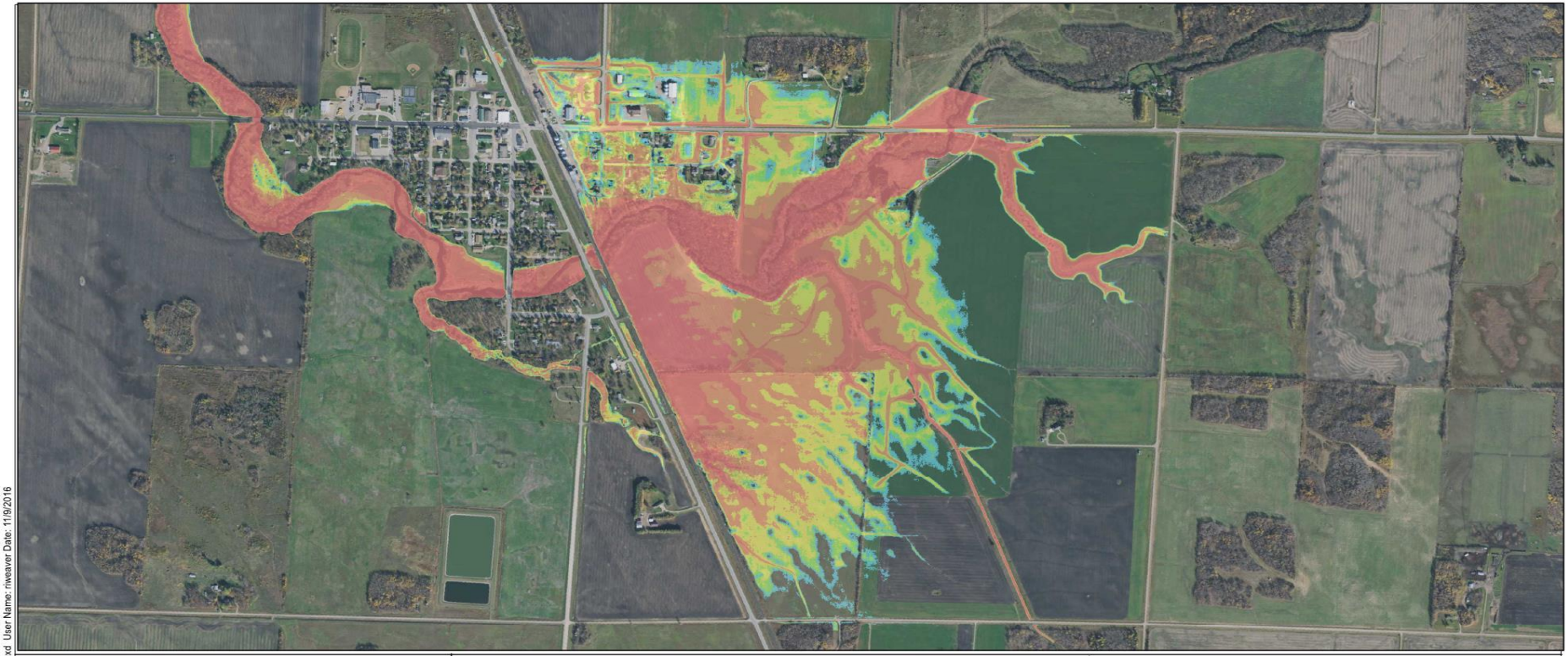
Middle River / Newfolden
Project Team Meeting
January 31, 2017


Longfellow
1975

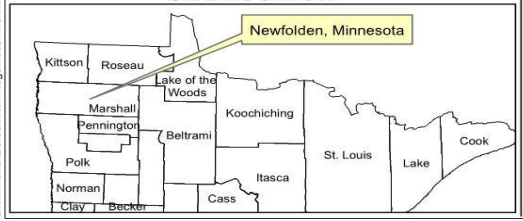
Adleyen, Donna & Nasley
Big rain in Newfolden

Traffic was slowed Wednesday on highway 59 four miles south of Newfolden as water was flowing over county road seven as well as highway 59. The Soo Line tracks near this intersection were under water as gravel under the rails washed away.



D:\MinnehahaCreek\Non-Regs\Atlas14vsHWM.mxd User Name: riweaver Date: 11/9/2016

SITE LOCATOR



Depth of Flooding in the City of Newfolden 1-Percent-Annual-Chance Event

N

Depth of Flooding (ft)

- No Flooding
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 2
- > 2

0 250 500 1,000 1,500 Feet

MNDNR

RiskMAP
Increasing Resilience Together

Risk Mapping, Assesment, and Planning (Risk MAP)

About this map:

This map shows the depth of flooding during the 1-percent-annual-chance (100-year) flood event. The depths were created using 2-foot LiDAR data for the City of Marshall.

Flood elevations were calculated using a revsied version of the Middle River HEC2 model developed for the 1987 Marshall County Flood Insurance Study.

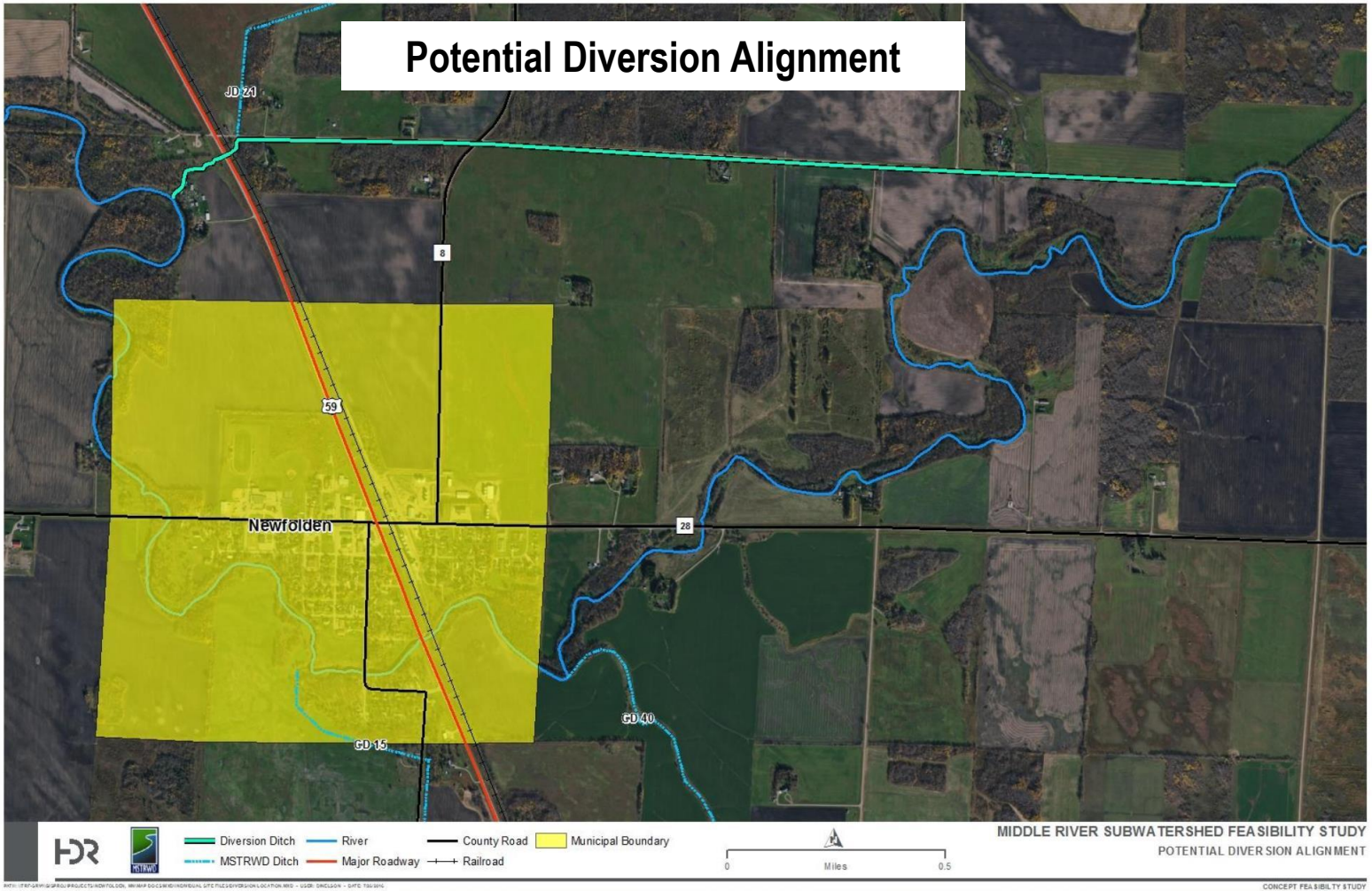
ALTERNATIVES

1. Do nothing – residents may raise lots, obtain LOMAs, etc.
2. Bore 1 or 2 – 48” to 54” steel pipes
3. Install 3 to 5 – 9’ x 9’ reinforced concrete boxes
4. Construct certifiable dike on north side of river, upstream of crossing
5. Construct dikes downstream of crossing or buyout affected properties
6. Construct a diversion channel
7. Retention area upstream or downstream
8. Some combination of the above measures

BENEFITS

- New crossing with extended lifespan
- Lower headwater
- Removal of high-head embankment dam
- 40 homes removed from 100-year floodplain
- Flood risk reduced
- Dam hazard reduced
- Improve downstream/upstream flood impacts

