Presented by:

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Wildcat Creek System Assessment, Howard County, Indiana

Howard County Surveyor's Office

March 13, 2018
Public Information Meeting

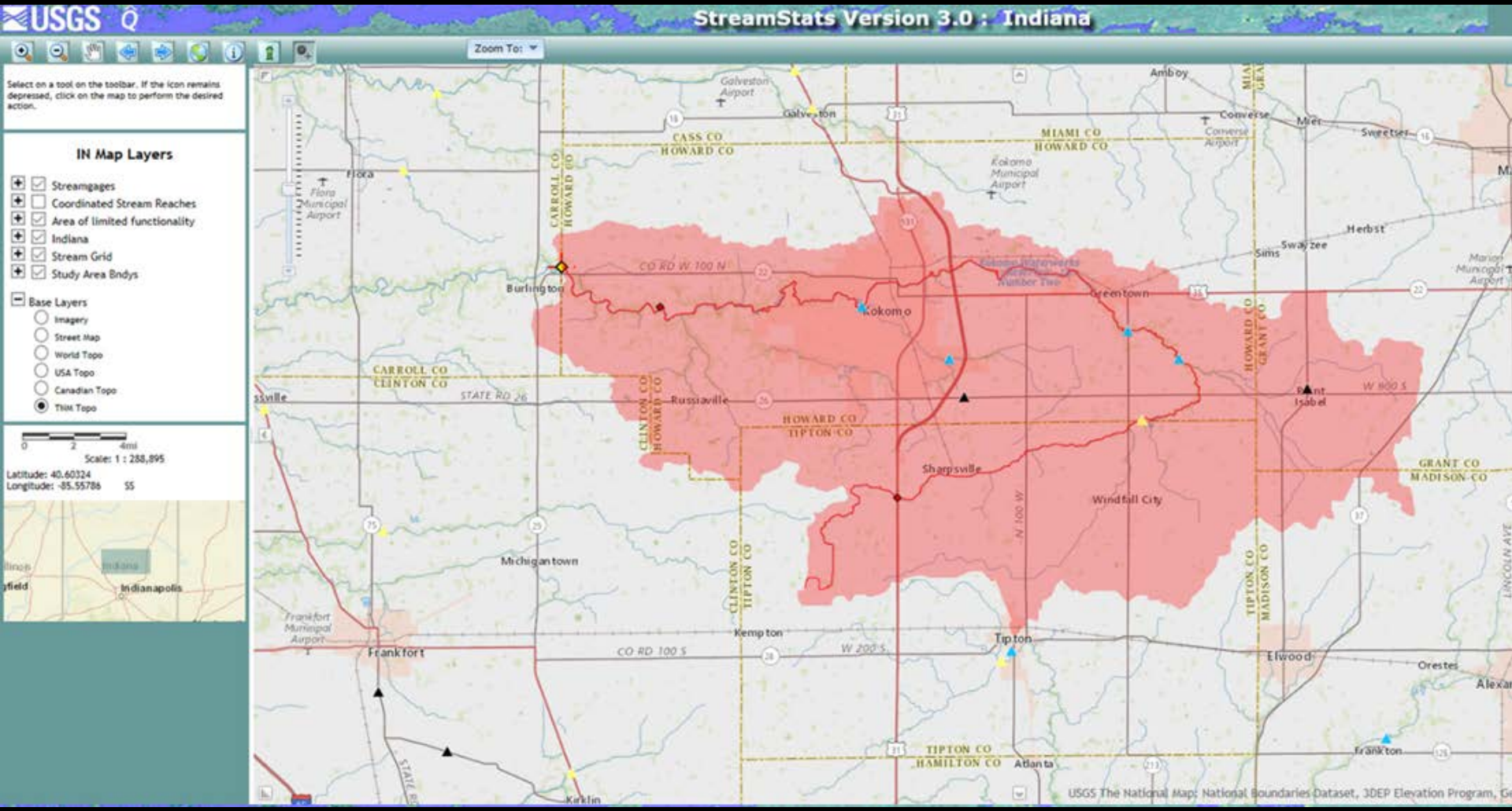
This study was completed in three successive phases:

The first phase included significant data gathering and site visits.

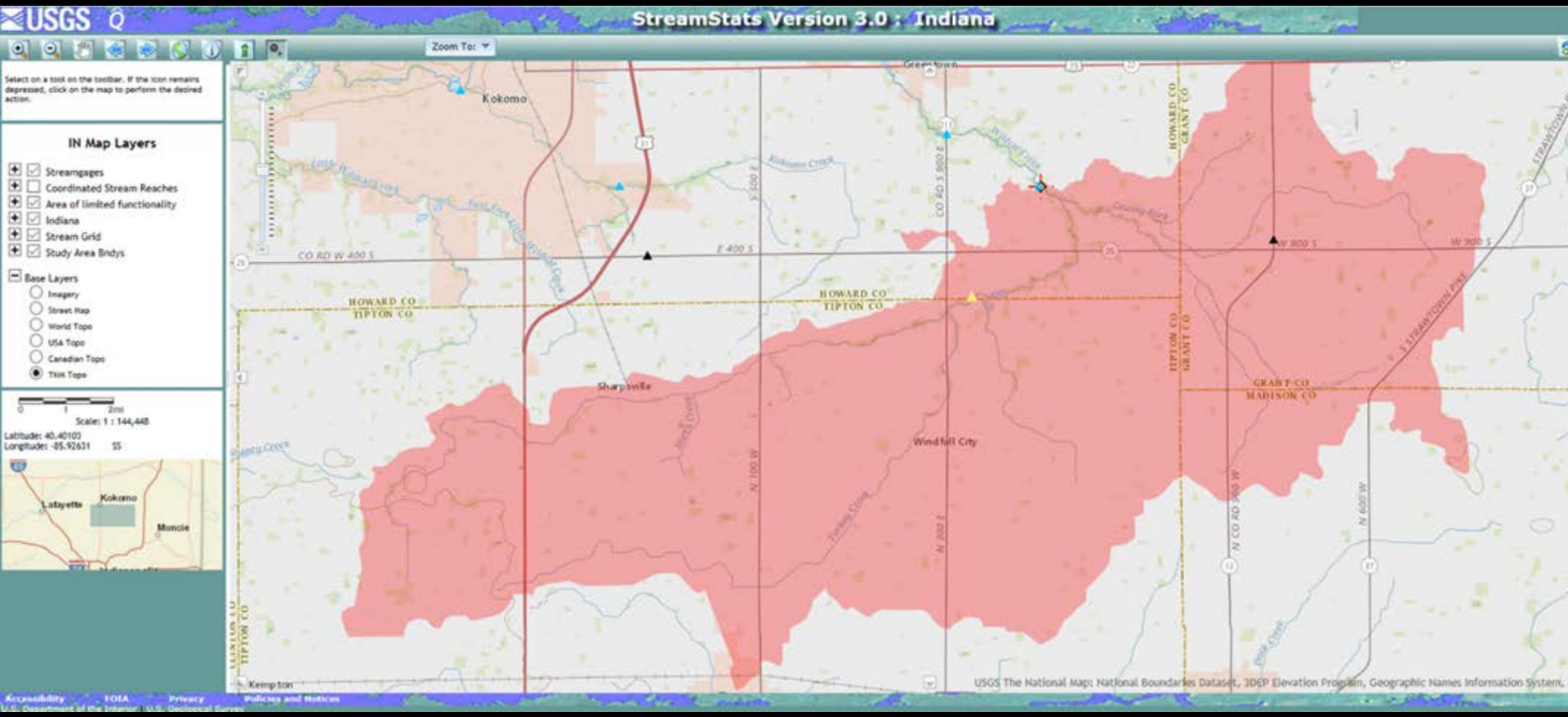
The second phase consisted of assimilation and processing of the data to determine major themes of the current morphologic condition of the stream system. Processed data were then used to identify stressors acting on the streambanks and causing flooding.

