Appendix F
Environmental

Fargo-Moorhead Metropolitan Area Flood Risk Management

Final Feasibility Report and Environmental Impact Statement

July 2011

US Army Corps of Engineers®

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1.0 INTRODUCTION

The purpose of this appendix is to provide supporting information for the feasibility study report and EIS. The information in this appendix includes wetland code definitions, a table indicating types and quantities of wetlands identified within project area using the National Wetland Inventory, a photo log from the wetland delineation completed for this project, water quality data, Farmland Conversion Impact Ratings, mitigation accounting spreadsheet, meeting notes from the natural resource agency meetings, threatened and endangered species information, documentation gathered and used to quantify impacts to floodplain forest, the scoping document and the Wetland Determination Report.

1.1 Wetland Code Definitions

SYSTEMS

[R] Riverine - The Riverine System includes all wetlands and deepwater habitats contained in natural or artificial channels periodically or continuously containing flowing water or which forms a connecting link between the two bodies of standing water. Upland islands or Palustrine wetlands may occur in the channel, but they are not part of the Riverine System.

[P] Palustrine - The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics:

1. are less than 8 hectares (20 acres);

2. do not have an active wave-formed or bedrock shoreline feature;

3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin;

4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

[L] Lacustrine - The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics:

1. situated in a topographic depression or a dammed river channel;

2. lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage.

3. total area exceeds 8 hectares (20 acres).

SUBSYSTEMS

Lacustrine

(2) Littoral - All wetland habitats in the Lacustrine System. Extends from shoreward boundary to 2 meters (6.6 feet) below annual low water or to the maximum extent of nonpersistent emergents, if these grow at depths greater than 2 meters.

Riverine

(2) Lower Perennial - This Subsystem is characterized by a low gradient and slow water velocity. There is no tidal influence, and some water flows throughout the year. The substrate consists mainly of sand and mud. The floodplain is well developed. Oxygen deficits may sometimes occur.

(4) Intermittent - This Subsystem includes channels that contain flowing water only part of the year, but may contain isolated pools when the flow stops.

CLASSES

[FO] Forested - Characterized by woody vegetation that is 6 m tall or taller.

[SS] Scrub-Shrub - Includes areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions.

[SB] Streambed - Includes all wetlands contained within the Intermittent Subsystem of the Riverine System and all channels of the Estuarine System or of the Tidal Subsystem of the Riverine System that are completely dewatered at low tide.

[EM] Emergent - Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

[AB] Aquatic Bed - Includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Aquatic beds generally occur in water less than 2 meters (6.6 feet) deep and are placed in the Littoral Subsystem (if in Lacustrine System).

[UB] Unconsolidated Bottom - Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%.

[US] Unconsolidated Shore - Includes all wetland habitats having three characteristics:

(1) unconsolidated substrates with less than 75% areal cover of stones, boulders, or bedrock;

(2) less than 30% areal cover of vegetation other than pioneering plants; and

(3) any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, seasonal-tidal, temporary-tidal, or artificially flooded. Intermittent or intertidal channels of the Riverine System or intertidal channels of the Estuarine System are classified as Streambed. Landforms such as beaches, bars, and flats are included in the Unconsolidated Shore class.

SUBCLASS

(1) Broad-leaved Deciduous - Woody angiosperms (trees or shrubs) with

relatively wide, flat leaves that are shed during the cold or dry season; e.g., black ash (Fraxinus nigra).

SPECIAL MODIFIER

[x] Excavated - Lies within a basin or channel excavated by man.

WATER REGIME

[A] Temporarily Flooded - Surface water is present for brief periods during growing season, but the water table usually lies well below the soil surface. Plants that grow both in uplands and wetlands may be characteristic of this water regime.

[C] Seasonally Flooded - Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.

[d] Partly Drained - The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes. This modifier is also used to indicate extensive ditch networks in wetlands where, due to the extreme number and narrow width of the ditches, individual delineation is impossible. Individual ditches shall be broken out as linears (with Excavated modifier) when they approximate the pen line width on the photography and if the area is not overly complex.

[F] Semipermanently Flooded - Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

[G] Intermittently Exposed - Surface water is present throughout the year except in years of extreme drought.

[h] Diked/Impounded - Created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. Originally, Diked and Impounded are described as separate modifiers (Cowardin et al. 1979). They have been combined here due to photointerpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits.

[K] Artificially Flooded - The amount and duration of flooding is controlled by means of pumps or siphons in combination with dikes or dams. The vegetation growing on these areas cannot be considered a reliable indicator of water regime. The Artificially Flooded modifier should be used with water and waste-water treatment facilities. Neither wetlands within or resulting from leakage from man-made impoundments, nor irrigated pasturelands supplied by diversion ditches or artesian wells are included under this modifier. Artificially Flooded can be used with any non-tidal water regime. The Artificially Flooded (K) symbol should always be listed before other water regime codes (e.g. PUBKF).

1.2 Total Wetlands Acres Within Project Area

Type	Wetland Code	Acres
Lacustrine, Littoral, Aquatic Bed, Intermittently Exposed, Excavated	L2ABGx	761.44
Lacustrine, Littoral, Unconsolidated bottom, Artificially Flooded, Intermittently Exposed, Excavated	L2UBKGx	91.01
Palustrine, Aquatic Bed, Semipermanently Flooded	PABF	77.25
Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded	PABFh	1.04
Palustrine, Aquatic Bed, Semipermanently Flooded, Excavated	PABFx	26.61
Palustrine, Emergent, Aquatic Bed, Semipermanently Flooded	PEM/ABF	24.28
Palustrine, Emergent, Forested, Broad-Leaved Deciduous, Seasonally Flooded	PEM/FO1C	7.07
Palustrine, Emergent, Forested, Seasonally Flooded	PEM/FOC	28.64
Palustrine, Emergent/Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded	PEM/SS1C	26.34
Palustrine, Emergent/ Unconsolidated Bottom, Semipermanently Flooded	PEM/UBF	2.09
Palustrine, Emergent, Temporarily Flooded	PEMA	163.05
Palustrine, Emergent, Temporarily Flooded, Partially Drained/Ditched	PEMAd	181.92
Palustrine, Emergent, Temporarily Flooded. Excavated	PEMAx	24.83
Palustrine, Emergent, Seasonally Flooded	PEMC	174.59
Palustrine, Emergent, Seasonally Flooded, Partially Drained/Ditched	PEMCd	71.22
Palustrine, Emergent, Seasonally Flooded, Excavated	PEMCx	242.63
Palustrine, Emergent, Semipermanently Flooded	PEMF	69.33
Palustrine, Emergent, Semipermanently Flooded, Partially Drained/Ditched	PEMFd	7.13
Palustrine, Emergent, Semipermanently Flooded, Excavated	PEMFx	32.12
Palustrine, Forested/ Emergent, Seasonally Flooded	PFO/EMC	3.98
Palustrine, Forested, Broad-Leaved Deciduous/ Emergent, Seasonally Flooded	PFO1/EMC	0.55
Palustrine, Forested, Broad-Leaved Deciduous, Temporarily Flooded	PFO1A	7.58
Palustrine, Forested, Broad-Leaved Deciduous, Seasonally Flooded	PFO1C	5.21
Palustrine, Forested, Temporarily Flooded	PFOA	31.53
Palustrine, Forested, Temporarily Flooded, Drained/Ditched	PFOAd	3.20
Palustrine, Forested, Seasonally Flooded	PFOC	10.56
Palustrine, Scrub-Shrub, Emergent, Seasonally Flooded	PSS/EMC	7.17
Palustrine, Scrub-Shrub, Emergent, Seasonally Flooded, Excavated	PSS/EMCx	10.33
Palustrine, Scrub-Shrub, Forested, Seasonally Flooded	PSS/FOC	5.38
Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Emergent, Seasonally Flooded	PSS1/EMC	1.33
Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded	PSS1C	11.41
Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded, Partially Drained/Ditched	PSS1Cd	0.91

Palustrine, Scrub-Shrub, Temporarily Flooded	PSSA	13.25
Palustrine, Scrub-Shrub, Seasonally Flooded	PSSC	2.57
Palustrine, Unconsolidated Bottom, Semipermanently Flooded	PUBF	6.47
Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded	PUBFh	2.97
Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Excavated	PUBFx	21.79
Palustrine, Unconsolidated Bottom, Intermittently Exposed	PUBG	0.31
Palustrine, Unconsolidated Bottom, Intermittently Exposed, Excavated	PUBGx	15.54
Palustrine, Unconsolidated Bottom, Artificially Flooded, Intermittently Exposed, Excavated	PUBKGx	74.71
Riverine, Lower Perennial, Unconsolidated Bottom, Intermittently Exposed	R2UBG	241.53
Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded	R2UBH	2114.90
Riverine, Lower Perennial, Unconsolidated Shore, Temporarily Flooded	R2USA	2.08
Riverine, Lower Perennial, Unconsolidated Shore, Seasonally Flooded	R2USC	2.10
Riverine, Intermittent, Streambed, Semipermanently Flooded	R4SBF	0.69
Riverine, Intermittent, Streambed, Semipermanently Flooded, Excavated	R4SBFx	15.33
Total		4625.97

1.3 Photo Logs

Photo Point 1 – Roadside ditch: west side wet, east side some evidence, but more marginal.

Photo Point 2 – Waterway with drown-out sparsely vegetated close to road.

Photo Point 3 – Drown-out along the south side of CR-16.

Photo Point 4 - Drown-out along the south side of CR-16.

Photo Point 5 - Drown-out along the south side of CR-16.

Photo Point 6 - Drown-out along the south side of CR-16.

Photo Point 7 - Drown-out along the south side of CR-16.

Photo Point 8 - Drown-out along the south side of CR-16.

Photo Point 9 - Drown-out along the south side of CR-16.

Photo Point 10 - Drown-out along the south side of CR-16.

Photo Point 11 - Drown-out along the south side of CR-16.

Photo Point 12 – Ditch along the north side of CR-16.

Photo Point 13 – Road side ditch at the corner of 172nd Ave SE and 49th Street.

Photo point 14 - Road side ditch at the corner of 172nd Ave SE and 49th Street.

Photo Point 15 – Road side ditch and drown out along the south side of 49th Street.

Photo point 16 - Road side ditch and drown out along the south side of 49th Street.

Photo point 17 - Road side ditch and drown out along the south side of 49th Street.

Photo point 18 - Road side ditch and drown out along the south side of 49th Street.

Photo point 19 - Road side ditch and drown out along the south side of 49th Street.

Photo point 20 - Road side ditch and drown out along the south side of 49th Street.

Photo point 21 - Road side ditch and drown out along the south side of 49th Street.

Photo point 22 – Drown-out along the north side of 49th Street, running east-west.

Photo point 23 – Drown-out along the north side of 49th Street.

Photo Point 24 - Road side ditch and drown out along the south side of 49th Street.

Photo Point 25 - Road side ditch and drown out along the south side of 49th Street.

Photo Point 26 – Small pooled wetland area between two farm fields on the north side of 49th Street.

Photo Point 27 – West side of the Wild Rice River from the bridge of 173rd Ave.

Photo Point 28 – Wild Rice River just beyond the tree line, pictured from 173rd Avenue.

Photo Point 29 – Ditches along the east and west side of Highway 29; some areas wet and others not wet.

Photo Point 30 - Ditches along the east and west side of Highway 29; some areas wet and others not wet.

Photo Point 31 - Ditches along the east and west side of Highway 29; some areas wet and others not wet.

Photo Point 32 – Drown-out on the south side of 49th Street.

Photo Point 33 – Ditch with flowing water and wetland fringe on the south side of 49th Street.

Photo Point 34 – Drown-out/swale on the south side of 49th Street.

Photo Point 35 – Drown-out on the east side of unnamed road running adjacent to the east of Highway 29.

Photo Point 36 - Drown-out on the east side of unnamed road running adjacent to the east of Highway 29.

Photo Point 37 - Drown-out on the east side of unnamed road running adjacent to the east of Highway 29.

Photo Point 38 – Drown out on the south side of 49th Street.

Photo Point 39 – Road side ditch and drown-out on the east side of CR-59.

Photo Point 40 – Drown-out on the south side of Highway 4.

Photo Point 41 – unknown depression in distance on the north side of Highway 4.

Photo Point 42 – Drown-out on the south side of Highway 4.

Photo Point 43 – Intermittent stream/drainage on the north side of Highway 4; connects to another larger stream to the north in the distant tree line.

Photo Point 44 - Intermittent stream/drainage on the north side of Highway 4; connects to another larger stream to the north in the distant tree line.

Photo Point 45 - Intermittent stream/drainage on the south side of Highway 4; connects to another larger stream to the north.

Photo Point 46 – Stream/Drainage on the south side of Highway 4; connects to a larger stream to the north.

Photo Point 47 – Stream/Drainage on the north side of Highway 4; connects to a larger stream to the north along the tree line.

Photo Point 48 – Drainage swale on the north side of Highway 4.

Photo Point 49 - Drainage swale on the south side of Highway 4.

Photo Point 50 – Drown-out on the west side of CR-59.

Photo Point 51 – Drown-out on the east side of CR-59.

Photo Point 52 – Intermittent stream draining into the Red River; picture toward the west from CR-59.

Photo Point 53 - Intermittent stream draining into the Red River; picture toward the east from CR-59.

Photo Point 54 – Drown-out on the east side of CR 59.

Photo Point 55 – Large depressional basin on the east side of CR-59; some crop stress apparent.

Photo Point 56 – Large ditch running east; pictured from Highway 75.

Photo Point 57 – Large drainage ditch/intermittent stream running east, draining into the Red River; Picture taken from Highway 75.

Photo Point 58 - Large drainage ditch/intermittent stream running east, draining into the Red River; Picture taken from Highway 75.

Photo Point 59 – Wetland/Intermittent stream draining east into the Red River; Picture take from 173rd Avenue facing east.

Photo Point 60 - Wetland/Intermittent stream draining east into the Red River; Picture take from Highway 29 facing east.

Photo Point 1 – MnRAM site 14-MN-JCD

Photo Point 2 - MnRAM site 14-MN-JCD

Photo Point 3 - MnRAM site 14-MN-JCD

Photo Point 4 – MnRAM site 0-MN-JCD; floodplain forest

Photo Point 5 - MnRAM site 0-MN-JCD; floodplain forest

Photo Point 6 - MnRAM site 0-MN-JCD; floodplain forest

Photo Point 7 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 8 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 9 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 10 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 11 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 12 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 13 - MnRAM site 0-MN-JCD; sugar beet field adjacent to floodplain forest; crop was stunted in areas and leaves were yellowing

Photo Point 14 – Drown-out area off County Road 59

Photo Point 15 – Drown-out area off County Road 59

Photo Point 16 – MnRAM site 11-ND-JCD; Soybean crop showing signs of stress

Photo Point 17 – MnRAM site 11-ND-JCD; Soybean crop showing signs of stress

Photo Point 18 – MnRAM site 12-ND-JCD; open water pond with minimal wetland fringe connecting to Wild Rice River

Photo Point 19 – Ditch and crop stressed drownouts along 49th Street.

Photo Point 20 – Ditch and crop stressed drownouts along 49th Street.

Photo Point 21 – Ditch and crop stressed drownouts along 49th Street.

Photo Point 22 – MnRAM 134-ND-JCD shallow marsh area along 173rd Avenue and Highway 29.

Photo Point 23 – MnRAM 134-ND-JCD shallow marsh area along 173rd Avenue and Highway 29.

Photo Point 24 – MnRAM 8-ND-JCD; wetland in wheat field

Photo Point 25 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 26 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 27 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 28 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 29 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 30 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 31 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 32 – MnRAM 8-ND-JCD;
wetland in wheat field

Photo Point 33 – Ditch and drownouts along 169th Avenue

Photo Point 34 – Ditch and drownouts along 169th Avenue

Photo Point 35 – Ditch and drownouts along 169th Avenue

Photo Point 36 – Ditch and drownouts along 169th Avenue

Photo Point 37 – Ditch and drownouts along 169th Avenue

Photo Point 38 – Ditch and drownouts along 169th Avenue

Photo Point 39 – Ditch and drownouts along 169th Avenue

Photo Point 40 – Ditch and drownouts along 169th Avenue

Photo Point 41 – MnRAM 33-ND-MRB; Arrowhead area near old oxbow

Photo Point 42 – MnRAM 33-ND-MRB; Arrowhead area near old oxbow

Photo Point 43 – MnRAM 33-ND-MRB; Arrowhead area near old oxbow

Photo Point 44 – Ditches and drown outs along multiple areas of the project corridor.

Photo Point 45– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 46– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 47– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 48– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 49– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 50– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 51– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 52– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 53– Ditches and drown outs along multiple areas of the project corridor.

Photo Point 54 – Ditches and drown outs along multiple areas of the project corridor.

Photo Point 1.1 – *168th Ave SE Maple River Bridge Crossing*
Maple River is almost overtopping the bridge, and the surrounding fields are flooded.

Photo Point 1.2 – *168th Ave SE Maple River Bridge Crossing*
Adjacent field to the SE of the Maple River is flooded. Maple River flows just beyond the tree line in the distance.

Photo Point 1.3 – *168th Ave SE Maple River Bridge Crossing*
Maple River is almost overtopping the bridge, and the surrounding fields are flooded. (Facing North)

Photo Point 1.4 – *168th Ave SE Maple River Bridge Crossing*
Maple River is almost overtopping the bridge, and the surrounding fields are flooded. (Facing West)

Photo Point 2.1 – *CR20/33rd Street SE & 167th Ave SE*
Maple River spillway location and Maple River aqueduct location at a distance.

Photo Point 2.2 – *CR20/33rd Street SE & 167th Ave SE*
Maple River spillway location and Maple River aqueduct location at a distance.

Photo Point 2.3 – *CR20/33rd Street SE & 167th Ave SE*
Maple River spillway location and Maple River aqueduct location at a distance.

Photo Point 3.1 – *168th Ave SE & 40th St SE*
Looking at the diversion alignment from a distance, which is adjacent to the existing Sheyenne Diversion. Fields are saturated with water.

Photo Point 3.2 – *168th Ave SE & 40th St SE*
Looking at the diversion alignment from a distance, which is adjacent to the existing Sheyenne Diversion. Fields are saturated with water.

Photo Point 3.3 – *168th Ave SE & 40th St SE*
Looking at the diversion alignment from a distance, which is adjacent to the existing Sheyenne Diversion. Fields are saturated with water.

Photo Point 3.4 – *168th Ave SE & 40th St SE*
Looking at the diversion alignment from a distance, which is adjacent to the existing Sheyenne Diversion. Fields are saturated with water.

Photo Point 4.1 – *168th Ave SE & 42nd St SE*
Looking at the diversion alignment from a distance, which is adjacent to the existing Sheyenne Diversion. Fields are saturated with water.

Photo Point 4.2 – *168th Ave SE & 42nd St SE*
Looking at the diversion alignment from a distance, which is adjacent to the existing Sheyenne Diversion. Fields are saturated with water.

Photo Point 5.1 – *168th Ave SE & 46th St SE*
Existing Sheyenne Diversion; river banks full to top. (South Facing)

Photo Point 5.2 – *168th Ave SE & 46th St SE*
Existing Sheyenne Diversion; river banks full to top.
(Southeast Facing)

Photo Point 5.3 – *168th Ave SE & 46th St SE*
Existing Sheyenne Diversion; river banks full to top.
(Southwest Facing)

Photo Point 5.4 – *168th Ave SE & 46th St SE*
Existing Sheyenne Diversion; river banks full to top. (North Facing)

Photo Point 5.5 – *168th Ave SE & 46th St SE*
Existing Sheyenne Diversion; river banks full to top. (Northwest Facing)

Photo Point 5.6 – *168th Ave SE & 46th St SE*
Existing Sheyenne Diversion; river banks full to top. (Northeast Facing)

Photo Point 6.1 – *CR16/48th St SE & 171st Ave SE*
Looking into Storage Area 1 and diversion alignment.

Photo Point 6.2 – *CR16/48th St SE & 171st Ave SE*
Looking into Storage Area 1; diversion alignment runs adjacent to the south end of the storage area.

Photo Point 7.1 – *CR16/48th St SE & 172nd Ave SE*
Looking into Storage Area 1; diversion alignment runs adjacent to the south end of the storage area.

Photo Point 7.2 – *CR16/48th St SE & 172nd Ave SE*
Looking into Storage Area 1; diversion alignment runs adjacent to the south end of the storage area.

Photo Point 7.3 – *CR16/48th St SE & 172nd Ave SE*
Looking into Storage Area 1; diversion alignment runs adjacent to the south end of the storage area.

