

SUSTAINABLE GREENWAYS

Progress through Partnership



August 14, 2019

NORTH DAKOTA TRAILS CONFERENCE – MINOT, ND

Mouse River Historical Flooding

1881 – 22,000 cfs

1904 – 12,000 cfs

1916 – 4,300 cfs

1927 – 3,900 cfs

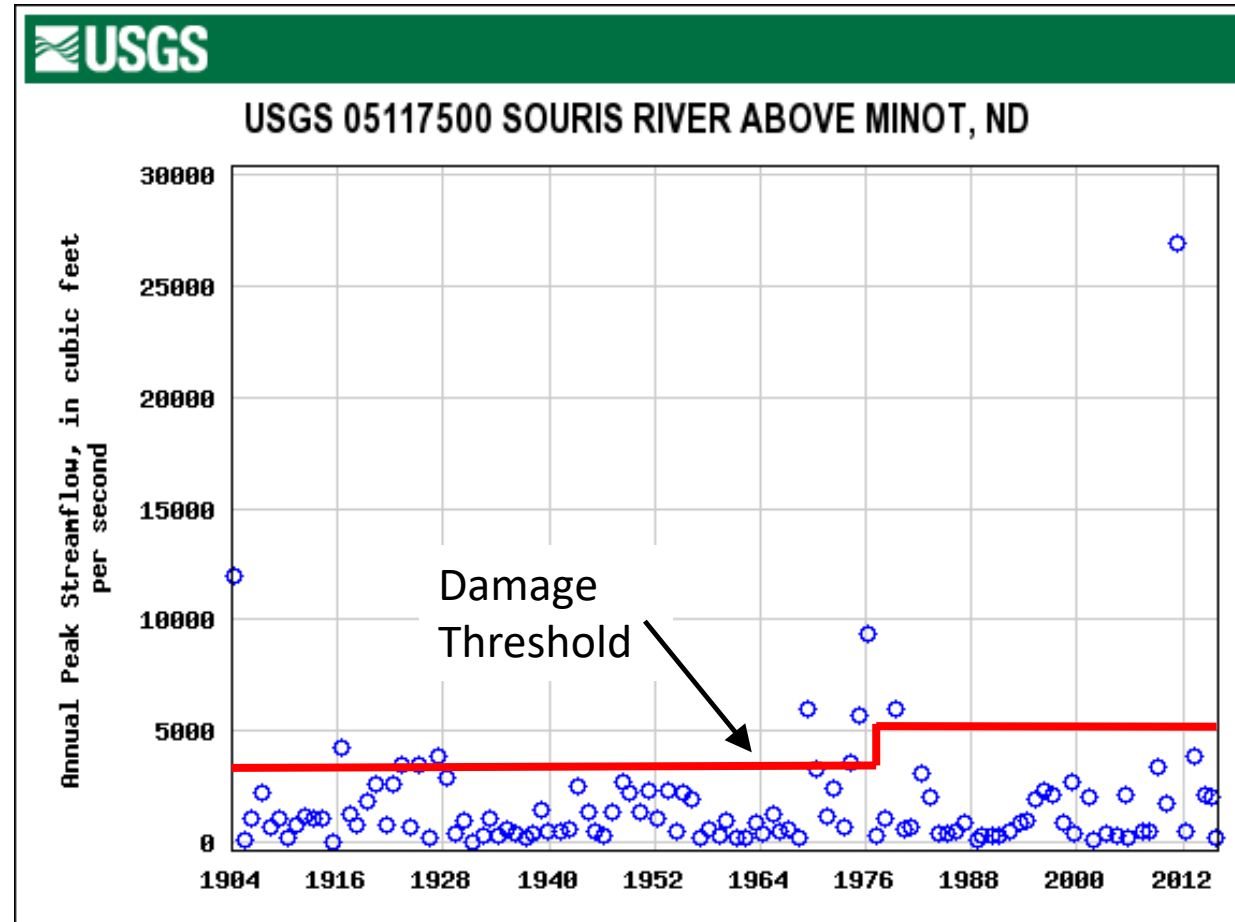
1969 – 6,000 cfs

1975 – 5,700 cfs

1976 – 9,400 cfs

1979 – 6,000 cfs

2011 – 27,400 cfs



1904 Mouse River Flood



1916 Mouse River Flood



1927 Mouse River Flood



Mouse River Flood Control...A Sorted History

- **1930** – USACE issues report recommending study of flood control alternatives including a storage reservoir near Foxholm, ND and a floodway through Minot
- **1935** – The USACE concludes that flood control is not justified
- **1936** – US Fish and Wildlife Service and Civilian Conservation Corps construct three migratory waterfowl refuges in the Mouse (Souris) River basin
- **1938** – The USACE reviews earlier studies and concludes that the Lake Darling Reservoir could have been used to mitigate damages caused by previous floods
- **1957** – The USACE studies earlier studies and concludes that more study is necessary...

Mouse River Flood Control...A Sorted History

- **1965** – Congress authorizes construction of flood control improvements within the Mouse River basin, including construction of the Burlington Dam and dredging and straightening the river channel through Minot (Public Law 89-298)
- **1969** – The USACE issues draft EIS for the Burlington Dam project
- **1981** – Senate Report 97-256 directs the USACE to take no further action to construct the Burlington Dam project
- **1986** – Congress rescinds authorization for Burlington Dam project and authorizes multiple features to reduce flood risk in the Mouse River basin
 - Rafferty-Alameda Project
 - Four foot raise of Lake Darling
 - Levees at rural communities and subdivisions (Burlington, Sawyer, Velva, Ward County, Mouse River Park, etc.)

What Happened Between 1965 and 1986?

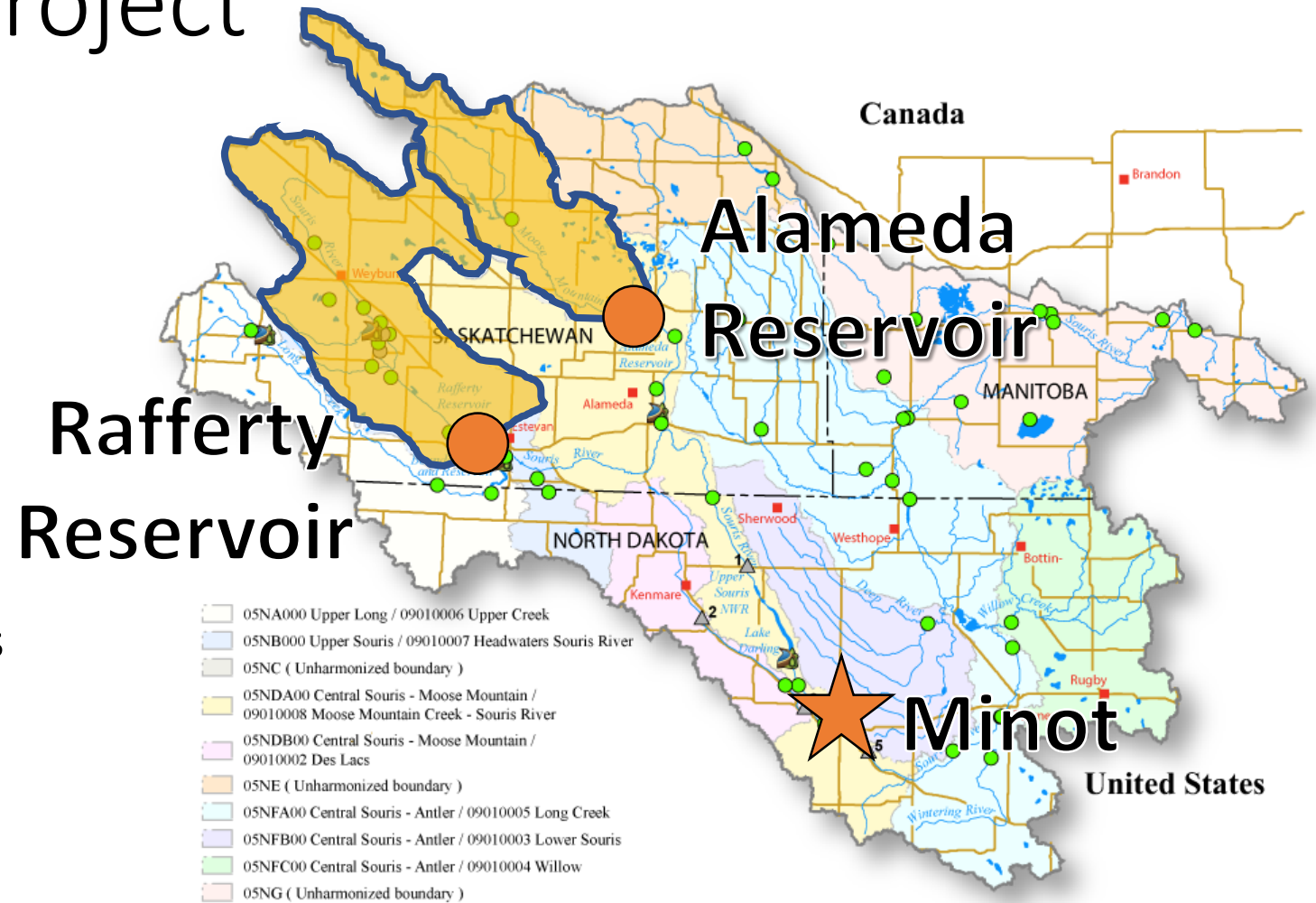
- Unfortunate period of history that pitted:
 - Urban vs. Rural
 - Upstream vs. Downstream
 - United States vs. Canada
 - 4 Dam Limited vs. Citizens United to Save the Valleys

“My Gawd, sir, there sure are some strange politics in North Dakota!”