The third phase included development of conceptual strategies for reducing or eliminating the stressors.

INTRODUCTION



Wildcat Creek at Carroll County – Howard County line (Drainage area = 353 mi^2, approx. 60 miles of main channel)



Wildcat Creek, upstream of Jerome, Indiana (DA=149 mi^2) (USGS StreamStats)

Mud Creek upstream from Sharpsville, Tipton County, Indiana (Agriculturally modified headwaters, 16.5 miles)

Middle Fork Wildcat Creek at confluence with Mud Creek, upstream of Jerome (Confluence to Jerome, 3 miles)

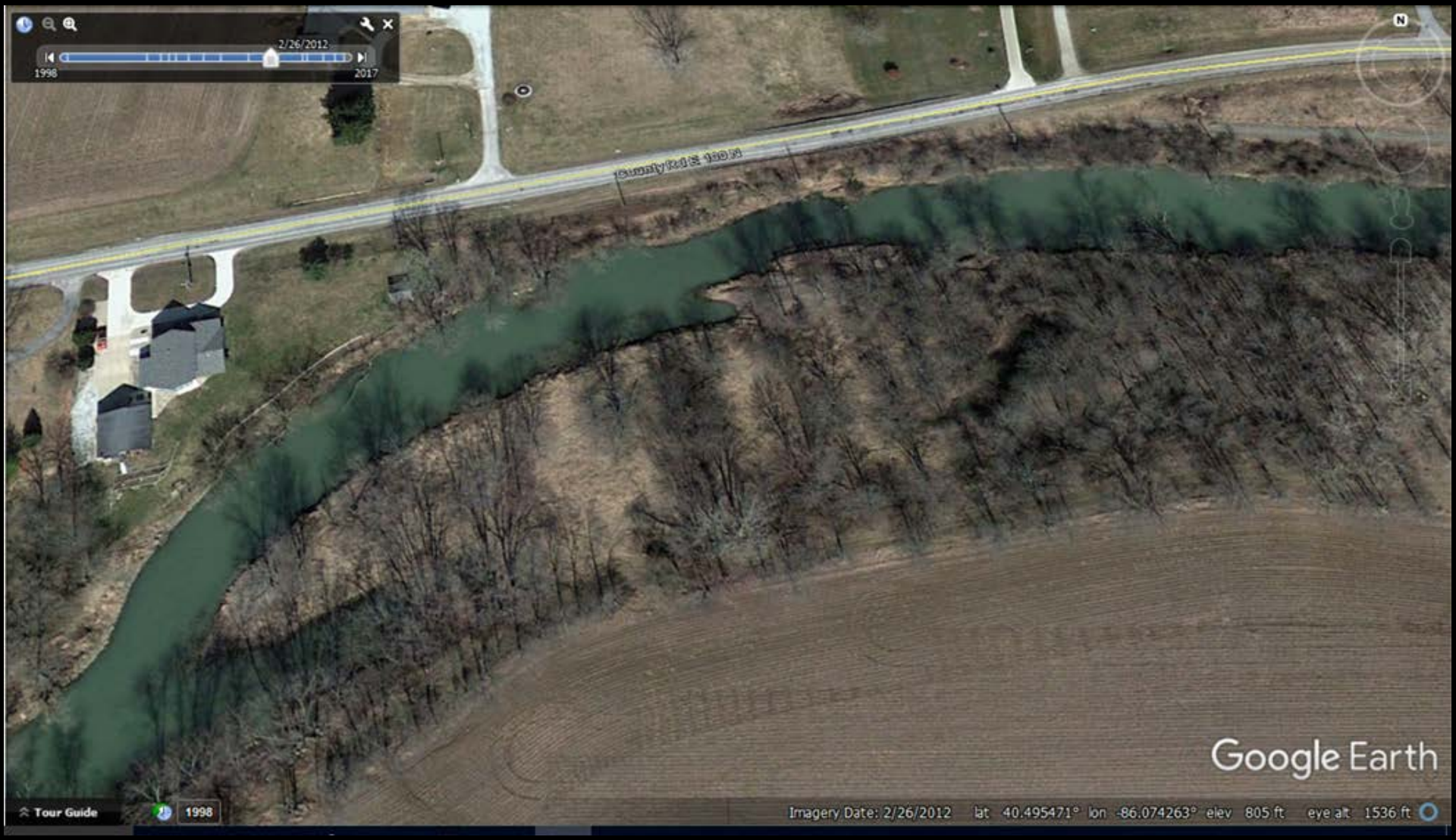
Wildcat Creek at Jerome Bridge, looking upstream

(Jerome to upstream of Greentown, 4.75 miles)

Kokomo Waterworks Reservoir #2 at Greentown, Indiana (Reservoir Reach, 4.9 miles)

Wildcat Creek near CR E 100 N, east of N Hardbeck Road

(Reservoir to US 931, 4.3 miles)