Potential Diversion Alignment

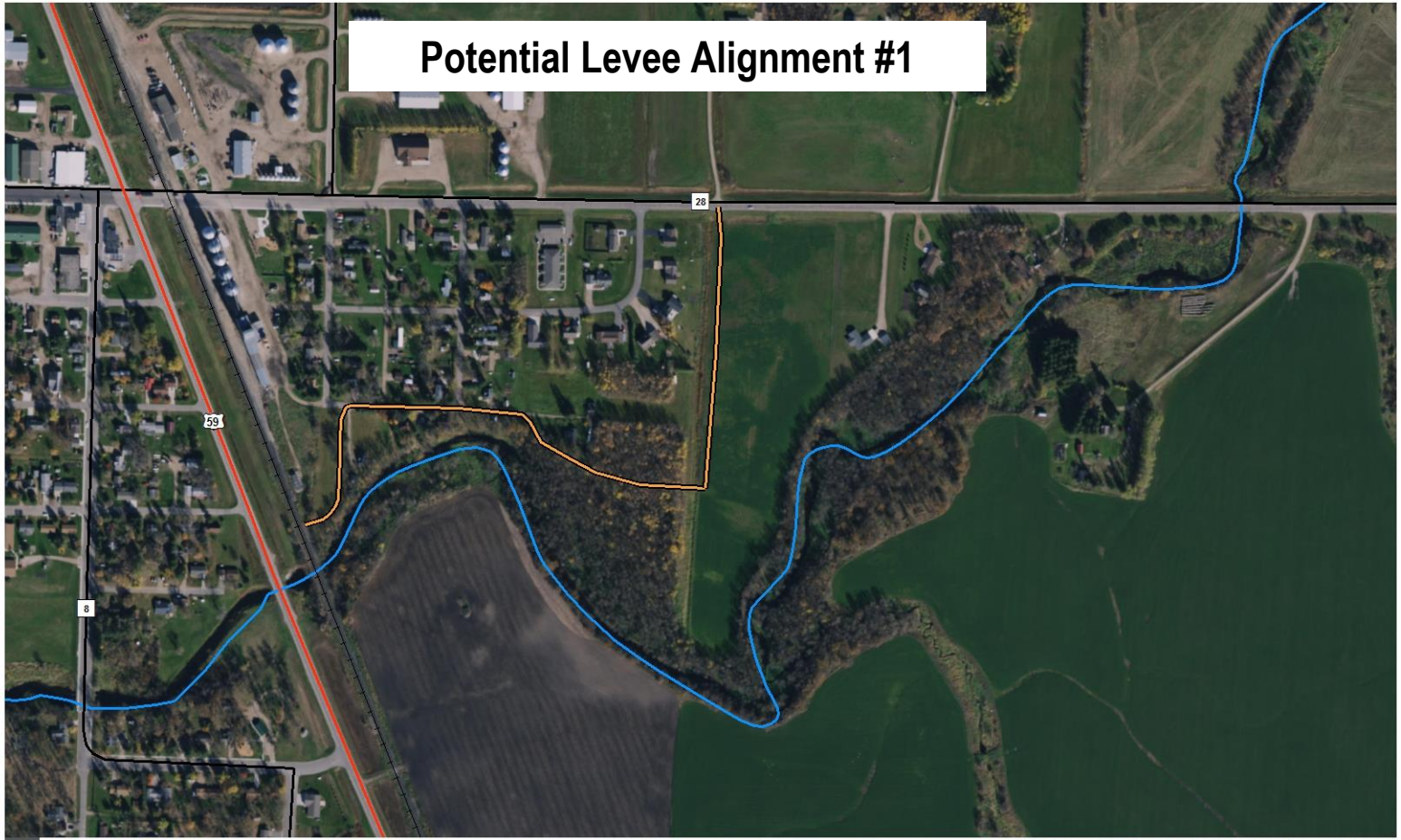


MIDDLE RIVER SUBWATERSHED FEASIBILITY STUDY

POTENTIAL DIVERSION ALIGNMENT

CONCEPT FEASIBILITY STUDY

Potential Levee Alignment #1

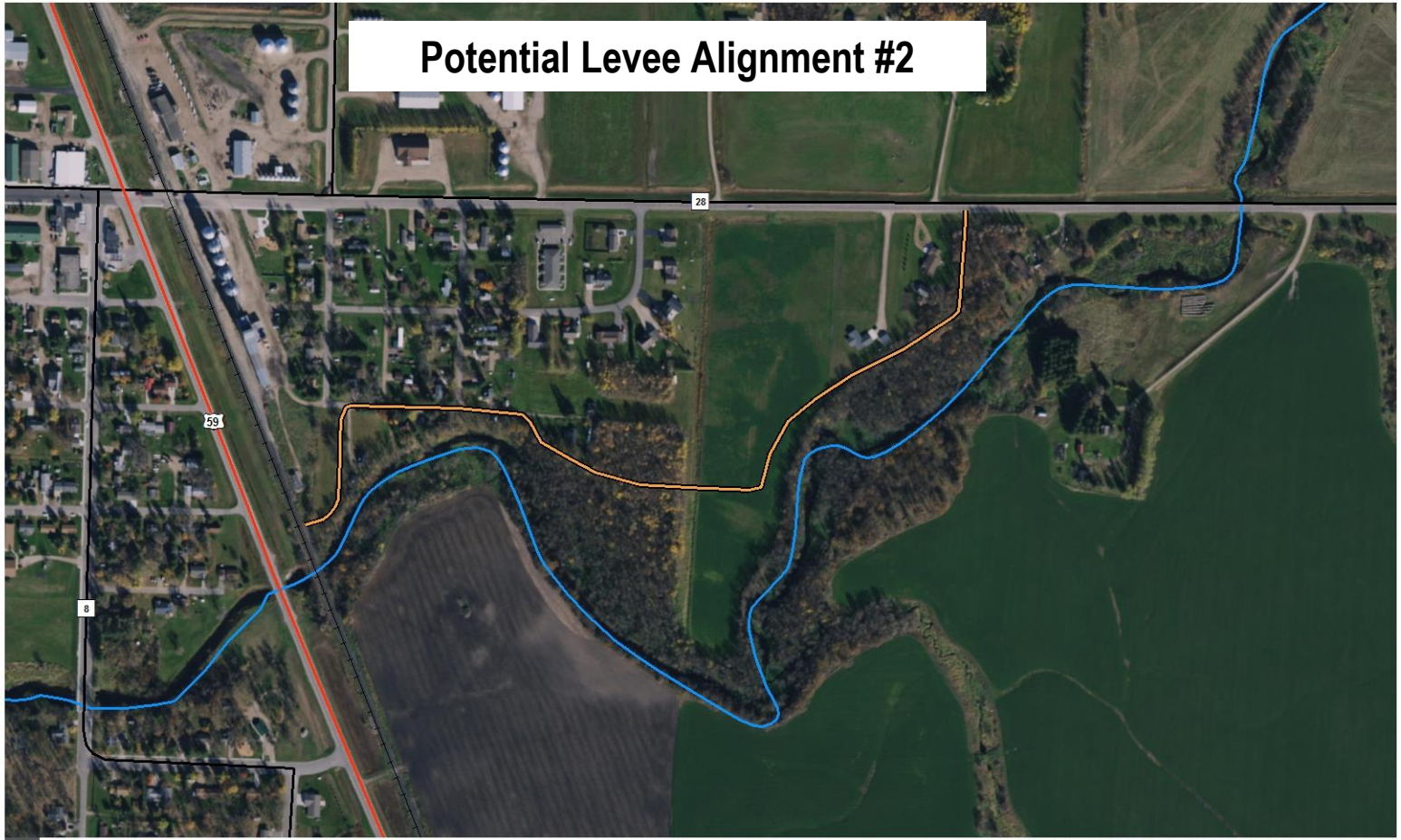


MIDDLE RIVER SUBWATERSHED FEASIBILITY STUDY

POTENTIAL LEVEE ALIGNMENT

CONCEPT FEASIBILTY STUDY

Potential Levee Alignment #2



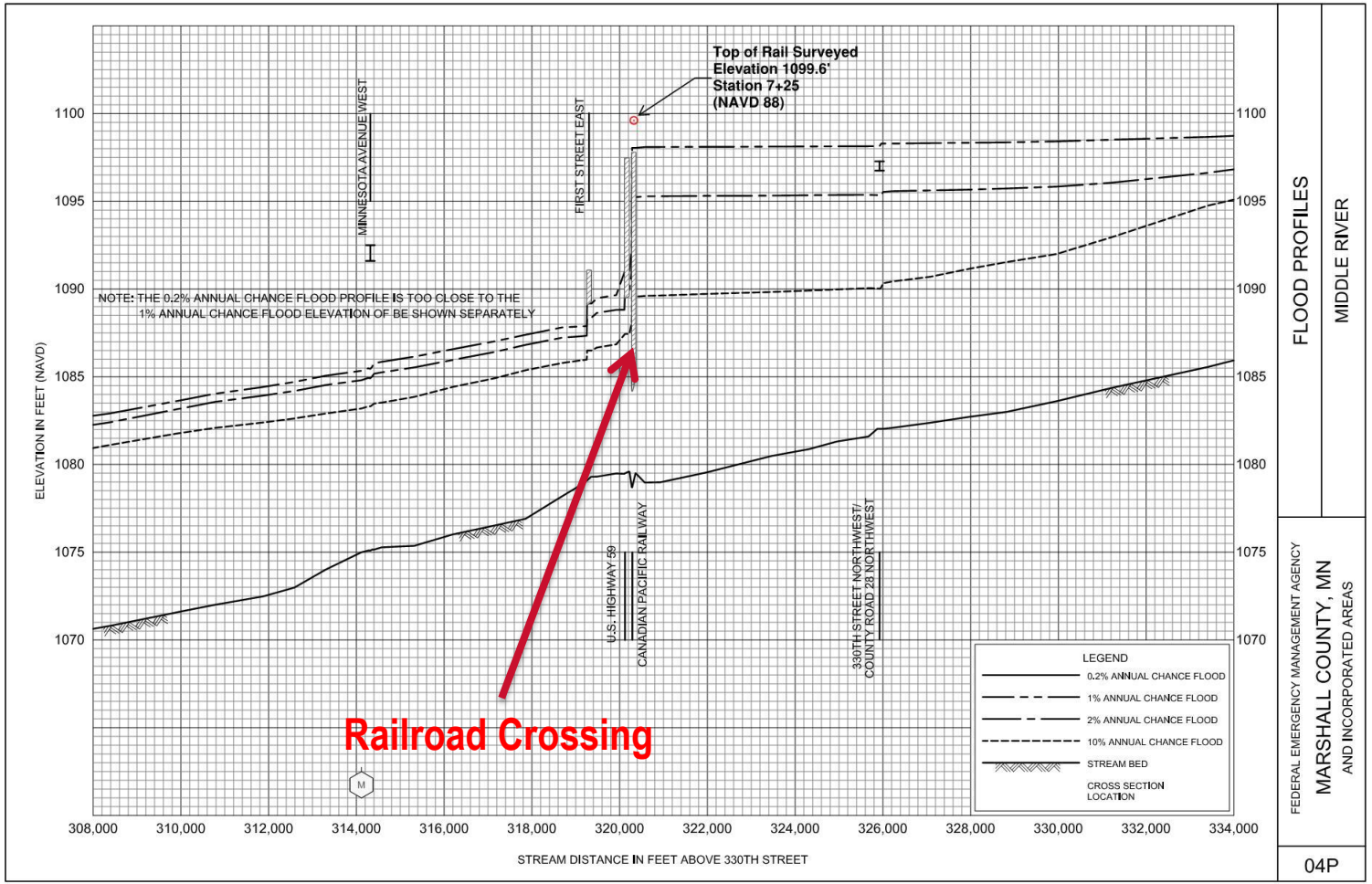
MIDDLE RIVER SUBWATERSHED FEASIBILITY STUDY

