DEPARTMENT OF NATURAL RESOURCES

Culvert Crossings
Floodplain and Public Waters Regulations

January 15, 2025

Main Points for Today

- Key floodplain regulations
  - Permits always required, but who issues?
  - Main standards; No rise / allowable rise
- Key additional public waters regulations
- List of floodplain and public waters website links and contact info

All “Development” in FEMA Mapped Floodplain Needs Permit

From 44 CFR 60.3 (b), 1: “Require permits for all proposed construction or other development” within Zone A on the community’s FEMA maps.

Development Definition: From 44 CFR 59.1 “...any man-made change to improved or unimproved real estate, including buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.”

All Development Needs Permit

…Floodplain permit
…Building permit
…Land Alteration Permit

→ All OK. Any type works

DNR Public Water Work permit can count as permit (see 4.17 in MN Model Floodplain Ordinance)

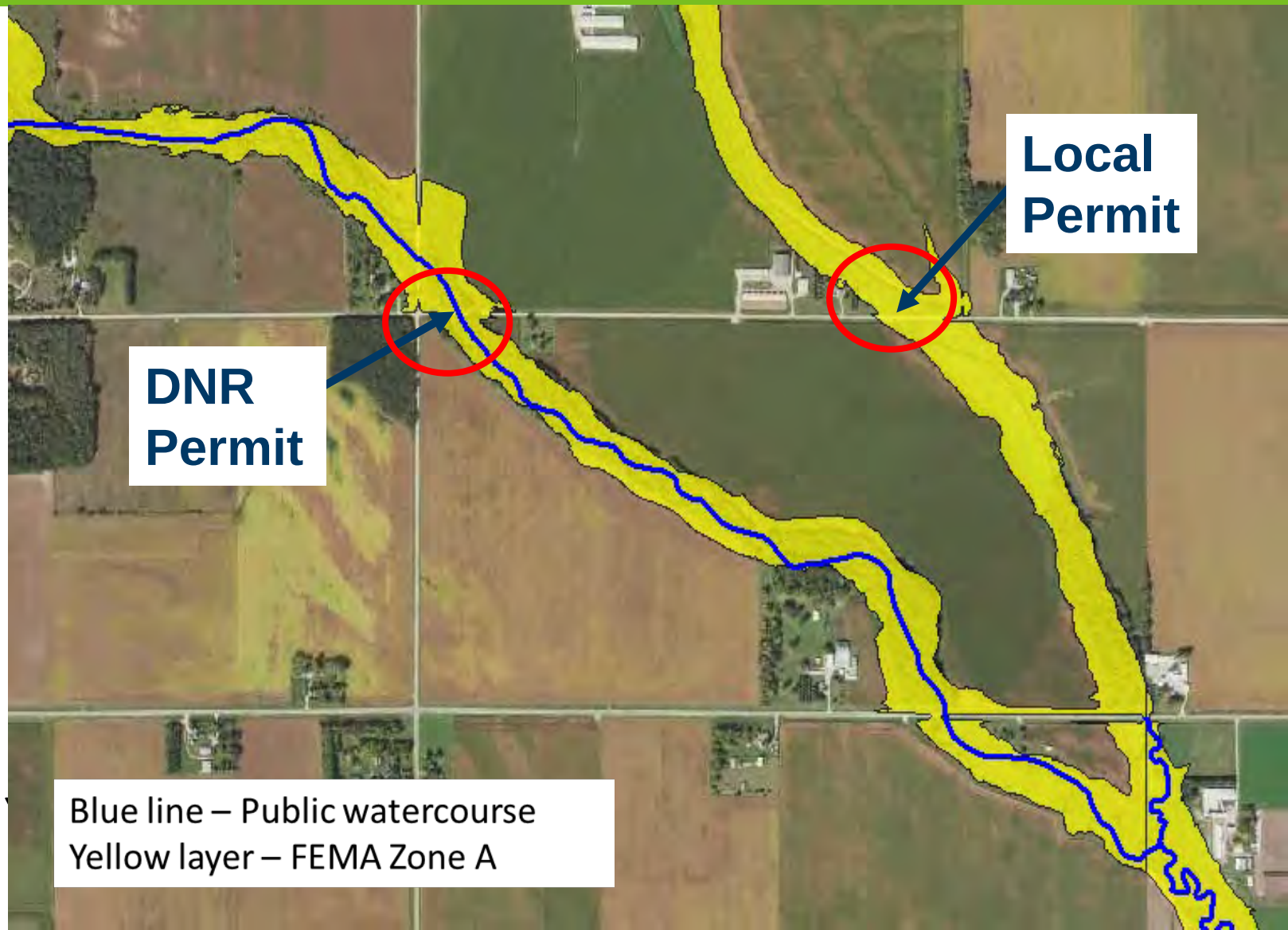
Can waive fees for development that wouldn't otherwise require a permit

Permit Required if in FEMA Mapped Floodplain
Allowable Rise Documentation Required

If DNR Public Waters Work permit required for same project (negligible portion above OHWL), separate community permit not required (see 4.17 in model ordinance)

If no DNR permit, community **MUST** require a permit:

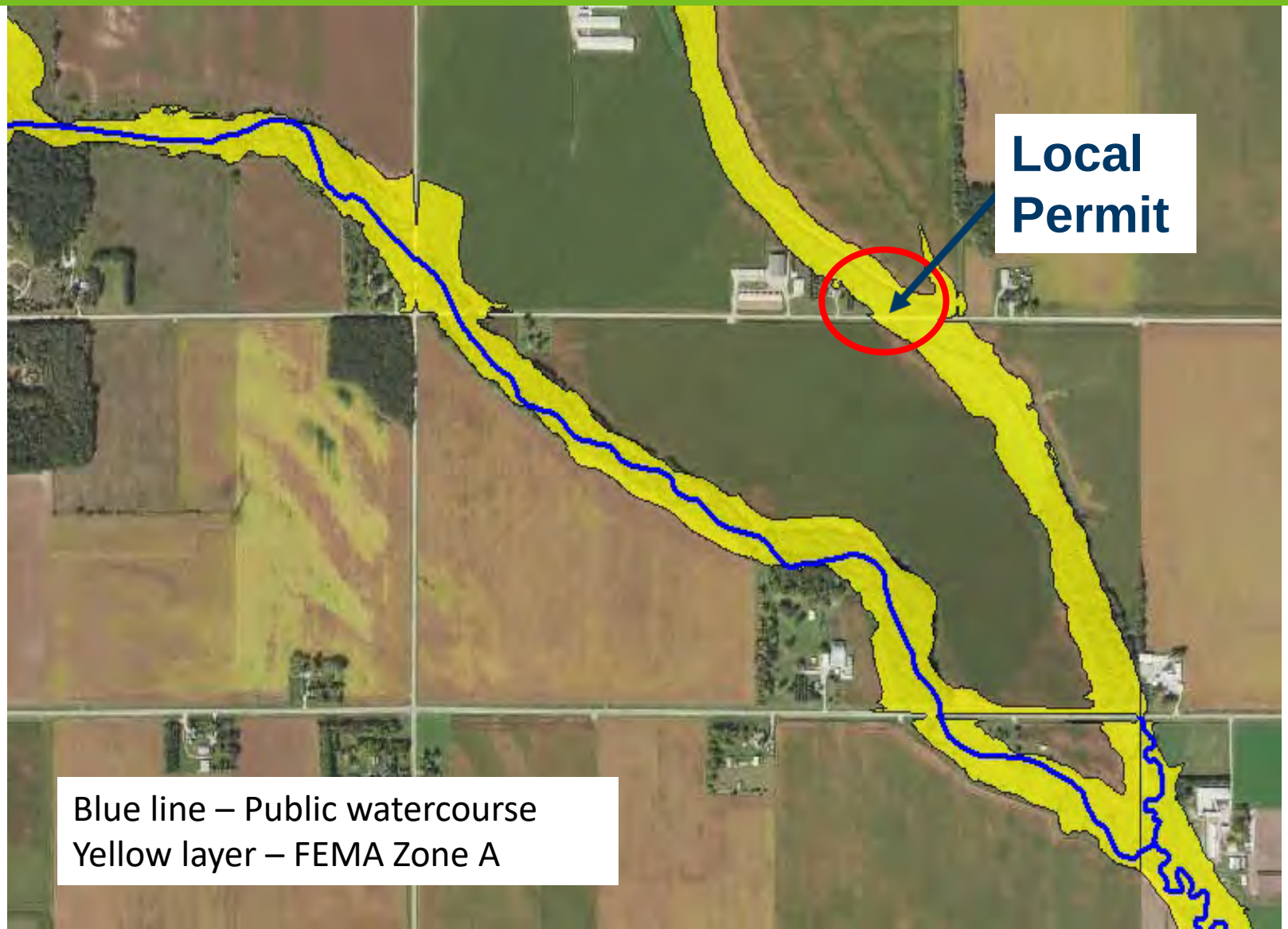
- ✓ Example: Where not on a public water



When no DNR Permit, Local Permit Required

If no DNR permit, community **MUST** require a permit:

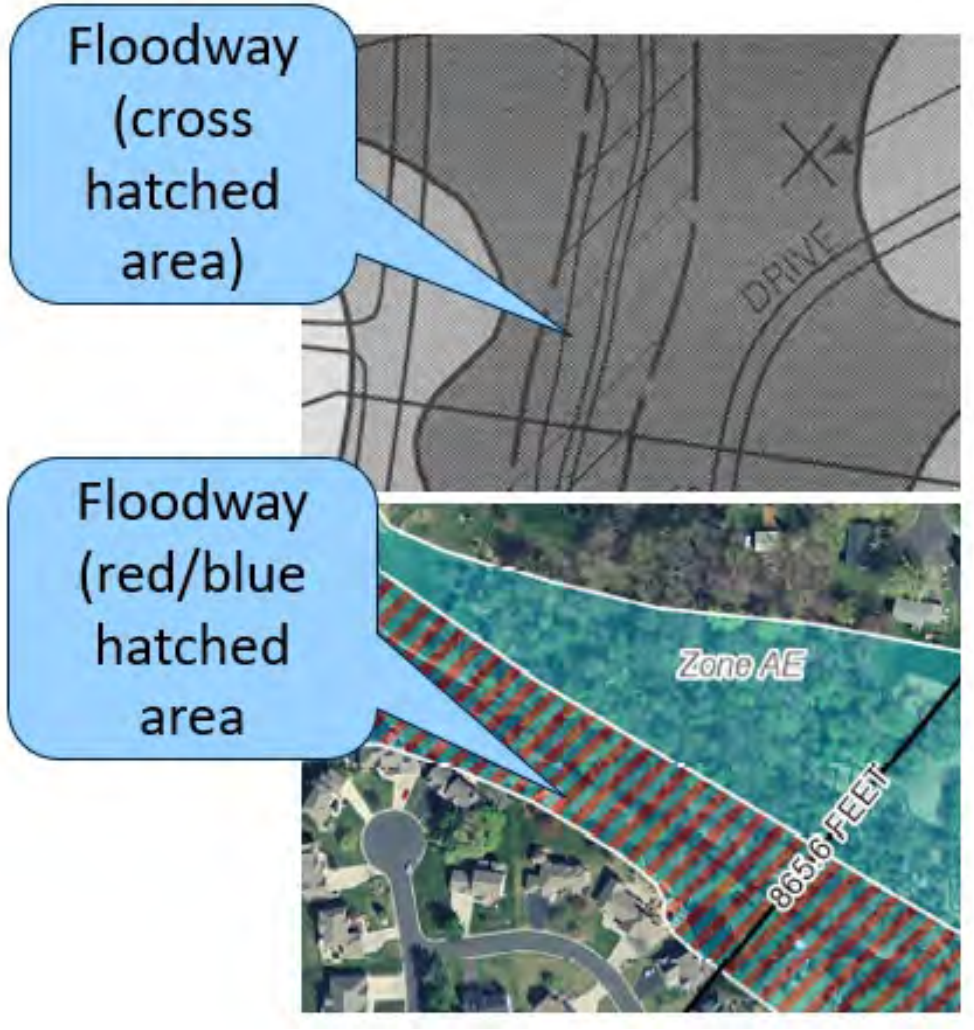
- Not a public water
- DNR permit not required since less than 5 square miles (and not on trout stream)
- DNR permit not required since in kind replacement or restoration (per 2015 statute update)
  - ✓ Not trout stream
  - ✓ Restored or replaced at same location
  - ✓ Same number of culverts
  - ✓ Same diameter, length and elevation
- 2015 In-Kind Culvert Replacement Fact Sheet



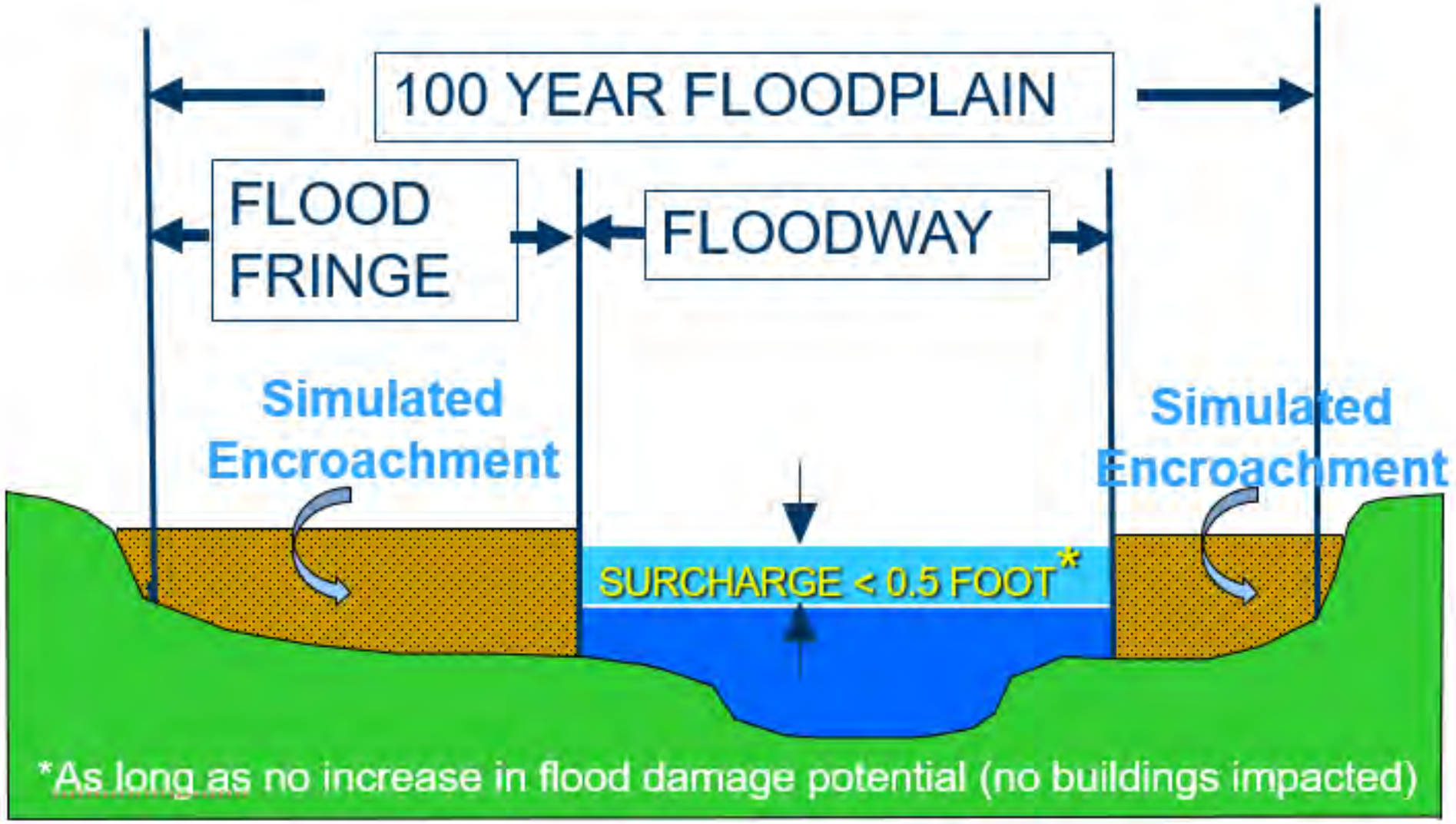
Standards in Floodway for Culverts

Floodway:

- No new structures (buildings)
- ANY development (grading, culvert/bridges, stream restoration) requires “No Rise” Certification
- No approach fill for **new** crossings in floodway (public waters rule 6115.0231, Subp. 2 B (1))



Maximum Encroachment Allowed
New Buildings Allowed in Flood Fringe (NOT in Floodway)



In Floodway – "No Rise" Certification Required

- No rise certification
  - ✓Signed by Professional Engineer (PE)
  - ✓Rise no more than 0.00 ft (0.004 ft rise or less)
  - ✓44 CFR 60.3, (d), (3)
- Not seeing words like: close, hardly, insignificant, minimal increase
- Completed by engineer, or satisfied through other standard engineering practices (and have a memo summarizing analysis)*

*i.e., if returning site to previous grade or cross section in model; backwater

MINNESOTA "NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified professional engineer licensed to practice in the State of Minnesota.

It is further to certify that the attached technical data supports the fact that the proposal

to _____

_____

_____ (*development name / short project description*)

will not impact the floodway width or 100-year flood elevation (will not raise or lower by more than 0.00 feet) on _____ (*Name of stream*) at published sections in the Flood Insurance Study for _____ (*Name of Community*) dated _____ (*Study Date*) and will not impact the 100-year flood elevation (will not raise or lower by more than 0.00 feet) at unpublished cross-sections in the vicinity of the proposed development / project.