Rafferty-Alameda Project

- Developed from 1988-1995
- Primary purpose was to provide water supply for Shand Power Plant near Estevan (Rafferty Reservoir)
- Alameda Reservoir was constructed to ensure apportionment (natural flow) requirements were being met under terms of Boundary Waters Treaty of 1909
- Secondary flood control purpose was added to the reservoirs following consultation with the United States



Rafferty-Alameda Project



Rafferty & Alameda Reservoirs

Canadian Water Supply

Souris (Mouse) River

Rafferty-Alameda Project



Rafferty & Alameda Reservoirs

United States Flood Control (~\$41 M)

Canadian Water Supply

Souris (Mouse) River

Rafferty-Alameda Project



Souris (Mouse) River

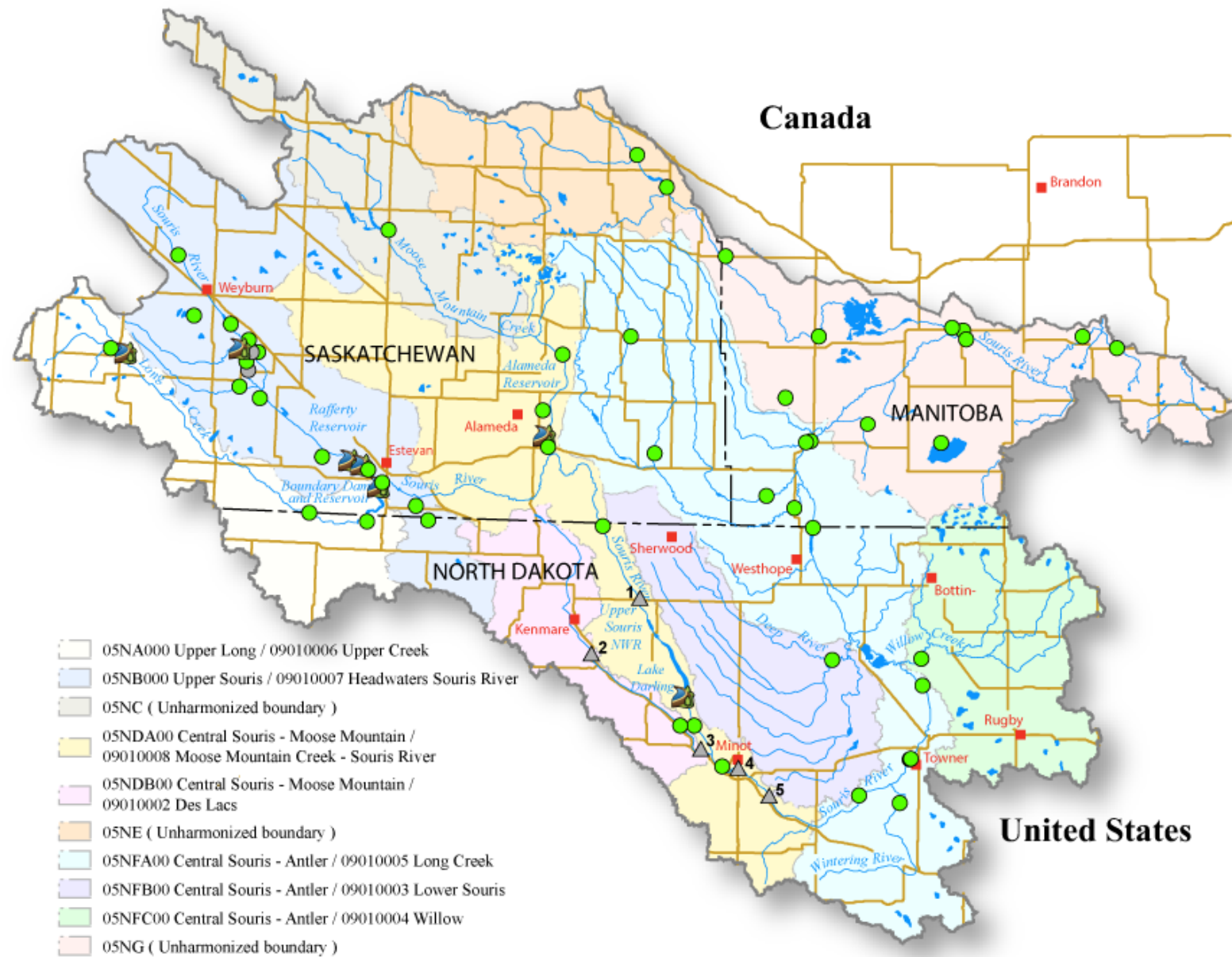


Rafferty ~ 11.5 feet
Alameda ~ 16.5 feet

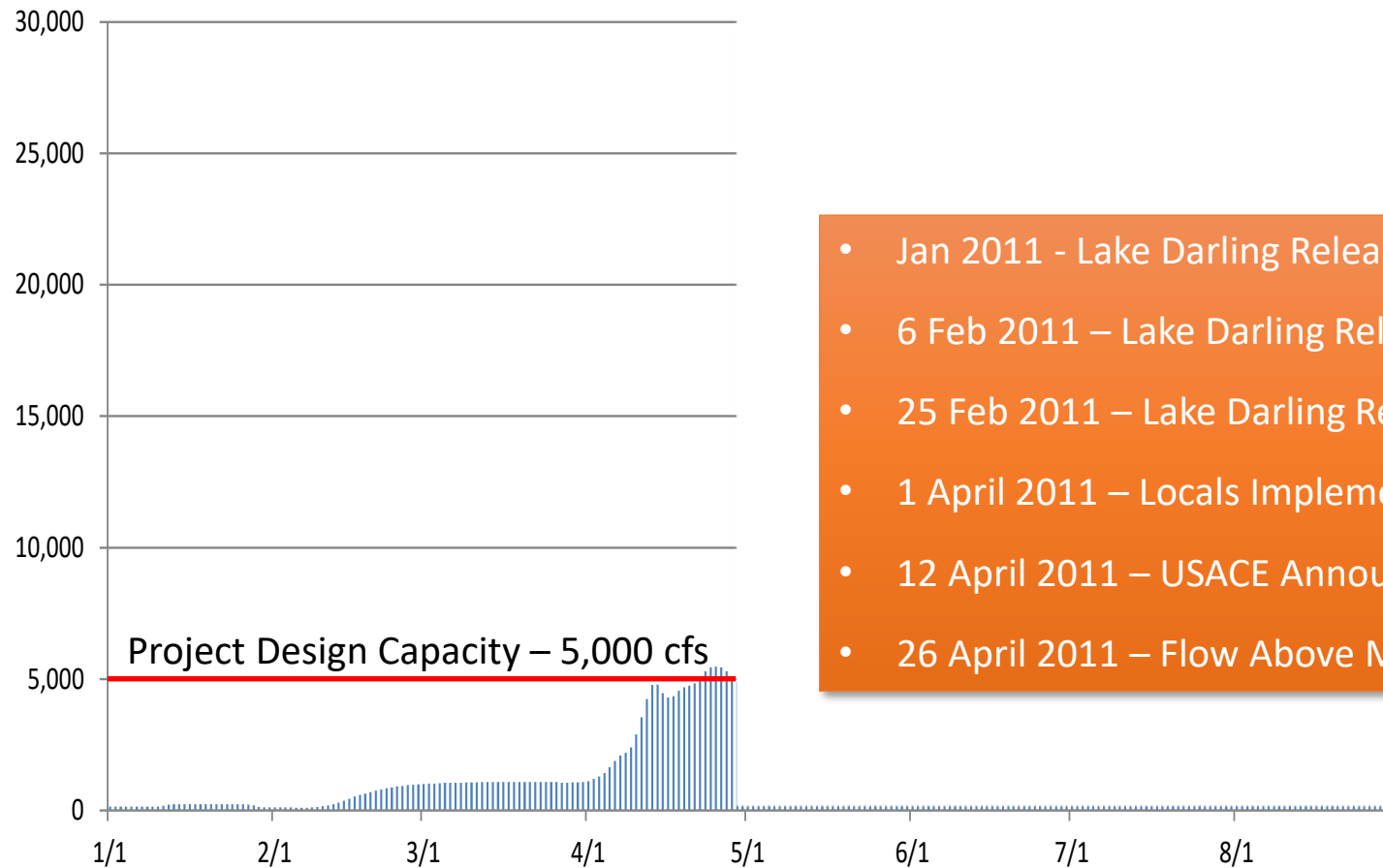
United States Flood Control (~\$41 M)

Canadian Water Supply

- International Watershed
- Heavily Regulated
 - Rafferty Reservoir on Souris (Mouse) River near Estevan, SK
 - Alameda Reservoir on Moose Mountain Creek near Oxbow, SK
 - Boundary Reservoir on Long Creek near Estevan, SK
 - Lake Darling Reservoir on Mouse (Souris) River near Burlington, ND
- Headwaters in Saskatchewan
- Flows Through Northern North Dakota
- Confluence with Assiniboine River in Manitoba
- Prairie Pothole Region with Volatile Hydrology