Wildcat Creek at Apperson Way, looking upstream

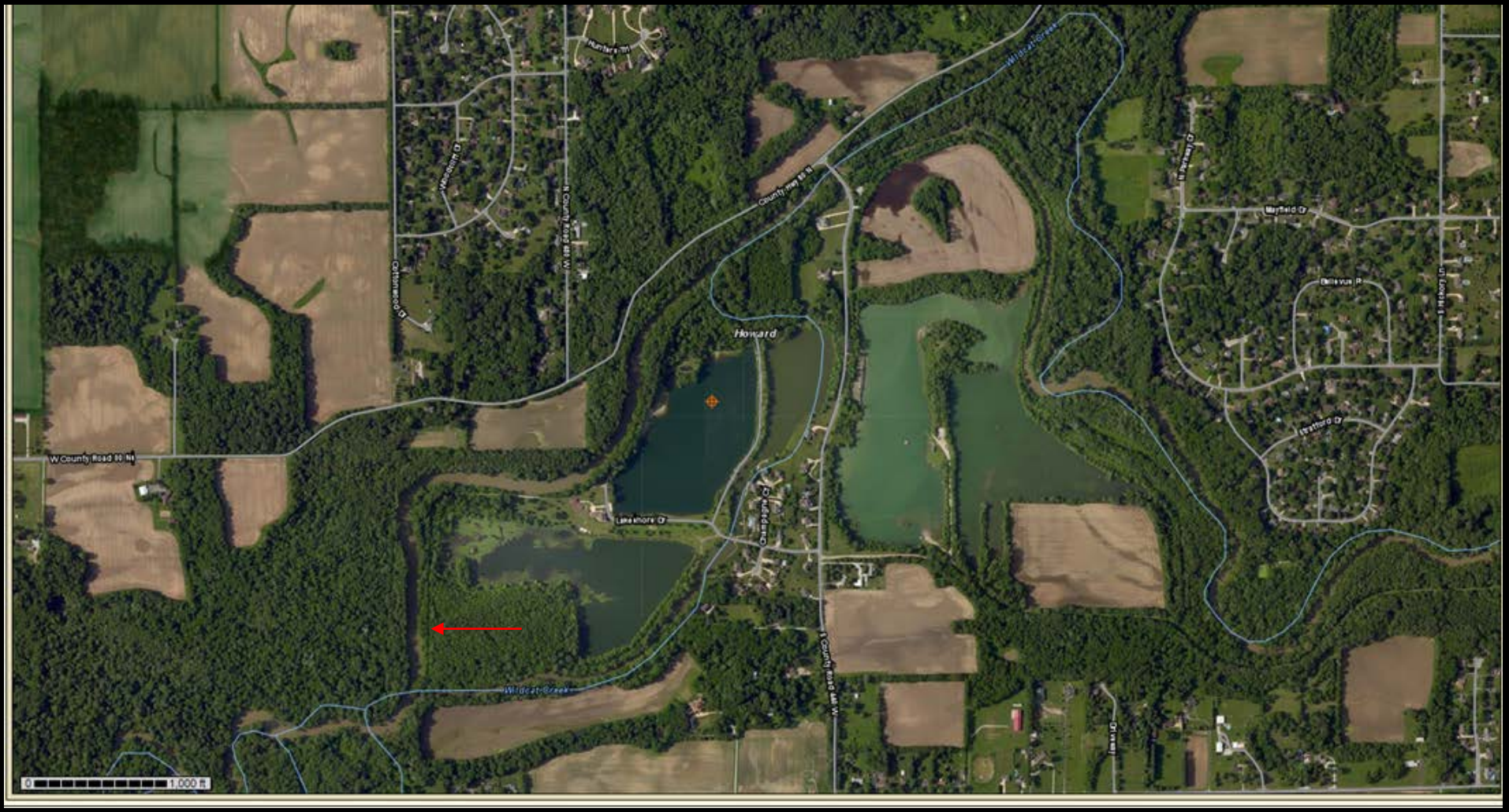
(Kokomo reach, 4.3 miles)

Wildcat Creek across from Martin-Marietta quarry

(active mined reach, 1.3 miles)

Wildcat Creek in the “post-mining area”

(Malfalfa Road to red arrow, 4.2 miles)



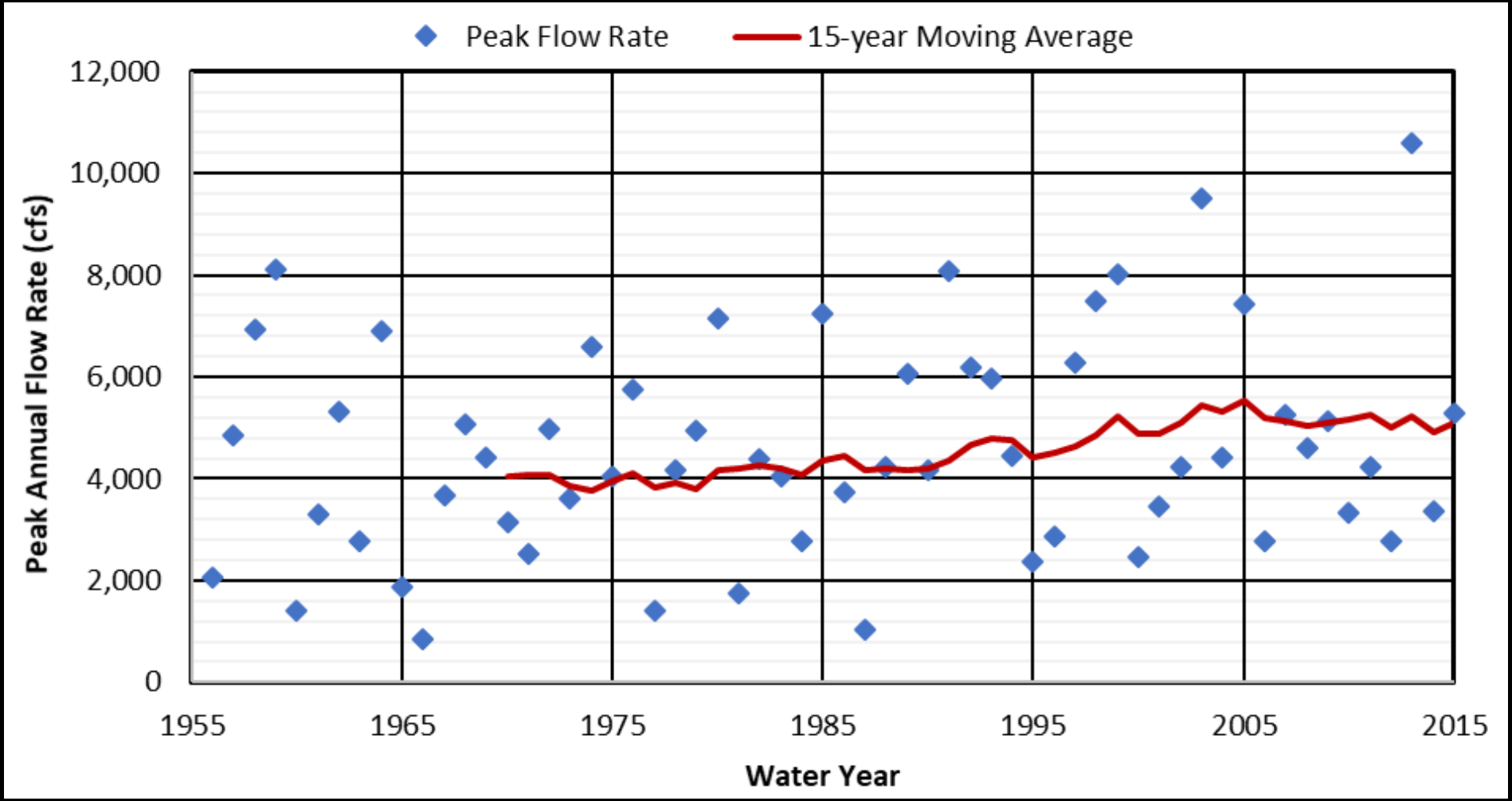
Wildcat Creek at CR S 750 N, looking upstream

