WMAO Water Management Association of Ohio

Stantec

City of Sharonville

2019 Ohio Stormwater Conference
Sharonville, OH – May 10th, 2019

Sharon Creek Tributary – Two Birds with One Stone

Funding Flood Mitigation and Infrastructure Repair with FEMA Grants

David Hayson, PE, SI

Senior Project Engineer

BS Civil Engineering – University of Dayton
Land Surveying Certificate – Cincinnati State

Cincinnati - Water Resources Group

- Hydrologic and Hydraulic Assessment
    - Planning and Site/Civil Design
    - Modeling
    - Benefit-Cost Analyses

Agenda

1. Safety Moment
2. Project Location / Background
3. Hydrologic Analysis
4. Hydraulic Analysis
5. Alternative Analysis
6. Grant Application
7. Path Forward

Safety Moment

Don’t Play, Swim, or Drive through Flooding Rivers

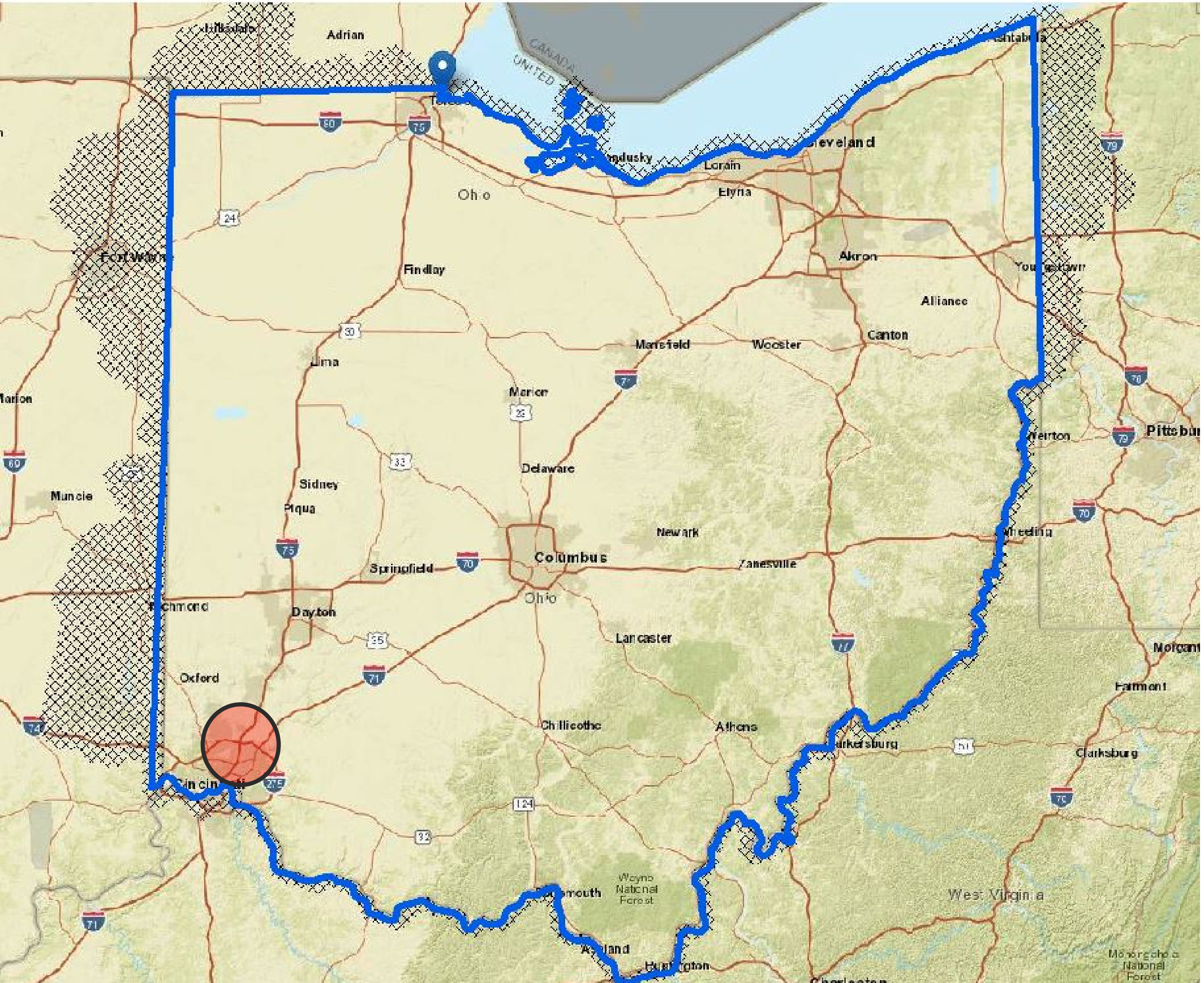
Stantec

Watershed / Client

Project Location / Background

2018 WMAO Conference

You Are Here!