1.4 Water Quality Data Collected in 2008/2009

Station_ID	START_DATE	START_TIME	Chloride/Total/ 4500-CL- (E)/mg/l	Dissolved oxygen (DO)/DO PROBE/mg/l	Hardness, carbonate /Total/130 _1/mg/l CaCO3	Nitrogen, ammonia as N/Total/3 50_1/mg/l	Nitrogen, Kjeldahl/T otal/351_ 2/mg/l	Nitrogen, Nitrite (NO2) + Nitrate (NO3) as/Total/3 53_2/mg/l	pH/FLD PH/None	Phosphor us as P/Total/36 5_3/mg/l	Phosphor us, orthophos phate as P/Total/36 5_3/mg/l	Solids, Total Suspen ded (TSS)/S uspend ed/254 0-D/mg/l	Solids, Volatile/S uspended /160_4/m g/l	Specific conductan ce/FLD CONDUCT ANCE/uS/ cm	Stream Physical Appearanc e, Minnesota (choice l/CSMP- CONDSUIT 1/	Stream Recreatio nal Suitability (choice list)/CSMP- CONDSUIT 1/	TD (RP to water)	Sulfur, sulfate (SO4) as SO4/Total /D516/mg /l	Temperat ure, water/FLD TEMP/deg C	Transpare ncy, tube with disk/CSMP TTUBE60/ cm	Transpare ncy, tube with disk/FLD TTUBE120 /cm	Turbidity (NTU)	Turbidity (FNU)
S002-097	11/04/2008	13:55:00	23.8	11.03	454	< 0.04	0.96	1.08	8.19	0.258	0.179	49	9	1069	2.CLOUDY	4.POOR	35.21	298	7.27	16		40.3	29.3
S002-097	12/01/2008	14:41:00	30.8	13.02	524	0.075	0.533	1.26	8.25	0.230	0.182	16	3	1227	2.CLOUDY	3.FAIR	36.33	306	-0.02	31.5		13.5	10.9
S002-097	02/09/2009	10:33:00	26.4	12.14	356	0.141	1.19	1.53	7.93	0.273	0.241	6	4	820	1A.CLEAR	2.GOOD		163	0.27		98	5.38	4.8
S002-097	03/03/2009	10:37:00	23.5	12.97	359	0.081	0.788	1.45	7.81	0.259	0.226	6	2	769	1A.CLEAR	2.GOOD		129	0.39		75	5.12	5.6
S002-097	03/24/2009	16:35:00					1.9	0.22		0.499	0.048	326	34		3.MUDDY	4.POOR						243	
S002-097	03/26/2009	15:40:00		4.51			2.05	0.32	7.75	0.389	0.041	296	46	283	3.MUDDY	5.VERY POOR			0.16	3		275	198.9
S002-097	03/29/2009	11:58:00		7.98			1.38	0.6	7.97	0.304	0.098	164	24	289	3.MUDDY	4.POOR			0.88	4		174	135.8
S002-097	04/02/2009	13:42:00	13.6	10.02	190	< 0.04	1.26	0.73	7.92	0.273	0.113	114	19	407	3.MUDDY	5.VERY POOR		104	1.01	5.5		112	84.1
S002-097	04/03/2009	11:00:00					1.05	0.72		0.277	0.121	107	16		3.MUDDY	4.POOR				6.5		102	
S002-097	04/05/2009	12:45:00		10.24			1.15	0.68	7.90	0.277	0.130	109	16	468	3.MUDDY	4.POOR			2.22	6.5		100	72.9
S002-097	04/05/2009	12:46:00					1.27	0.67		0.282	0.126	113	15									96.6	
S002-097	04/05/2009	12:46:00		10.28					7.84					469	3.MUDDY	4.POOR			2.20	6.5			74.3
S002-097	04/07/2009	08:57:00		10.69			1.25	0.72	8.18	0.303	0.132	134	21	499	3.MUDDY	4.POOR			2.38	7.5		117	80.7
S002-097	04/09/2009	09:32:00		10.75			1.29	0.65	7.86	0.306	0.146	141	17	537	3.MUDDY	5.VERY POOR			3.71	7		118	86.6
S002-097	04/13/2009	09:00:00		9.61			1.19	0.54	7.86	0.301	0.137	120	12	499	3.MUDDY	4.POOR			6.74	8.5		103	78.3
S002-097	04/15/2009	10:20:00		8.16			1.19	0.23	7.62	0.269	0.096	112	15	426	3.MUDDY	5.VERY POOR			7.53	8.5		95	72.2
S002-097	04/17/2009	08:29:00		8.68			1.04	0.15	7.73	0.233	0.092	74	8	432	2.CLOUDY	4.POOR			9.28	12.5		64.3	51.4
S002-097	04/20/2009	09:17:00		9.05			1.11	0.15	7.98	0.226	0.115	57	11	519	2.CLOUDY	4.POOR	10.07		10.26	14		49.9	40.9
S002-097	04/23/2009	13:40:00		9.27			1.23	0.27	7.96	0.259	0.130	76	11	602	3.MUDDY	4.POOR	10.96		10.27	10		68.3	51
S002-097	04/27/2009	10:01:00		9.72			1.15	0.15	8.09	0.244	0.109	93	13	633	3.MUDDY	4.POOR	12		9.30	8		84.2	65.5
S002-097	04/30/2009	14:04:00		9.74			1.05	0.07	8.06	0.223	0.112	70	10	672	2.CLOUDY	4.POOR	13.4		9.53	11.5		62.1	48.2
S002-097	05/05/2009	09:48:00		9.33			0.877	0.1	8.16	0.210	0.115	54	8	774	2.CLOUDY	4.POOR	17.12		12.04	14.5		47.6	39
S002-097	05/07/2009	10:09:00	17.6	8.79	331	0.074	1	0.09	8.18	0.215	0.113	61	5	780	2.CLOUDY	4.POOR	18.83	201	13.39	11.5		80.2	40.7
S002-097	05/12/2009	09:20:00		8.88			0.918	0.25	8.15	0.224	0.136	72	10	786	2.CLOUDY	4.POOR	22.58		13.35	12		57.3	46.5
S002-097	05/14/2009	10:17:00		9.25			1.05	0.21	8.23	0.215	0.122	74	< 5	778	3.MUDDY	4.POOR	23.2		13.57	12.5		54.9	49.8
S002-097	05/18/2009	13:32:00		9.22			0.852	0.23	8.22	0.206	0.111	79	9	828	2.CLOUDY	4.POOR	24.53		14.01	11.5		52.5	47.3
S002-097	05/20/2009	09:22:00		9.18			0.881	0.18	8.27	0.204	0.106	91	16	815	2.CLOUDY	4.POOR	25.37		14.79	12		63.3	50
S002-097	05/27/2009	11:14:00		8.18			0.825	0.45	8.12	0.280	0.125	142	13	799	3.MUDDY	4.POOR	29.05		16.51	9.5		95.7	79.4
S002-097	05/28/2009	10:03:00		8.34			1.22	0.53	8.17	0.297	0.136	153	14	790	3.MUDDY	4.POOR	29.03		16.86	8.5		96.5	82.5
S002-097	06/01/2009	13:21:00		8.14			1.16	0.56	8.13	0.297	0.129	172	16	823	3.MUDDY	4.POOR	30.26		17.98	9		111	87.2
S002-097	06/04/2009	10:09:00	18.0	8.30	358	< 0.04	1.131	0.35	8.24	0.287	0.121	157	14	785	3.MUDDY	4.POOR	31.33	181	18.53	8.5		101	81.6
S002-097	06/04/2009	10:10:00	18.2		364	< 0.04	1.194	0.35		0.293	0.120	159	14					168				98.6	
S002-097	06/04/2009	10:10:00		8.24					8.22					784	3.MUDDY	4.POOR	31.36		18.54	8.5			82.4
S002-097	06/08/2009	12:59:00		8.67			1.12	< 0.02	8.27	0.244	0.107	98	8	755	3.MUDDY	4.POOR	32.94		15.87	12		68.4	53.1
S002-097	06/11/2009	11:16:00		9.34			1	0.46	8.29	0.232	0.120	84	10	683	2.CLOUDY	4.POOR	33.32		15.87	11.5		55.1	46.8
S002-097	06/15/2009	13:53:00		8.56			1.17	0.36	8.29	0.240	0.102	18	11	650	2.CLOUDY	4.POOR	33.82		19.86	12		72.4	60.9
S002-097	06/17/2009	20:28:00		8.05			0.954	0.45	8.27	0.277	0.104	150	14	628	3.MUDDY	4.POOR	32.44		20.22	11.5		80.3	71.8
S002-097	06/18/2009	14:26:00		7.36			1.66	0.8	8.20	0.536	0.106	532	29	773	3.MUDDY	5.VERY PO	27.93		20.03	4		349	260.6
S002-097	06/19/2009	08:45:00		6.26			2.66	3.94	7.91	0.762	0.224	672	52	372	3.MUDDY	5.VERY PO	25.1		19.04	2.5		539	436.1
S002-097	06/22/2009	13:19:00		5.37			1.36	2.45	7.74	0.412	0.212	152	19	406	3.MUDDY	4.POOR	19.28		21.72	5		186	150
S002-097	06/24/2009	09:32:00		5.20			1.22	1.72	7.74	0.330	0.225	71	6	506	3.MUDDY	4.POOR	18.62		22.54	9.5		71.8	63.4
S002-097	06/26/2009	10:20:00		5.23			1.22	1.2	7.68	0.358	0.270	58	5	593	2.CLOUDY	4.POOR	20.25		22.64	13		58.7	50.1
S002-097	06/29/2009	15:41:00		5.77			1.48	0.69	7.83	0.437	0.271	172	16	754	3.MUDDY	5.VERY PO	25.57		22.61	7		116	110.2
S002-097	07/09/2009	15:21:00	19.4	6.65	403	0.068	1.37	0.6	8.05	0.426	0.206	261	22	838	3.MUDDY	5.VERY PO	33.43	201	24.27	6		173	134.7
S002-097	07/21/2009	10:52:00		7.20			1.11	0.8	7.90	0.370	0.172	172	19	551	3.MUDDY	4.POOR	32.36		20.37	6		149	115.4
S002-097	07/29/2009	14:36:00		7.51			1.02	0.4	8.16	0.264	0.119	145	10	732	3.MUDDY	4.POOR	36		23.09	9		102	87.1
S002-097	08/12/2009	10:06:00	16.8	7.52	279	< 0.04	0.968	0.59	8.26	0.300	0.169	108	12	603	2.CLOUDY	4.POOR	37.24	111	22.98	9		88.9	73.2
S002-097	08/12/2009	10:07:00	16.4		283	< 0.04	0.872	0.58		0.296	0.162	109	11					108				88	
S002-097	08/12/2009	10:07:00		7.46					8.26					603	2.CLOUDY	4.POOR	37.2		22.97	9.5			71.5
S002-097	08/26/2009	11:49:00		8.25			0.734	0.71	8.31	0.306	0.206	71	6	589	2.CLOUDY	4.POOR	37.03		21.31	9.5		62.3	47.3
S002-097	09/16/2009	10:06:00	18.4	7.86	250	< 0.04	0.92	0.93	8.36	0.346	0.239	80	10	577	2.CLOUDY	4.POOR	38.4	95.8	21.63	14.5		64.7	51.6
S002-097	10/05/2009	09:20:00	20.4	10.09	332	0.091	0.963	0.68	8.40	0.308	0.152	185	15	668	3.MUDDY	5.VERY PO	34.13	142	11.16	8		122	102.8
S002-097	10/07/2009	15:15:00		9.78			1.82	1.83	7.98	0.500	0.278	247	22	767	3.MUDDY	5.VERY PO	34.29		9.89	6		192	150.8
S002-097	10/09/2009	09:44:00		10.18			1.42	1.52	8.22	0.400	0.245	152	16	846	3.MUDDY	5.VERY PO	33.69		8.66	8		112	93.8
S002-097	10/26/2009	12:02:00		10.30					7.95					966	3.MUDDY	5.VERY PO	30.44		5.87	6			156.2

Prime and Unique Farmland Summary as of 7-March 2011

Prime and Unique Farmland would be the following:

FCP = 5,668 for diversion and an additional 872 acres for the tie back levee, for a total of acres = 6540.

LPP = 5,500 for diversion and an additional 214 acres for the Cty 17 tie back levee, and an additional 434 for the eastern tie-back levee and an additional 730 for the perimeter of the storage area for a total of 6,878 acres.

ND35K = 5,455 for the diversion and an additional 434 acres for the tie-back levees, for a total of 5,889.

March 7, 2011

Mr. Terry Birkenstock
Chief, Environmental and GIS Branch
US Army Corps of Engineers
190 East 5th St, Suite 401
St Paul, MN 55101

Subject: Form AD-1006
RE: Farmland Conversion Impact Rating for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Dear Mr. Birkenstock,

The NRCS portion of the AD-1006 “Farmland Conversion Impact Rating” for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project has been completed as requested. I changed the acreage figures for Sites A and C on the form per phone conversation with Jonathan Sobiech. Please send me a copy of the form when it is completed.

Should you have any questions concerning the AD-1006 please contact me at 701-252-1460, extension 115.

Sincerely,

FREDERICK P. AZIZ
Area Resource Soil Scientist

Enclosure

cc: Steven Seiler, State Soil Liaison, NRCS, Bismarck, ND
Lee Voigt, Acting DC, NRCS, Fargo, ND
Stuart N. Blotter, ASTC (FO), NRCS, Jamestown, ND
Jonathan Sobiech, Forester, US, ACE, St Paul, MN

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*

Date Of Land Evaluation Request 2/19/11

Name Of Project Fargo Moorhead Metro Flood Risk Reduction

Federal Agency Involved US Army Corps of Engineers

Proposed Land Use Diversion Channel

County And State Cass, North Dakota

PART II *(To be completed by NRCS)*

Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland?
(If no, the FPPA does not apply -- do not complete additional parts of this form).
Yes ☑ No ☐

Acres Irrigated 8745

Average Farm Size 830

Major Crop*(s)* Soybeans, Corn

Farmable Land In Govt. Jurisdiction
Acres: 1,084,302 % 97

Amount Of Farmland As Defined in FPPA
Acres: 925,155 % 83

Name Of Land Evaluation System Used Cass County LE

Name Of Local Site Assessment System None

Date Land Evaluation Returned By NRCS 3/7/11

	Maximum Points	Alternative Site Rating			
PART III *(To be completed by Federal Agency)*		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		6,556.0	224.0	820.0	
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		6,556.0	224.0	820.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		5,500.1	214.7	729.8	
B. Total Acres Statewide And Local Important Farmland		31.2	0.0	0.0	
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.0	0.0	0.0	
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		53.3	53.3	53.3	
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		85	89	84	
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		15	15	15	
2. Perimeter In Nonurban Use		10	10	10	
3. Percent Of Site Being Farmed		20	20	20	
4. Protection Provided By State And Local Government		0	0	0	
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average		10	10	10	
8. Creation Of Nonfarmable Farmland		5	5	5	
9. Availability Of Farm Support Services		3	3	3	
10. On-Farm Investments		5	5	5	
11. Effects Of Conversion On Farm Support Services		5	5	5	
12. Compatibility With Existing Agricultural Use		0	0	0	
TOTAL SITE ASSESSMENT POINTS	160	73	73	73	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	85	89	84	
Total Site Assessment *(From Part VI above or a local site assessment)*	160	73	73	73	0
TOTAL POINTS *(Total of above 2 lines)*	260	158	162	157	0

Site Selected:

Date Of Selection

Was A Local Site Assessment Used?
Yes ☐ No ☒

Reason For Selection:

(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)

1.5 Farmland Conversion Impact Rating for North Dakota Diversion Alternative

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
SIBLEY SQUARE AT MEARS PARK
190 FIFTH STREET EAST, SUITE 401
ST. PAUL MN 55101-1638

December 7, 2009

Regional Planning and Environmental Division North
Environmental and GIS Branch

SUBJECT: Farmland Conversion Impact Rating for Alternatives for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Mrs. Sharon Lean
Natural Resources Conservation Service
U.S. Department of Agriculture
1615 30th Avenue South
Moorhead, Minnesota 56560

Dear Mrs. Lean:

The St. Paul District, U.S. Army Corps of Engineers, is working on a flood risk management feasibility report for the Fargo, North Dakota, and Moorhead, Minnesota, metropolitan area. Several alternatives that would divert floodwaters around the cities have been studied, including diversion channels on the Minnesota side and the North Dakota side of the Red River.

The proposed diversion channels would be constructed through farmland. We have not selected an alternative yet, but we would like to submit the four leading alternatives for review in the Farmland Conversion Impact Rating. I have attached Form AD-1006, which includes the four alternatives on the Minnesota side. I have sent a similar package to Mr. Keith Weston of the Natural Resources Conservation Service in Fargo that includes four alternatives for diversions on the North Dakota side. I have attached the project fact sheet and an area map highlighting the proposed alternatives.

Site A represents the Minnesota Short Diversion Alternative built to a size that would pass 25,000 cubic feet per second (cfs), Site B represents the alternative that would pass 35,000 cfs, Site C represents the same diversion alternative but designed to pass 45,000, and Site D represents the tie-back levee for the North Dakota diversion channel.

If you have any questions or need further information, please call Jonathan Sobiech at (651) 290-5428.

Sincerely,

for
Terry J. Birkenstock
Chief, Environmental and GIS Branch

3 Enclosures

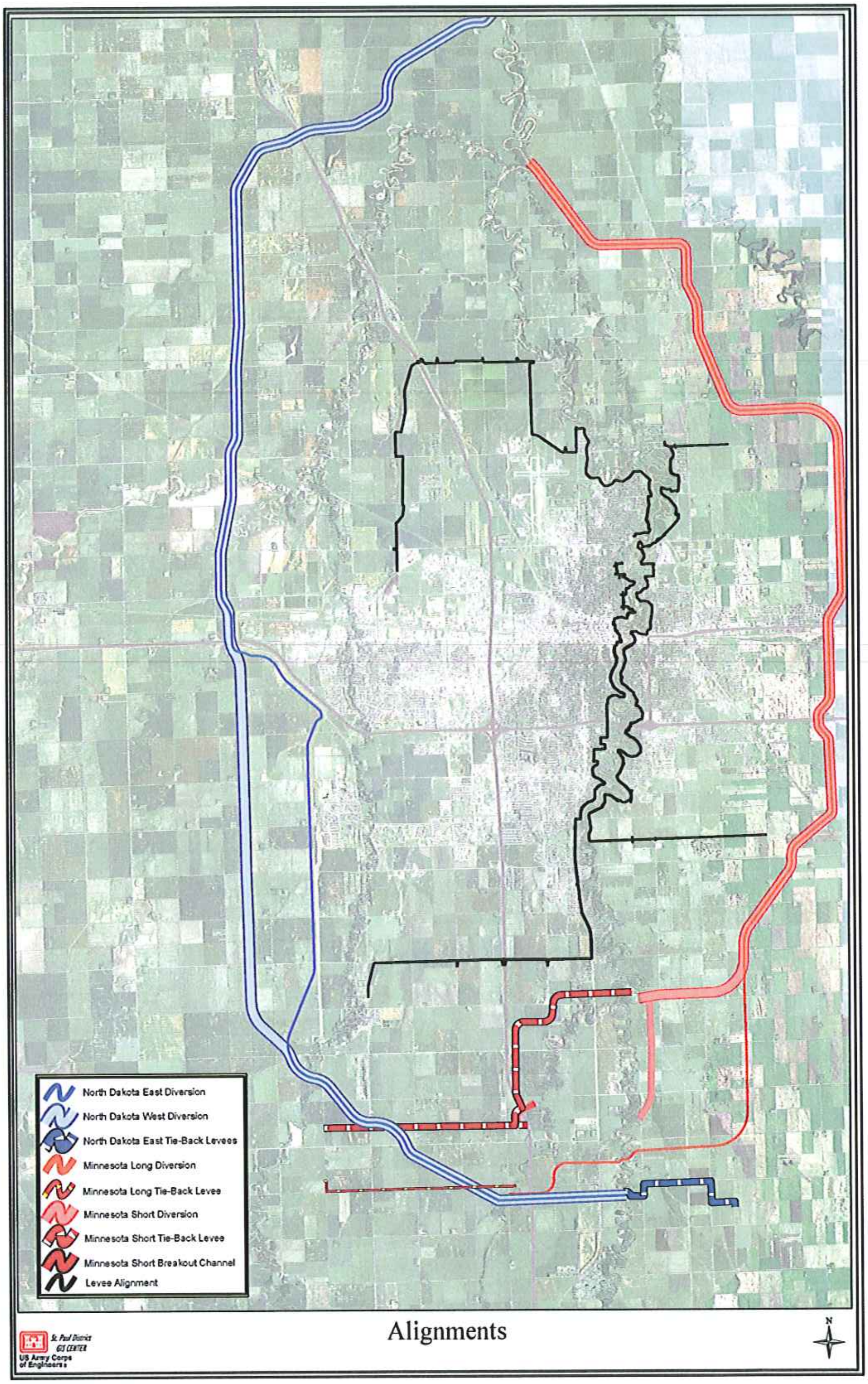

Figure 1. Diversion and levee alignments.

Army Corps of Engineers Centre, 190 Fifth Street East, St. Paul, MN 55101-1638

US Army Corps of
Engineers
St. Paul District

Flood Risk Management: Fargo-Moorhead Metro, North Dakota and Minnesota

Location/Description

An emergency levee protects the city at Second Street during the 2009 flood.

Fargo, North Dakota, and Moorhead, Minnesota, are on the west and east banks, respectively, of the Red River of the North approximately 150 miles south of the Canada/United States border. In addition to the Red River, the Wild Rice, Sheyenne, Maple and Rush Rivers in North Dakota and the Buffalo River in Minnesota also cross the study area.

Background

The Fargo-Moorhead metropolitan area is a major health, educational, cultural, and commercial center serving southeastern North Dakota and west-central Minnesota. The area is prone to flooding; the Red River has exceeded flood stage in 50 of the past 106 years and every year from 1993 through 2009. A 500-year event would flood nearly the entire city of Fargo and a large portion of the city of Moorhead, as well as several smaller communities in the area. Flooding occurs not only from the rivers, but also from large rainfall events that overwhelm storm drainage systems. Average annual flood damages are estimated at more than $64 million.

Although emergency flood fights have been very successful in Fargo and Moorhead, the area is significantly vulnerable to flooding. Both the 1997 and 2009 flood events came close to overwhelming the emergency levee systems, and many homes outside the levees were damaged.

Status

The Corps and the cities of Fargo and Moorhead are jointly conducting this study. The study will assess the feasibility of measures to reduce flood risk in the entire metropolitan and surrounding area. The study will consider an array of potential alternatives including nonstructural flood proofing, diversion channels, levee/floodwall systems, and flood storage.

The study team held public meetings in November 2008 and May 2009 to request input regarding alternatives and potential impacts. The team is developing preliminary alternatives to determine which concepts are likely to be most cost-effective for reducing flood risk. Results of the initial screening are scheduled to be released at public meetings in October 2009.

The study is scheduled for completion in December 2010. The feasibility cost share agreement was signed on September 22, 2008.

Authority

This specifically authorized study originates from a resolution of the Senate Committee on Public Works, September 30, 1974.

Fiscal

Federal cost	$3,200,000
Non-federal cost	$3,050,000
Total estimated cost	$6,250,000
Fiscal year 2009 federal funds	$567,000
FY 2009 ARRA (Stimulus) funds	$222,000
Total federal funds through 2009	$1,389,000

Non-Federal funding is being provided by the cities of Fargo and Moorhead and the Buffalo-Red River Watershed District in Minnesota.

Public Affairs (651) 290-5201 (651) 290-5752(fax) cemvp-pa@usace.army.mil
http://www.mvp.usace.army.mil

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 12/4/09
Name Of Project Fargo Moorhead Metro Flood Risk Reduction	Federal Agency Involved US Army Corps of Engineers
Proposed Land Use Diversion Channel	County And State Clay, Minnesota
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☐ No ☐	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	5,475.0	6,545.0	7,455.0	100.0
B. Total Acres To Be Converted Indirectly	115.0	115.0	115.0	10.0
C. Total Acres In Site	5,590.0	6,660.0	7,570.0	110.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
1004 Frontier Drive
Fergus Falls, MN 56537

Helping People
Help the Land

Phone: (218) 736-5445
FAX: (218) 736-7215

January 5, 2010

Terry J. Birkenstock
Chief, Environmental and GIS Branch
Department of the Army
St. Paul District, Corps of Engineers
Sibley Square at Mears Park
190 Fifth Street East, Suite 401
Saint Paul, MN 55101-1638

RE: Farmland Conversion Impact Rating for Alternatives for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Dear Mr. Birkenstock:

I was forwarded the information you sent for the proposed project near the city of Moorhead in Clay County, MN. I have located the area on a soil map and filled out parts II, IV and V of the attached Farmland Conversion Impact Rating form (AD-1006).

At Site A, of the 5,590 acres affected, 5533.7 acres are classified as Prime Farmland, and 23.4 acres are considered Farmland of Statewide Importance. Site B consists of 6,593.4 acres of Prime Farmland and 26.6 acres of Farmland of Statewide Importance. Site C contains 7493.9 acres of Prime Farmland and 28.5 acres of Farmland of Statewide Importance. Each of these three alternatives has a relative value of 91 (on a scale of 1 to 100, with 100 being the most agriculturally productive farmland in Clay County, MN). Alternative Site D contains 102 acres of Prime Farmland and has a relative value of 77.

