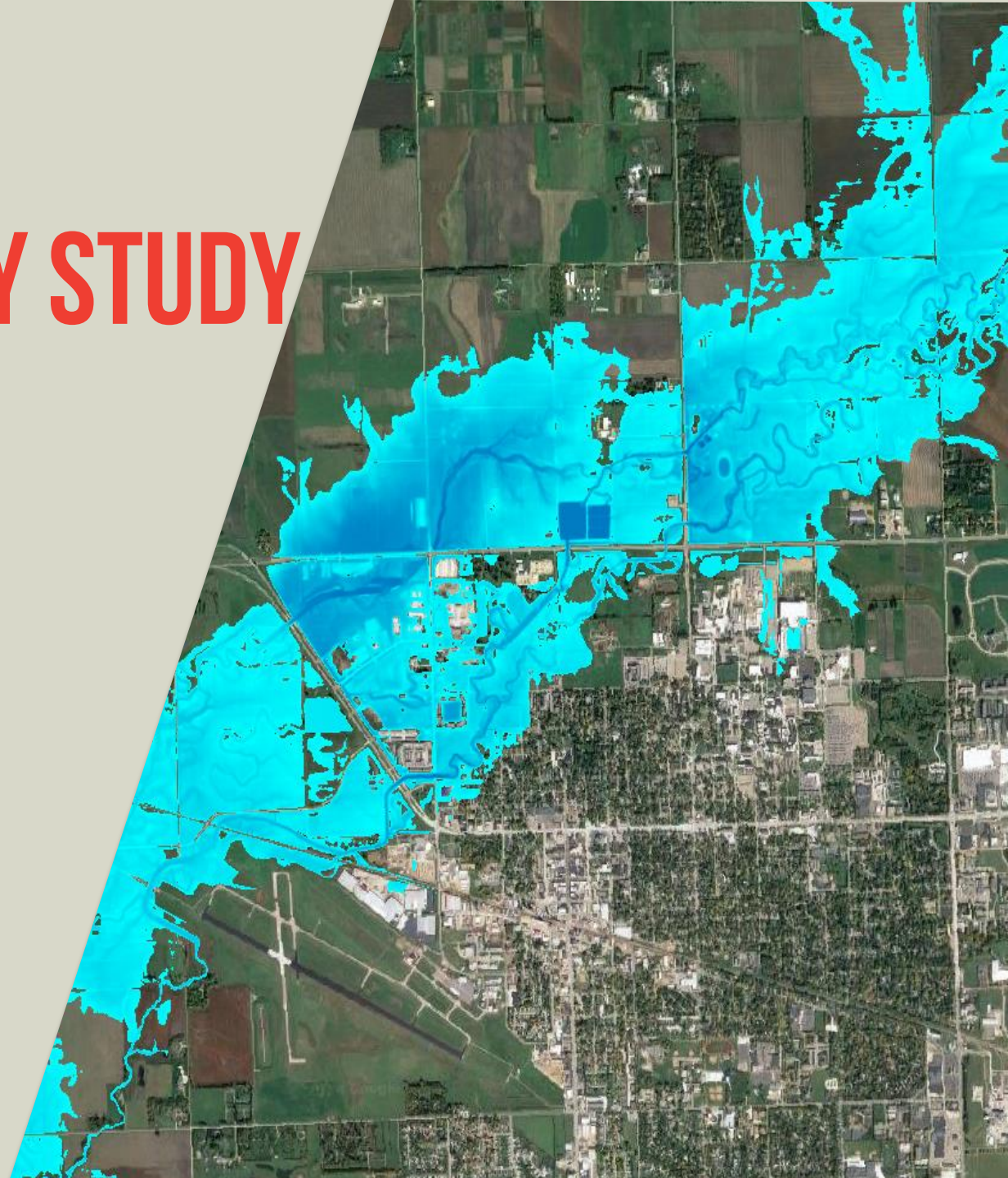
SIX-MILE CREEK FEASIBILITY STUDY

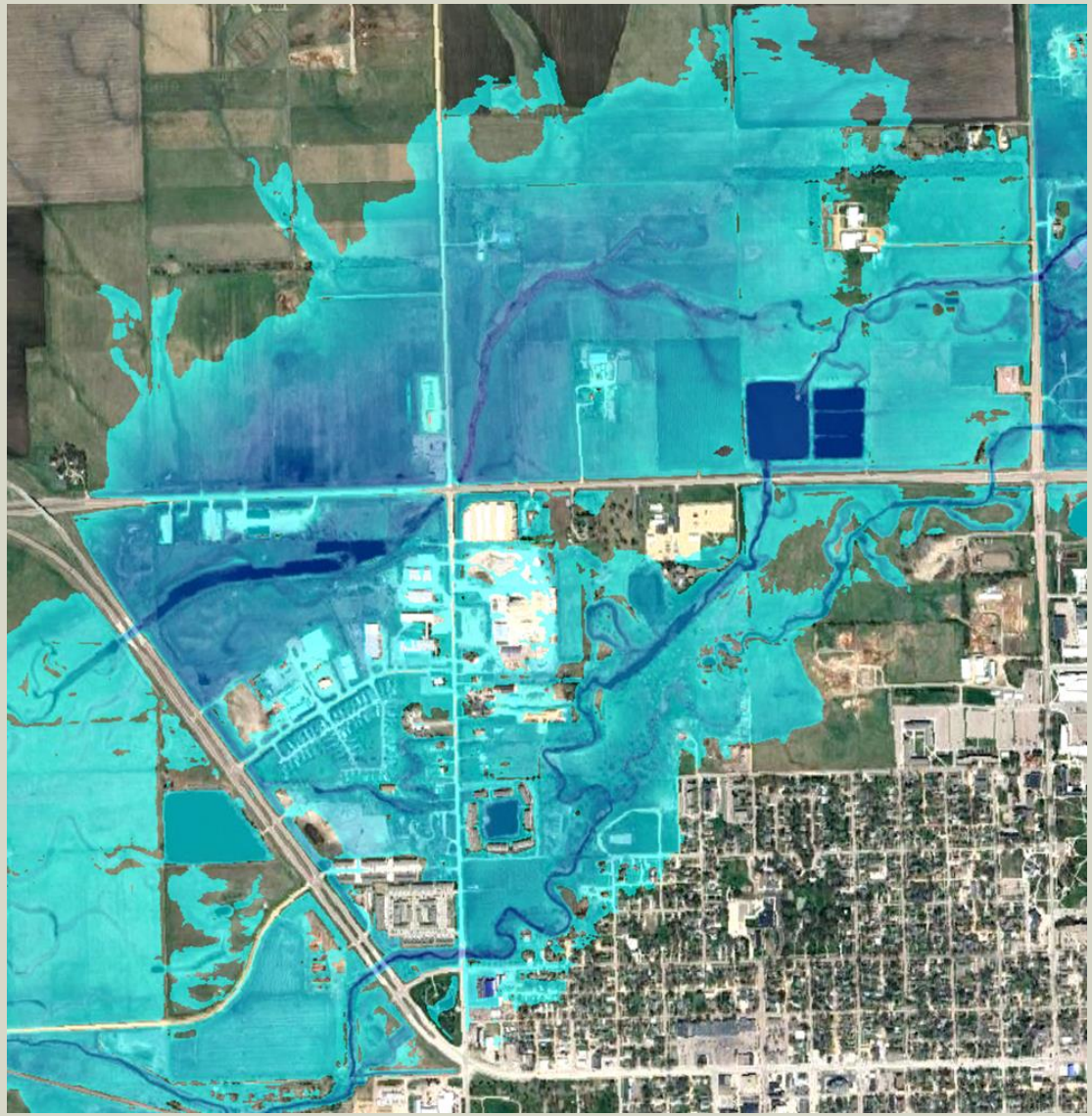
CITY OF BROOKINGS

September 24, 2024



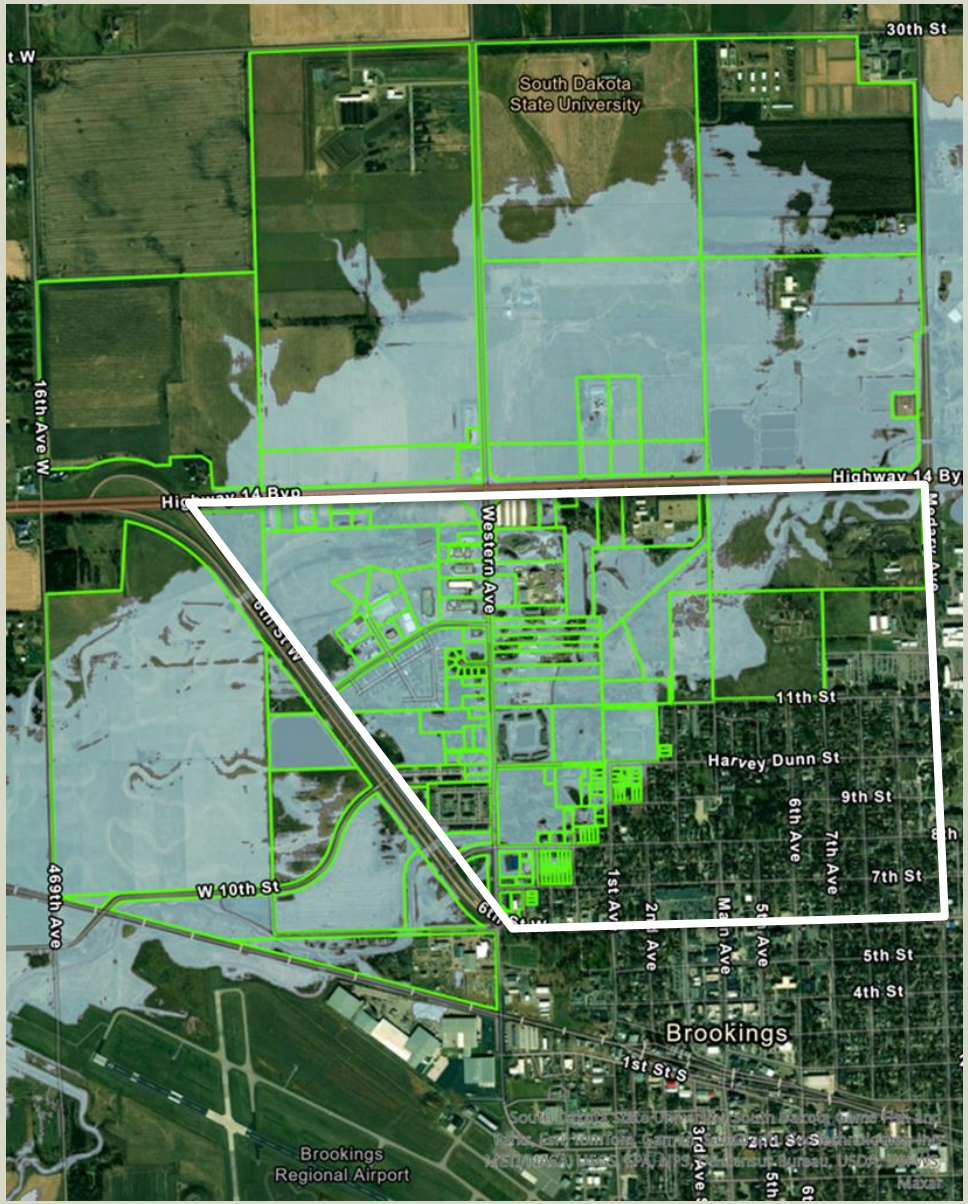
OVERVIEW

- SIX-MILE CREEK FEASIBILITY PROJECT
  - Reduce flood risk along Six-Mile Creek
  - Funded by:
    - City of Brookings
    - South Dakota Department Public Safety
- FEMA MODEL TO STUDY MODEL
- DEVELOPMENT OF FLOOD MITIGATION CONCEPTS
- BENEFIT COST ANALYSIS
- NEXT STEPS



EXISTING CONDITIONS STUDY MODEL

- PROPOSED EFFECTIVE MODEL
  - Regional Model updated for Study
- AREA OF FOCUS
    - Northern Extent = Hwy 14 Bypass
    - Eastern Extent = Medary Avenue
    - Western Extent = Hwy 14 diagonal
    - Southern Extent = 6th Street
  - Impacts approximately 230 structures
  - Baseline for flood mitigation concepts and ideas