(post-mining area to county line, 12 miles)

KEY FINDINGS

Changing Hydrology

- increasing trend in heaviest rainfalls
- increasing trend in observed flood peaks,
- increasing trend in the frequency of bankfull discharges
- increasing trend in flow volumes.



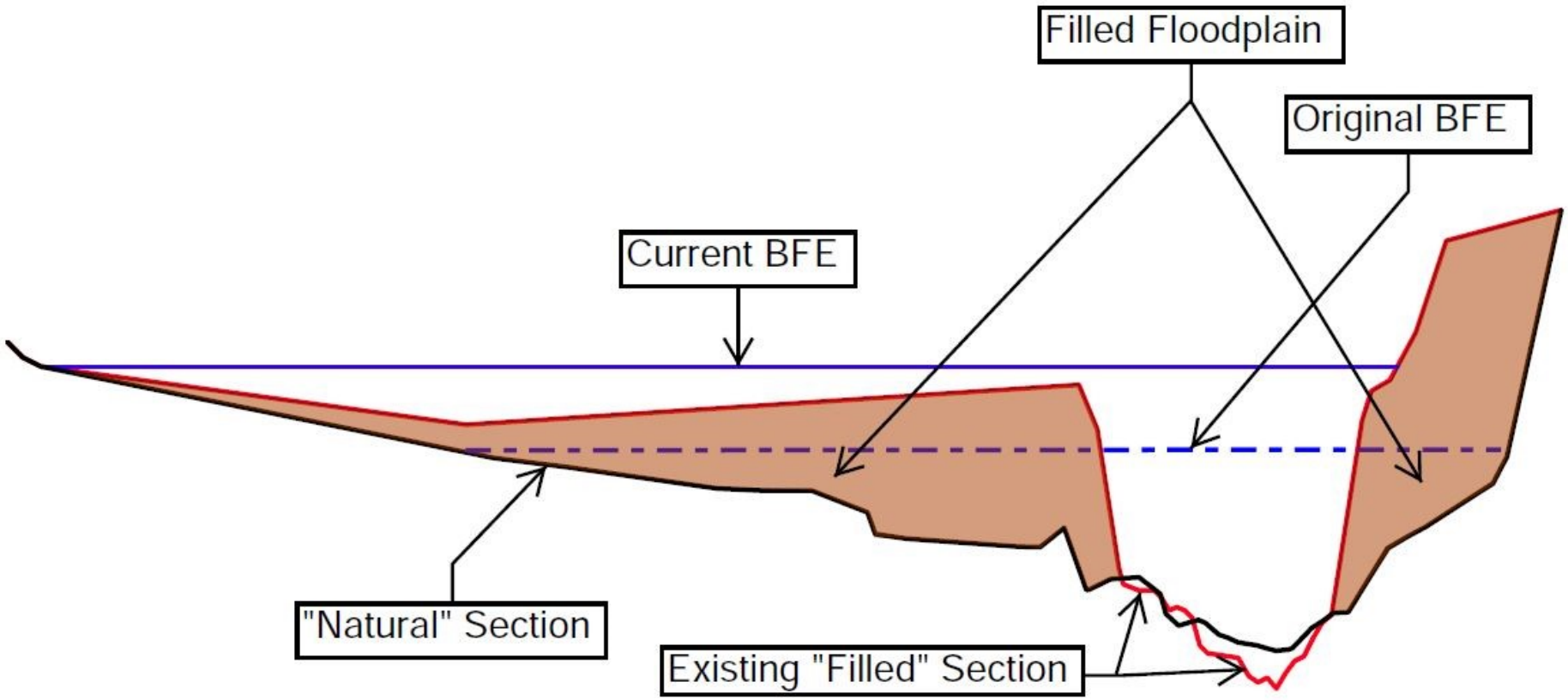
Peak Annual Flow Rate at USGS Gage at Kokomo, IN

Remaining floodplains are essential

- Several disturbed stream reaches act as stressors to the Wildcat Creek system,
- In every case relatively short reaches of the Creek that have retained their functions, or more of their functions than the disturbed reaches, are buffering the effects of disturbed portions of the stream corridor