If you have any questions feel free to contact me at (218) 736-5445 extension 102 or by e-mail at Jeffrey.Hellerich@mn.usda.gov

Sincerely,

Jeff Hellerich

Jeff Hellerich
Area Resource Soil Scientist
Natural Resources Conservation Service
1004 Frontier Drive
Fergus Falls, MN 56537

cc: Sharon Lean, DC, NRCS, Moorhead, MN
File

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 12/4/09
Name Of Project Fargo Moorhead Metro Flood Risk Reduction	Federal Agency Involved US Army Corps of Engineers
Proposed Land Use Diversion Channel	County And State Clay County, MN
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑	No ☐	Acres Irrigated ----	Average Farm Size 532

Major Crop*(s)* Corn, Wheat, Soybeans	Farmable Land In Govt. Jurisdiction Acres: 606,292 % 90	Amount Of Farmland As Defined in FPPA Acres: 559,512 % 83
Name Of Land Evaluation System Used ----------------	Name Of Local Site Assessment System ------------------	Date Land Evaluation Returned By NRCS

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		5,475.0	6,545.0	7,455.0	102.0
B. Total Acres To Be Converted Indirectly		115.0	115.0	115.0	10.0
C. Total Acres In Site		5,590.0	6,660.0	7,570.0	112.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		5,533.7	6,593.4	7,493.9	102.0
B. Total Acres Statewide And Local Important Farmland		23.4	26.6	28.5	0.0
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		1.0	1.2	1.3	0.0
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		25.3	25.3	25.3	75.4
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		91	91	91	77
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		14	14	14	14
2. Perimeter In Nonurban Use		10	10	10	10
3. Percent Of Site Being Farmed		20	20	20	20
4. Protection Provided By State And Local Government		0	0	0	0
5. Distance From Urban Builtup Area		0	0	0	0
6. Distance To Urban Support Services		0	0	0	0
7. Size Of Present Farm Unit Compared To Average		1	1	1	1
8. Creation Of Nonfarmable Farmland		10	10	10	10
9. Availability Of Farm Support Services		0	0	0	0
10. On-Farm Investments		5	5	5	5
11. Effects Of Conversion On Farm Support Services		0	0	0	0
12. Compatibility With Existing Agricultural Use		2	2	2	2
TOTAL SITE ASSESSMENT POINTS	160	62	62	62	62
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	91	91	91	77
Total Site Assessment *(From Part VI above or a local site assessment)*	160	62	62	62	62
TOTAL POINTS *(Total of above 2 lines)*	260	153	153	153	139

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

Minnesota Diversion Alternate routes for the MN35K diversion channel. The modified original diversion footprint is Site A and includes 5,822 acres to be converted directly, Site B is Alternate route 1 which follows the footprint of the original until toward the northern end where the route is moved further west, this route would convert 5,706 acres directly, and the final route is a little further west site C which would convert 5,783 acres directly. Site D on this form is the number acres that would be converted directly for the ND35k tieback levee.

For all three of the MN35K routes over 99% of the land is considered to be prime and unique farmland. For Site D the North Dakota tie back levee, over 95% is considered to be prime and unique farmland.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*

Date Of Land Evaluation Request 4/29/10

Name Of Project Fargo Moorhead Flood Risk Reduction - MN Div

Federal Agency Involved US Army Corps of Engineers

Proposed Land Use Diversion Channel

County And State Clay County, MN

PART II *(To be completed by NRCS)*

Date Request Received By NRCS 4/29/10

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☑ No ☐

Acres Irrigated -----

Average Farm Size 532

Major Crop(s) Corn, Wheat, Soybeans

Farmable Land In Govt. Jurisdiction Acres: 606,292 % 90

Amount Of Farmland As Defined in FPPA Acres: 559,512 % 83

Name Of Land Evaluation System Used Minnesota Crop Productivity Index

Name Of Local Site Assessment System -----------------------

Date Land Evaluation Returned By NRCS 5/3/10

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		5,822.40	5,706.90	5,783.90	454.20
B. Total Acres To Be Converted Indirectly		0.00	0.00	0.00	0.00
C. Total Acres In Site		5,822.40	5,706.90	5,783.90	454.20
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		5,781.90	5,668.50	5,745.50	434.90
B. Total Acres Statewide And Local Important Farmland		19.30	11.00	11.90	7.10
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.9600	0.9400	0.9500	0.0700
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		31.00	25.30	25.30	62.50
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		90	91	91	86
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		14	14	14	14
2. Perimeter In Nonurban Use		10	10	10	10
3. Percent Of Site Being Farmed		20	20	20	20
4. Protection Provided By State And Local Government		0	0	0	0
5. Distance From Urban Builtup Area		0	0	0	0
6. Distance To Urban Support Services		0	0	0	0
7. Size Of Present Farm Unit Compared To Average		1	1	1	1
8. Creation Of Nonfarmable Farmland		10	10	10	10
9. Availability Of Farm Support Services		0	0	0	0
10. On-Farm Investments		5	5	5	5
11. Effects Of Conversion On Farm Support Services		0	0	0	0
12. Compatibility With Existing Agricultural Use		2	2	2	2
TOTAL SITE ASSESSMENT POINTS	160	62	62	62	62
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	90	91	91	86
Total Site Assessment *(From Part VI above or a local site assessment)*	160	62	62	62	62
TOTAL POINTS *(Total of above 2 lines)*	260	152	153	153	148

Site Selected:

Date Of Selection

Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

Form AD-1006 (10-83)

This form was electronically produced by National Production Services Staff

1.5 Farmland Conversion Impact Rating for Minnesota Diversion Alternative

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
SIBLEY SQUARE AT MEARS PARK
190 FIFTH STREET EAST, SUITE 401
ST. PAUL MN 55101-1638

December 7, 2009

Regional Planning and Environmental Division North
Environmental and GIS Branch

SUBJECT: Farmland Conversion Impact Rating for Alternatives for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Mr. Keith Weston
Natural Resources Conservation Service
U.S. Department of Agriculture
4660 Amber Valley Parkway South
Fargo, North Dakota 58104

Dear Mr. Weston:

The St. Paul District, U.S. Army Corps of Engineers, is working on a flood risk management feasibility report for the Fargo, North Dakota, and Moorhead, Minnesota, metropolitan area. Several alternatives that would divert floodwaters around the cities have been studied, including diversion channels on the Minnesota side and the North Dakota side of the Red River.

The proposed diversion channels would be constructed through farmland. We have not selected an alternative yet, but we would like to submit to you four leading alternatives for review in the Farmland Conversion Impact Rating. I have attached Form AD-1006, which includes four alternatives on the North Dakota side. I have sent a similar package to Mrs. Sharon Lean of the Natural Resources Conservation Service in Moorhead that includes three alternatives for diversions on the Minnesota side. I have attached the project fact sheet and an area map highlighting the proposed alternatives.

Site A represents the North Dakota West Diversion Alternative built to a size that would pass 35,000 cubic feet per second (cfs), Site B represents the same diversion alternative but designed to pass 45,000 cfs, Site C represents the North Dakota East Diversion and Site D represents the tie-back levee for the Minnesota Short diversion channel.

If you have any questions or need further information, please call Jonathan Sobiech at (651) 290-5428.

Sincerely,

for Terry J. Birkenstock
Chief, Environmental and GIS Branch

3 Enclosures

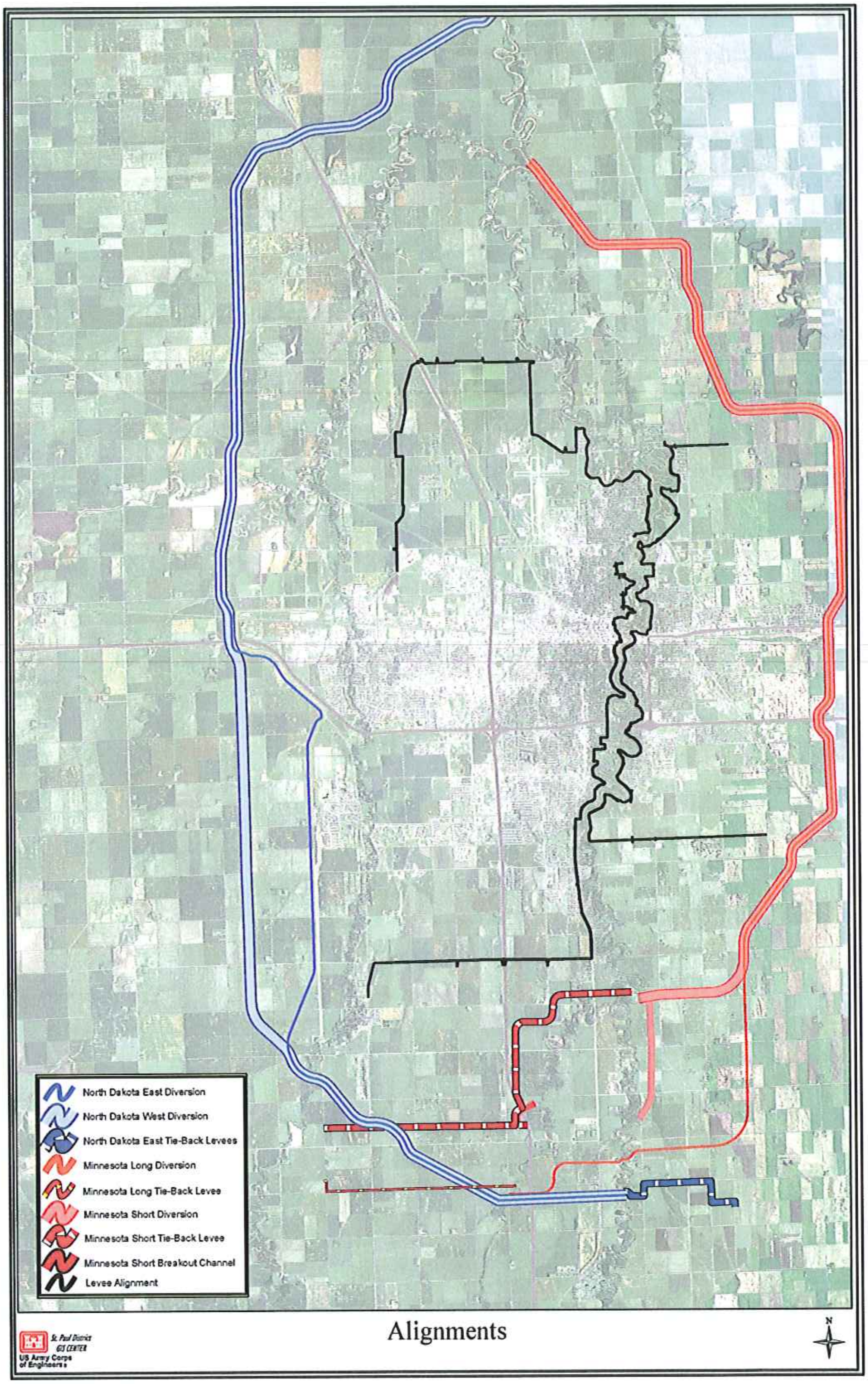

Figure 1. Diversion and levee alignments.

Army Corps of Engineers Centre, 190 Fifth Street East, St. Paul, MN 55101-1638

US Army Corps of
Engineers
St. Paul District

Flood Risk Management: Fargo-Moorhead Metro, North Dakota and Minnesota

Location/Description

An emergency levee protects the city at Second Street during the 2009 flood.

Fargo, North Dakota, and Moorhead, Minnesota, are on the west and east banks, respectively, of the Red River of the North approximately 150 miles south of the Canada/United States border. In addition to the Red River, the Wild Rice, Sheyenne, Maple and Rush Rivers in North Dakota and the Buffalo River in Minnesota also cross the study area.

Background

The Fargo-Moorhead metropolitan area is a major health, educational, cultural, and commercial center serving southeastern North Dakota and west-central Minnesota. The area is prone to flooding; the Red River has exceeded flood stage in 50 of the past 106 years and every year from 1993 through 2009. A 500-year event would flood nearly the entire city of Fargo and a large portion of the city of Moorhead, as well as several smaller communities in the area. Flooding occurs not only from the rivers, but also from large rainfall events that overwhelm storm drainage systems. Average annual flood damages are estimated at more than $64 million.

Although emergency flood fights have been very successful in Fargo and Moorhead, the area is significantly vulnerable to flooding. Both the 1997 and 2009 flood events came close to overwhelming the emergency levee systems, and many homes outside the levees were damaged.

Status

The Corps and the cities of Fargo and Moorhead are jointly conducting this study. The study will assess the feasibility of measures to reduce flood risk in the entire metropolitan and surrounding area. The study will consider an array of potential alternatives including nonstructural flood proofing, diversion channels, levee/floodwall systems, and flood storage.

The study team held public meetings in November 2008 and May 2009 to request input regarding alternatives and potential impacts. The team is developing preliminary alternatives to determine which concepts are likely to be most cost-effective for reducing flood risk. Results of the initial screening are scheduled to be released at public meetings in October 2009.

The study is scheduled for completion in December 2010. The feasibility cost share agreement was signed on September 22, 2008.

Authority

This specifically authorized study originates from a resolution of the Senate Committee on Public Works, September 30, 1974.

Fiscal

Federal cost	$3,200,000
Non-federal cost	$3,050,000
Total estimated cost	$6,250,000
Fiscal year 2009 federal funds	$567,000
FY 2009 ARRA (Stimulus) funds	$222,000
Total federal funds through 2009	$1,389,000

Non-Federal funding is being provided by the cities of Fargo and Moorhead and the Buffalo-Red River Watershed District in Minnesota.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*

Date Of Land Evaluation Request 12/4/09

Name Of Project Fargo Moorhead Metro Flood Risk Reduction

Federal Agency Involved US Army Corps of Engineers

Proposed Land Use Diversion Channel

County And State Cass, North Dakota

PART II *(To be completed by NRCS)*

Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☐ No ☐

Acres Irrigated

Average Farm Size

Major Crop*(s)*

Farmable Land In Govt. Jurisdiction Acres: %

Amount Of Farmland As Defined in FPPA Acres: %

Name Of Land Evaluation System Used

Name Of Local Site Assessment System

Date Land Evaluation Returned By NRCS

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	6,400.0	7,220.0	6,385.0	900.0
B. Total Acres To Be Converted Indirectly	145.0	145.0	145.0	50.0
C. Total Acres In Site	6,545.0	7,365.0	6,530.0	950.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:

Date Of Selection

Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

Form AD-1006 (10-83)

This form was electronically produced by National Production Services Staff

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
P.O. Box 2096
Jamestown, ND 58402-2096

January 8, 2010

Mr. Terry Birkenstock
Chief, Environmental and GIS Branch
US Army Corps of Engineers
190 East 5th St, Suite 401
St Paul, MN 55101

Subject: Form AD-1006
RE: Farmland Conversion Impact Rating for Alternatives for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Dear Mr. Birkenstock,

The NRCS portion of the AD-1006 "Farmland Conversion Impact Rating" for the Alternatives for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project has been completed as requested. I changed the acreage figure for Site B on the form per phone conversation with Jonathan Sobiech. Please send me a copy of the form when it is completed.

Should you have any questions concerning the AD-1006 please contact me at 701-252-1460, extension 115.

Sincerely,

FREDERICK P. AZIZ
Area Resource Soil Scientist

Enclosure

cc: Steven Seiler, State Soil Liaison, NRCS, Bismarck, ND
Keith Weston, DC, NRCS, Fargo, ND

w/o encl.
Michael D. Collins, ASTC (FO), NRCS, Jamestown, ND
Jonathan Sobiech, Forester, US, ACE, St Paul, MN

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FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*

Date Of Land Evaluation Request 12/4/09

Name Of Project Fargo Moorhead Metro Flood Risk Reduction

Federal Agency Involved US Army Corps of Engineers

Proposed Land Use Diversion Channel

County And State Cass, North Dakota

PART II *(To be completed by NRCS)*

Date Request Received By NRCS 12/14/09

Does the site contain prime, unique, statewide or local important farmland?
(If no, the FPPA does not apply -- do not complete additional parts of this form).
Yes ☑ No ☐

Acres Irrigated 8745

Average Farm Size 830

Major Crop(s) Soybeans, Corn

Farmable Land In Govt. Jurisdiction
Acres: 1,084,302 % 97

Amount Of Farmland As Defined in FPPA
Acres: 925,155 % 83

Name Of Land Evaluation System Used Cass County LE

Name Of Local Site Assessment System None

Date Land Evaluation Returned By NRCS 1/8/10

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	6,400.0	6,500.0	6,385.0	900.0
B. Total Acres To Be Converted Indirectly	145.0	145.0	145.0	50.0
C. Total Acres In Site	6,545.0	6,645.0	6,530.0	950.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	5,811.2	5,927.4	5,455.4	872.6
B. Total Acres Statewide And Local Important Farmland	0.0	0.0	0.0	0.0
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.6	0.6	0.6	0.1
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	59.3	59.3	59.3	59.3
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	81	81	81	81

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		15	15	15	15
2. Perimeter In Nonurban Use		10	10	10	10
3. Percent Of Site Being Farmed		20	20	20	20
4. Protection Provided By State And Local Government		0	0	0	0
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average		10	10	10	10
8. Creation Of Nonfarmable Farmland		5	5	5	5
9. Availability Of Farm Support Services		3	3	3	3
10. On-Farm Investments		5	5	5	5
11. Effects Of Conversion On Farm Support Services		5	5	5	5
12. Compatibility With Existing Agricultural Use		0	0	0	0
TOTAL SITE ASSESSMENT POINTS	160	73	73	73	73
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	81	81	81	81
Total Site Assessment *(From Part VI above or a local site assessment)*	160	73	73	73	73
TOTAL POINTS *(Total of above 2 lines)*	260	154	154	154	154

Site Selected:

Date Of Selection

Was A Local Site Assessment Used?
Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)

1.6 Instructions for Farmland Conversion Impact Rating

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C together with maps indicating locations of site(s), to the Natural Resources Conservation Service (NRCS) local field office and retain copy D for their files. (Note: NRCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field office locations are available from the NRCS State Conservationist in each state).

Step 3 – NRCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

. Step '4 – In cases where farmland covered by the FPPA will be converted by the proposed project, NRCS field offices will complete Parts II, IV and V of the form.

Step 5 – NRCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for NRCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal policies.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.

2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as shown in § 658.5 (b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood control, criteria #5 and #6 will not apply and will, be weighed zero, however, criterion #8 will be weighed a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 12 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned relative adjustments must be made to maintain the maximum total weight points at l60.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points, and alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site "A."}$$

Site Assessment Scoring for the Twelve Factors Used in FPPA

The Site Assessment criteria used in the Farmland Protection Policy Act (FPPA) rule are designed to assess important factors other than the agricultural value of the land when determining which alternative sites should receive the highest level of protection from conversion to non agricultural uses.

Twelve factors are used for Site Assessment and ten factors for corridor-type sites. Each factor is listed in an outline form, without detailed definitions or guidelines to follow in the rating process. The purpose of this document is to expand the definitions of use of each of the twelve Site Assessment factors so that all persons can have a clear understanding as to what each factor is intended to evaluate and how points are assigned for given conditions.

In each of the 12 factors a number rating system is used to determine which sites deserve the most protection from conversion to non-farm uses. The higher the number value given to a proposed site, the more protection it will receive. The maximum scores are 10, 15 and 20 points, depending upon the relative importance of each particular question. If a question significantly relates to why a parcel of land should not be converted, the question has a maximum possible protection value of 20, whereas a question which does not have such a significant impact upon whether a site would be converted, would have fewer maximum points possible, for example 10.

The following guidelines should be used in rating the twelve Site Assessment criteria:

1. How much land is in non-urban use within a radius of 1.0 mile from where the project is intended?

More than 90 percent:	15 points
90-20 percent:	14 to 1 points
Less than 20 percent:	0 points

This factor is designed to evaluate the extent to which the area within one mile of the proposed site is non-urban area. For purposes of this rule, "non-urban" should include:

- Agricultural land (crop-fruit trees, nuts, oilseed)
- Range land
- Forest land
- Golf Courses
- Non paved parks and recreational areas
- Mining sites
- Farm Storage
- Lakes, ponds and other water bodies
- Rural roads, and through roads without houses or buildings
- Open space
- Wetlands
- Fish production
- Pasture or hayland

Urban uses include:

- Houses (other than farm houses)
- Apartment buildings
- Commercial buildings
- Industrial buildings
- Paved recreational areas (i.e. tennis courts)
- Streets in areas with 30 structures per 40 acres
- Gas stations

- Equipment, supply stores
- Off-farm storage
- Processing plants
- Shopping malls
- Utilities/Services
- Medical buildings

In rating this factor, an area one-mile from the outer edge of the proposed site should be outlined on a current photo; the areas that are urban should be outlined. For rural houses and other buildings with unknown sizes, use 1 and 1/3 acres per structure. For roads with houses on only one side, use one half of road for urban and one half for non-urban.

The purpose of this rating process is to insure that the most valuable and viable farmlands are protected from development projects sponsored by the Federal Government. With this goal in mind, factor S1 suggests that the more agricultural lands surrounding the parcel boundary in question, the more protection from development this site should receive. Accordingly, a site with a large quantity of non-urban land surrounding it will receive a greater number of points for protection from development. Thus, where more than 90 percent of the area around the proposed site (do not include the proposed site in this assessment) is non-urban, assign 15 points. Where 20 percent or less is non-urban, assign 0 points. Where the area lies between 20 and 90 percent non-urban, assign appropriate points from 14 to 1, as noted below.

Percent Non-Urban Land within 1 mile	**Points**
90 percent or greater	15
85 to 89 percent	14
80 to 84 percent	13
75 to 79 percent	12
70 to 74 percent	11
65 to 69 percent	10
60 to 64 percent	9
55 to 59 percent	8
50 to 54 percent	7
45 to 49 percent	6
40 to 44 percent	5
35 to 39 percent	4
30 to 24 percent	3
25 to 29 percent	2
21 to 24 percent	1
20 percent or less	0

2. How much of the perimeter of the site borders on land in non-urban use?

More than 90 percent:	l0 points
90 to 20 percent:	9 to 1 point(s)
Less than 20 percent:	0 points

This factor is designed to evaluate the extent to which the land adjacent to the proposed site is non-urban use. Where factor #1 evaluates the general location of the proposed site, this factor evaluates the immediate perimeter of the site. The definition of urban and non-urban uses in factor #1 should be used for this factor.