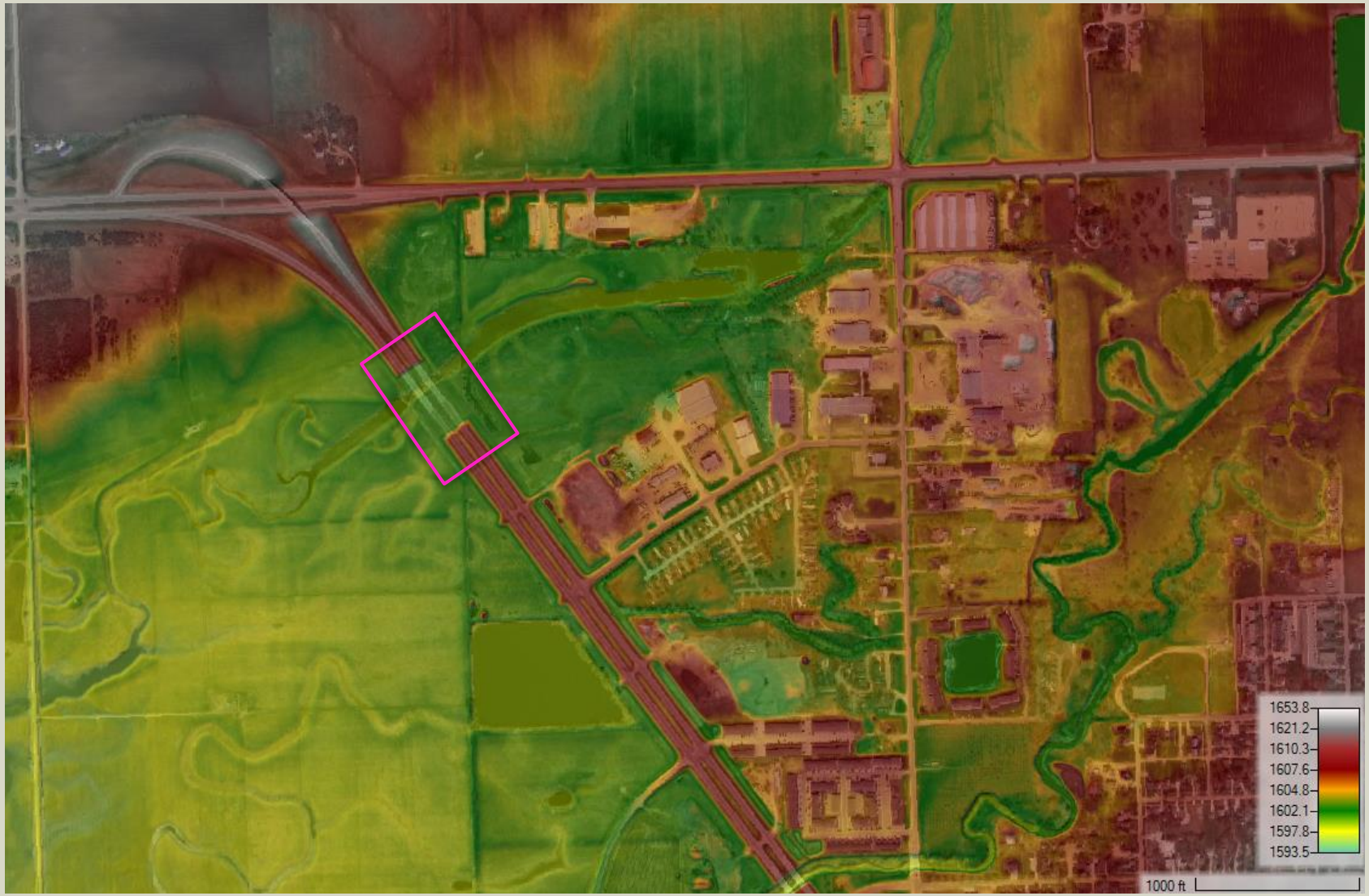
FLOOD MITIGATION CONCEPTS

PRIMARY CONCEPTS

- Channel Connectivity
- Lengthen Diagonal Bridges
- Levees
- Channel Bypass
- Upstream Detention

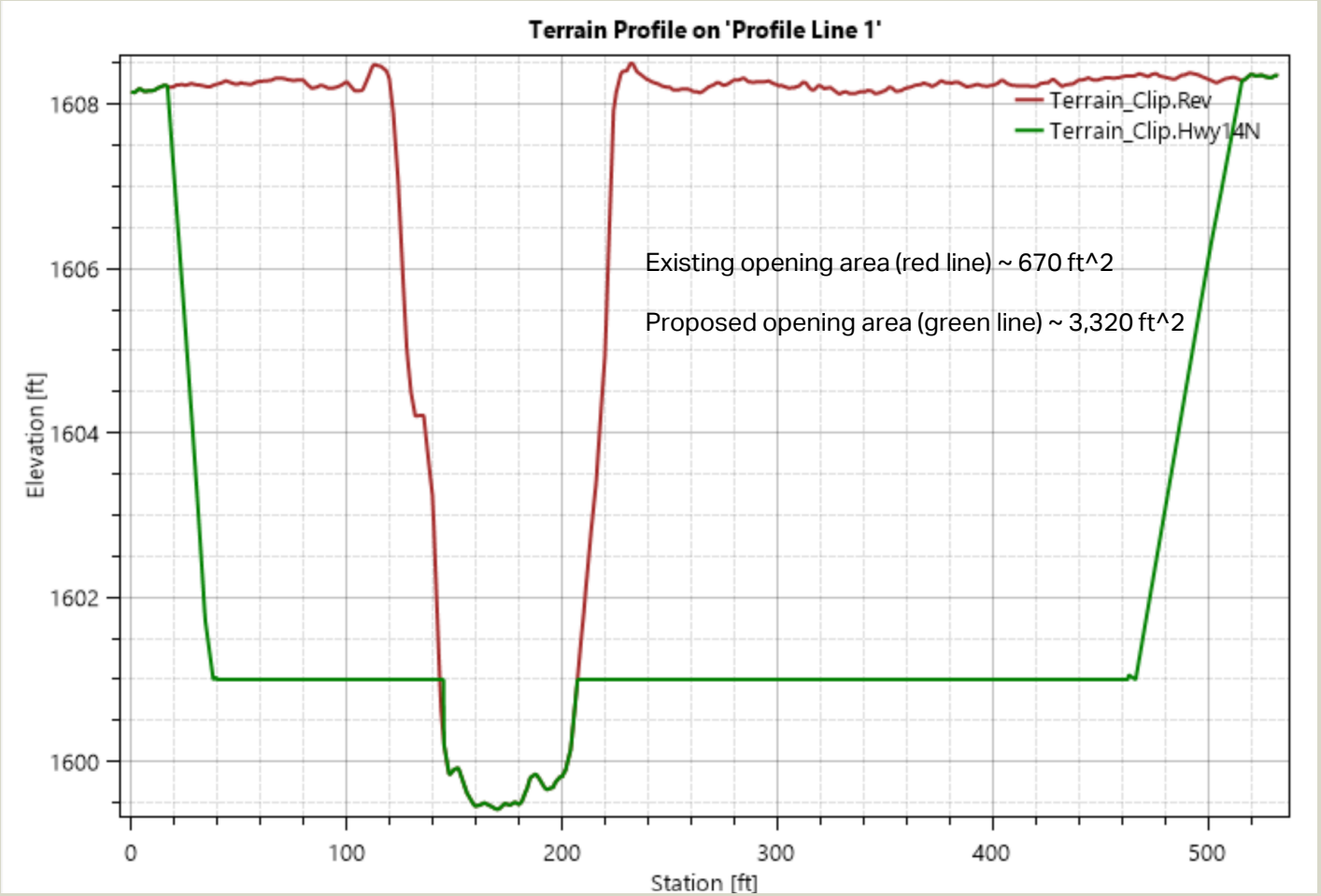
LENGTHEN NORTH HWY 14 BRIDGE

- **GOAL**
  - Allow more flow through Hwy 14 (currently holds back water)
- **APPROACH**
  - Lengthened North and South Channel Bridge
  - Analyzed together and separately
- **NOTES**
  - Determined that the south bridge has minimal impact on lowering WSEs and was removed as part of the alternative