POTENTIAL LEVEE ALIGNMENT WITH EXPANDED CITY LIMITS

CONCEPT FEASIBILTY STUDY

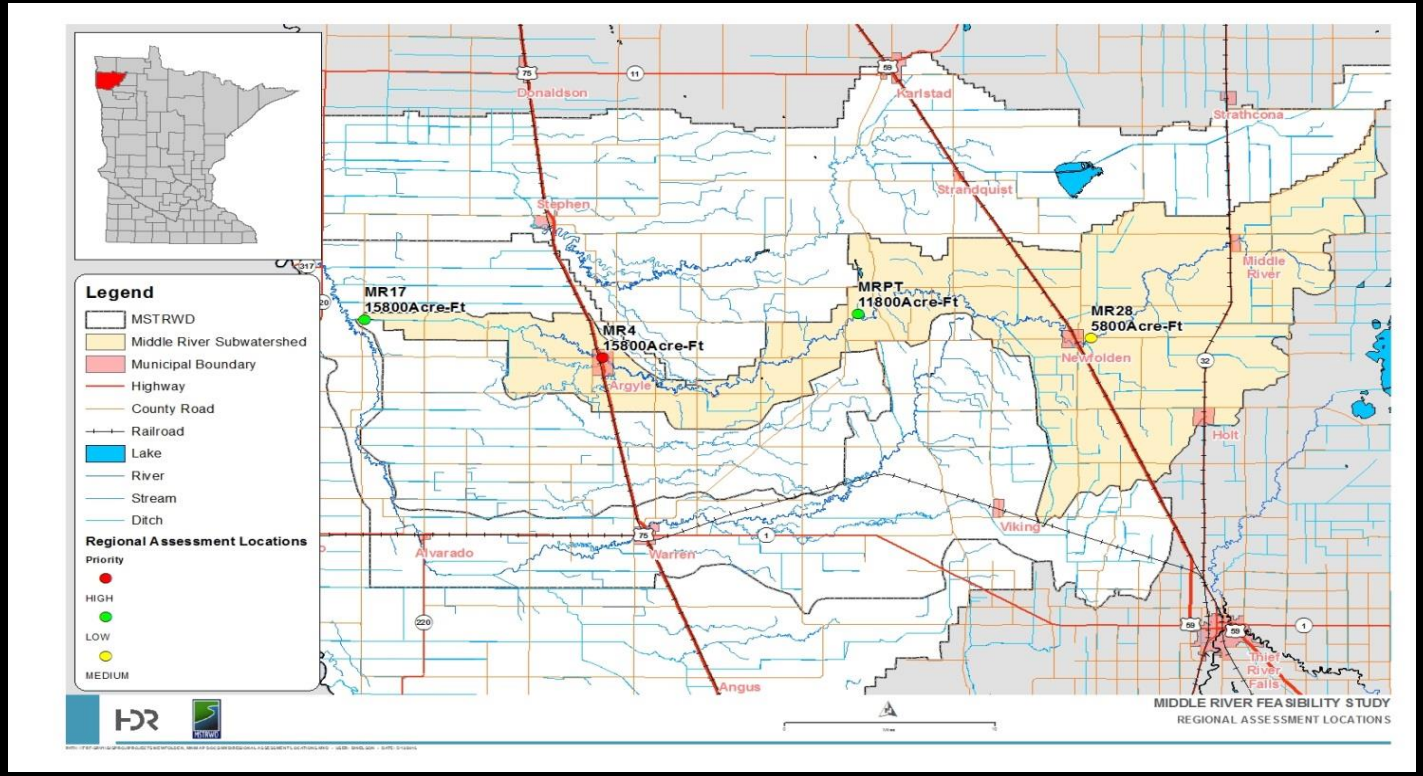
2 – 96” CSP

3 – 66” CSP


Top of Rail Surveyed
Elevation 1099.6'
Station 7+25
(NAVD 88)
MINNESOTA AVENUE WEST
FIRST STREET EAST
NOTE: THE 0.2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION OF BE SHOWN SEPARATELY
U.S. HIGHWAY 59
CANADIAN PACIFIC RAILWAY
330TH STREET NORTHWEST/
COUNTY ROAD 28 NORTHWEST
Railroad Crossing
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
ELEVATION IN FEET (NAVD)
1100
1095
1090
1085
1080
1075
1070
308,000
310,000
312,000
314,000
316,000
318,000
320,000
322,000
324,000
326,000
328,000
330,000
332,000
334,000
STREAM DISTANCE IN FEET ABOVE 330TH STREET
FLOOD PROFILES
MIDDLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
MARSHALL COUNTY, MN
AND INCORPORATED AREAS
04P

EXISTING CONDITIONS VS. PROPOSED RAILROAD ALTERNATIVES

Alternative	Peak WSE at Railroad (FT)	Difference in WSE (FT)	Peak WSE at Hwy 59 (Ft)	Difference in WSE (FT)	Peak WSE at E. 1st St. (Ft)	Difference in WSE (FT)	Peak Flow at Railroad (CFS)
Existing	1098.01	N/A	1092.63	N/A	1089.57	N/A	2612
48" CSP	1097.68	-0.33	1092.49	-0.14	1089.50	-0.07	2579
54" CSP	1097.57	-0.44	1092.52	-0.11	1089.52	-0.05	2587
(2) 48" CSP	1097.28	-0.73	1092.60	-0.03	1089.56	-0.01	2605
(2) 54" CSP	1097.06	-0.95	1092.67	0.04	1089.59	0.02	2622
(3) 9' x 9' Box Culverts	1096.11	-1.9	1092.95	0.32	1089.71	0.14	2689
(5) 9' x 9' Box Culverts	1094.50	-3.51	1093.28	0.65	1089.86	0.29	2764



Red River Basin Commission goal of 20% reduction of peak flows to the Red River

Approximately 15,000 – 16,000 acre-feet of storage needed for the Middle River Subwatershed

Four regional assessment locations within the sub-watershed

Potential Retention Sites Ranking Matrix

Rating Multiplier	3.5		1		0.5		3		4		2.5		2		1.5			
SITE	Drainage Area Captured (Sq. Mi)	Rank	Elevation Drop Across Site (Ft)	Rank	Embankment Height (Ft)	Rank	Acres of Wetlands Impacted	Rank	AC-FT Storage	Rank	Inches of Runoff Captured	Rank	Number of Landowners Affected	Rank	Footprint (Acres)	Rank	Sum	Final Rank
A	22.7	4	10.0	6	12.0	5	27	5	1640.7	6	1.4	8	5	6	411	5	101.0	7
B	20.7	5	10.5	5	12.5	6	4	1	2493.0	3	2.3	4	2	2	463	6	63.5	1
C	62.7	1	11.5	2	13.5	8	6	2	2256.8	4	0.7	10	3	3	622	8	74.5	2
D	33.5	2	11.5	2	13.5	8	65	9	2876.1	2	1.4	7	7	10	642	9	99.0	6
E	25.0	3	6.0	8	8.0	2	50	7	1582.0	8	1.2	9	5	6	581	7	117.5	9
F	19.5	6	11.0	4	13.0	7	8	4	1630.5	7	1.6	6	3	3	293	3	94.0	4
G	9.7	7	9.0	7	11.0	4	6	3	1747.0	5	3.4	2	3	3	292	2	76.5	3
H	8.9	8	17.5	1	19.5	10	467	10	11318.0	1	23.8	1	5	6	1295	10	97.5	5
I	4.5	10	4.5	10	6.5	1	44	6	452.9	10	1.9	5	5	6	134	1	129.5	10
J	7.7	9	6.0	8	8.0	2	52	8	991.4	9	2.4	3	1	1	364	4	116.0	8

Legend	
1	Most Favorable
2	
3	
4	
5	
6	
7	
8	
9	
10	Least Favorable

EXISTING CONDITIONS VS. ADDED DETENTION SITE

Alternative	Peak WSE at Railroad (FT)	Difference in WSE (FT)	Peak WSE at Hwy 59 (Ft)	Difference in WSE (FT)	Peak WSE at E. 1st St. (Ft)	Difference in WSE (FT)	Peak Flow at Railroad (CFS)
Existing	1098.01	N/A	1092.63	N/A	1089.57	N/A	2612
Site B	1095.87	-2.14	1091.21	-1.42	1088.89	-0.68	2266
Site C	1096.16	-1.85	1091.26	-1.37	1088.80	-0.77	2323
Site D	1096.16	-1.85	1091.26	-1.37	1088.80	-0.77	2323
Site F	1097.29	-0.72	1091.90	-0.73	1089.23	-0.34	2440
Site G	1098.01	0.00	1092.62	-0.01	1089.56	-0.01	2612

