

# Oelwein Flood Mitigation Scoping Study

City Council

*Marie Amundson, PE*

May 13<sup>th</sup>, 2024

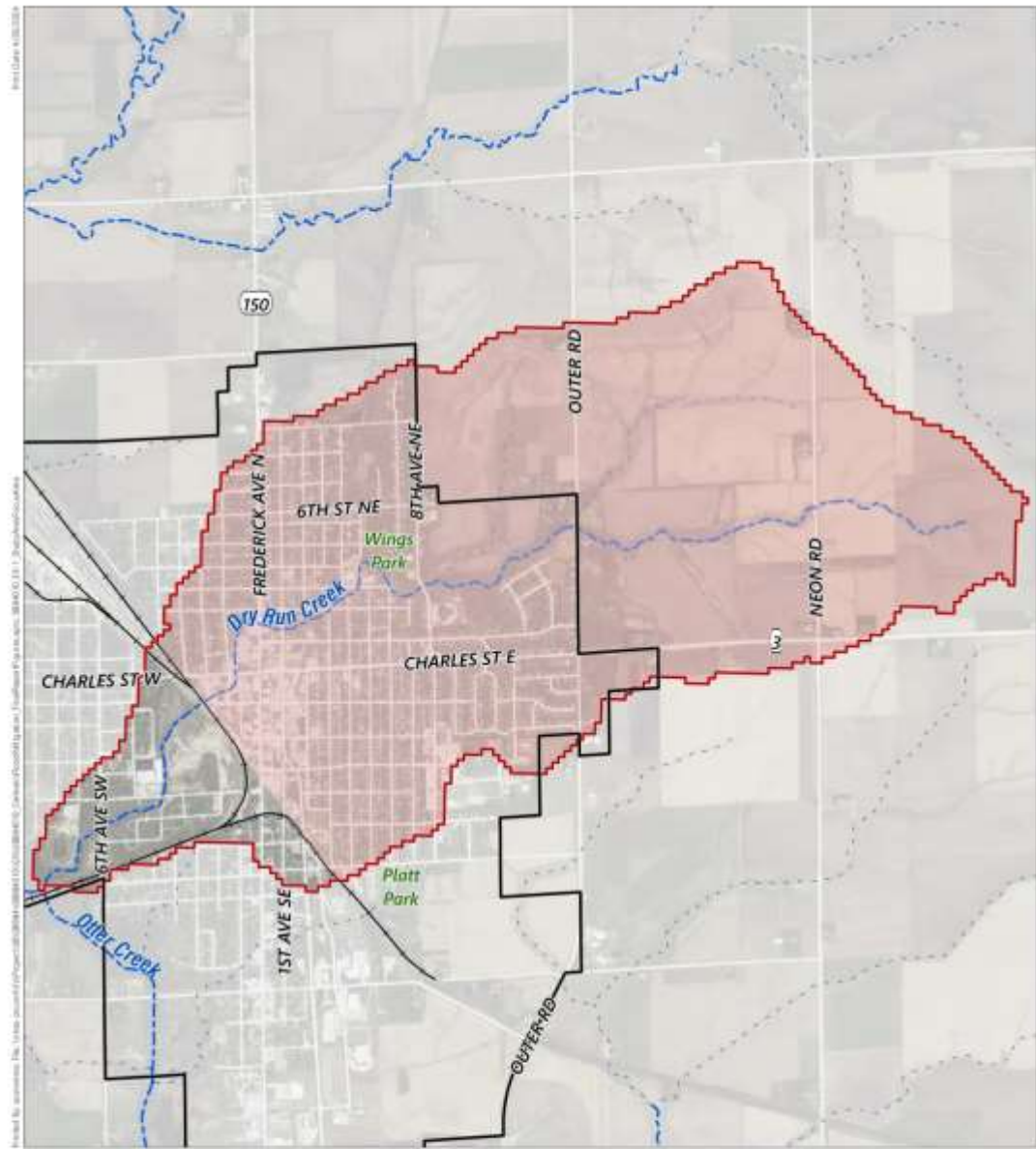


# Today's Presentation

- **Background: Historical Flooding in Oelwein**
- Scope of Work for this Study
- Modeling: Proposed Mitigation Alternatives
- Recommended Option #1: Regional Pond 3b Revised
- Recommended Option #2: 1<sup>st</sup> Ave SW Bridge Removal
- Recommended Option #3: Charles St Parking Lot Removal
- Recommended Option #4: Property Acquisition
- Benefit Cost Analysis: FEMA's BCA Toolkit
- Funding
- Next Steps

# Historical Flooding in Oelwein

- Riverine flooding from Dry Run Creek
- Drainage Area Upstream of RR Culvert: 2.9 sq miles



Data Sources:  
Municipal Boundary: Fayette County  
Road Centerlines: Iowa DMV  
Floodplain Extents: FEMA (2011/05/17)  
Aerial: Fayette County