In rating the second factor, measure the perimeter of the site that is in non-urban and urban use. Where more than 90 percent of the perimeter is in non-urban use, score this factor 10 points. Where less than 20 percent, assign 0 points. If a road is next to the perimeter, class the area according to the use on the other side of the road for that area. Use 1 and 1/3 acre per structure if not otherwise known. Where 20 to 90 percent of the perimeter is non-urban, assign points as noted below:

Percentage of Perimeter Bordering Land	Points
90 percent or greater	10
82 to 89 percent	9
74 to 81 percent	8
65 to 73 percent	7
58 to 65 percent	6
50 to 57 percent	5
42 to 49 percent	4
34 to 41 percent	3
27 to 33 percent	2
21 to 26 percent	1
20 percent or Less	0

3. How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last ten years?

More than 90 percent: 20 points
90 to 20 percent: 19 to 1 point(s)
Less than 20 percent: 0 points

This factor is designed to evaluate the extent to which the proposed conversion site has been used or managed for agricultural purposes in the past 10 years.

Land is being farmed when it is used or managed for food or fiber, to include timber products, fruit, nuts, grapes, grain, forage, oil seed, fish and meat, poultry and dairy products.

Land that has been left to grow up to native vegetation without management or harvest will be considered as abandoned and therefore not farmed. The proposed conversion site should be evaluated and rated according to the percent, of the site farmed.

If more than 90 percent of the site has been farmed 5 of the last 10 years score the site as follows:

Percentage of Site Farmed	Points
90 percent or greater	20
86 to 89 percent	19
82 to 85 percent	18
78 to 81 percent	17
74 to 77 percent	16
70 to 73 percent	15
66 to 69 percent	14
62 to 65 percent	13
58 to 61 percent	12
54 to 57 percent	11
50 to 53 percent	10
46 to 49 percent	9
42 to 45 percent	8
38 to 41 percent	7
35 to 37 percent	6
32 to 34 percent	5
29 to 31 percent	4
26 to 28 percent	3

23 to 25 percent	2
20 to 22 percent percent or Less	1
Less than 20 percent	0

4. Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?

Site is protected:	20 points
Site is not protected:	0 points

This factor is designed to evaluate the extent to which state and local government and private programs have made efforts to protect this site from conversion.

State and local policies and programs to protect farmland include:

State Policies and Programs to Protect Farmland

1. Tax Relief:

A. Differential Assessment: Agricultural lands are taxed on their agricultural use value, rather than at market value. As a result, farmers pay fewer taxes on their land, which helps keep them in business, and therefore helps to insure that the farmland will not be converted to nonagricultural uses.

1. Preferential Assessment for Property Tax: Landowners with parcels of land used for agriculture are given the privilege of differential assessment.

2. Deferred Taxation for Property Tax: Landowners are deterred from converting their land to nonfarm uses, because if they do so, they must pay back taxes at market value.

3. Restrictive Agreement for Property Tax: Landowners who want to receive Differential Assessment must agree to keep their land in - eligible use.

B. Income Tax Credits

Circuit Breaker Tax Credits: Authorize an eligible owner of farmland to apply some or all of the property taxes on his or her farmland and farm structures as a tax credit against the owner's state income tax.

C. Estate and Inheritance Tax Benefits

Farm Use Valuation for Death Tax: Exemption of state tax liability to eligible farm estates.

2. "Right to farm" laws:

Prohibits local governments from enacting laws which will place restrictions upon normally accepted farming practices, for example, the generation of noise, odor or dust.

3. Agricultural Districting:

Wherein farmers voluntarily organize districts of agricultural land to be legally recognized geographic areas. These farmers receive benefits, such as protection from annexation, in exchange for keeping land within the district for a given number of years.

4. Land Use Controls: Agricultural Zoning.

Types of Agricultural Zoning Ordinances include:

A. Exclusive: In which the agricultural zone is restricted to only farm-related dwellings, with, for example, a minimum of 40 acres per dwelling unit.

B. Non-Exclusive: In which non-farm dwellings are allowed, but the density remains low, such as 20 acres per dwelling unit.

Additional Zoning techniques include:

A. Slidinq Scale: This method looks at zoning according to the total size of the parcel owned. For example, the number of dwelling units per a given number of acres may change from county to county according to the existing land acreage to dwelling unit ratio of surrounding parcels of land within the specific area.

B. Point System or Numerical Approach: Approaches land use permits on a case by case basis.

   LESA: The LESA system (Land Evaluation-Site Assessment) is used as a tool to help assess options for land use on an evaluation of productivity weighed against commitment to urban development.

C. Conditional Use: Based upon the evaluation on a case by case basis by the Board of Zoning Adjustment. Also may include the method of using special land use permits.

5. Development Rights:

   A. Purchase of Development Rights (PDR): Where development rights are purchased by Government action.

      Buffer Zoning Districts: Buffer Zoning Districts are an example of land purchased by Government action. This land is included in zoning ordinances in order to preserve and protect agricultural lands from non-farm land uses encroaching upon them.

   B. Transfer of Development Rights (TDR): Development rights are transferable for use in other locations designated as receiving areas. TDR is considered a locally based action (not state), because it requires a voluntary decision on the part of the individual landowners.

6. Governor's Executive Order: Policy made by the Governor, stating the importance of agriculture, and the preservation of agricultural lands. The Governor orders the state agencies to avoid the unnecessary conversion of important farmland to nonagricultural uses.

7. Voluntary State Programs:

   A. California's Program of Restrictive Agreements and Differential Assessments: The California Land Conservation Act of 1965, commonly known as the Williamson Act, allows cities, counties and individual landowners to form agricultural preserves and enter into contracts for 10 or more years to insure that these parcels of land remain strictly for agricultural use. Since 1972 the Act has extended eligibility to recreational and open space lands such as scenic highway corridors, salt ponds and wildlife preserves. These contractually restricted lands may be taxed differentially for their real value. One hundred-acre districts constitute the minimum land size eligible.

      Suggestion: An improved version of the Act would state that if the land is converted after the contract expires, the landowner must pay the difference in the taxes between market value for the land and the agricultural tax value which he or she had been paying under the Act. This measure would help to insure that farmland would not be converted after the 10 year period ends.

B. Maryland Agricultural Land Preservation Program: Agricultural landowners within agricultural districts have the opportunity to sell their development rights to the Maryland Land Preservation Foundation under the agreement that these landowners will not subdivide or develop their land for an initial period of five years. After five years the landowner may terminate the agreement with one year notice.

As is stated above under the California Williamson Act, the landowner should pay the back taxes on the property if he or she decides to convert the land after the contract expires, in order to discourage such conversions.

C. Wisconsin Income Tax Incentive Program: The Wisconsin Farmland Preservation Program of December 1977 encourages local jurisdictions in Wisconsin to adopt agricultural preservation plans or exclusive agricultural district zoning ordinances in exchange for credit against state income tax and exemption from special utility assessment. Eligible candidates include local governments and landowners with at least 35 acres of land per dwelling unit in agricultural use and gross farm profits of at least $6.000 per year, or $18,000 over three years.

8. Mandatory State Programs:

A. The Environmental Control Act in the state of Vermont was adopted in 1970 by the Vermont State Legislature. The Act established an environmental board with 9 members (appointed by the Governor) to implement a planning process and a permit system to screen most subdivisions and development proposals according to specific criteria stated in the law. The planning process consists of an interim and a final Land Capability and Development Plan, the latter of which acts as a policy plan to control development. The policies are written in order to:

- prevent air and water pollution;
- protect scenic or natural beauty, historic sites and rare and irreplaceable natural areas; and
- consider the impacts of growth and reduction of development on areas of primary agricultural soils.

B. The California State Coastal Commission: In 1976 the Coastal Act was passed to establish a permanent Coastal Commission with permit and planning authority The purpose of the Coastal Commission was and is to protect the sensitive coastal zone environment and its resources, while accommodating the social and economic needs of the state. The Commission has the power to regulate development in the coastal zones by issuing permits on a case by case basis until local agencies can develop their own coastal plans, which must be certified by the Coastal Commission.

C. Hawaii's Program of State Zoning: In 1961, the Hawaii State Legislature established Act 187, the Land Use Law, to protect the farmland and the welfare of the local people of Hawaii by planning to avoid “unnecessary urbanization”. The Law made all state lands into four districts: agricultural, conservation, rural and urban. The Governor appointed members to a State Land Use Commission, whose duties were to uphold the Law and form the boundaries of the four districts. In addition to state zoning, the Land Use Law introduced a program of Differential Assessment, wherein agricultural landowners paid taxes on their land for its agricultural use value, rather than its market value.

D. The Oregon Land Use Act of 1973: This act established the Land Conservation and Development Commission (LCDC) to provide statewide planning goals and guidelines.

Under this Act, Oregon cities and counties are each required to draw up a comprehensive plan, consistent with statewide planning goals. Agricultural land preservation is high on the list of state goals to be followed locally.

If the proposed site is subject to or has used one or more of the above farmland protection programs or policies, score the site 20 points. If none of the above policies or programs apply to this site, score 0 points.

5. How close is the site to an urban built-up area?

The site is 2 miles or more from an urban built-up area	15 points
The site is more than 1 mile but less than 2 miles from an urban built-up area	10 points
The site is less than 1 mile from, but is not adjacent to an urban built-up area	5 points
The site is adjacent to an urban built-up area	0 points

This factor is designed to evaluate the extent to which the proposed site is located next to an existing urban area. The urban built-up area must be 2500 population. The measurement from the built-up area should be made from the point at which the density is 30 structures per 40 acres and with no open or non-urban land existing between the major built-up areas and this point. Suburbs adjacent to cities or urban built-up areas should be considered as part of that urban area.

For greater accuracy, use the following chart to determine how much protection the site should receive according to its distance from an urban area. See chart below:

Distance From Perimeter of Site to Urban Area	**Points**
More than 10,560 feet	15
9,860 to 10,559 feet	14
9,160 to 9,859 feet	13
8,460 to 9,159 feet	12
7,760 to 8,459 feet	11
7,060 to 7,759 feet	10
6,360 to 7,059 feet	9
5,660 to 6,359 feet	8
4,960 to 5,659 feet	7
4,260 to 4,959 feet	6
3,560 to 4,259 feet	5
2,860 to 3,559 feet	4
2,160 to 2,859 feet	3
1,460 to 2,159 feet	2
760 to 1,459 feet	1
Less than 760 feet (adjacent)	0

6. How close is the site to water lines, sewer lines and/or other local facilities and services whose capacities and design would promote nonagricultural use?

None of the services exist nearer than 3 miles from the site	15 points
Some of the services exist more than one but less than 3 miles from the site	10 points
All of the services exist within 1/2 mile of the site	0 points

This question determines how much infrastructure (water, sewer, etc.) is in place which could facilitate nonagricultural development. The fewer facilities in place, the more difficult it is to develop an area. Thus, if a proposed site is further away from these services (more than 3 miles distance away), the site should be awarded the highest number of points (15). As the distance of the parcel of land to services decreases, the number of points awarded declines as well. So, when the site is equal to or further than 1 mile but less than 3 miles away from services, it should be given 10 points. Accordingly, if this distance is 1/2 mile to less than 1 mile, award 5 points; and if the distance from land to services is less than 1/2 mile, award 0 points.

Distance to public facilities should be measured from the perimeter of the parcel in question to the nearest site(s) where necessary facilities are located. If there is more than one distance (i.e. from site to water and from site to sewer), use the average distance (add all distances and then divide by the number of different distances to get the average).

Facilities which could promote nonagricultural use include:

- Water lines
- Sewer lines
- Power lines
- Gas lines
- Circulation (roads)
- Fire and police protection
- Schools

7. Is the farm unit(s) containing the site (before the project) as large as the average-size farming unit in the county? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage of Farm Units in Operation with $1,000 or more in sales.)

As large or larger:	10 points
Below average: Deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more is below average	9 to 0 points

This factor is designed to determine how much protection the site should receive, according to its size in relation to the average size of farming units within the county. The larger the parcel of land, the more agricultural use value the land possesses, and vice versa. Thus, if the farm unit is as large or larger than the county average, it receives the maximum number of points (10). The smaller the parcel of land compared to the county average, the fewer number of points given. Please see below:

Parcel Size in Relation to Average County Size	**Points**
Same size or larger than average (l00 percent)	10
95 percent of average	9
90 percent of average	8
85 percent of average	7
80 percent of average	6
75 percent of average	5
70 percent of average	4
65 percent of average	3
60 percent of average	2
55 percent of average	1
50 percent or below county average	0

State and local Natural Resources Conservation Service offices will have the average farm size information, provided by the latest available Census of Agriculture data

8. If this site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?

Acreage equal to more than 25 percent of acres directly converted by the project	10 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project	9 to 1 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project	0 points

This factor tackles the question of how the proposed development will affect the rest of the land on the farm The site which deserves the most protection from conversion will receive the greatest number of points, and vice versa. For example, if the project is small, such as an extension on a house, the rest of the agricultural land would remain farmable, and thus a lower number of points is given to the site. Whereas if a large-scale highway is planned, a greater portion of the land (not including the site) will become non-farmable, since access to the farmland will be blocked; and thus, the site should receive the highest number of points (10) as protection from conversion

Conversion uses of the Site Which Would Make the Rest of the Land Non-Farmable by Interfering with Land Patterns

Conversions which make the rest of the property nonfarmable include any development which blocks accessibility to the rest of the site Examples are highways, railroads, dams or development along the front of a site restricting access to the rest of the property.

The point scoring is as follows:

Amount of Land Not Including the Site Which Will Become Non-Farmable	**Points**
25 percent or greater	10
23 - 24 percent	9
21 - 22 percent	8
19 - 20 percent	7
17 - 18 percent	6
15 - 16 percent	5
13 - 14 percent	4
11 - 12 percent	3
9 - 11 percent	2
6 - 8 percent	1
5 percent or less	0

9. Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?

All required services are available	5 points
Some required services are available	4 to 1 point(s)
No required services are available	0 points

This factor is used to assess whether there are adequate support facilities, activities and industry to keep the farming business in business. The more support facilities available to the agricultural landowner, the more feasible it is for him or her to stay in production. In addition, agricultural support facilities are compatible with farmland. This fact is important, because some land uses are not compatible; for example, development next to farmland cam be dangerous to the welfare of the agricultural land, as a result of pressure from the neighbors who often do not appreciate the noise, smells and dust intrinsic to farmland. Thus, when all required agricultural support services are available, the maximum number of points (5) are awarded. When some services are available, 4 to 1 point(s) are awarded; and consequently, when no services are available, no points are given. See below:

Percent of Services Available	**Points**
100 percent	5
75 to 99 percent	4
50 to 74 percent	3
25 to 49 percent	2
1 to 24 percent	1
No services	0

10. Does the site have substantial and well-maintained on farm investments such as barns, other storage buildings, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?

High amount of on-farm investment	20 points
Moderate amount of non-farm investment	19 to 1 point(s)
No on-farm investments	0 points

This factor assesses the quantity of agricultural facilities in place on the proposed site. If a significant agricultural infrastructure exists, the site should continue to be used for farming, and thus the parcel will receive the highest amount of points towards protection from conversion or development. If there is little on farm investment, the site will receive comparatively less protection. See-below:

Amount of On-farm Investment	**Points**
As much or more than necessary to maintain production (100 percent)	20
95 to 99 percent	19
90 to 94 percent	18
85 to 89 percent	17
80 to 84 percent	16
75 to 79 percent	15
70 to 74 percent	14
65 to 69 percent	13
60 to 64 percent	12
55 to 59 percent	11
50 to 54 percent	10
45 to 49 percent	9
40 to 44 percent	8
35 to 39 percent	7
30 to 34 percent	6
25 to 29 percent	5
20 to 24 percent	4
15 to 19 percent	3
10 to 14 percent	2
5 to 9 percent	1
0 to 4 percent	0

11. Would the project at this site, by converting farmland to nonagricultural use, reduce the support for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?

Substantial reduction in demand for support services if the site is converted	10 points
Some reduction in demand for support services if the site is converted	9 to 1 point(s)
No significant reduction in demand for support services if the site is converted	0 points

This factor determines whether there are other agriculturally related activities, businesses or jobs dependent upon the working of the pre-converted site in order for the others to remain in production. The more people and farming activities relying upon this land, the more protection it should receive from conversion. Thus, if a substantial reduction in demand for support services were to occur as a result of conversions, the proposed site would receive a high score of 10; some reduction in demand would receive 9 to 1 point(s), and no significant reduction in demand would receive no points.

Specific points are outlined as follows:

Amount of Reduction in Support Services if Site is Converted to Nonagricultural Use	Points
Substantial reduction (100 percent)	10
90 to 99 percent	9
80 to 89 percent	8
70 to 79 percent	7
60 to 69 percent	6
50 to 59 percent	5
40 to 49 percent	4
30 to 39 percent	3
20 to 29 percent	2
10 to 19 percent	1
No significant reduction (0 to 9 percent)	0

12. Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of the surrounding farmland to nonagricultural use?

Proposed project is incompatible with existing agricultural use of surrounding farmland	10 points
Proposed project is tolerable of existing agricultural use of surrounding farmland	9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland	0 points

Factor 12 determines whether conversion of the proposed agricultural site will eventually cause the conversion of neighboring farmland as a result of incompatibility of use of the first with the latter. The more incompatible the proposed conversion is with agriculture, the more protection this site receives from conversion. Therefor-, if the proposed conversion is incompatible with agriculture, the site receives 10 points. If the project is tolerable with agriculture, it receives 9 to 1 points; and if the proposed conversion is compatible with agriculture, it receives 0 points.

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor-type site or design alternative for protection as farmland along with the land evaluation information.

For Water and Waste Programs, corridor analyses are not applicable for distribution or collection networks. Analyses are applicable for transmission or trunk lines where placement of the lines are flexible.

(1) How much land is in nonurban use within a radius of 1.0 mile form where the project is intended?

(2)	More than 90 percent	(3)	15 points
(4)	90 to 20 percent	(5)	14 to 1 point(s).
(6)	Less than 20 percent	(7)	0 points

(2) How much of the perimeter of the site borders on land in nonurban use?

(3)	More than 90 percent	(4)	10 point(s)
(5)	90 to 20 percent	(6)	9 to 1 points
(7)	less than 20 percent	(8)	0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?

(4)	More than 90 percent	(5)	20 points
(6)	90 to 20 percent	(7)	19 to 1 point(s)
(8)	Less than 20 percent	(9)	0 points

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?

Site is protected	20 points
Site is not protected	0 points

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage of Farm Units in Operation with $1,000 or more in sales.)

As large or larger	10 points
Below average deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average	9 to 0 points

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?

Acreage equal to more than 25 percent of acres directly converted by the project	25 points
Acreage equal to between 25 and 5 percent of the acres directly convened by the project	1 to 24 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project	0 points

(7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?

All required services are available	5 points
Some required services are available	4 to 1 point(s)
No required services are available	0 points

(8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?

High amount of on-farm investment	20 points
Moderate amount of on-farm investment	19 to 1 point(s)
No on-farm investment	0 points

(9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?

Substantial reduction in demand for support services if the site is convened	25 points
Some reduction in demand for support services if the site is convened	1 to 24 point(s)
No significant reduction in demand for support services if the site is converted	0 points

(10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?

Proposed project is incompatible to existing agricultural use of surrounding farmland	10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland	9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland	0 points

1.7 Mitigation Spreadsheet Describing Costs

Fargo/Moorehead Metro Flood Study: Mitigation Cost Estimate

Mitigation Total for MN Alignment:	**$30,764,967**
Mitigation Total for ND Alignment:	**$60,518,726**

Impacts for either diversion alternative (ND or MN)
Definite Impacts for ND diversion that require Mitigation
Unlikely but potential impacts for ND that require monitoring,
could require mitigation down the road.

Red River Control Structure Footprint			
Impact Area:	10	acres	
Mitigation Ratio:	2	to 1	
Mitigatin Area	20	acres	
Total Mitigation Cost:	***$6,672,527***	Assumes 75ft width stream re-meander	

Red River Fish Passage		
Provide Gates that are 50-ft wide	$5,000,000	Assumed value
Provide rock rapids at the control weir (Red OR Wild Rice)	$10,000,000	Assumed value
Increase width of fish bypass gates and channel	$3,000,000	Assumed value - assigned the original cost for fish bypass channel
Fish Passage Monitoring at RR Fish ByPass Channel	$150,000	
Total Mitigation Cost:	***$18,150,000***	

Geomorphic Impact to Red River		
Impact Distance - MN Diversion	48.5	Miles
Impact Distance - ND Diversion	60.0	Miles
Mitigation Cost	N/A	
Pre-construct geomorphic survey	$750,000	
Post-construct geomorphic survey	$750,000	
Pre-contruct biotic surveys:	$500,000	
Post-construct biotic surveys:	$500,000	
Total Mitigation Cost	***$2,500,000***	

Wild Rice River Control Structure Footprint			
Impact Area:	10	acres	Assumes 0.75 miles of impact X 110ft wide channel
Mitigation Ratio:	2	to 1	
Mitigatin Area	20	acres	
Total Mitigation Cost:	***$6,672,527***	Assumes 75ft width stream re-meander	

Geomorphic Impact to Wild Rice River			
Impact Distance	12.3	Miles	
Impact Area	74.5	Acres	Distance X Width of 110ft
Mitigation Cost	$4,701,060	Assumes buffering as mitigation method	
Pre-construct geomorphic survey	$150,000		
Post-construct geomorphic survey	$150,000		
Pre-contruct biotic surveys:	$100,000		
Post-construct biotic surveys:	$100,000		
Total Mitigation Cost	***$5,201,060***		

Rush River Channel Abandonment			
Impact Area:	15.3	acres	2.8 miles Long X 45ft wide
Mitigatin Area	0	acres	
Mitigation Cost:	$0	Assumes we mitigate by use of re-meander in flood channel	
Pre-contruct biotic surveys (Rush River):	40,000	Assumes three surveys at $50k	
Post-construct biotic surveys (new channel):	200,000	Assumes four surveys at $150k	
Total Mitigation Cost:	***$240,000***		

Lower Rush River Channel Abandonment			
Impact Area:	12.7	acres	3.5 miles long X 30ft width
Mitigatin Area	0	acres	
Mitigation Cost:	$0	Assumes we mitigate by use of re-meander in flood channel	
Pre-contruct biotic surveys (Rush River):	40,000	Assumes three surveys at $50k	
Post-construct biotic surveys (new channel):	Combined in Rush		
Total Mitigation Cost:	***$40,000***		

Sheyenne River Tributary Structure Footprint			
Impact Area:	7.6	acres	7.6 110ft wide X 3000 ft long
Mitigation Ratio:	2	to 1	
Mitigatin Area	15.2	acres	
Total Mitigation Cost:	***$5,054,945***	Assumes 75ft width stream re-meander	

Geomorphic Impact to Sheyenne River			
Impact Distance	43.1	Miles	
Impact Area	261.2	Acres	Distance X Width of 110ft
Mitigation Cost	N/A		
Pre-construct geomorphic survey	$500,000		
Post-construct geomorphic survey	$500,000		
Pre-contruct biotic surveys:	$250,000		
Post-construct biotic surveys:	$250,000		
Total Mitigation Cost	***$1,500,000***		

Maple River Tributary Structure Footprint			
Impact Area:	9.0	acres	8.953168044 100ft wide X 3700 ft long
Mitigation Ratio:	2	to 1	Add 150ft to include footprint of overflow weir
Mitigatin Area	17.9	acres	
Total Mitigation Cost:	***$5,974,026***	Assumes 75ft width stream re-meander	

Geomorphic Impact to Maple River			
Impact Distance	3.6	Miles	
Impact Area	21.8	Acres	Distance X Width of 50ft
Mitigation Cost	N/A		
Pre-construct geomorphic survey	$40,000		
Post-construct geomorphic survey	$40,000		
Pre-contruct biotic surveys:	$40,000		
Post-construct biotic surveys:	$40,000		
Total Mitigation Cost	***$160,000***		

Wetland Impacts to Project Area	Direct Acres	Indirect acr.	Trib Impact acr	Total acr.	Total Cost
MN Diversion Wetlands Excavation	24.5	85	--	109.5	$3,285,000
ND East Diversion Wetlands Excavation	71.5	107	143	321.5	$9,645,000

Forest mitigation to Project Area	Acres	Total Cost
MN Diversion	16.4	$157,440
ND Diversion	38.4	$368,640

River Meander Mitigation

Assume 1/2 mile buffer, with 1/4 mile on each side of stream
This equates to 320 acres land per mile restored
Assume 25% contingency on area of land to be purchased to account for RE flexibility for transactions
This results in 400 acres of land per mile restored

Assume:	the need to establish vegeation on 250ft of immediate buffer on each side (60 acres per mile)	
Assume:	$4,000	per acre for easment costs.
Assume:	$3,000	per acre for revegetation costs
Assume:	$750,000	for structures, riprap or earth moving to recreate meanders

Real Estate:	$1,600,000
Revegetation:	$180,000
Structures:	$750,000
Contingency 20%	$506,000.0
Total Cost per Mile:	$3,036,000

Acres per Mile at Assumed Stream Width:

50ft:	6	acres
75ft:	9.1	acres
100ft:	12.1	acres

Riparian Corridor Mitigation

Assume 150 ft buffer on each side of stream.
This equates to 36.4 acres of buffer per stream mile
Assume 25% contingency on area of land to be purchased to account for RE flexibility for transactions
This results in 45.5 acres of land per mile buffered

Assume:	the need to establish vegeation (45.5 acres per mile)	
Assume:	$4,000	per acre for easment costs.
Assume:	$3,000	per acre for revegetation costs

Real Estate:	$182,000
Revegetation:	$136,500
Contingency 20%	$63,700.0
Total Cost per Mile:	$382,200

Wetland Impacts and Bank Mitigation

Assume:	$30,000	per acre for wetland bank mitigation

Riparian Forest Mitigation
Assume $4,000 per acre
Assume $800 per acre for reforestation costs

Minnesota Diversion	
Real Estate MN;	$131,200
Reforestation Cost	$26,240
Total	$157,440
North Dakota Diversion	
Real Estate ND:	$307,200
Reforestation Cost	$61,440
	$368,640

1.8 Agency Meeting Notes

Fargo-Moorhead Metro Feasibility Study
NEPA Scoping Meeting with Agencies

Date: Wednesday, 02-Sep-09
Time: 1:00-3:00 p.m.
Location: Fargo library community room, 102 3rd Street North, Fargo.