Attached are the following documents that support my findings:

_____

_____

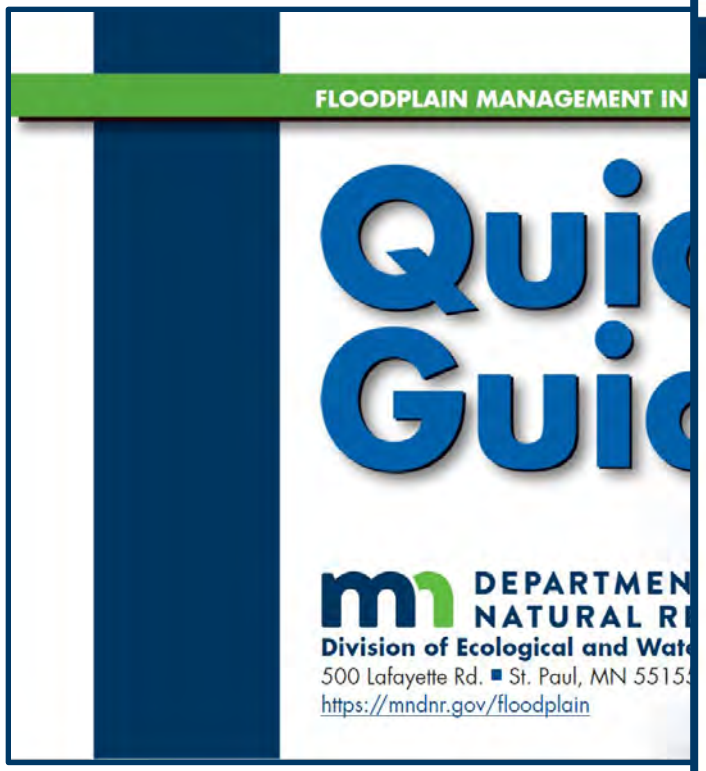
Date: _____

Signature: _____ {SEAL}

Title: _____

Sample Minnesota "No Rise" Certification form

MN 2022 Floodplain Management Quick Guide Now Online



[2022 MN Floodplain Management Quick Guide on DNR site]

The Floodway "No-Rise" Certification

- Floodways convey the largest volume of water and may have high velocities.
- State law restricts development in floodways.
- Engineers must prepare floodway encroachment analyses to evaluate the hydraulic impact of proposed development (includes grading/filling, new/replacement culverts and bridges, and bank stabilization).
- Development is not allowed unless certified to cause "no-rise" (0.00 ft. increase) in BFEs.
- Fencing in floodways should be "open" to allow floodwater to flow through; solid and chain link fencing are floodway encroachments.
- "No-rise" certifications must be signed by a Professional Engineer licensed in Minnesota and qualified to conduct hydraulic analyses.
- Download the "No-Rise" Certification form from Floodplain Administration Resources on MNDNR's Floodplain Regulations web page (see page 83).

ENGINEERING "NO-RISE" CERTIFICATION

Community: Anytown, MN
Applicant: ABC Developers, Inc.
Address: 210 River Road

This is to certify that I am a duly qualified professional engineer licensed to practice in the State of Minnesota. It is further to certify that the attached technical data supports the fact that the described project will not impact the floodway width or 1% elevation (will not raise or lower by more than 0.00 ft.) of said flooding source in the Flood Insurance Study for the above community dated [date of FIS] and will not impact the 1% elevation at unpublished cross-sections in the vicinity of the proposed development.

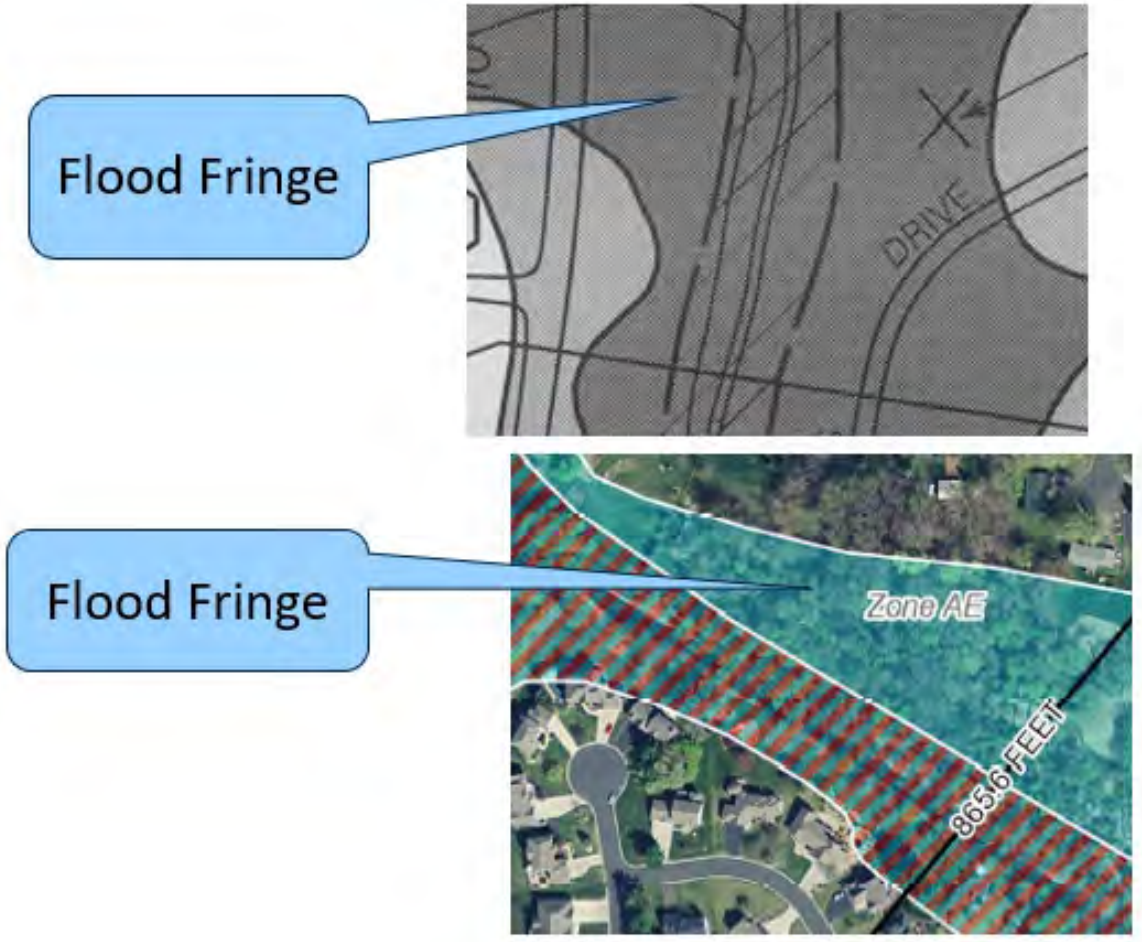
P.E.

The floodway encroachment analysis must be based on technical data obtained from FEMA.
Reduce flood risk – don't build in the Floodway!

Standards in Flood Fringe for Culverts

Flood Fringe:

- Example: Driveway culvert
- Modeling assumes flood fringe is filled
- No Rise Certification not required for development in flood fringe
- Still look at impacts on localized drainage and ensure not increasing flood damage potential



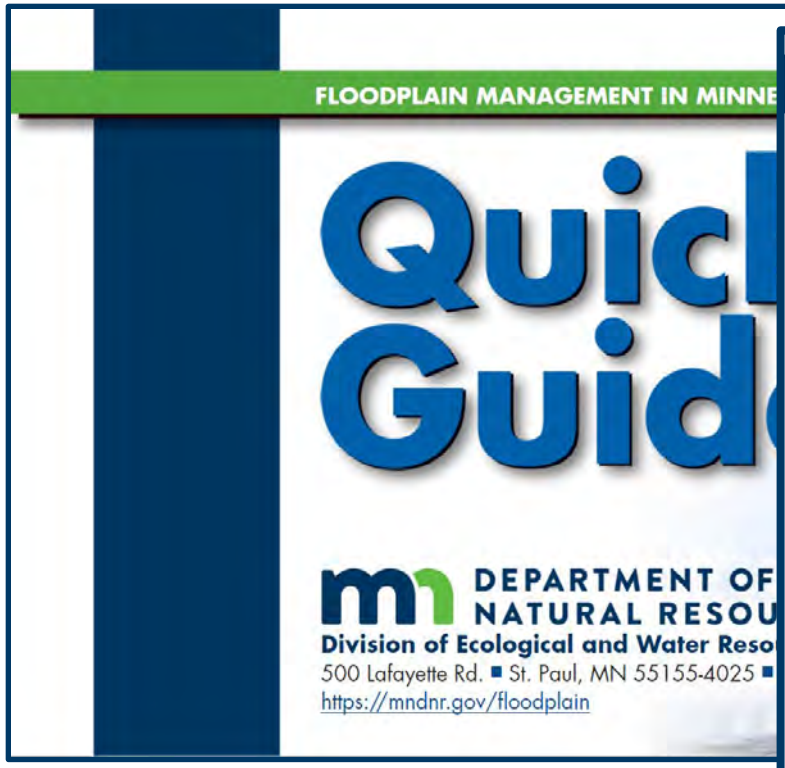
Development Standards in General Floodplain

General floodplain (A or AE zone with no floodway shown):

- For buildings, treat as Floodway (i.e., no buildings unless demonstrated it's flood fringe)
- For culverts/bridges (and other grading/filling/alterations), determine it meets "allowable rise"*; no impact on existing insurable buildings (with walls/roof), and cumulative rise ≤ .5 ft

* MN Rules 6120.5700, subp. 4, A.

MN 2022 Floodplain Management Quick Guide Now Online



[2022 MN Floodplain Management Quick Guide on DNR site]

Limiting Rises Where Floodways Not Delineated

Buildings and Structures. New buildings and structures, substantial improvements, and additions are not permitted in Zone A or Zone AE where floodways have not been delineated, unless applicants provide certification prepared by experienced Professional Engineers that show sites are flood fringes, without causing flood level increases more than Allowable Increases (below).

Other Development. When development such as filling, grading, alteration of a watercourse, and culverts and bridges are proposed where floodways have not been delineated, communities must determine proposed projects will not cause more than Allowable Increases (below).

Allowable Increases (Rises). In Zone A and Zone AE where floodways have not been delineated, allowable cumulative increase (rise) in flood level is:

- Up to 0.5 feet, as long as there is no increased flood damage potential (i.e., no existing buildings are in or touching the floodplain).
- No more than 0.00 feet, if existing buildings are impacted.

Flood studies and floodway/flood fringe determinations for development and subdivisions of 50 lots or 5 acres (whichever is lesser) must be certified by experienced Professional Engineers.

FEMA Conditional Letters of Map Revision (CLOMRs)

Conditional Letter of Map Revision (CLOMR)

- In floodways:
  - Required if a rise of more than 0.00 feet, community cannot permit unless Conditional Letter of Map Revision (CLOMR) is obtained from FEMA; and must require Letter of Map Revision (LOMR) within 6 months of project completion; 44 CFR 60.3, (d), (4)

FEMA Letters of Map Revisions (LOMRs)

Letter of Map Revision (LOMR) required in AE Zone with Floodway:

- Flood stage increase more than 0.00 feet
- Flood stage decrease more than 0.1 feet (will change content in Flood Insurance Study)!!!
- Change floodway location
- Change of the extent of the mapped Zone AE floodplain (of 25 feet horizontally or more)

Letter of Map Revision (LOMR) requirements in A Zone/AE Zone without floodway

- Required if cumulative stage increase over 1 foot, but state law says no cumulative increase over 0.5 feet, so we don't see required LOMRs in A Zones/AE zones without floodway
- Required if relocating the floodplain (i.e., stream restoration in new path) or making larger!!! (But fees are waived for environmentally beneficial projects)
- No LOMR requirement for decreases in BFE or floodplain area

FEMA Letters of Map Revisions (LOMRs) and Conditional LOMRs

Optional Conditional Letter of Map Revision (CLOMR)

- If they want to verify FEMA will accept the analysis
- Faster to get LOMR once built, assuming project didn't change (good for USACOE projects since no fee for USACOE flood reduction projects)

Optional Letter of Map Revision (LOMR):

- Zone A, and want updated FEMA map (usually to show development outside of mapped floodplain)

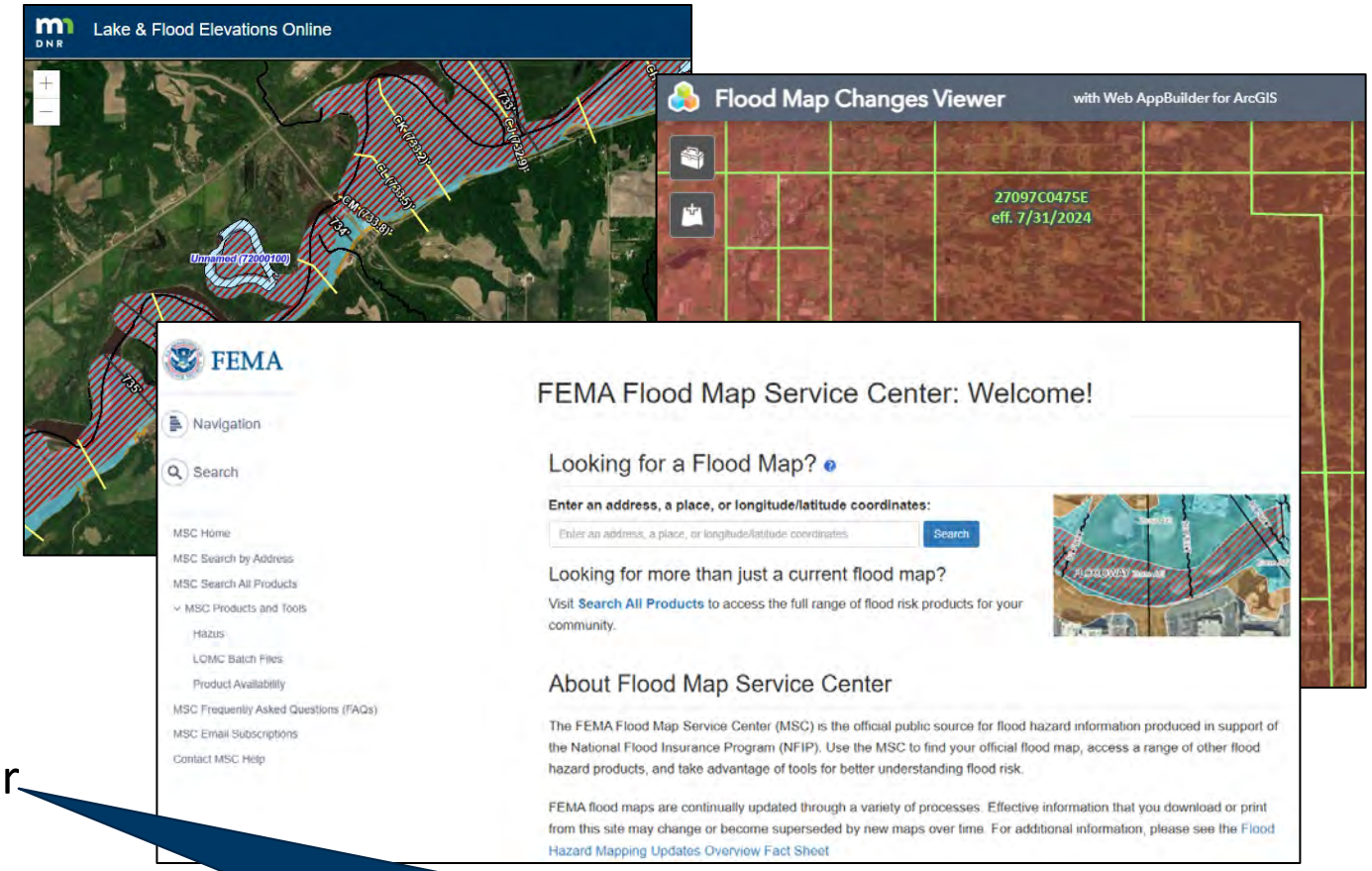
Why avoid CLOMRs/LOMRs?