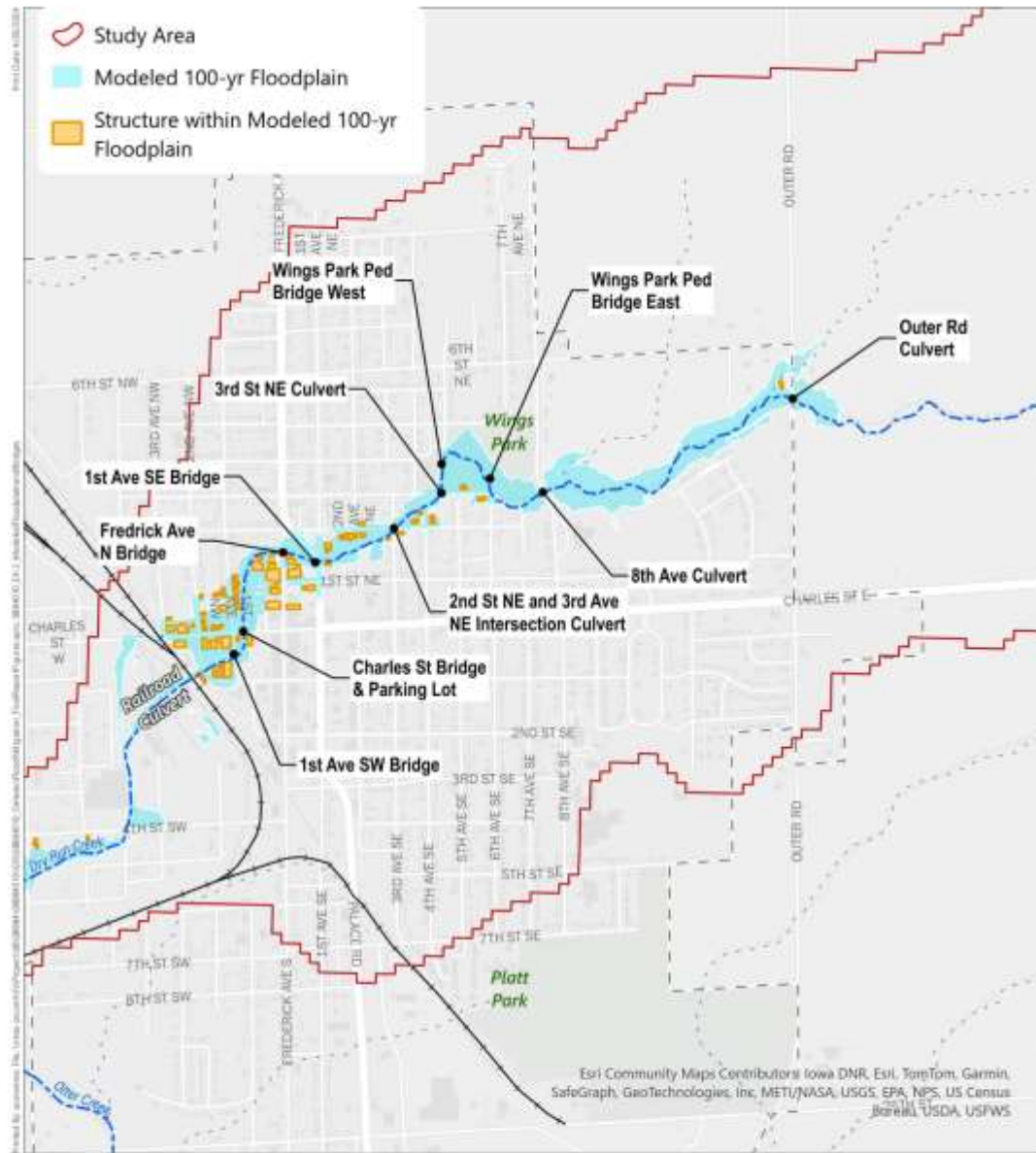
- ☒ Oelwein
- 📍 Study Area
- 📍 Focus Area
- Railroad

## Study Area

Figure EX-1  
Flood Mitigation Scoping

# Historical Flooding in Oelwein

- Many structures within the 100-yr floodplain, including the Fire Department
- Creek restricted by bridges and Railroad Culvert
- Charles Street Viaduct acts as secondary overland flow path



Data Sources:  
 Municipal Boundary: Fayette County  
 Road Centerlines: Iowa DMR  
 Floodplain Extents: FEMA (2021/05/17)

**Modeled 100-yr Floodplain and Existing Bridges & Culverts**

0 0.13 0.25 Miles



Figure EX-2  
 Flood Mitigation Scoping

# Historical Flooding in Oelwein

- Dry Run Creek overtops the banks and regularly floods the downtown areas
- Largest daily total

Date	Daily Total Precipitation (in)
July 23, 2010	9.93
September 7, 1989	7.19
June 15, 1925	6.5
August 31, 1981	6.38
June 10, 2020	5.48
July 19, 1963	4.63
July 26, 1940	4.55
August 21, 1966	4.44
May 16, 1999	4.38
September 8, 1941	4.25



*Flooding along Charles Street, June 2020.  
Photo from the Oelwein Daily Register.*

# Historical Flooding in Oelwein

Prior Studies for Flood Reduction in Oelwein:

- **1981 Storm Sewer Study:** Recommended detention upstream of 8th Ave NE, surface water interception, and soil stabilization.
- **1982 Flood Study Report:** Recommended channel improvements, tile outlet terraces, and floodwater detention upstream of 8th Ave NE.
- **1983 Initial Appraisal:** Recommended more detailed study of flood reduction methods.
- **1987 Army Corp of Engineers Flood Control Project:** Recommended widening the channel but indicated that flooding would still occur in the 2-yr storm.
- **2021 Iowa CTP Real Time Technical Assistance:** Recommended bridge removal, upstream detention basins, widening the channel, and flood walls

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# Scope of Work for this Study

Use the 2021 Study as a starting point:

- 1. Update Floodplain Mapping:** Update the Federal Emergency Management Agency (FEMA) regulatory floodplain model for Dry Run Creek to add additional detail to support flood reduction alternative analyses
- 2. Mitigation Alternatives:** Conceptualize and model flood mitigation alternatives
- 3. Recommendations:** Identify preferred mitigation alternatives
- 4. Benefit/Cost Analysis:** Estimate the benefits using the FEMA BCA toolkit, and estimate design & construction costs for each alternative
- 5. Funding:** Review funding options to complete mitigation project(s)



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# Modeling: Proposed Mitigation Alternatives

10-, 50-, 100- and 500-yr floodplain maps for existing conditions

- Mitigation alternatives added to the model to estimate flood reduction
- **Water Surface Elevation (WSEL):** The height of flood waters of various magnitudes and frequencies in a floodplain
- **Discharge:** The amount of water that passes a point in a river



# Modeling: Proposed Mitigation Alternatives

Considerations when  
Reviewing  
Alternatives

- **Cost Effective**
- Do not negatively impact other properties. Do not "shift the problem elsewhere"
- Storage solutions designed to 100-yr event
- No floodwalls
- Upsizing culvert under RR would be



Data Source:  
Municipal Boundary: Fayette  
County  
Road Centerlines: Iowa DMV



**All Flood Mitigation Alternatives**

Flood Mitigation Scoping

# Modeling: Proposed Mitigation

Modeled Alternative	# of Structures Removed from the Modeled 100-yr Floodplain
Modeled Existing Conditions	(69 Total)
Pond 1	64
Pond 2	1
Pond 3a	8
Pond 3b	66
Pond 4	1
Pond 1+2	67
Pond 1 + 3a	67
Pond 2 + 3a	11
Pond 1 + 2 + 3a	67
Pond 1 + 2 + 3b	67
Remove 1st Ave SW Bridge	6
Remove Charles St Parking Lot	0
Remove portion of RR Culvert	0
RR Upsize	10
Widen Channel	1



## All Flood Mitigation Alternatives

### Flood Mitigation Scoping



# Modeling: Proposed Mitigation

## Alternatives

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Widen Channel	1



All Flood Mitigation Alternatives

Flood Mitigation Scoping

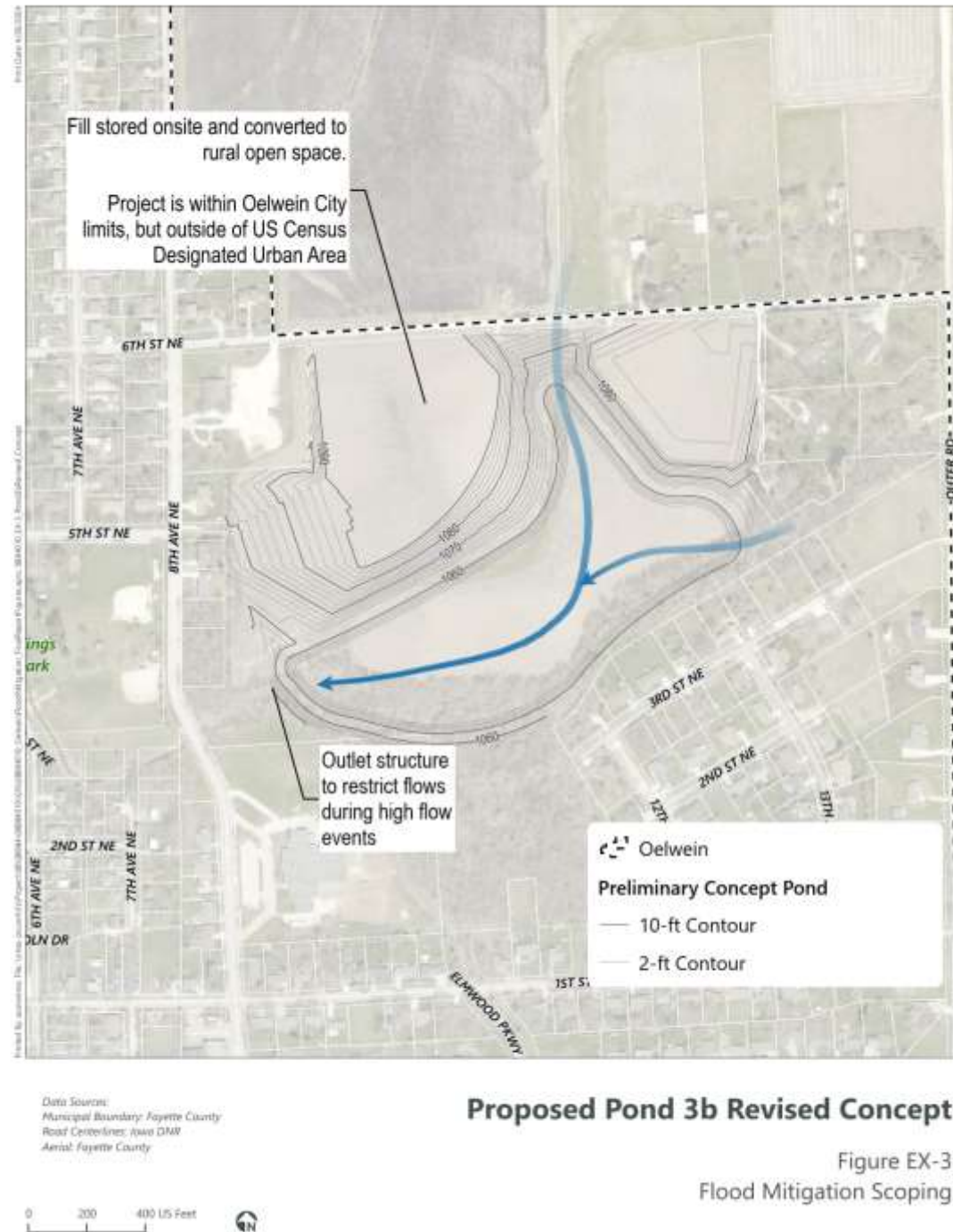
**Property Acquisition.** Not modeled within HEC-RAS but permanently removes a structure from the floodplain