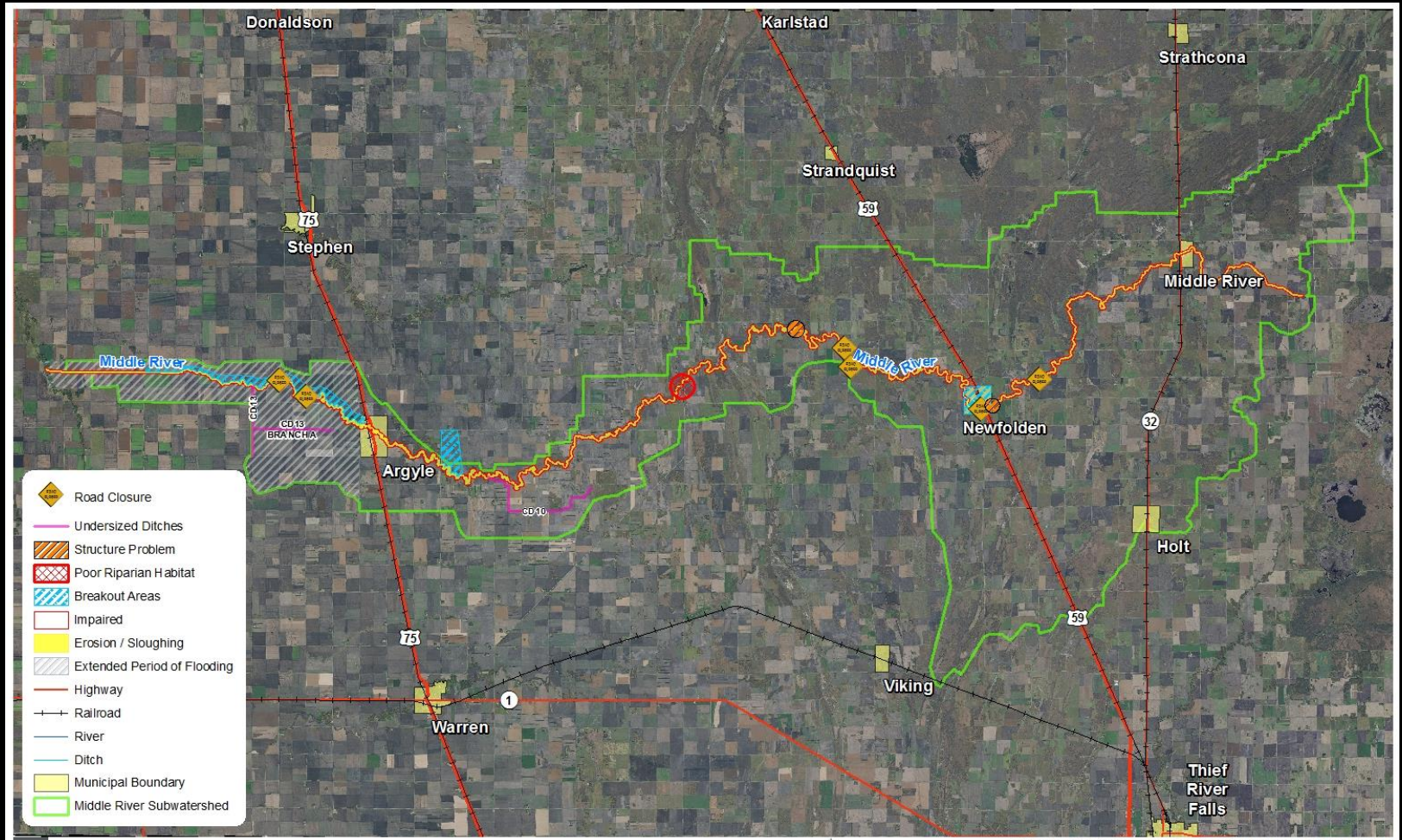
Alternative	Reduces Subwatershed Peak Flows	Reduces Subwatershed Runoff Volume	Decreases WSE at Newfolden	Improves Riparian Habitat	Enhances Water Quality	Benefits Highways	Benefits Railroad
48" CSP	N	N	Y	N	N	N	Y
54" CSP	N	N	Y	N	N	N	Y
(2) 48" CSP	N	N	Y	N	N	N	Y
(2) 54" CSP	N	N	Y	N	N	N	Y
(3) 9' x 9' Box Culverts	N	N	Y	N	N	N	Y
(5) 9' x 9' Box Culverts	N	N	Y	N	N	N	Y
Certified Levee	N	N	N	N	N	N	N
Certified Levee Expanded	N	N	N	N	N	N	N
Diversion Channel	N	N	Y	N	N	Y	Y
Detention Site B	Y	Y	Y	Y	Y	Y	Y
Detention Site C	Y	Y	Y	Y	Y	Y	Y
Detention Site D	Y	Y	Y	Y	Y	Y	Y
Detention Site F	Y	Y	Y	Y	Y	Y	Y
Detention Site G	Y	Y	Y	Y	Y	Y	Y
Detention Site B w/ Culvert Alt.	Y	Y	Y	Y	Y	Y	Y
Detention Site C w/ Culvert Alt.	Y	Y	Y	Y	Y	Y	Y
Detention Site D w/ Culvert Alt.	Y	Y	Y	Y	Y	Y	Y
Detention Site F w/ Culvert Alt.	Y	Y	Y	Y	Y	Y	Y
Detention Site G w/ Culvert Alt.	Y	Y	Y	Y	Y	Y	Y

PROJECT OBJECTIVES TO DEVELOP PURPOSE & NEED

- Remove Newfolden from floodplain and eliminate flood damages
- Minimize flood insurance
- Enhance future development
- Minimize upstream / downstream flooding / impacts
- Improve water quality & natural resources

Problems Identified within the Middle River Subwatershed

- Runoff contribution and timing is excessive from Eastern portion
- Remove or prevent structures in the floodplain (Newfolden)
- Flooding problems throughout the watershed (Extended flooding in Western region)
- Undersized ditch systems
- Insufficient waterway structures
- Impairment of the Middle River for turbidity, dissolved oxygen, fish & aquatic life
- Banks of Middle River are eroding/sloughing
- Base flows too small for fish passage & other habitat needs
- Roads overtop in high water events

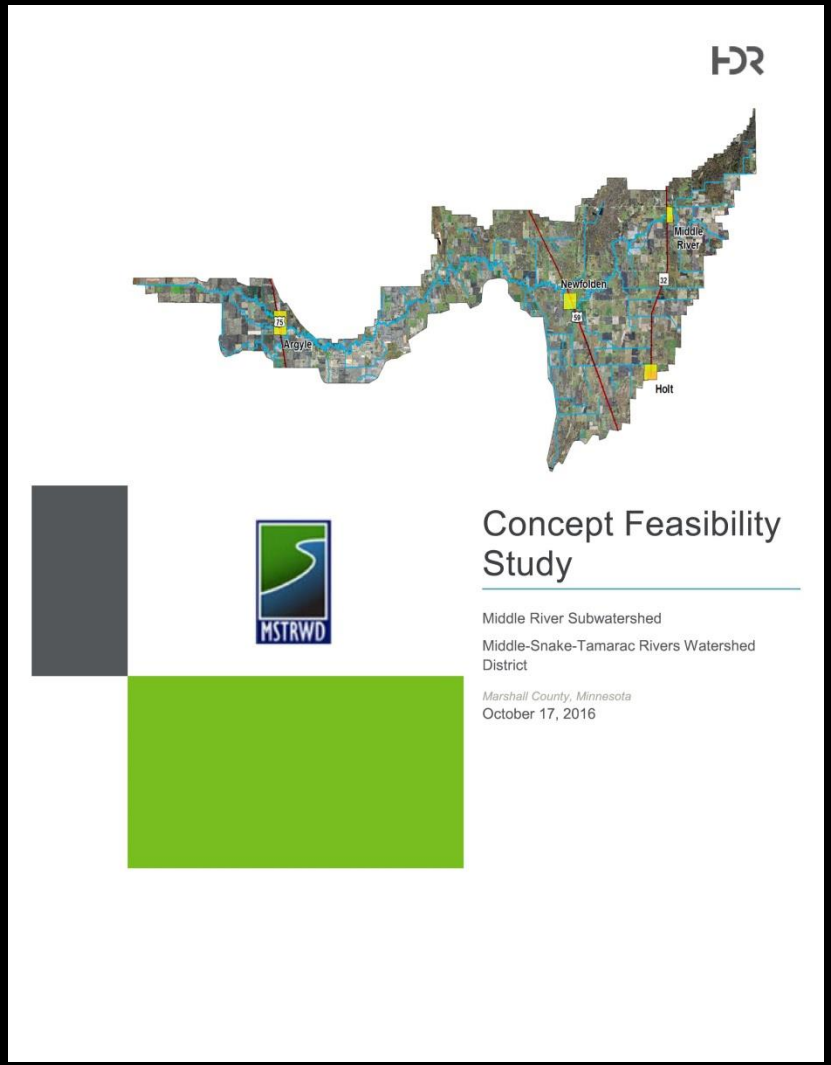


MIDDLE RIVER SUBWATERSHED FEASIBILITY REPORT

KNOWN SUBWATERSHED PROBLEM AREAS

Review Comments From USACE

- Suggested “Removal of Newfolden from the 1% annual chance floodplain”
- Then develop alternatives based on P&N
- USACE would permit alternative that best addresses P&N and also is the Least Environmentally Damaging Practicable Alternative (LEDPA)



