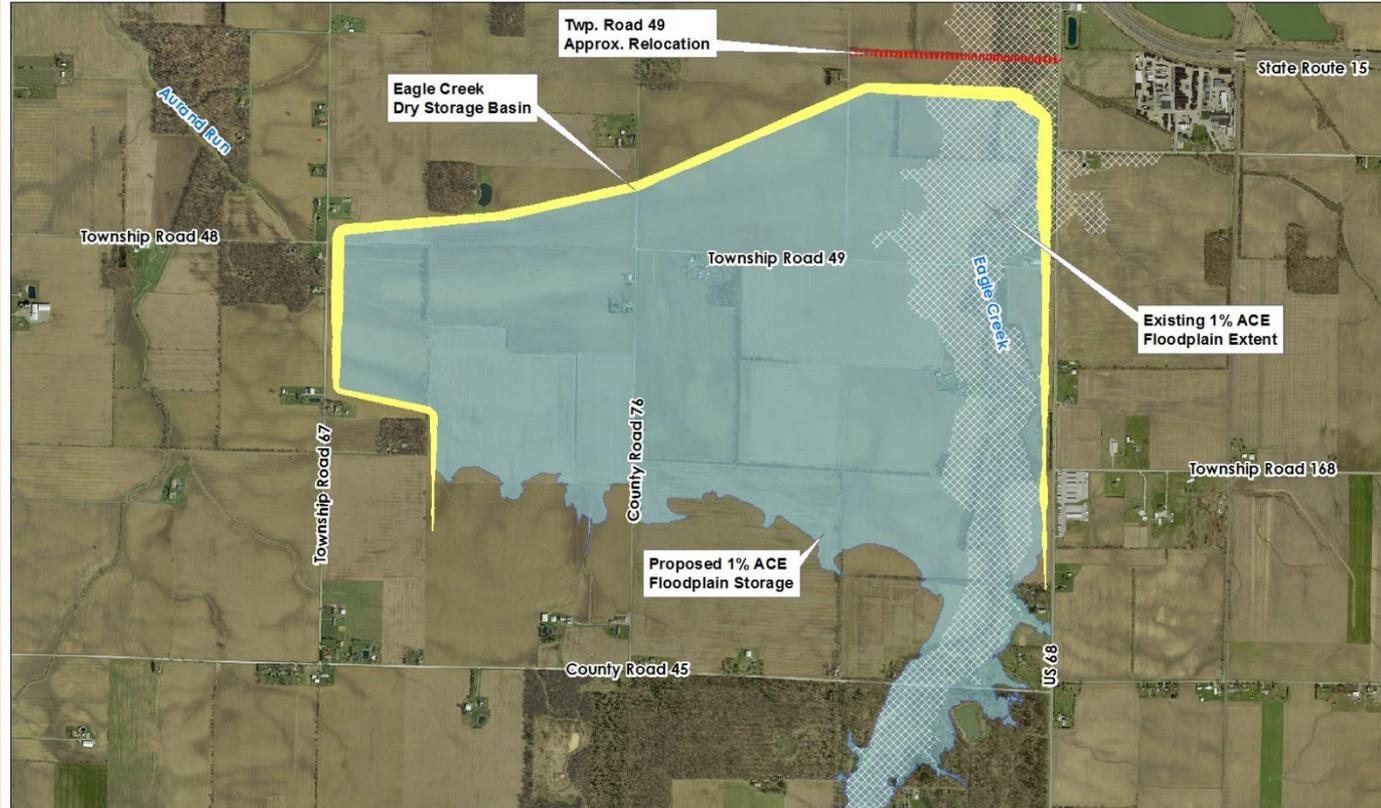
# Blanchard River & Potato Run at Mt. Blanchard