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# Recommended Option #1: Regional Pond 3b Revised

- Within City Limits
- Diverts Dry Run Creek into pond
- Maintain low-flow through channel
- Only stores water during large rain events
- Berm to protect homes to the south
- Requires property acquisition
- Attempt to keep all fill onsite
- *Ecosystem Services:*  
Converts agricultural



# Recommended Option #1: Regional Pond

## 3b Revised

\$4.1M + Unknown Costs

57 of 69 Structures Removed



## Proposed Pond 3b Revised Floodplain

Figure 22  
Flood Mitigation Scoping

City of Oelwein  
Fayette County, IA

- Oelwein
- Existing 100-yr Floodplain
- With Pond 3b as a Dam, 100-yr Floodplain
- Building within Existing 100-yr Floodplain (69)
- Building Removed from 100-yr Floodplain (57)
- Preliminary Concept Pond
  - 10-ft Contour
  - 2-ft Contour

**In this alternative, Pond 3b Revised would be classified as a Dam.**

City of Oelwein  
Floodplain Engineer: MSA  
Base Map: Esri Community Map Contributor, Iowa DNR, C  
OpenStreetMap, Microsoft, Esri, Garmin, GeoEye, Aero  
Geo/Aerials, Inc, NITV/NASA, USGS, EPA, NPS, US Census Bureau,  
USDA, USFWS, Esri Community Map Contributor, Iowa DNR, Esri,  
Garmin, GeoEye, Geo/Aerials, Inc, NITV/NASA, USGS,  
EPA, NPS, US Census Bureau, USDA, USFWS



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- Recommended Option #1: Regional Pond 3b Revised
- **Recommended Option #2: 1st Ave SW Bridge Removal**
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# Recommended Option #2: 1<sup>st</sup> Ave SW Bridge Removal

- One-time up-front cost
- Other transportation options for residents to get downtown
- Bridge is in poor condition
- Install concrete barriers to block access



Data Source:  
Municipal Boundary: Fayette County  
Road Centerlines: Iowa DMV  
Aerial: Fayette County

**Remove 1st Ave SW Bridge**

0 25 50 US Feet



Flood Mitigation Scoping

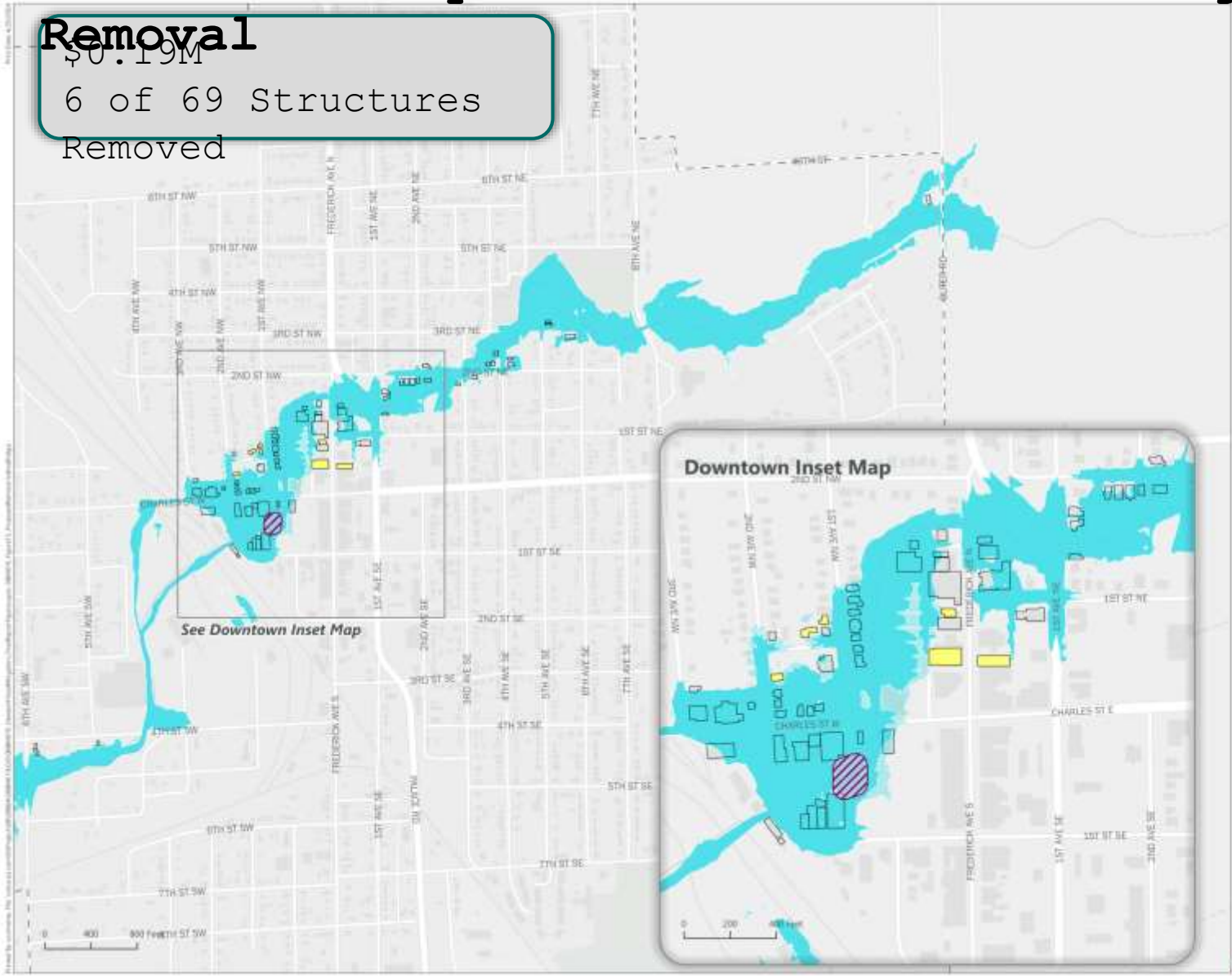
# Recommended Option #2: 1<sup>st</sup> Ave SW Bridge