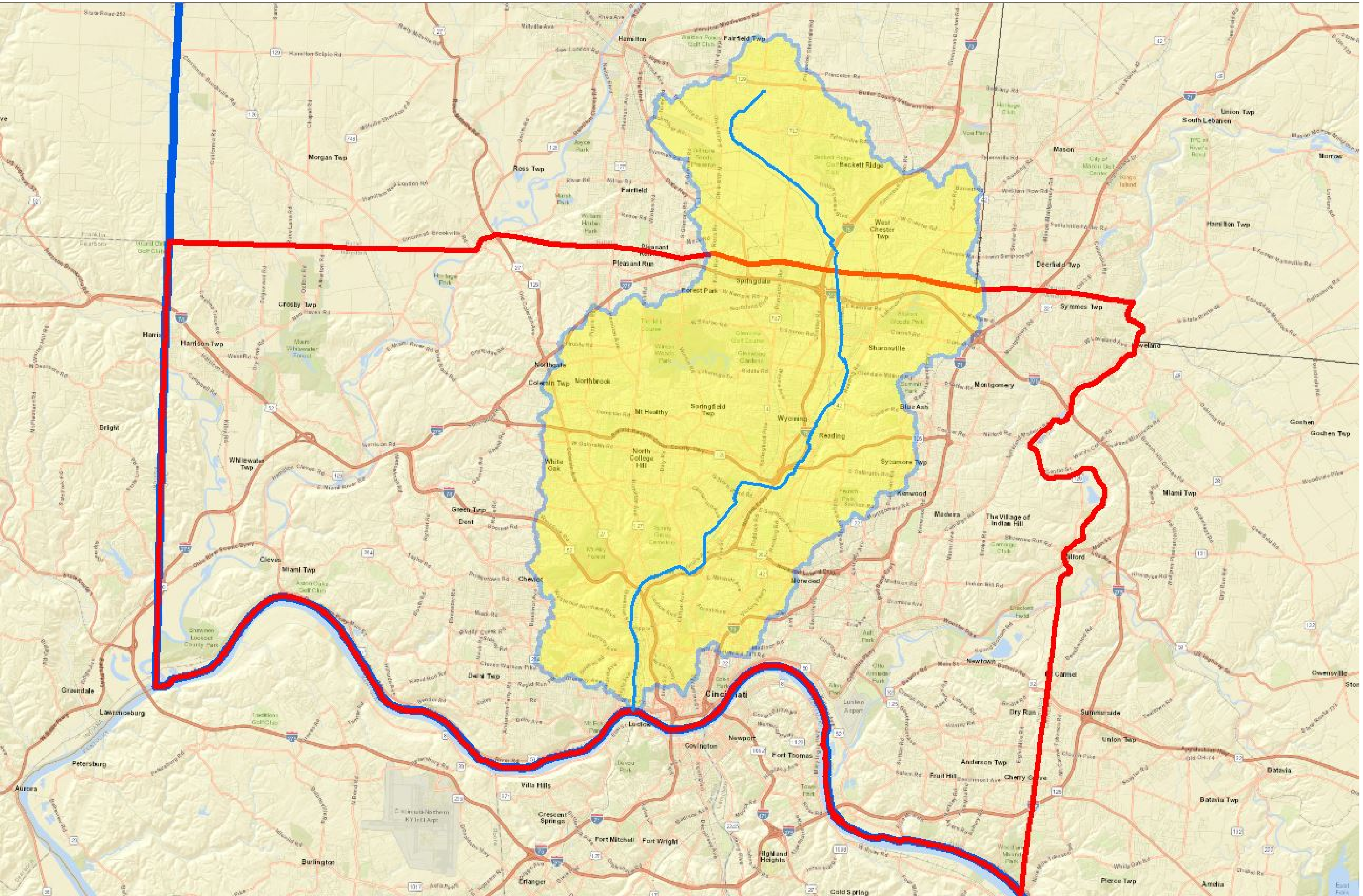


Project Location

Mill Creek Watershed

~169 sq. miles

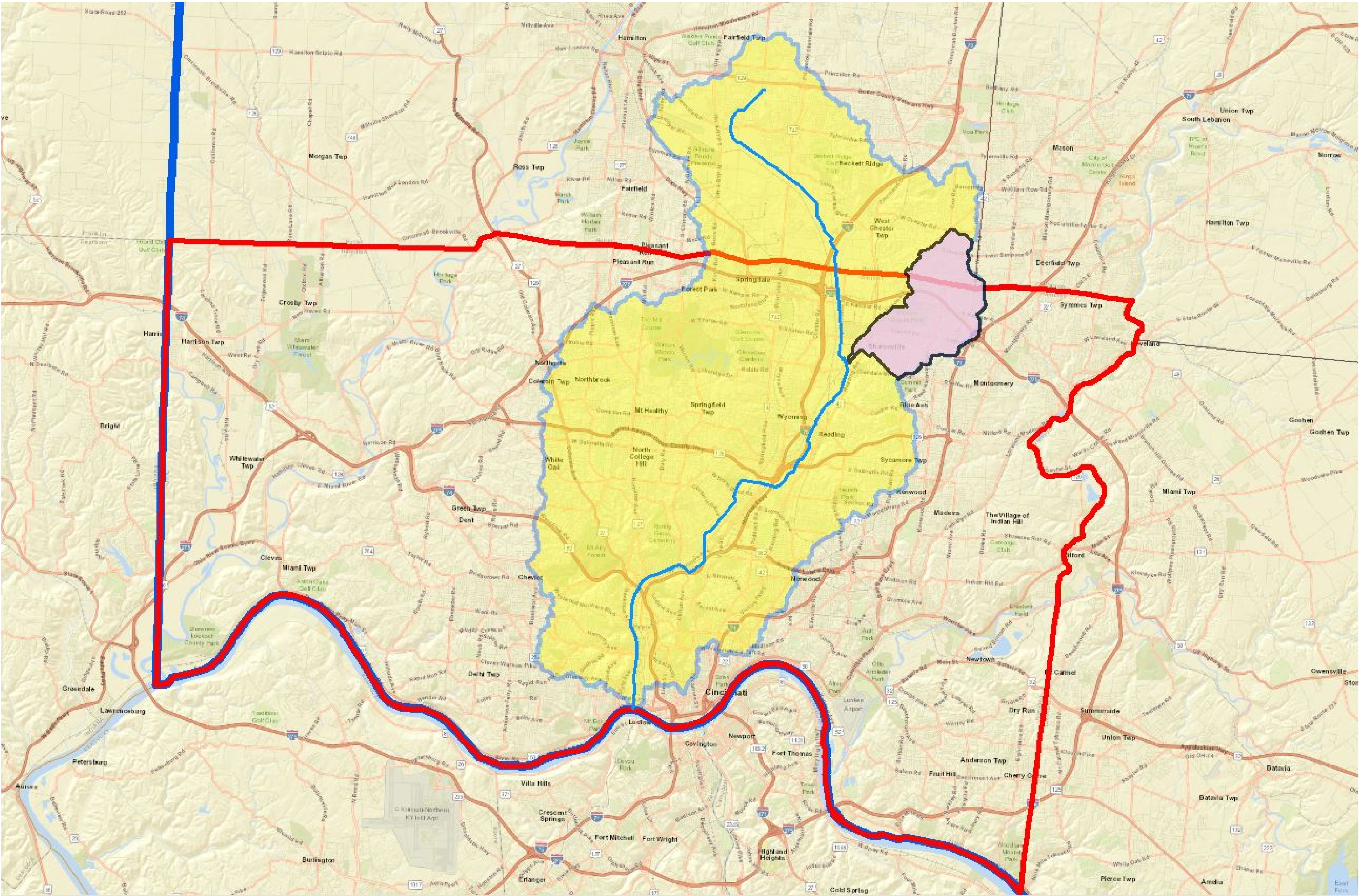
Project Location



Mill Creek Watershed

~169 sq. miles

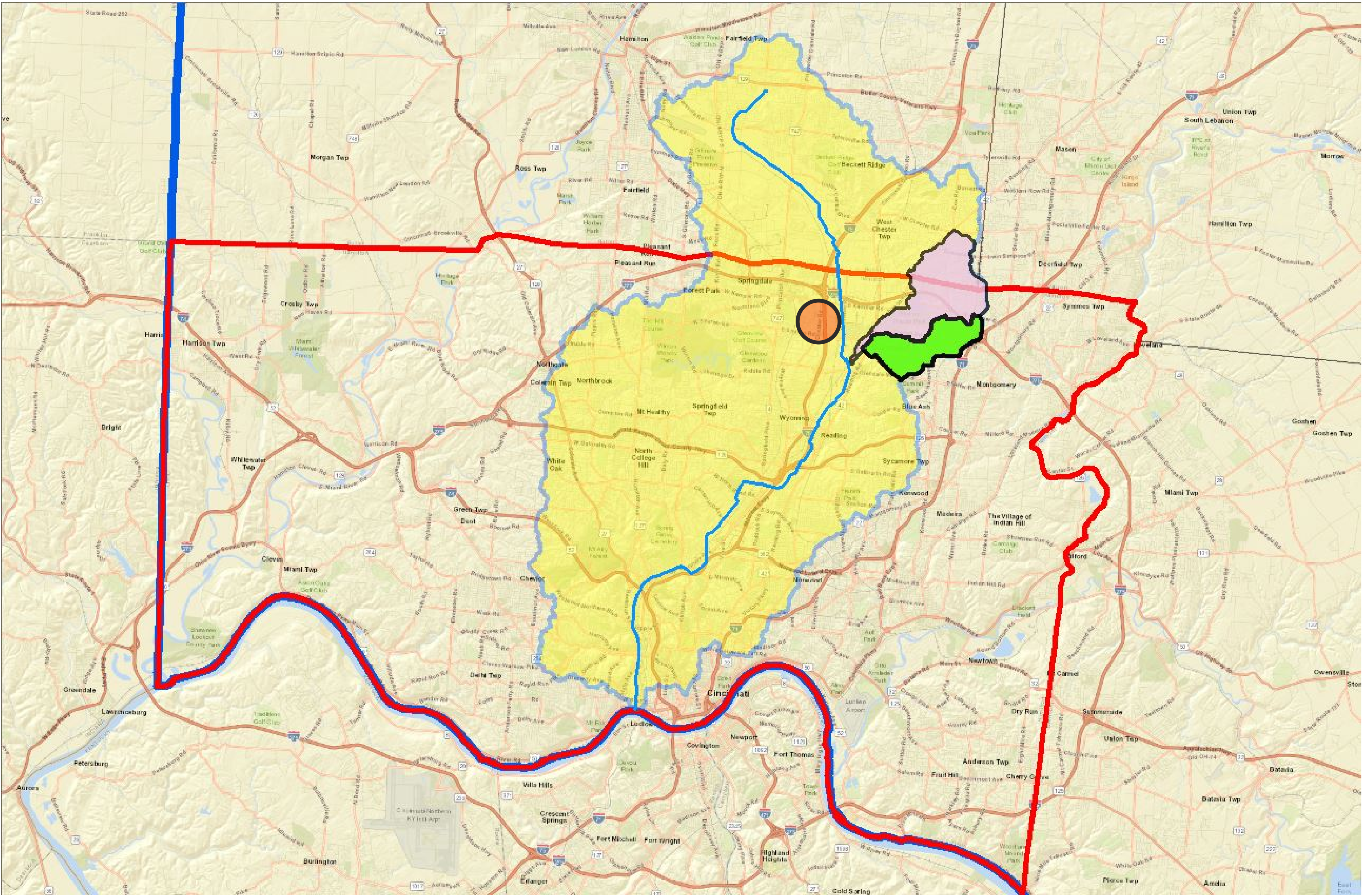
Project Location



Sharon Creek Watershed

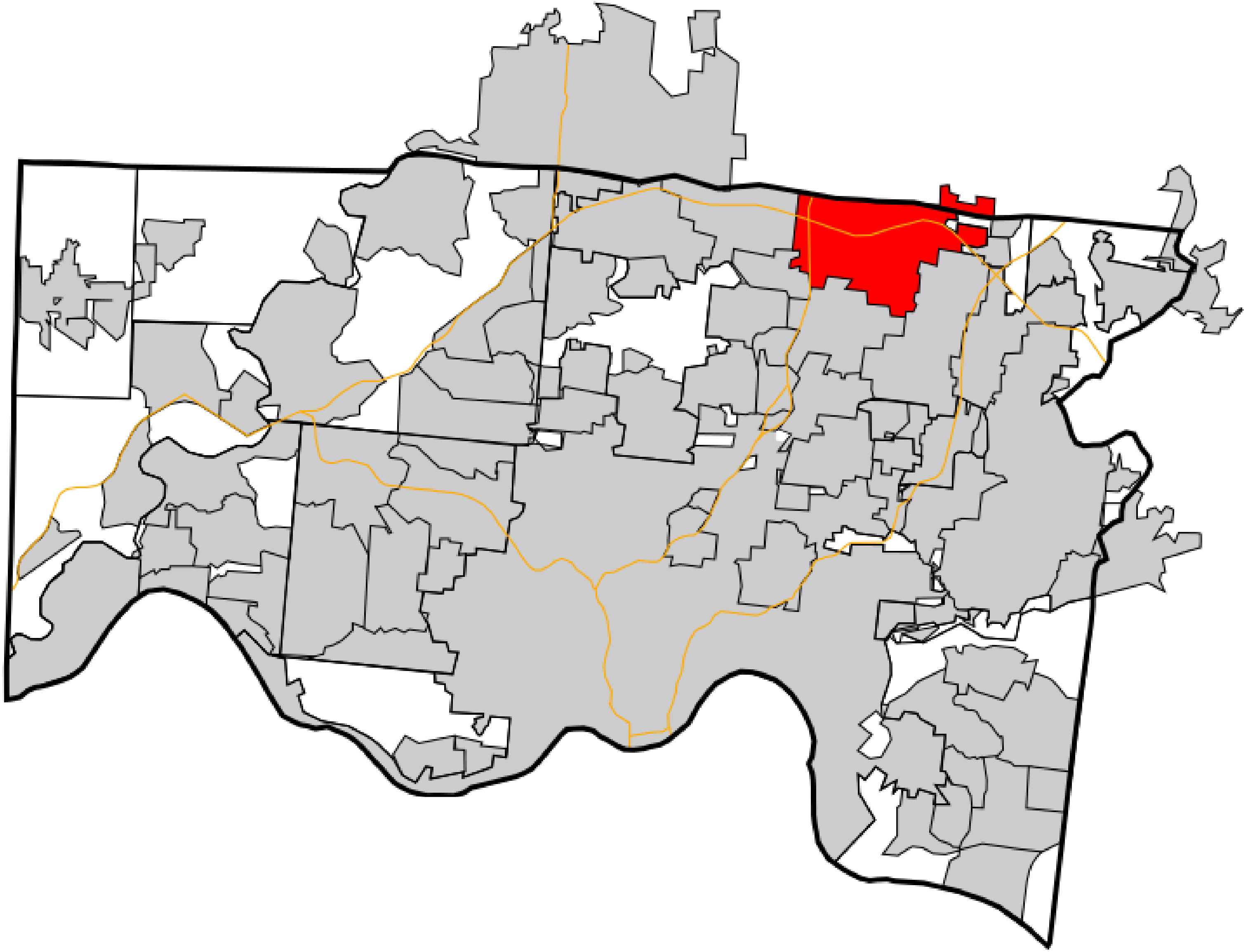
~10 sq. miles

Project Location



Sharon Creek
Tributary
Watershed

~3.4 sq. miles