Proposed  
Conditions

1% ACE event



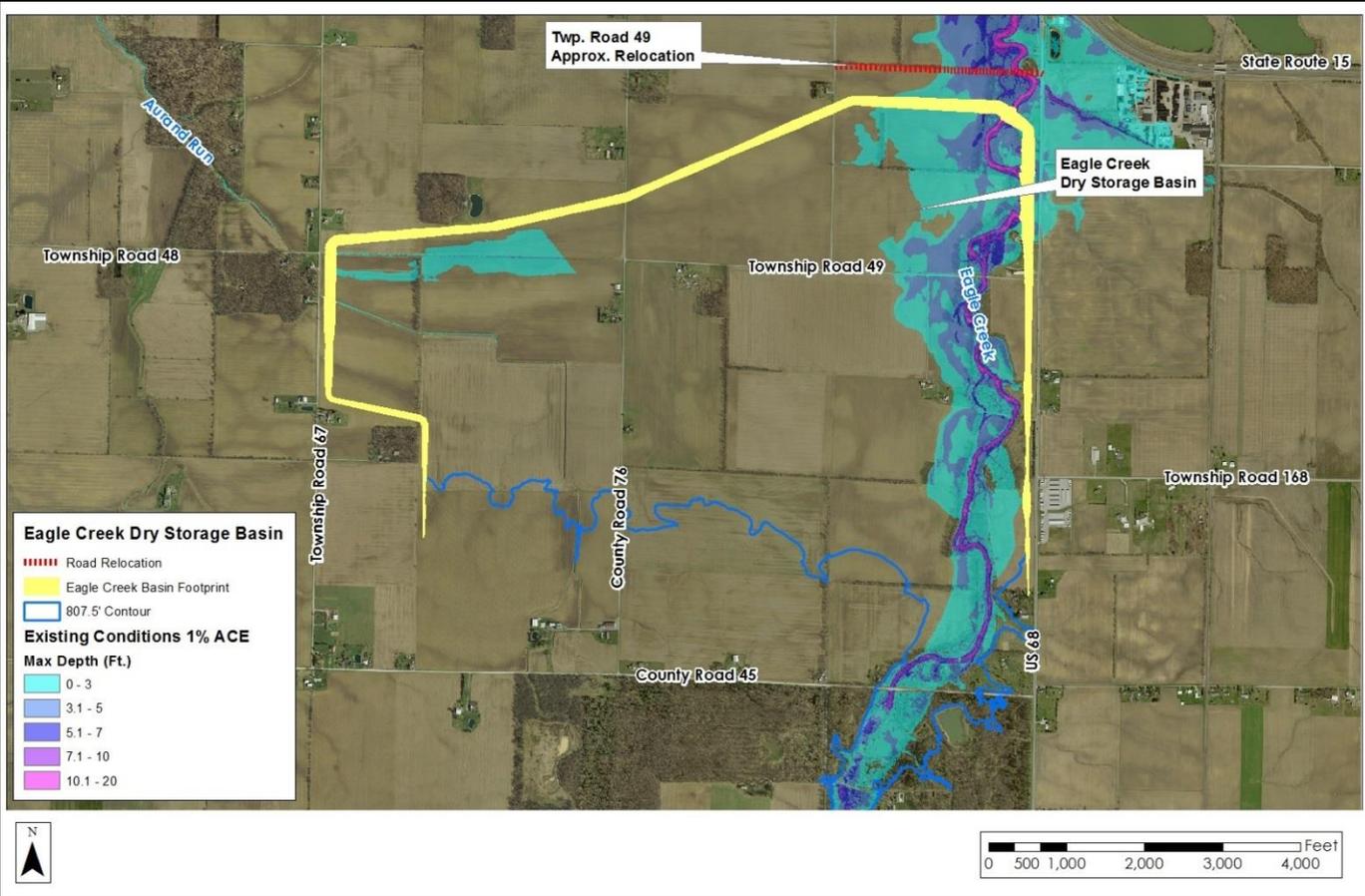
# Eagle Creek Dry Storage



# Eagle Creek Dry Storage

Existing  
Conditions

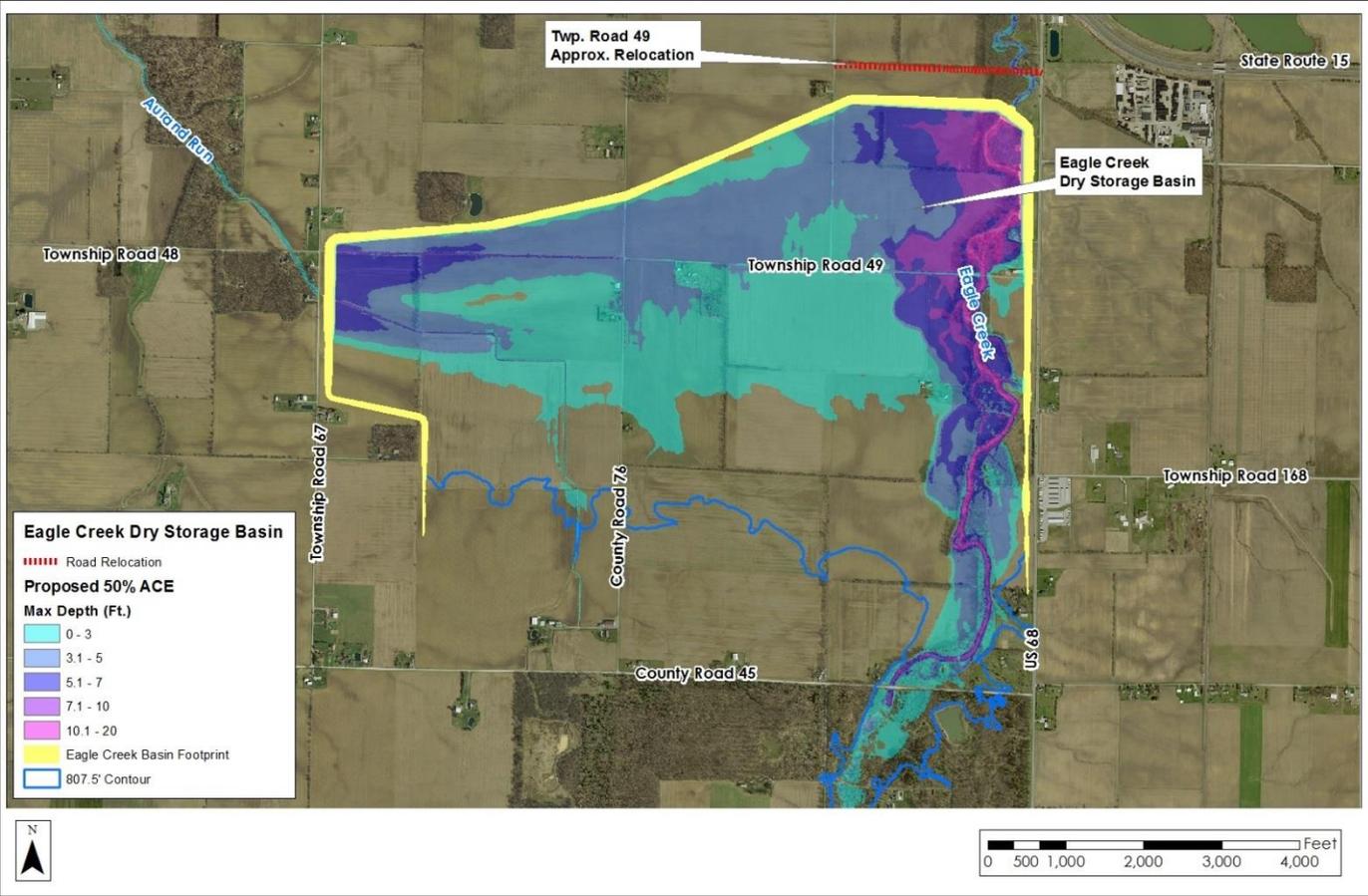
1% ACE event



# Eagle Creek Dry Storage

Proposed  
Conditions

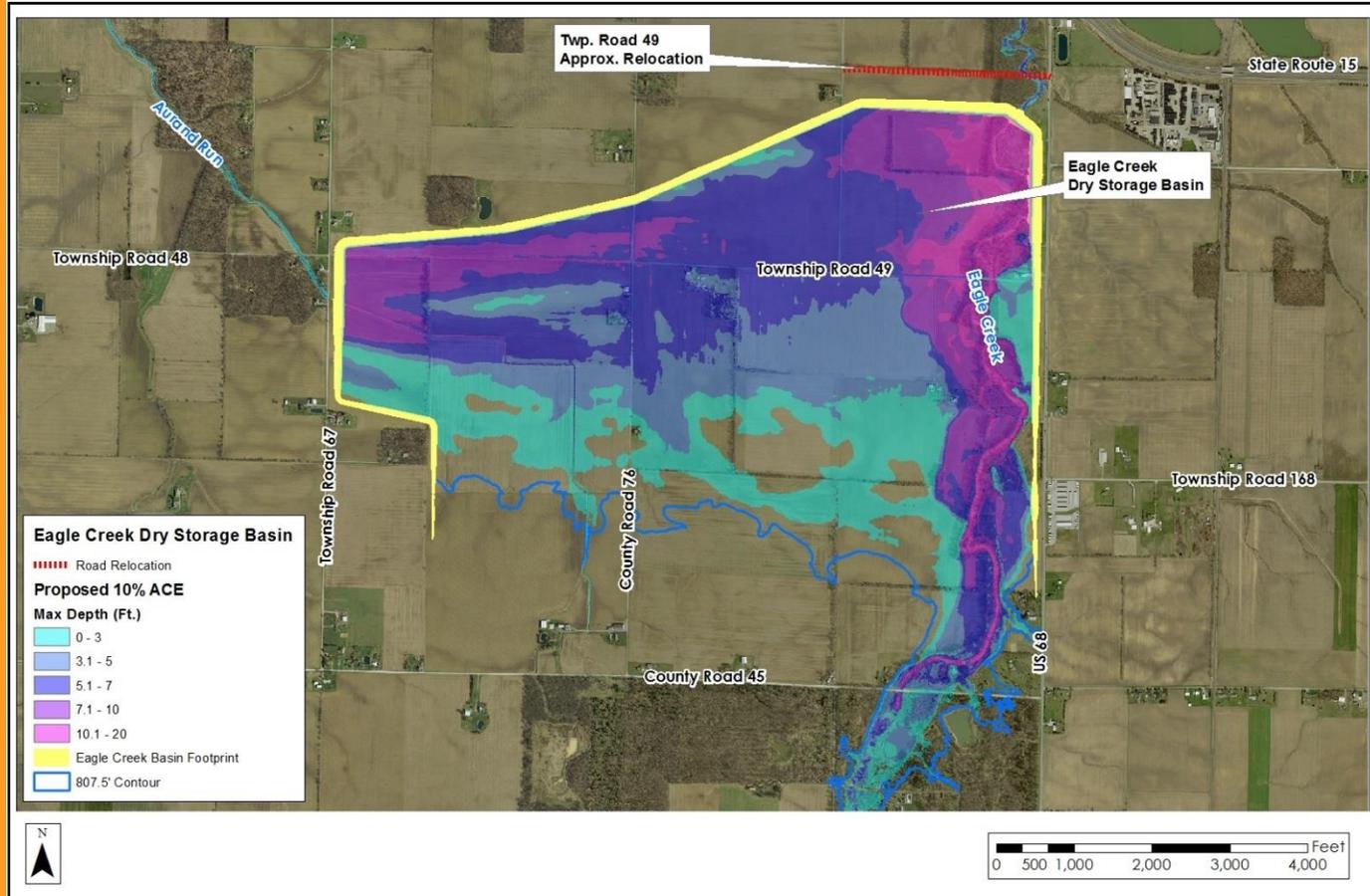
50% ACE event



# Eagle Creek Dry Storage

Proposed  
Conditions

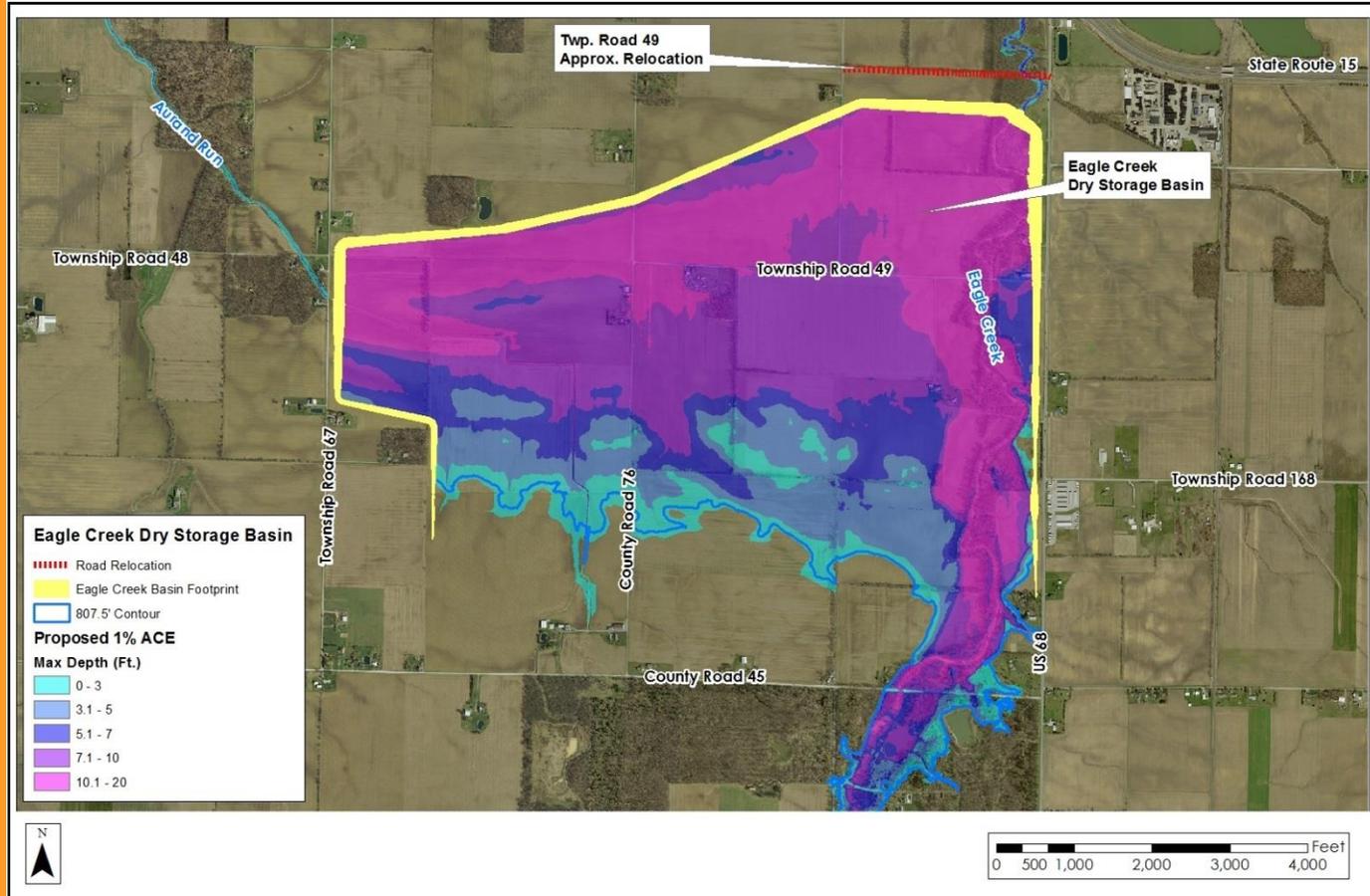
10% ACE event



# Eagle Creek Dry Storage

Proposed  
Conditions

1% ACE event

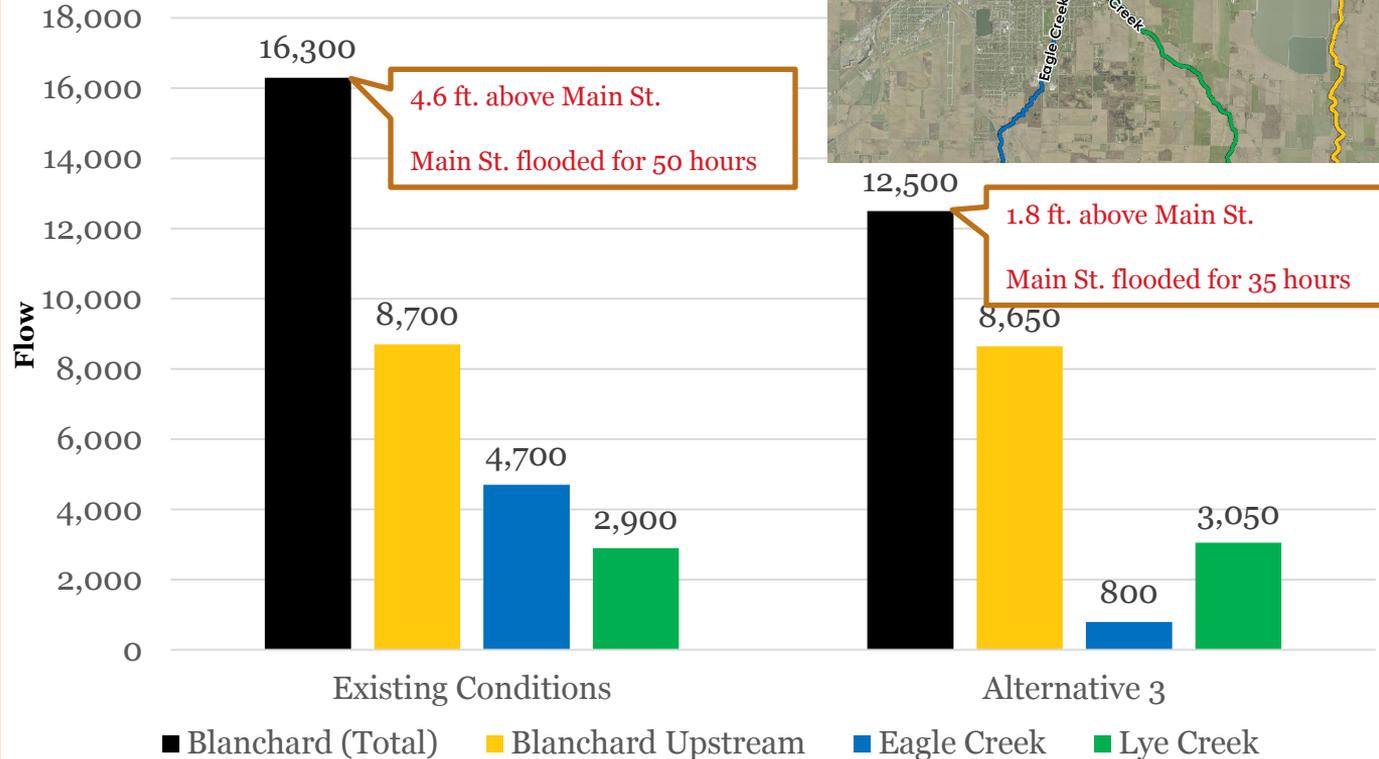




## Eagle Creek Storage

1% ACE  
100-Year, 24-Hour  
SCS Type II = 5.26"

Blanchard River  
in Findlay



1% ACE  
100-Year, 24-Hour  
SCS Type II = 5.26"

## Eagle Creek Storage + Blanchard R. and Potato Run Storage



Blanchard River  
in Findlay

# Opinions of Probable Cost

## Alternative Components

Alternative Option	Base Cost	Cost With Contingency
USACE Plan (25-Year Diversion of Eagle Creek)	<b>\$63,804,000</b>	<b>\$80,902,000</b>
Refined Diversion (100-Year Diversion of Eagle Creek)	\$81,300,000	\$105,690,000