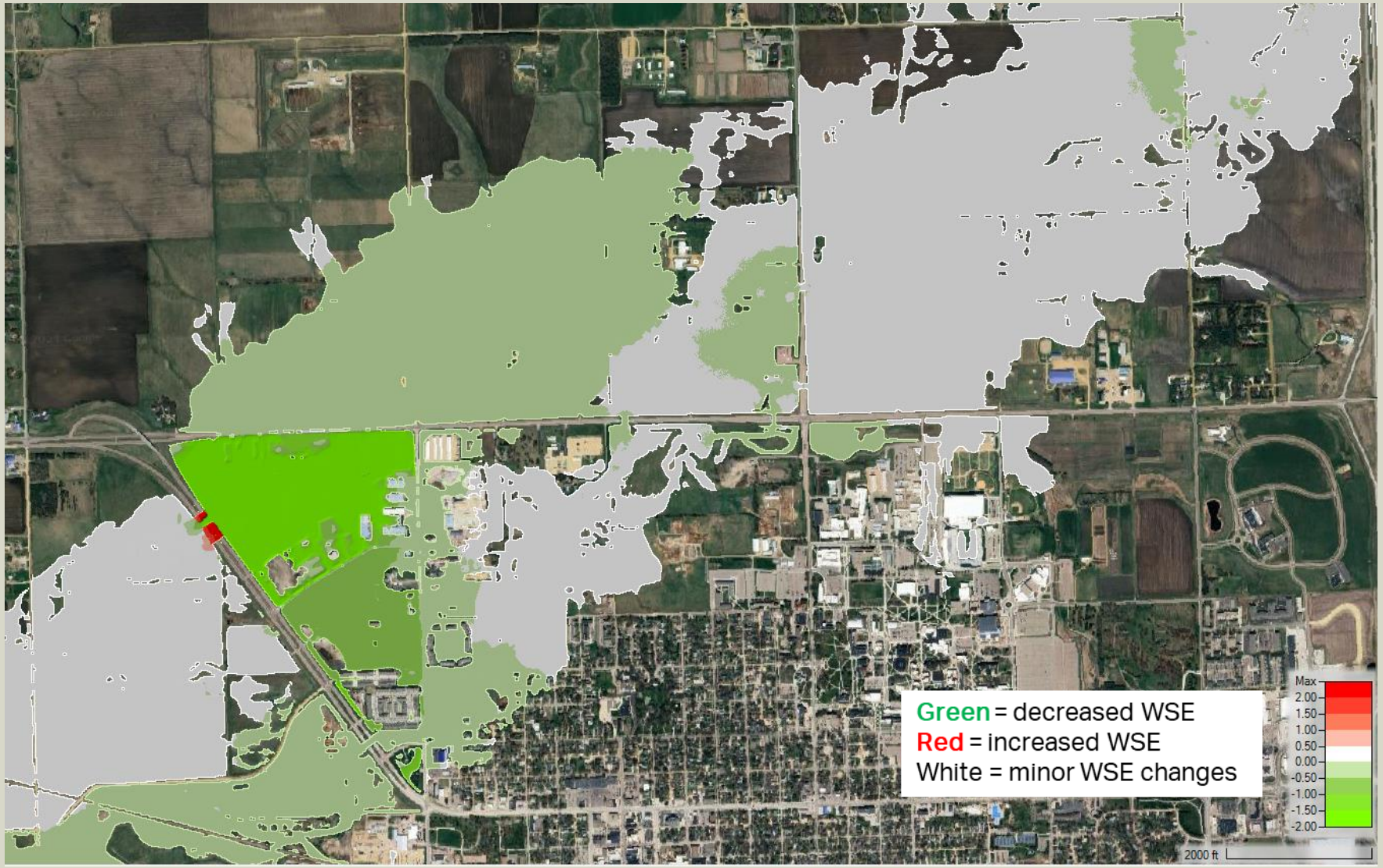
NORTH BRIDGE - DETAILS

- NORTH BRIDGE
  - Existing length = 100'
  - Proposed length = 500'
  - Length increase = 400'
- INCREASED OPENING AREA EVEN FURTHER BY LOWERING THE EXISTING TERRAIN



LENGTHEN NORTH HWY 14 BRIDGES– 100 YR PRELIMINARY RESULTS

- DAMAGE RESULTS:
  - Existing: $43.6 mil
  - Proposed: $29.0 mil
  - Reduction: $14.6 mil
- OPINION OF PROBABLE COST: $11 - $12 MIL
- BENEFIT-COST RATION: 0.62 – 0.93
- CHALLENGES
  - Downstream impacts



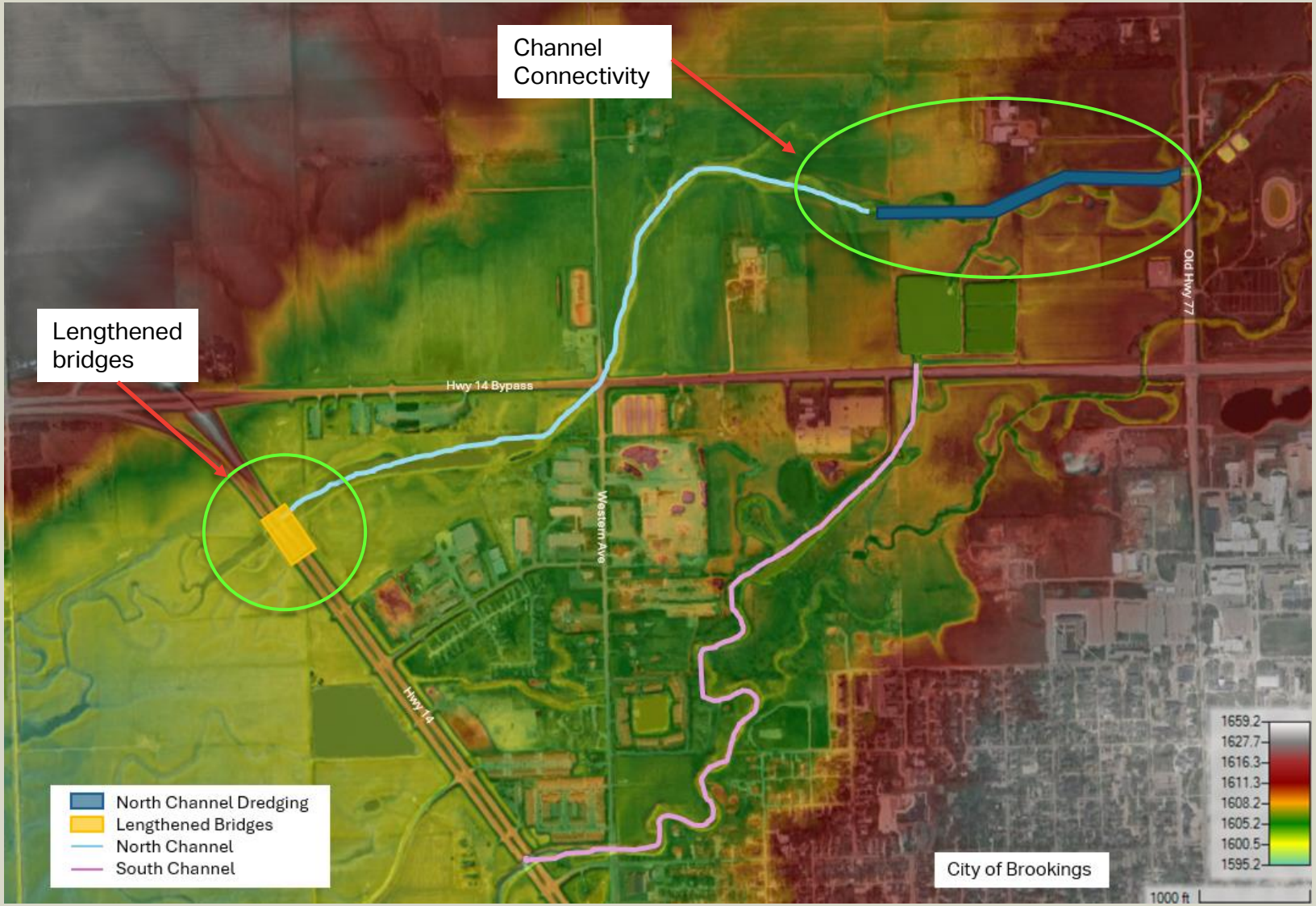
CHANNEL CONNECTIVITY AND HWY 14 N. BRIDGES

GOAL

- Allow more water to flow through the north channel to alleviate flooding along the south channel through the City of Brookings