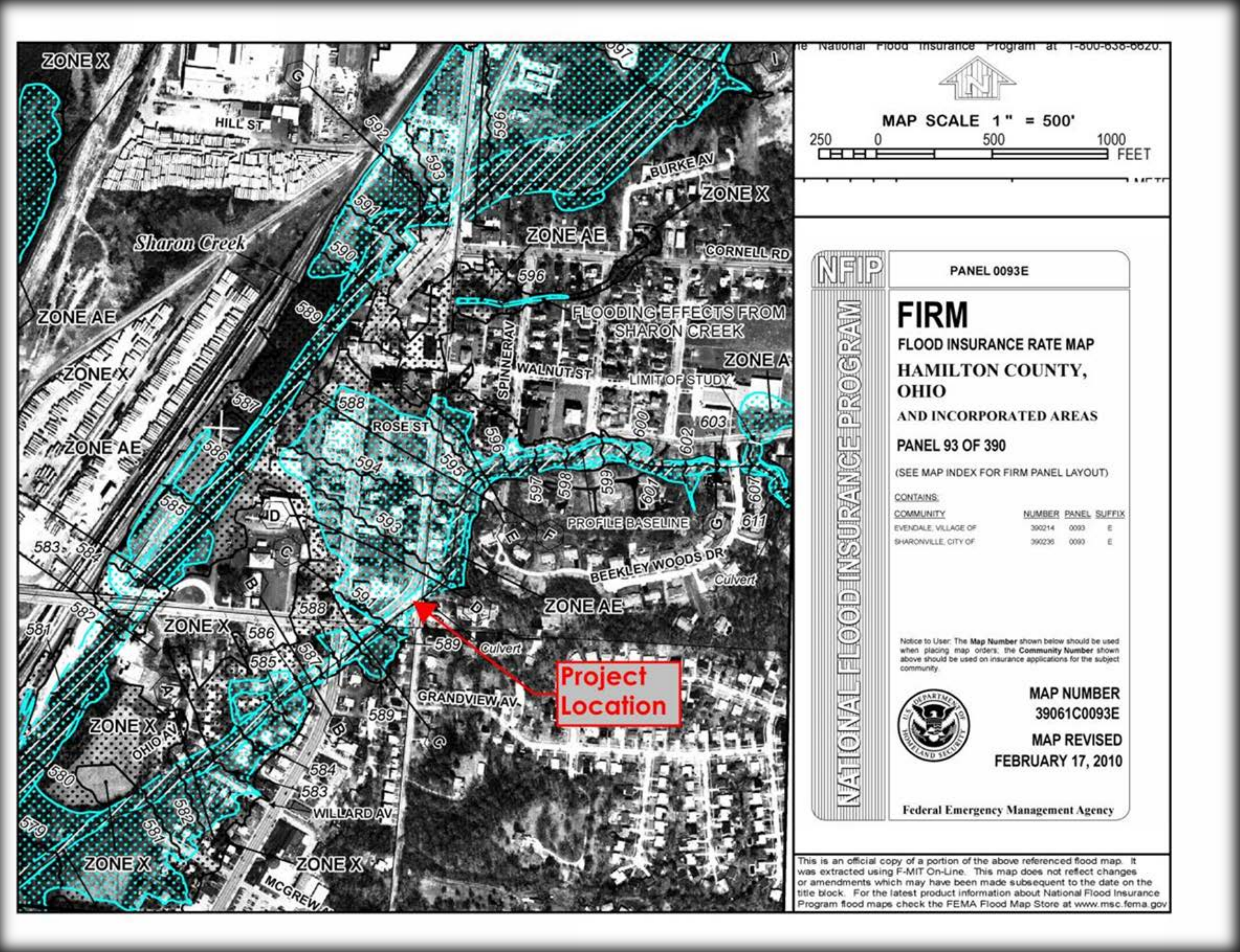
Project Client

City of Sharonville

Population 13,560

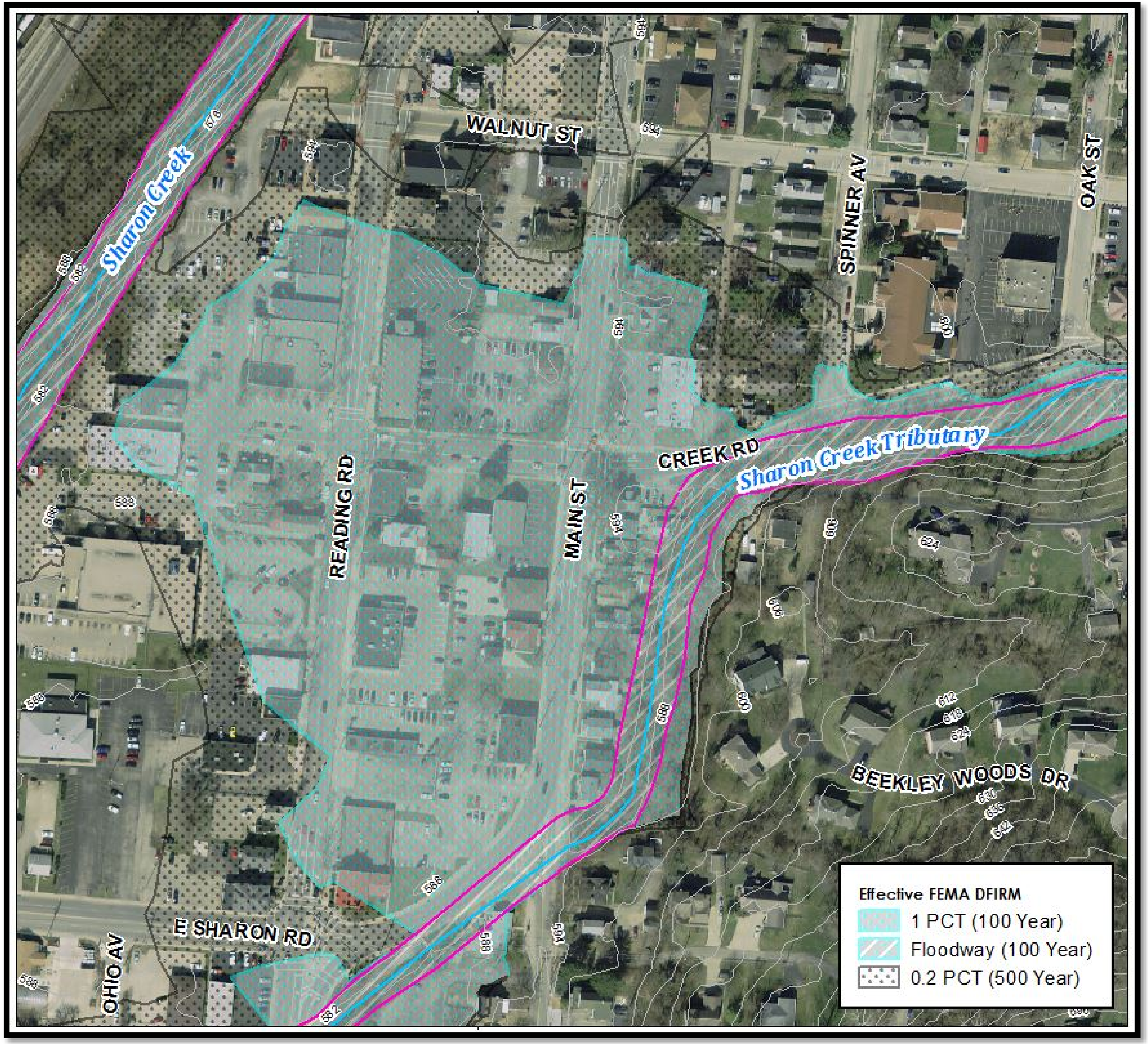
Project Background

Why are we studying the watershed?



Project Background

Effective Regulatory Floodplain



Local Buildings

Where Does the Water Come From?

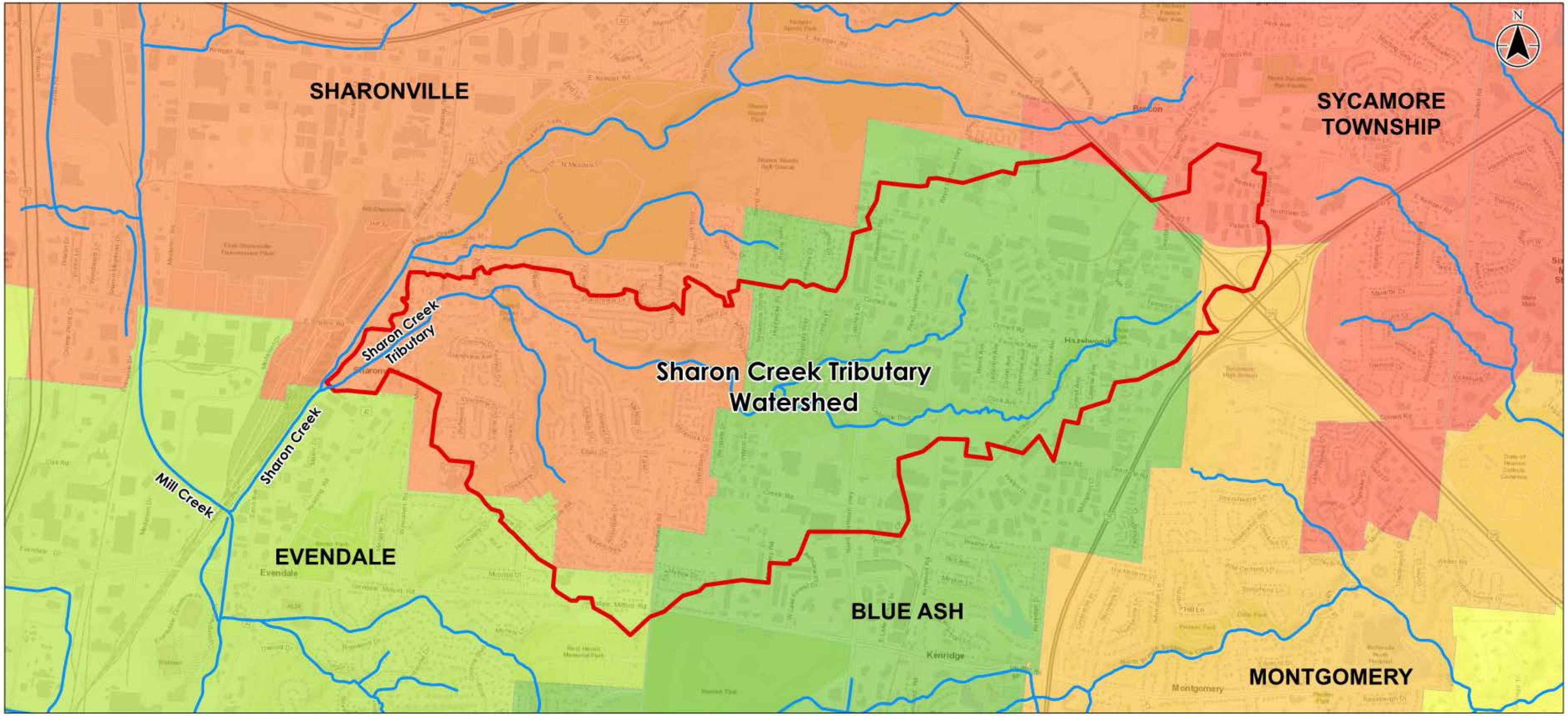
Project Background

Watershed = ~3.4 mi. ^{2}

Project Background

Where Does the Water Come From?