Diversion Channel Extension (Eagle Creek to Blanchard River)	\$67,800,000	\$88,140,000
<b>Total Diversion Channel Extension</b>	<b>\$149,100,000</b>	<b>\$193,830,000</b>
Riffle/Inline Structures Removal	\$780,000	\$1,014,000
Floodplain Bench Widening and Railroad Bridge Modifications	\$14,500,000	\$18,850,000
<b>Total Hydraulic Improvements</b>	<b>\$15,280,000</b>	<b>\$19,864,000</b>
Eagle Creek Dry Storage Basin	\$53,500,000	\$69,550,000
Blanchard River Dry Storage Basin	\$34,400,000	\$44,720,000
Potato Run Dry Storage Basin	\$19,700,000	\$25,610,000
<b>Total Storage</b>	<b>\$107,600,000</b>	<b>\$139,880,000</b>

Opinions of  
Probable Cost

Spatial Spread  
of Projects

Independent  
Projects that  
make up a  
Program

## Alternatives

Alternative	Base Cost	Cost With Contingency
Alternative 0 – Existing Conditions	--	--
Alternative 1 – USACE Plan (25-Year Diversion of Eagle Creek)	\$63,804,000	\$80,902,000
Alternative 2 – Blanchard River Modifications	\$15,280,000	\$19,864,000
Alternative 3 – Alt. 2 + Eagle Creek Dry Storage Basin	\$68,780,000	\$89,414,000