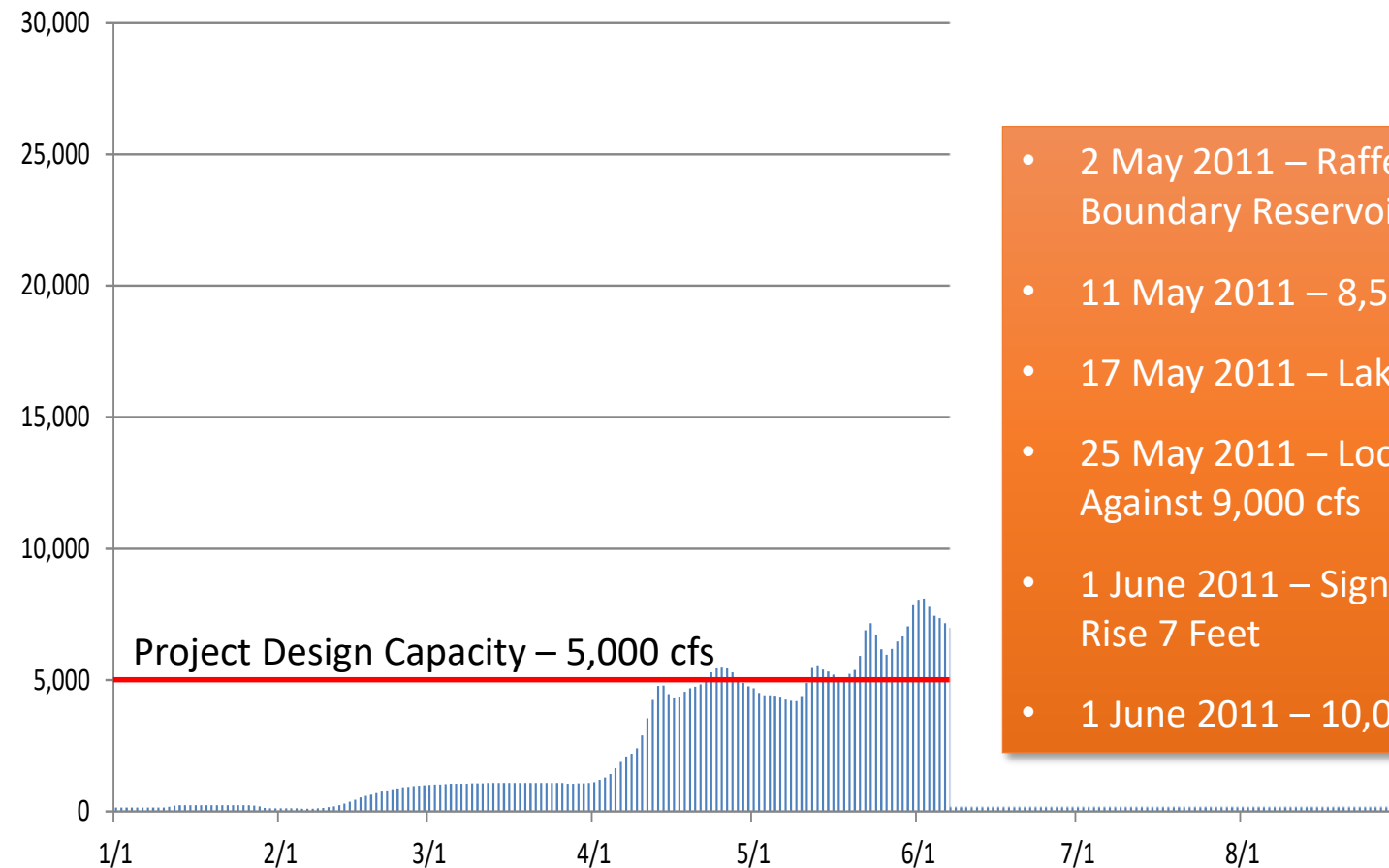


Recap – January to April 2011



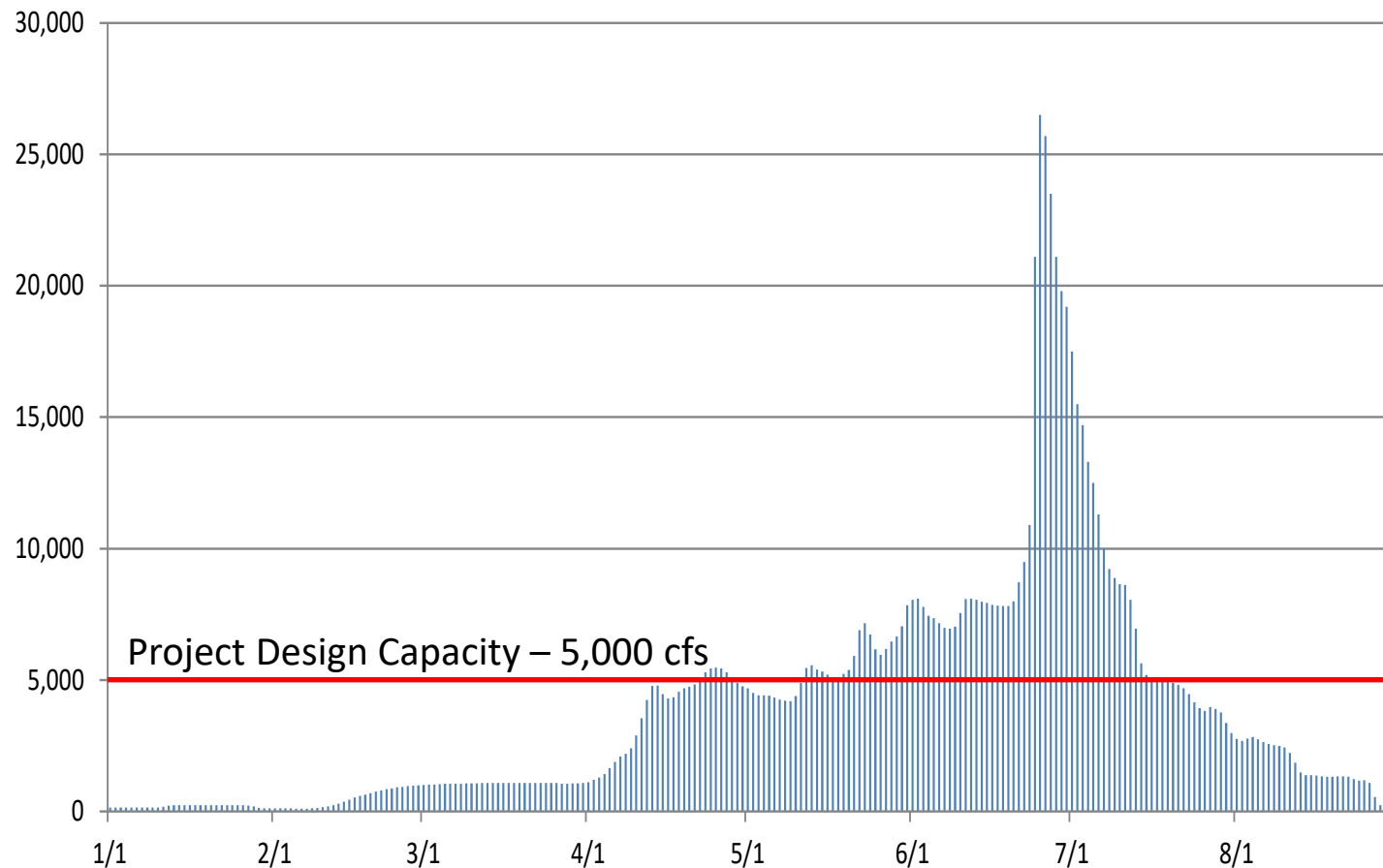
- Jan 2011 - Lake Darling Releases 200 -450 cfs
- 6 Feb 2011 – Lake Darling Releases 600 cfs
- 25 Feb 2011 – Lake Darling Releases 1,100 cfs
- 1 April 2011 – Locals Implement Plans for Protection Against 7,000 cfs
- 12 April 2011 – USACE Announces Target Flow of 5,000 cfs at Minot
- 26 April 2011 – Flow Above Minot Reaches 5,440 cfs

Recap – May to June 2011



- 2 May 2011 – Rafferty Reservoir Within 2 Feet of Spillway; Boundary Reservoir Within 0.2 Feet of Spillway
- 11 May 2011 – 8,500 cfs Out of Saskatchewan
- 17 May 2011 – Lake Darling Releases 4,800 cfs
- 25 May 2011 – Locals Implement Plans for Protection Against 9,000 cfs
- 1 June 2011 – Significant Rainfall Causes Des Lacs River to Rise 7 Feet
- 1 June 2011 – 10,000 Minot Residents Evacuated

Recap – June to August 2011



- 6 June 2011 – Minot Evacuation Order Lifted
- 6 June 2011 – Lake Darling Releases 7,500 cfs
- 17 June 2011 – 7 Inches of Rain Above Rafferty Reservoir Near Weyburn
- 22 June 2011 – Mandatory Evacuations Ordered
- 24 June 2011 – Lake Darling Releases 26,000 cfs
- 25 June 2011 – River Crests in Minot at 27,400 cfs



Development of the Mouse River Plan Preliminary Engineering Reports (PER)

- Residents within the valley needed information to make personal decisions (i.e. should I rebuild?)
- Parallel initiatives were planned to address urban and rural flood risk



Mouse River Plan Development

- Initial study timeline for urban areas was condensed to 5 months



Mouse River Plan Development

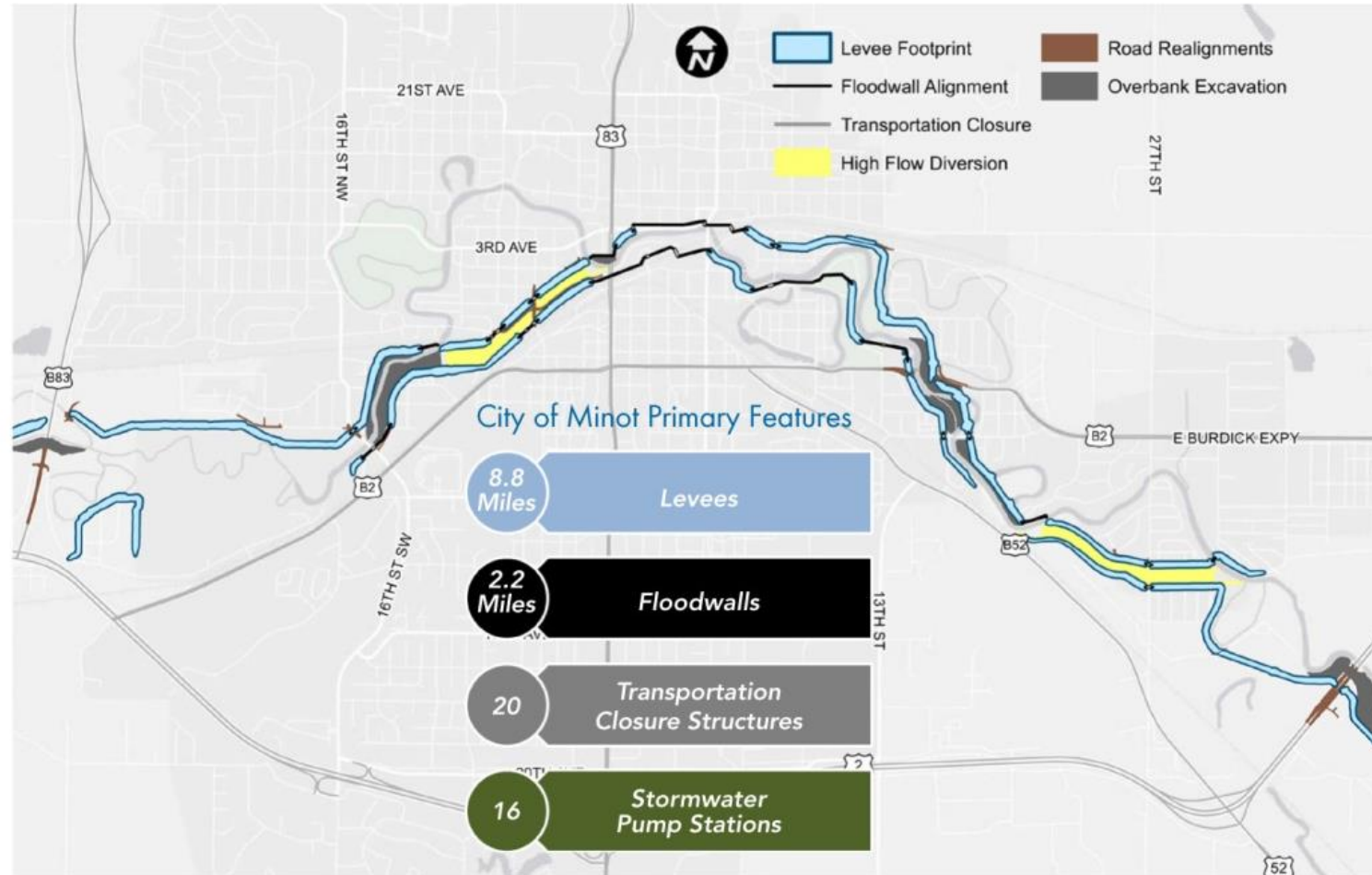
- Development of Mouse River Plan was an iterative, transparent process