Watershed = ~3.4 mi.^{2}



Stantec

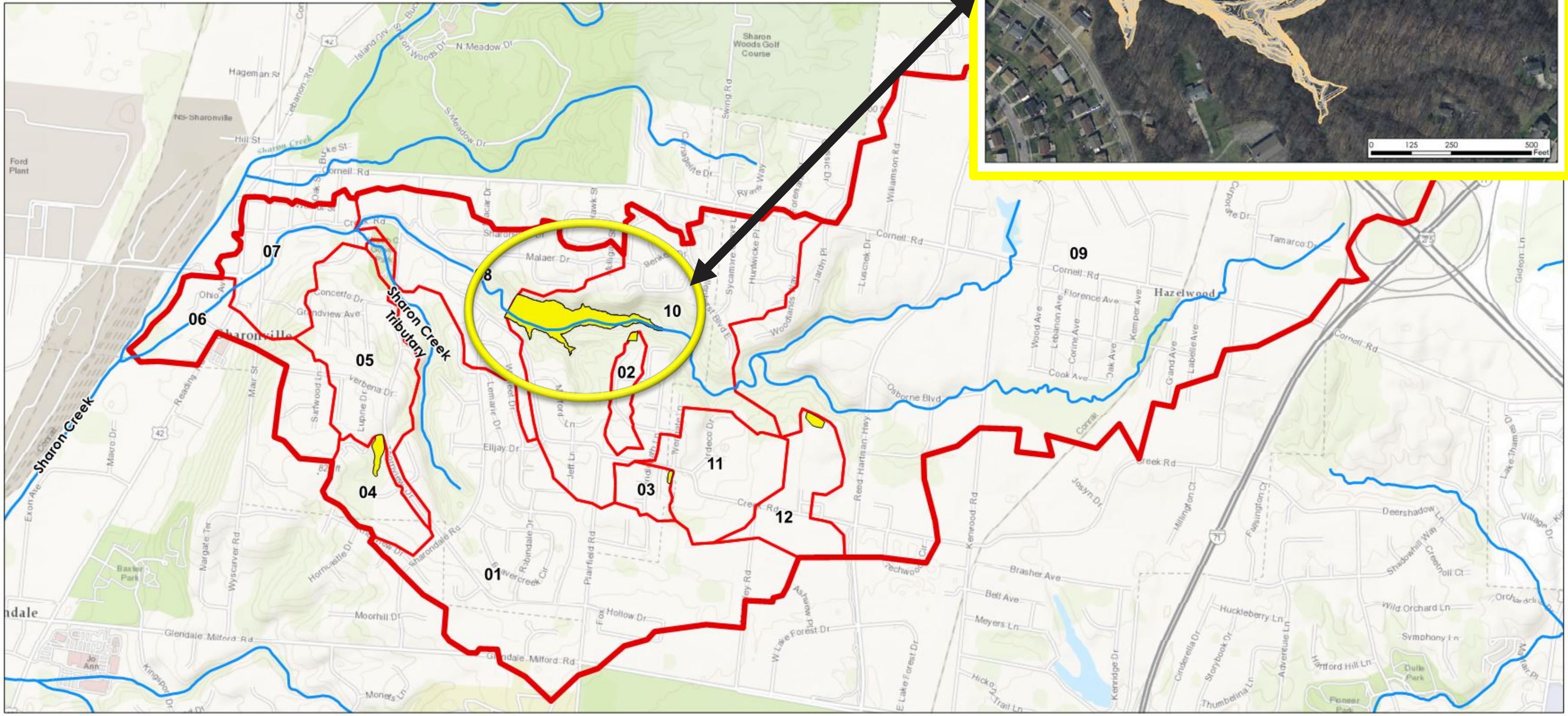
Phased Scope of Work

Hydrologic Analysis

Hydrologic Analysis

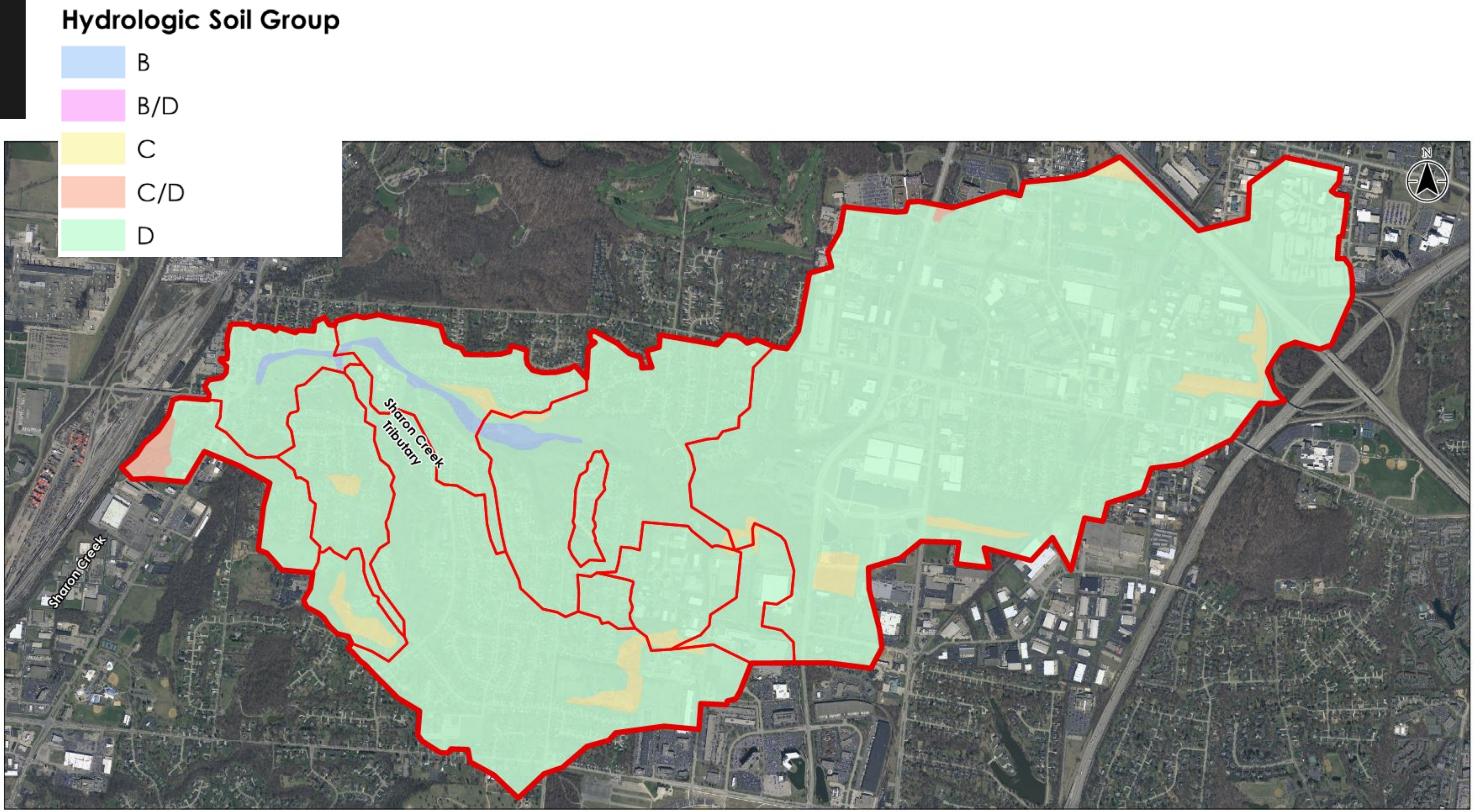
Sub-Divide Watershed

Develop Stage-Storage Areas



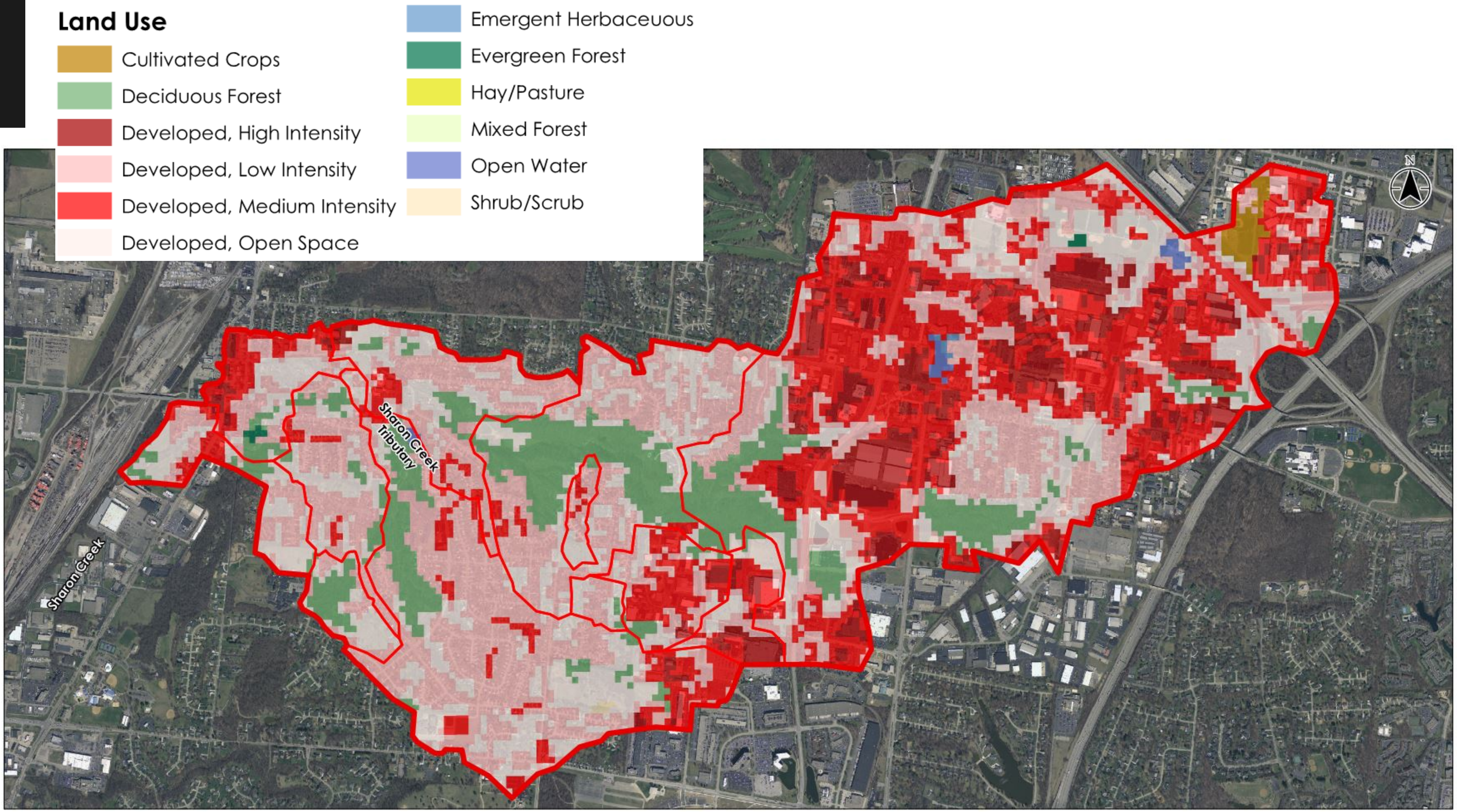
Hydrologic Analysis

Determine Hydrologic Soil Groups



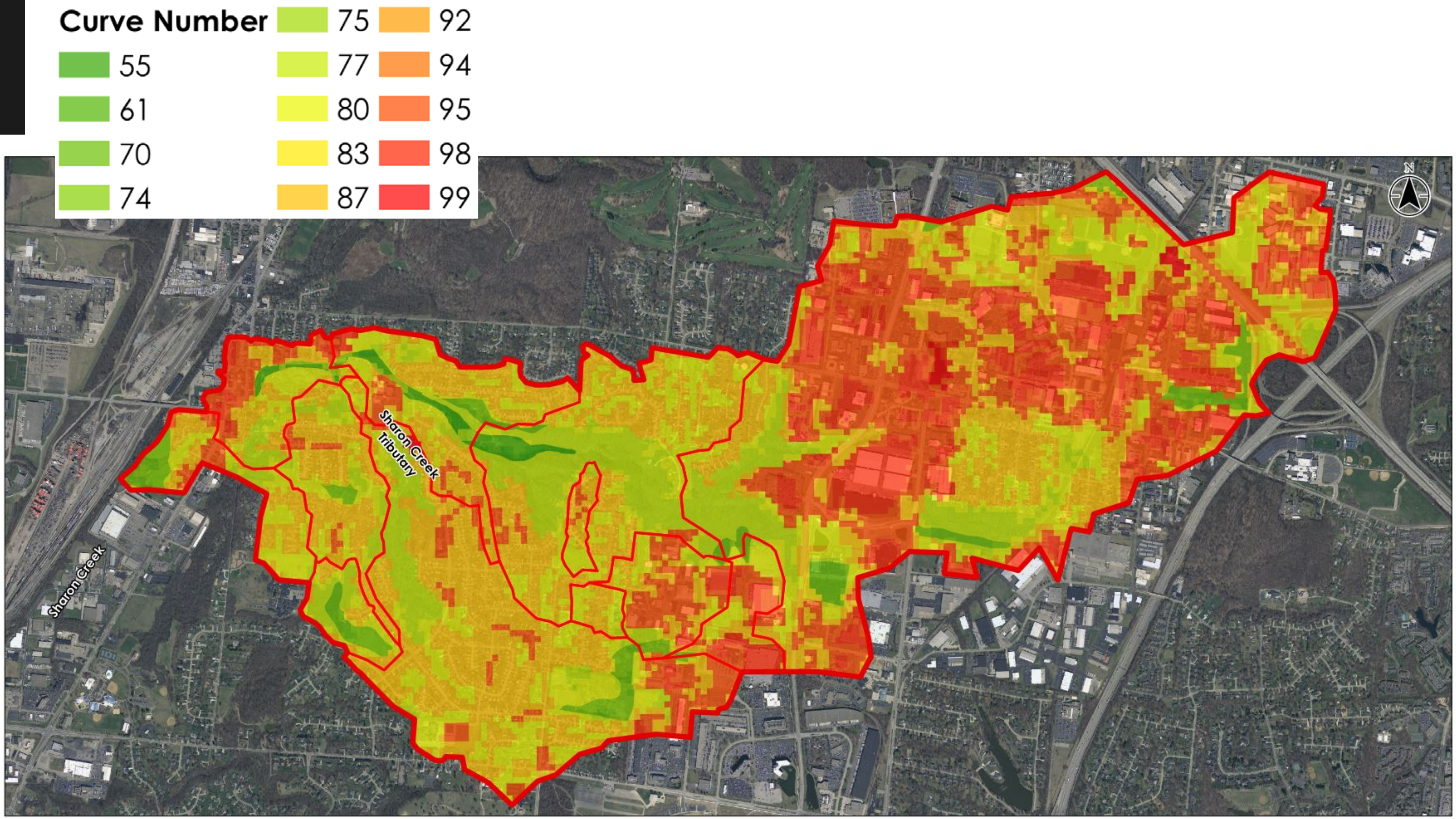
Hydrologic Analysis

Determine Land Cover



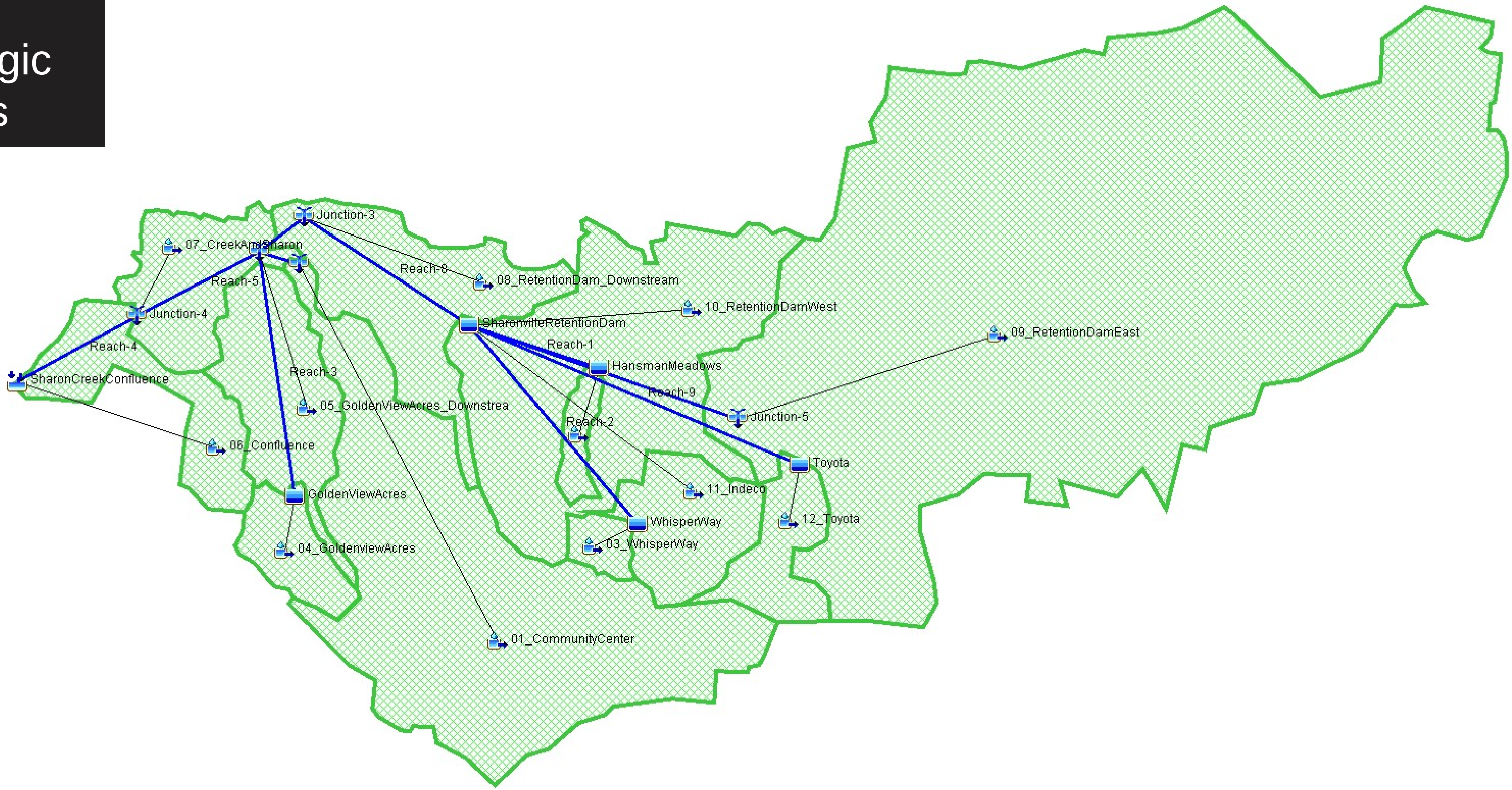
Hydrologic Analysis

Determine Composite CNs



Develop HEC-HMS Model

Hydrologic Analysis



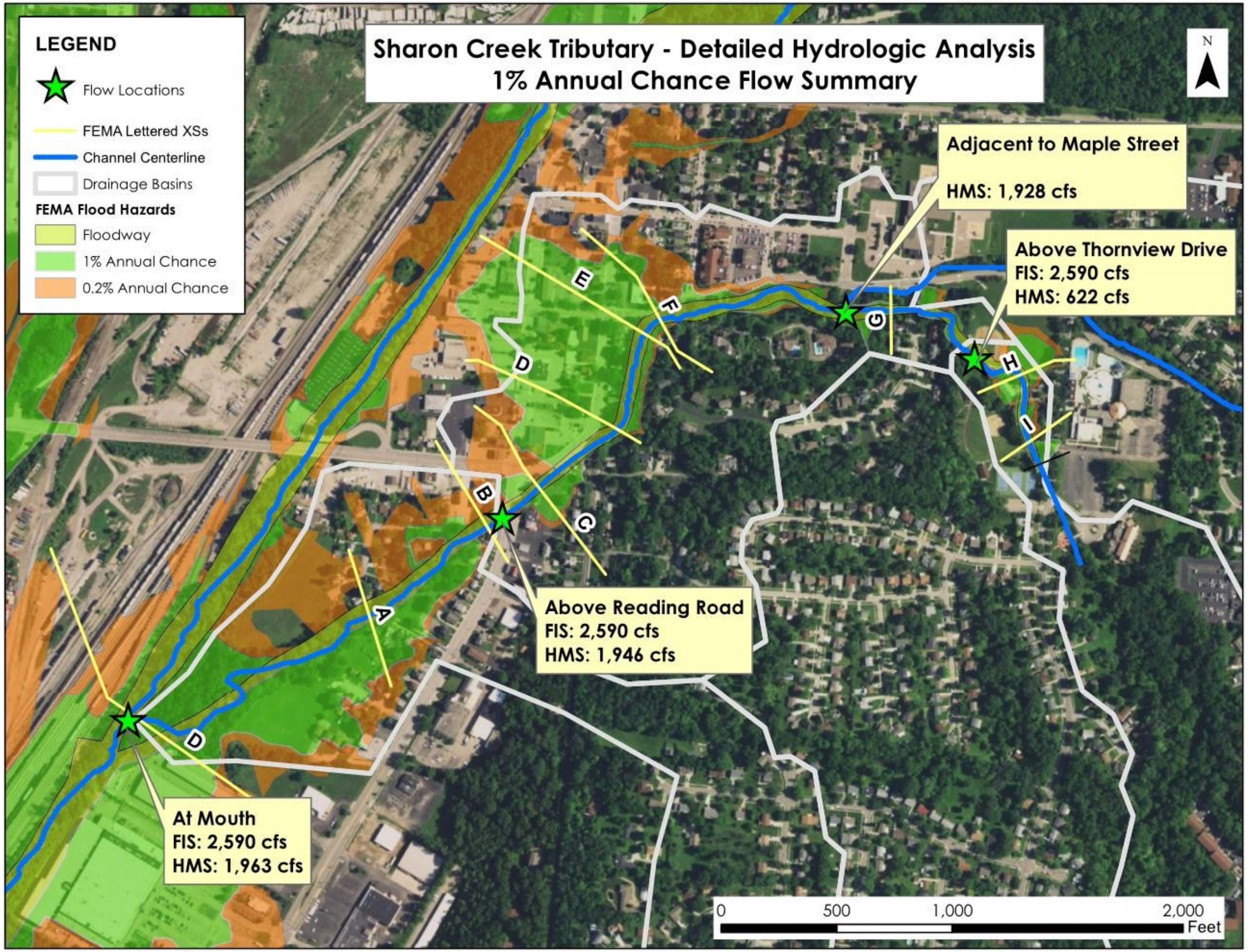
Hydrologic Analysis

Compare HEC-HMS to Effective Flow Rates

			Peak Discharges (cubic feet per second)			
Model	**Location**	**Drainage Area (square miles)**	**10% Annual Chance Exceedance**	**2% Annual Chance Exceedance**	**1% Annual Chance Exceedance**	**0.2% Annual Chance Exceedance**
Effective FIS	Above Thornview Drive	0.63	1,380	2,100	2,590	4,050
HEC-HMS	Above Thornview Drive	0.55	381	547	622	802
Effective FIS	Above Main Street	3.05	1,700	2,110	2,590	4,050
HEC-HMS	Above Reading Road	3.30	979	1,584	1,946	2,768
Effective FIS	At Mouth	3.55	1,700	2,110	2,590	4,050
HEC-HMS	At Mouth	3.40	1,094	1,598	1,963	2,795