1. **Attendees**: Cass County: Keith Berndt; Clay County: Tim Magnusson; Moorhead: Jody Bertrand; Fargo: April Walker, Mark Bittner, Nathan Boerboom; Corps St. Paul District: Jon Sobiech, Craig Evans, Aaron Snyder; MN DNR: Tom Carlson, Bob Merritt; NDSWC: Randy Gjestvang; USDA-NRCS: Sharon Lean

   Attendees via telephone: EPA: Robin Coursen; FEMA: Steve Hardegen, Mike Hillenberg; ND Game and Fish: Bruce Kreft; MN DNR: Nathan Kestner, Bob Bezek; USFWS: Richard Davis

2. Information to add to Scoping Document:
   a. Robin Coursen would like to see the list of prior studies incorporated into the document.
   b. Robin would like to add a broader alternative to the document; she will provide the verbiage to Jon. The alternative is a sustainable alternative that looks at use of zoning, enlarging the floodway, redevelopment and new growth, etc.
   c. Develop Screening criteria. Coursen
   d. Add objectives after the Purpose and Need Statement. Coursen and Kreft.

3. Questions asked:
   a. Is the Waffle project in or out? Coursen

      Corps: The waffle project has been looked at and is currently being looked at through other studies; this study is on a fast track and will not look at storage alternatives as thoroughly as could be.

      MN DNR: Merritt said the volume of water from flooding overwhelms any potential upstream storage.

   b. Can a Diversion channel be designed with Wetland Restoration in mind? Will the Corps pursue this if a diversion is the preferred alternative? Richard Davis FWS.

      Corps: Yes it can be and will be looked at.

4. Issues to Add:
   a. Natural Resource Habitat along entire impacted area. Merritt
   b. Slope stability along river corridor. Merritt
   c. Upstream Water Quantity Issues. Randy G

5. General comments:

a. Robin Coursen would like to look at our Economic analysis guidance. Craig will send her link to it.
b. Will we combine alternatives? Combining alternatives can lessen impacts. Coursen
c. There is no such thing as a permanent easement in North Dakota law, only a 99 year maximum. Randy G.
d. Do we have all of the agencies we need to participate? We need to add Pete Waller BWSR and Tom Fischer SE Cass WRD.

Fargo Moorhead Metro Feasibility Study
Resource Agency Meeting to discuss Impacts, Issues, Mitigation For Diversion Channel Alternatives
10-29-2009

Attendees: Jon Sobiech, Mike Lesher, Elliot Stefanik and Aaron Snyder USACE, Mike Buringrud NCWB, Joe Nigg Metro COG, Bonnie Johnson and Keith Berndt Cass County, Tom Carlson, Luther Aadland and Bob Merritt MN DNR, Pete Waller BWSR, Nathan Boerboom and Mark Bittner City of Fargo, Randy Gjestvang ND State Water Commission, Tom MacDonald and Brian LeMon Barr Engineering, Keith Weston ND NRCS, Tom Fischer SE Cass WRD, Rodger Olson, Jody Bertrand and Bob Zimmerman City of Moorhead, Sharon Lean MN NRCS, Jack Frederick MPCA, Erik Jones and Gregg Thielman Houston Engineering, Lee Beauvais Moore Engineering, Tim Magnusson Clay County, Pam Gulleson Senator Dorgan's Office, Mike Hillenburg FEMA, Bruce Kreft ND Game and Fish, Jim Louie EPA Region 8, Matt Mesker, and Richard Davis FWS.

Meeting Agenda

1. Introductions and go over Agenda. Identify objectives of the meeting.
    a. I.D. Issues concerns of the agencies associated with the diversion channel alternatives construction and operation.
    b. Identify design criteria for fish passage.
    c. Assist us to identify the impacts of the project and what we can do to avoid, minimize or mitigate those impacts.

2. Overview of project and where we are with it.

3. Discussion of the Diversion channel as designed.

4. Open it up to agencies to get their input on concerns, issues, design criteria

General Comments on overview of project to date:

Bob Merritt MN DNR: Why not make a shorter diversion on the North Dakota side? A shorter diversion on the ND side would have some additional costs because you would cross the Sheyenne River and the Sheyenne diversion at separate places. The Channel may also need to be made larger due to loss of head, additional costs would be anticipated.

What is the major cost difference between the diversion channels on the MN Side and North Dakota Side? The structures for crossing the tributaries on the ND side are the major cost difference between the MN and ND side diversions.

Mike Hillenburg – Asked about executive order 11988? This was discussed and agreed upon as an issue, it was addressed that the North Dakota side diversion and the MN Diversion are different in areas that they protect so they are not the same as far as practicable alternatives are concerned.

Fish Passage Questions, Issues, and Concerns related to diversion alternatives;

Luther Aadland MN DNR –

- Big red flag for Luther is the structure for the red river itself. How much analysis was given to the design of the structure?

- I have partnered with the corps on fish passage in the past and we know what works. Fish ladders haven't worked in the past.

- Culverts are a problem for fish passage. There are 90 different species of fish in the Red River all needing a little different flows, uniformed flows are not a good thing. Turbulent flows have worked in the past.

- Why the need for the structure, the Breckenridge bypass is a passive structure? I need to see proof that a passive approach will not work.

- Concept of manipulation by gates is another area of impacts. Having to manipulate gates will have an effect on the BC ratio as well.

- The intent was to not manipulate less than 5 year event.

Response to why the passive approach will not work:

- A passive design was looked at, using this approach would cause the size of the diversion to have to be larger which would cost more.

- Minimize the size of the diversion, lower profile through town, were reasons why it was eliminated.

What velocities going through the low flow culverts would be excessive?

- A general rule for flow through conduits to stand by is a couple feet per second. Natural channels you can have an excess of that up to 3 feet per second.

Will fish enter those types of structures?

- Aadland, the more you can emulate what fish will encounter in nature the better off you will be.

Barr Engineering – Looking at base flow, during high events like a 500 year event on the Maple flow is 9600 cfs which is much higher then 3 feet per second.

The timing of when we need to maintain certain velocities needs to be discussed.

Winter conditions fish passage?

- Whole groups of species that move throughout the summer, young of the year walleye, channel catfish, passage should be provided all the time for all species. There are winter migrations, but there isn't a lot of information on this.

Luther Aadland and others at this meeting have agreed to assist the corps and AE's to address fish passage issues. What information can we provide a sub group to show how we got to this point?

- **The Corps agreed to do a brief technical write-up to address how we went from the passive approach for the diversion to a structure.**

Bob Merritt MN DNR –

- Permit review on the MN Side; take steps to devise a positive cost benefit at the risk of environmental damages. Too suggest that a diversion as the acceptable alternative when we may have something else may be very difficult to sell. We do allow projects that are less then 1.

- The levee alternative doesn't have the impacts of the structure. There is not a way to mitigate for the structure.

- We are focused on minimizing the impacts.

- The problem the alternatives were trotted in front of the public without the true analysis of what are the benefits and the costs. The public has already made their mind up. This is the story we are getting from the corps. To be on the fast track as we are, and to suggest that there is only one alternative at this point is very premature, and to expect us to come up with a design for you in the time you want it is too much.

- If there is a viable alternative that will do the job it is our obligation to do it.

Corps Response:

- The levee and a ND diversion are alternatives. These could be carried on as a locally preferred plan; however, the ND diversion would require a B/C ratio above 1 for it to be a locally preferred plan.

- The issue is trying to find the optimum cost Benefit ratio, the higher the better is what the corps is looking at. We did look at a diversion channel that is passive and found it had an unacceptable BC ratio? There was also concern that reducing the upstream profiles would reduce overbank floodplain storage which increases the potential for downstream impacts.

- It appears that the reason for the structure is to focus on the lower flows. Should focus more on the 25, 50, 100 year etc..

What is the existing habitat on the five ND tributaries (Wild Rice, Sheyenne, Maple, Rush and Lower Rush) and there relationship with the Red?

Bruce Kreft –

- The fish migrate up these tribs for spawning during the spring months, they provide significant habitat for reproduction. The streams provide significant spawning habitat value, response to pulse events. The fish seem to seek the red in during the winter months, the interaction between the tributaries and the Red is very important.

Is this true for the Rush River and the Lower Rush, fish will migrate up the rush to some extent this will be looked at more?

- be sure to address sediment transport, flood flows, and habitat forming functions in the study

- be sure to include fish movement into tribs from by-pass channel during flood events.

- be sure to address fish stranding issue

- for fish stranding, can we model stage changes over time for a typical descending hydrograph.

- be sure to address energy transfer between channel intersecting, and avoid head-cutting.

Are there any existing structures on the five tribs on the ND side??

- The Sheyenne has a large structure near Lisbon, the Maple has a dam upstream. There is a low head damn in West Fargo on the Sheyenne. The state water commission has records of those. The West Fargo Diversion is also an impediment for the Sheyenne.

Bruce Kreft ND Game and Fish

- The five tributaries haven’t identified any critical habitat, they all provide unique habitat, the Sheyenne has a large watershed area. It is important to note that fish are not the only issue these structures will impact other aquatic species including but not limited to mussels, invertebrates, etc.

Luther

- Mussels are an issue, migrating fish are necessary for mussel reproduction.

- Existing barriers, many of the barriers are inundated providing a window of passage, the more barriers the more unlikely there will be those windows of passage.

- The Sheyenne is the most significant tributary to the red.

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Corps and AE’s Question:

- What design criteria or considerations should be used to make the tributary structures more environmentally friendly? For fish and general aquatic habitats, riparian zone habitats, considerations would you like to see incorporated?

Luther:

- Sediment transport is a key element, bank full discharge is key to both red and other trib. Flows above the 2-5 year even start spilling into the floodplain.
- Key elements: You could have aggradations problems because it doesn’t have the energy to carry it, mostly silt and sand load. Any time where you rob energy or the opposite can be a problem.
- Where flows are diverted from can be a problem.
- In stream habitat- MN has done a lot of modeling to monitor fish and other species, it is very complicated, some do well under low flow conditions, others feed in high discharge conditions. No matter what we are impacting some part of the species.

General Comments:

- Flood flows have gotten bigger over recent years.
- Projects that store flood water are generally a good thing.
- Problems that can be significant are those that cause sudden change in discharge and flow.
- Always leery when using gate controls in projects.

- If a river stops flowing during dry times and has a massive flood during high times it is not a good thing. Rivers that maintain constant flows have better fish and mussel assemblages.

Will more fish be forced up the Buffalo River if either diversion channel is built?

Flow regime of the diversion channels, do we reach a point where the flows are shut off and stranded?

Fish Stranding:
The design now has the weir being overtopped at a greater than 5 year event.
Some of this will be a function of what the weir looks like.

Will there be grade control within the diversion channel for incision? The slope is so minor that shouldn't be an issue.

The plan is too design a meandering pilot channel running down the middle of the diversion.

Footprint Impacts

Levee alternatives Impacts:

The Corps looked at the NWI for wetland impacts. Very minimal wetland impacts, the ones we have should be mitigatable.

Luther MN DNR –

- Is the intent to have levees devoid of trees?

The rule is too keep vegetation 15 feet away from the toes of the levee.

- The corridor is a real key element for terrestrial species movement along the red river.

FWS –

- Clearing of cottonwoods could impact bald eagle nests, this needs to be considered, there is a permit process for removing an eagle nest. Information of known eagle nests will be provided by the FWS.

NRCS Farmland protection Policy Act,

- Most of the area is prime farmland. There will be impacts of the riparian zones when crossing the rivers with the diversion channel. The straightening of the channel will have riparian impacts.

Wetland Conservation Act on the MN Side, similar to the corps.

Tom C MN DNR -

- Natural Heritage data base found the short beaked arrowhead plant as a species of special concern one location in a city park. The levee alignment will impact this.
- Very interested in types of vegetation for the diversion channel.

Diversion channel footprint impacts of the bypass channels.
Will the diversion channel be designed with herbaceous material inside it?

DNR is not aware of any native prairies or plant communities within the footprint of the diversion channels.

Buffalo River Aquifer – Make sure this is identified and not impacted.

NRCS –

- Fragmentation of family farms, and transportation issues for moving farming materials.

Luther MN DNR

- In river diversion structure, canoe pass and navigation through the structure.

Bob M MN DNR

- There are a fair number of drainages we will encounter, the interactions of the drainages. Also the ongoing discharge coming out of those ditches needs to be looked at. We get a substantial amount of erosion right now, that is a significant cost during the floods, and this will be an issue that will need to be addressed. We are lower then the gradient by quite a bit and need to address them like a tributary.
- There is potentially a significant aquifer (Border Aquifer) near the south end of the MN diversion. There is limited data on this. Need to get this data from Bob Merrit. We need to find out how deep it is and where it is.

Richard Davis –

- Would this diversion act as drainage to any of the adjacent wetlands?

- From a drainage standpoint, tile outlet drainages into the diversion channel, and the process of the continual wetness, tile will be something that is added as features of drainage.

It would be good to design the pilot channel with sinuousity to benefit sediment transport. Winnipeg has done a nice job of seeding the diversion.

An idea was shared to divert the five tributaries on the ND side into the diversion channel allowing no water to pass through the diversion.

SHPO has to be involved.

Water Resource District point of view, all drainage will be accommodated by this diversion. We will try not to ignore any drainage.

Have we looked into using some of the diverted water to create some wetland areas and offsetting impacts?

Notes from USDA NRCS Sharon Lean– Minnesota Side Diversion

- NRCS has identified 7 acres of additional wetlands that are not identified on the NWI.
- The project will impact prime farmland which will require a Farmland Conversion Impact Statement. This is needed when government funding is involved. Looking at the farmland impacted by the diversion, I find that all soils that are involved is considered prime farmland.
- Also SHPO will have to be involved. I have looked at the Archeological Site database and Historical Inventory database. There is at this time 24 sites that will be impacted. I also know through producers in these areas that there are more sites that have not been identified.

Due Outs:

- Main control structure on the Red River, write a technical memo to discuss the issue of a passive structure vs. hard structure. We will also take a more detailed look at the velocity passing through, adjust openings rough them up, through the openings, how frequently we can make them passable. Provide that to the agencies as quickly as we can. the design to improve fish movement through the structure

- Luther requests that we open this up a little bit more, there was a limited number of scenarios at looking at the passive, lets open a little bit to look at more scenarios that would work for a passive structure. He would much rather see controlling structure on a bypass vs the Red River.

- We agreed to have a sub committee to address the following issues:
    - the design to include passive features for fish
    - the design to improve fish movement through the structure

- This committee will consist of the following members: Luther Aadland and Bob Merritt MN DNR, Mike Lesher and Jon Sobiech Corps, Bruce Kreft ND Game and Fish, Richard Davis FWS, Tom MacDonald Barr, and Lee Beauvais Moore.

- Bruce Kreft ND Game and Fish will get over to the Rush and lower rush to take a look at that. ND Game and Fish would have difficulty to walk away from the Wild rice, Sheyenne, and Maple Rivers but have agreed to look at the Rush and Lower Rush.

Fargo Moorhead Metro
Fish Passage working meeting
November, 10 2009

Craig Evans PM, Jon Sobiech, Elliot Steffanik, Mike Lesher Corps, Richard Davis FWS, Luther Aadland Mn DNR, Bruce Kreft ND Game and Fish, Lee Beauvais, Jeff Volk, Stuart Dobberpuhl with Moore Engineering, Jody Bertrand and Bob Zimmerman Moorhead, Nathan Boerboom and Mark Bittner Fargo, Gregg Thielman Houston Engineering, Keith Berndt Cass County, and Brian Lemon and Miguel Wong with Barr Engineering.

Can the Red River control structure be designed to operate passively?

Passive control = a means to divert the flows into the diversion channel without a channel structure. Stuart explained the difference between Breckenridge diversion channel and our objectives for this project. Stu then went into the handout showing the differences between the no structure project and w/structure project.

Could you widen the entrance? You could it would help a little bit but not significantly enough to bring the benefits to where they would need to be to have a justified project.

Are the existing conditions considering future development or not? Only existing.

In order to have a feasible project we have to have a certain amount of benefits, a structure on the red for a diversion channel is needed in order to capture that quantity of benefits.

Red River Structure to divert water from Red River into Diversion.

What are some of the alternatives that you might use that will facilitate fish passage and canoe passage, etc.

- Ramp the bed up.
    - Issue with this is the huge head difference.

The initial structure has an impediment to fish 100% of the time, we need to look at structures where this will not be the case.

Luther said that the existing structure is not a mitigatable thing. We need to figure out the solutions.

Winnipeg structure (which opens from the bottom up)?

- This structure could raise the levels of the water upstream up to 4 feet at the 500 year event.
- The existing structure in Winnipeg has serious fish passage issues.

What will drive the design? Design criteria should include:

- Unimpeded passage up to the 5 year event.
- Proximity to fish passage from structure on the down stream side, needs to be very close so the fish will not have much trouble finding the passable channel.
- Less concerned about the light then the duration of excessive velocities.

Will a sturgeon seek out a higher opening as flows increase? If designed right they could find their way.

Are we in agreement that we have to have a structure on the Red River? Yes.

See attached concept drawings!

DNR likes the concept of building a channel around a structure on the Red vs. building a structure and cutting off an oxbow. The fish channel around the structure has to be designed in a way that it doesn't impact the number 1 goal of limiting flows through town.

They can work both concepts for this review.

Agencies would rather not abandon the channel, they wouldn't comment officially on this at this point. There experience shows that this hasn't worked well in the past, Drayton was an example.

The new structure would have a larger tainter gate with natural slot bottom and passage around the side. This is the preferred option now. It is not only better for handling fish passage but also better for handling debris.

Use option 1 but design the fish passage around the structure to mirror the abandoned channel which could mitigate for the abandoning of the existing channel, so it would be a one for one.

What Barr Said they can do:

- Verify gate by next week, carry option 1 forward with gate, and figure out if stair steps create any problems, with a matching section that replaces what is taken.

- Look at both options for a cost estimate realizing that option 2 will be making some aggressive geotechnical assumptions.

- They will deliver concept 1 and 2 sketches to Craig by tomorrow noon 11/11/09.

What we will want, is some type of a conceptual drawing of the gates, culverts would look like, etc.

North Dakota Diversion

Tributaries:

Currently designed to pass a 5 year flow. If the flow that passes through the diversion structure is reduced to below a 5 year the cost would be reduced significantly.

Potential changes include:

Take the top off of the trib culvert, to allow mixing with the diversion flow, this could be controlled with a gate at the end of the trib channel preventing too much flow to pass into the downstream portion of the trib.

Narrowing opening for trib flow will save money up to 10 million dollars but will do nothing for fish passage.

Raising the trib elevation allowing the entire diversion channel flow to go underneath the tributary.   This would increase upstream elevations.

Providing more openings to allow the entire diversion flow underneath the tributary and designing the bed of the tributary with more natural material, earth, stones, etc.. This is the desired option for now realizing it will not allow for passage 100% of the time.

Goals for fish passage:
Elimination of the siphon is desirable.

Eliminating structures on the Rush and Lower rush would reduce cost but not as much as folks may think, in order to build a drop structure and a ramp there will be a cost.

Can we go lower then a 5 year flow through the tributaries?

We will continue to look at Figure 4 option to cost it out.

Due outs for the ND tributaries:

Deciding to mix waters.

Another issue is the velocities at the crossings?

Figuring out how the structures will work under conditions when we are not flooding. Making it work the 80% of the time we are not flooding.

Throw a date to get back to folks on going from a 5 year to a 2 year flow. Could we drop the rush and lower rush by maintaining the 5 year flow out of the maple.