Alternative 4 – Alt. 3 + Blanchard & Potato Dry Storage Basins	\$122,880,000	\$159,744,000

- Alternative 4 is Stantec's Recommended Plan
  - Hydraulic improvements
  - Eagle Creek dry storage basin
  - Blanchard River dry storage basin
  - Potato Run dry storage basin

# Benefits and Impacts Summary

Alternative	Modeled Scenario	Reduction in WSE at Main St (Feet)	Max Water Depth on Main St (Feet)	Duration Water is 6" Above Main St (Hours)	Total Acres Directly Impacted by Project Construction	Home Buyouts	New Bridges or Cul-De-Sacs	Acres Impacted Outside of Ex. Regulatory Floodplain	Acres Removed from Floodplain	Agricultural Acres Removed from Floodplain	Parcels Directly Impacted by Project Construction	Parcels Removed from Floodplain
0	Existing Conditions	n/a	4.6	50	--	--	--	--	--	--	--	--
1	USACE Plan (25-Yr Diversion)	0.9	3.6	45	960	1	13	960	1,690	1,140	75	1,670
2	Blanchard R. Modifications	0.9	3.7	40	2	0	0	2	280	40	5	760
3	Blanchard R. + Eagle Cr. Storage	2.8	1.8	35	1,140	14	1	863	2,780	1,180	55	2,460
4	Blanchard R. + Eagle Cr. Storage + Blanchard & Potato Storage	3.6	1	15	2,430	19	2	1,514	5,060	2,850	135	2,850