- Very difficult, long process (typically a year or more)
- Expensive (~$10,000 for FEMA review, plus engineering cost); fees are waived for environmentally beneficial projects – i.e., dam removals, stream restorations

Steps to Review a New Crossing in Floodway and Public Water

Steps:

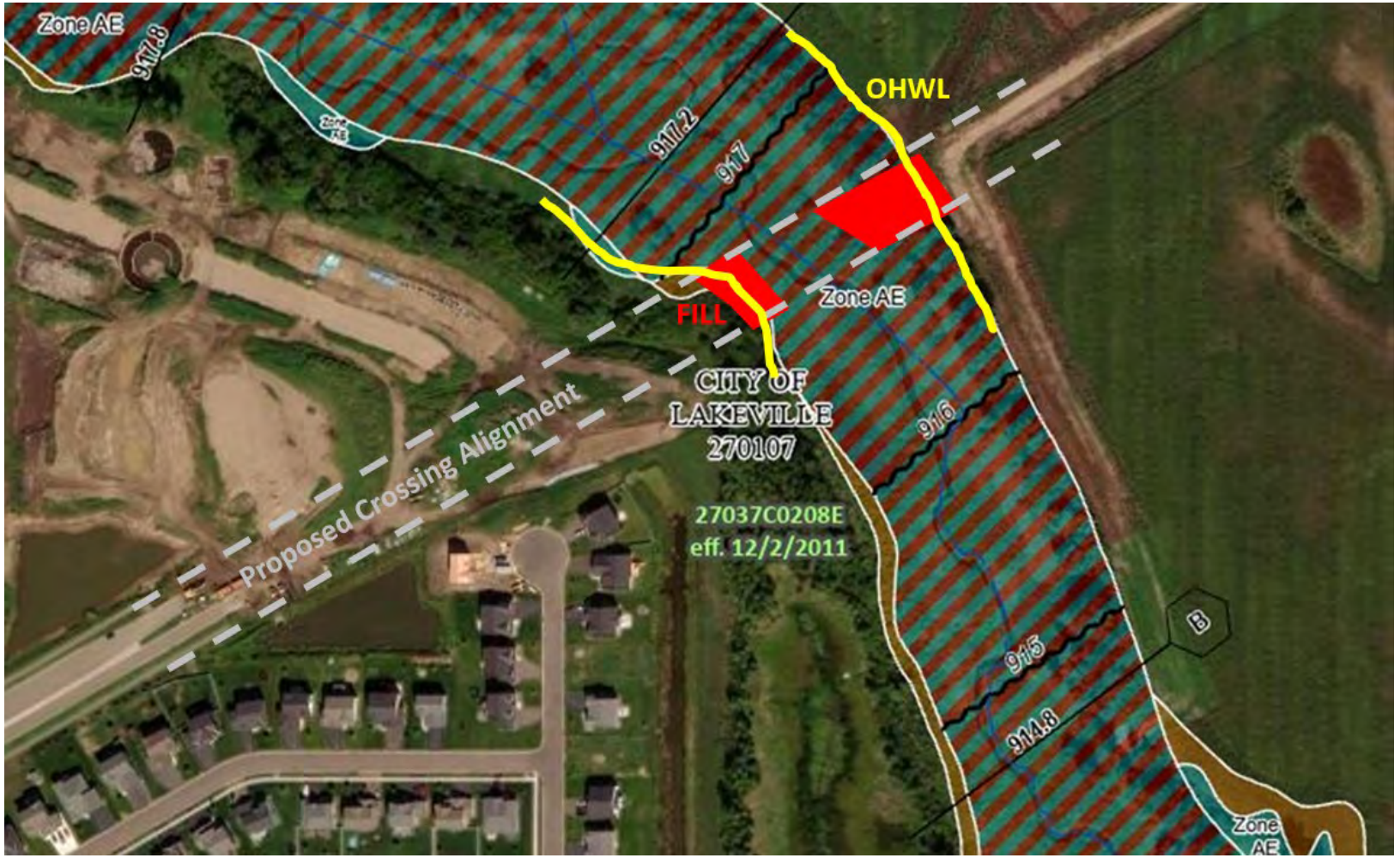
1. Verify public water work permit required
2. Determine if floodway, A/AE Zone without floodway, or not
3. Determine if floodway in DNR's Lake & Flood Elevations Online (LFEO), FEMA's Map Service Center or FEMA's Flood Map Changes Viewer
4. Key standards:
   a. NO approach fill in floodway (PW Rules) for NEW crossing
   b. NO Rise certification (or Conditional Letter of Map Revision required)



Floodplain standards typically understood by consultants, but forgot about no approach fill

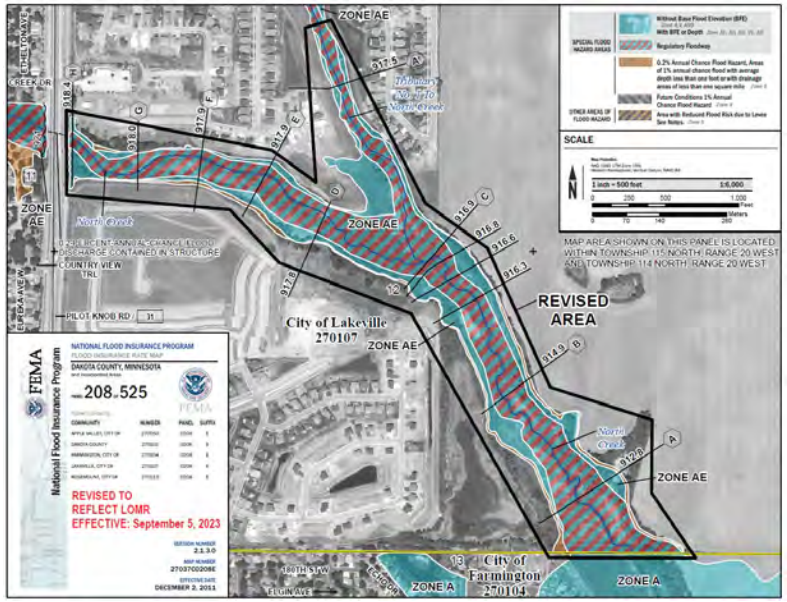
Example: Proposed New Crossing - Floodway, Public Water

- Proposal for new road bridge crossing showed approach fill in mapped floodway
- Key standards:
  - NO approach fill in floodway for NEW crossing (from public waters rules)
  - No Rise Certification or CLOMR required
- Options for City to consider before a public waters permit could be approved:
  - Change crossing design to not include fill in floodway
  - First receive a floodway boundary LOMR

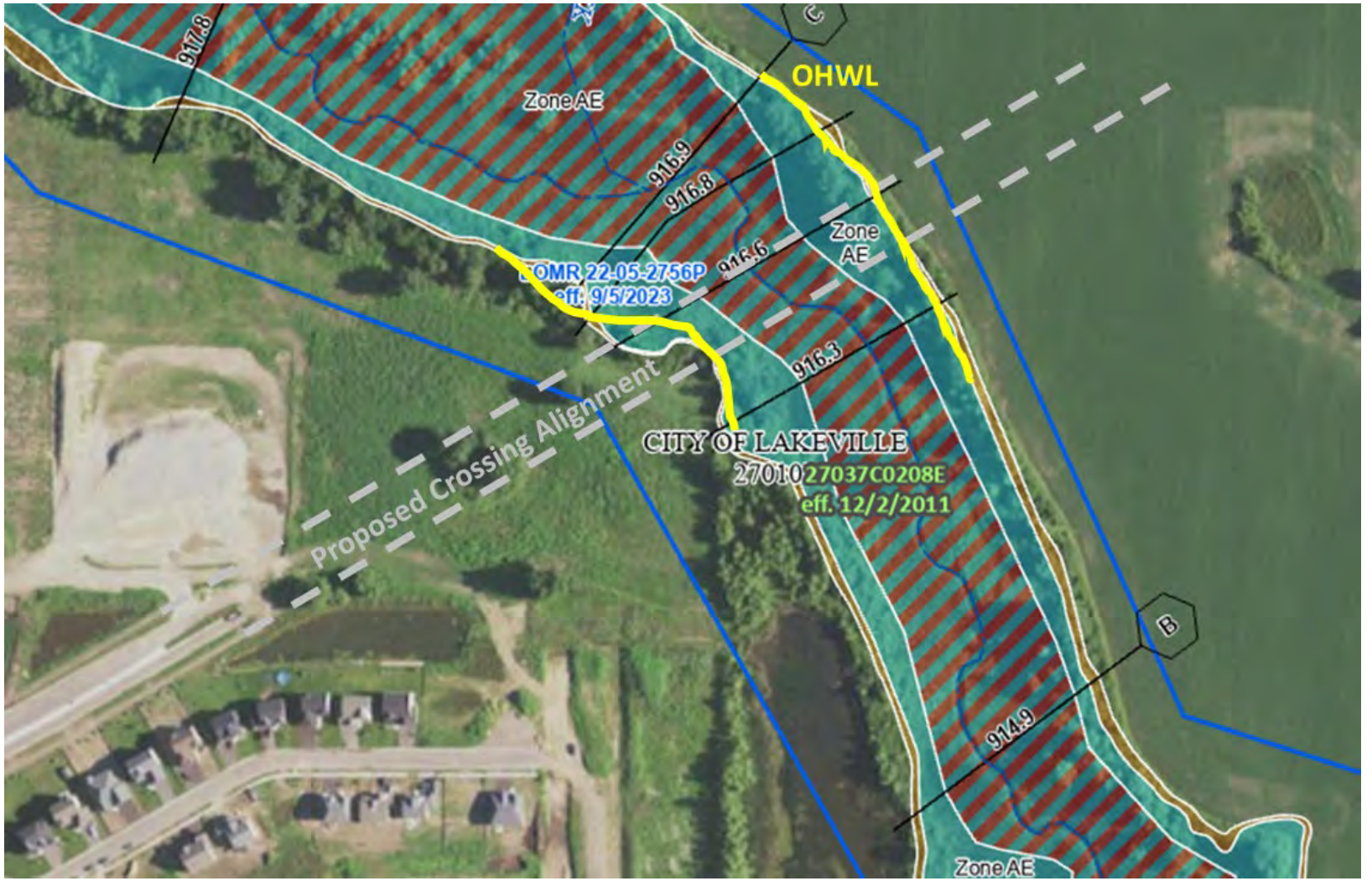


Example: Proposed New Crossing - Floodway, Public Water

- Before starting project, City chose to apply for a floodway boundary LOMR
- Updated modeling to show:
  - Can narrow floodway without causing more than a cumulative 0.5-foot rise and that change will not impact existing buildings



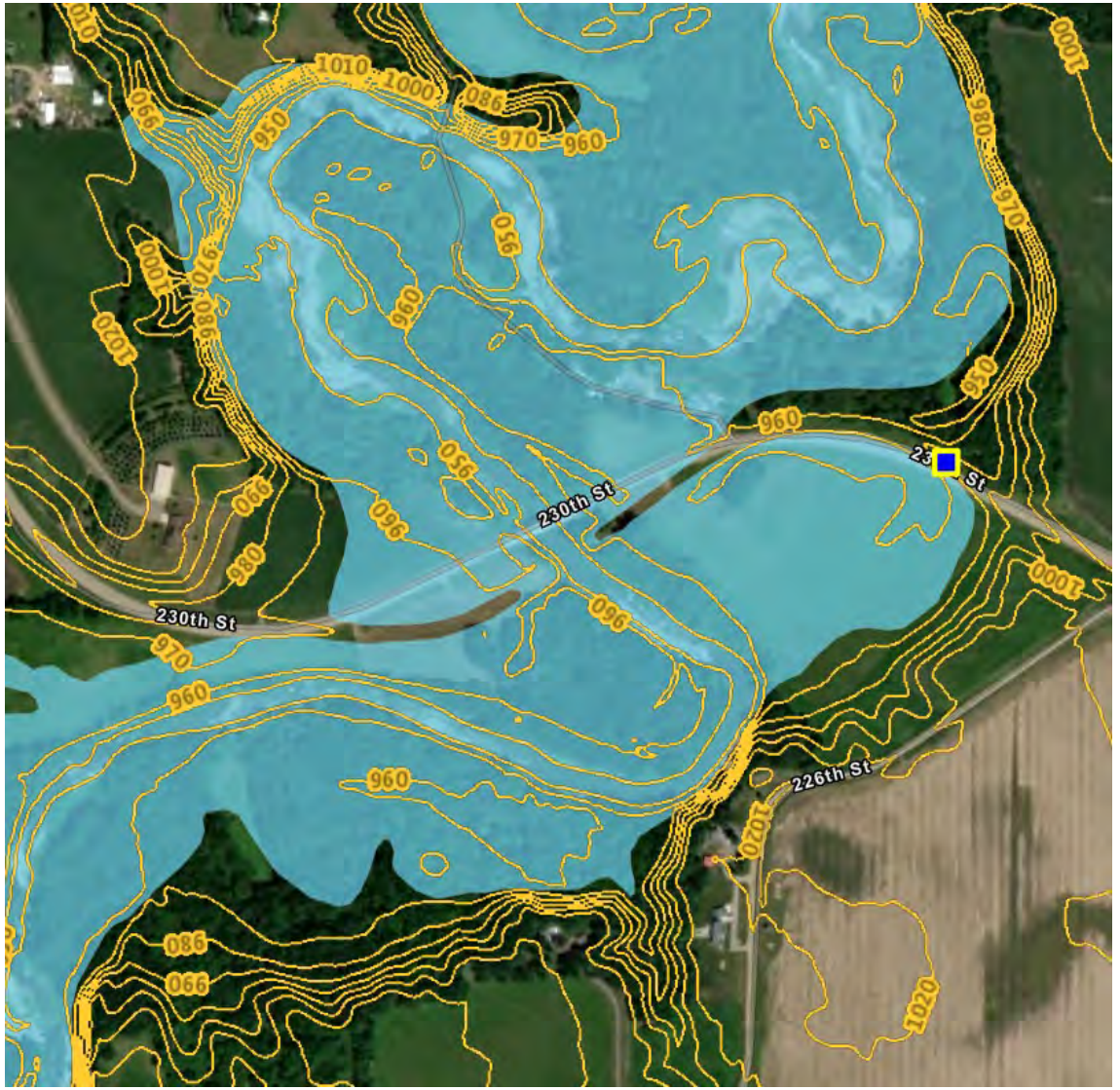
- Received LOMR on 9/5/2023



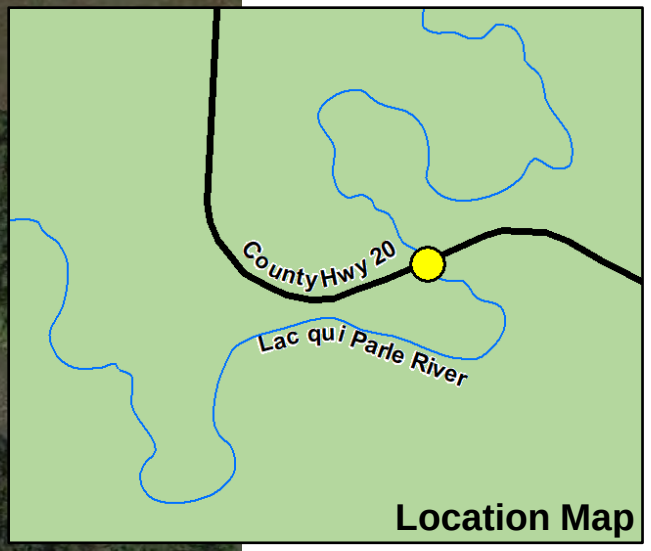
Example: Bridge Replacement – AE Zone without Floodway
Big Decrease Example

What happened:

- Bridge got replaced and lowered BFE about two feet! (Which is good!)
- Zoning administrator recently asked Ceil why the map wasn't changed to reflect lower BFE.
- Bridge replacement was done in 2012 and a Letter of Map Revision (LOMR) was not done… not mandatory but could have been done
  - Value: To remove structures from the regulated floodplain



Bridge Replacement – AE Zone Floodway
Big Decrease Example



Example: Culvert Replacement – A Zone

Proposed stage increase: 8.4 ft
Inplace condition increase: 13.6 ft

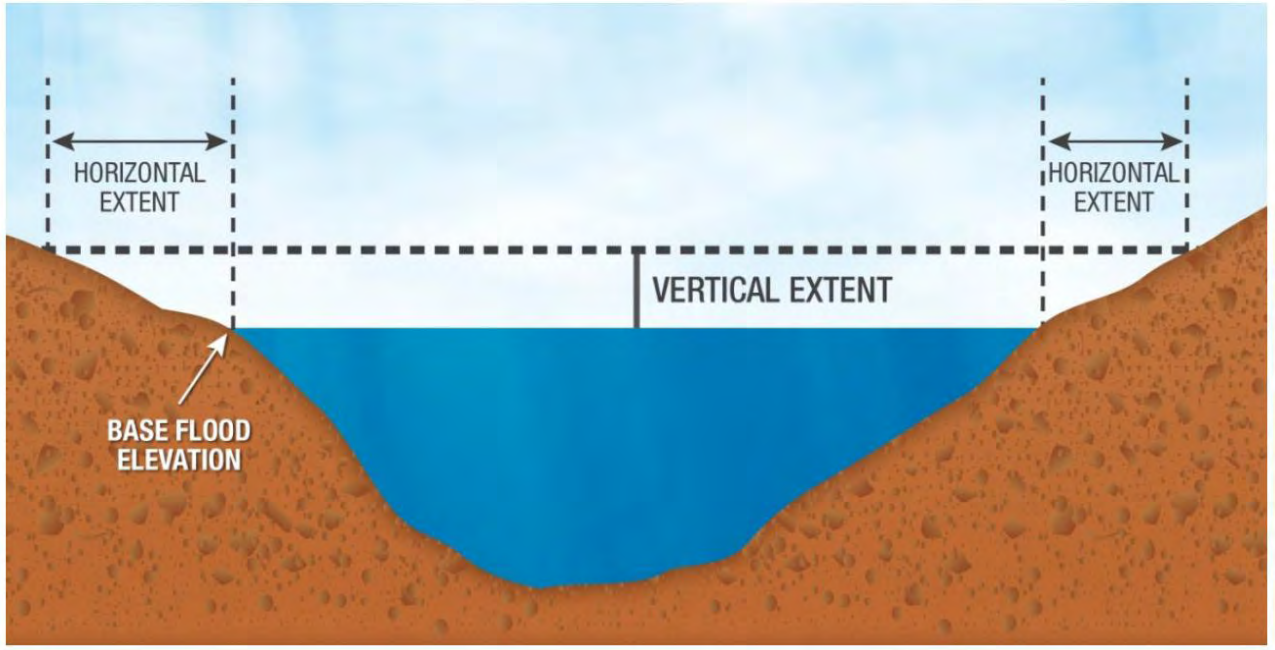
Net result: 5.2 foot **drop** in stage increase

No LOMR required (since A Zone)

Design Flood (100 Year Frequency)	1850 cfs
Design Stage	1034.3
Total Stage Increase	8.4 ft.
Headwater Elevation	1042.7
Stage Increase of the Inplace Condition	13.6 ft.
Mean Outlet Velocity	19.3 fps
Average Channel Velocity	8.2 fps

FFRMS Approaches from E.O. 13690
FFRMS = Federal Flood Risk Management Standards

- Climate-Informed Science Approach (CISA)
  - ✓mainly Sea Level Rise; not currently used in FEMA Region 5
- Freeboard Value Approach (FVA)
  - ✓Critical facilities – 3-foot freeboard
  - ✓Non-critical facilities – 2-foot freeboard
  - ✓ If using FVA, using the horizontal extension
- 0.2 percent annual chance Flood Approach (0.2FPA)



FEMA FFRMS Rules – Effective Sept. 9, 2024

See final FEMA Policy: Federal Flood Risk Management Standard (FFRMS); FEMA Policy 206-24-005

What is funded by FEMA?