Broad stakeholder and public input initiated and drove the process throughout, resulting in a high degree of acceptance.



MREFPP Minot Overview



Parallel Community Recovery and Planning Efforts

- FEMA Long-Term Community Recovery Strategy
- RiverFront and Center Initiative
- Minot Comprehensive Plan Update

Common themes emerged:

- Enhanced Trail System
- Enhanced River Access
- Greenway

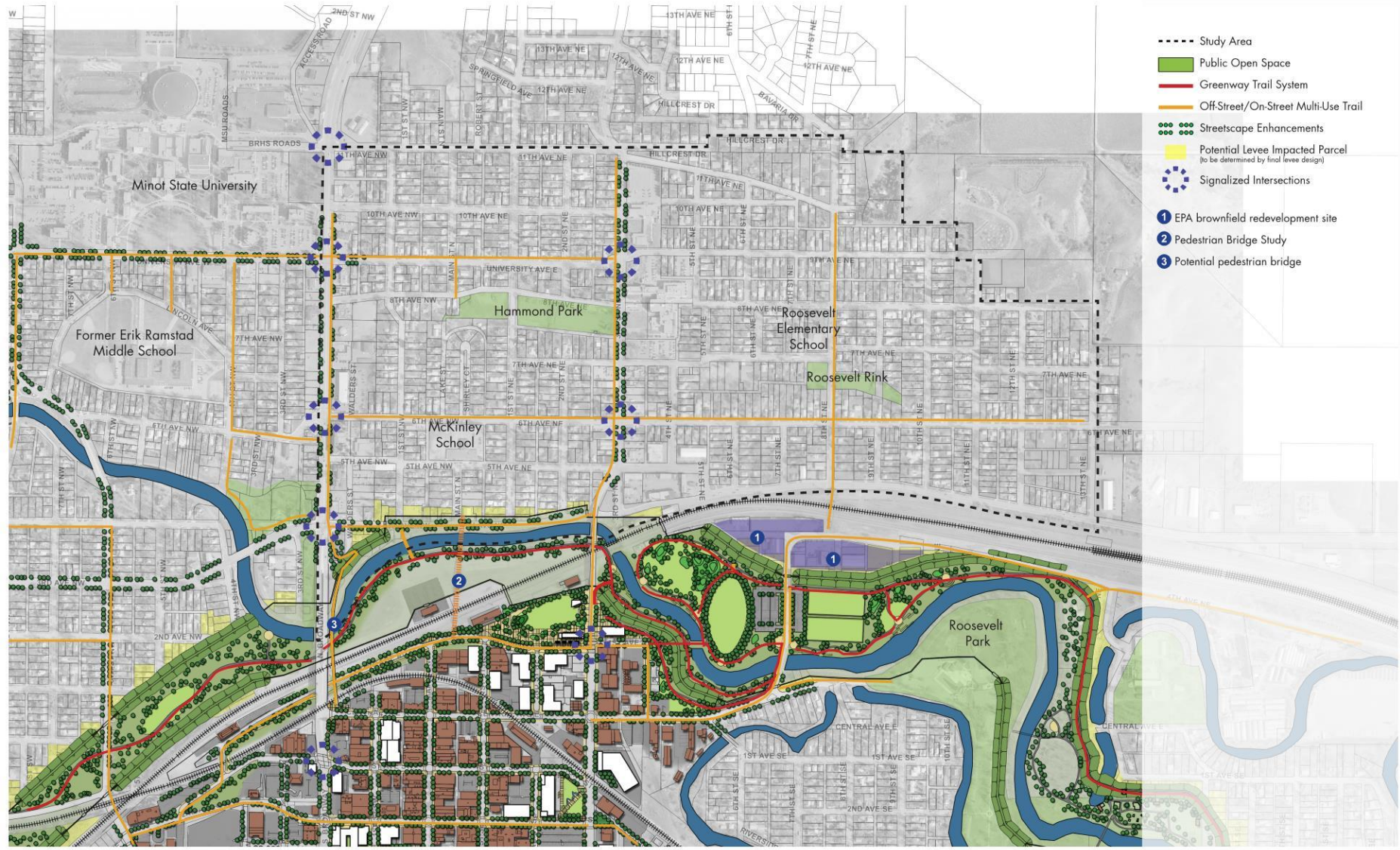


RiverFront and Center

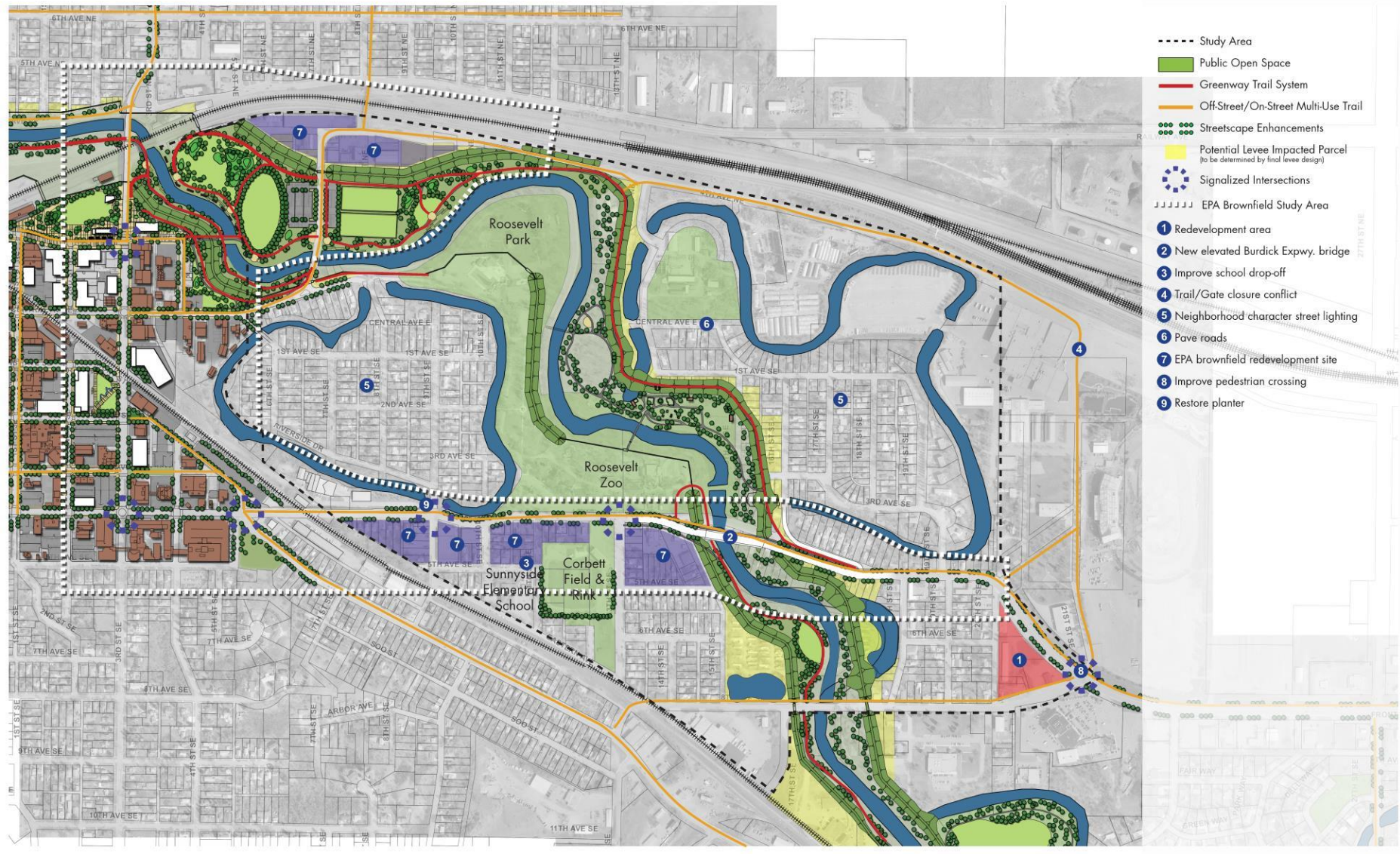
- Greenway planning effort organized by neighborhood throughout Minot
- 6 different neighborhoods
- High level concepts to identify corridors of connectivity
- Pedestrian arterial along the flood control project throughout the community