Benefit / Impact Summary HEC-RAS Results (SCS Type II – NOAA Atlas 14 100-Year, 24-Hour event (5.26 inches) equally distributed across watershed)

# Hancock County Flood Risk Reduction Program: Benefit Cost Analysis

(STANTEC Project # 174316204)

Prepared for:



Submitted by:



## Point of Contact:

Michael F. Lawrence, JFA President

4915 Saint Elmo Avenue, Suite 205

Bethesda, Maryland 20814

Phone: (301) 961-8835 Fax: (301) 469-3001

[lawrence@ifaucett.com](mailto:lawrence@ifaucett.com)

March 2017

## Opinion of Probable Construction Cost

Alternative Option	Base Cost	Cost With 30% Contingency
Riffle/Inline Structures Removal	\$780,000	\$1,014,000
Floodplain Bench Widening and Railroad Bridge Modifications	\$14,500,000	\$18,850,000
<b>Total Hydraulic Improvements</b>	<b>\$15,280,000</b>	<b>\$19,864,000</b>
Eagle Creek Dry Storage Basin	\$53,500,000	\$69,550,000
Blanchard River Dry Storage Basin	\$34,400,000	\$44,720,000
Potato Run Dry Storage Basin	\$19,700,000	\$25,610,000
<b>Total Storage</b>	<b>\$107,600,000</b>	<b>\$139,880,000</b>