PURPOSE

- Remove Newfolden from 1% Annual (100 year) Floodplain

NEED

- ~43 Residences, multiple elevator & seed structures, a church, and apartment building in floodplain
- 10/14 properties surveyed are within ½ foot of the Preliminary BFE of 1098.1’
- Structures within floodplain with federally secured mortgage require flood insurance
- City of Newfolden required to adopt a floodplain ordinance
- Economic & residential expansion will be difficult
- Structures in the floodplain will have less value
- New structures must be built 1.5’ above BFE
- Home additions may not exceed 50% of home value

POTENTIAL PARTNERS

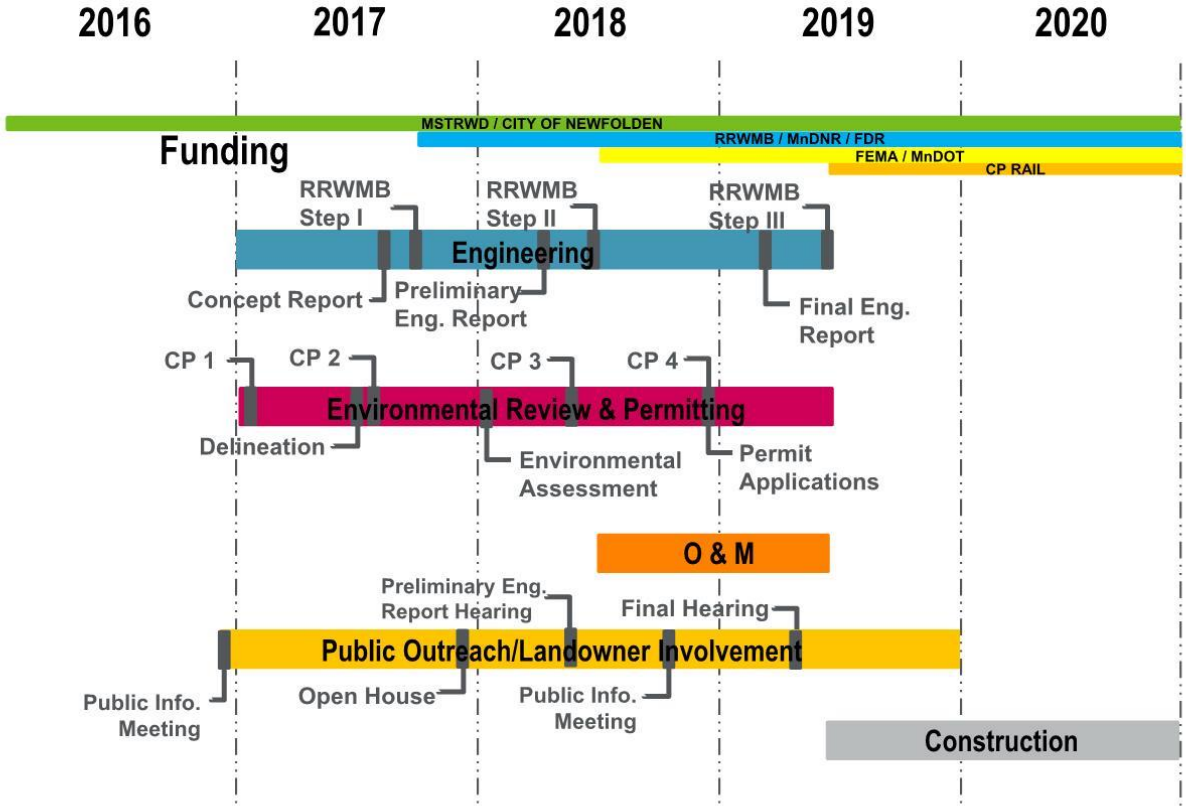
- FEMA – MN HSEM
- RRWMB
- NWRDC (Northwest Regional Development Commision)
- CP Railway
- State of MN – DNR & FDR
- MnDOT
- Marshall County
- Middle-Snake-Tamarac Rivers WD
- City of Newfolden

Petition to Middle Snake Tamarac Rivers Watershed District and Affiliates

Petition summary and background	Many property owners in Newfolden have received notification that they are now in the preliminary stages of being mapped into FEMA's 100 year floodplain. This action is expected to become final in 2017. It is our understanding that, in addition to the risk of flooding, we will be mandated to carry costly flood insurance and will be further limited in terms of how and where our property can be developed. On a larger scale, we recognize that this issue will likely impact Newfolden's future. Our ability to develop, grow, and thrive as a community impacts each resident's current and future investment in Newfolden. It impacts the future of our business community and our school district. The short term and long term consequences of un-mitigated flood risk is a high-priority concern!
Action petitioned for	We, the undersigned, are concerned citizens who urge the leaders of the Middle Snake Tamarac Rivers Watershed District and affiliates to act now to move forward with a Newfolden flood mitigation project. The expertise of the MSRTWD and subsequent relationships with legislators and other critical resources, positions you well to lead this initiative. Please say yes to partnering with the City of Newfolden, coordinating, planning, developing, and bringing to fruition the proposed flood reduction project.

Funding Partners		Potential Funding Partners
FDR	50%	NWRDC
RRWMB	15%	MnDOT
FEMA	10%	Marshall County
MSTRWD	10%	
CP	10%	
City of Newfolden	5%	

Timeline


2016
2017
2018
2019
2020
MSTRWD / CITY OF NEWFOLDEN
RRWMB / MnDNR / FDR
FEMA / MnDOT
CP RAIL
Funding
RRWMB Step I
RRWMB Step II
RRWMB Step III
Engineering
Concept Report
Preliminary Eng. Report
Final Eng. Report
CP 1
CP 2
CP 3
CP 4
Environmental Review & Permitting
Delineation
Environmental Assessment
Permit Applications
O & M
Preliminary Eng. Report Hearing
Final Hearing
Public Outreach/Landowner Involvement
Public Info. Meeting
Open House
Public Info. Meeting
Construction

PROJECT DEVELOPMENT AND NEXT STEPS

- Finalize Scope of Work going forward
- Analyze & screen alternatives
- Begin landowner discussions
- Reach out to potential project partners

Project Understanding and Scope of Services

HDR understands that the Middle-Snake-Tamarac Rivers Watershed District (MSTRWD) is interested in developing a Flood Damage Reduction project of significance, as the MSTRWD works towards removing the City of Newfolden from the 100-year floodplain and resolving chronic flood problems in the region. This scope of work includes tasks and deliverables deemed necessary to complete the alternatives analysis stage of the project. These tasks include the following:

1. Project Management
2. Project Team Meetings and Preparation of Technical Information
3. Development of Alternatives and Updated Feasibility Report

Proposed Action Description

The City of Newfolden is currently home to approximately 400 residents, including several key regional businesses. In 2015, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) performed a Flood Insurance Study (FIS) and developed a draft Flood Insurance Rate Map (FIRM) for Newfolden. In that study, FEMA has mapped many portions of the eastern half of Newfolden in the 1% Annual Chance Floodplain. Upon finalization of the FIS and FIRM, Newfolden will be required to adopt a floodplain ordinance, and all residents with homes and properties located within the floodplain must obtain flood insurance if they hold a federally backed mortgage. These results will make it difficult for the City of Newfolden to develop and prosper. The City of Newfolden is located within the Middle River Subwatershed. With the diverse terrain throughout the subwatershed, flooding occurs yearly and can occur for an extended period of time. Damages from theses floods include infrastructure, agricultural, environmental, and property losses. The water within the Middle River Subwatershed needs to be managed to remove the City of Newfolden from the 1% Annual Chance Floodplain and reduce flood impacts to the region.

The proposed engineering report update will further address the feasibility and potential costs of the Middle River Subwatershed/Newfolden flood reduction feasibility analysis.

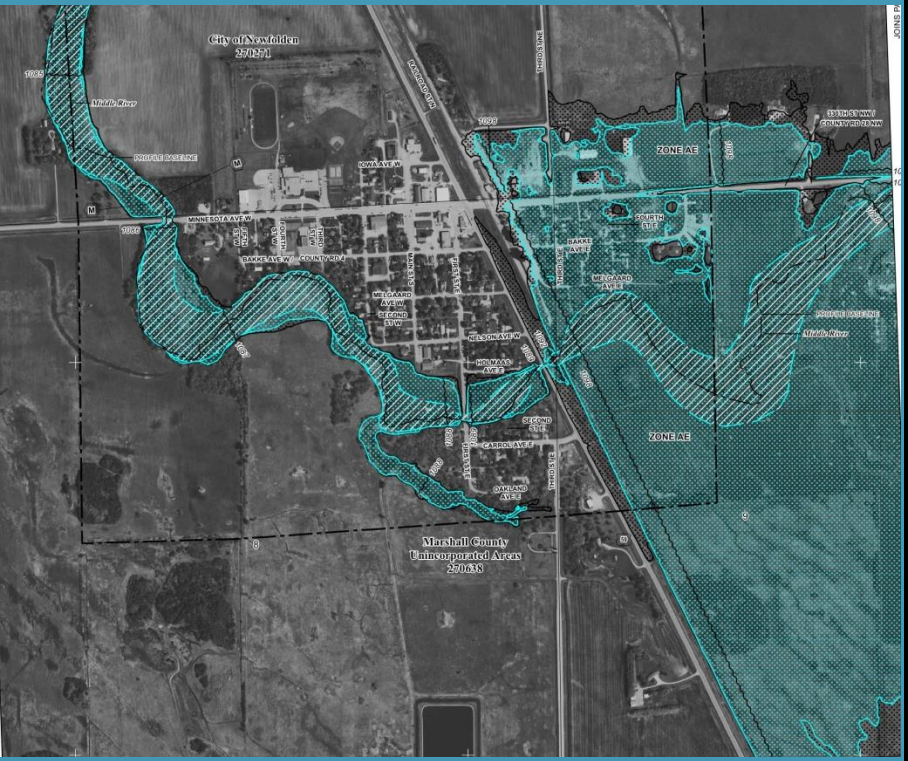
Proposed Project Team

The project team will consist of HDR staff that has experience in developing engineering and environmental documentation in addition to well established relationships with agency experts that will likely be involved in this process. The team may consist of the following staff:

Role	Staff
Client/Project Manager	Nate Dalager, PE
Water Resources Engineers	Matthew Redington, PE Dillon Nelson, EIT Cory Gieseke, EIT Jacob Huwe, EIT Michael Ryan, PE
Design Technician	Randy Knott

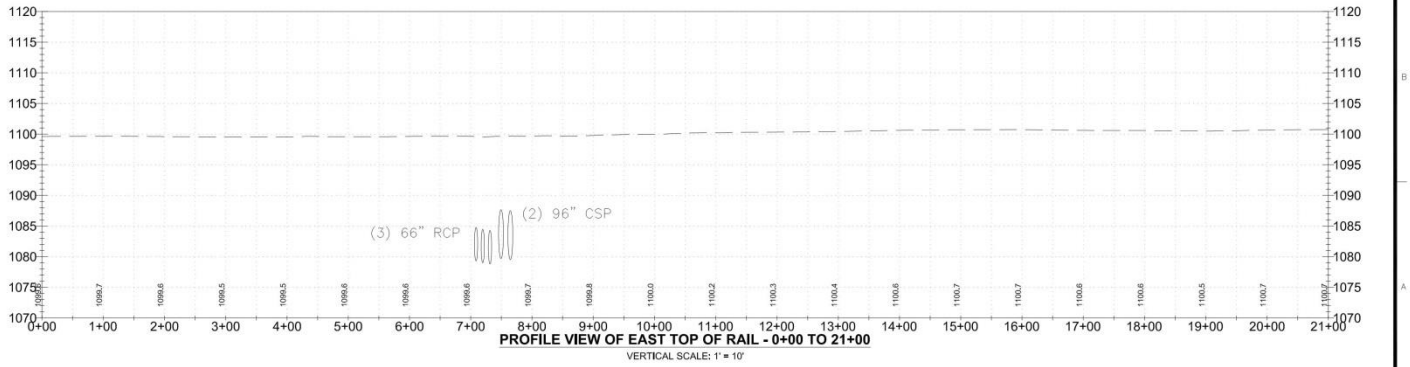
CURRENT MSTRWD DETENTION SITES

Site Name	Year Implemented	Total Stored Volume	Subwatershed
East Park WMA	1975	7,920 Ac-ft	Tamarac River
Florian Park	1975	1,097 Ac-ft	Tamarac River
Angus Oslo Site #1	1983	764 Ac-ft	Angus-Oslo
Angus Oslo Site #4	2001	6,430 Ac-ft	Angus-Oslo
Snake River Off Channel Storage Site	2005	6,460 Ac-ft	Snake River
Agassiz Valley Water Resource Management Project	2010	10,670 Ac-ft	Snake River
Brandt Angus Coulee Impoundment	2013	5,210 Ac-ft	Angus-Oslo



Flood Insurance Study (FIS)

- 14 Elevation certificates requested
- FEMA issued an updated FIRM
- HDR surveyed railroad tracks
- City of Newfolden filed an appeal with FEMA….pending



PROFILE VIEW OF EAST TOP OF RAIL - 0+00 TO 21+00

VERTICAL SCALE: 1" = 10'

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	Nathan P. Dalager
DESIGNED	D. Nelson
DESIGNED	
CHECKED	R. Knott
CHECKED	
DRAWN	D. Nelson
DRAWN	

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

DATE 11/19/2015 REG. NO. 25309

Nathan P. Dalager

CITY OF NEWFOLDEN
PO BOX 188 - 145 EAST FIRST ST.
NEWFOLDEN, MN 56738 (218) 874-7135

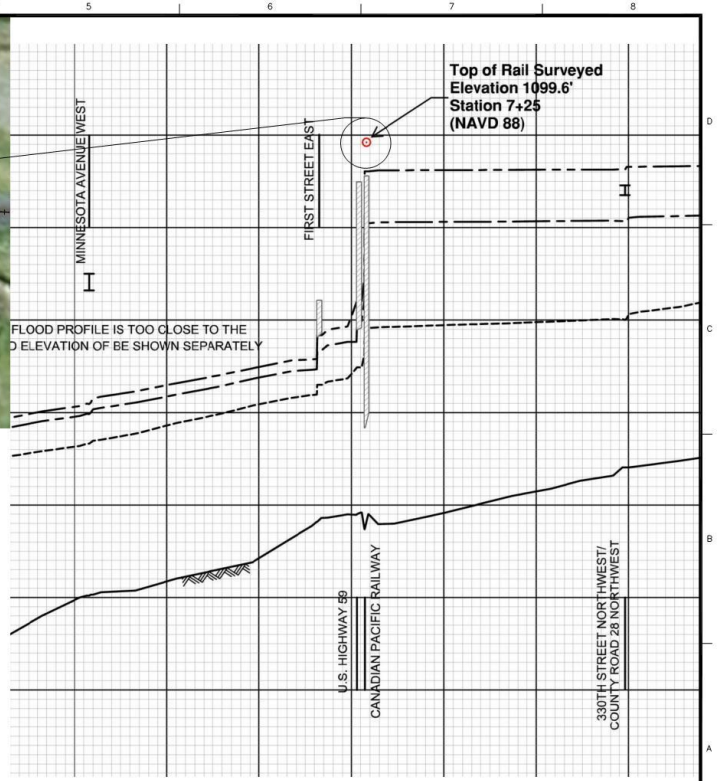
CITY OF NEWFOLDEN, MN

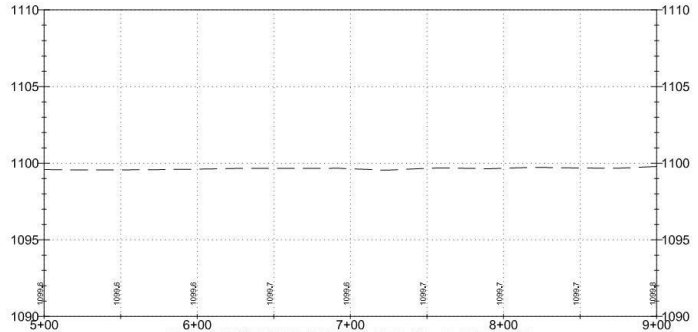
CANADIAN PACIFIC RAILWAY
TOP OF RAIL SURVEY 11-17-16
FIGURE 1-1

0 1/2" 1"

FILENAME

SHEET 1





PROFILE VIEW OF EAST TOP OF RAIL - 5+00 TO 9+00

VERTICAL SCALE: 1" = 10'

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	Nathan P. Dahlger
DESIGNED	D. Nelson
DESIGNED	
CHECKED	R. Knott
CHECKED	
DRAWN	D. Nelson
DRAWN	

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PO BOX 188 - 145 EAST FIRST ST.
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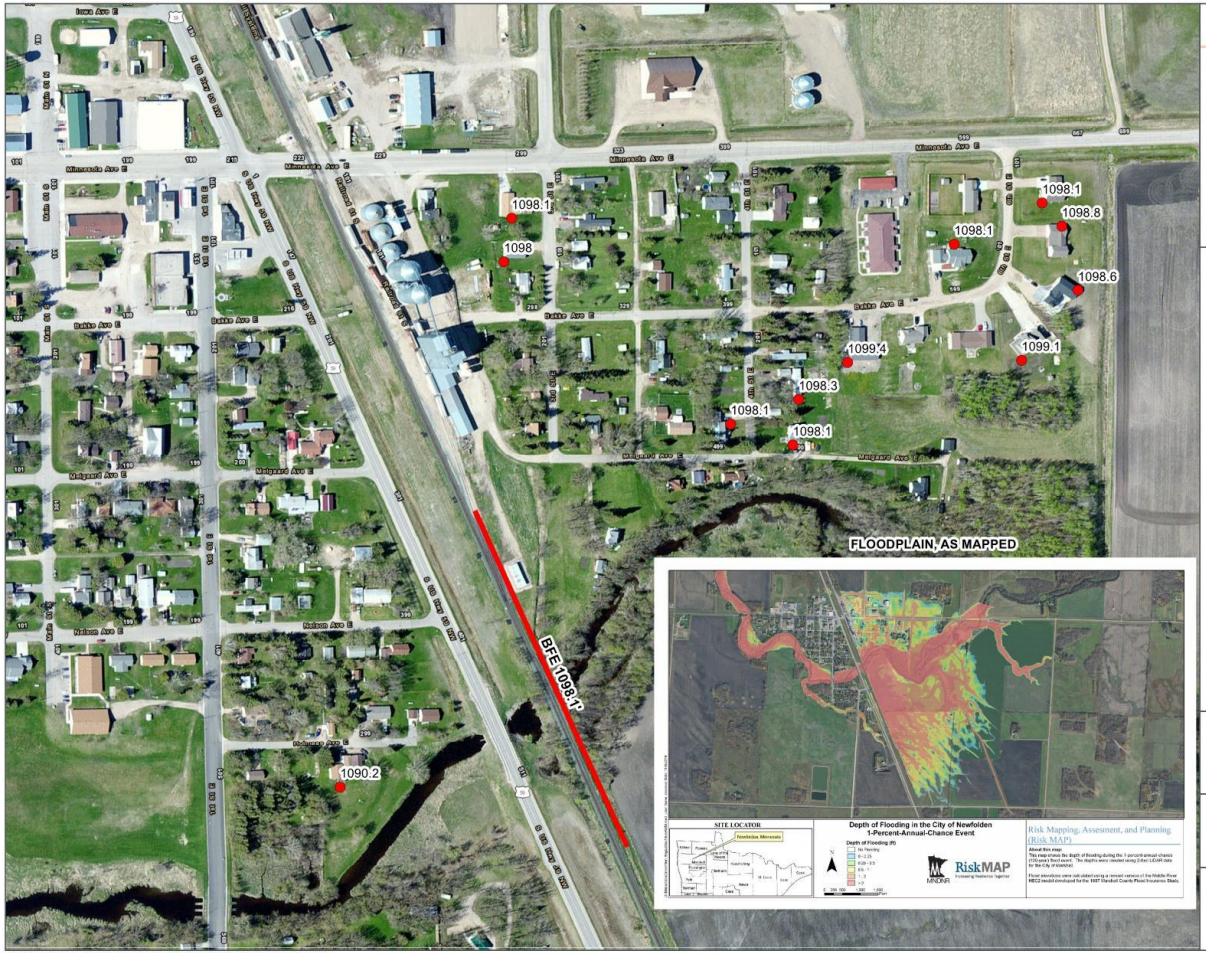
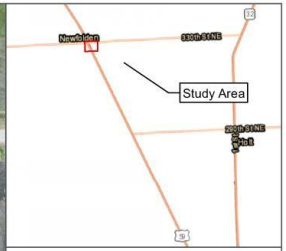
CITY OF NEWFOLDEN, MN