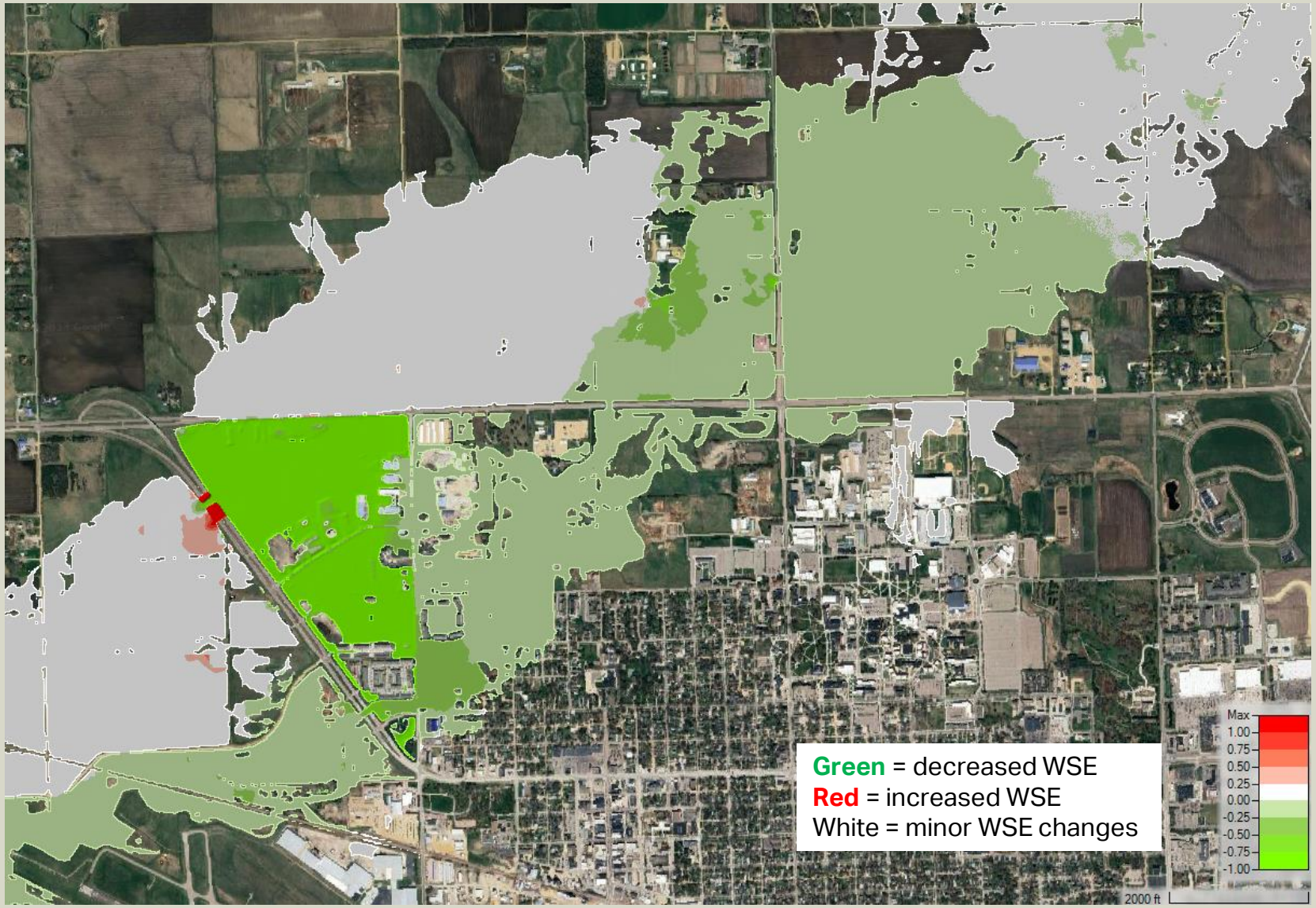
APPROACH

- Enhance natural inter-basin transfer
- Numerous iterations
- Had to be paired with lengthening the north bridges on Hwy 14



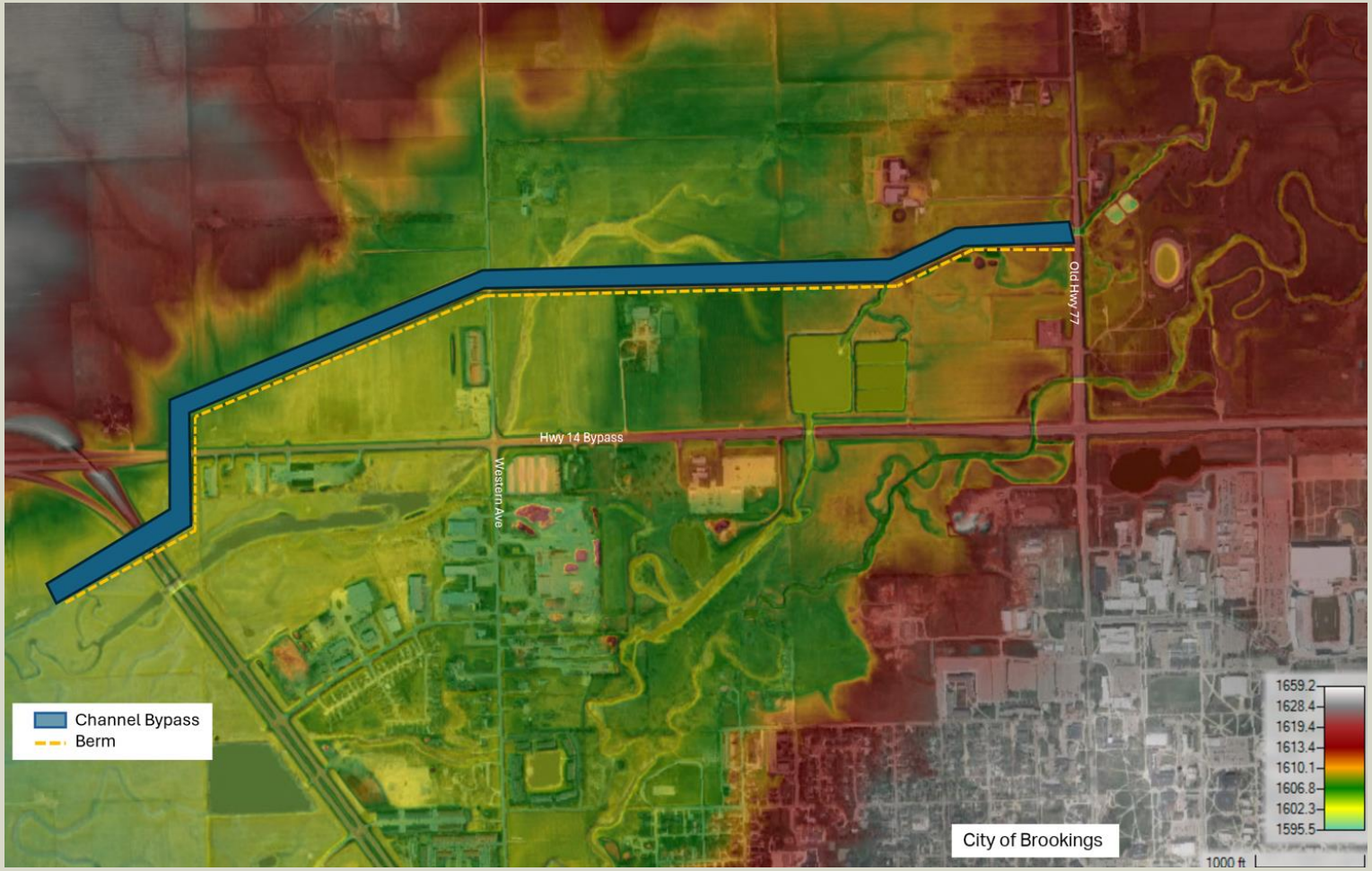
CHANNEL CONNECTIVITY– 100 YR PRELIM RESULTS

- **DAMAGE RESULTS:**
  - Existing: $43.6 mil
  - Proposed: $27.6 mil
  - Reduction: $16.0 mil
- **OPINION OF PROBABLE COST: $21 - $23 MIL**
- **BENEFIT COST RATIO: 0.48 – 0.71**
- **CHALLENGES:**
  - Wetlands
  - Easements
  - Downstream impacts