Hydrologic Analysis

Compare HEC-HMS to Effective Flow Rates



Stantec

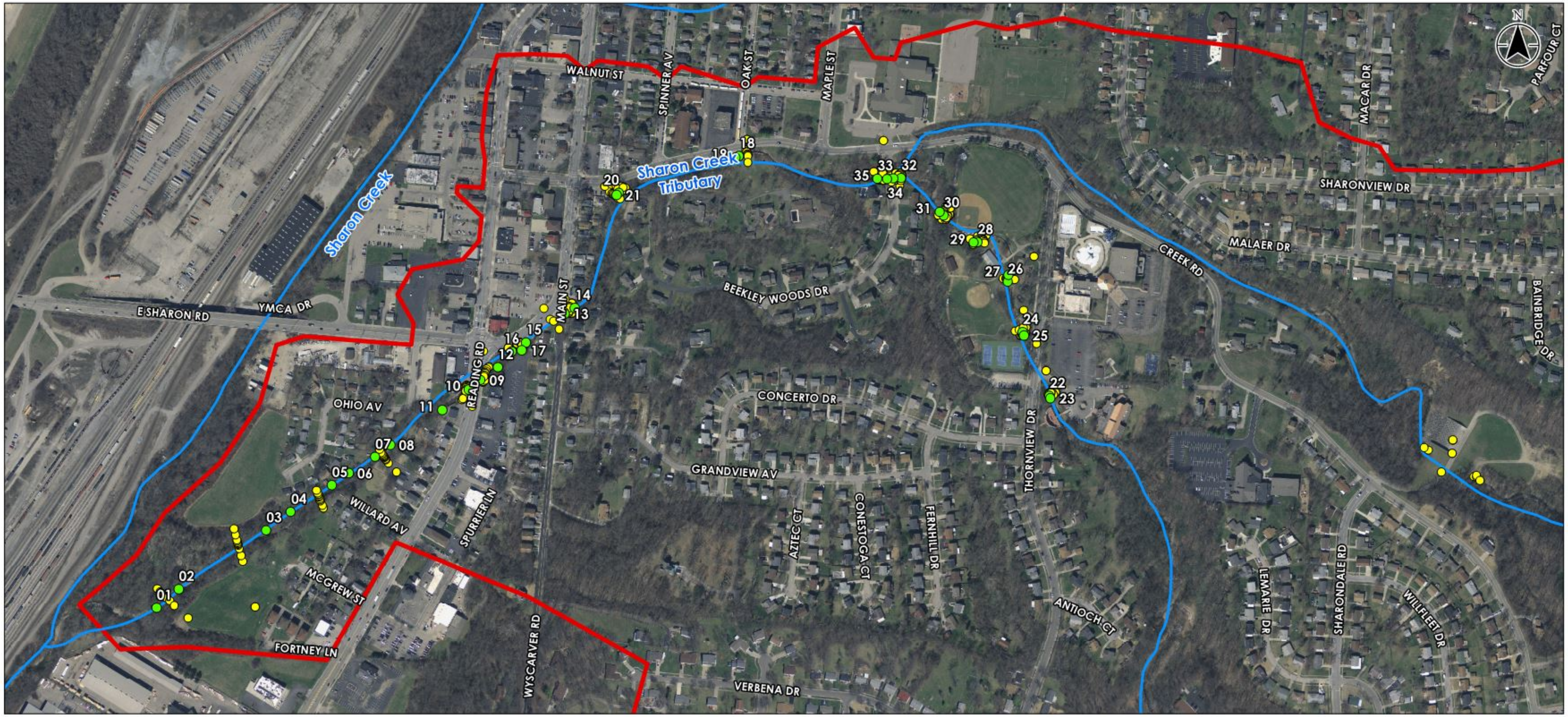
Phased Scope of Work

Hydraulic Analysis

Hydraulic Analysis

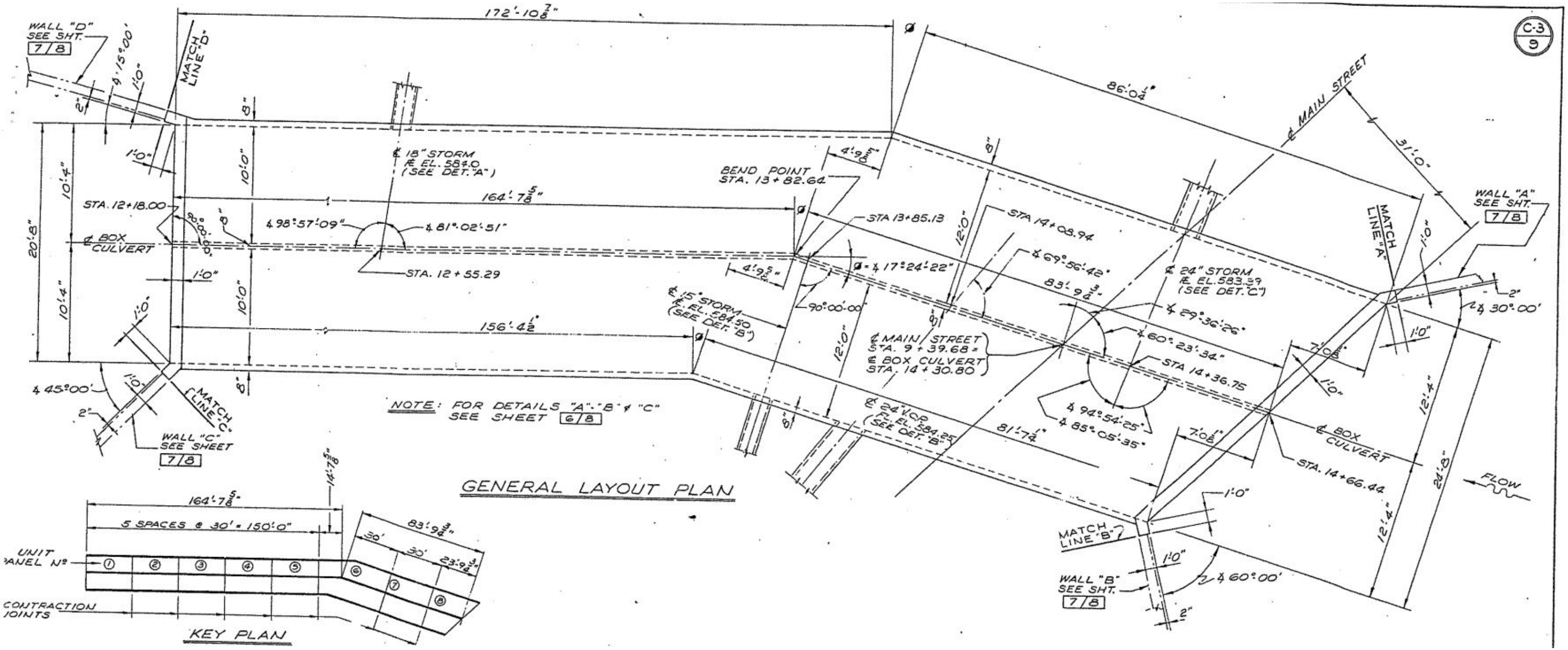
Topographic Survey

- Field Photos (Approximate Location)
- Survey Points



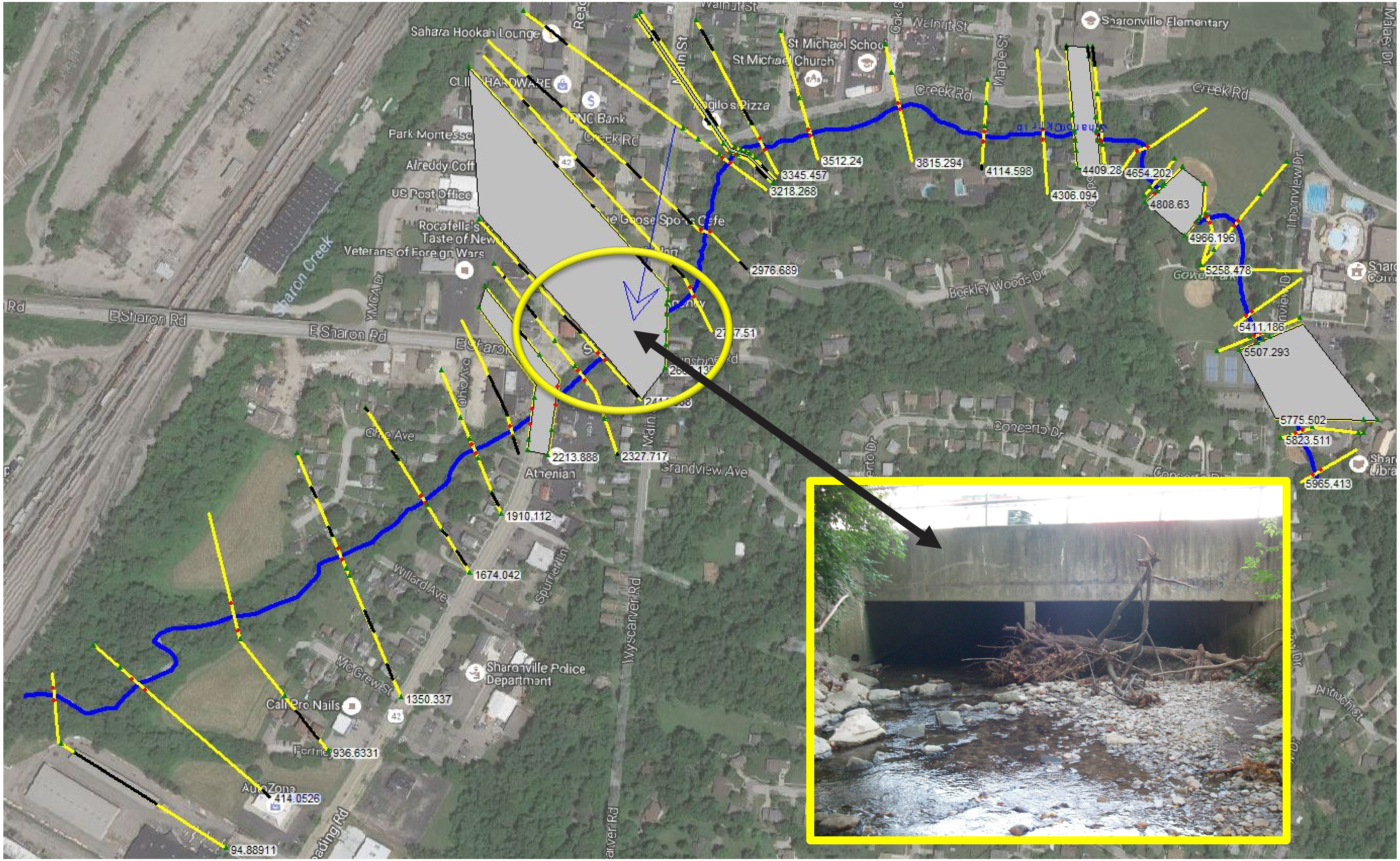
Structure Drawings

Hydraulic Analysis



Hydraulic Analysis

HEC-RAS Schematic



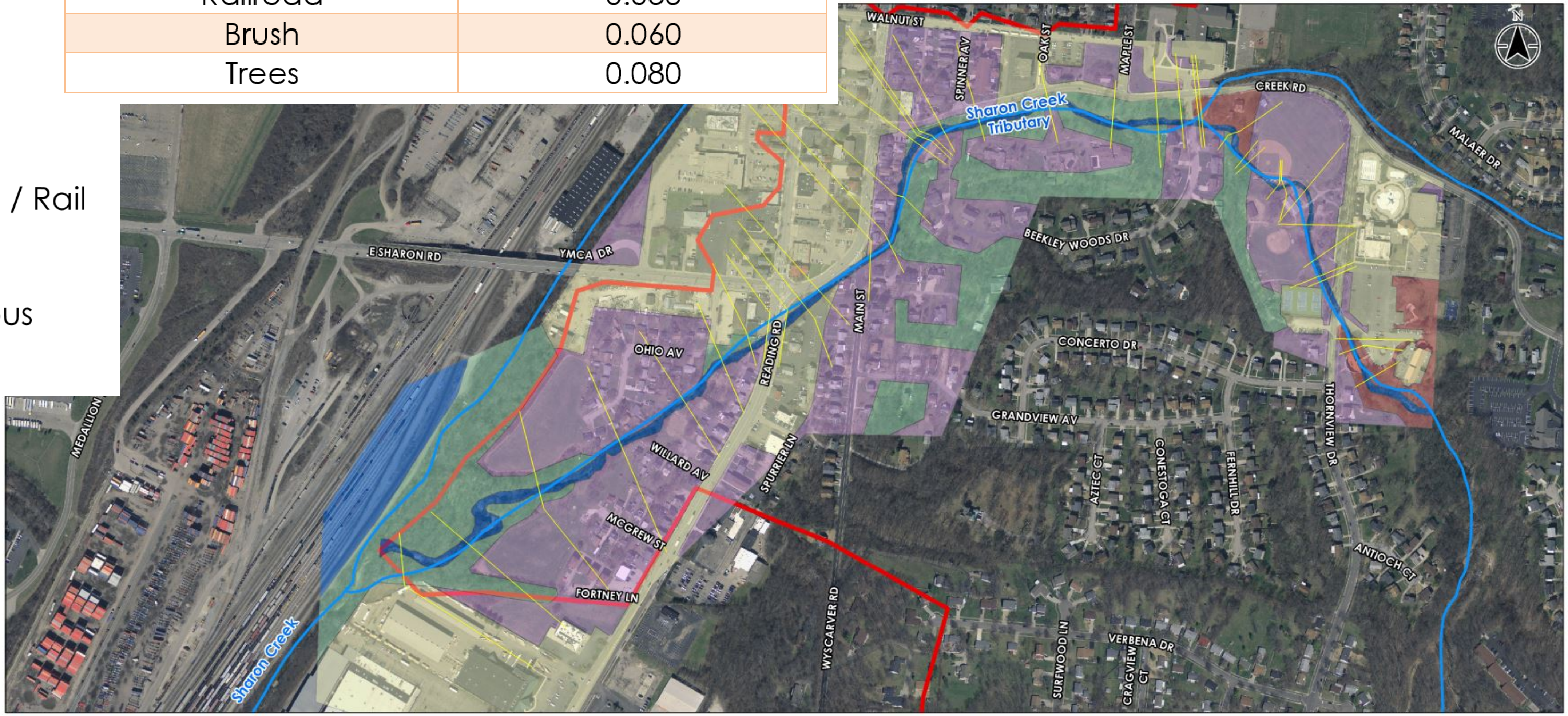
Hydraulic Analysis

Modeled Roughness Values

Land Use	Manning's "n" Value
Channel	0.035 - 0.050
Impervious Surface	0.015
Residential / Short Grass	0.030
Railroad	0.035
Brush	0.060
Trees	0.080

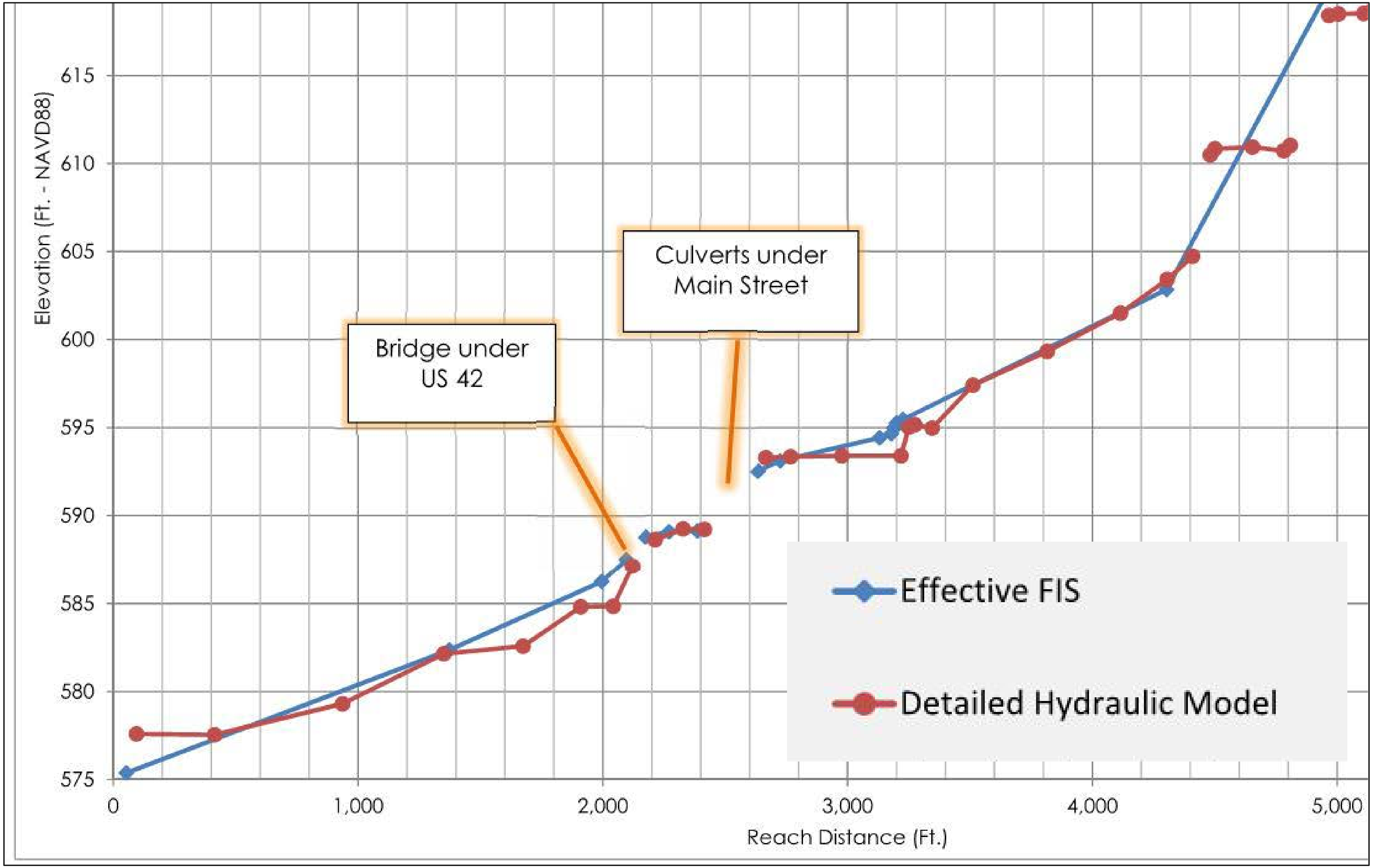
Land Use

- Brush
- Channel / Rail
- Grass
- Impervious
- Trees



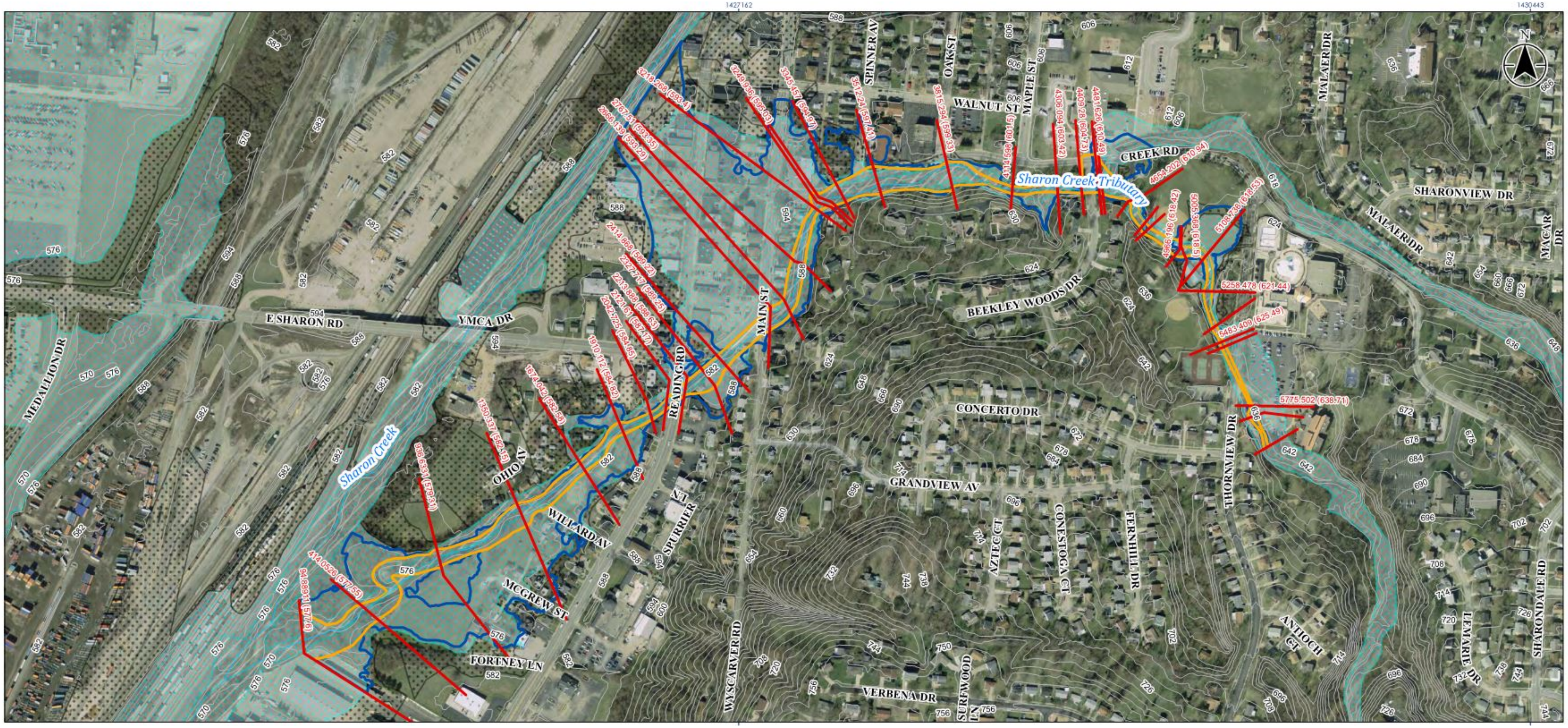
Hydraulic Analysis

Compared HEC-RAS Profile to Effective Profile



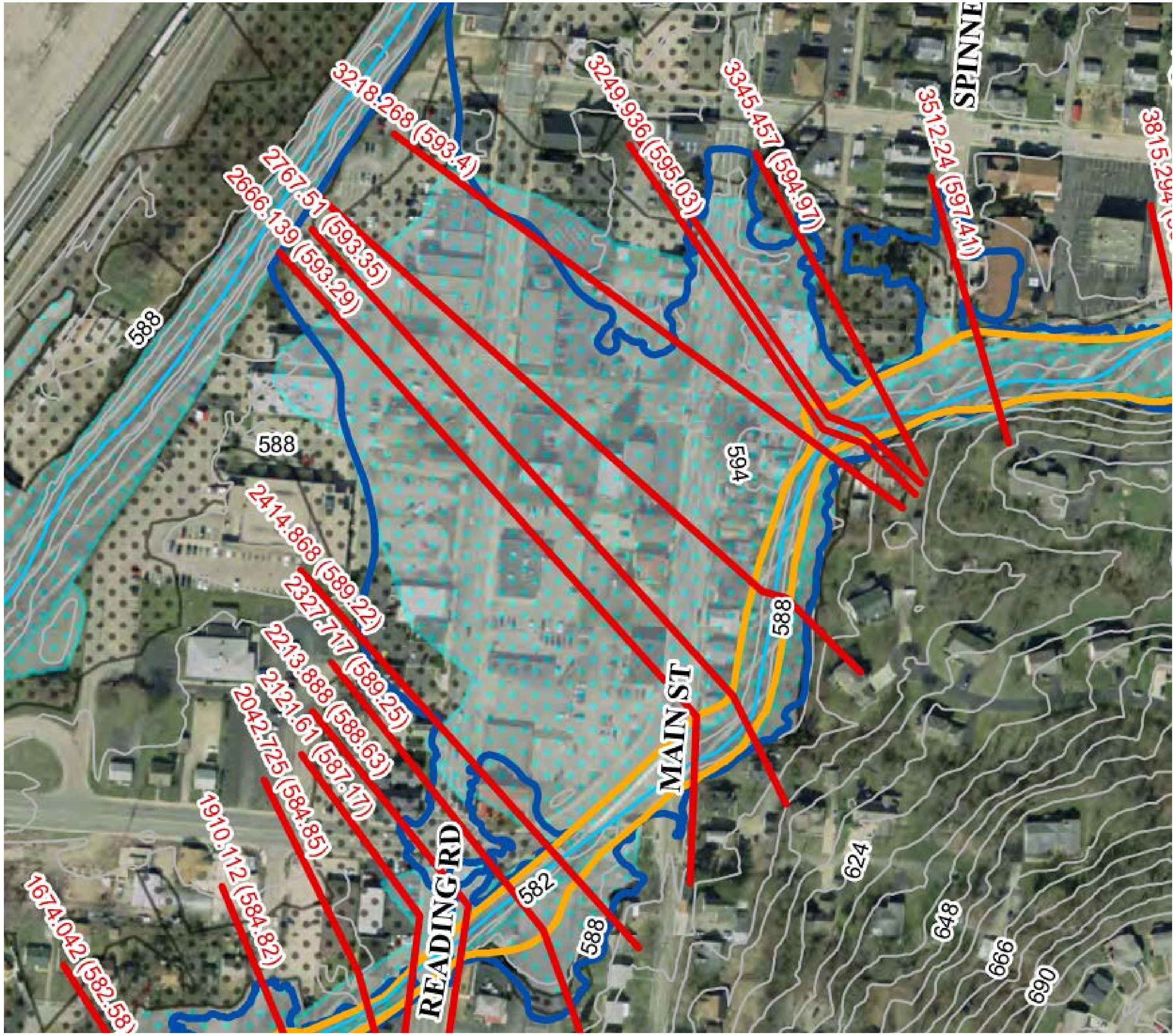
Compared HEC-RAS and Effective Floodplain Extents