## Operations and Maintenance Cost:

- Hydraulic Improvements - \$17,700 annually
  - Mowing, debris removal
- Dry Storage Basins - \$155,000 annually
  - Annual inspections, EAP updates, mowing, embankment repair, debris removal

# Benefit-Cost Analysis

## Program Benefits

- NED Benefits/Damages Avoided:

- Structures & Content
- Motor Vehicles Transportation

### Benefit Schedule

Year	Hydraulic Improvements		Full Program	
	Year	Benefits	Year	Benefits
	Phase 1 – Hydraulic Improvements		Phase 3A – Blanchard River Dry Storage Basin	
	Phase 2 – Eagle Creek Dry Storage Basin		Phase 3B – Potato Run Dry Storage Basin	
<b>Timeline (Years)</b>	2017-2021		2020-2029	
	2022		2022	
	2023		2023	
	2024		2024	
	2025		2025	
	2026		2026	
	2027		2027	
	2028		2028	
	2029		2029	
	2030		2030	
			Total	

- RED Benefits/Damages Avoided:

- Business Losses
  - Income, Clean-up, Emergency Plan
- Environmental / Landuse

# Hydraulic Improvements

## Costs / Benefits - NPV

(Thousands of 2017 Dollars)

Category	Cost	Benefit	Benefit-Cost Ratio
<b>Program Costs</b>	\$20,233		
<b>Structures (Residential)</b>		\$33,896	
<b>Structures (Business)</b>		\$24,901	
<b>Motor Vehicles</b>		\$2,523	
<b>Transportation</b>		\$5,969	
<b>Emergency Response</b>		\$4,050	
<b>NFIP Administrative Cost</b>	5,969	\$5,698	
<b>Business Losses (Income)</b>		\$2,067	
<b>Business Losses (Cleanup)</b>		\$2,673	
<b>Business Losses Emergency Plan</b>		\$797	
<b>Agricultural</b>		\$163	
<b>Environmental</b>		\$11,229	
<b>Total</b>	<b>\$20,233</b>	<b>\$93,966</b>	<b>4.64</b>

# Benefit-Cost Analysis

# Full Program

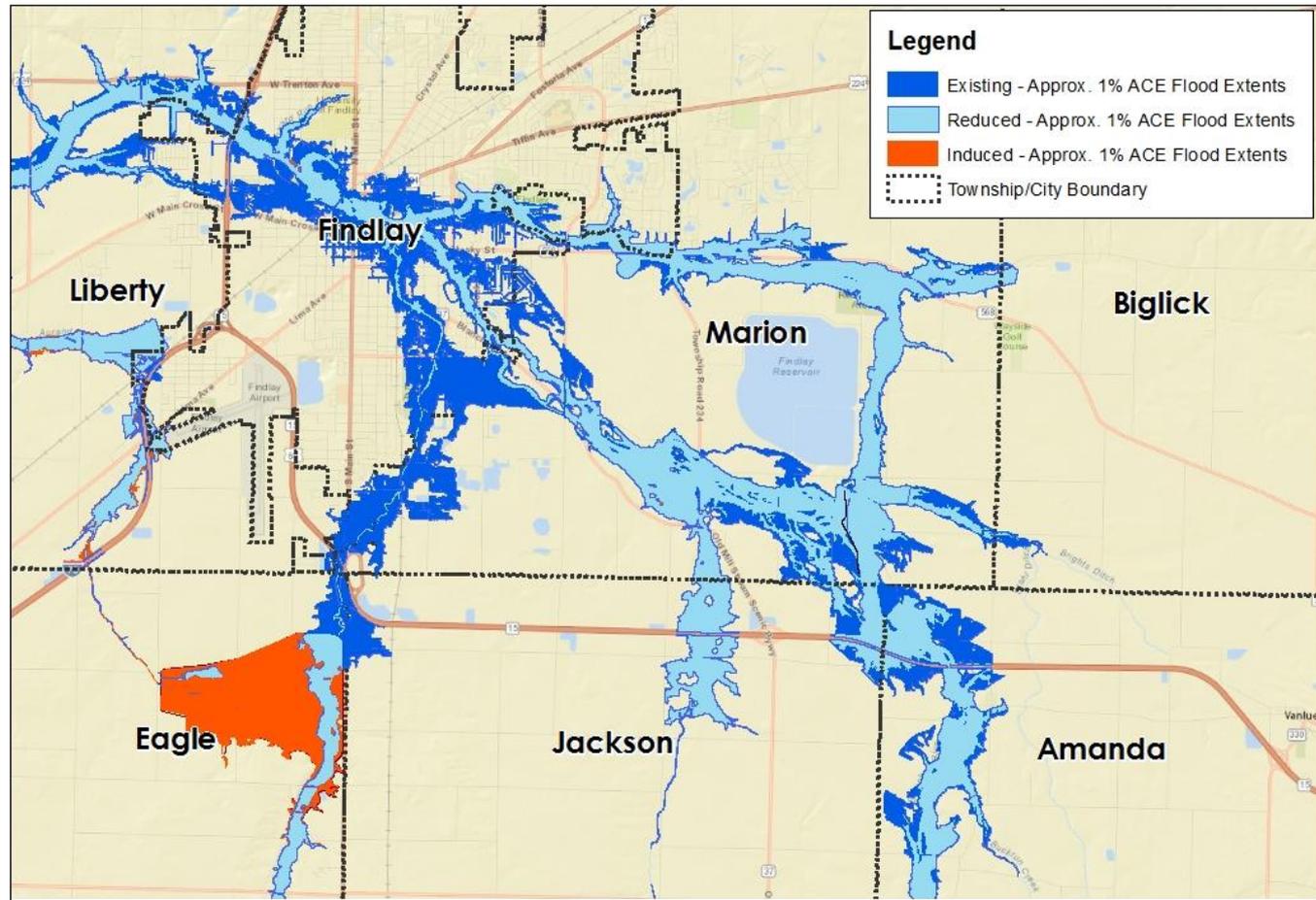
## Costs / Benefits - NPV (Thousands of 2017 Dollars)