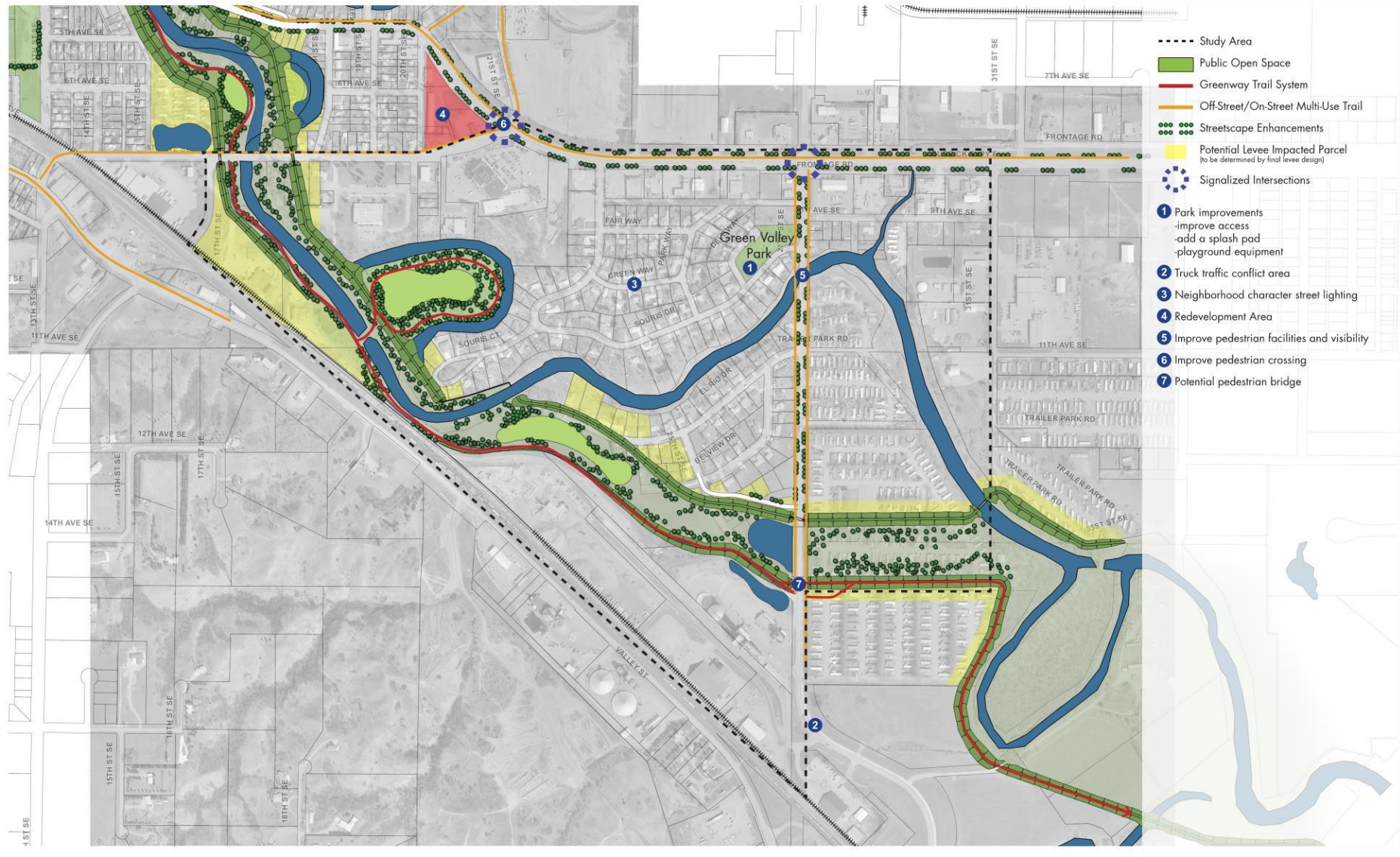






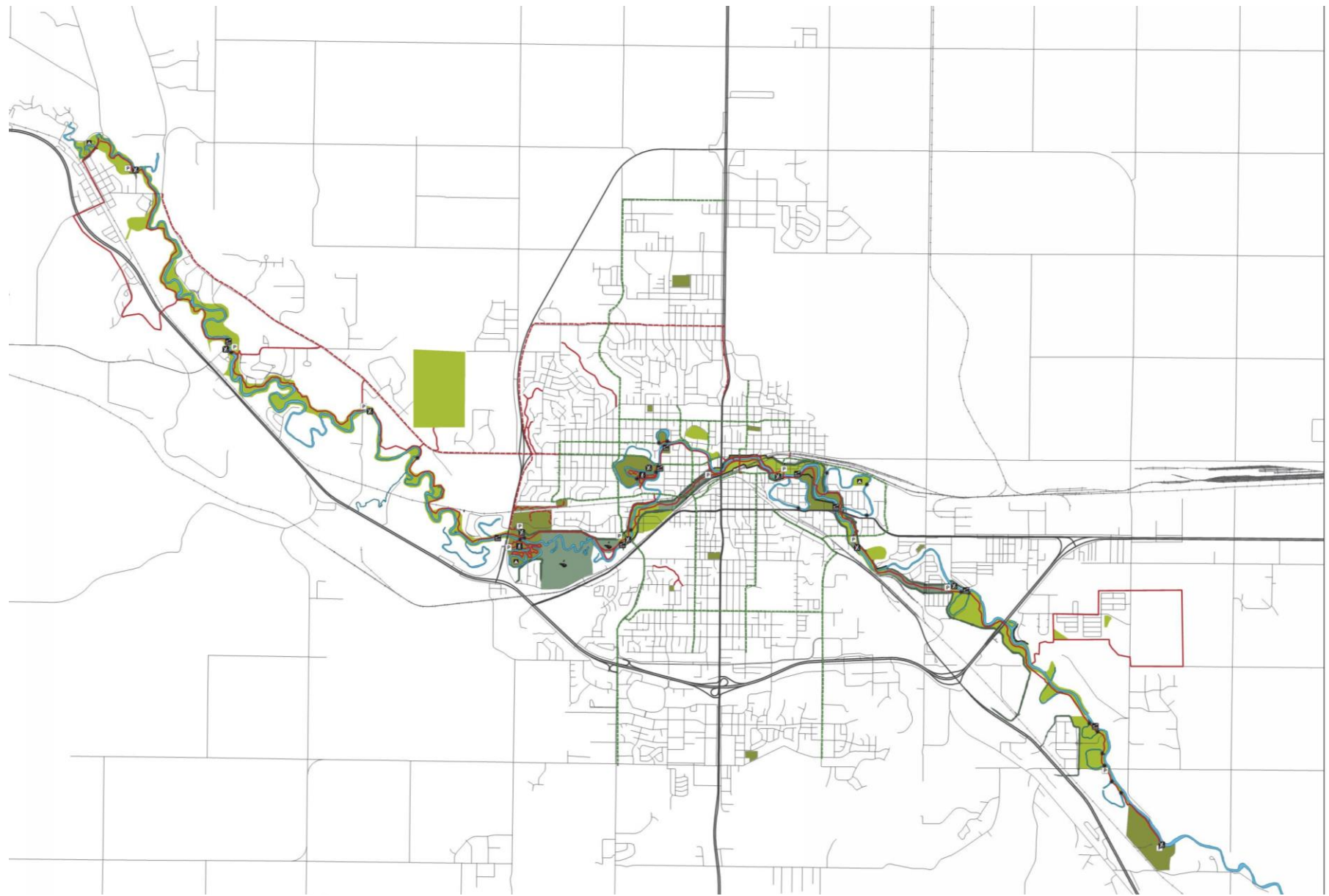
- Study Area
- Public Open Space
- Greenway Trail System
- Off-Street/On-Street Multi-Use Trail
- Streetscape Enhancements
- Potential Levee Impacted Parcel
(to be determined by final levee design)
- Signalized Intersections
- 1 EPA brownfield redevelopment site
- 2 Pedestrian Bridge Study
- 3 Potential pedestrian bridge