Fargo Moorhead Metro Feasibility Study
Fish Passage Conceptual Drawings Meeting with AE and Corps Staff
12-3-2009

Attendees: Jon Sobiech, Mike Lesher, Elliot Stefanik, Jeff Hansen, Tony Fares, Craig Evans, Eric Wittine, and Randy Devendorf USACE, Keith Berndt Cass County, Nathan Boerboom, April Walker, and Mark Bittner City of Fargo, Brian LeMon, Miguel Wong, Greg Williams, Paul Nielsen, and Matt Metzger Barr Engineering, Jody Bertrand and Bob Zimmerman City of Moorhead, Erik Jones and Rick St Germaine Houston Engineering, Lee Beauvais and Stuart Dobberpuhl Moore Engineering

AGENDA
Red River Diversion
Fargo-Moorhead Metropolitan Flood Risk Management Project, Feasibility Study
Scoping Design of Hydraulic Structures and Cost Estimates Meeting – Barr Engineering Co.
Place: U.S. Army Corps of Engineers, St. Paul District – Executive Conference Room
Date/Time: December 2, 2009 – 12.00 m
Use Corps of Engineers call information:
Teleconference: 866-821-8922
Participant Passcode: 9059736

1. Introductions
2. Justification of Control Structure on the Red River of the North
3. Background information – Red River of the North (and Wild Rice River)
4. Preliminary design of Control Structure on the Red River of the North and Inlet Weir to Diversion
Channel: MN Short-20Kcfs, MN Short-35Kcfs and ND East-35Kcfs
5. Background information – North Dakota tributaries (work in progress)
6. Alternative designs of Hydraulic Structures (crossing/diversion) at North Dakota tributaries
(work in progress)
7. Main assumptions used in cost estimates (follow-up meeting with Jeff Hansen, Corps of
Engineers scheduled for December 8th or December 11th)
8. Discuss outline of presentation for meeting with Agencies on December 10th
9. Other

Meeting discussion

1. The need for a diversion structure on the Main Stem of the Red was discussed and justified. Mn DNR seemed to not buy into this at the last meeting.
    a. We need to put together a technical write-up memo fleshing this out.

2. Discussed the conceptual drawings for the main stem structure. It was determined that we need to focus on passing fish for all situations up to a 5 year event, and we need to look at the 5-50 year event more closely.
3. For now we shouldn't worry about the 100 – 500 year event, fish can pass using the diversion channel at this point.

4. We discussed which concept we would prefer, at the meeting we decided we want at least 3 gates for redundancy. We need to get back to them on our chosen alternative.

    a. How will this concept handle large debris? They will get back to us on this.

5. Is boat passage a big issue? We need to work through this and get back to them, during meeting it was decided that boat passage is necessary for a 5 year event and lower, after that it will not be required based on safety issues and concerns.

6. This design effort needs to develop a list of issues that need to be addressed.

    a. How many gates, what type of gates, need to know this for the DEC 31 date.
    b. A Matrix to work through pros and cons will be developed to help guide the decision.
7. We need to share an Ice POC with BARR to start looking into the Ice jamming issues.
8. Building the structure in the wet vs. dry and how this affects cost, the AE's will develop this further and get back to us.
9. Cost
    a. Assumptions on Direct, indirect, labor, materials, schedule all affect contingencies.
    b. Barr will do some work to refine the estimates, they need to participate in the Jan 7th Cost and schedule Risk analysis.

Tributaries

1. Should we use a 2 year minimum or a 2 year maximum flow?
2. The 2 year flow issue was related to geomorphic needs to maintain some existing habitat condition.
3. Fish Passage, is still a problem, we discussed passing a 2 year event and passing a 5 year acceptable velocity to pass through.

December 10 Agency Meeting

- **Focus on presenting the next iteration of design, showing what it will look like and discussing issues and concerns with it.**

ACTION ITEMS

- **Prepare a technical memo justifying why we are going with a structure on the Red vs. a passive approach.**
- **Determine how many gates we would prefer**
- **Determine what type of Gates we want for the structure.**
- **The AE will look into how the structure will handle Large Debris (cottonwoods)**
- **Is boat passage a big issue? We determined for a 5 year even and lower to allow passage, but after the 5 year event we would go with no passage. Need to address with agencies and follow up.**
- **AE's will develop a matrix with pros and cons of gated structures.**
- **Contact an Ice expert possibly from CRREL and provide contact to BARR.**
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Notes from 10-Dec-09 FMMFS Fish Passage meeting
Fergus Falls DNR Office

Attendees:
Craig Evans, Aaron Snyder, Elliot Stefanik, Jon Sobiech, Mike Lesher with USACE, Nathan Boerboom, April Walker, and Mark Bittner city of Fargo, Lee Beauvais and Stuart Dobberpuhl Moore Engineering, Jason Benson and Tom Souey Cass County, Brian LeMon, Bill Spychalla, Omid Mohsemi, and Miguel Wong Barr Engineering, Dave Friedl, Nathan Kestner, Tom Groshens, Luther Audland, Tom Carlson and Bob Merritt MN DNR, Bob Zimmerman and Jody Bertrand city of Moorhead, Rick St Germain Houston engineering, Bruce Kreft NDGFD, and Rich Davis FWS

1. The Corps will write a short white paper to document the need for a control structure on the Red River main stem and how we arrived at that design.

2. Elliott presented slides to show the exceedence probability of various flows. During the wetter period we've seen recently, a 5-year event flow occurs less than 1% of the time for 11 months out of the year and only 8% of the time during April. For fish passage, we would like to be able to pass fish 100% of the time, but that may not be possible. 20-yr event (19,000 cfs) occurs less than 1% of the time during April. This info is based on the wetter portion of the flow records, and different assumptions about period of record would affect the results.

3. RRN Control Structure:

Miguel Wong presented info on the preliminary conceptual design of the RRN control structure. The purpose of this meeting is not to get a blessing of the concept but to get input on all of the design considerations. All of the preliminary work originally used the Phase 1 hydrology. The info presented today is based on Phase 2 hydrology.

Red River and Wild Rice flows are in the same order of magnitude. Design is based on coincidental flows on the Wild Rice for design flows on the Red. Design flows for the MN diversion vary significantly from median flow 360 to 500-year flow 53k cfs. Stages vary over 32 feet (elev. 880-913). Average velocities vary, but are generally less than 1.3 fps. Bottom elevation 861 top ws elev 913 = more than 50 feet difference between thalweg and water surface.

MN Short 35k diversion 500-yr event (53k cfs) would divert 35k cfs and allow 17.9 cfs into the city = less than a 20-year event. For most flow conditions, about a 5-year flow would be allowed into the city.

MN Short 20k would divert 20k and allow 33k into the city = more than existing 100-yr event. So with a 500 yr event you would be fighting something over a current 100-yr event. Bottom line—design is to maximize the amount of water that can be diverted.

Also, the elevation differences are very large, so a very large structure is needed.

ND diversion would start upstream of the Wild Rice confluence. 500-yr event with a 35k diversion would take 18k cfs from the Red and only allow 1400 cfs of wild rice flows plus 16k red flows into town. The project will only let between a 5-10 year event flow into town. Average flow velocities are 0.7 to 1.3 fps depending on flood event (average over most of the flood plain, but not all).

USGS measurements show that average velocities at the Fargo gage are about 2 fps for 2 yr to 5 yr flows.

Design concept we're currently proposing is intended to minimize impacts on events smaller than the 5-yr event. Most of the time (99.5% of the time), the structure would act like a bridge with minimal impacts to the flows. Could pass ice, fish and boats. Inlet weir would be set to keep flows up to the 5-yr event in the main channel.

Questions: what is the minimum width opening needed to pass ice—assumption now is 40 feet.

For events larger than the 5-yr event, the structure would block various openings to limit the flow coming through, but the structure would never entirely block the flow. During the larger events (100-yr plus) the lower openings would pass bed load and keep it from settling out upstream of the structure.

Need input on desired number of gates. Presented charts showing various configurations and openings required to pass various flows. Same or different widths? Various bottom elevations? More or fewer openings? Gates operable to various heights or just open or closed?

Preliminary modeling shows that this type of structure can achieve 1-2 fps average velocities up to the 5-yr event when the gates are not being operated. Once the gates go into operation, the head difference will drive velocities, and they increase substantially to the 13-20 fps range.

Luther noted that the existing cross section of the river is pertinent to the discussion. Miguel stated that the structure openings would actually provide more flow area than the existing condition. Luther suggested that the existing channel is elliptical, so it would be good to have the middle opening with a lower elevation than the sides.

Observed velocities by USGS across the channel for 2007 (about 8-yr event) vary from 0.5 to 3.5 cfs depending on distance from the banks.

Barr created a 2-D model to see how flow velocities vary across the channel (very preliminary). Models show up the to 5-yr event there will be areas that have flow velocities near 1.0 fps with some roughness built into the channel.

Goal for today—refine the concept

Question—what is the length of flow path? = about 50 feet of 2-3 fps.

Erosion protection will be needed downstream of the structure, but not a large cost relative to the rest of the structure.

Question—how will bed load sediment transport downstream be affected? Most of the bed load is fine-grained silt and clay rather than a sand material. Miguel consulted with Gary Parker and also worked on the Buffalo River. At this time, we know more work is needed, but it does not appear to be a large issue.

Luther noted that the RRN produces large volumes of sediment, even if the grain size is small.

For floods larger than the 5-year event (up to about 50-year) a side ramp could allow fish passage. Ramp slopes up to gated openings at various elevations that could be closed off if elevations exceed operational constraints.

Ice passage is an issue. Propose keeping minimum gate openings to 40 feet. Could use an ice control structure upstream of the gates to keep ice out.

Question—Aaron—could we let a 15-year event pass without operating the structure? Answer—it could be operated that way, but that would allow more water into town that what we're designing for.

April Walker said a 30-foot stage is about a 7 or 8-year event when 2nd Street floods. Elm street and 12th Ave bridge go under sooner. Fargo would not try to prevent those lower level damages from occurring. Houses are generally good to 35 foot stage. Bob Zimmerman said major disruption to traffic occurs at about 32 feet. Mark Bittner confirmed that the 30-foot stage is the "magic number" for Fargo.

Stu Dobberpuhl presented. 10-yr stage is about 32.7. Raising the weir crest operation would require a much larger weir. Luther was more concerned about the frequency of operation of the structure.

Luther—what are the damages on the more frequent events; are they things that could be moved? Good planning on behalf of the cities could be part of the solution and allow the less frequent operation. Passive intake at 1 foot above 5-yr event and beginning operation at 5-10 year event

To look at the concept, it would be helpful to model the proposed structure for moderate events without operation of the gates to see what those velocities would be.

Luther thought that a 30-foot gate width is probably a practical minimum.

Trash load could be addressed with booms to direct trees, etc. to a handling area.

Luther would rather see trash passed through the structure using larger gates. Booms that intercept trash would keep woody debris from the natural environment and cause problems during events. Bruce Kreft noted that this design is important to set precedent for other projects in the basin.

Bruce Kreft asked whether all of the concepts could handle navigation. The designs would allow boats up to about the 5-yr event. Wider gates would be better.

Tainter gates can be 40+ feet wide. Corps uses roller gates for openings larger than that. The number of gates affects redundancy. Need to be able to accomplish the operation with some gates out of commission and provide bulkheads for emergency closure.

Luther would like to match the bankfull capacity of the river and try to match the sill elevation to the existing channel bottom.

Miguel proposed picking a concept now to include in the report and cost out. Craig pointed out that the Corps needs a cost estimate within 20% of final, but details can change later if costs are reasonably within the estimate. Cost will be driven by excavation, concrete and number of piles related to width of the structure. Other considerations, ramps, etc. can be added for small increments of cost.

Elliott—we're wondering if there is comfort that these concepts will provide adequate fish passage. Is this general design acceptable?

Luther—two other elements haven't been discussed. The bypass and issues of off-channel vs existing channel location. Other places have used a more varied/slotted design with different elevations of weirs.

Bob Merritt noted that fish passage structures can be people magnets due to concentrating the fish. Possible enforcement issues. Luther is not too concerned about poaching. Look at Breckenridge design as a sample.

Tom Groshens—would storage affect the design of the project?
We would not design this project smaller if more storage was built. It could affect the frequency of events and allow it to operate less frequently.

Bruce Kreft—ND contributions from ag drainage will probably increase rather than decrease over time.

Luther reminded us that flooding is a cue for migration that is missed when we focus on percentage of time that flows occur.

Issue of where the structure gets built—in existing channel or adjacent to the existing channel. Abandoning existing channel could cause impacts. If we build adjacent, what happens to the existing channel?

Miguel showed aerial photo. Using a straight portion of the channel would minimize these impacts. Building in the existing channel would require construction during at least one snow-melt event—very risky for construction.

Mark Bittner assumes we would build the diversion before the control structure so flood flows would be diverted during construction.

Elliott—we need to factor mitigation into our cost estimate, so we need to make some assumptions.

Luther thinks placement of the structure is a very important consideration.

Miguel—at this time a safe assumption is to build off-channel.

Elliott—either temporary drainage of existing channel and build bypass or re-route channel and abandon the old channel. Need to identify what are the issues and how can we avoid, minimize or mitigate for them.

--Lunch—

4. Tributary crossing structures

Miguel presented slides on the trib crossings. Focus on Wild Rice, Sheyenne and Maple rivers. Our prior agreement for design was to drop the Lower Rush and Rush rivers into the diversion and compensate by letting more of the Maple flows come through.

Design is based on the coincidental flows on the tribs when the RRN has a design event. Goal is to keep the water surface in the diversion lower than the coincidental stages on the tribs so that the tribs can be captured in the channel.

2-yr depths 10+ feet.

Natural conditions on the Sheyenne River are 2-3 fps mean velocity. Wild Rice R. velocities for 2-yr event are 2-3 fps until larger events when more flood plain comes into play.

Phase 1 design allowed minimum 5 year flows to cross in the tribs. Cost about $50 million per structure to accomplish this. Box culverts assumed to be 200-400 feet wide with high velocities.

Phase 2 design (to be completed 31-Dec-09):

- Shorter transitions to concrete-lined sections (about 400 feet)

- Tribs pass minimum 2-yr flows into protected area
- Allow fish passage
- Minimize risk of ice jamming
- 3 major crossings: Wild Rice, sheyenne, Maple
- 2 drops: Lower Rush and Rush

Elliott noted that some of these assumptions may be less than desirable, but we are trying to see what could possibly make the ND diversion viable and still remain environmentally acceptable. For instance, the two drop structures at Rush and Lower Rush. We're balancing cost with environmental concerns. Unless BCR increases to 1.0, we cannot even consider it.
The diversion invert is significantly lower elevation than the tribs (12-15 feet).

Conceptual design scenarios:
1. Flow in trib, no flow over spillway, no flow in diversion
2. Flow in trib, flow over spillway, no flow in diversion
   Open channel flow in trib; gated openings kept open during event
   Could cause incresed stages upstream on tribs for moderate events
3. Flow in trib, flow in spillway, flow in diversion under aqueduct
4. Flow in trib, flow in spillway, flow in diversion over and under aqueduct
   Requires a wall on both sides of the diversion to keep diversion flows from spilling into the tribs.

Conceptual design of trib channels:

a. Use channel walls 6-8 feet high with additional removable gates/sidewalls that must be dropped when the diversion channel needs additional flow capacity. Would need to anticipate large events and drop the gates before the trib flows are up against them. Crest gates are used on other dams in the region. Operation during winter conditions could be difficult. Structure would probably be expensive.

b. Use a higher trib invert over the diversion channel. Would increase velocities to 5-6 fps over the diversion and back water up on the upstream side that would divert trib water into the diversion. Could cause sedimentation upstream.

c. Use a combination of box culverts with open channel on top, approx total height 8 to 8.5 feet, keep invert elevation same as existing trib invert.

d. Use multiple layers in both the trib and diversion.

e. Mark Bittner: use a separate diversion around the trib crossing to handle excess flows on the diversion.

Costs: Miguel believes that the revised structures could be significantly less expensive than the original design, or at least within the original cost. (Given that we're dropping the Rush and Lower Rush structures.)

Mark Bittner and Bob Zimmerman are not ready to drop these options yet.

Miguel thinks concept “b” is most viable.
Up to what event do we need to pass fish?

Bruce Kreft—want as much as possible to keep passable to fish under all conditions.

Elliott—there is no exact frequency we can specify that would be acceptable. If you could pass up to a 50-year event, that would be 99% of the time over all months.

Bruce—if that was acceptable as a first step, we could consider mitigation for the remaining loss of passability.

Tom Groshens: need similar info to what was presented for the RRN Control structure.

Luther—other issues: freeze-ups of the channel? Distribution of sediment moving down the tributary? (Miguel: sediment is a bigger issue on the Sheyenne and Maple)

Miguel: we would design the spillway into the diversion to be very efficient so that for even very large events on the tribs, the flow velocities through the crossings would be similar to the existing 2-year flood velocities.

Gates on the downstream end of the crossing would be required for events on the diversion larger than the 20-yr event.

Fargo prefers to see Mark’s concept pursued. Bruce Kreft would like as much natural ground as possible.

Aaron—how would these structures function for a huge event like a 1000-yr event. How robust would it be?

Brian—they could be designed to handle any event.

Barr says details could be developed for one concept within a week.

Meeting via telcon scheduled for 22-Dec in the morning. Corps will coordinate this.

Barr will continue to look at concepts “b” and “e”—the raised trib invert with efficient diversion weir and Mark’s concept with a high-level diversion around the trib crossing.

5. Mitigation? What options do we have to mitigate for footprint and other impacts we can’t avoid. Need to discuss at a later time. Want to mitigate based on need, not cost, but we need to know what the cost is going to be.

6. Action items:
    a. Meeting to discuss footprint impacts.

b. Develop new refined designs for two trib concepts
c. Identify mitigation for any impacts to trib fish passage

Meeting Notes – Red River/Tributary December 22, 2009

Attendance: Craig Evans, Mike Lesher, Aaron Snyder, Elliot Stefanick, Jon Sobiech USACE, Brian Lemon, Katie Wenigmann, Omid Mohseni with BARR engineering at Corps office.
Dave Freidl, Tom Groshens, Bob Merritt, and Nathan Kestner MN DNR, Bruce Kreft North Dakota Game and Fish, and Richard Davis FWS via phone.
Lee Beauvais, Mike Opat, Stuart Dobberpuhl with Moore Engineering, April Walker, Nathan Boerboom, and Mark Bittner City of Fargo, Bob Zimmerman and Jody Bertrand City of Moorhead, Keith Berndt Cass Co., Gregg Thielman and Rick St. Germain Houston Engineering and Wade Frank and Kris Bakkegard with KLJ all together in West Fargo.

1) Connecting wild rice and red rivers, the weir will be on the west bank of the wild rice river. The inverts of the rivers were so close, that it was complex, this structure is simplified significantly.
2) The Sheyenne crossing is looking like a box over a box. No flow in diversion channel will ever flow over Sheyenne structure. All diversion flow goes under Sheyenne.
3) Maple is similar to before, lower flows under higher flows over.
4) Rush Rivers, simple drop structures step energy dissipation carrying flows into diversion channels, they will peel off low flow fish channel for the rush rivers. This will be on the west side, with a slope of 3% or less, should be 100% passage.
5) Rush Creating more channel than we are eliminating with the rush rivers, removing nearly 5 miles of channel and making 11 miles or so which will replace that with higher quality habitat.
6) ND East water surfaces –
    a. No pressurized flows 5-year
    b. Channel from wild rice to red slopes towards red.
    c. Pressurized flows on 10-year
    d. Elevation of weir is at the 5-year plus 1foot? Flow into diversion in excess of 5-year event. Coincidental flows may enter channel. Slightly less flow through town with a 5-year.
    e. Wild rice structure is a double weir structure, one on each side of river, this was done to keep 5-year red river flows from entering the wild rice.
    f. 10-year event pressurized flows - maple, 20- under Sheyenne and maple. 100 – Sheyenne and maple. 500 all and over maple.
    g. Any issues with getting flows we need into diversion? They don't see an issue with that.
    h. Sheyenne River channel stayed at 125 feet, maple to the red is 300 feet?
7) Wild Rice River
    a. Initially was $84 million. Currently dropped sustainably. Moving closer to $30 million.
    b. 2 large gates 30 feet wide are used for redundancy. When gets totally closed there will still be some flows into protected areas for bed loads.

    c. A fish ramp will be included. Proposed to be 10 feet wide and 3 feet deep to maintain 1.3 feet of water depth.
    d. Connecting channel vs diversion channel. The controlling weirs are now on the wild rice. The connecting channel is mainly a big ditch.
    e. Flows enter connecting channel at 2-year but don't go over weir until the 5-year.
    f. 7650 will go through town for a 5-year event – 1950 will be diverted for the 5-year event, this is based on the 2-year flows.
    g. Anything over 2 year event on all tribs will go into diversion.
    h. Operation plans could allow more flow into town, if desired.
    i. Is there a cost benefit to not operate those gates? Don't need to operate as a flood benefit on a 5-year.
    j. 99.5% of time gates are wide open.
    k. Two 30 foot gates, that are approximately 22 feet high.
    l. 30 and 35K look similar with velocities.
    m. Tail water backs up and doesn't allow as much flows into the protected area for the large events 500-year and 100-year.
    n. Complex flows at bottom of channels with boulders or rubble.
    o. Will fish passage be needed at the 5-year event on the trib structure vs. at the 10-year.
    p. Ice considerations 40 feet is optimal. 20 feet could work. On the red may make the center gate larger. On WR single gate may be recommended.
    q. Could be sedimentation issues with the WR structure. Diverting the top portion of the flows which has less sediment. Less flow will be moving the material on the bottom, need to have morphodynamic modeling and sediment sampling in the future.
    r. Will sediment be an issue in the connecting channel?
    s. Would two levels of fish passage structures be necessary?
    t. 10 feet for fish passage seems kind of narrow, should be more like 20 feet-30 feet?
    u. How much of operation of structures will be during spawning runs, April, May, June? Walleyes, Pike, Sauger in April. Sturgeon in April, mostly in May and some in June.
    v. Sturgeon have a narrow window in time for spawning. Fish can wait, but some won't. They may stack up until it's too late. Some species (northern pike) go back to the same locations each year. Other species might find available habitat. They may reabsorb their eggs if they can't find suitable habitat to drop their eggs.
    w. Populations can reestablish themselves upstream after extremely large events.
    x. Need Corps direction on fish passage, do we need two? Should they be at least 20 feet.