Hydraulic Analysis



Compared HEC-RAS and Effective Floodplain Extents

Hydraulic Analysis



Phased Scope of Work

Alternative Analysis

Alternatives Considered

Options to reduce risk of flooding downtown Sharonville

Modifications to Increase Storage Capacity

- Existing Structure Provides Minimal Storage
- Several Options Available

Alternatives Considered

Options to reduce risk of flooding downtown Sharonville

Increased Capacity through Culvert under Main Street

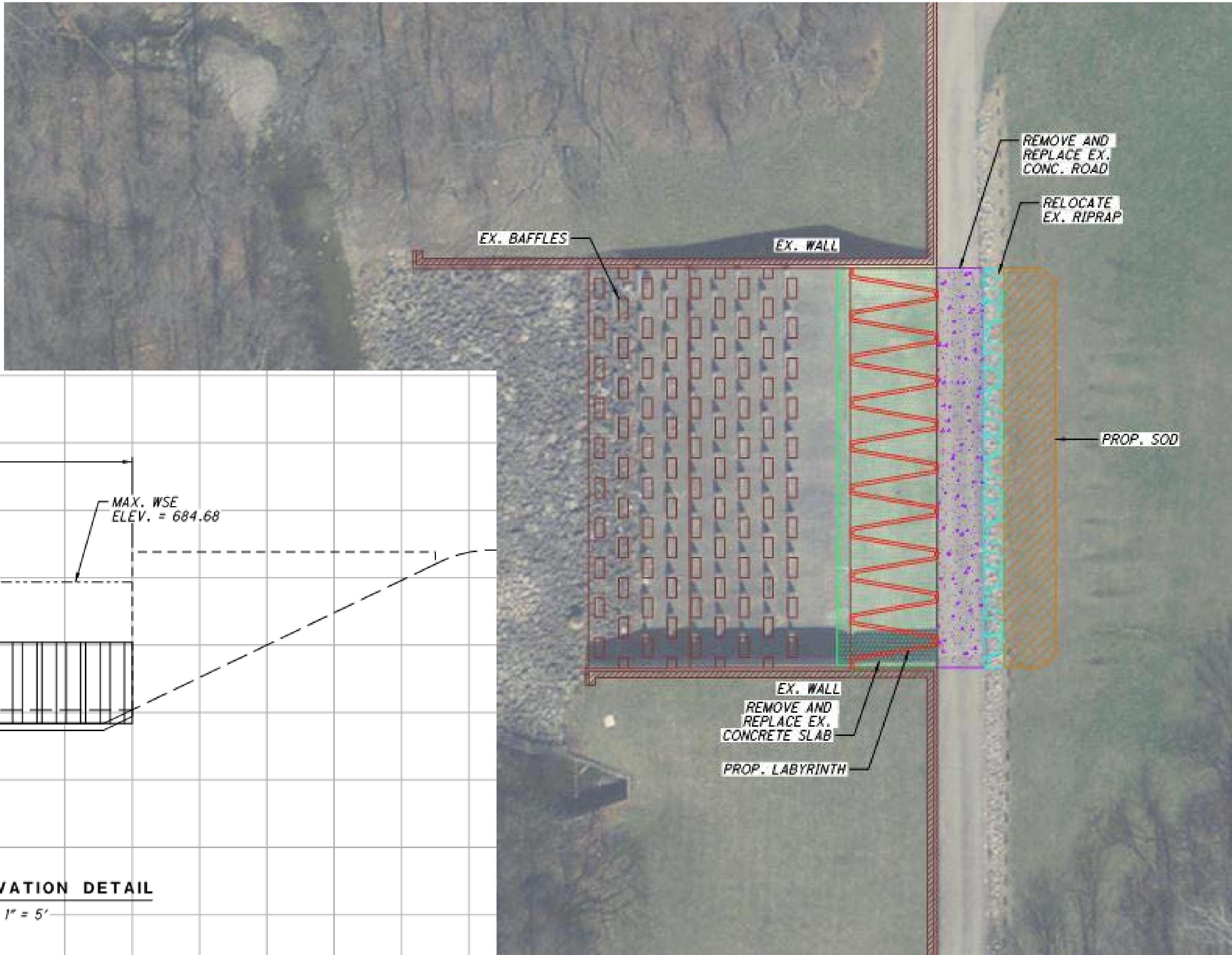
- Existing Bottleneck
- ODOT Scheduled Repairs

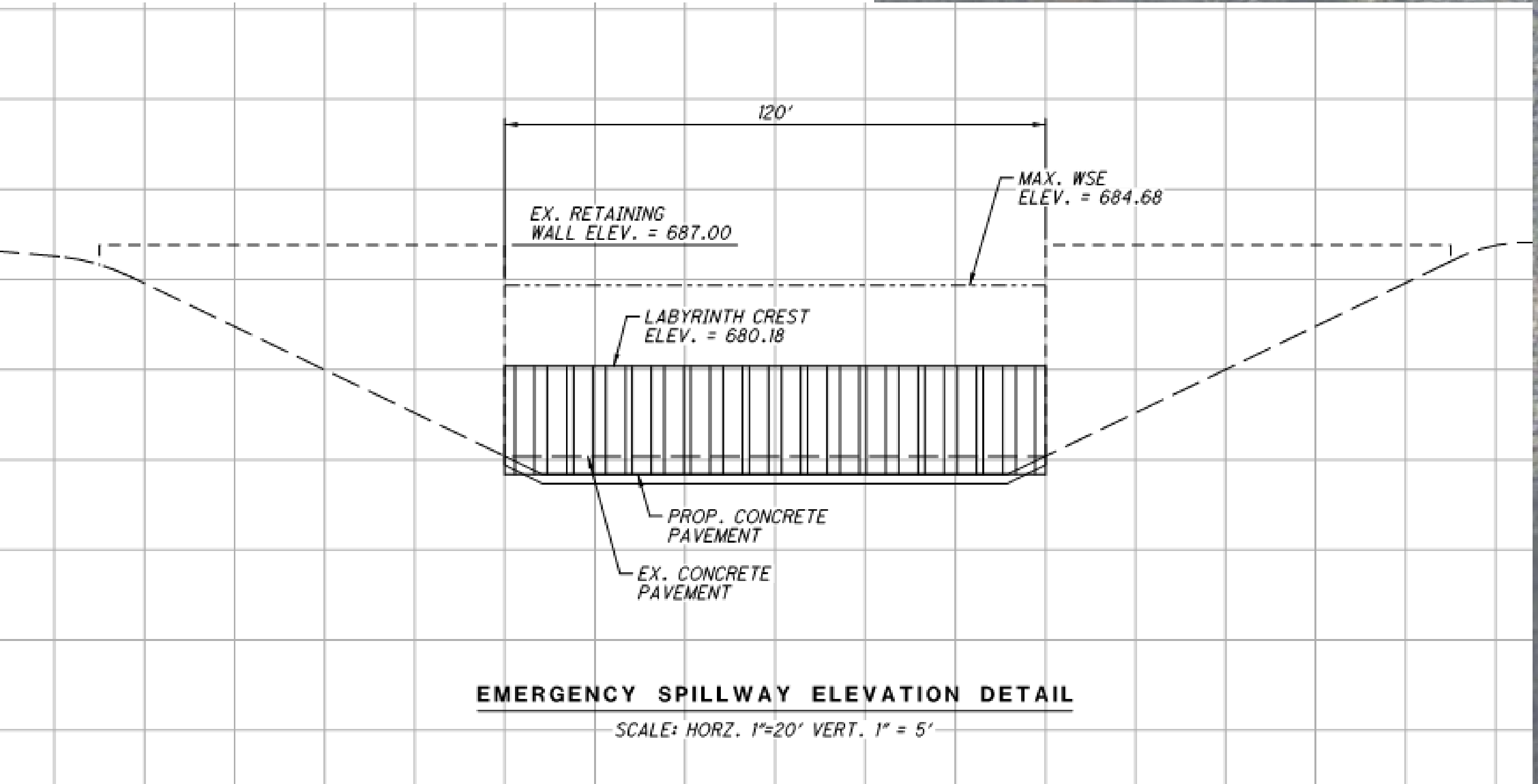
Alternative Analysis

Labyrinth Spillway Modification

Labyrinth Spillway Modification

Alternative Analysis





Alternative Analysis

Labyrinth Spillway Modification

			Peak Discharges (cubic feet per second)		
Model	**Location**	**Drainage Area (square miles)**	**10% Annual Chance Exceedance**	**2% Annual Chance Exceedance**	**1% Annual Chance Exceedance**
Existing Conditions	Above Main Street	3.30	979	1,584	1,946
Labyrinth Weir	Above Reading Road	3.30	979	1,338	1,783
Existing Conditions	At Mouth	3.40	1,094	1,598	1,963
Labyrinth Weir	At Mouth	3.40	1,094	1,512	1,802