CANADIAN PACIFIC RAILWAY
TOP OF RAIL SURVEY 11-17-16
FIGURE 1-2

FILENAME

SHEET 2





LEGEND

- LAG (Elevation) NAVD 88

0 60 120 240 360 480 Feet

CITY OF NEWFOLDEN, MN

SURVEY
LOWEST ADJACENT GRADE ELEVATIONS

HDR

PATH: Y:\PROJECTS\NEWFOLDEN, MN\MAP DOCS\MXD\HOME FLOOD ELEVATION SURVEY.MXD - USER: JHUNE - DATE: 11/17/2016

Project: Newfolden Project
Proposer: Middle-Snake-Tamarac Rivers Watershed District

Description/Location: The city of Newfolden is located in northwestern Minnesota in Marshall County and lies within the Middle River Subwatershed. The Middle River Subwatershed, as well as Newfolden, has been subject to periodic flooding. A preliminary FEMA Flood Insurance Rate Map and Flood Insurance Study has placed the eastern half of the city in the 1% Annual Chance Floodplain.

The Middle River enters Newfolden from the east and passes through several culverts under the railway. These culverts are insufficient to convey peak flows, resulting in increased flooding east of the tracks and potential failure of the railroad structure under flooding conditions. Having the ability to better manage water levels in the Middle River at the city of Newfolden would meet the stakeholder's desires by providing upstream and downstream flood damage reduction benefits and natural resources enhancements.

Project Benefits:

Flood Control
- Remove Newfolden from the floodplain
- Reduce subwatershed peak volume and flows
- Reduce upstream and downstream agricultural and private land damages
- Reduce risk of road and railroad damages
- Improve hydrologic conditions within the subwatershed

Habitat Restoration
- Protect and/or enhance existing upland, wetland, riparian, and aquatic habitats
- Improve water quality

Erosion Reduction
- Improve stability of watercourses
- Reduce sediment and nutrient loading from upland sources

Partners: Red River Watershed Management Board, State of Minnesota Flood Damage Reduction Program
Estimated Project Cost = $6,000,000
Funding: local (City and RRWMB capped at 2% of Newfolden (156 households x $42,500 median household income x .02 = $132,600) Balance FDR = $5,861,400.
Funding Schedule:

	Prior Years	FY2018 (7/18-6/19)	FY2019 (7/19-6/20)	FY2020 (7/20-6/21)	FY2021
Funding	WD $0.46M WG $0.15M	WD $0.139M FDR $0.336M	FDR $1.000M RB $0.400M	FDR $2.525M	FDR 2.OM
Activity	Project Development, Assessment, Feasibility Study	Final Design, Permitting	Acquisition	Construction Phase I	Construction Phase II

Key: FDR=Flood Damage Reduction Work Group; RB=Red River Watershed Management Board; WD=Watershed District; MWG=Mediation Work Group

ATTENTION PROPERTY OWNERS! FLOOD INSURANCE RATE MAPPING

Newfolden's East Side - proposed 100 year flood plain

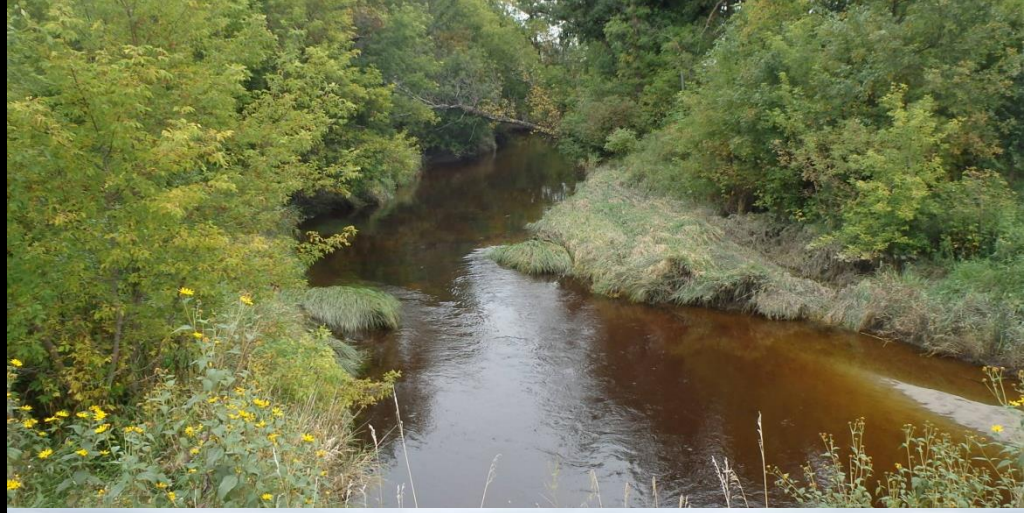
The Department of Homeland Security's Emergency Management Agency (FEMA) has completed a Preliminary Flood Insurance Rate Map (FIRM) and a Flood Insurance Study (FIS) for the City of Newfolden. Up until now, Newfolden did not have flood plain elevation data or floodplain maps. For this reason, Newfolden was not required to adopt a flood-plain ordinance; nor were residents in Newfolden required to carry flood insurance.

The next step in the process has begun. FEMA has published a notice of flood hazard determination and a public notification concerning the appeal process. The end result will be a final Federal Flood Insurance Rate Map, in which base flood elevations are determined and 100 and 500 flood hazard areas are identified. Once this is final, residents with structures in these flood plains, and who have a federally secured mortgage, will be required to obtain flood insurance.

Click HERE to for more QUESTIONS AND ANSWERS for property owners in FEMA's proposed 100 year flood plain

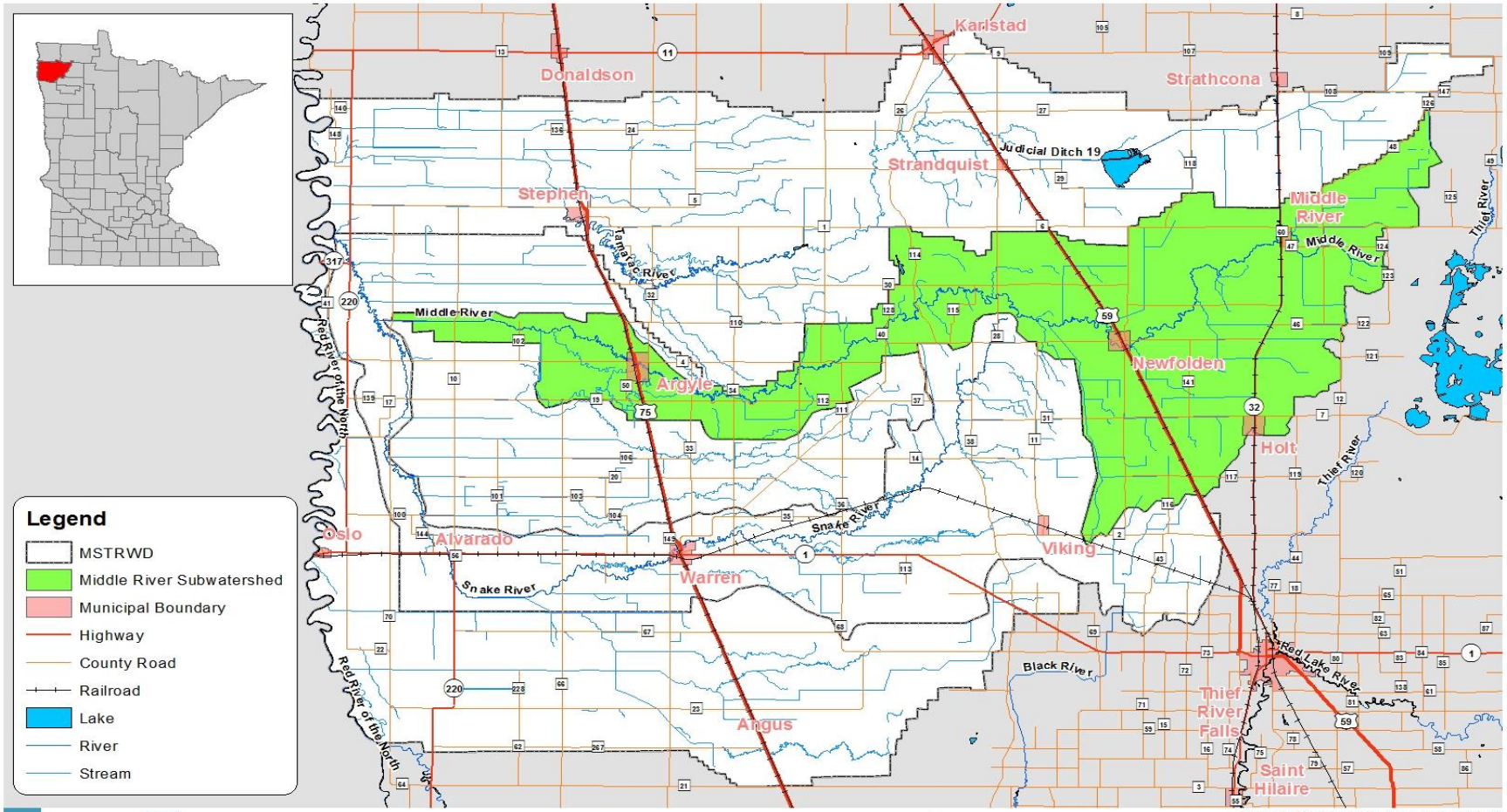
GOALS OF MSTRWD

- Flood Damage Reduction
- Manage Legal Drainage Systems
- Manage Natural Resources & Recreation Areas
- Manage & Improve Water Quality
- Provide Erosion & Sediment Control
- Educate
- Coordinate with Agencies
- Collect & Manage Data