8) Sheyenne River Structure –
    a. Only allowing 2-year event into protected area. So flows are peeled off at that point.

    b. The 500-year water surface in diversion never will crest over top of the tributary.
    c. Increased flow area under the structure.
    d. No mixing of diversion and trib waters.
    e. Lowered invert of diversion 3 feet raised invert of Sheyenne approximately 1 foot.
    f. This is a completely passive structure.
    g. Drop structure will be necessary for energy dissipation to ensure channel stability.
    h. Diversion is 250 feet for the 35K diversion and 225 feet for the 30K diversion. The tributary is 60 feet wide. Basically a box over a box.
    i. How are flows limited into protected area? System acts passively no control. Should more positive control be incorporated?
    j. Should include trash booms to handle debris.
    k. Shortened the concrete lined section, the decrease of the invert will match the low flow channel so there will not be pooling under the structure.
    l. Would include a winter low flow channel
    m. Matched 2-year flow area with the flow area in the structure. Allows same flow through.
    n. A rough bottom was included in both the diversion and the tributary. Across the entire channel area.
    o. Sheyenne does transport sand, pulling water from top of flows, there are sedimentation issues that need to be modeled and examined in the future.
    p. Design would be intended to not get anchor ice.

9) Maple River
    a. This structure passes 2-year maple flow, plus 2 yr lower rush, plus 2 yr rush into the protected area.
    b. Water goes over the tributary around the 100-year event.
    c. Maple structure has an open channel with winter crossing and with headwall upstream and gates downstream to limit flow into the protected area. Max flow into the protected area is 3550 cfs. Includes drop structure/headcutting structure. Upstream headwall is to keep diversion flows in the diversion—may not be needed.
    d. Gates will only be operated at large events greater then 100 year.
    e. There will be mixing of water between diversion and tributary.
    f. Gate operations necessary for large events.
    g. Diversion and tributary dimensions same as the Sheyenne.
    h. Tributary invert raised 1-2 feet.
    i. Sedimentation issues could occur due to raising the bottom of the tributaries, but not as much of an issue as it is with WR and the Sheyenne.
    j. Maple has same roughness factors included.

10) Follow up discussion
    a. What structures are most impacted if additional flows are required into the protected area?
    b. What about long term maintenance what is the design life? 50-100 years.
    c. Is access to all the structures included? Yes this will be included.

   d. Would raising the invert basically be the same as a low-head dam? Hesitate to say this because of the not exact data, may or may not raise at all. This would be designed not to create a low head dam. If that happens riffle structures would be included. Worked to increase area under the structure to minimize the channel invert increase.
   e. Maple flows go to 0 in the winter sometimes, 11 times in last 30 years. This could be a function of the data and the means of collection.
   f. What are the velocities through the diversion structures. Sheyenne has 8 fps, maple 7.5 fps, for the 35K for the 500-year event.
   g. At what point to diversion structures become impassible for fish?
   h. Could a table on velocities in the diversion be added to the presentation?
   i. Quality of habitat in the diversion would be low. The habitat would be more critical below the Rush and Lower Rush – the intent would be to do this to accommodate the two rivers.
   j. Fish stranding? Is there an issue with fish moving into diversion, similar to how it would be with hydropower peaking? The weirs are designed to have a “v” notch to keep from having an immediate shut off and there would be a low flow channel with grade so the fish can have an out.
   k. Sediment – you will need to figure that out and you will see sediment issues. This could be a long term maintenance issue.
   l. FWS – concern regarding drying out of floodplain wetlands, 2-year events should maintain surface water connection to wetlands. This could be an impact over time if they were to lose hydrology. There could be a cost for mitigating those impacts. Floodplain wetlands downstream of diversions.
   m. Corps told contractors to accommodate fish passage for the 20-year event.
   n. Has enough been done on these designs to say we are OK to move forward? What are the agencies seeing? Seeking the agencies input and feedback.
   o. What does the outlet of the diversion look like? This would be a riprap protected area, no special structure.

11) Mitigation Discussion
   a. How to account for the Rush and Lower Rush channels being abandoned? The base of the channel is intended to provide habitat to offset any impacts. How sustainable would this be? Would the pilot channel stay in place? If designed properly the pilot channel should maintain itself. The pilot channel would be meandered. The thought is that these features would offset the impact of cutting off the rivers.
      i. Important part is to make sure its not just a curvy run, we need to include habitat and diversity, variability within the channel, pool run, etc.
      ii. Looking for an “E” channel with well established vegetation and banks.
      iii. Don’t want to restrict meander belt – may not have wide enough bottom to make a good belt width.
      iv. Goal to offset the loss from the straightened Rush and Lower Rush rivers.

v. The system would have to be stable and sustainable within the current channel width.

vi. Need to look at the confluence of where the Rush and Lower Rush intersect with the Sheyenne, what will some of those impacts look like? Need to maintain that habitat quality.

vii. What dimensions are necessary? Want to have fairly sinuous channel, want to maximize floodplain available. 20 bank full widths with an “e” channel or more.

viii. Can Corps supply any figures, with the drainage areas? Because its altered does the regional curve apply? Discharge and recurrence intervals.

ix. No woody growth will be allowed, no trees.

x. Use native vegetation.

b. What will happen to the existing rush and lower rush channels?

i. The intent would be to abandon the existing channels.

ii. Smart to maintain as a greenway and establish wetlands to use with internal drainage.

iii. Corps should ask that these areas be maintained to provide some habitat value.

c. Are the Rush and Lower Rush rivers channelized and confined by levees? Unknown, most likely excavation and side cast placement.

d. Red River Control Structure –

i. Construction in channel or adjacent to channel. There are concerns with constructability with in channel construction. Two options 1) build in dry adjacent to river, then rout river to structure, abandon existing channel. 2) Excavate temporary channel and then close natural channel to build structure, once complete reopen natural channel and close temporary channel. EIS to include flexibility to do either of those two. Options to mitigate or minimize impacts. Option 1 would have some in channel loss of habitat, looks like we would impact 2600 feet or so. Given width of river and the loss of .6 miles that would be 9 acres of habitat lost. To offset those impacts could remeander to offset these impacts, looked at remeandering 1-2 miles of the Ottertail river. Look to restore an equal number of acres on the Red, maybe a mile or two on both the MN and ND side, which could come to 12-20 acres of habitat.

ii. Need to look at impacts to riparian forest and costs should be included. Forest and footprint impacts.

iii. Large cost of remeanders would be for real estate costs, and get easements to revegetate.

iv. Will building in dry have more mitigation needs? Yes that would be to mitigate the permanent loss of habitat.

v. Option 2 has greater construction risks. Option 2 would avoid permanent loss of habitat in the Red. Reconnected once construction is over. There would still be some loss of habitat due to impacts. Looking at a 2-year window.

e. Loss of full fish passage – don’t want this to be lost in the shuffle.
   i. What would the impacts be of the 0.5% to fish reproduction? Saying that it is less than significant may be a stretch.
   ii. Just upstream there are two dams Christine and Hickson, they can be passed with higher flows today – combined with some of the passage barriers with the diversion with the higher flows maybe the combination wouldn’t allow fish passage.
   iii. Christine and Hickson are in the works to address fish passage for passage nearly 100% of the time. But if they are not then you have additional issues if these are not addressed by the proposed project. Could these two projects be wrapped into these two projects to use them as mitigation for the 0.5%? Possibly if the impact is significant, if not it would be difficult and if those are built would that get the impact down to less than significant.
   iv. Even with 500-year fish passage there will be an impact to the ability of the fish to move.
   v. Fish passage—still losing floodplain passage by providing a constriction at the channels. That needs to be acknowledged.
   vi. April Walker says that flood-fighting activities already prevent fish passage at the railroad bridge near first avenue in Fargo, so existing conditions may be worse than our conditions after construction.
   vii. Groshens says fish seem to try to get back to the same habitat each year. Probably wouldn’t go looking for another spawning area. May either not drop eggs or just drop them where the fish can get—either way, low success rate for reproduction.
   viii. Doubt that fish would just find another place to spawn, they will do one of two things reabsorb or just dump eggs wherever.
   ix. If agencies don’t believe that what we have done today are enough to avoid and minimize, what do we need to do to mitigate? Need to shoot for passage at all flows, maybe not possible but shoot as high as you can, is where we need to go.
   x. Corps to talk with consultants about 50-year for the Red River Structure. This should be accomplished.
   xi. Could diversion have some roughness included for fish passage at other location than just bridges and areas where drains enter?
   xii. Agencies think that habitat diversity would be a good thing. This would apply to MN and ND diversions along entire length.
   xiii. Could a meandering pilot channel be created through the entire channel? This applies to both MN and ND.
   xiv. Develop a 2D model for the diversion channels to get an estimate of what the pilot channel might look like? Corps to check on this.
   xv. There are other dams and impediments to the rivers that are in place, if the fish cannot get to the impediments that are being built with this project what is the purpose.

xvi. Is there a regional goal to reconnect the system? Goal to not segment the river anymore.
xvii. What are the differences between the MN side and the ND side? How do the plans differ from each other? What are the costs of those?

DNR and ND Game and Fish are both very interested in flood protection, but they also need to be concerned with the environment.

Lee Beauvais says the AEs will assume a need for fish passage up to a 50-year event. Agencies should assume 50-year for RRN and min 20-year event on tribs. Lee thinks Sheyenne and Maple should have acceptable velocities up to 100-year event. 20-year is doable on the WR.

These are our action items where we need information as soon as possible.

1) Is our approach for the Rush and Lower Rush rivers acceptable to avoid, minimize and mitigate any adverse impacts?

2) For the Red River structure, is Option #2 the preferred option for construction?

3) Is our proposed mitigation actions appropriate for Option #1?

4) Any recommendations where you would like to see mitigation done, with order of preference being: Red River close to project site; Tributaries close to project site; other Red River or trib locations further from site (e.g., over 30 miles).

5. Assuming we provide fish passage through/around Red River main structure for the 50 year event and passage through around the ND tribs for the 20 year event are impacts to fish migration and connectivity still significant?

6. If so what needs to be done to mitigate for the impacts?

Natural Resource & Environmental Presentation
3 February 2010
Memorandum of Comments

MVP
Edith Pang
Craig Evans
Aaron Snyder
Elliott Stefanik
Jon Sobiech
Tony Fares
Shannon Bauer
Terry Birkenstock
Mike Lesher
Elizabeth Killian

Call In
Keith Trego
Nathan Kestner
Amanda Hill
Robin Coursen

MN DNR
Mike Carroll
Dave Friedl
Tom Groshens
Peter Buesseler
*Tom Carlson
*Nathan Kestner

EPA
*Robin Coursen

FEMA
Steven Hardegen

Barr Engineering
Miguel Wong

Houston Engineering
Gregg Thielman
Erik Jones

Moore Engineering
Jeff Volk
Lee Beauvais

City of Moorhead
Jody Bertrand

City of Fargo
Nathan Boerboom
April Walker
Mark Bittner

Cass County
Bonnie Johnson
Keith Berndt

Clay County
Tim Magnusson

USDA NRCS
Sharon Lean MN
Betsy Hernandez ND
Keith Weston ND

ND Health Dept.
Mike Sauer

ND GFD
Bruce Kreft
Lynn Schlueter

Fargo Commission
Mike Williams

Sen. Dorgan
Pam Gulleson

North Dakota Natural Resources Trust
Keith Trego

North Dakota Water Commission
Randy Gjestvang

National Wildlife Federation
Amanda Hill

Dave (DNR)

Q: How is the term “significant impact” determined?

A: The term defines the point at which there is going to be noticeable impacts for connectivity and for footprint.

Bruce (DNR)

Q: There is Geomorphic Pre/Post consideration and studies, but is there any Pre/Post studying for the fish passage abilities?

A: The Red River has biotic studies built in that are not specific to fish passage, but could add a low cost approach to do post studies on the project.

Q: What if there is a significant issue how will the issue be paid for to mitigate after the project is completed?

A: Once the construction is done our funds are spent, but the locals could go to congress for another authorization. They could also see funds through our Continuing Authorities Program. Section 1135 involves modifications of existing projects for habitat restoration.

Randy

FYI there is a West Fargo aquifer that lies about 40-60’ deep.

Mike

FYI we will be looking closely at the language in the plan for future fixes since future funding is not guaranteed.

Tom (DNR)

Q: There seems to be a flaw in the logic/concern and I need more science to stand behind your reasoning for why the fish passage has a non-significant impact and that no mitigation needs to be included.

A: Elliott provided a fish passage discussion showing hydraulic modeling and flow velocities which are passable up to a 50 year event. That discussion was followed up with fish passage thru the structures up to a 50 year event and additional money was added to increase the dimensions of the passages.

Steve (FEMA)

Q: Has there been time spent looking at how many structures will be affected from increasing the flood plain or areas downstream?

A: The 100 year flood plain doesn’t expand, but the stage does increase 9 – 10”. The duration stays the same, but since no extra damages are caused by the channels, we have found no takings as part of this project.

Dave

Q: I am not convinced that there are no geomorphic impacts. How quickly will the door close for the fish to leave the channel?

A: We will look to provide modeling to simulate this window and try to get the associated number and a solution to the fish sufficient time to emigrate.

Q: How will the jurisdiction be regulated if the alignment goes through ND?

A: (MN DNR) Both agencies will have an interest.

Peter (DNR)

Q: Monitor now – Come back later: Will you clarify the exact solutions that will be imposed for each situation if they need to come back later to show mitigation and fixes are required?

TEAM to further discuss impacts and mitigation:

- Bruce Kreft
- Rich Davis
- Tom Groshens
- Dave Freidl
- Miguel Wong
- Nathan Kestner
- Lynn Schluezer
- Luther Audland

NR Agency meeting
19-Feb-10, 0930
Centennial hall basement meeting room

North Dakota Game and Fish: Bruce Kreft and Lynn Schlueter
Minnesota DNR: Dave Freidl and Nathan Kestner
USFWS: Richard Davis
Corps: Craig Evans: Elliot Stefanik, and Jon Sobiech
Moore Engineering: Stu Dobberpuhl
Barr Engineering: Miguel Wong
City of Fargo: April Walker, Mark Bittner, and Nathan Boerbom
Houston Engineering: Mark Aanenson

Meeting Agenda

Discussion for impacts will follow this general approach:

Resource Category
- Impact assessment and determination
- Mitigation and/or monitoring (as appropriate)

9:30 Intro and Overview

9:45 Aquatics (MN Alignment)
  - Footprint Impacts
  - Geomorphic Impacts
  - Connectivity Impacts
  - Fish Stranding/Other

Aquatics (ND Alignment)
  - Footprint Impacts
  - Geomorphic Impacts
  - Connectivity Impacts

12:30 Wetlands

1:00 Water Quality, Groundwater

1:30 T&E species; Upland habitat; Safety; Ice/Debris

2:00 Adjourn

Overview

Elliot Stefanik and Jon Sobiech presented a more detailed look at the impacts associated with the various diversion alignments (both MN and ND diversions). The approach was to go through these impacts based on the above agenda, then discuss the preliminary mitigation plans/ideas for each impact, and then to get reactions, ideas, and comments from the agencies on each proposal.

In general, no major ecological issues were identified that would require a diversion alignment be dropped from further consideration. In general, the agencies are much more concerned about impacts associated with the ND alignment, compared to the MN alignment. Concerns also remain on the significance of impacts to fish passage, and potential for fish stranding issues within the flood diversion channel.

The presentations used during the meeting were all provided before the meeting. The notes below capture the majority of what was said at the meeting. They do not capture all thoughts or conversations during the meeting. At the end of the notes is a compilation of action items that need to be done as a result of the meeting.

Notes:

Elliott—this will be a programmatic EIS and we anticipate that there would be specific supplements to address the specific impacts once details are known. Thus, their will continue to be detailed planning, coordination and public review beyond the initial EIS. Each major project feature could potentially need a supplemental NEPA document.

The corps presented the footprint of the proposed Red River Structure, and weir for MN side. The Corps is currently recommending stream re-meandering to re-create 20 acres of habitat to mitigate for the main structure on the Red River. Mitigation sites have not been identified. Such sites would ideally be on the Red River, an adjacent near-by tributary, or as a last resort, a more distant tributary location within the watershed.

The PDT team will optimize the MN alignment at a meeting next week February 23rd.

Dave Freidl – an impact to consider is one of channel length, and how the different actions could affect channel length and possible geomorphic effects.

Lynn S- noted that we should observe and learn from the Drayton Dam experience. This includes placement of a dam that modified channel conditions and resulted in bank instability around the site.

Miguel—we have produced an order of magnitude estimate of impacts. We are still looking for the exact location.

Agencies generally supported this approach for mitigation. MnDNR did have some suggestions of potential project sites where mitigation could be done.

Dave Freidl – can we roll the mitigation into one large project? Phase 2 feasibility studies for the Wild Rice Ecosystem restoration project, is one example?
Please Provide other identified areas for possible mitigation.

This type of action may be possible, but it also has to consider existing uses and authorizations, may have to de-authorize a federal project. For this reason, it is much more difficult to pursue stream remaindering in places where an existing authorized project is already in place.

Nathan – if there is something unique about an area that will be impacted it would be good to replace those features.

Dave F. There are lots of details that need to be discussed. The less you have to operate the Red River control structure gates the more comfortable we will be. A very detailed operational plan has to be developed before we construct and get a permit.

April W. Will base the decision of project operation on not wanting to build the 2nd street level which is at a 30 foot elevation, they have to get prepared at 24 feet in order to have it in place in time. The city is talking about the need for flood proofing inside the protected area.

Dave Friedl: MN DNR wants to stay involved in designing the fish passage structure(s). They have an interest to see any preliminary drawings, hydraulic data, etc for the structure.

Most of this information is available. Will need to do additional analyses to assess rates of water level decline within the flood diversion channel (as it relates to impacts with fish stranding). **We will provide this available information to the agencies.**

MN DNR fisheries regional managers met yesterday to discuss this project. Dan Lais is taking over for Bob Bezek. Points that came out:

1. Not comfortable that there are no significant impacts—will need more information. Even a well designed fish bypass channel would still result in a significant loss in connectivity. There will likely be a loss of fish passage, and there may be other places to improve fish passage to mitigate. Even with all impact minimization efforts in place, the remaining loss in connectivity is not “mitegateable” at the project site. There is no question that there will be lost connectivity, the way it is currently designed fish connectivity is reduced from a 5 year to 50 year event. However, implementation of fish passage at Drayton Dam, Christine Dams, similar to what has been done at other dams, would be adequate to off-set these impacts. DNR also has a lot of ideas to improve existing plans. Overall there will be a loss of migration. DNR has worked hard to minimize barriers. This project will remove the large events where fish passage occurs now. The more extreme events are perfect years for fish to move, great years for fish

distribution. We don't want to minimize this. Ultimately, this project will take away some connectivity and would like to put it back. MNDNR is not ready to draw the same conclusions. They expect a thorough impact analysis.

MnDNR noted that tag returns from lake sturgeon, have been observed all they way to Winnipeg for fish planted in the Otter Tail River. **Dave Freidl will provide this information to us.**

MN DNR also mentioned trap net surveys during the flood, 40 foot lead with a 6 foot box. 200-300 catfish, walleyes, mooneye, sauger, etc. Fish move out of the banks in large quantities during flood events. We have to be sure not to stack the fish up in the diversion channel. Also, efforts need to be implemented to ensure fish can migrate out of the flood diversion channel at the upstream control weir.

Elliott: Drayton Dam is frequently passable. How does improving passage there mitigate impacts in Fargo, 250 river miles upstream, when the concern is impacts that happen a small percentage of the time, and only at a high discharge? We need info to substantiate the link and explain why this mitigation is appropriate. Project currently does include $150,000 to monitor and to evaluate how effectively the fish use this structure.

Lynn: improving access there will increase the numbers of fish that can get to the fish passage structure at Fargo. Lynn also suggested the need to tie the impacts to species or guilds, etc. to really understand the impacts.

The Corps will need additional discussion and information to send up the chain as it relates to fish passage. MN DNR believes it is premature to say it is not a significant impact. The DNR is firm that they cannot mitigate on-site. Further discussion on fish passage was tabled for the remainder of the meeting, and will be revisited.

MN DNR's discussion largely centered on the MN option because of the sheer complexity of the North Dakota options.

Bruce Kreft: There is agency concern that their won't be money later to address issues that come up. If mitigation isn't proposed, we may not get funding later to correct was has been impaired. Can we set up a mitigation trust fund for future expenses?

Fish stranding issue: Dave would incorporate features to minimize the potential for stranding.

Elliott: we're not planning to build pools for waterfowl. We would try to taper flows off so the fish sense the need to move downstream in the diversion. Need to model the operations to reduce impacts.

We will look at fish stranding. We don't have anything to share today but will in the near future, look at rates of water decline to try and better describe the likelihood of stranding.

We recognize that fish can get up there up to a 5-15 year event, possibly up to a 20-year event and beyond, could be able to swim up there.

Luther didn’t feel there is any feasible way to keep fish out of it, the key is to get them out and/or over.

Geomorphic issue – Red river structure in place in the Red. The project will pass a 5 year event, flows beyond that will go into the diversion channel. There is concern but it is our thought that the risk for impacts is low.

Preliminary conclusions are that the impacts are less then significant. However, to verify we propose to do pre-construction and post-construction monitoring to see if this is true. We will work with the agencies to set up that plan, looking at both geomorphic and biotic surveys.

Dave Freidl – A sediment analysis would be good to help with this determination. Ideally we should develop a plan to do a more formal assessment in the next few months, to have a better level of understanding.
Action item, we need to put someone on this for the scope of work. We can do this in the coming field season.

Lynn: Noted a recent USGS sediment load study for the Red River.
Miguel has already been looking at this and yes we will include this into our EIS.

ND alignment issues:

Issues with RRN structure are approximately the same.

Wild Rice

Wild Rice structure is similar to the Red River structure with weirs on both sides of the WR River.

Wild Rice will be passable for fish to a 5 year event, with a fish passage channel functional up to a 20 year event (instead of a 50 year event).

Lynn, there are problems with the structures; it is sort of a sediment bowl. Could result in geomorphic effects.

Sheyenne and Maple Structures
Roughened bottom to create some complexity.
2 year event flow velocities are the same as the existing conditions.

Design of the concrete channel for these structures is important for the fish to be able to swim through, it has to be understood that we have different species going through there.

Dave F. One tip on the design is to have a parabolic shape that can be used for different species you can do this using the roughness. Initial thought from the engineers is that this may be something we can accommodate for the final design. We have some flexibility.

Geomorphic effects on tributaries:

The MN DNR didn’t see the connection between our mitigation proposal for the possible geomorphologic impacts to the Wild Rice and the impact; they indicated that the construction of additional length onto an already identified re-meandering project would provide more meaningful mitigation to offset the geomorphologic impacts.

The corps will work to make a better connection for mitigation for geomorphology mitigation on the Wild Rice River. This could possibly re-meandering, but also other options (possibly riparian corridor). We need flexibility here given real estate challenges associated with mitigation areas.

The preliminary conclusion for geomorphic effects on the Wild Rice was that there might be significant impacts that arise on the Wild Rice from the project. However, this will continue to be evaluated. Sediment transport on the Wild Rice may not be affected as much as we’re assuming, because the backwater effects of the RRN keep velocities low in the lower reaches of the wild rice.

Maple and Sheyenne Rivers appears to have less sand in the bedload, so we don’t expect significant adverse impacts. Existing project on the Sheyenne River diverts water out of the Sheyenne now—our project shouldn’t be worse and might be better from a geomorphic perspective.