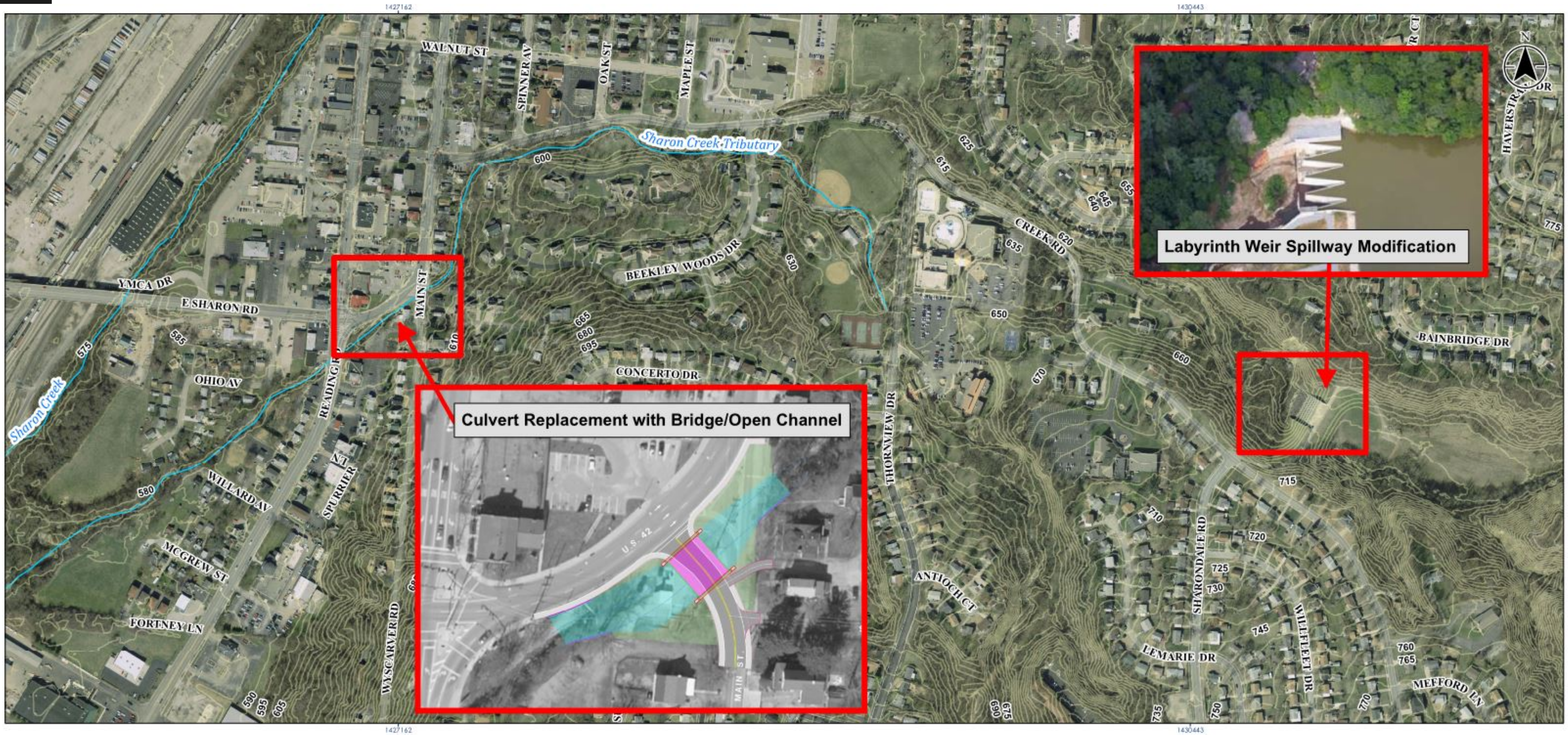
Existing Twin Box Culverts

Bridge / Open Channel Concept

Alternative Analysis

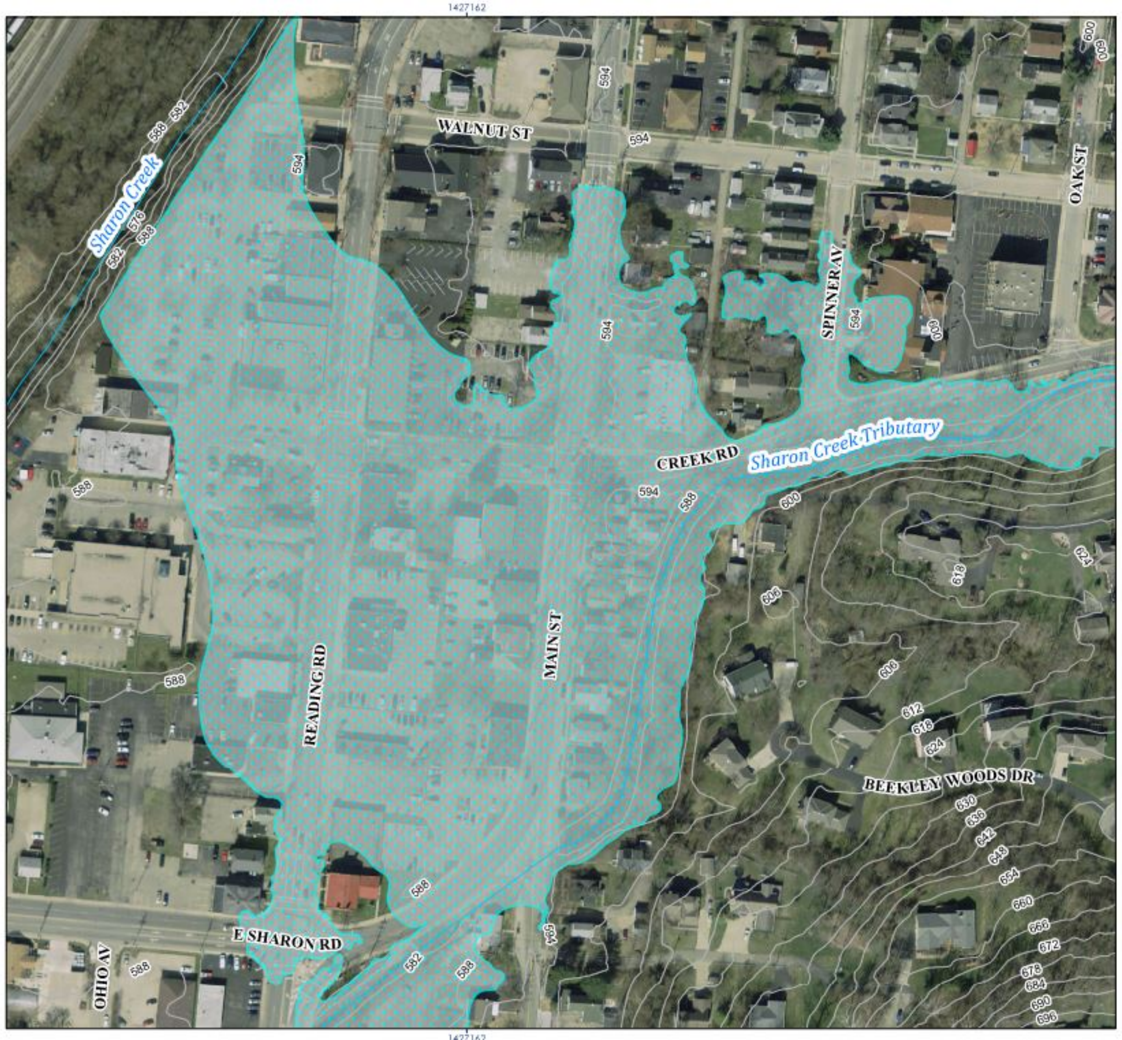
Alternative Analysis

Alternative Analysis Mapping



Alternative Analysis Mapping

Alternative Analysis



Alternative Analysis

Alternative Analysis Costs

	Cost (2017 $)
Main Street Bridge Subtotal	**$1,840,000**
Labyrinth Weir Subtotal	**$358,000**
Total for Construction	**$2,198,000**
Engineering Design	$220,000
Permitting, Administration and Management	$154,000
Total for Construction & Engineering	**$2,572,000**
Annual O&M Cost	$500
Design Life (Years)	50
Total Maintenance Costs (NPV)	$6,900
Total Life Cycle Cost	**$2,579,000**

Stantec

Phased Scope of Work

Grant Application

FEMA

FEMA administers three programs that provide funding for eligible mitigation planning and projects that reduces disaster losses and protect life and property from future disaster damages

- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance (FMA) Program
- Pre-Disaster Mitigation (PDM) Program

FEMA

HMGP

- Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act
- Purpose of HMGP is to help communities implement hazard mitigation measures following a Presidential Major Disaster Declaration in the areas requested by the Governor or Tribal Executive
- HMGP funding is limited; therefore, recipients and local government officials must make difficult decisions as to the most effective use of grant funds

FMA Program

- Authorized by Section 1366 of the National Flood Insurance Act of 1968
- Goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP)
- Provides funding for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the NFIP
- Funding is appropriated by Congress annually
- Hazard Mitigation Plans are a condition for assistance

PDM Program

- Authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act
- Designed to assist in implementing a sustained pre-disaster natural hazard mitigation program
- Goal is to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters
- Funding is appropriated by Congress annually
- Hazard Mitigation Plans are a condition for assistance

FMA Eligible Activities

- Infrastructure protective measures
- Localized flood control to protect critical facilities
- Floodwater storage and diversion
- Floodplain and stream restoration
- Water and sanitary sewer system protective measures
- Utility protective measures
- Stormwater management
- Aquifer storage and recovery
- Wetland restoration/creation

Benefits of Grant Programs

- Supports risk reduction activities
- Improves resiliency
- Eliminates the impact of future events
- Provides a long-term solution to a problem
- Offers a cost-effective solution
  - To be funded, a project’s potential savings must be more than the cost of implementing the project.
- Helps avoid repetitive damage from disasters

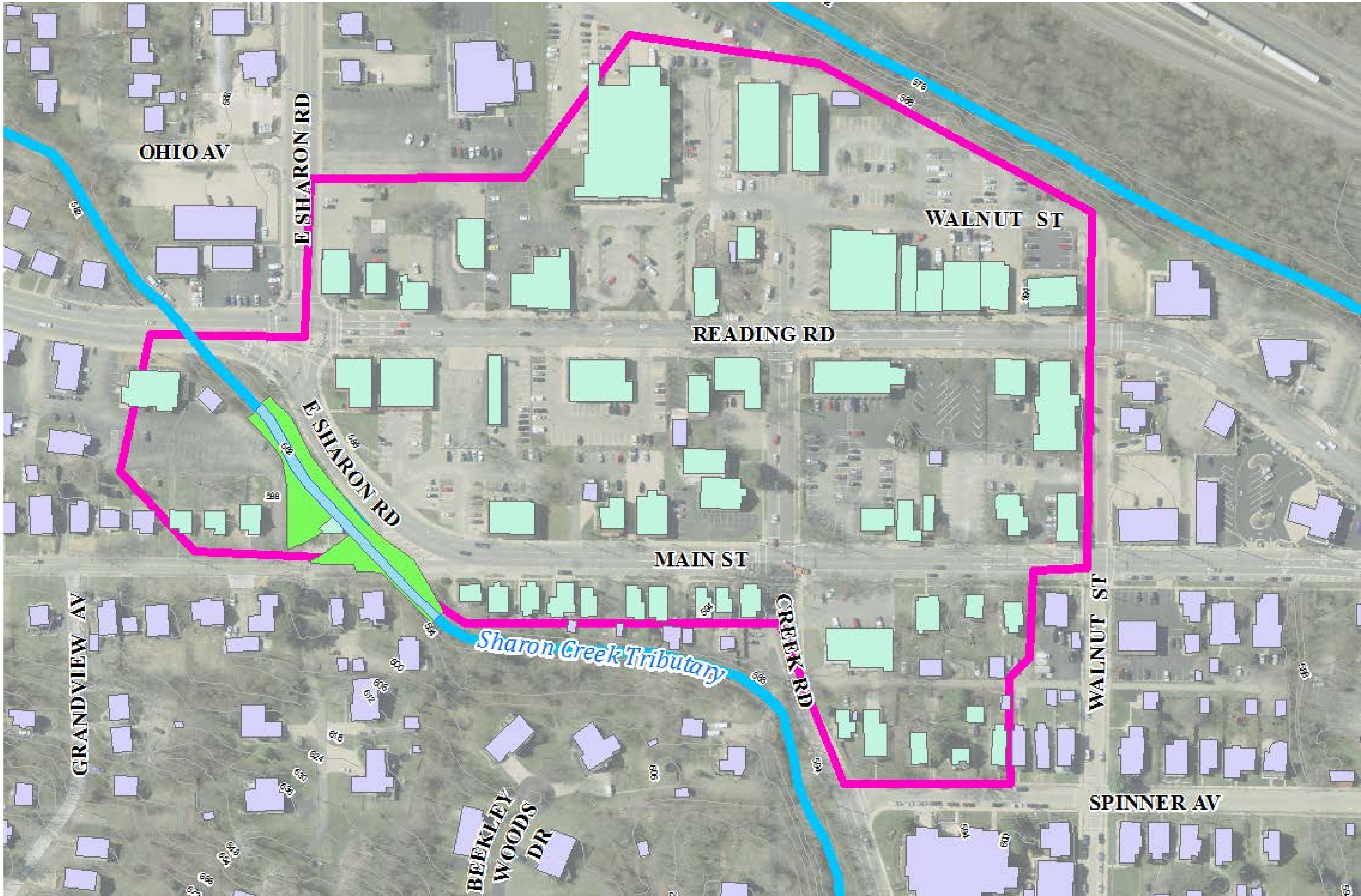
Benefit-to-Cost Analysis

Grant Application

~60 Structures

First Floor Elevations

Auditor's Data



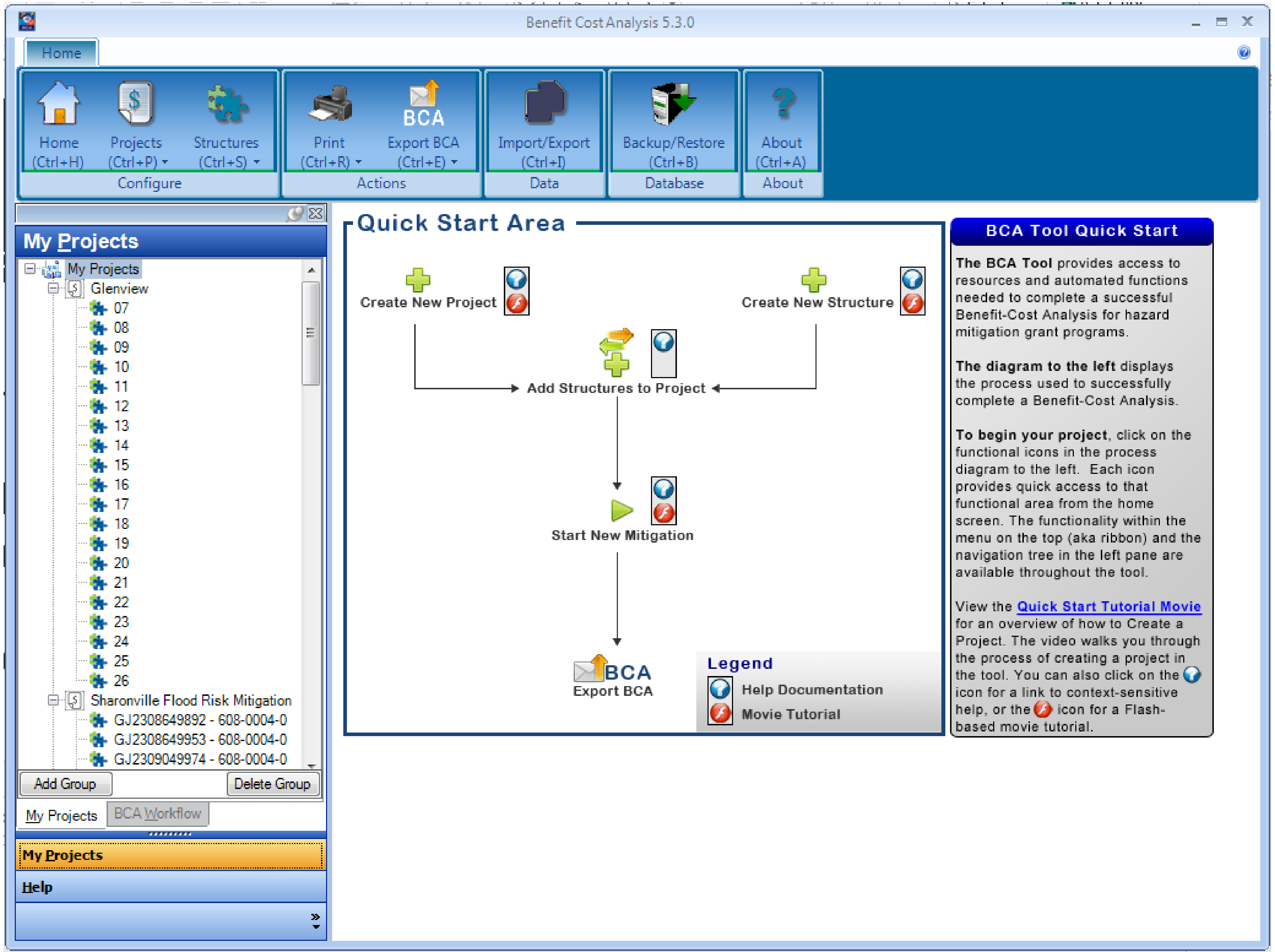
FEMA BCA Toolkit

Grant Application

~60 Structures

First Floor Elevations

Auditor's Data



FEMA BCA Toolkit

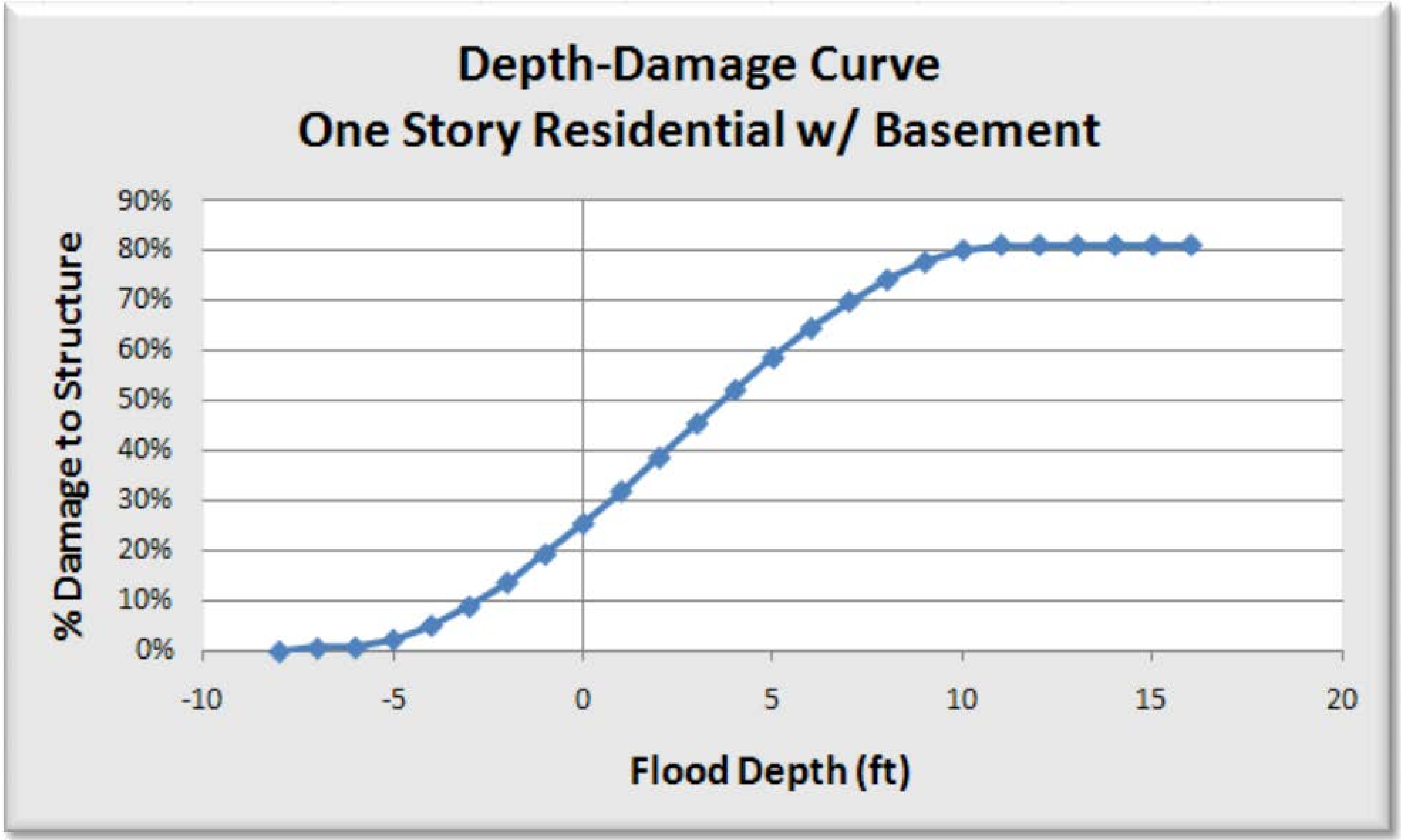
Grant
Application

~60
Structures

First Floor
Elevations

Auditor's
Data

Figure 2: Example depth-damage relationship:
USACE, Economic Guidance Memo #04-01, October 2003



Benefit-to-Cost Analysis – Transportation Damages

Grant Application

AADT Data

Reading Rd. / Main St.