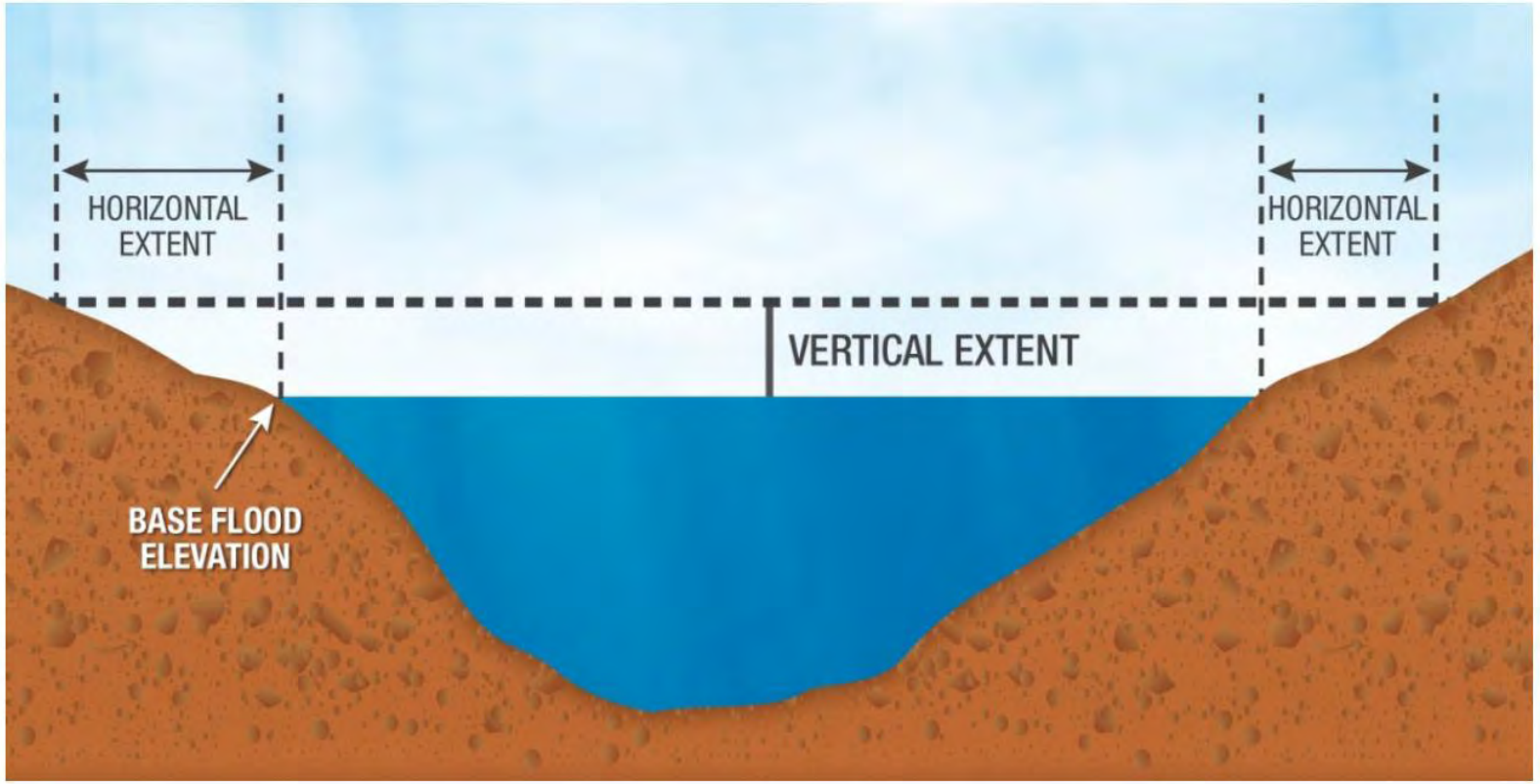
- Public Assistance (PA) – post disaster assistance for public infrastructure & buildings
- Hazard Mitigation Grant Program (HMGP) – grants after declared disasters, used statewide
- Flood Mitigation Assistance Program (FMA) – national competitive grants

Won't affect current disaster declaration, but will impact future declarations, and future grants for Notice of Funding Opportunities (NOFOs)

FEMA FFRMS Rules – Where Do they Apply?

Within the FFRMS floodplain, i.e., within the floodplain with the horizontal expansion

- ✓ Critical actions – Higher of 3 foot above BFE or 0.2%
- ✓ Non-critical actions – Lower of 2 foot above BFE or 0.2% (most culverts)



FEMA FFRMS Rules – Culvert Replacements

When is it a Substantially Damaged (SD) culvert?

From E.6. of Policy

"SI/SD Determinations for Facilities. Cases where the cost of improvement to a facility or cost to repair damage to a facility exceeds 50% of the facility's replacement cost will be determined SI/SD. For example, if work to repair a culvert costs more than 50% of replacing the culvert, FEMA will consider that facility to be substantially damaged. If a facility is an essential link in a larger system, such as a roadway or electrical system, the percentage of damage will be based on the relative cost of repairing the damaged facility to the replacement cost of the portion of the system which is operationally dependent on the facility."

FEMA FFRMS Rules – Must Use Nature-based Solutions

From F.1. of Policy

"Alternatives to a proposed action: For actions located within or that may affect a floodplain or wetland, the following alternatives must be considered: a) no action; b) alternative locations; and c) alternative actions, including alternative actions that use natural features or nature-based solutions. Where possible, the Agency shall use natural systems, ecosystem processes, and nature-based solutions.19

The requirement to consider natural features and nature-based solutions applies to all actions that are subject to the alternatives analysis (Step 3 of the 8-step process)—not only to Actions Subject to the FFRMS."

FEMA FFRMS Rules – Culvert Replacements

From G.2. of Policy

Flood Risk Minimization for Facilities

"The FFRMS is a resilience standard. Particularly in cases where elevation may not be feasible or appropriate for non-structure facilities, the FFRMS floodplain, determined according to the process described in section C of this policy, establishes the level to which a structure or facility must be resilient. Resilience measures include using structural or nonstructural methods to reduce or prevent damage; elevating a structure; or, where appropriate, designing it to adapt to, withstand and rapidly recover from a flood event."

Bottom Line: No more replacing in-kind if that is not resilient design

Floodplain Culvert: Before (top) vs After (bottom)

Floodplain & Public Waters Resources

- DNR's Floodplain Management pages
- DNR's Lake & Flood Elevations Online (LFEO)
- DNR's MnTOPO viewer (LiDAR source; see 2' contours; check spot elevations/profiles)
- FEMA's Map Service Center (print "FIRMettes," see current, preliminary & historical maps, Flood Insurance Studies & GIS files)
- FEMA's Flood Map Changes Viewer (interactive viewer for current and preliminary FEMA mapping)
- Shoreland & Floodplain Education & Training Center (upcoming virtual trainings, 2025 one-hour training videos)
- *Water Talk* newsletter (links to past issues; sign up for future issues)

DEPARTMENT OF NATURAL RESOURCES

Thank You!

Ceil Strauss | Jen Sorensen

ceil.strauss@state.mn.us | jenifer.sorensen@state.mn.us

651-259-5713 | 651-259-5725

To contact your DNR Area Hydrologist: Contact List

Public Waters Rules for In-Channel Storage

Garry Bennett | Floodplain Hydrologist
Ceil Strauss | State Floodplain (NFIP) Manager
Jen Sorensen | Public Waters Hydrologist

DEPARTMENT OF NATURAL RESOURCES

Field Hydrologist Forum | January 15, 2025

Discussion Topics

- In-Channel Storage, Minnesota Rules high-level overview:
  - Water Level Control Structures
  - Bridges & Culverts (Allowable Stage Increase)
  - Floodplain Management
  - Excavation

What is In-Channel Storage?

"Culvert sizing"

- Purposely under-sizing culverts at road crossings with the intent of holding back slightly more water than otherwise would.
- Storage is usually to be contained within the banks of the channel itself.
- Cumulative effective is to reduce downstream peak flows.

Typical swellhead policies might look like:

New or reconstructed bridges and culverts must be designed to provide a minimum swellhead of 1.0 feet.

Water Level Control Structures: Minnesota Rules

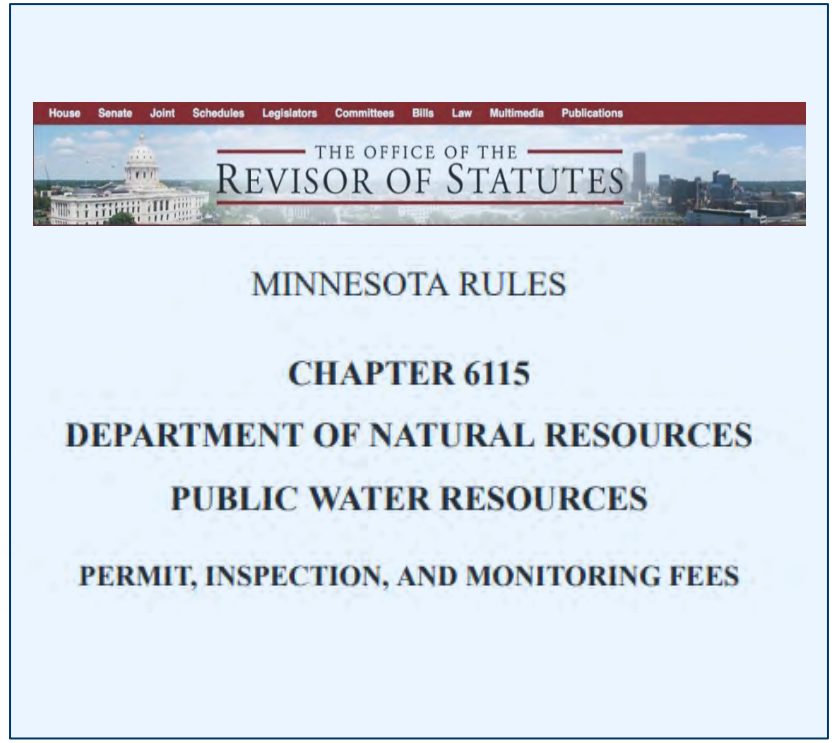
Water Level Control Structure means any structure which impounds or regulates the water surface elevation or flow of public waters…

6115.0220, Subpart 1. It is the goal of the department to manage public waters to:

A. Maintain or restore natural flow and natural water level conditions to the maximum feasible extent;

B. Encourage the construction of small off-channel retarding structures…; and

C. Limit the artificial manipulation of water levels…

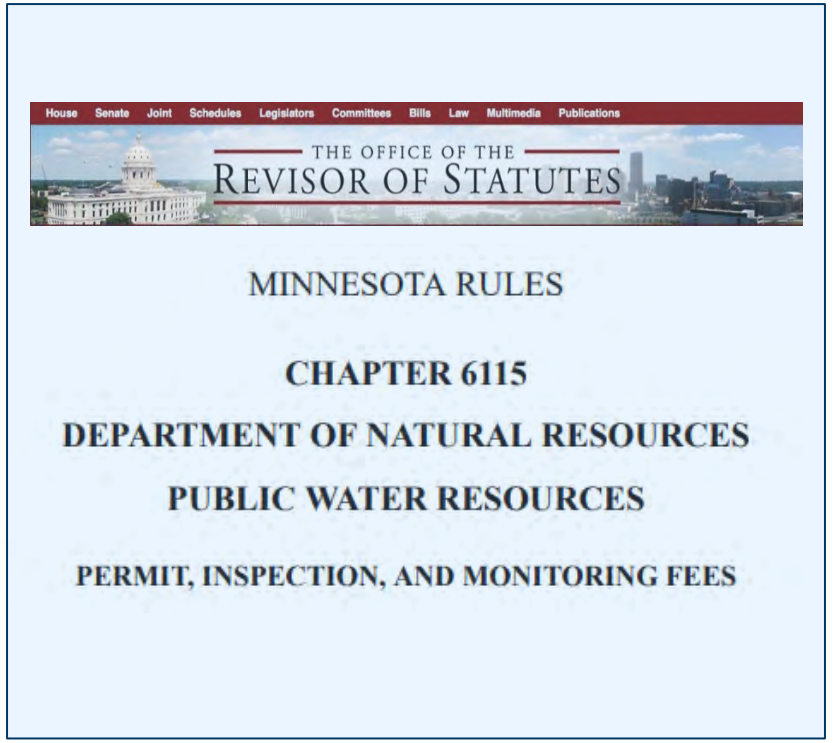


Bridges & Culverts: Minnesota Rules

6115.0231, Subpart 2(B)(1&2). Allowable 100-year (1% annual chance) flood elevation stage increase:

New Crossings. Up to 0.5 ft. Additional increase allowed only if analysis shows no upstream or downstream structures impacted by increase.

Replacement Crossings. Up to 0.5 ft. (if existing is ≤ 0.5 ft.) OR up to the existing swellhead (if existing is > 0.5 ft.) AND analysis shows no significant flood damage potential upstream. Additional increase allowed only if analysis shows no upstream or downstream structures impacted by increase.

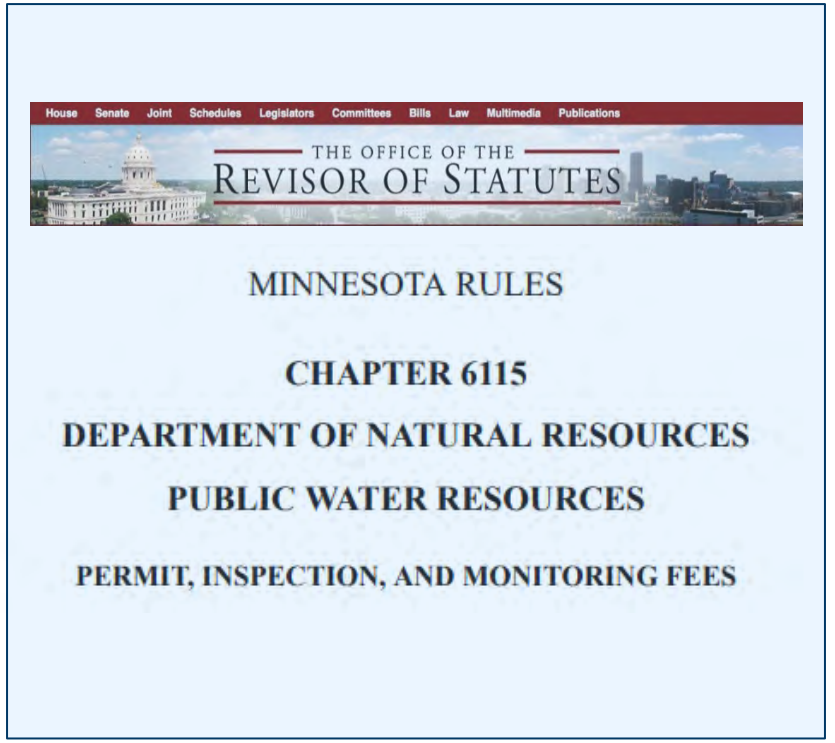


Floodplain: Minnesota Rules

6120.5700, Subpart 4(A) – Delineation of the floodway. Limits of the floodway shall be designated so permissible encroachments on the floodplain will not cause an increase in stage of the regional flood of more than 0.5 feet in any one reach for the cumulative effect of several reaches of a watercourse.

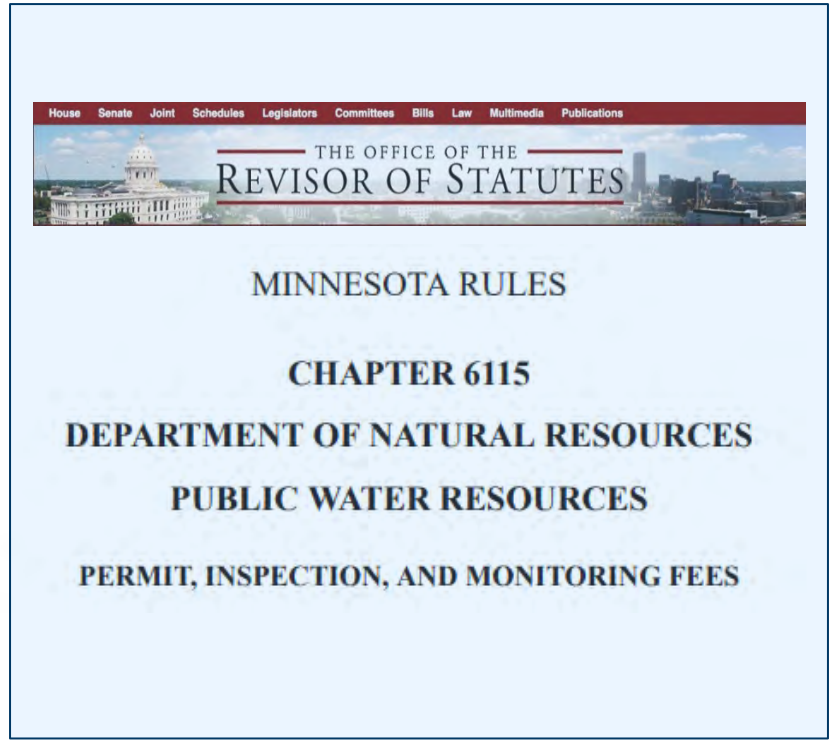
Zone A and AE w/o floodway. Up to 0.5 ft. 100-year stage increase (i.e., “allowable rise”).