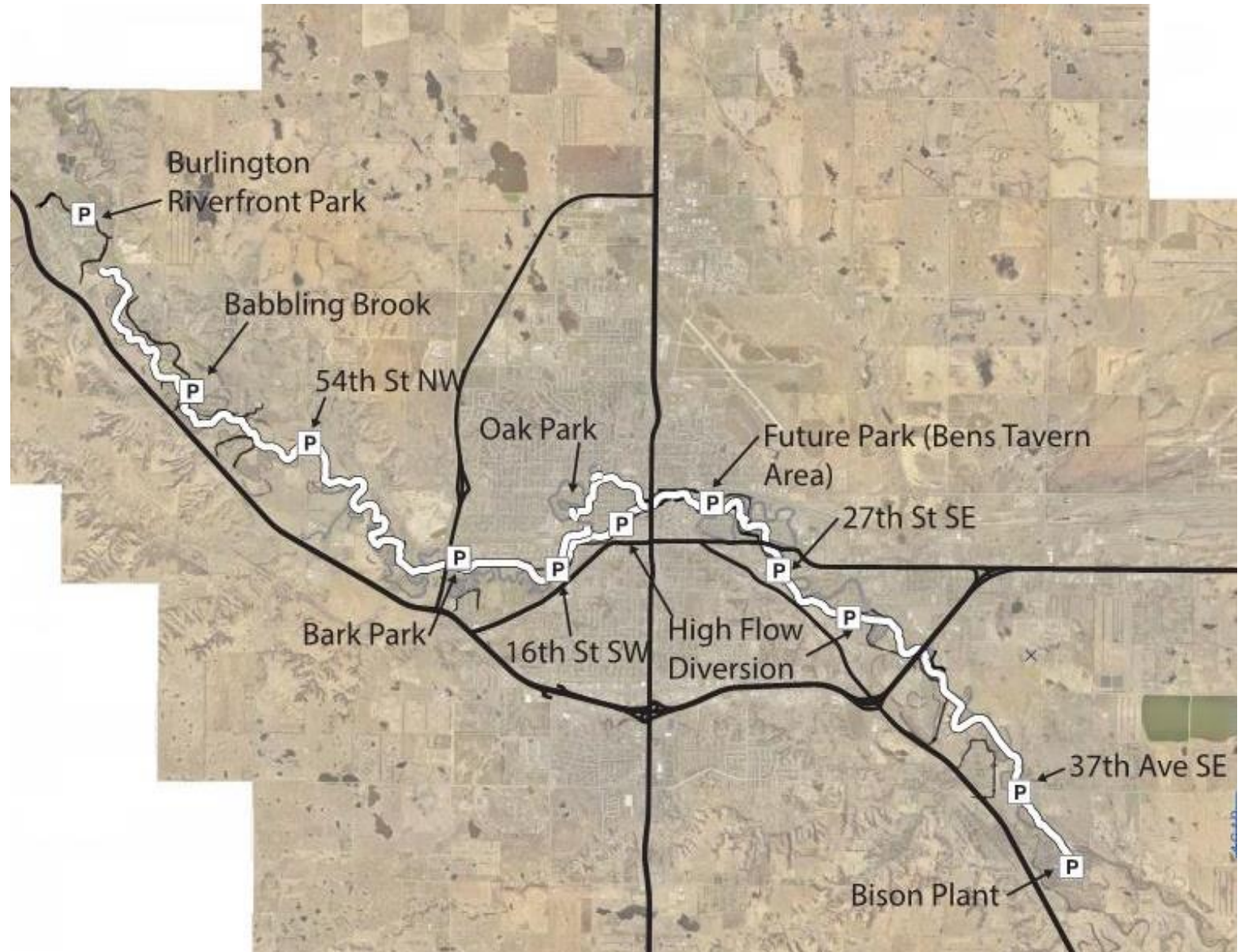
Minot Region Trail Master Plan

- Burlington to the Bison Plant (~17 trail miles)
- Utilize Mouse River corridor in combination with other shared use corridors
- Connections from greenway corridors to other community features
 - Parks
 - Minot State University
 - Downtown
 - ND State Fair Center



Minot Region Trail Master Plan

- Incorporate periodic trailheads and parking (1.5 mile average spacing)
- Minimize at-grade crossings with vehicle routes
- Minimize trails attached to other transportation corridors
- Pavement types dependent on setting
 - Asphalt vs. concrete
 - User preference
 - Flood control nexus