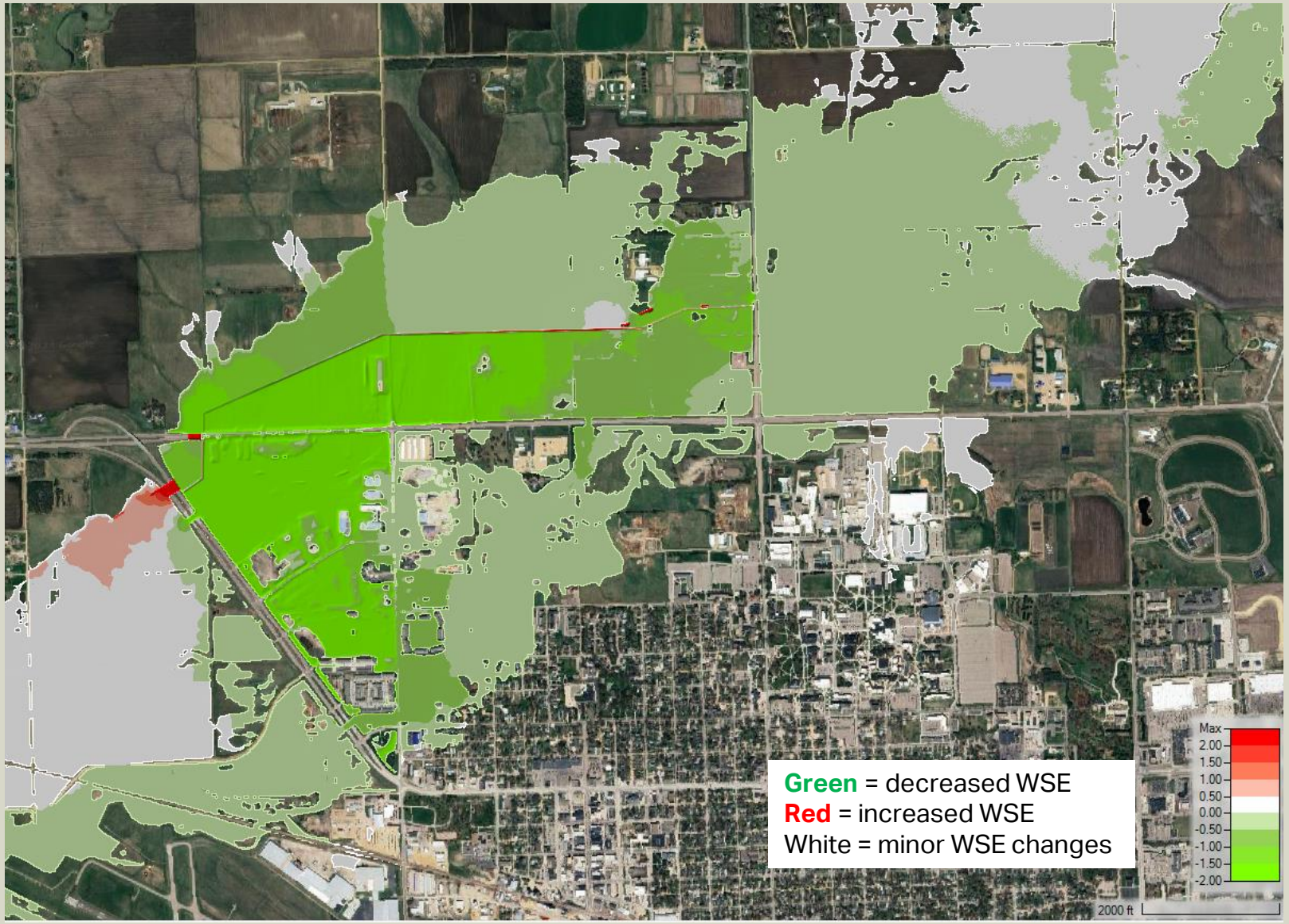
CHANNEL BYPASS

- GOAL
  - Channel to direct flow around the City of Brookings
    - Decrease flow in the north and south channels
- APPROACH
  - Large scale floodwater control
  - Berm added to the south side to help contain flow



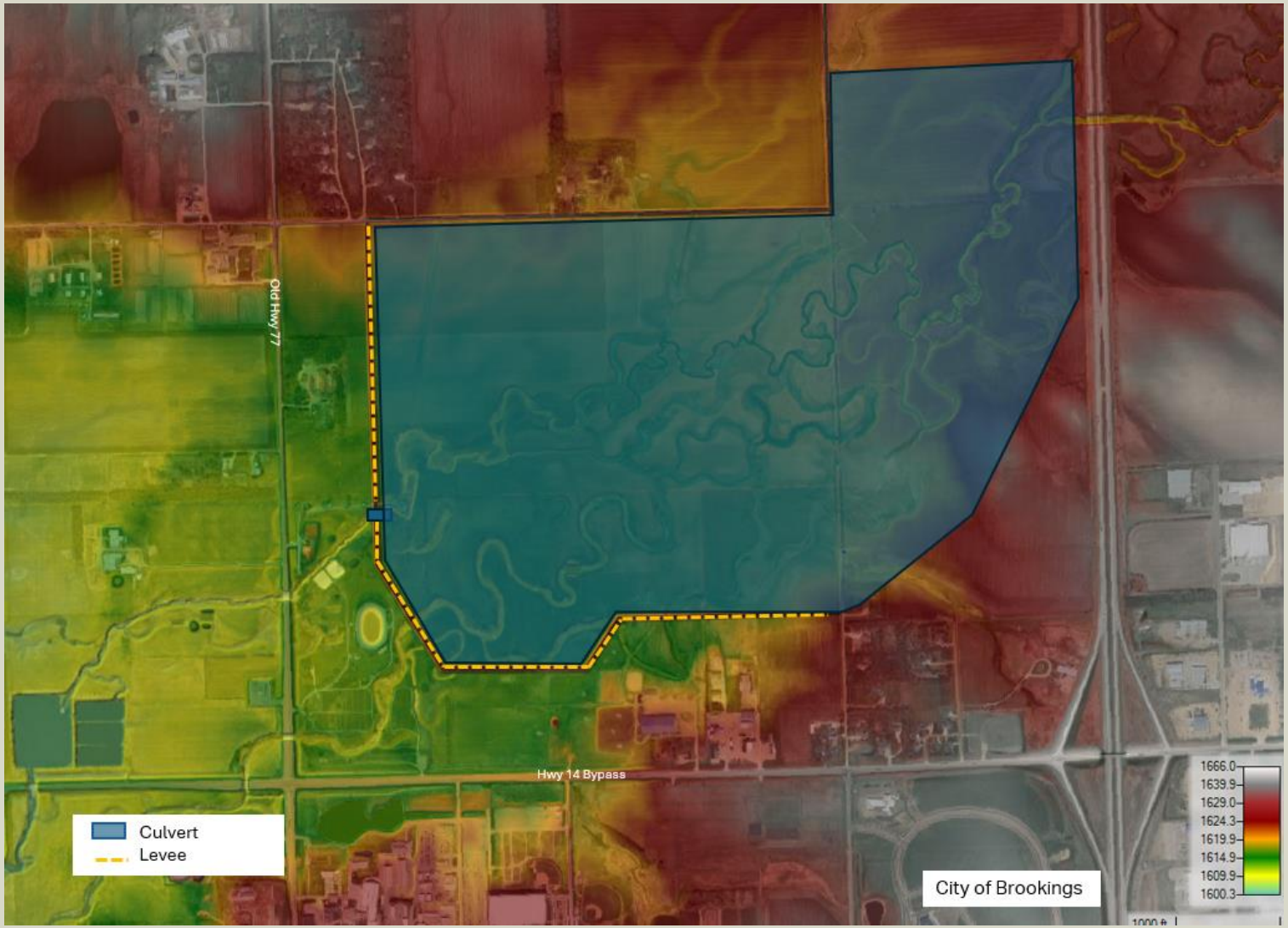
CHANNEL BYPASS– 100 YR PRELIMINARY RESULTS