Zone AE w/ floodway. Up to 0.00 ft. 100-year stage increase (i.e., “no-rise”).



Excavation: Minnesota Rules

6115.0201, Subpart 7(I). The preferred alternative to widening, deepening, or straightening a watercourse for the control of floodwaters is the construction of water impoundment structures in upstream areas. Where impoundments are infeasible, impractical, or would result in adverse effects on health and safety or greater environmental effects, the preferred alternative is the construction of flood bypass channel to convey high velocity flood flows.



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Thank You!

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Jen Sorensen | jen.Sorensen@state.mn.us

Salam Murtada, EWR-DNR
Kevin Zytkovicz, EWR-DNR

UPDATE: Culvert Replacement Funding Using Geomorphic Approach

DNR-LGU Forum

January 15, 2025

Culvert Replacement Incentive Program

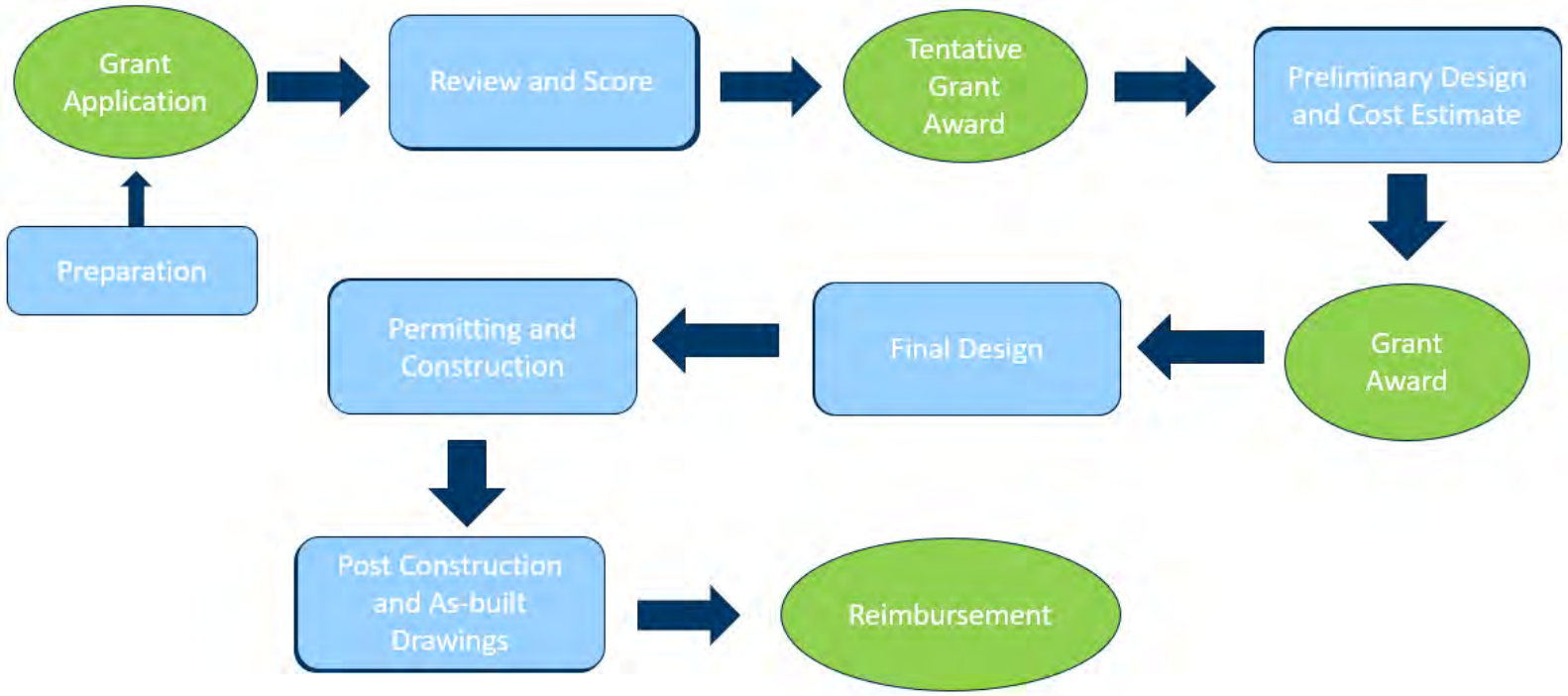
- Program Goal: Provide financial and technical assistance for Counties and local governments to help replace culverts using the Geomorphic Approach to address the following:

  - Floodplain connectivity
  - Biological connectivity (fish passage)
  - Long-term Channel stability
  - Reduce maintenance costs
  - Safer roadways and resilient infrastructure

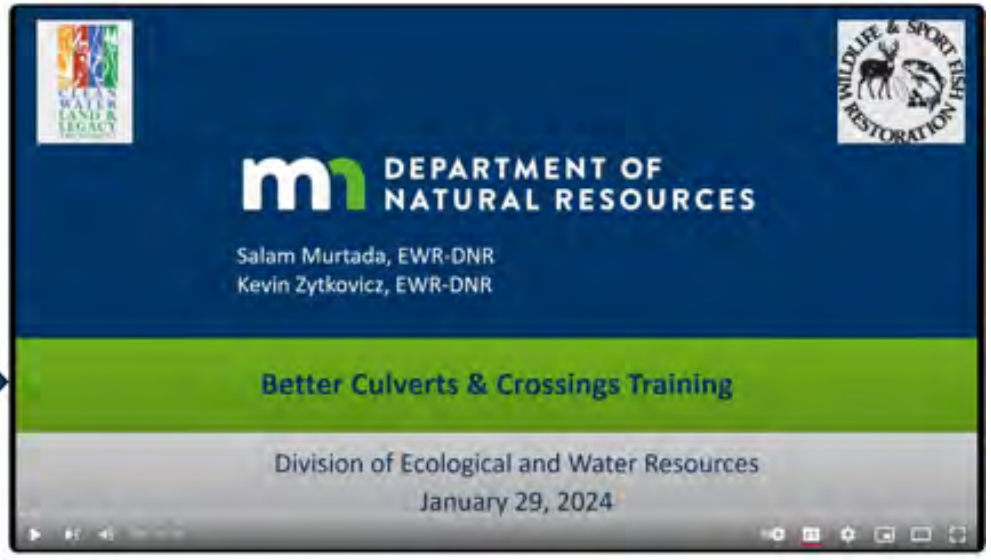
Our goal is to reduce sediment, improve fish communities particularly by addressing fish passage.

Geomorphic Approach Team

- Salam Murtada, LEU
- Kevin Zytkovicz, REU
- Dan Reinartz, LEU
- Amanda Hillman, REU
- Aaron Lamb, LUP
- Truman Morsman, student volunteer
- Dan OShea, REU



Resources:



https://www.dnr.state.mn.us/eco/streamhab/geomorphology/index.html

Project Tracking

	Project progression	Initiation	Prelim Geomorph Assmnt	Prelim Model	Prelim Design Approved	Geomorp Field Data	Model Field Data	Final Geomorph Assmnt	Final Model	90% Plans	Formal Agreement	Construction Complete	Final Approval	Final Payment
1	CR8 and Yellow Medicine River													
2	CSAH 3 and Cascade River													
3	Hoyt Ave and Trib to Crow													
4	Dry Run and 205th													
5	Ottertail River, two crossings													
6	St. James Creek and 300th Ave													
7	North Fork Watonwan and 710th													
8	CSAH8 Crossing and Le Sueur River													
9	North Fork Watonwan and 680th													
10	Butterfield and 310th													
11	MN 95 and Mill Stream													
12	West Baptism													
13	Manitou													
14	Bucks Mill Culvert													
15	Florida Creek													
16	Gorman Creek													
17	Chatham Township, Wright County													
18	198th and Rabbit Creek, Aitkin County													
19	Mud Creek and 41st													
20	Mud Creek and 2 crossings and 2st													
21	Bergman Creek site													
22	Agate Beach Rd and Mill Ck													
23	Florida Creek and 140th (L7933)													
24	Pioneer Creek													
25	Mud Outlet, Blue Earth													

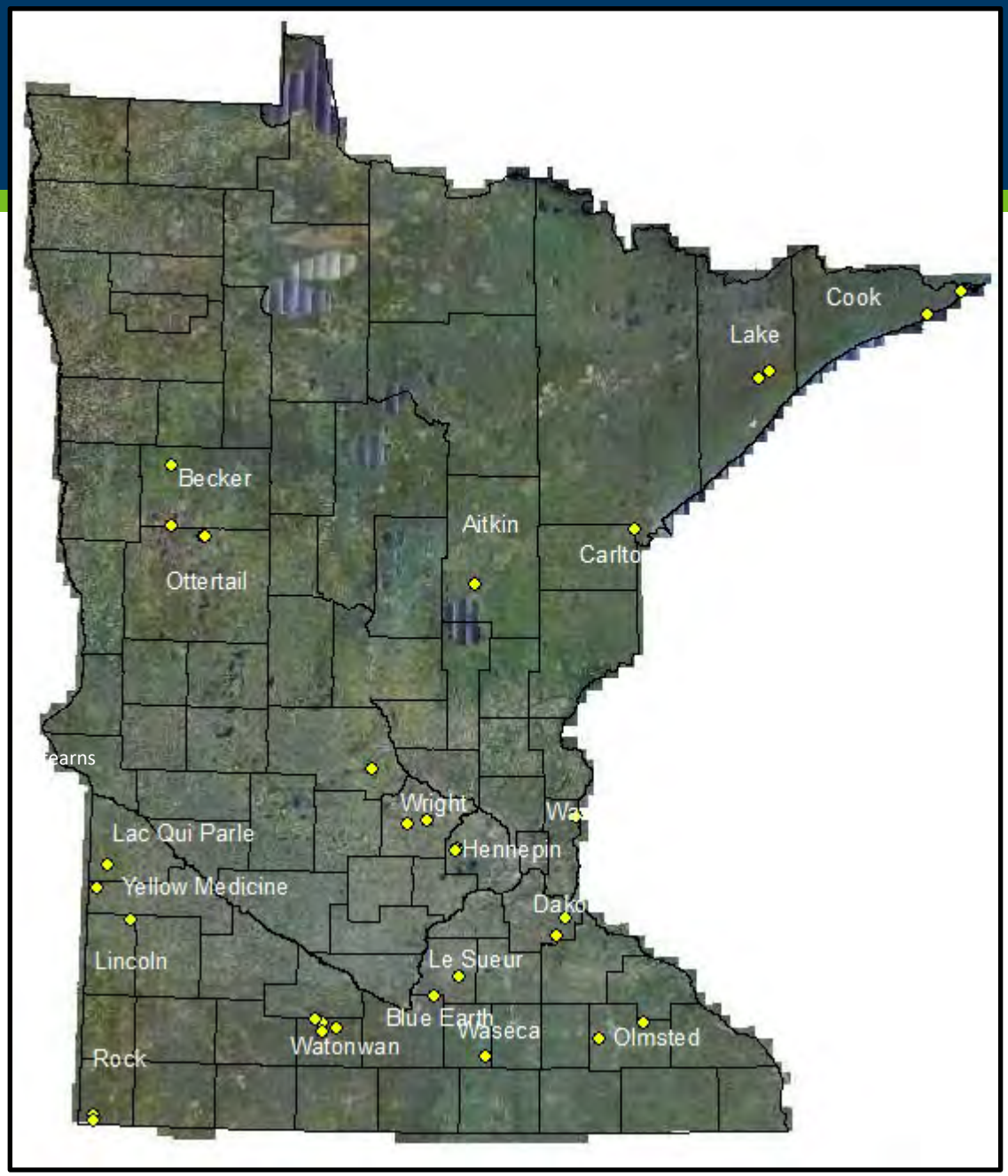
Projects highlighted in yellow are to be constructed in 2025

* All grant funding for 2024-2025 will be spent before June 30th, 2026

Geomorphic Approach Project Sites

32 sites Considered

22 sites studied

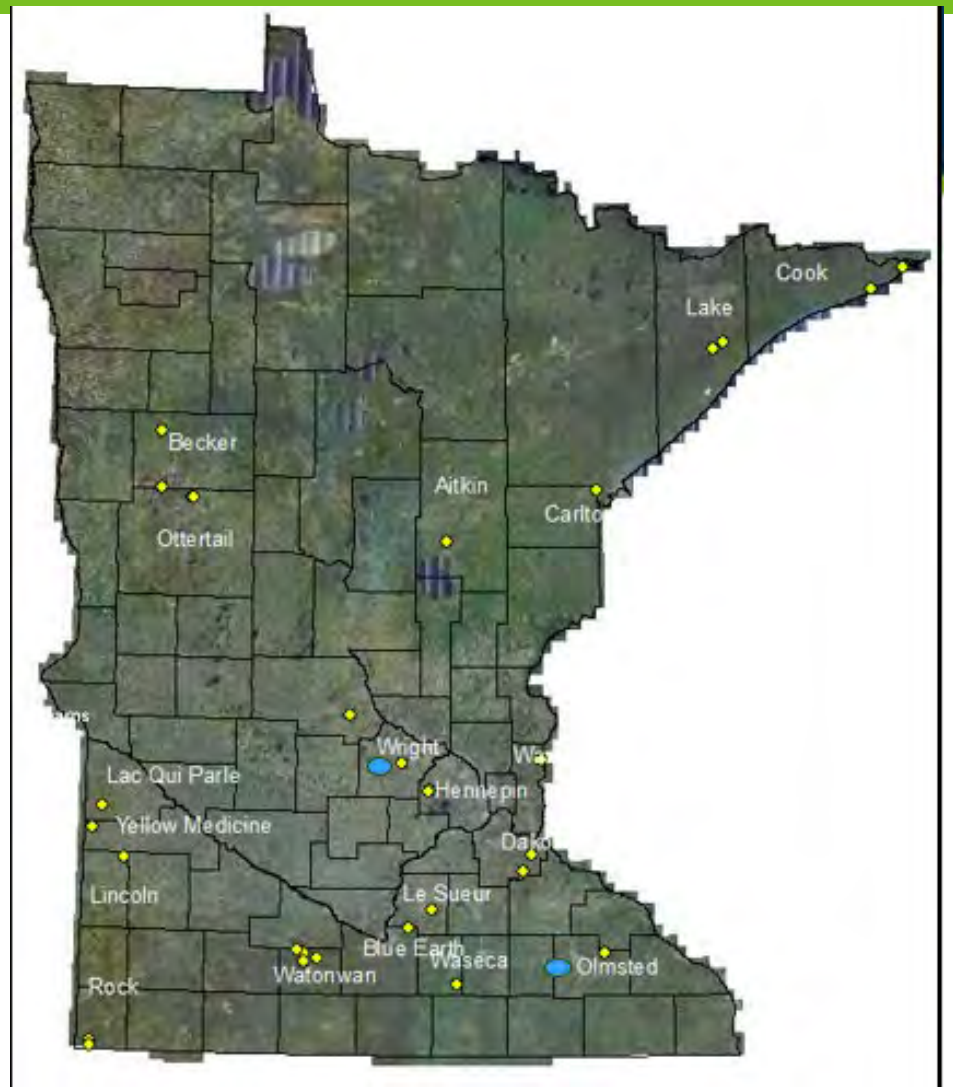


Geomorphic Approach Project Sites

32 sites Considered

22 sites studied

2 sites constructed (Blue)