**Removal**  
 \$0.19M  
 6 of 69 Structures  
 Removed

## Proposed Remove 1st Ave SW Bridge Floodplain

Figure 15  
 Flood Mitigation Scoping

City of Oelwein  
 Fayette County, IA



- Oelwein
- Existing 100-yr Floodplain
- Remove 1st Ave NW Bridge, 100-yr Floodplain
- Building within Existing 100-yr Floodplain (69)
- Building Removed from 100-yr Floodplain (6)
- Remove 1st Ave SW Bridge
- Stream

Data Sources:  
 Municipal Boundary: Fayette County  
 Floodplain Colors: MSA  
 Basemap: Esri Community Map Contributor, Iowa DNR, ©  
 OpenStreetMap, Microsoft, Esri, Garmin, Garmin, SateGraph,  
 GeoEye/Airphoto, Inc, NITV/NASA, USGS, Esri, NPS, US Census Bureau,  
 USDA, USFWS, Esri Community Map Contributor, Iowa DNR, Esri,  
 Garmin, SateGraph, GeoEye/Airphoto, Inc, NITV/NASA, USGS,  
 EPA, NPS, US Census Bureau, USDA, USFWS

# Today's Presentation

- Background: Historical Flooding in Oelwein
- Scope of Work for this Study
- Modeling: Proposed Mitigation Alternatives
- Recommended Option #1: Regional Pond 3b Revised
- Recommended Option #2: 1st Ave SW Bridge Removal
- **Recommended Option #3: Charles St Parking Lot Removal**
- Recommended Option #4: Property Acquisition
- Benefit Cost Analysis: FEMA's BCA Toolkit
- Funding
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## Recommended Option #3: Remove Charles St Parking Lot

- One-time up-front cost
- Other parking lots available downtown
- Will require funds to maintain if not removed
- Install a concrete barrier to block access
- Does not provide flood mitigation benefits on its own, but could be coupled with conversion of adjacent lands to urban open space for Ecosystem



Data Source:  
Municipal Boundary: Fayette County  
Road Centerlines: Iowa DMR  
Aerial: Fayette County