- DAMAGE RESULTS:
  - Existing: $43.6 mil
  - Proposed: $17.8 mil
  - Reduction: $25.8 mil
- OPINION OF PROBABLE COST: $38 – $40 MIL
- BENEFIT-COST RATION : 0.58 - 0.77
- CHALLENGES
  - Would require 2-3 new structures
  - Wetlands
  - Property Acquisition/ Easements
  - Complexity
  - Downstream Impacts



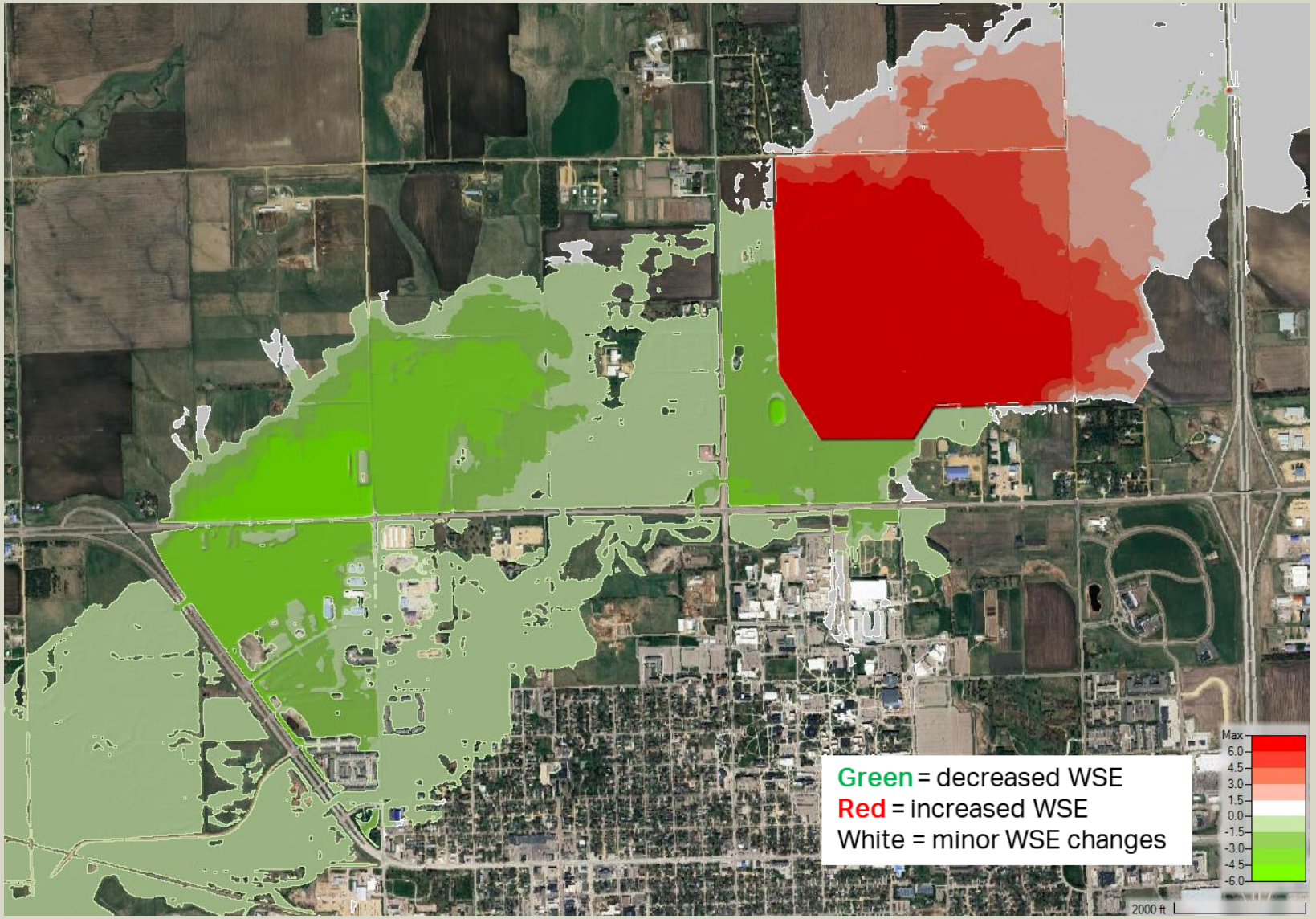
UPSTREAM DETENTION

- GOAL
  - Detain water upstream and slowly release it to minimize adverse impacts downstream
- APPROACH
  - Dry dam
  - Simplified “Footprint”
  - Utilized a levee to hold back water
  - Static controls