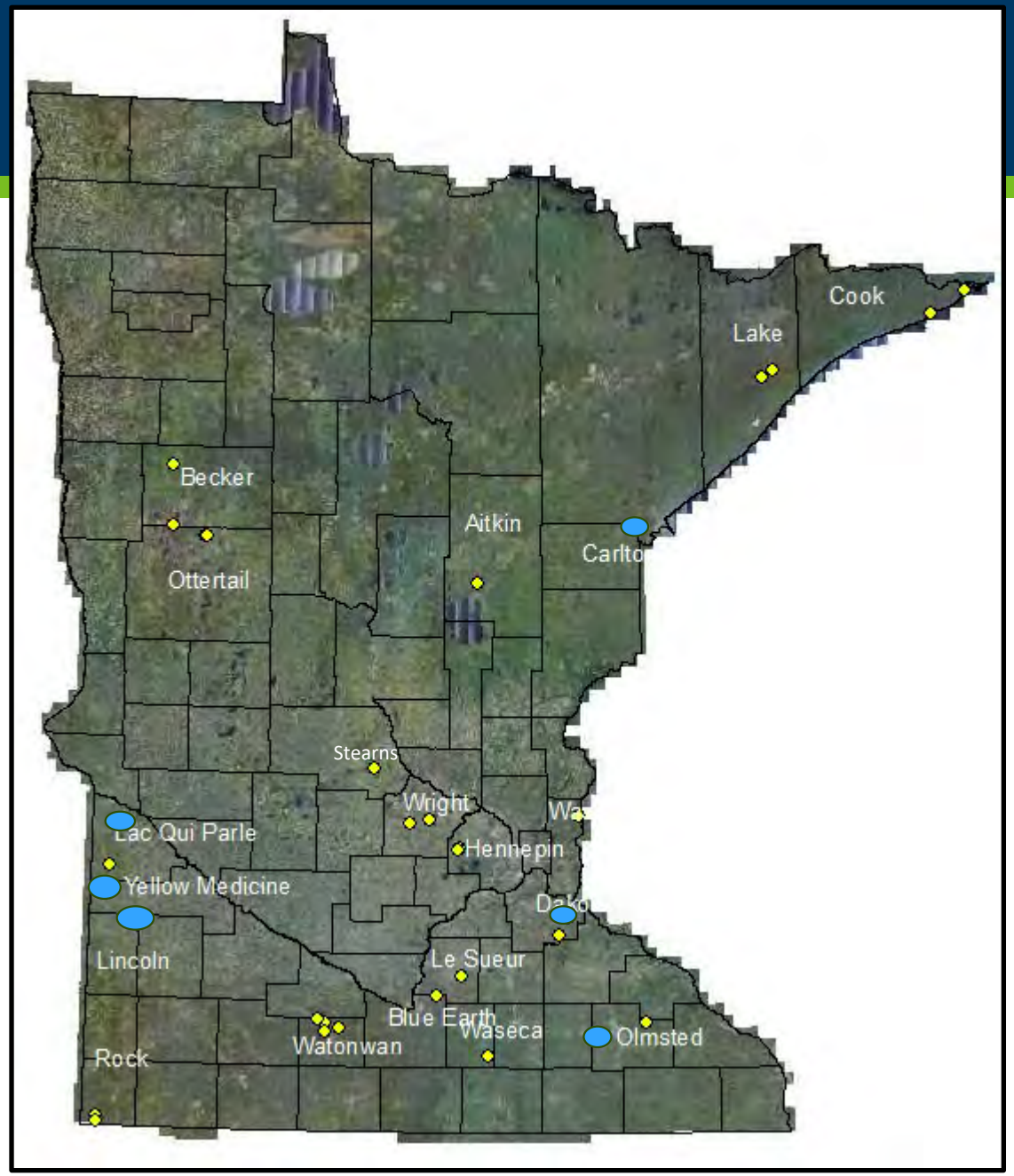


Geomorphic Approach Project Sites

32 sites Considered

22 sites studied

7 sites constructed for 2025 (Blue)



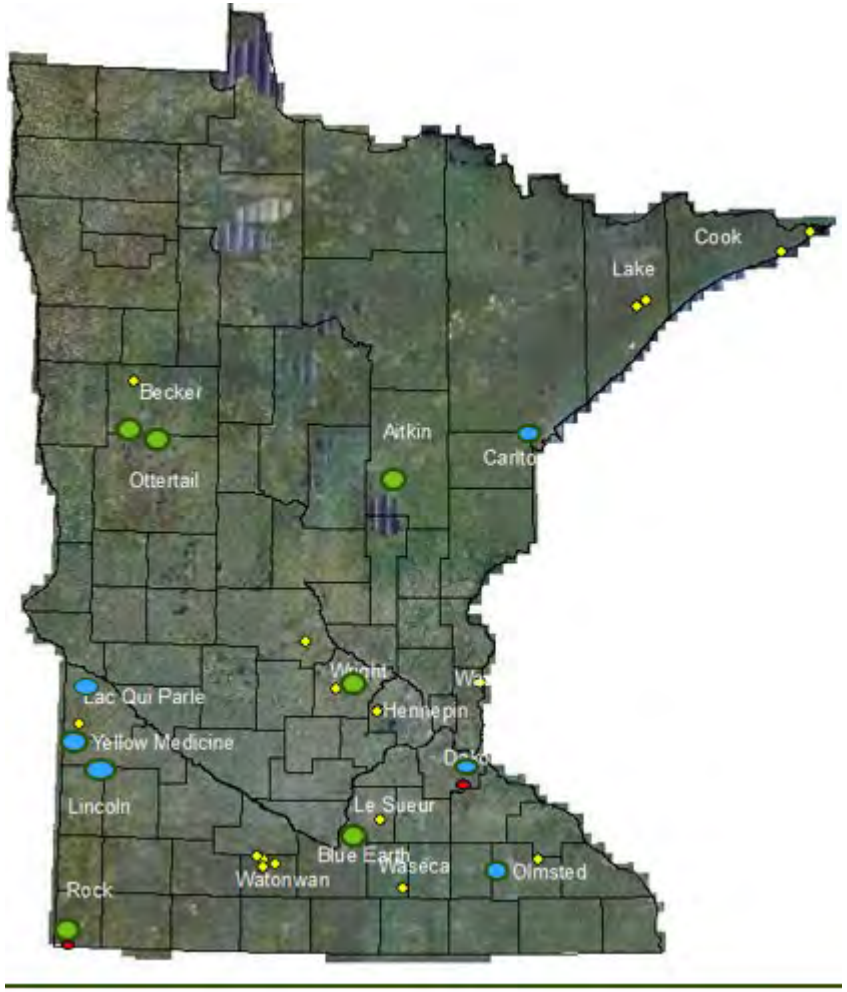
Geomorphic Approach Project Sites

32 sites Considered

22 sites studied

7 sites constructed in 2025 (Blue)

6 additional sites for implementation (Green)



Thanks to our Collaborators

Collaborators:

- Townships
- County Highway Departments
- Cities
- MNDOT
  - Bridge Office
- University of Minnesota
  - St. Anthony Falls Lab (SAFL)
- DNR Clean Water staff
- DNR Area Hydrologists
- DNR Climatology
- Private consultants
- FEMA
- + Others

Area Hydrologists and Clean Water Staff:

- James Bedell
- Wes Saunders-Pearce
- Nicole Lehman
- Jacob Frie
- Kyle Jarcho
- Bri Speldrich
- Jon Lore
- Nicholas Kludt
- Katie Wigen
- Erynn Jenzen
- Tom Kresko
- Nicki Blake-Bradely
- Michael Kelly

First Grant Project (CSAH 3 and Cascade, Olmsted Cty) - Before

Pre-Project Site Concerns:

Channel Stabilty:

Overwide on channel culverts
disrupts natural flow regime
(inconsistent channel widths)
(Flood Flow Confinement)
Large expansion channel downstream of road

Non uniform channel

No floodplain consideration provided in structures being replaced

Fish Passage:

Very shallow (for fish passage) during low flow conditions

Very high velocities and bed shear during high flow conditions

First Grant Project - After

Existing: three in-channel 10 x 8 openings
Proposed: one in-channel 16 x9 and two 14 x 6 floodplain culverts

First Grant Project (CSAH3 and Cascade) – After

Project Expectations:

A Natural, consistent channel will form

A flat vegetated floodplain will form adjacent to channel (green shaded area)

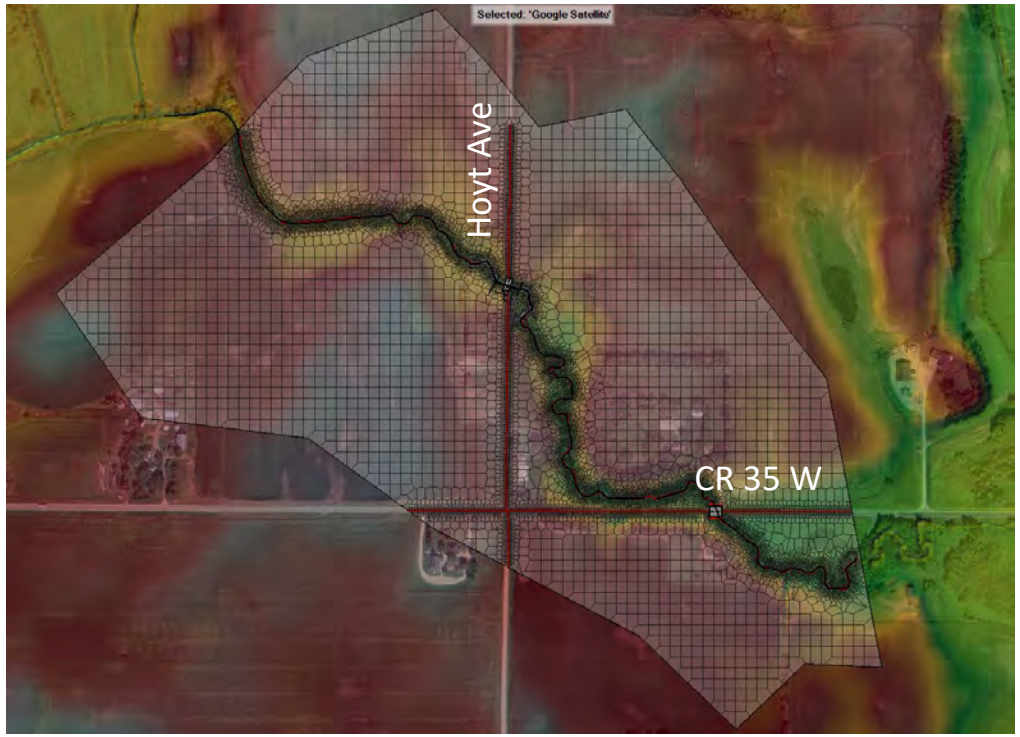
Natural channel bedform Will establish through roadway

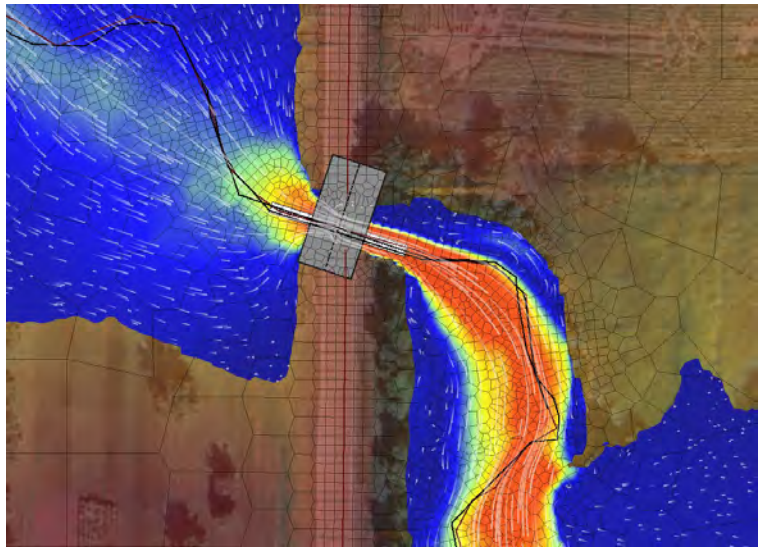
- Riffle
- Run
- Pool
- Glide

Second Grant project (Hoyt Ave and Tributary to Crow) - Before

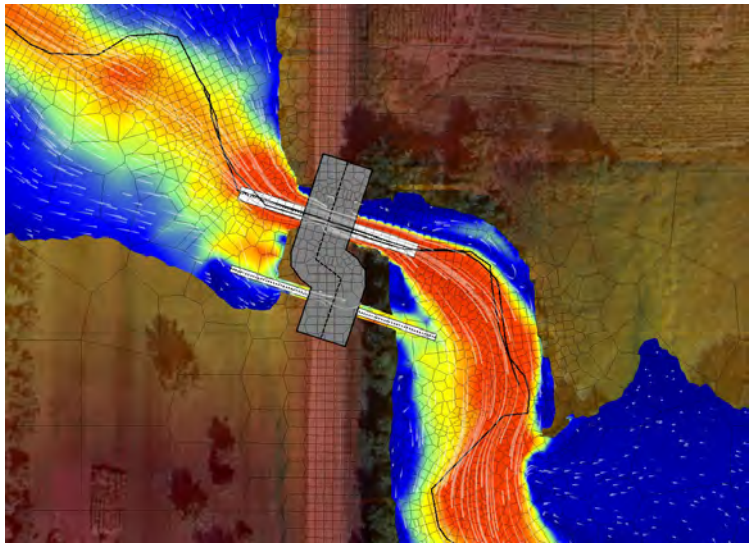
Second Grant Project (Hoyt Ave and Tributary to Crow) - After

2D RAS Modeling



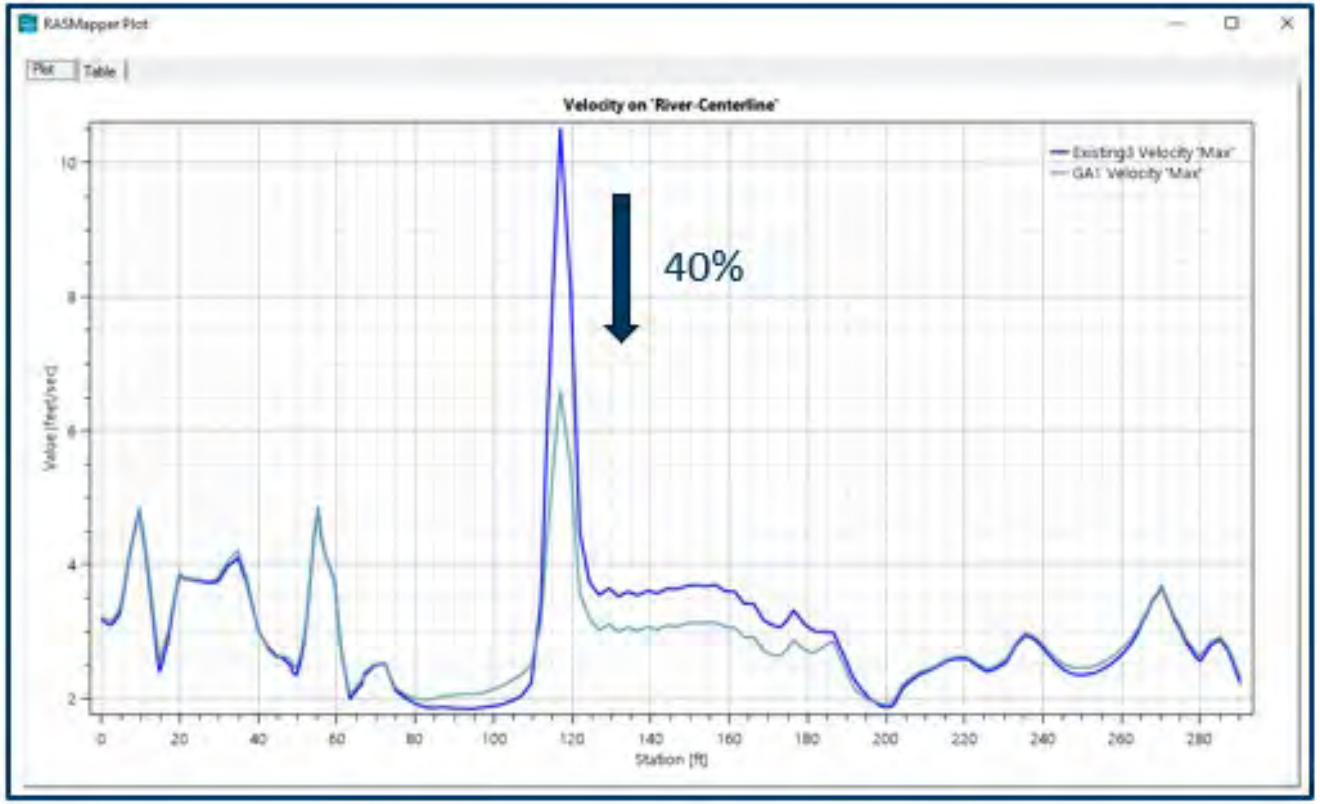


EXISTING

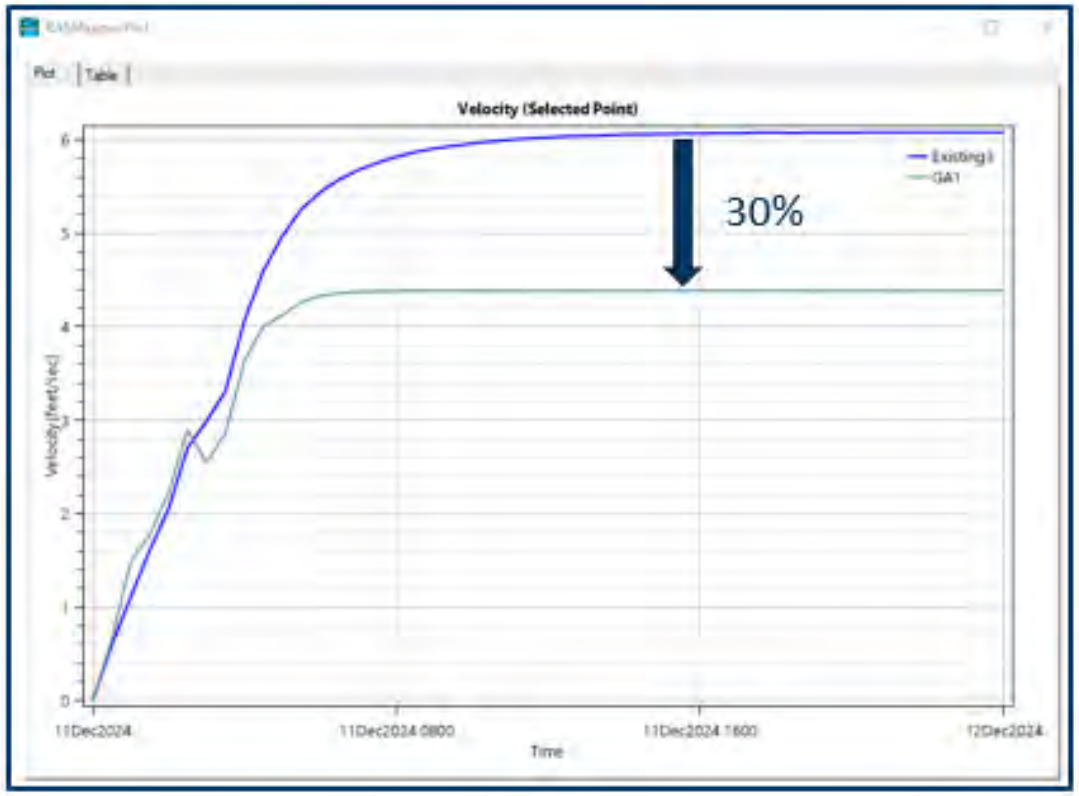


Constructed

More Output for velocity and water surface elevations



channel velocity (10-YR)