Perkett Ditch Stormwater Storage



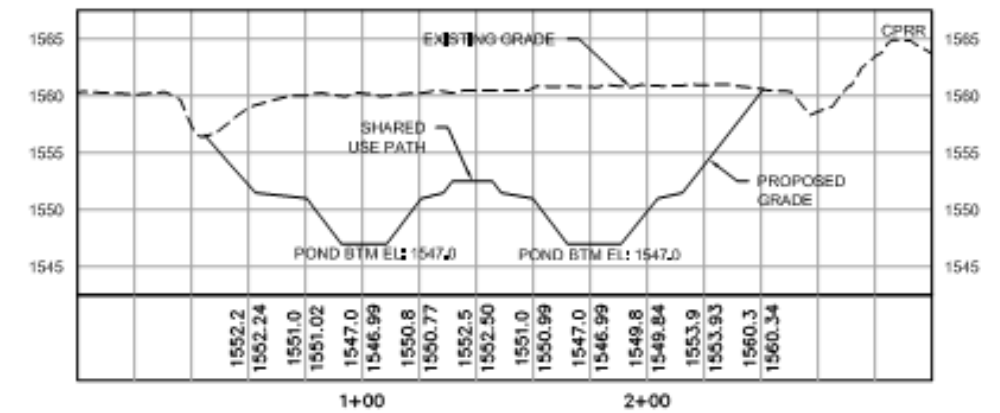
Perkett Ditch Stormwater Storage



Perkett Ditch Stormwater Storage

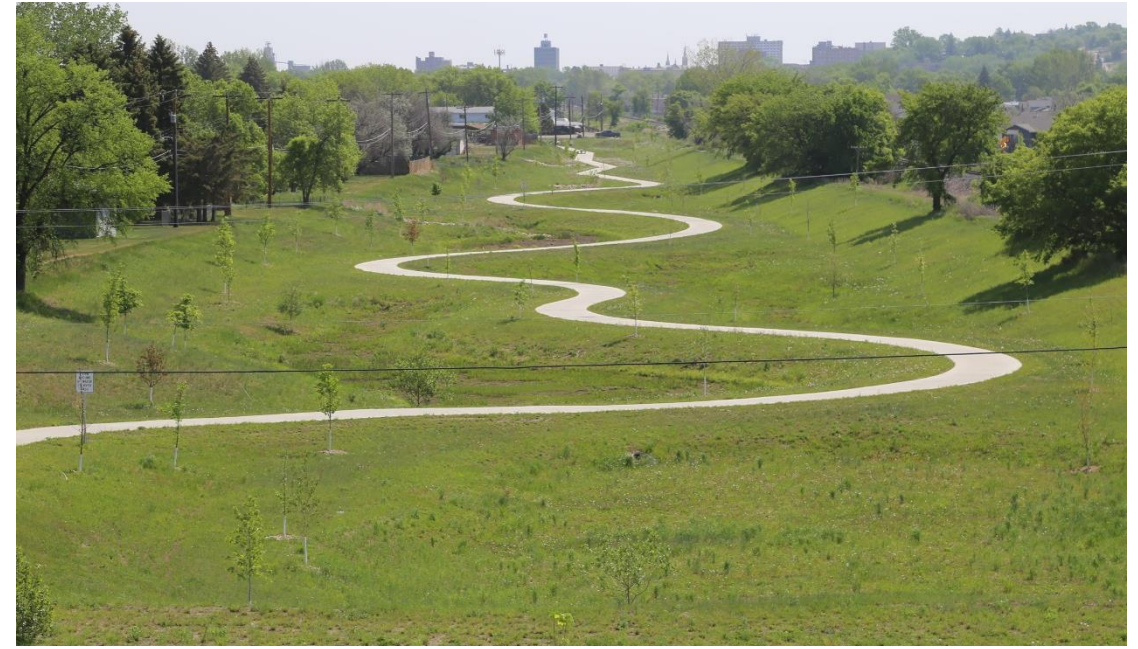


Perkett Ditch Stormwater Storage



2 SECTION

Perkett Ditch Stormwater Storage



Napa Valley Levee Dakota Bark Park



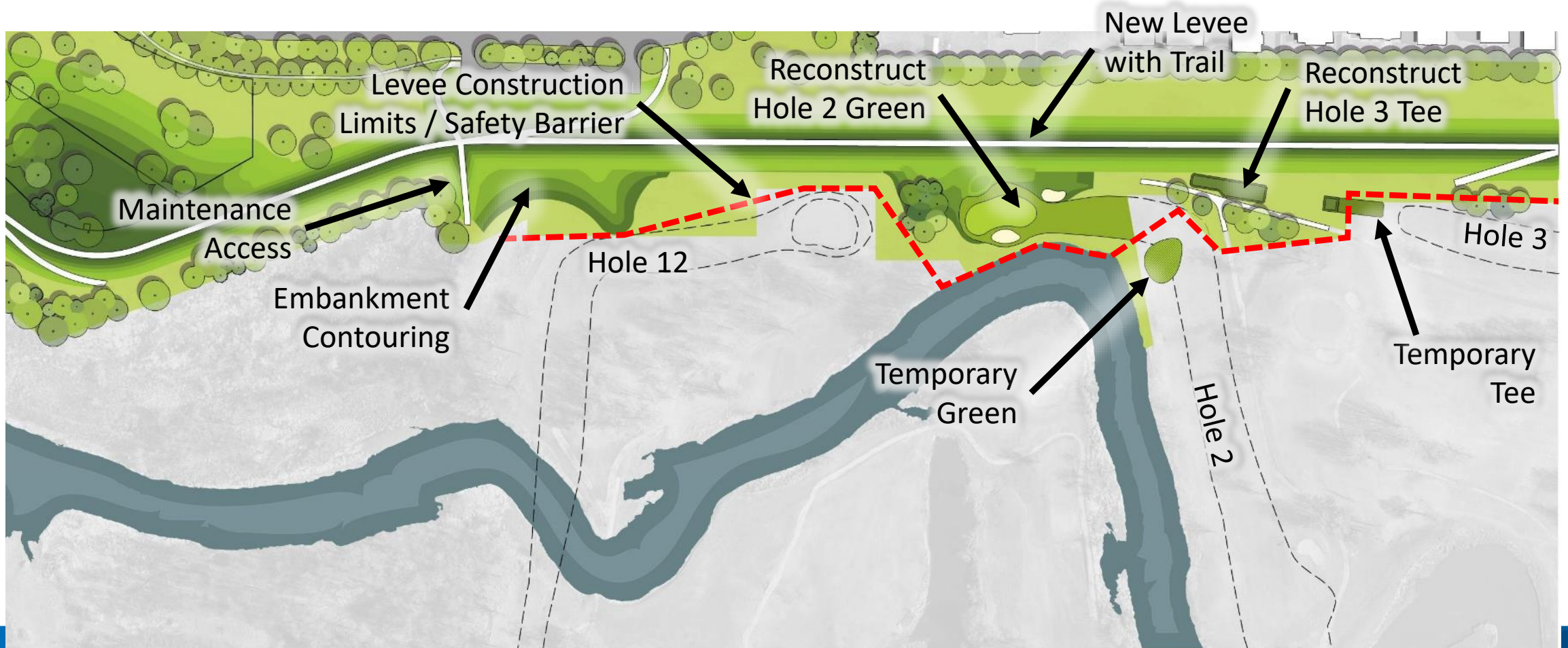
Napa Valley Levee Dakota Bark Park



Napa Valley Levee Souris Valley Golf Course



Napa Valley Levee Souris Valley Golf Course



Napa Valley Levee Souris Valley Golf Course



Napa Valley Levee Souris Valley Golf Course



Napa Valley Levee Wee Links



Napa Valley Levee Wee Links



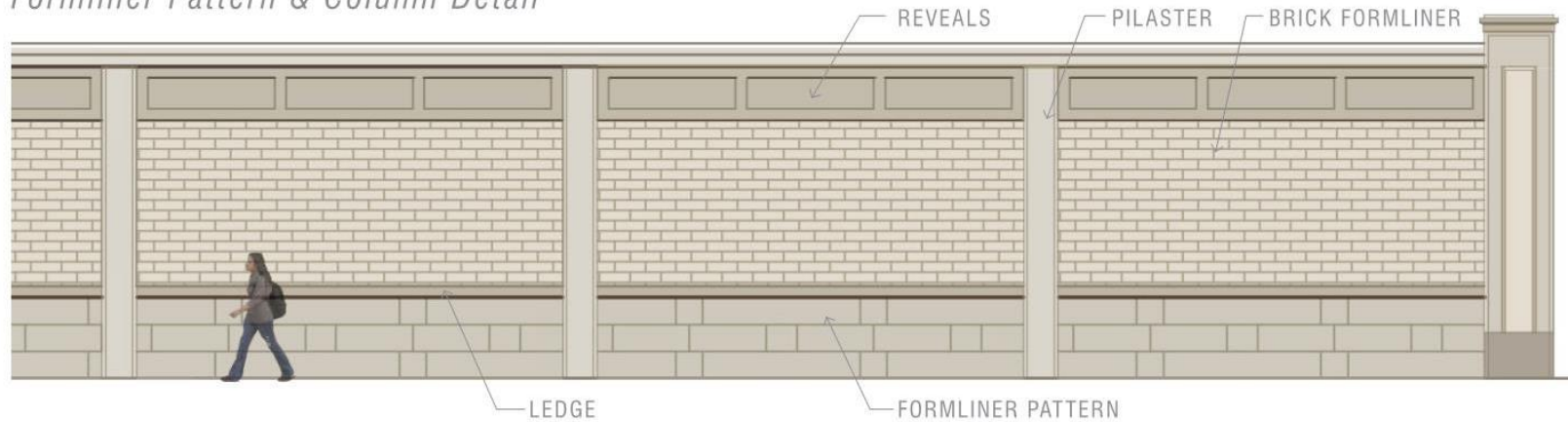
4th Avenue Floodwalls

Broadway Greenway Access



4th Avenue Floodwalls Broadway Greenway Access

Formliner Pattern & Column Detail



Gateway Wall Opening



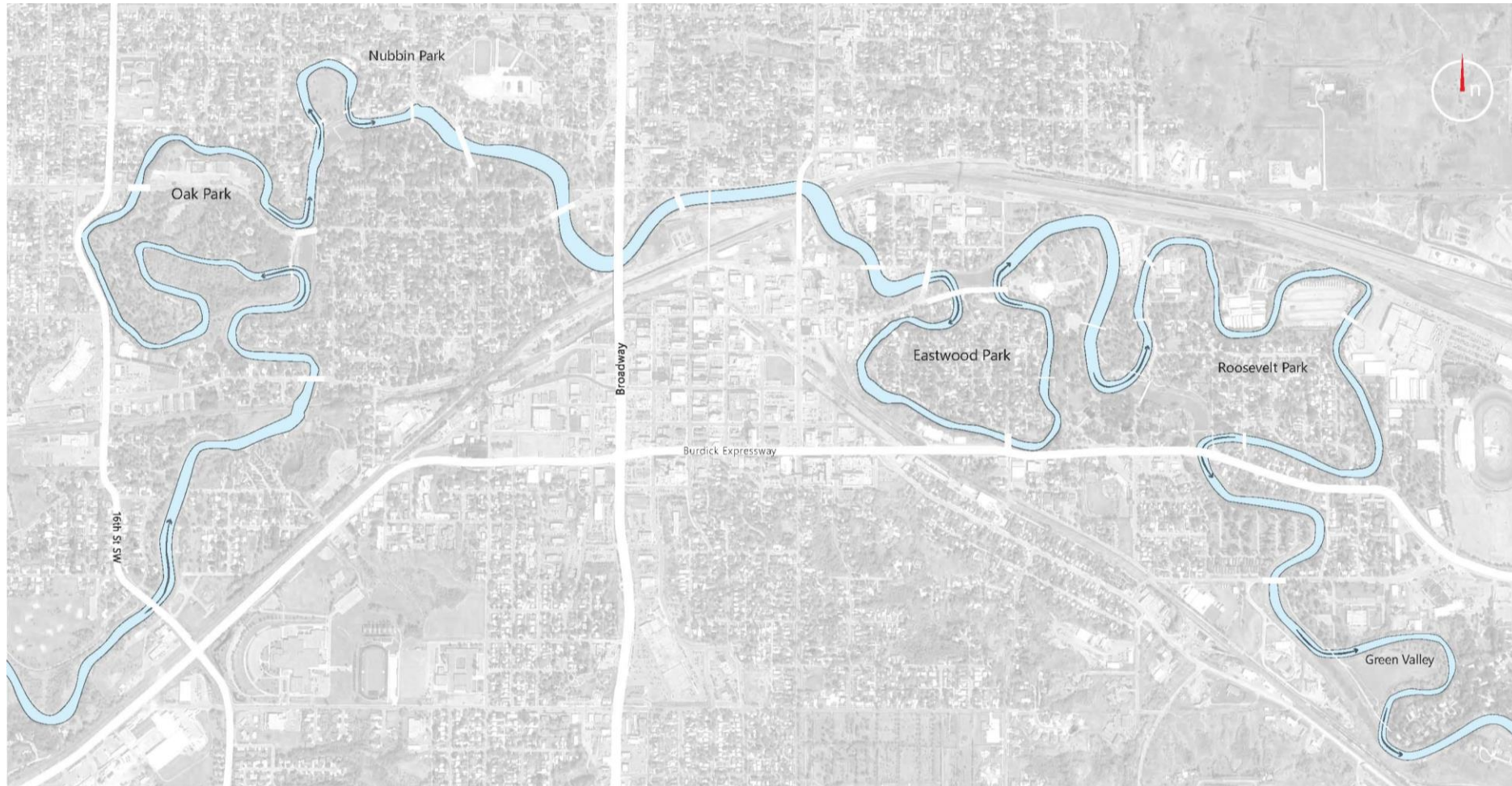
4th Avenue Floodwalls Broadway Greenway Access