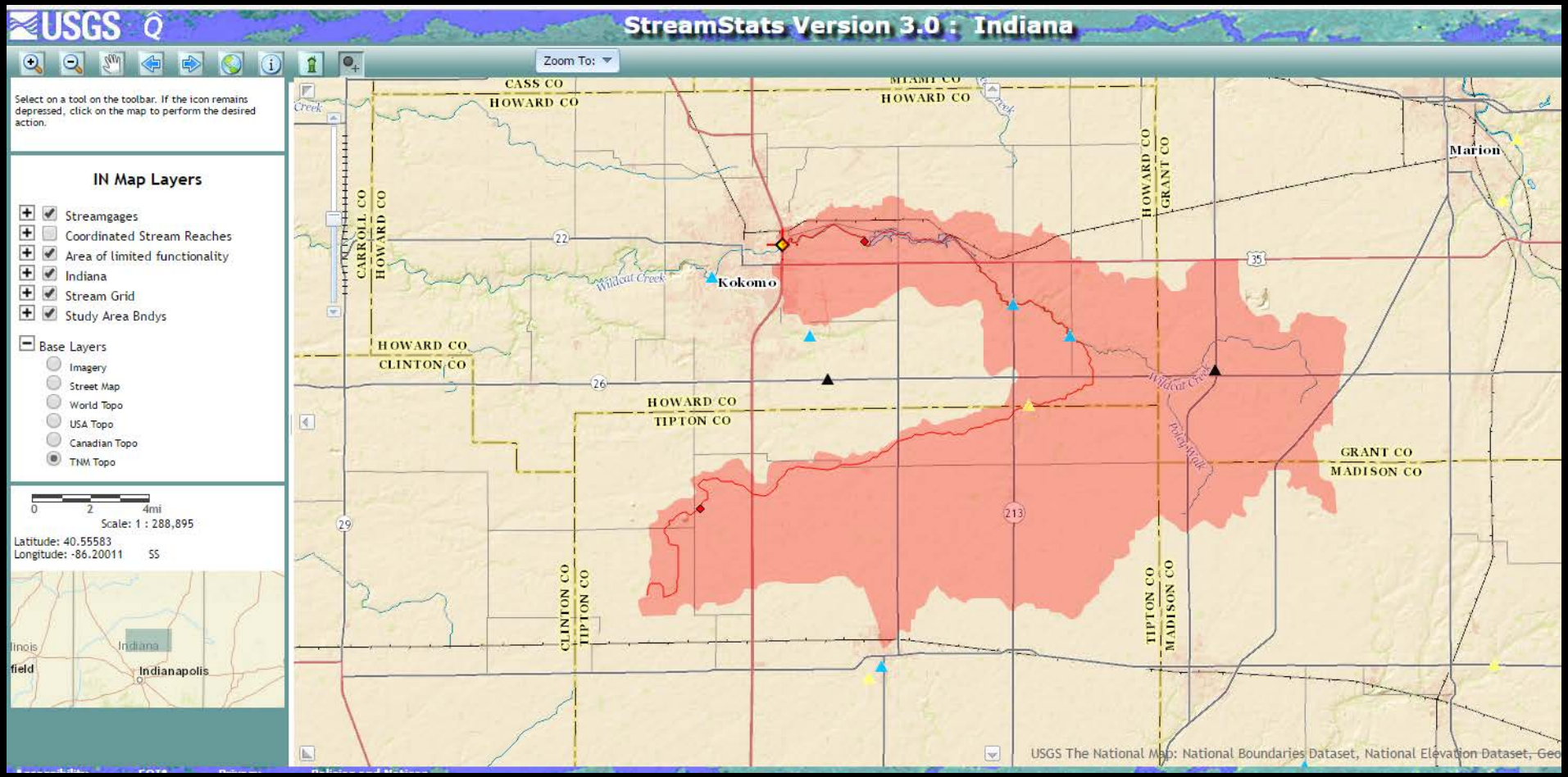
Almost a complete loss of floodplain in Kokomo

- The most obvious issue in Howard County that increases flooding risk along Wildcat Creek is the fact that the natural floodplain has been almost filled in Kokomo
- This filling occurred over many decades as the city developed
- Filling has increased flood elevations along the creek


Filled Floodplain
Original BFE
Current BFE
"Natural" Section
Existing "Filled" Section

Upstream channel modifications

- Over 100 square miles of the upstream drainage area are in Tipton County
- Most of the creek and tributary ditches in this upper watershed have been modified to support agricultural drainage
- 76 percent of the 1% annual event in Kokomo can be generated upstream of Jerome



Wildcat Creek at US 31, Kokomo, Indiana

PRIMARY CONCERNS WITH REGARDS TO STREAM STABILITY AND FLOODING:

Future development within the watershed in Howard County, especially along the river corridor impact areas, is expected to increase flooding in low-lying areas

Future development within the watershed outside of Howard County in Tipton County, especially along the river corridor impact areas, is expected to increase flooding in low-lying areas

Observed trends in increasing rainfall intensities, average daily flows, and peak annual flows, as well as the forecasted intensification of these trends due to a changing climate, is expected to increase flooding in low-lying areas

Accumulation of large wood and logjams within the Wildcat Creek channel may result in an increase in flood stages and/or stream instability, but this problem can be reduced with a management program.

Current new location of stream corridor along the former quarry on the west side of Kokomo threatens the integrity of the gravel pit levee, with grave consequences on stream stability upstream and downstream of this reach

Severe streambank erosion within the highly-modified river corridor reach in Kokomo is expected to further deteriorate the water quality and stream stability in areas immediately west of Kokomo and require costly frequent ongoing maintenance by the City.

MAJOR RECOMMENDATIONS FROM THIS STUDY:

Summary of Recommendations

- Passive Watershed-wide Mitigation Strategies
  1. Implement More Stringent Stormwater Standards
  2. Institute Riparian Corridor & Use Restrictions
  3. Adopt and Implement Flood Resilience Strategies
  4. Adopt and Implement a Tree and Large Wood Management Program
  5. Update & Expand Hydrologic & Hydraulic Models