Velocity through structure (10-YR)

DEPARTMENT OF NATURAL RESOURCES

Thank You

CLEAN WATER LAND & LEGACY AMENDMENT

WILDLIFE & SPORT FISH RESTORATION

HOYT AVE CULVERT REPLACEMENT – GEOMORPHIC APPROACH

HOYT AVE – GEOMORPHIC APPROACH

Self Introduction: Dan Bogart

NDSU
2005 – 2010
Bachelors of Science;
Civil Engineering

NDSU
2010 – 2012
Masters of Science;
Civil Engineering

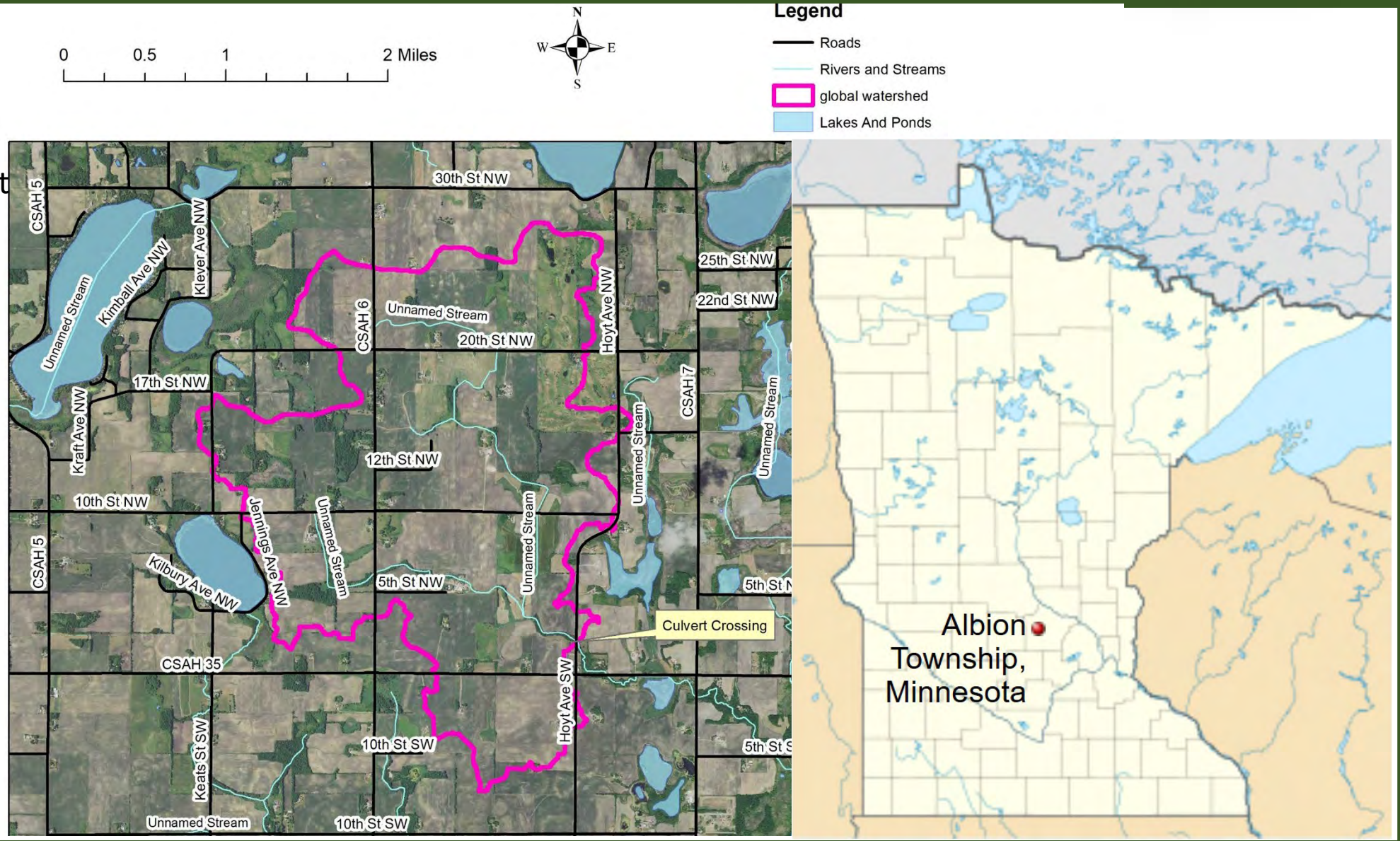
Houston Engineering Inc.
2012 – 2022
Water Resources Engineer

Bogart Pederson and Associates
2022 – Present
Water Resources Engineer
Decentralized Wastewater Engineer

Email: dbogart@bogart-Pederson.com
Office: 763.262.8822
Direct: 763.270.6159

HOYT AVE – GEOMORPHIC APPROACH

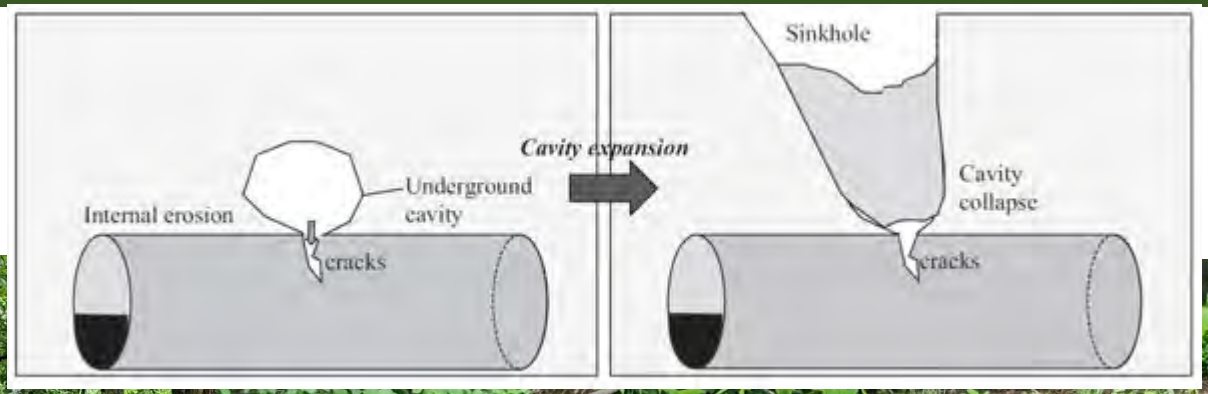
- Albion Township, Wright County
- 5.2 Sq. Mi DA
- > 90% Ag
- 60-inch RCP
  - 76-ft
- Gravel Road
- Known issue since 2022



HOYT AVE – GEOMORPHIC APPROACH

Nearing Failure!!!

- **Poor installation methods**
- **High velocities causing tailwater scour**



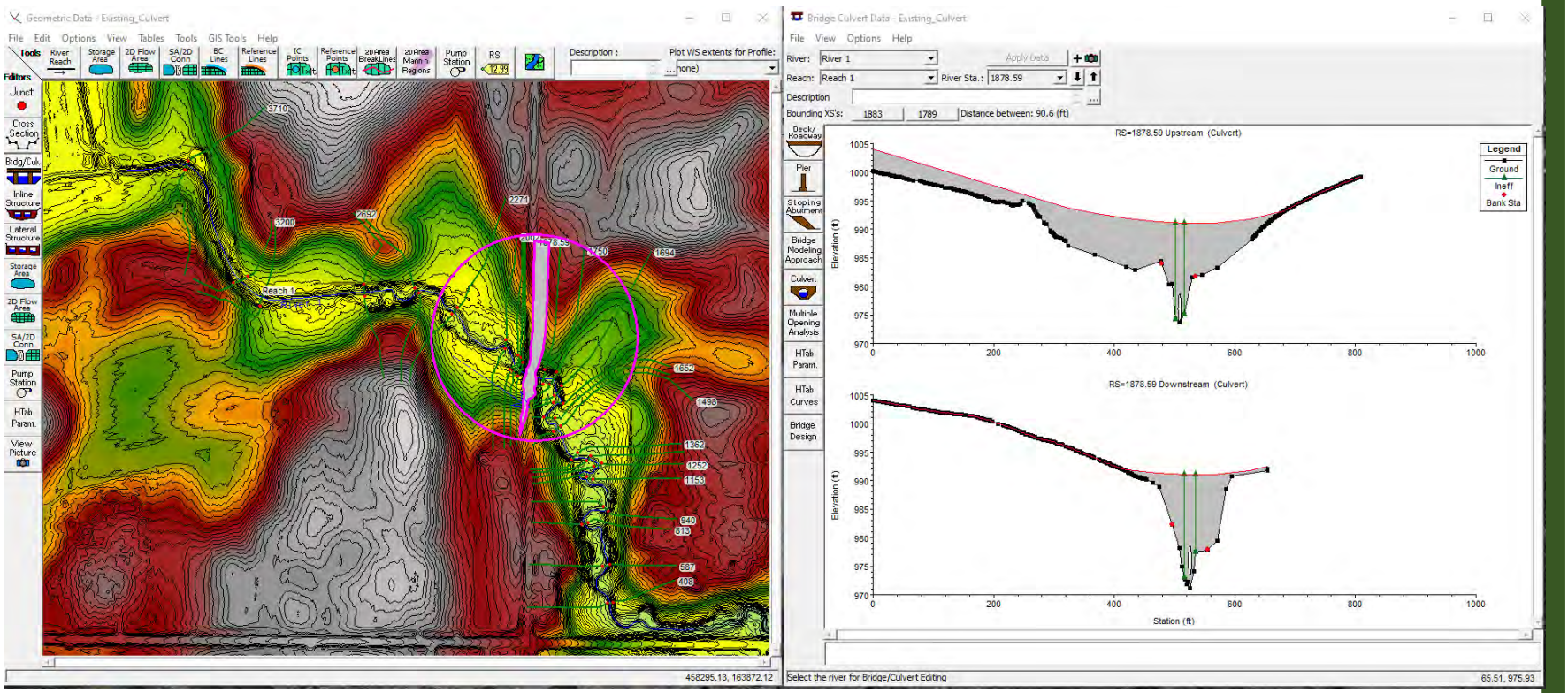
HOYT AVE – GEOMORPHIC APPROACH

Removed pipe (Reason for failure) and standard RCP joint

HOYT AVE – GEOMORPHIC APPROACH

CULVERT REPLACEMENT TIME!!

- **HEC-RAS model of existing and proposed conditions (my favorite part!)**
- **Comparison of results between standard design and geomorphic approach**
  - **6X5 Box VS 8X5 Box and 48-inch barrel**
- **Township selects design option and plans and specs are drawn up**
- **Due to supply chain constraints, the town elected to purchase the box materials prior to the bid.**



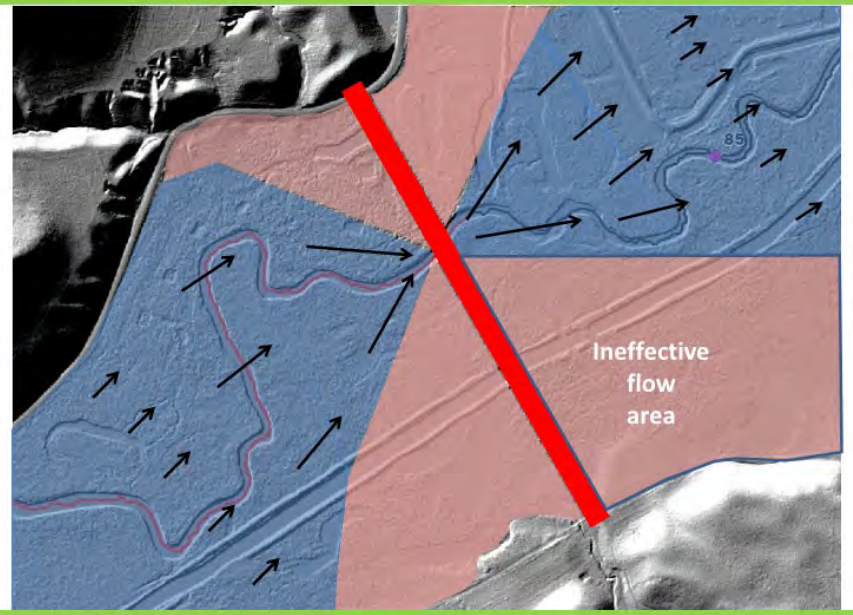
Parameter	Existing		6-ft x 5-ft Box		Geomorphic Approach		Comments
	US	DS	US	DS	US	DS	
WSE (10-YR)	987.2	978.6	982.1	978.6	979.8	978.6	The existing under-sized culvert causes aggradation upstream, as you can see from the deline-ation, with high velocities going through the culvert. By adding the box culvert and floodplain culvert, we saw reductions in the model velocities, resulting in a more naturally connected system
Culvert Velocity (10-YR)	18.1	18.1	5	4.8	3.6	3.4	

HOYT AVE – GEOMORPHIC APPROACH

Geomorphic Approach

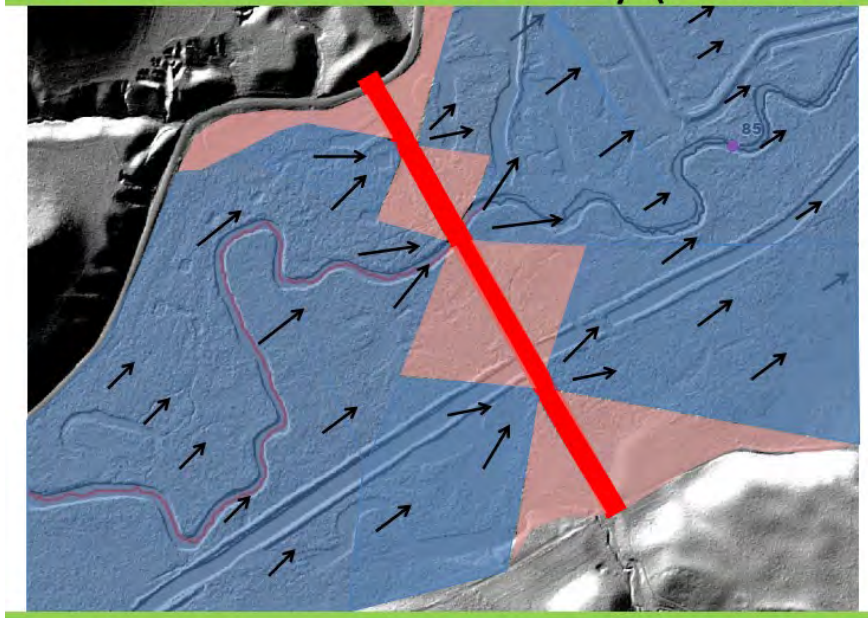
- **The mitigation of deleterious effects on a watercourse's natural processes from road fill encroachments.**
- **This process largely relies on reducing spikes in velocity at crossings to return the flow regime to pre-crossing conditions.**
- **MNDNR offers cost sharing program to pay fc 25% of project construction costs!**

Floodplain Conveyance through confinement, no floodplain connectivity



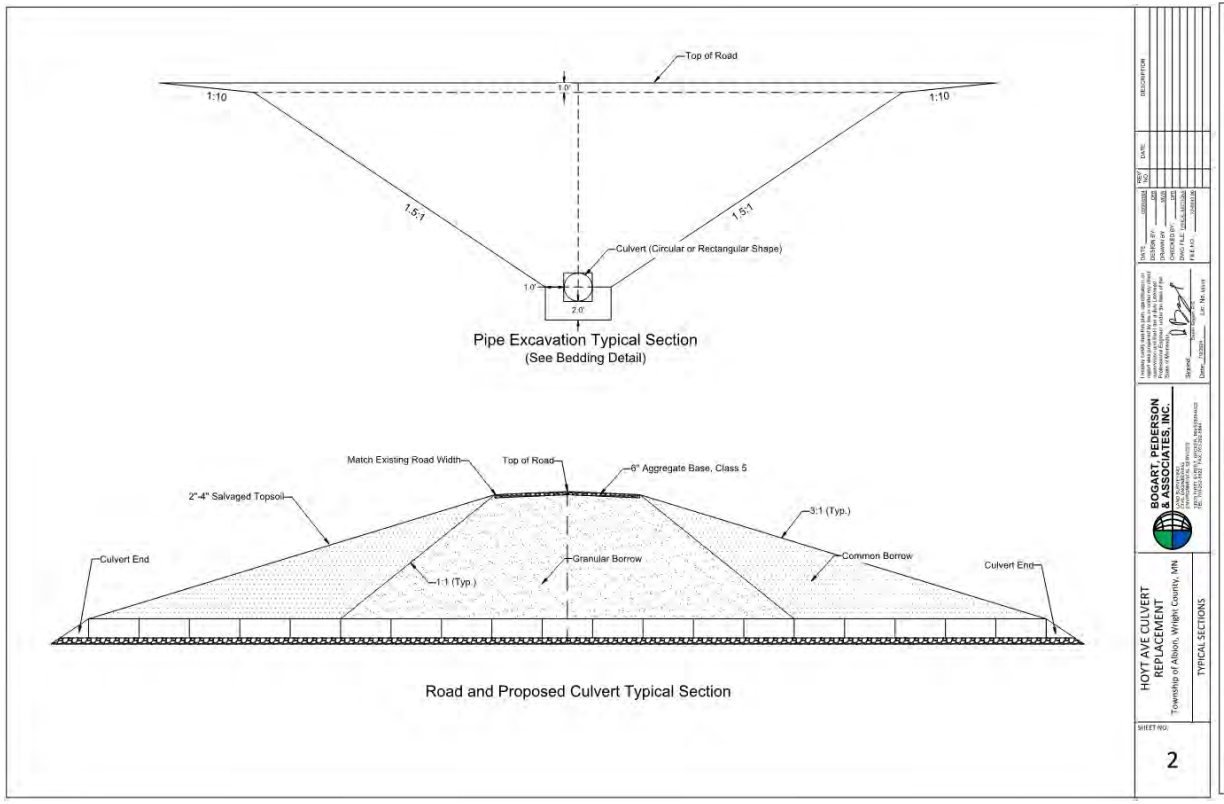
Typical Approach to increasing conveyance