**Remove Charles St Parking Lot**

0 25 50 US Feet



Flood Mitigation Scoping

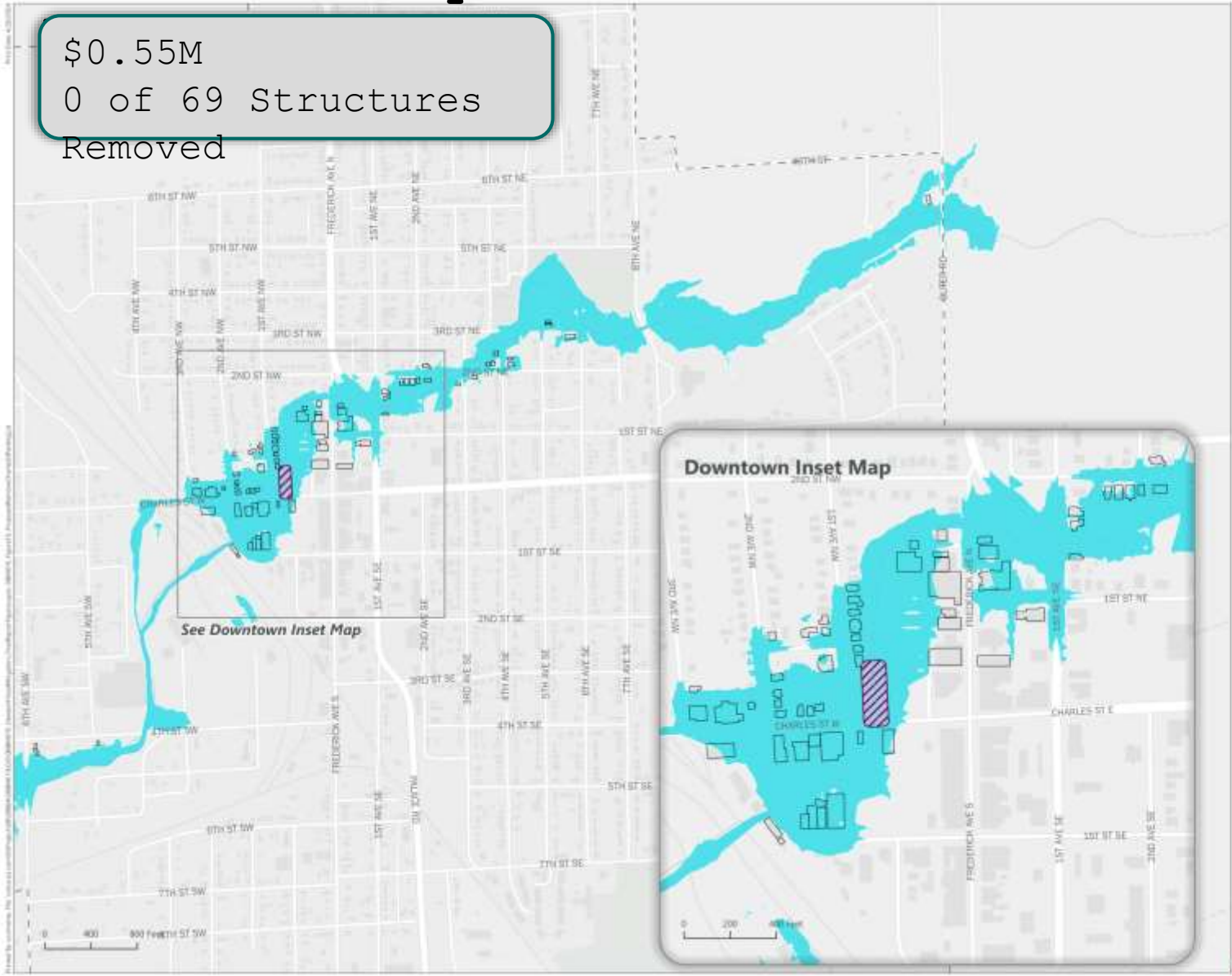
# Recommended Option #3: Remove Charles St

\$0.55M  
0 of 69 Structures  
Removed

## Proposed Remove Charles St Parking Floodplain

Figure 16  
Flood Mitigation Scoping

City of Oelwein  
Fayette County, IA



- Existing 100-yr Floodplain
- Remove Charles St Parking Lot, 100-yr Floodplain
- Building within Existing 100-yr Floodplain (69)
- Building Removed from 100-yr Floodplain (0)
- Remove Charles St Parking Lot
- Stream

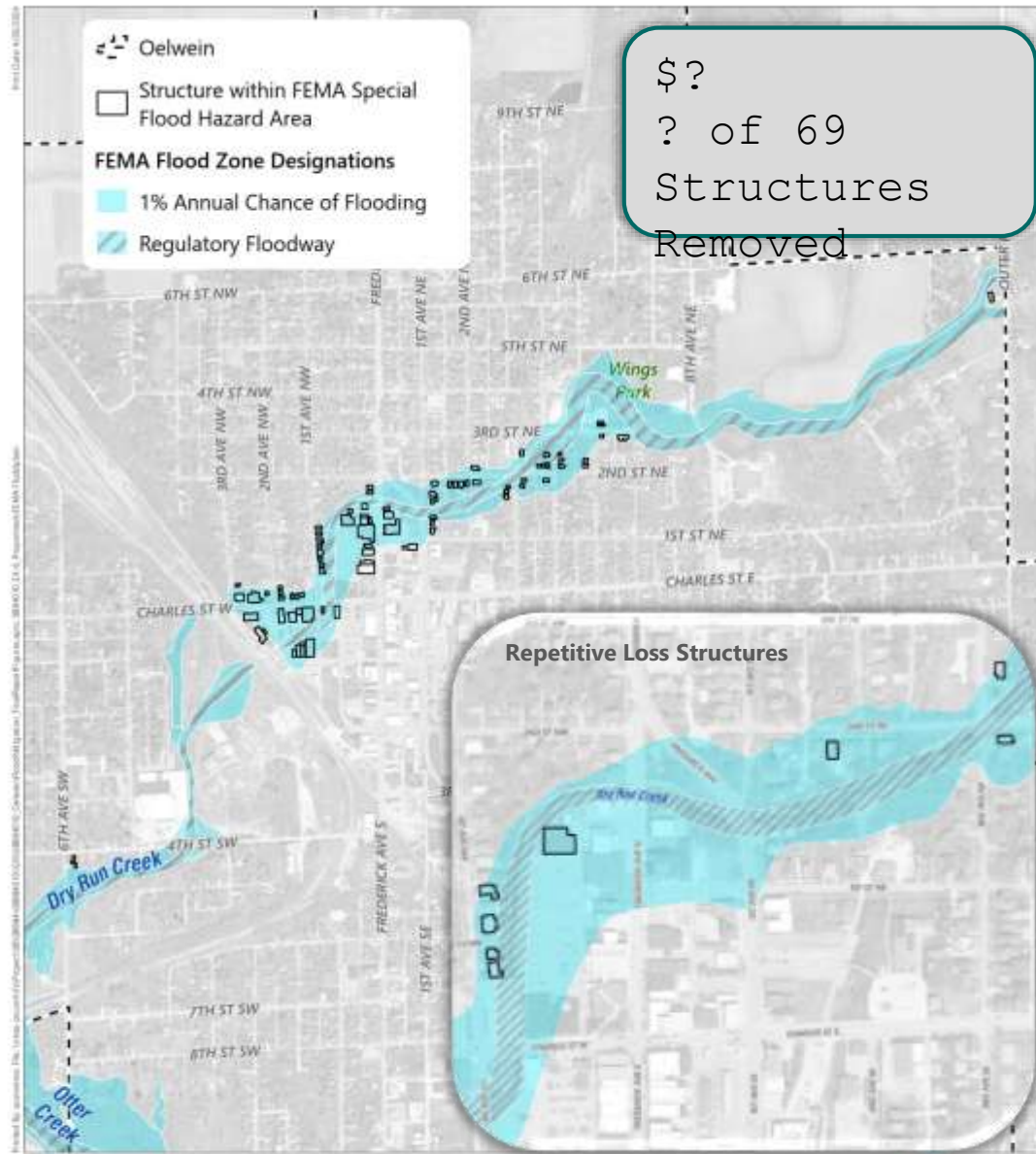
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- **Recommended Option #4: Property Acquisition**
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# Recommended Option #4: Property Acquisition