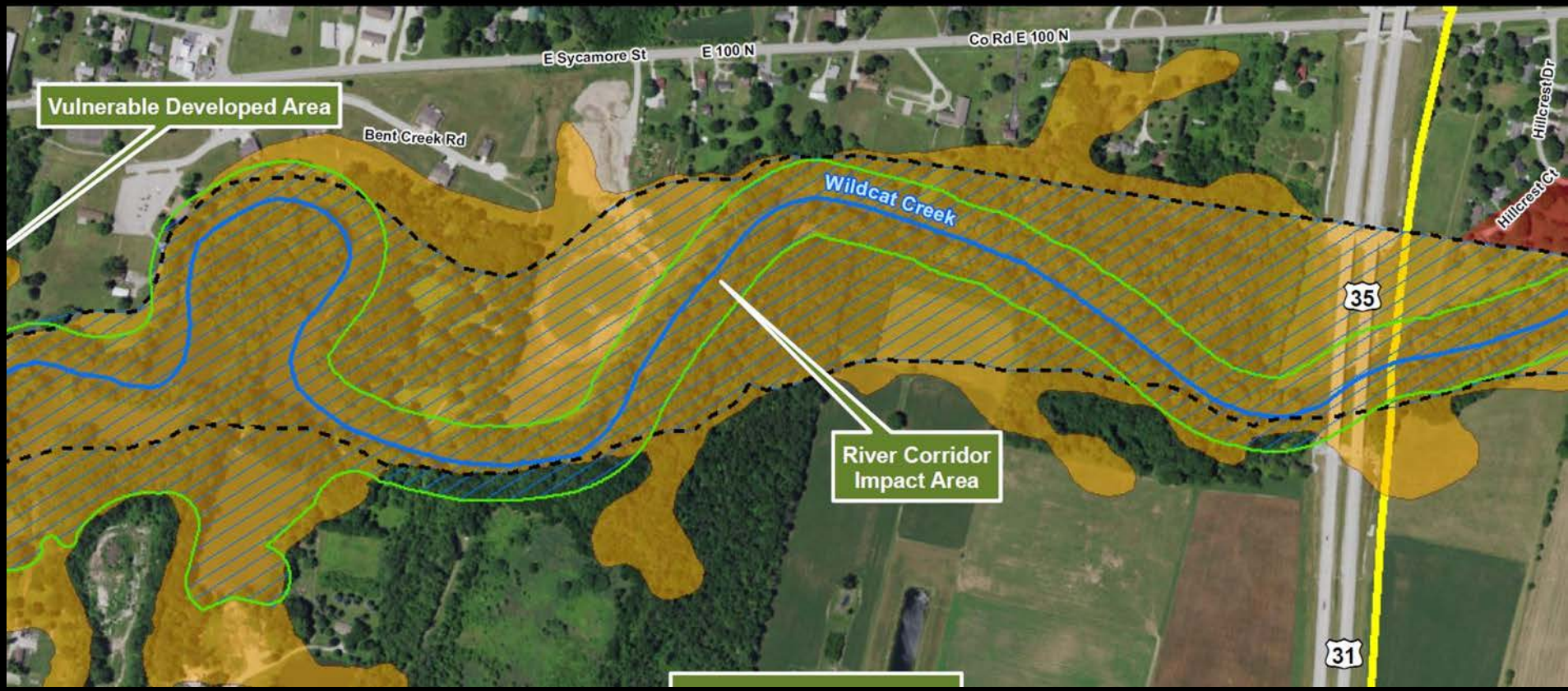
- Reach-Specific Active Mitigation Strategies
  6. Provide Additional Flood Storage
  7. Reroute the Stream along the Former Quarry to its Original Location
  8. Address the Severe Streambank Erosion through the Kokomo Reach

1. Implement More Stringent No-Adverse-Impact Stormwater Standards

- Develop and adopt accurate watershed-specific maximum allowable release rates (cfs/acre)
- Add requirement for Channel Protection Volume (retainage or extended detention of first 2.5 inches of storms)
- Add requirements for no disturbance within floodways and erosional corridors
- Discourage Development within floodplains and add requirement for compensatory floodplain storage
- Add and incentivize standards for LID/Green practices
- Plan for and build Regional Detention Ponds based on watershed master plans for urbanizing areas

2. Institute Riparian Corridor & Use Restrictions

- Avoid Disturbance within Fluvial Erosion Hazard Corridor: the area where the channel may migrate over time or where disturbance may impact the stability of stream.



3. Adopt and Implement Flood Resilience Strategies

Flood Resilience Strategies

River Corridor Impact Areas	Floodway or Fluvial Erosion Hazard Area, whichever is greater	To conserve land and prohibit development
Undeveloped High Hazard/ Flood Storage Areas	Undeveloped Land in the Floodway Fringe	To conserve land and maintain the natural and beneficial function of the floodway fringe.
Vulnerable Developed Areas	Existing developed Land in the SFHA (floodway and floodway fringe)	To protect people, buildings, and facilities in vulnerable areas and reduce future flood risk
Safer Areas	Outside the SFHA, but within the planning jurisdiction	To plan for and promote development in areas that are less vulnerable to future floods
Watershed	Entire drainage area	To promote coordination and partnerships and implement practices to slow, spread and infiltrate flood water

1. Orthoimagery from National Agricultural Imagery Project, USDA, 2016
2. Street Centerlines, Political Boundaries from US Bureau of the Census, 2016
3. Floodway from FEMA DFIRM, Effective Date - 2015-02-04
4. Stream Centerlines from National Hydrography Dataset, Local Resolution, 2016

River Corridor Impact Areas
Vulnerable Developed Areas
Undeveloped High Hazard Flood/Storage Areas
Floodway
Fluvial Erosion Hazard Area
County Boundary
Municipal Boundary

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PROJECT: Wildcat Creek Stream Stability Assessment
PROJECT NO. 15-0132
APPROX. SCALE 1" = 500'
DATE: 08/2017
TITLE: Flood Resilience Planning Areas Sheet 6 of 14
EXHIBIT 4