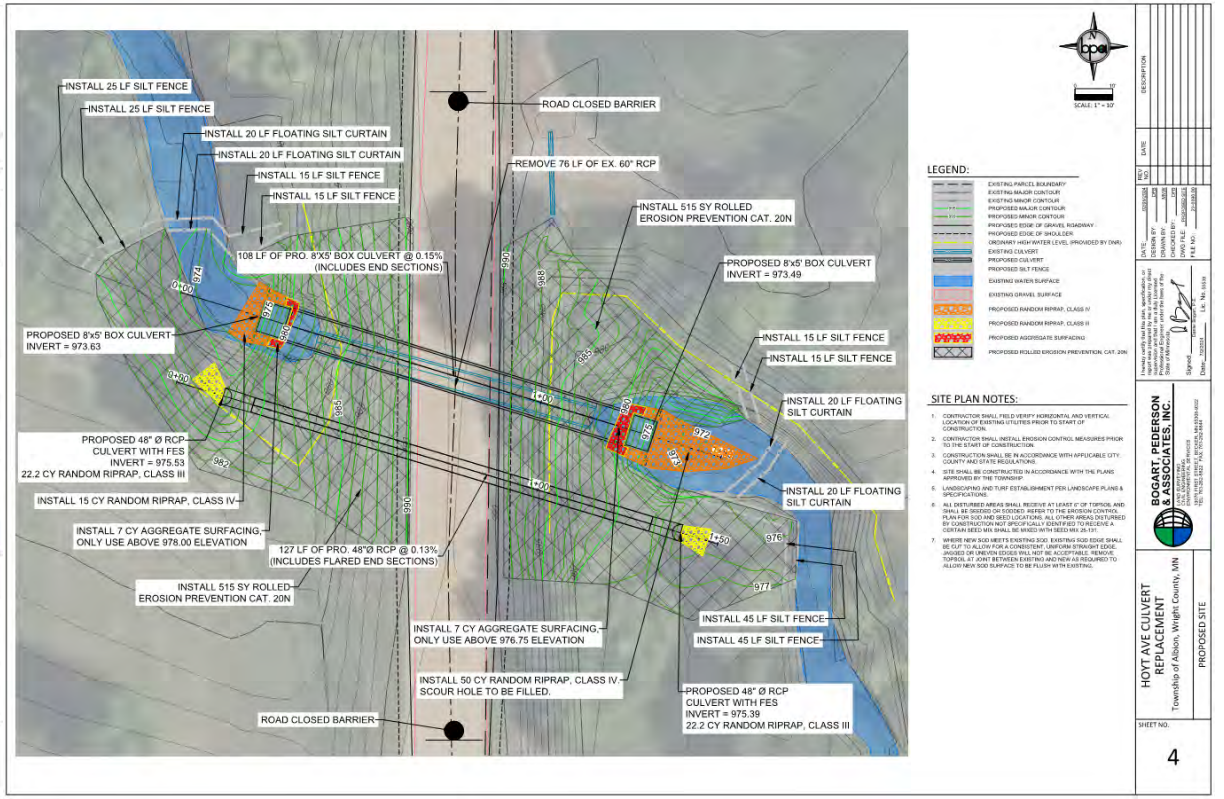
Floodplain Conveyance with minimal connectivity (2 culverts)



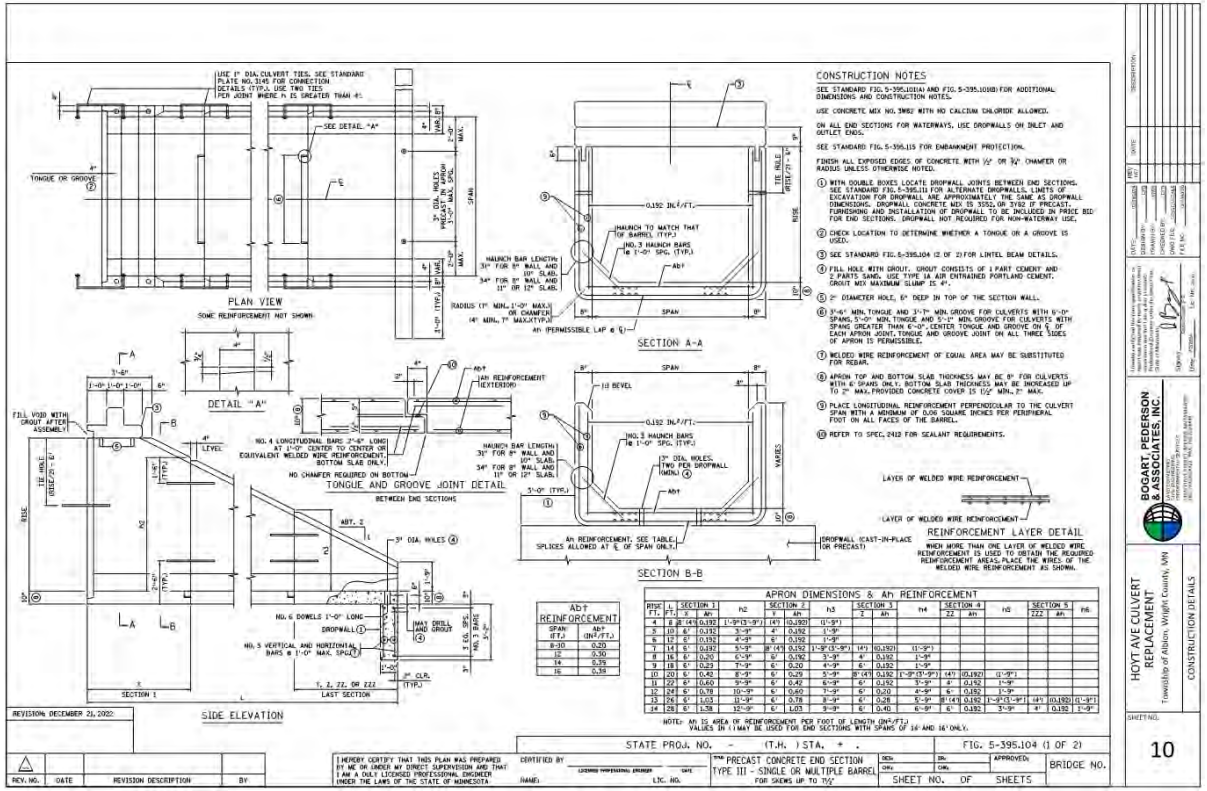
Preferred Approach: address floods on floodplain

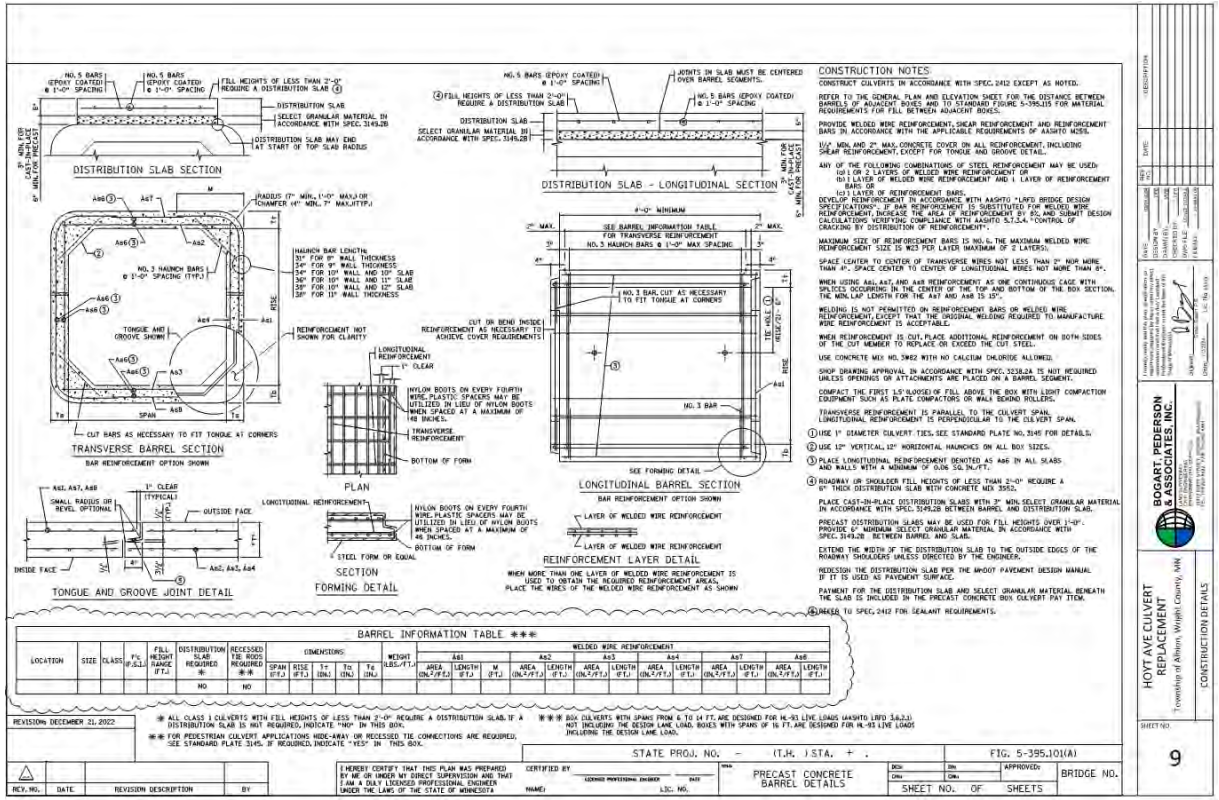
HOYT AVE – GEOMORPHIC APPROACH





HOYT AVE – GEOMORPHIC APPROACH



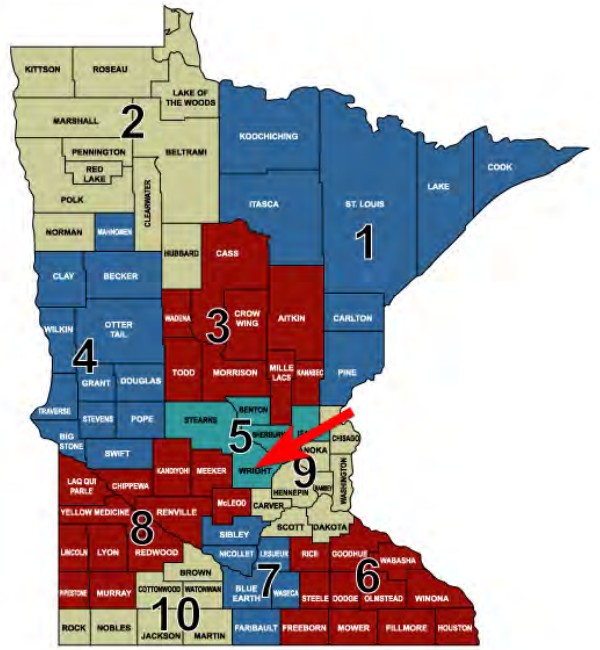


HOYT AVE – GEOMORPHIC APPROACH

Bidding Process

- **Collected 10 bids**
- **Project was awarded to Fields Contracting LLC, Harris MN**
- **Project required prevailing wages**
- **Grant was approved for up to $92k based on OPC. 25% of construction costs were covered by the grant**

High Bid	$	391,788.07
Bid	$	313,880.00
Average Bid	$	233,727.40
Bid	$	233,358.00
Engineer's OPC	$	226,946.50
Bid	$	221,781.00
Bid	$	216,097.00
Bid	$	215,255.50
Bid	$	214,586.10
Bid	$	204,285.00
Low Bid	$	172,668.50



HOYT AVE – GEOMORPHIC APPROACH

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HOYT AVE – GEOMORPHIC APPROACH

Construction process

- **Began:**
  - **10/22/2024**
- **Pipe removal and general excavation**
- **Prepare trench and pipe bedding**
- **Install box culvert**
- **Prep barrel bedding**
- **Install barrel culvert**
- **Backfill/compact**
- **Install gravel road**
- **Seed/blanket**
- **Wrap up:**
  - **11/20/2024**
- **Light at the end of the tunnel, No Change Orders!**

HOYT AVE – GEOMORPHIC APPROACH

Suggestions for future consideration

- **An initial OPC comparison between the standard approach and geomorphic showed that the difference in cost was larger than 25%.**
  - **$221,304.54 VS 315,258.61**
- **An online database of project bid tabs (or annual aggregation) for projects that received grant funding could be made available for public access**
  - **This will help determine a reasonable difference in costs**
- **Webinars for designers to become familiar with the geomorphic approach and therefore more likely to employ it.**

Standard Design

ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
MOBILIZATION	LUMP SUM	1	$ 18,592.86	$ 18,592.86
CLEARING	ACRE	0.25	$ 24,200.00	$ 6,050.00
GRUBBING	ACRE	0.25	$ 17,307.14	$ 4,326.79
REMOVE CONCRETE CULVERT	LIN FT	76	$ 77.86	$ 5,917.36
COMMON EXCAVATION	CU YD	950	$ 9.53	$ 9,053.50
DEWATERING	LUMP SUM	1	$ 6,628.71	$ 6,628.71
AGGREGATE BASE CLASS 5	TON	64	$ 31.71	$ 2,029.44
COARSE AGGREGATE BEDDING (P)	CU YD	114	$ 57.07	$ 6,505.98
Granular Embankment (CV)	CU YD	600	$ 21.90	$ 13,140.00
6X5 PRECAST CONCRETE BOX CULVERT	LIN FT	92	$ 1,126.64	$ 103,650.88
6X5 PRECAST CONCRETE BOX CULVERT END SECTI	EACH	2	$ 12,280.50	$ 24,561.00
RANDOM RIPRAP CLASS IV (P)	CU YD	65	$ 105.00	$ 6,825.00
TRAFFIC CONTROL	LUMP SUM	1	$ 2,187.14	$ 2,187.14
SILT FENCE, TYPE HI	LIN FT	530	$ 5.14	$ 2,724.20
FLOTATION SILT CURTAIN, TYPE MOVING WATER	LIN FT	55	$ 33.95	$ 1,867.25
AGGREGATE SURFACING	Sq Yd	14	$ 69.50	$ 973.00
TURF ESTABLISHMENT	LUMP SUM	1	$ 6,271.43	$ 6,271.43
			TOTAL	**$ 221,304.54**

Geomorphic Approach Design

ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
MOBILIZATION	LUMP SUM	1	$ 18,592.86	$ 18,592.86
CLEARING	ACRE	0.33	$ 24,200.00	$ 7,986.00
GRUBBING	ACRE	0.33	$ 17,307.14	$ 5,711.36
REMOVE CONCRETE CULVERT	LIN FT	76	$ 77.86	$ 5,917.36
COMMON EXCAVATION	CU YD	2130	$ 9.53	$ 20,298.90
DEWATERING	LUMP SUM	1	$ 6,628.71	$ 6,628.71
AGGREGATE BASE CLASS 5	TON	98	$ 31.71	$ 3,107.58
COARSE AGGREGATE BEDDING (P)	CU YD	229	$ 57.07	$ 13,069.03
Granular Embankment (CV)	CU YD	1250	$ 21.90	$ 27,375.00
8X5 PRECAST CONCRETE BOX CULVERT	LIN FT	92	$ 1,216.64	$ 111,930.88
8X5 PRECAST CONCRETE BOX CULVERT END SECTI	EACH	2	$ 13,645.00	$ 27,290.00
48" RC PIPE APRON	LIN FT	108	$ 317.79	$ 34,321.32
48" RC PIPE CULVERT	EACH	2	$ 3,903.57	$ 7,807.14
RANDOM RIPRAP CLASS III (P)	CU YD	45	$ 97.21	$ 4,374.45
RANDOM RIPRAP CLASS IV (P)	CU YD	65	$ 105.00	$ 6,825.00
TRAFFIC CONTROL	LUMP SUM	1	$ 2,187.14	$ 2,187.14
SILT FENCE, TYPE HI	LIN FT	530	$ 5.14	$ 2,724.20
FLOTATION SILT CURTAIN, TYPE MOVING WATER	LIN FT	55	$ 33.95	$ 1,867.25
AGGREGATE SURFACING	Sq Yd	14	$ 69.50	$ 973.00
TURF ESTABLISHMENT	LUMP SUM	1	$ 6,271.43	$ 6,271.43
			TOTAL	**$ 315,258.61**

HOYT AVE – GEOMORPHIC APPROACH

THANK YOU!

ADDITIONAL THANKS TO:

- **SALAM MURTADA**
- **KEVIN ZYTKOVICZ**
- **JAMES BEDELL**

Q/A