MIDDLE RIVER SUBWATERSHED

- Middle River drainage area is approximately 295 square miles
- River is approximately 98 miles long
- Is a tributary to the Snake River
- Passes through Middle River, Newfolden, Old Mill State Park, and Argyle



MIDDLE RIVER FEASIBILITY STUDY

MIDDLE SNAKE TAMARAC WATERSHED DISTRICT MAP

ALTERNATIVE #1 - #6							
ALTERNATIVE	#	UNITS	TOTAL ESTIMATED QUANTITIES	UNIT COST	SUBTOTAL	CONTINGENCY	TOTAL
48" STEEL CASING PIPE CULVERT .69" MINIMUM WALL THICKNESS (JACK INSTALLED)	1	LF	100	$850.00	$85,000.00	$42,500.00	$127,500.00
54" STEEL CASING PIPE CULVERT .81" MINIMUM WALL THICKNESS (JACK INSTALLED)	2	LF	100	$1,000.00	$100,000.00	$50,000.00	$150,000.00
(2) 48" STEEL CASING PIPE CULVERT .69" MINIMUM WALL THICKNESS (JACK INSTALLED)	3	LF	200	$850.00	$170,000.00	$85,000.00	$255,000.00
(2) 54" STEEL CASING PIPE CULVERT .81" MINIMUM WALL THICKNESS (JACK INSTALLED)	4	LF	200	$1,000.00	$200,000.00	$100,000.00	$300,000.00
(3) 9' X 9' CONCRETE BOX CULVERT	5	LF	300	$1,500.00	$450,000.00	$135,000.00	$585,000.00
(5) 9' X 9' CONCRETE BOX CULVERT	6	LF	500	$1,500.00	$750,000.00	$150,000.00	$900,000.00

SHOO-FLY				
ITEM	UNITS	TOTAL ESTIMATED QUANTITIES	UNIT COST	TOTAL PRICE
Shifted Track	TF	555	$100.00	$55,500.00
New Track	TF	1,795	$350.00	$628,250.00
Relocated Turnout	EACH	1	$90,000.00	$90,000.00
Common Borrow~~Earth Fill~~	CY	45,000	$5.00	$225,000.00
SUBTOTAL				$998,750.00
CONTINGENCY				$199,750.00
TOTAL				$1,198,500.00

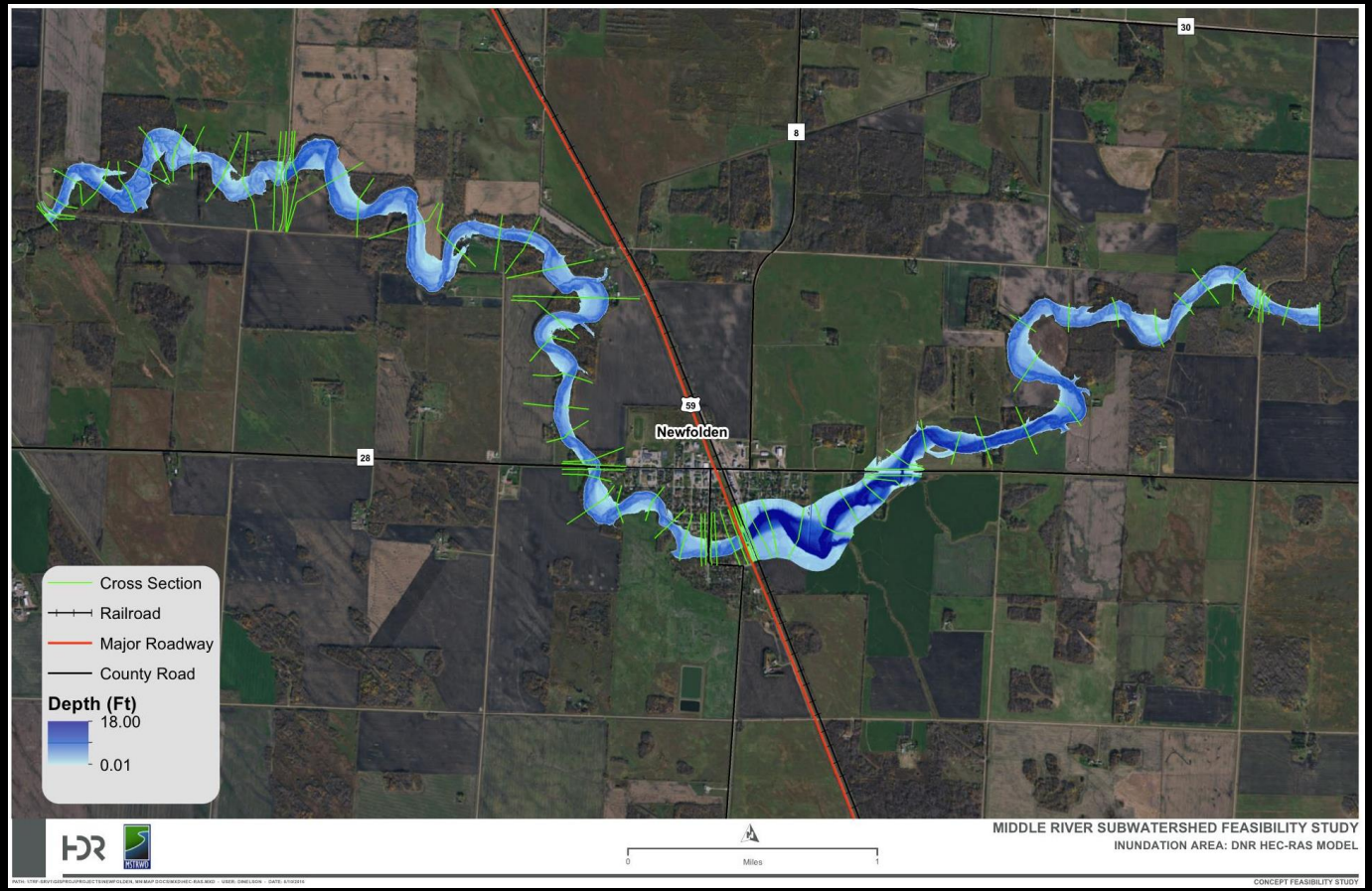
DETENTION SITE					
Item	B	C	D	F	G
IMPOUNDMENT	$4,986,000.00	$4,513,600.00	$5,752,200.00	$3,261,000.00	$3,494,000.00
INLET STRUCTURE	$150,000.00	$150,000.00	$150,000.00	$150,000.00	$150,000.00
OUTLET STRUCTURE	$300,000.00	$300,000.00	$300,000.00	$300,000.00	$300,000.00
SUBTOTAL	$5,436,000.00	$4,963,600.00	$6,202,200.00	$3,711,000.00	$3,944,000.00
CONTINGENCY	$1,087,200.00	$992,720.00	$1,240,440.00	$742,200.00	$788,800.00
TOTAL	$6,523,200.00	$5,956,320.00	$7,442,640.00	$4,453,200.00	$4,732,800.00

LEVEE OPTION 1				
ITEM	UNITS	TOTAL ESTIMATED QUANTITIES	UNIT COST	TOTAL PRICE
COMMON BORROW	CY	24,000	$5.00	$120,000.00
COMMON EXCAVATION	CY	5,700	$2.50	$14,250.00
HOME BUYOUT	EACH	3	$100,000.00	$300,000.00
UTILITY RELOCATION & EASEMENTS	LS	1	$200,000.00	$200,000.00
SUBTOTAL				$634,250.00
CONTINGENCY				$126,850.00
TOTAL				$761,100.00

LEVEE OPTION 2				
ITEM	UNITS	TOTAL ESTIMATED QUANTITIES	UNIT COST	TOTAL PRICE
COMMON BORROW	CY	32,000	$5.00	$160,000.00
COMMON EXCAVATION	CY	7,600	$2.50	$19,000.00
HOME BUYOUT	EACH	3	$100,000.00	$300,000.00
UTILITY RELOCATION & EASEMENTS	LS	1	$200,000.00	$200,000.00
SUBTOTAL				$679,000.00
CONTINGENCY				$135,800.00
TOTAL				$814,800.00

DIVERSION CHANNEL				
ITEM	UNITS	TOTAL ESTIMATED QUANTITIES	UNIT COST	TOTAL PRICE
COMMON EXCAVATION	CY	270,500	$2.50	$676,250.00
INLET STRUCTURE	LS	1	$300,000.00	$300,000.00
HOME BUYOUT	EACH	1	$100,000.00	$100,000.00
UTILITY RELOCATION & EASEMENTS	LS	1	$200,000.00	$200,000.00
SUBTOTAL				$1,276,250.00
CONTINGENCY				$255,250.00
TOTAL				$1,531,500.00

CURRENT MAPPING FROM DNR HEC-RAS MODEL



MAPPING FROM HDR MODIFIED HEC-RAS MODEL