Category	Cost	Benefit	Benefit-Cost Ratio
<b>Program Costs</b>	\$159,876		
<b>Structures (Residential)</b>		\$107,450	
<b>Structures (Business)</b>		\$42,867	
<b>Motor Vehicles</b>		\$5,388	
<b>Transportation</b>		\$8,992	
<b>Emergency Response</b>		\$6,419	
<b>NFIP Administrative Cost</b>		\$18,311	
<b>Business Losses (Income)</b>		\$3,276	
<b>Business Losses (Cleanup)</b>	\$5,388	\$3,153	
<b>Business Losses Emergency Plan</b>		\$1,277	
<b>Agricultural</b>		\$368	
<b>Environmental</b>		\$57,707	
<b>Total</b>	<b>\$159,876</b>	<b>\$255,208</b>	<b>1.60</b>

# Benefit-Cost Analysis

# 1% ACE Flood

Blanchard &  
Potato Storage  
+  
Eagle Creek  
Storage  
+  
Hydraulic  
Improvements



# 1% ACE Flood

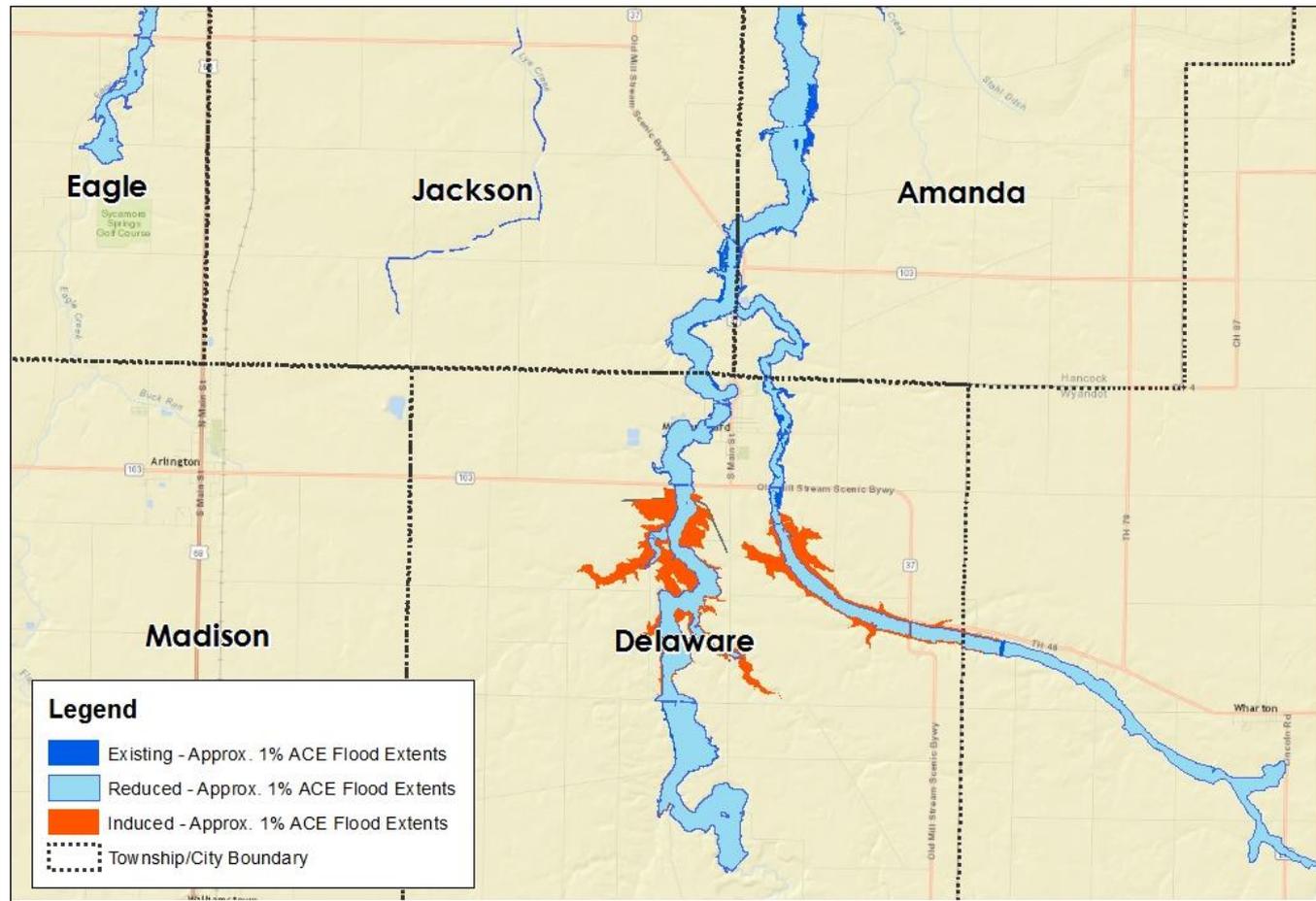
Mt. Blanchard  
Storage

+

Eagle Creek  
Storage

+

Hydraulic  
Improvements



# 1% ACE Flood

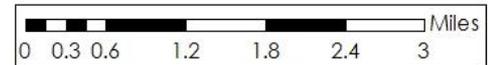
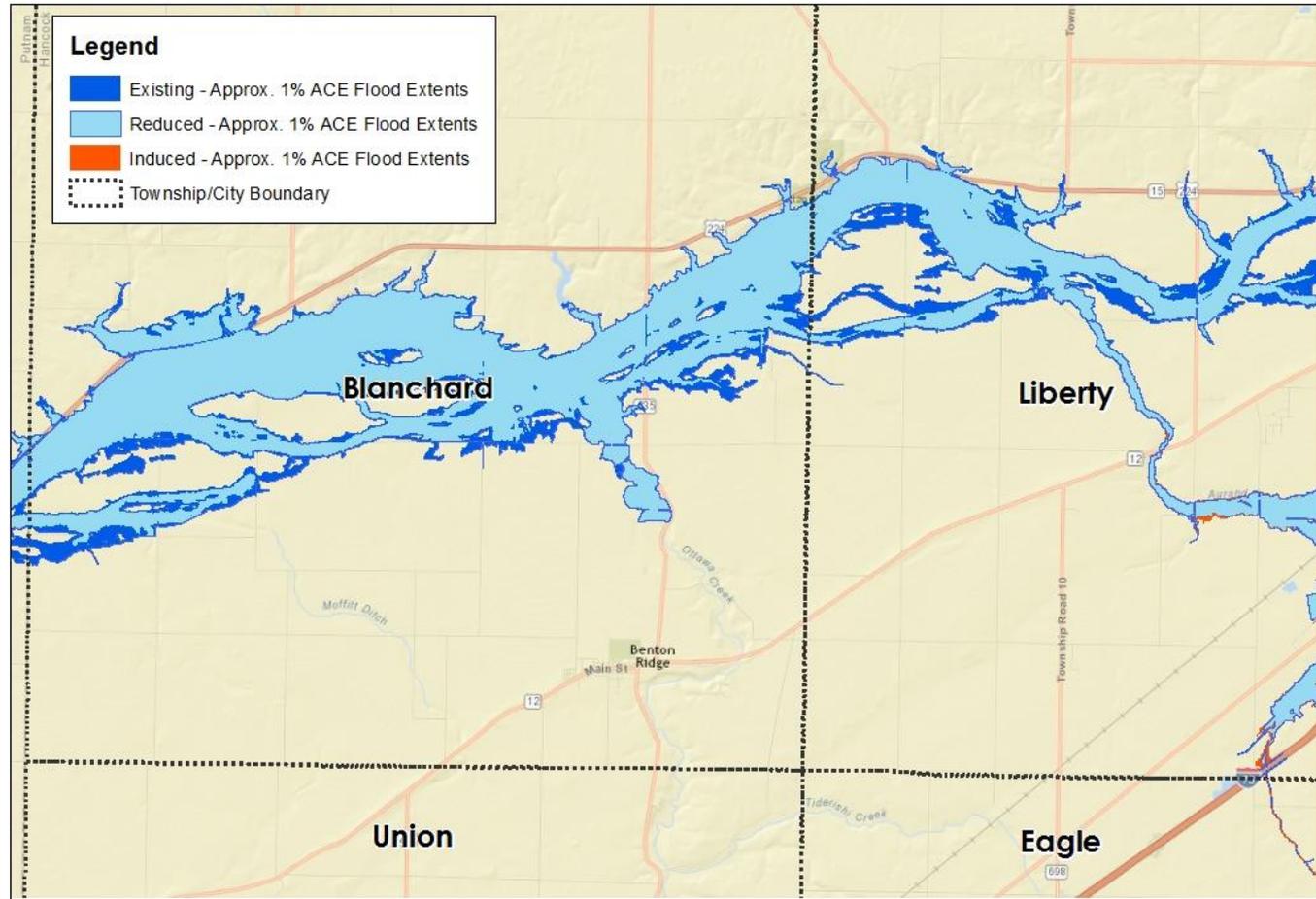
Mt. Blanchard  
Storage

+

Eagle Creek  
Storage

+

Hydraulic  
Improvements



# Additional Notes from MWCD

- The MWCD Board and Conservancy Court have only authorized the detailed design and permitting related to the Hydraulic Improvements. Additional authorization will be required for construction of these improvements;
- The MWCD Board and Conservancy Court have neither endorsed nor accepted the conceptual program within the Proof of Concept report, beyond the Hydraulic Improvements;

# Additional Notes from MWCD

- Funding for the Hydraulic Improvements is anticipated to come from the existing Hancock County Flood Reduction fund, resulting from the county tax revenues dedicated for such purposes;
- Funding methods and strategies for the remainder of the conceptual program have not been defined and will not be developed until after a formal program is adopted within the Official Plan, if that occurs; and
- Additional opportunity for public review and input of the proposed Hydraulic Improvements will occur during the detailed design of those improvements.

## Questions

[www.HancockCountyFlooding.com](http://www.HancockCountyFlooding.com)

Hancock County Flood Risk Reduction  
Program Report

Steve Wilson - [scwilson@co.hancock.oh.us](mailto:scwilson@co.hancock.oh.us)

Project Manager

Maumee Watershed Conservancy District

1900 Lima Ave.

Findlay, OH 45840

Phone: 419-424-5050