Detour Time / Distance

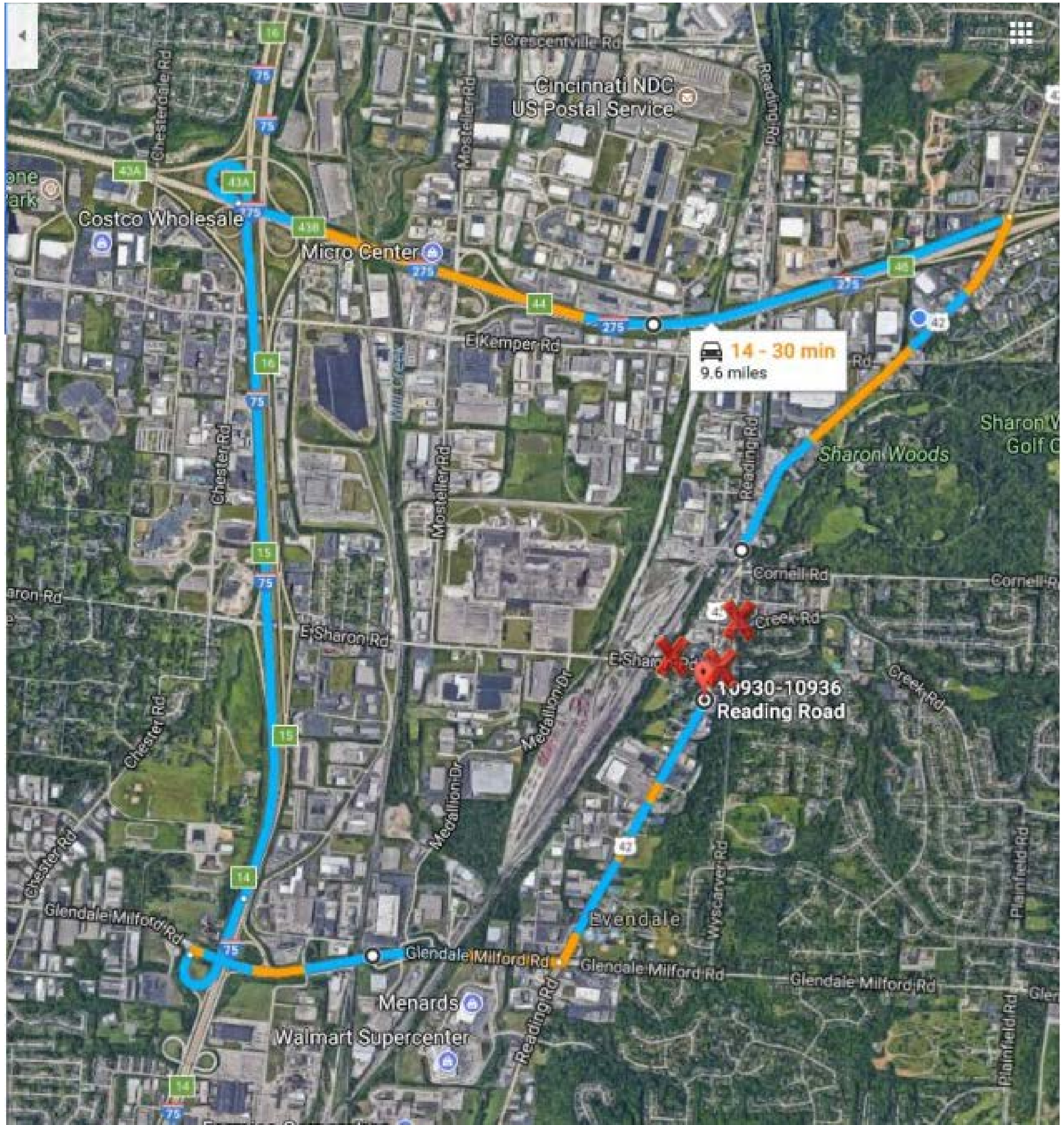
Benefit-to-Cost Analysis – Transportation Damages

Grant Application

AADT Data

Reading Rd. / Main St.

Detour Time / Distance

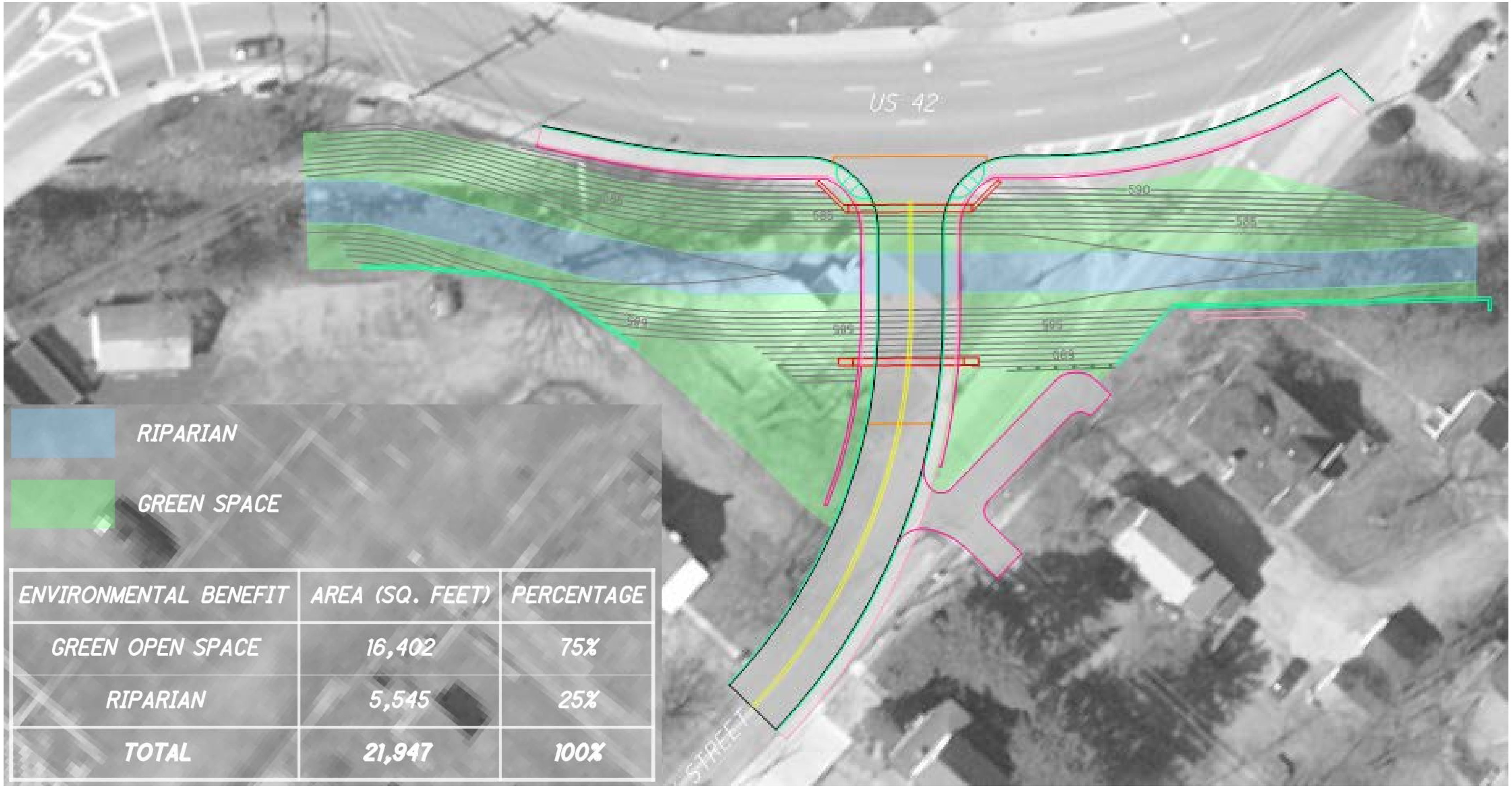


Benefit-to-Cost Analysis – Environmental Benefits

Grant Application

Open Green Space

Riparian Areas



ENVIRONMENTAL BENEFIT	AREA (SQ. FEET)	PERCENTAGE
GREEN OPEN SPACE	16,402	75%
RIPARIAN	5,545	25%
TOTAL	21,947	100%

Grant Application

Benefit-to-Cost Analysis

- Reduction in property and contents damages to 60 commercial and residential structures
- Reduction in displacement and disruption costs for residents and commercial businesses
- Reduction in service loss for public roadways
- Social benefits
- Environmental improvements to the creek and riparian area

Grant Application

Benefit-to-Cost Analysis

Total Life Cycle Cost	**$ 2,578,988**
Total Structural Benefits	**$ 1,948,461**
Base Structural BCR	**0.76**

Total Social Benefits	**$ 1,849,345**
Total Environmental Benefits	**$ 112,063**
Total Life Cycle Benefits	**$ 3,909,869**
Final BCR	**1.52**

Grant Application

Cost Share

- Up to 75% of the cost through PDM / FMA Grant ($1.93 MM)
- ODOT agreed to provide local match if certain conditions met ($645 k)

Grant Application

Grant Application Submitted to OEMA – 9/29/2017

State Hazard Mitigation Team Voted in Favor – 10/16/2017

Grant Application Submitted to FEMA – 10/27/2017

FMA Grant Application Identified for Further Review – 3/22/2018

Applicant	Subapplication Title	Submitted Federal Share	Status
OH	City of Sharonville Flood Mitigation Project - FMA	$1,927,027.02	Identified for Further Review

Grant Application – Next Steps

RFI #1 from FEMA – 4/9/2018

RFI #2 from FEMA – 6/27/2018

RFI #3 from FEMA – 8/20/2018

- FEMA will go through Environmental Assessment (EA) – 9/25/2018
- Data and Information Request from FEMA Contractor – 10/15/2018
- Submitted Requested Data – 10/29/2018

- Environmental Assessment Complete! – 2/22/2019

Grant Application – Next Steps

Target is to publish public notice mid-April 2019

After 30 days, there will be a review and comment period for 30 days

Target is to provide notification of outcome by mid-June 2019

Grant Application – Outcomes

1. Finding of No Significant Impact (FONSI)
2. Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS)

With either determination of a FONSI or the completion of the EIS, consideration of approval of the award cannot be done until after completion of the EHP review.

Conclusions

City of Sharonville – Flood Mitigation Project

Phased Approach

- Allowed for several “go / no-go” decision points

Community Driven Projects

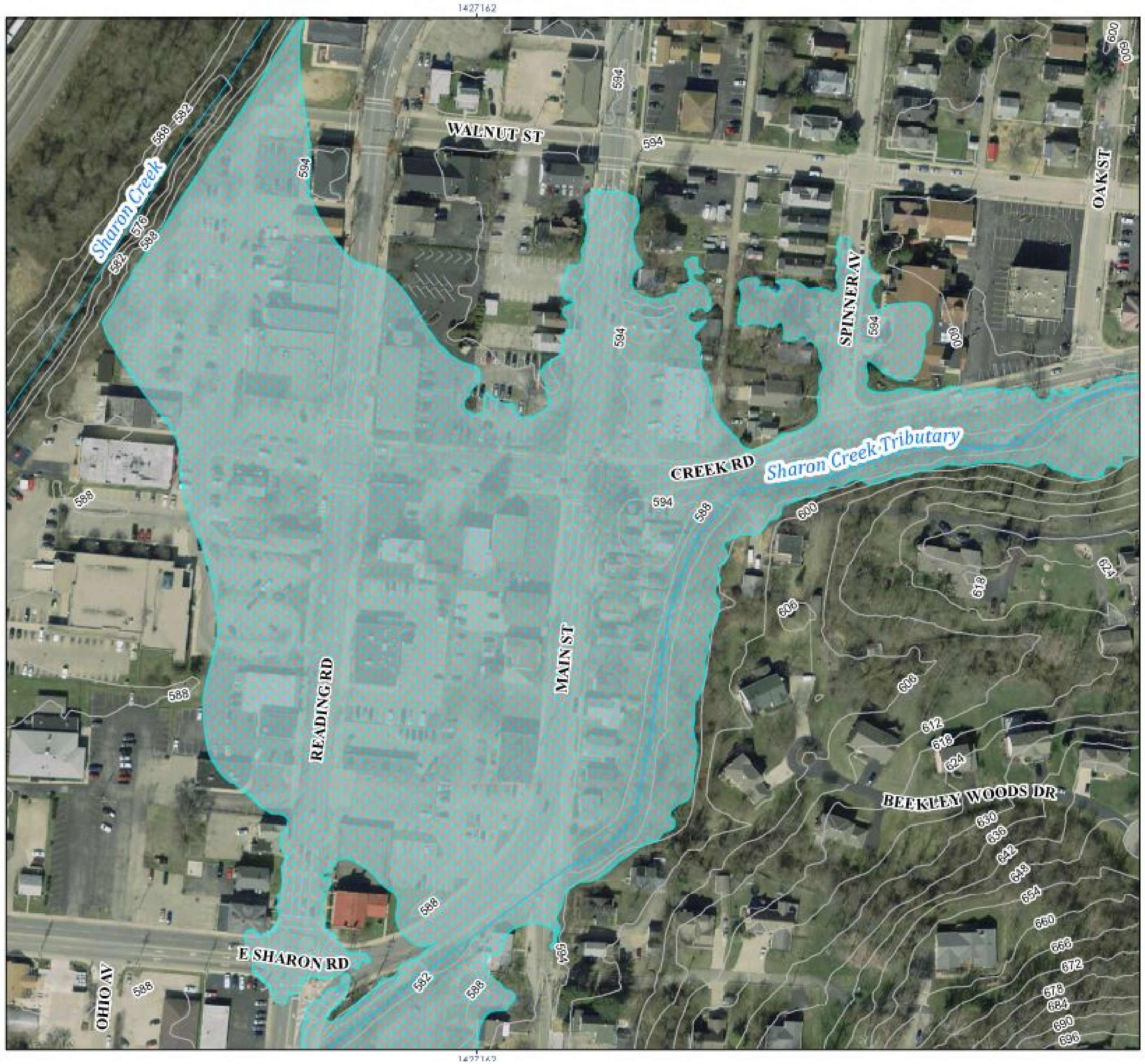
- Identified locally

Combination of Projects

- Developed watershed with multiple tributaries

Multi-faceted Team

- Working closely together on a tight schedule provides benefits.


WALNUT ST
Sharon Creek
SPINNER AV
OAK ST
CREEK RD
Sharon Creek Tributary
READING RD
MAIN ST
BEEKLEY WOODS DR
E SHARON RD
OHIO AV


WALNUT ST
Sharon Creek
SPINNER AV
OAK ST
CREEK RD
Sharon Creek Tributary
READING RD
MAIN ST
BEEKLEY WOODS DR
E SHARON RD
OHIO AV

Questions?