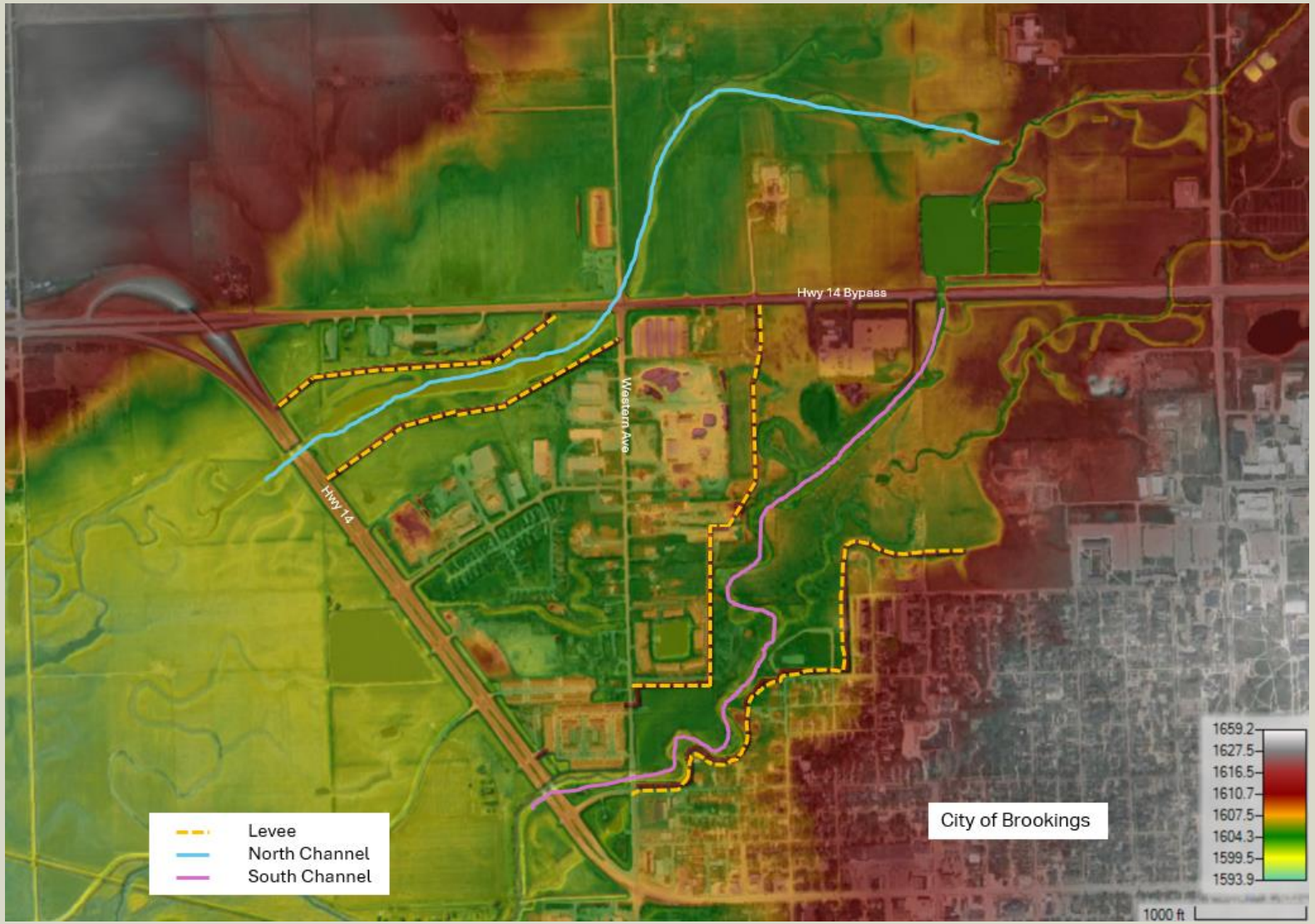
UPSTREAM DETENTION– 100 YR PRELIMINARY RESULTS

- DAMAGE RESULTS:
  - Existing: $43.6 mil
  - Proposed: $16.4 mil
  - Reduction: $27.2 mil
- OPINION OF PROBABLE COST : $18 - $20 MIL
- BENEFIT-COST RATIO : 1.11 – 1.49
- CONCERNS:
  - High Hazard Dam classification
  - Property acquisitions/easements
  - Wetlands



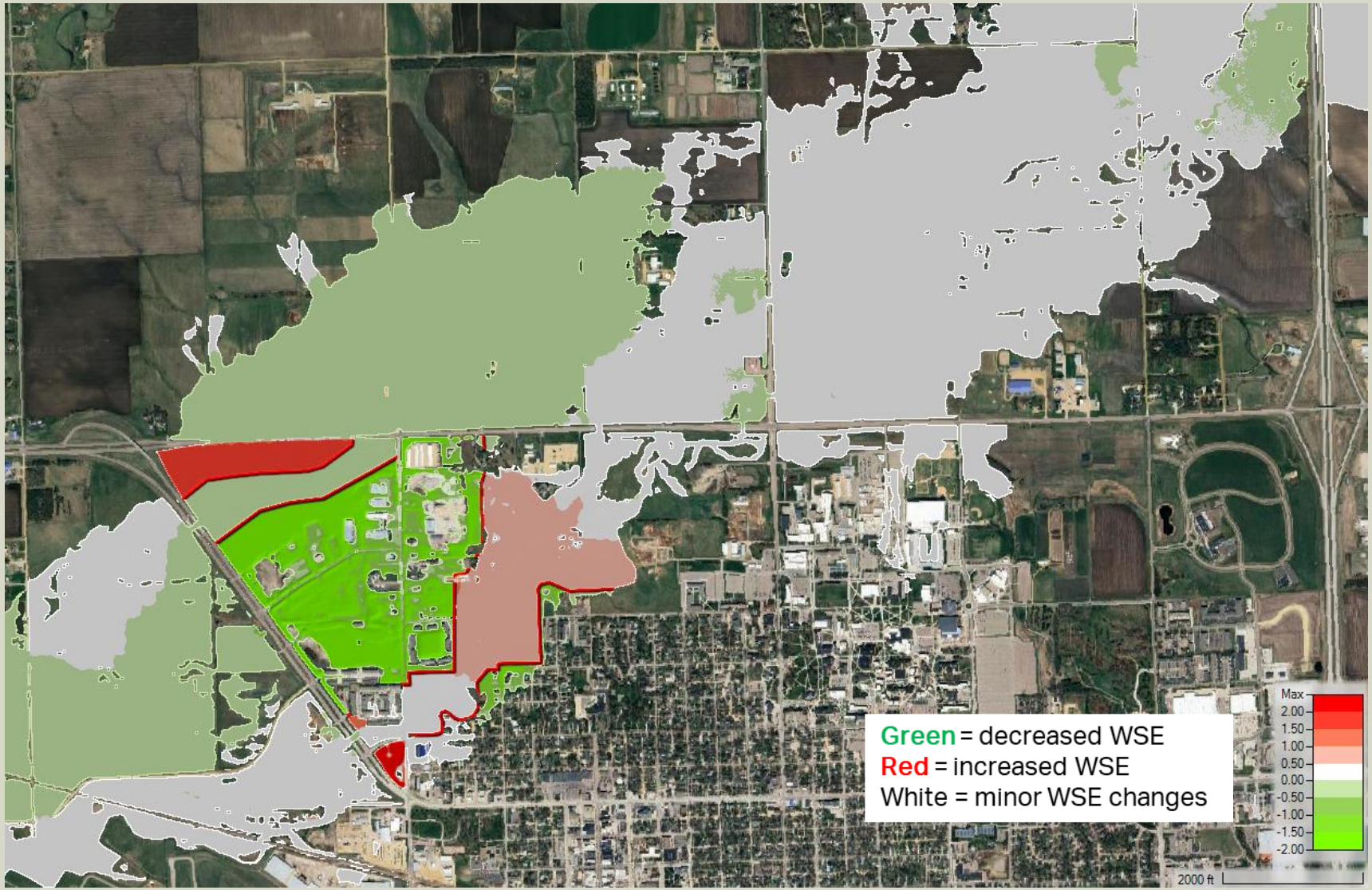
LEVEES

- **GOAL**
  - Protect homes and businesses from floodwaters within the focus area
- **APPROACH**
  - General configurations tested
  - 4 Levee Scenario/2 Levee Scenario
  - Careful consideration required-lateral and downstream impacts



LEVEE V1– 100 YR PRELIMINARY RESULTS

- **DAMAGE RESULTS:**
  - Existing: $43.6 mil
  - Proposed: $16.6 mil
  - Reduction: $27.0 mil
- **OPINION OF PROBABLE COST: $43 - $45 MIL**
- **BENEFIT-COST RATIO: 0.49 – 0.66**
- **CHALLENGES**
  - Levee classification
  - Complexity
  - Land acquisition/easement



SUMMARY OF BENEFIT-COST ANALYSIS OF MITIGATION OPTIONS

Options	Opinion of Probable Project Cost ($ Million)	Proposed Benefits ($ Million)	Benefit-Cost Ratio
Lengthen N Hwy 14 Diagonal Bridge	20.2	7.4 – 11.5	0.37 – 0.57
Channel Connectivity and North Bridge	24.1	10.1 – 15.7	0.40 – 0.61
Channel Bypass	48.8	19.5 – 30.4	0.27 – 0.36
Upstream Detention	11.8	18.7 – 29.2	1.12 – 1.49
Levees	27.5	19.2 – 29.9	0.50 – 0.67

NEXT STEPS

- REFINEMENT OF MITIGATION OPTIONS
  - Utilize FEMA Technical Assistance
- FEMA PHASED GRANT
  - Further Development/Refinement
  - Design
    - Competitive BRIC Grant – Building Resilient Infrastructure and Communities
    - FMA Grant – Flood Mitigation Assistance
- DEVELOP MAINTENANCE PROGRAM FOR SIX-MILE CREEK