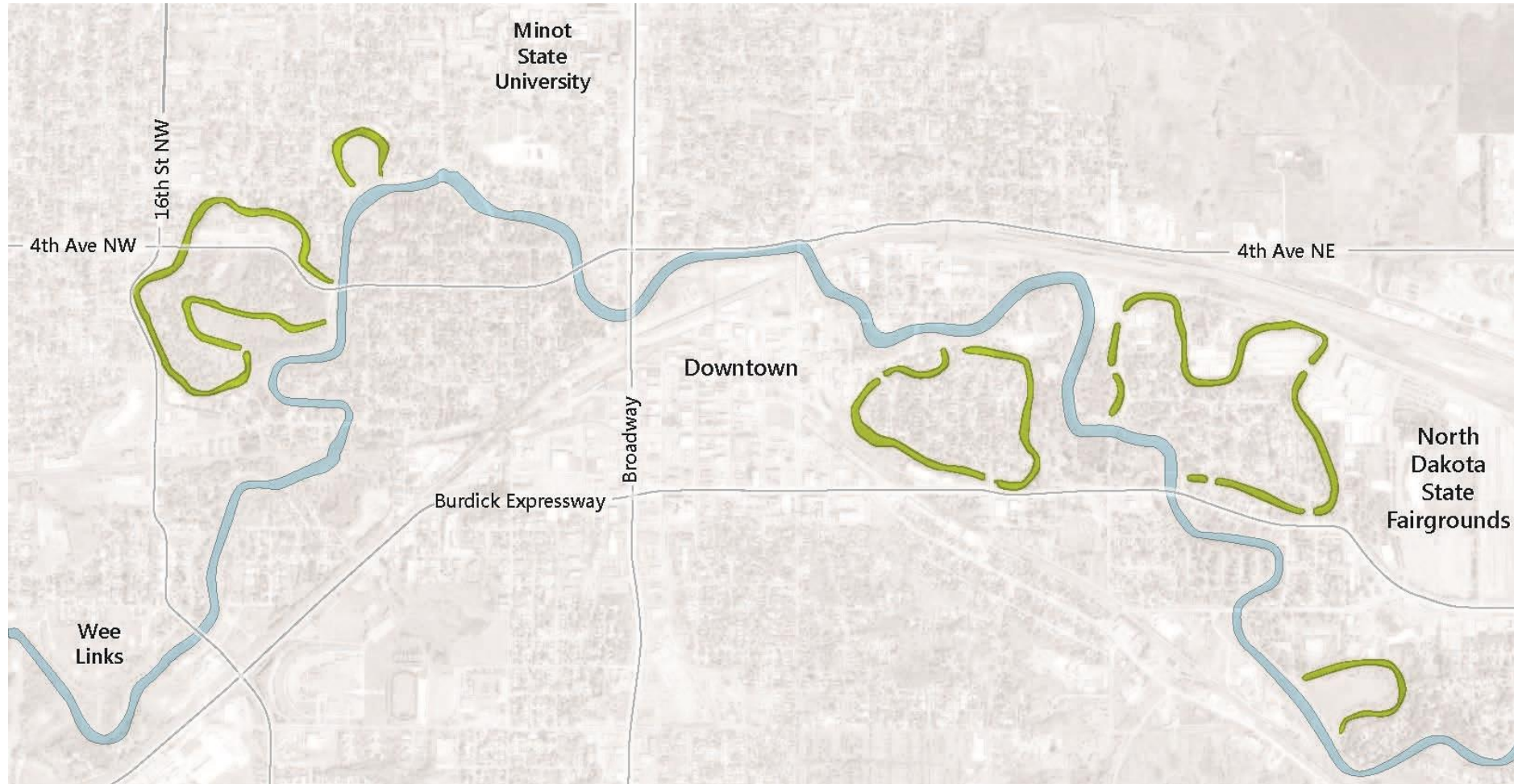
Burlington Levee



Mouse River before 1970s flood control



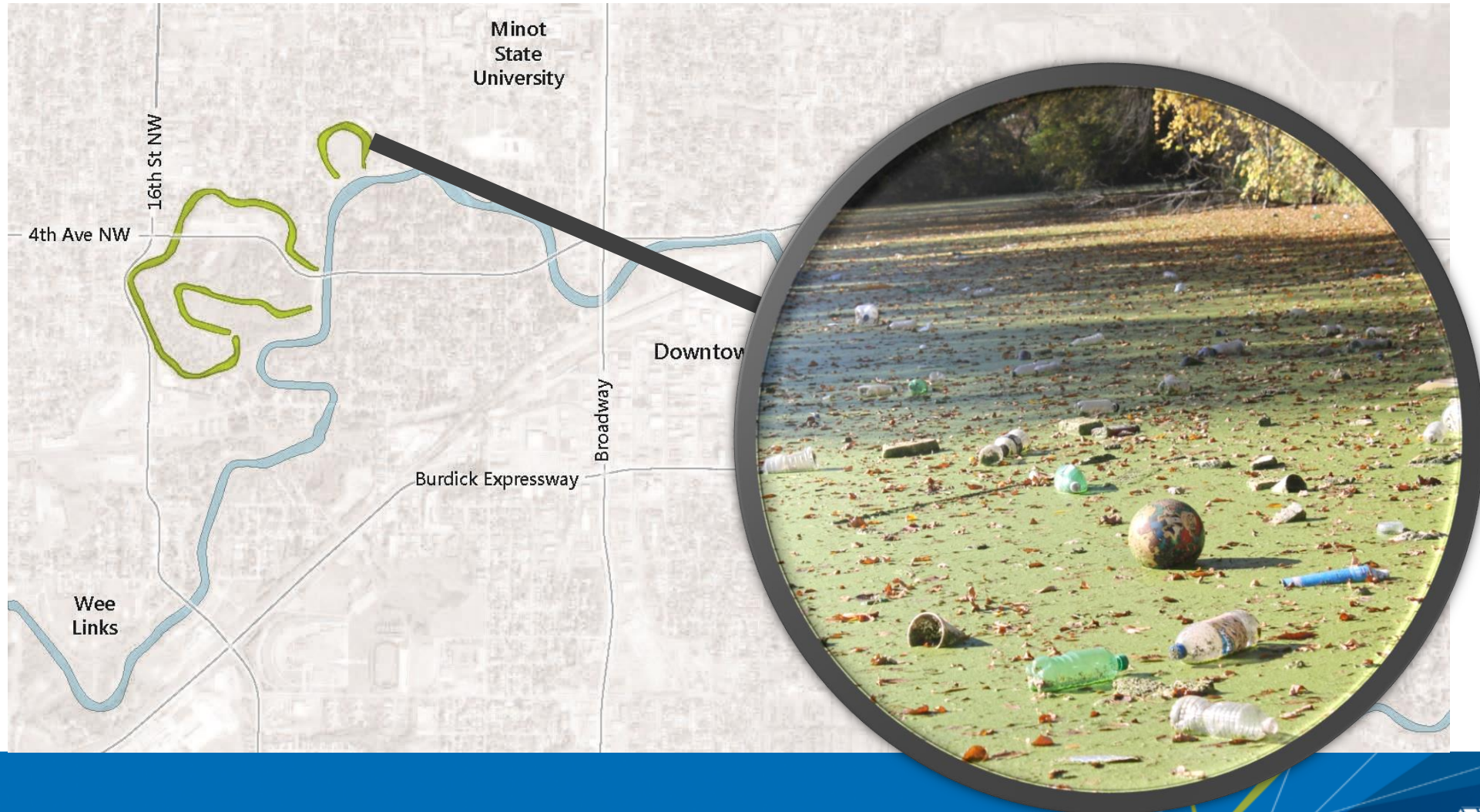
Mouse River following 1970s flood control



Rock-Lined Channels



The Dead Loops



Low Head Dams



Dead Loop Dilemma

- The solution is costly
- The priorities are life safety, property protection, economic protection (flood protection)
- Recreation opportunities and ecosystem restoration are important, but lower priority

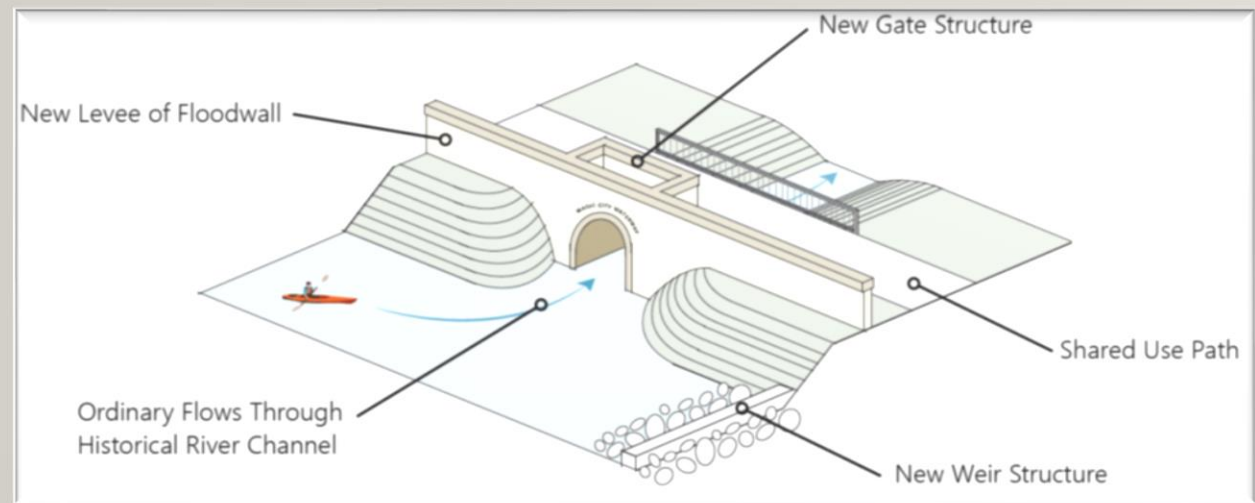


Dead Loop Dilemma...Flipped

- If the ecosystem is restored and recreational opportunities are provided, it can unlock additional federal funding for flood protection
- Flood protection provided as a result of ecosystem restoration and recreation
- Non-traditional approaches to answering the 'billion-dollar question'



Magic City Waterway



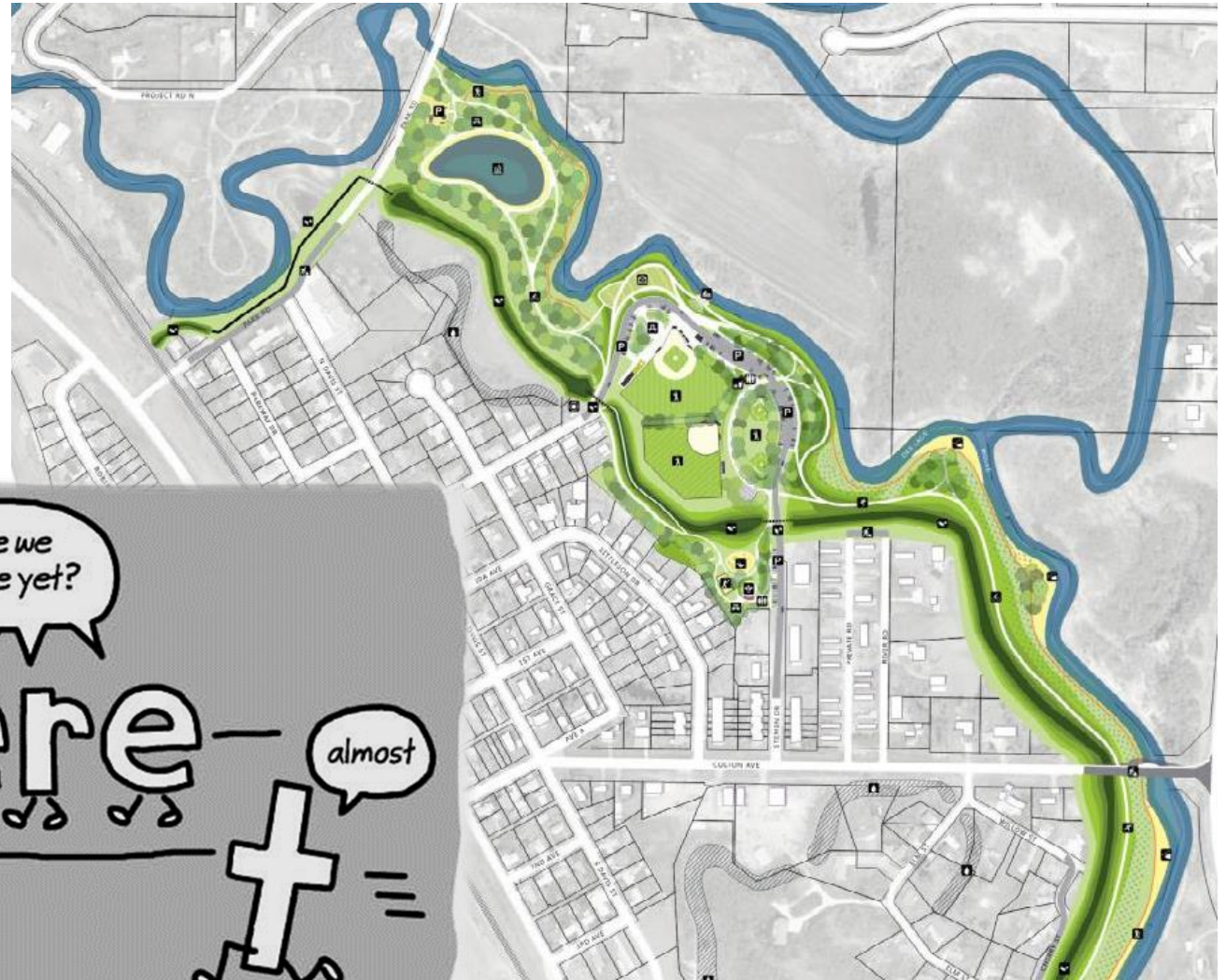
Partnership is Key

- Souris River Joint Board (Flood Control Project Sponsor)
- City of Minot (Local Funding Source)
- Ward County (Local Funding Source / Previous Project Sponsor)
- Minot Park District (Major Land Owner / Greenway Operations)
- State of North Dakota (Primary Funding Source)
- Federal Government (Funding Source)



Elements of Success

- Early Alignment
- Candor
- Basin-Wide Commitments
- Creativity
- Flexibility
- Continuous Improvement



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