4. Adopt and Implement a Tree and Large Wood Management Program

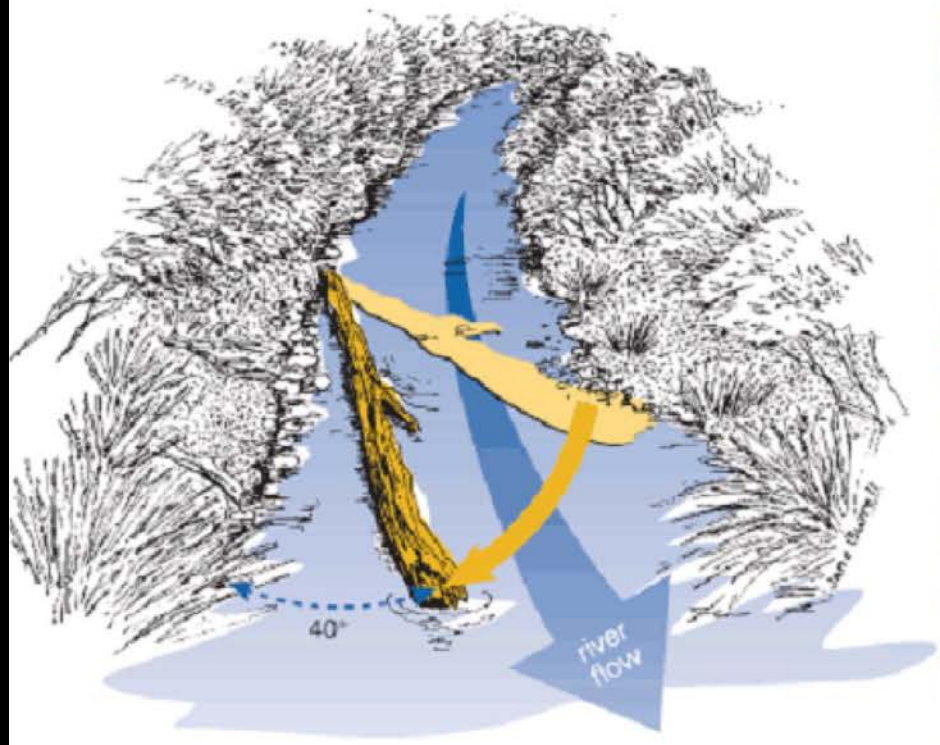
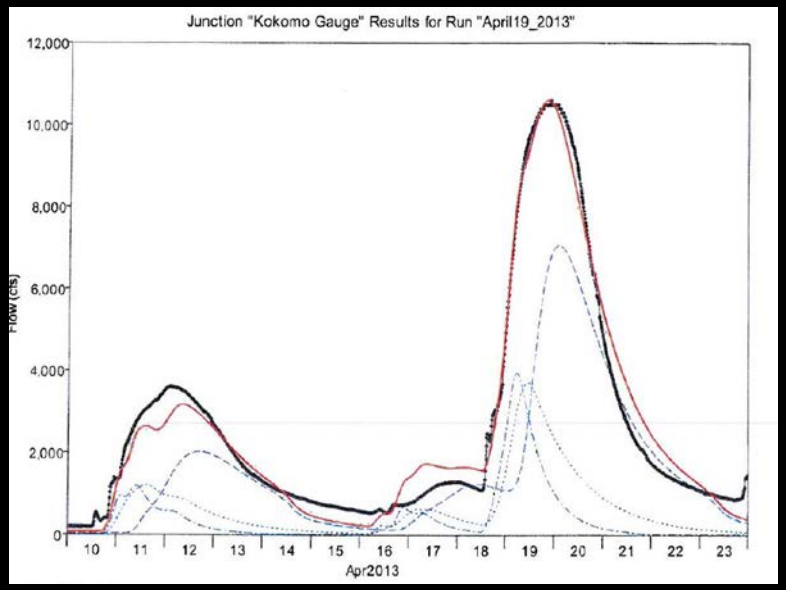


Figure 2: Clearing an obstructed channel

Natural example, Wildcat Creek, Howard County, Indiana

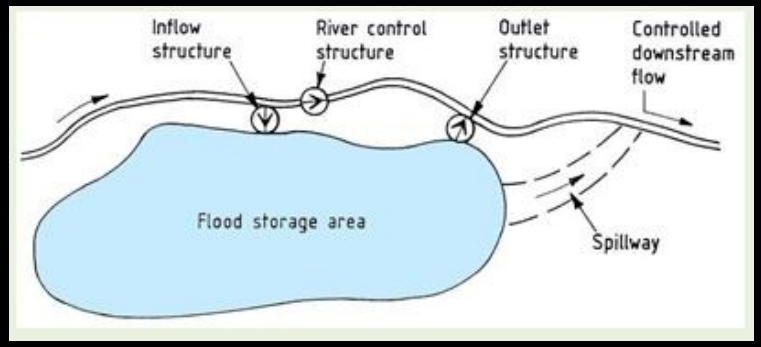
5. Update & Expand Hydrologic & Hydraulic Models

- Wildcat Creek Hydraulic Model and mapping is almost 30 years old
- It does not accurately reflect the changes within the watershed and the river corridor
- New model needs to be calibrated to the 2013 flood