- One-time up-front cost
- Property acquisition is easiest for structures located within the FEMA mapped floodplain
- Property owners volunteer to participate in the program
- Homes valued for less than 360K can use Pre-Calculated Benefits Based of 360K
- Repetitive Loss Structures are the



Structures within FEMA Special Flood Hazard Area

Figure EX-6  
Flood Mitigation Scoping

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Municipal Boundary: Fayette County  
Road Centerlines: Iowa DMR  
Floodplain Extents: FEMA (2021/05/17)  
Aerial: Fayette County



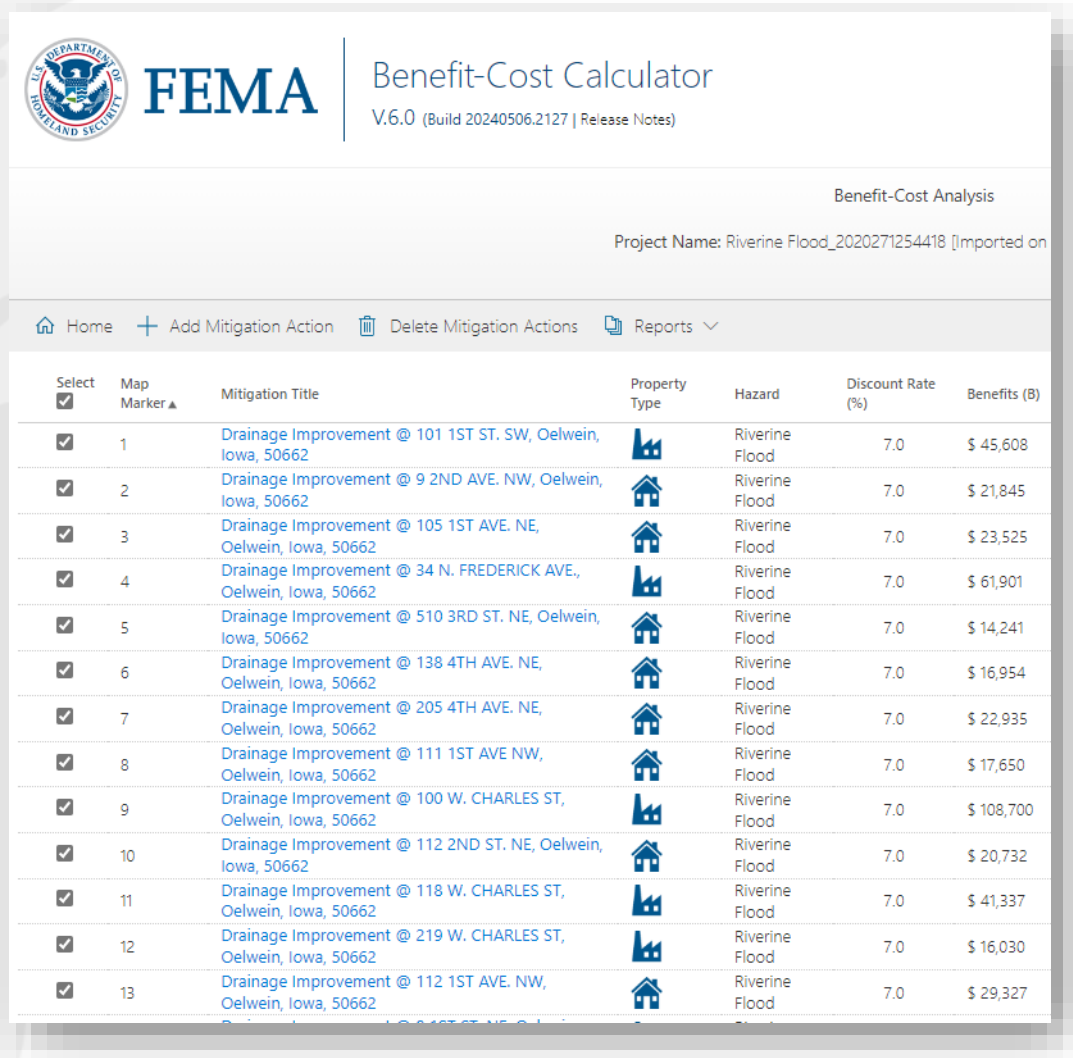
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- **Benefit Cost Analysis: FEMA's BCA Toolkit**
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# Benefit Cost Analysis:

FEMA's BCA Analysis (BCA) toolkit estimates the monetary benefits of flood risk reduction

- **Standard benefits** account for reduced risk to buildings, contents within the building, displacement costs and ecosystem services\*
- **Social benefits** account for the improvement mental health and productivity for residents who are less impacted by flooding
- **Ecosystem services**



The screenshot displays the FEMA Benefit-Cost Calculator interface. At the top, the FEMA logo and the text "Benefit-Cost Calculator V.6.0 (Build 20240506.2127 | Release Notes)" are visible. Below this, the project name "Riverine Flood\_2020271254418 [Imported on]" is shown. The main content area features a navigation bar with "Home", "Add Mitigation Action", "Delete Mitigation Actions", and "Reports". Below the navigation bar is a table with the following columns: "Select", "Map Marker", "Mitigation Title", "Property Type", "Hazard", "Discount Rate (%)", and "Benefits (B)". The table lists 13 mitigation actions, all of which are checked in the "Select" column. Each row includes a map marker, a title for a drainage improvement at a specific address in Oelwein, Iowa, a property type icon, the hazard "Riverine Flood", a discount rate of 7.0%, and a corresponding benefit value.

Select	Map Marker	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)
<input checked="" type="checkbox"/>	1	Drainage Improvement @ 101 1ST ST. SW, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 45,608
<input checked="" type="checkbox"/>	2	Drainage Improvement @ 9 2ND AVE. NW, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 21,845
<input checked="" type="checkbox"/>	3	Drainage Improvement @ 105 1ST AVE. NE, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 23,525
<input checked="" type="checkbox"/>	4	Drainage Improvement @ 34 N. FREDERICK AVE., Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 61,901
<input checked="" type="checkbox"/>	5	Drainage Improvement @ 510 3RD ST. NE, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 14,241
<input checked="" type="checkbox"/>	6	Drainage Improvement @ 138 4TH AVE. NE, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 16,954
<input checked="" type="checkbox"/>	7	Drainage Improvement @ 205 4TH AVE. NE, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 22,935
<input checked="" type="checkbox"/>	8	Drainage Improvement @ 111 1ST AVE NW, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 17,650
<input checked="" type="checkbox"/>	9	Drainage Improvement @ 100 W. CHARLES ST, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 108,700
<input checked="" type="checkbox"/>	10	Drainage Improvement @ 112 2ND ST. NE, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 20,732
<input checked="" type="checkbox"/>	11	Drainage Improvement @ 118 W. CHARLES ST, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 41,337
<input checked="" type="checkbox"/>	12	Drainage Improvement @ 219 W. CHARLES ST, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 16,030
<input checked="" type="checkbox"/>	13	Drainage Improvement @ 112 1ST AVE. NW, Oelwein, Iowa, 50662		Riverine Flood	7.0	\$ 29,327

# Benefit Cost Analysis: FEMA's BCA Toolkit

Alternative	Regional Pond 3b Revised		Remove 1st Ave SW Bridge			Remove Charles St Parking over Creek			Residential Property Acquisition within FEMA Special Flood Hazard Area (52 Structures @ 360K)	
Assumed Project Lifespan	30-yr		100-yr			100-yr			100-yr	
Structure/Social Benefit*	\$2.710 M		\$1.125 M			\$0.000 M			\$18.720 M	
Ecosystem Service	17 ac, Rural Open Space	46 ac, Rural Open Space	None. Unless the project creates urban open space			None. Unless the project creates urban open space			None. Unless the project creates urban open space	
Ecosystem Services Benefit*	\$2.243 M	\$6.069 M								
Total Benefits*	\$4.953 M	\$8.779 M	\$1.125 M			\$0.000 M			\$18.720 M	
One-Time Cost Description**	Construction Costs (see Table 5)	Property Acquisition, Hauling Costs, Permitting, Stream Mitigation Fee	Bridge Removal	Guard Rail	Contingency (20%)	Parking Lot Removal	Guard Rail	Contingency (20%)	Property Acquisition (based on tax assessment)	Demolition (15K per Structure)
Individual One Time Cost	\$3.845 M	Unknown	\$0.150 M	\$10,000	\$32,000	\$0.450 M	\$5,000	\$91,000	\$3.178 M	\$0.780 M
Total One Time Cost	\$3.845M + Unknown Costs		\$0.192 M			\$0.546 M			\$3.958 M	
Maintenance Costs***	\$0.255 M		none			none			none	
Total Cost	\$4.100 M + Unknown Costs		\$0.192 M			\$0.546 M			\$3.958 M	

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# Funding

- **FEMA's Hazard Mitigation Grants**



- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA) Grant
- Safeguarding Tomorrow Revolving Loan Fund (STRLF)
- Flood Mitigation Assistance Swift Current (Swift C

- **Environmental Protection Agency (EPA)**



- Community Change Grant

- **Iowa Department of Natural Resources (IDNR)**



- Resource Enhancement and Protection (REAP)

- **Bridge Removal Funding, Iowa DOT**



- Poorly rated bridges may be eligible for funding to be removed

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# Next Steps

- **Select preferred alternative(s)**
  - Regional Pond 3b
  - Combination of other alternatives
    - Remove 1<sup>st</sup> Ave SW Bridge
    - Remove Charles St Parking Lot
    - Property Acquisition
    - Create urban open space (for Ecosystem Services Benefits)
- **Apply for funding and start project design**
- **Model alternative with updated FEMA model and BCA Toolkit**