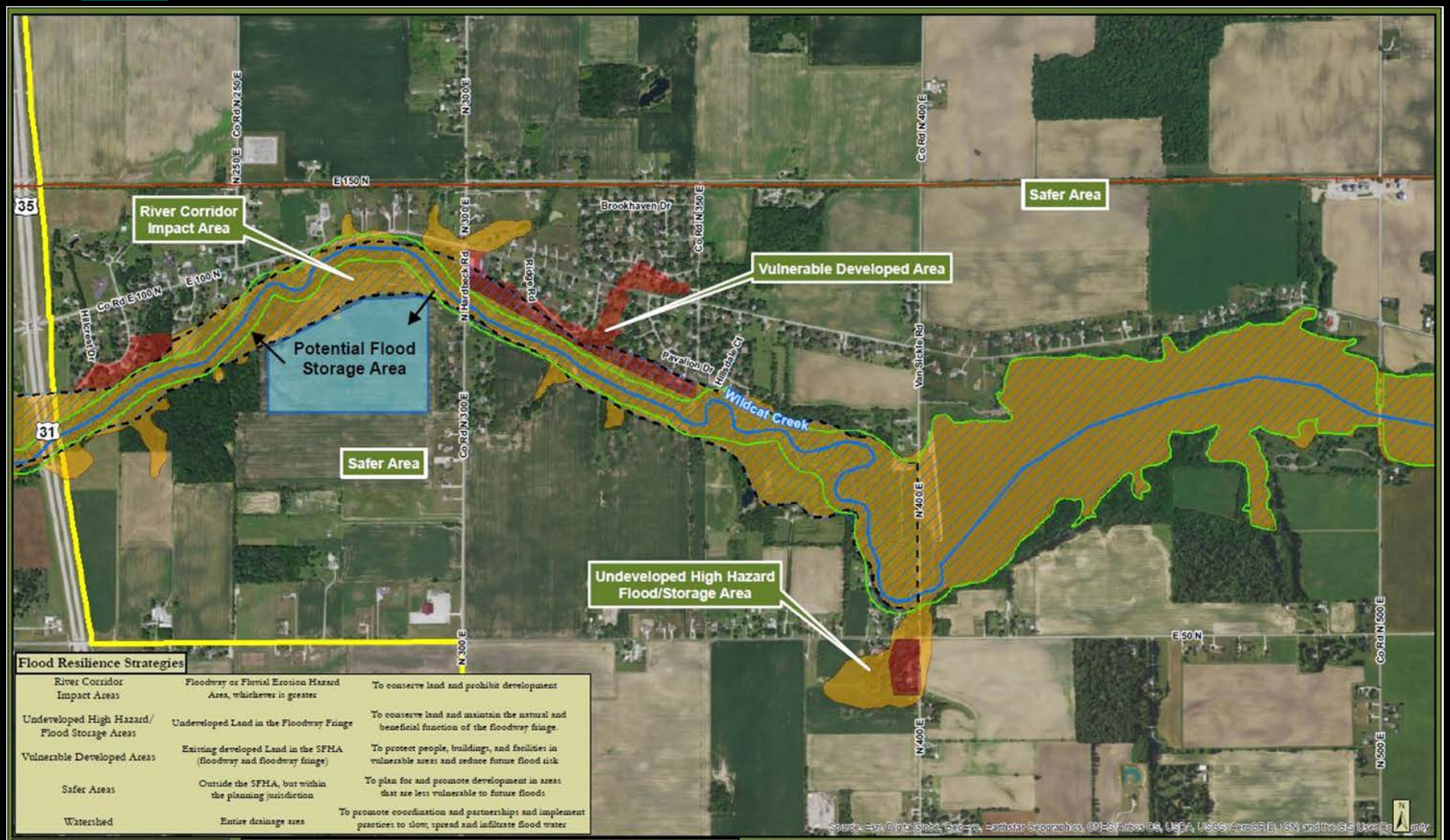


6. Provide Additional Flood Storage

- Preservation of remaining attached floodplain storage along Wildcat Creek is paramount
- Consider adding off-line floodplain storage along Wildcat Creek, either as mitigation for already lost floodplain storage or as a mitigation bank for future
- Coordinate with Tipton County to find ways to preserve access to floodplain storage along agricultural ditches



6. Provide Additional Flood Storage (cont.)



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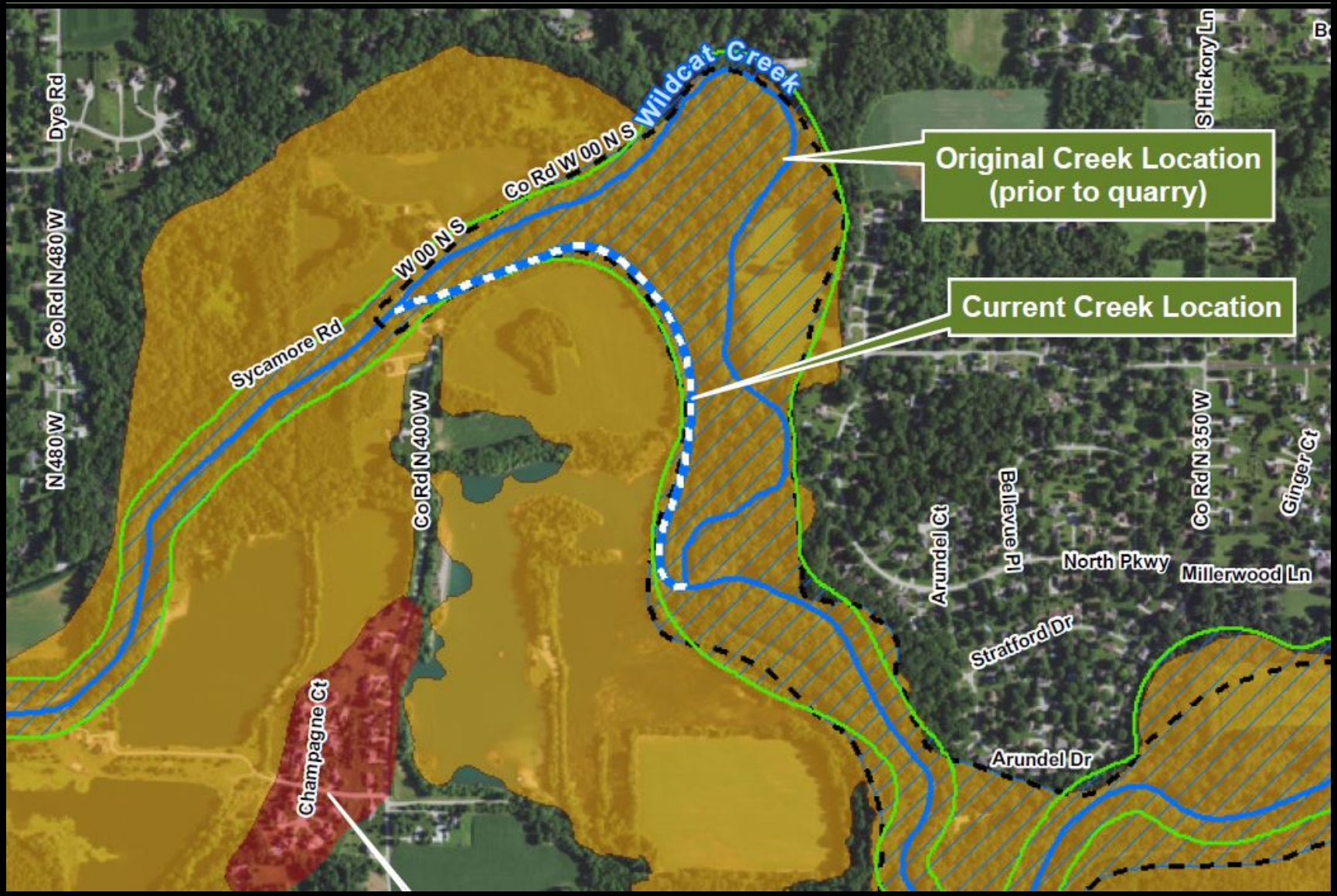

8. Address the Severe Streambank Erosion through the Kokomo Reach

- Current conditions (either armored or eroding) is expected to further deteriorate the water quality and stream stability in areas immediately west of Kokomo
- The stream needs room, and there is not much available!
- At a minimum, the City should
  - Explore adding low flow shelf/benches to try stabilizing the channel toe areas
  - To the extent possible, use nature-based streambank stabilization measures to repair failing streambanks
- Should recognize that location-specific patches may not result in a stable channel in Kokomo
- Kokomo reach needs a restoration master plan, with detailed modeling and a reach-scale approach

- As is the case in many urban streams, the solutions are limited, but the value of a functional and aesthetically pleasing stream corridor is worth the effort!

Questions?

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