The existing Sheyenne diversion provides a good case study to look at to understand what might happen with the larger diversion.

Note that while effects may be similar Maple only has a 3 mile section whereas the Sheyenne is over 40 miles of River between the proposed structures and the confluence with the Red.

Provide the states Dave Freidl and Bruce Kreft with the study from West for the Sheyenne River.

The Agencies are asked to please provide ideas they have for specific projects, types of restoration actions or locations that might be useable for mitigation.

At this point in the meeting the question was asked by the corps if there is anything that they see presented today or in the past that would lead them to not permit this project, is there any show stoppers if you will, it was also asked if there is a preference between the alternatives.

The comfort level is lower with the complexity of the ND plan, and more environmental review will be needed, but there does not appear to be a showstopper issue that would keep us from pursuing the ND plan. There is a lot more uncertainty, when comparing the ND plan with MN plan.

Specifically, there is no objection today to diverting the Rush and Lower Rush rivers and creating a sinuous channel in the bottom of the diversion.

Mark B. asked what would make our project better?
Dave Friedl and Bruce Kreft both said we need to make the best possible fish passage, but there will still be impacts.

OTHER IMPACTS

Wetlands: our assumption is that we'll create wetlands in the bottom of the channel that will be better quality than existing.

Mark Aanenson and Rich Davis indicated that the agencies may object to that assumption on the MN side, because they would not be providing the same wetland function as the existing seasonal wetlands.

During delineation MNRAM should be used to see how quality can be replaced.

Nathan Kestner talked about the function of wetland habitat—one method to assess is MNRAM.

Mark Bittner: can we create wetland that recreates functions?

Nathan: MNDNR prefers wetland banking in the geographic area. This was a general statement with the thought established wetland bank sites have been accepted and are already functioning wetlands. The DNR is open to other mitigation options.

Rich Davis: check with local agencies that might want to create a bank.

Bruce Kreft: ND does not have any wetland mitigation banks. Would like to see government money go to public banks rather than private banks that could turn into private hunting areas.

Overall the quantity of wetlands impacted is small.

Groundwater: lateral effects will be very minimal because of the tight soils. There was consensus on this point.

Miguel talked to Ray Wuolo on Barr's staff. Ray thought that 2000 feet would be adequate separation—one mile is definitely OK.

Water quality:
Mark Bittner: do we have opportunities to incorporate things to improve water quality?

T&E species:
No T & E species in project area, mussels were brought up as something that may need to be looked at a little closer.

Question? Who purchases, owns and maintains mitigation areas, for instance, a re-meandered stream not located near the main project?

Question—when can we release the draft report to the state agencies for preliminary scoping comments?

Action Items:

- Corps will optimize the MN alignment Feb 23rd, using a variety of criteria (This was since completed).
- Agencies to provide the corps all the potential mitigation sites they have identified for re-meandering, fish passage, etc. for North Dakota and Minnesota. It's important to note agencies should provide a full range of ideas and locations.
- Corps to provide agencies all existing information on design and hydraulic evaluations. Additional modeling will be needed to further evaluate rate of stage reduction in the flood diversion, and possible effects to fish stranding.
- Mn DNR Dave Freidl will provide tag return data on sturgeon (We have subsequently received a PDF file providing some information on sturgeon in the basin, though more discussion would be helpful).
- Corps needs to develop a scope of work for geomorphic assessment for the Red.
- Provide Agencies the study done by West for the Corps Sheyenne River (This has been posted to our FTP site)

It's important for agencies to forward ideas they have for mitigation actions. This should include not only specific project ideas, but basic methods and/or locations where mitigation could be performed. While not discussed in detail at our meeting last Friday, we do have limitations with how we can implement mitigation. For example, mitigation usually is done from willing landowners. We also can't compromise an existing federal project without that project being de-authorized (e.g., a previous federal project for stream straightening can't be re-meandered without de-authorizing the project). We may not be able impact similar State or local projects that have done stream straightening. We will try to do stream re-meandering as our mitigation method, and we are basing our cost estimates off this approach. However, it may be difficult to find sites where we could implement this mitigation. Thus, it's critical to get input from folks in the area on ideas for mitigation types and locations that might be acceptable for offsetting project impacts.

NR Agency Tele-conference
12-May-10, 0900

North Dakota Game and Fish: Bruce Kreft and Lynn Schlueter
North Dakota Department of Health: Mike Ell
Minnesota DNR: Tom Groshens, Luther Audland, and Nathan Kestner
USFWS: Richard Davis
Corps: Craig Evans: Elliot Stefanik, and Jon Sobiech
Moore Engineering: Stu Dobberpuhl
Barr Engineering: Miguel Wong
City of Fargo: April Walker and Mark Bittner
Houston Engineering: Mark Aanenson and Gregg Thielman
City of Moorhead: Bob Zimmerman

Overview

Elliot gave an overview of the comments our vertical team provided to include more detailed information for our mitigation plan. We just can’t arbitrarily go with a 2:1 ratio for mitigation. We need to have more developed plans in place where we know that they are implementable.

Ideas for mitigation that were presented by Elliot and Jon:

1) Implement an on-going stream habitat study as mitigation.
    a. Wild Rice River (Corps SA study)
    b. Red Path Project (stream remeandering project by local agency)
2) Implement local fish passage projects as mitigation for footprint impacts.

Other ideas provided by agencies included:

1. Buffalo River through Hawley. (Erik Jones with Houston Engineering is the point of contact for this).
2. Bois de Sioux River
3. Agencies were in support of the other mentioned projects.
4. North Dakota is taking a hard serious look to find projects for stream re-meandering in their state, will get back to Corps soon.
5. The agency team liked the idea of using fish passage as mitigation for footprint impacts.

There was discussion of how difficult it would be to implement the Wild Rice River (MN) option. Reasons for the difficulty include:

1. This reach of the river is in the same watershed as the Hendrum, Halstad, and other cities that will be impacted by downstream impacts from the Fargo Moorhead project, and now they may get some more increased water with the proposed re-meander.

2. There is already known landowners opposed to this type of project within the Wild Rice River project area.

If the Agency team decides to pursure the option of fish passage the corps will need letters of support from the partnering agencies.

Mitigation will be done before or concurrently with project construction.

Scope of works
There were suggestions to use folks from N. Dakota State, UND, or S. Dakota State (Chuck Berry, Nels Troelstrup, and Steve Chipps).
Tom Groshens recommended using Chris Yoder or Ed Rankin with Midwest Biodiversity Institute, they are already doing fish monitoring on 20 sites on the Red River.
Other names mentioned that could help out include Nels Tronstrup and Steve Chips?

There were questions about doing early season monitoring while the flooding is occurring? There will be continued communication on this issue.

Due outs:
Corps

1. Look into cost of pit tags and floy tags to see how we can work with other groups to potentially tag some fish this summer.
2. Contact folks that are already going to do surveys in the Red River this summer.

Agencies

1. Continue to identify potential mitigation sites and report them back to the Corps.

Fargo-Moorhead Metropolitan Area Feasibility Study
Fargo Civic Center
Fargo Flood Study Agency Meeting

Meeting Held: June 10, 2010

ATTENDEES

NAME	COMPANY	CONTACT
April Walker (AW)	City of Fargo (FAR)	701-241-1554
Nathan Boerboom (NB)	City of Fargo (FAR)	701-476-6743
Mark Bittner (MB)	City of Fargo (FAR)	701-241-1572
Jody Bertrand (JB)	City of Moorhead (MOOR)	218-299-5388
L.R. Schlueter (LS)	North Dakota Fish & Game (NDFG)	701-662-3617
Bruce Kreft (BK)	North Dakota Fish & Game (NDFG)	701-328-6224
Nathan Kestner (NK)	Minnesota Department of Natural Resources (MDNR)	218-308-2672
Mike Ell (ME)	North Dakota Department of Health (NDDOH)	701-328-5214
Rich Davis (RD)	US Fish & Wildlife Service (USFWS)	
Mark Aanaeson (MA)	Houston Engineering (HE)	701-237-5065
Stuart Dobberpiehl (SD)	Moore Engineering (ME)	701-499-5823
Miguel Wong (MW)	Barr Engineering (BE)	952-832-2632
Chris Erickson (CE)	US Army Corps of Engineering (USACE)	651-290-5437
Craig Evans (CEV)	US Army Corps of Engineering (USACE)	651-290-5594
Aaron Snyder (AS)	US Army Corps of Engineering (USACE)	651-290-5489
Jon Sobiech (JS)	US Army Corps of Engineering (USACE)	651-290-5428
Elliott Stefanik (ES)	US Army Corps of Engineering (USACE)	651-290-5260
Mike Lesher (ML)	US Army Corps of Engineering (USACE)	651-290-5637
Katie Young (KY)	US Army Corps of Engineering (USACE)	651-290-5259
Troy Maggied (TM)	US Army Corps of Engineering (USACE)	614-572-9691

I. Introductions:

a. All attendees introduced themselves and their party.

II. Public Meeting Presentation w/ Q&A

a. USACE reviewed the slideshow that had been presented to the community in Moorhead on 6/9 and will be presented to Fargo the evening of 6/10.
b. USACE noted that the downstream impact analysis currently ends with Halstead. Analysis of impacts to communities farther north of Halstead is currently underway.
c. USACE noted that the elements outlined in the recreation plan discussed in the presentation are the same for both the MN and ND plans, however no specifics have yet been designed.
d. USACE noted that the dollar amounts vary in some slides due to some being inflated through the midpoint of construction. The actual cost does not change, however for different discussions it is more useful to account for the time-value of money, whereas at other times it is more useful to use current dollars for all figures.
e. USACE noted that the 45-day review period for all agencies begins on 6/11.
f. USACE stated that all agencies have been sent hard copies of the draft report.

III. Update on Study Components

a. NDDOH asked for clarification on why the ND plan is preferred.
    i. FAR stated that the ND plan will provide for protection of more area in the northwest and southwest of the city once the diversion channel is operational.
    ii. USACE stated that one of the factors that make the MN 40K plan the NED plan is that the ND plan takes one more year to construct, reducing the benefits period to 49-years as opposed to the 50-years of benefits for the MN 40K plan. This slightly skews the benefit/cost ratio in favor of the MN plan.
b. USACE noted that some of the numbers presented may change slightly once the final location of the diversion channel is confirmed. The width of the channel and spoils is still not yet finalized as geotechnical studies and determination of the final location have yet to complete.
c. USACE stated that the Moorhead meeting went well, however there was only one comment from the public.

IV. Specific Discussion of Mitigation

a. USACE urged local sponsors and agencies to come to agreement on how much mitigation they want, where it should be, and who would perform this work. USACE asked if the sponsors wanted mitigation to be site specific or a system-wide approach with emphasis on fish passages.
   i. NDFG stated that they are struggling with deciding between the different measures. They are currently focusing on fish passages at specific sites.
   ii. USACE stated that they need to be able to demonstrate that the impacts from the project are off-set, however they can mix and match strategies to achieve this goal.
   iii. NDFG stated that they would need to tie into the whole system to thoroughly mitigate the project's impacts, however they haven't identified any specific problem sites yet.
   iv. USACE stated that the Draft Report identifies on-going efforts at mitigation and that they are open to discussing any means of mitigating impacts.
   v. The systemic concept seams good and the MNDNR is supportive of mitigation projects that when completed benefit the system as a whole but their approach as described in the DEIS needs some fleshing out. Preference is for project as close to the impacts site as possible and within the watershed (after hearing ND ask about statewide mitigation projects). With systemic/passage projects being discussed the preference would be for improvements downstream. I will discuss concept further with other DNR staff for consensus.

b. NDFG stated that they are willing to look for mitigation solutions in MN, since the rivers are all part of one system, however for political reasons they need to identify action to be taken in ND as well.
   i. NDDOH stated that the required mitigation will depend on the project.
   ii. USACE concurred, stating that mitigation that occurs within the basin and closest to the project will be the most beneficial. Mitigating in the main tributaries should be emphasized.

c. USACE stated that looking beyond the project area for benefits could be discussed if such mitigation adds value and if all agencies and local sponsors agree that this is a good solution.
   i. NDFG asked if they can go broader if long term benefits are found for the basin.
   ii. USACE stated this might be looked at, however policy dictates that the focus is on the watershed. USACE stated that they must show that all options in the basin have been investigated and that any solution outside the basin is agreed upon by all parties.

d. USDOH stated that Bois de Sioux had been previously channelized by the Corps. Could a re-meandering of this be considered as a solution?
   i. USACE stated that as this channelization was a Corps project, that original study and authorization must stand. Since this channel now belongs to the local sponsor, any re-meandering would need to go through another study for authorization.

e. USACE stated that impacts and potential mitigation must be linked and proven to work, and that this was stated in the report. If this is not clear in the report, USACE urged NDFS to comment so that it can be more strongly emphasized. However, USACE is open to big-picture mitigation solutions, including those outside of the project plan. USACE reiterated that the impacts caused by the project must be linked, documented, and off-set equally elsewhere.
   i. MNDNR stated that starting the search for mitigation within the project area and moving out is a good process. There is better chance to off-set project impacts closer to the project.

f. USACE stated that the group needs to move towards determining what changes will take place and begin to determine costs. Part of this process is determining specifically what mitigation will occur, and where. The agencies and local sponsors need to determine what process (system-wide fish passage or site specific) and what specific sites will be mitigated.

g. USACE stated that they can compensate footprint impacts with re-meandering mitigation elsewhere, however a ladder or fish-passage will be needed if it is desired by the agencies. USACE stated that they will need a letter from the agencies on whether the mitigation will be system-based or site-specific. This documentation will be needed before the project can move forward.
   i. The agencies agreed that a system-wide plan would be the best approach. NDFG indicated that they aren't yet convinced that the system-wide approach is the best, however that it should be looked at closely.
   ii. The agencies requested a description of benefits, costs, and impacts from USACE to help with their letter.

h. USACE emphasized that the review period is only 45-days and will close on 7/27. They need specific ideas to include in the report and urged the agencies to make this decision. USACE stated that they need to show progress on the plan and need to know how to measure the success of any proposed mitigation.

i. USACE stated that any transmitters for fish monitoring would need to be in-place this summer in order to be prepared for monitoring in the spring. If a plan is in place, USACE can proceed with equipment procurement and determine who will perform this work.
   i. All parties discussed elements of an appropriate sample size and the number of species. No agreement was reached on this at this time.

    ii. NDDOH stated that the group also needs to research what information is already known. Prior research should be investigated and, if applicable, used in order to reduce redundancy.
    iii. NDDOH stated that this information will not necessarily be used to measure mitigation efforts since actual mitigation efforts will not be known until the project is complete. However, all parties agreed that this information can determine if fish are moving as expected and whether the proposed structures will obstruct that movement.
    iv. USACE again reiterated that they need the goals and objectives of mitigation clearly laid out soon due to the schedule of authorization, design, and construction.

j. Should there still be impacts after mitigation and project completion, USACE confirmed that there is no additional dollars for mitigation for the project once it is completed, however there may be a way to receive monitoring dollars, include it in the USACE CAP program, or that another agency could step-up and implement other mitigation.

k. USACE stated that they would like two seasons of biotic monitoring prior to the project. Ideally, the agencies, academia, and others would look at this data.

l. NDDOH wanted to confirm that the environmental monitoring won't impact the project.
    i. Both USACE and FAR concurred that this wouldn't occur. Even at the most aggressive schedule, there is sufficient time for any required environmental monitoring required.

m. USACE stated that in order to balance the schedule with data collection and monitoring, the project will proceed on the best available data and continues to monitor post-project, using supplemental data when available

n. NDFG stated that three years is the rule of thumb for monitoring and that at least two species should be monitored, however this should be discussed further.
    i. USACE stated that field work will occur in 2011, but the scopes of work will be complete this year in order to be able to act in 2011. Both MNDNR and USACE agreed that the only work that could take place this year is the tagging of fish to be monitored

o. NDFG, NDDOH, and MNDNR all expressed interest in not only off-setting the impacts of the diversion channel, but also at enhancing habitat as well.
    i. NDFG suggested looking at buffers in select areas as well as riparian corridors to enhance water quality.
    ii. HE stated that existing oxbow wetlands could be allowed to come back and to plant them with native vegetation.
    iii. MNDNR stated that there are opportunities to enhance water quality and that the team should look at transferring function for function in mitigation efforts.

p. USACE stated that the MN plan impacts the environment the least. The EPA still needs to complete their review under Section 404 of the Clean Water Act. USACE agrees that the approach taken on the ND plan is the right approach, however the EPA disagrees. While the USACE Regulatory arm is not involved in the project, the USACE Civil works division will act in this role. Despite this difference, USACE believes that the matter will be settled without escalation.
    i. USACE stated that the EPA not be present at the mitigation meetings, however the EPA is comfortable if the USFWS and the state fisheries agencies are present.

q. MNDNR stated that fish passage improvements can be used in addition, not as a substitute to other mitigation projects and methods discussed to date (those which are easier to measure areas improved and biotic responses)

r. MNDNR does not share same conclusions with COE regarding no impacts to passage, however; fish passage improvement projects (as systemic mitigation) may help begin to address DNR's fish passage concerns.

s. MNDNRThe "future without the project" includes very likely forthcoming fish passage improvements at locations such as Christine & Hickson. COE fish mitigation project must not stymie existing initiatives and is less meaningful if the project is likely to occur without FM project funds injection.

V. Upcoming Work for Agency Team

a. USACE will send the updated mitigation plan to all parties the last week of the month. This will identify fish passages and other measures discussed. All parties are to provide feedback on this plan.

b. USACE will provide a list of what they will monitor, the timeframe, and the costs associated with this work. Scopes of work will be finalized in the near future.

c. BE will look at the low flow channels in the Rush and Lower Rush Rivers for examples of how to stabilize the low flow channel in the diversion channel. Rock could be used to stabilize this channel, but this would come at the expense of habitat. BE and MDNR both confirmed that they would provide details on more natural techniques for stream bank erosion measures to USACE by 6/25.

VI. Adjourn

a. USACE reminded all parties that EIS comments are due back by 7/26.

b. USACE and NDFG will meet to discuss a possible inspection of the Red River tributaries.

c. USACE reminded all parties that they need to receive the letters noted above by the end of July. These can be integrated with the EIS comments.
d. All parties agreed to adjourn until the next meeting.

Respectfully Submitted,

THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT

Jon Sobiech / tmm
Environmental Specialist

Cc: Attendees
File

Fargo-Moorhead Metro Feasibility Study
Minnesota DNR Agenda, 11:00 AM
12-July-10 (Monday)

Minutes

Attendees:
MNDNR – Suzanne Jiwani, Kent Lokkesmoe, Pat Lynch
City of Fargo – Mark Bittner, April Walker
City of Moorhead – Bob Zimmerman
USACE – Judy DesHarnais, Craig Evans, Aaron Snyder, Terry Birkenstock, Joe Willging, Jon Sobiech, Mike Lesher, Lance Awsumb, Aaron Buesing, Damon Roberts, Tamara Cameron, Katie Young, Troy Maggied, Kelly Urbanek (Phone)

1. Project Overview
   -USACE reviewed previously presented data on hydrologic conditions, the anticipated effectiveness of the various diversion alternatives, and projected downstream impacts.

2. Discussion of Issues
   a. Downstream Impacts
      -USACE stated that their downstream analysis currently extends to Halstead. Analysis will continue down to Thompson and until "zero effect" is reached.
      -USACE stated that there are two steps to any potential Takings analysis. First, USACE's Office of Council has determined that there will be no requirement to buy a flowage easement. This decision was made based on the present flood depth and frequency without project. Any additional water added to the downstream communities will not be large enough or frequent enough to require a flowage easement. Secondly, once the downstream analysis is completed, a structure-by-structure analysis will take place on all improvements determined to be at risk of damage.
      i. MDNR concerns
         -MDNR stated that they believed USACE was being inconsistent in their policy of addressing downstream communities. They cited a previous project in Brown's Valley, MN in which they claim that the USACE required downstream impacts to be zero. USACE stated that they have no administrative record of this requirement, nor is it USACE policy. Moreover, the permit issued for the project does not address stage increases. MNDNR stated that Ed Eaton from USACE was the individual who required mitigation to zero impacts. Also included in the project, per MNDNR, were USACE employees Eric Norton and Terry Zein. MDNR will provide USACE with copies of correspondence requiring downstream mitigation to be zero on this project.
            -MDNR also cited the Holman Field Airport project as another project that required mitigation to be zero. Both parties agreed, however, that this was not a Corps project and so Corps policies are not in question.
         -MDNR stated that at this point they are unwilling to issue the project a permit, stating that downstream impacts need to be addressed.
            -Moorhead asked for guidance as to what form of mitigation the DNR would prefer to see for downstream communities. DNR stated that a fund for claims for damages could be set up. Moorhead stated that it would be very difficult to determine what damages were caused by the diversion and what were caused by the existing flooding frequency and height that was present before the diversion.
      ii. Corps authorities

- USACE stated that if it is determined the flood's impact to the improvement constitutes a Taking, compensation will be provided. If there is no determination of a Taking, then USACE has no authority to act. Any mitigation will fall to the Local Sponsors.

-MDNR stated that regardless of authority, they view it as the responsibility of USACE and the Local Sponsors to mitigate any increase in water levels at the downstream communities.

b. Channel Stability Effects

-USACE stated that they are looking at the geomorphology of the river to determine any impacts on the river's natural shape or route caused by the diversion channel.

c. Floodplain Impacts

-USACE stated that they are investigating the potential for a downstream community non-structural analysis. The goal of this would not be to mitigate against the incremental increase in water levels caused by the diversion, rather it would look to mitigate existing flooding conditions in the downstream communities.

-Fargo stated that they currently have a moratorium on new building until the diversion design and impact analysis are completed. Any new design in the city must comply with the new hydrology.

-MDNR stated that their environmental staff are finalizing the state EIS. Locals are required to pay for this. MDNR stated that new data doesn't need to be generated and the data developed by USACE can be used for the EIS.

-MDNR stated that they do not have a timeline for completion of the EIS at this point.

-USACE stated that a levee breach analysis is currently underway. USACE is coordinating with MDNR on this work.

3. Review and explanation of updated hydrology

-USACE explained the revised hydrology used on the project. This hydrology is the result of the recommendation of a panel of experts. The panel, consisting of climatologists, noted in the historical data a dry and a wet period. Currently, the Fargo-Moorhead area is in a wet period. The panel recommended that USACE use this data to determine their hydrology.

-With this new hydrology, flood levels are higher on average than the old hydrology. A "year 0" occurrence was previously 39.5 feet per the gage in Fargo. With the revised hydrology, the level is 42.4 at this same gage.

-USACE stated that the Cedar Rapids project also used the "truncated" hydrology based on the wet-dry weather cycle. Fargo-Moorhead is not the first or only USACE project to use this method.

-USACE noted that FEMA is still using the traditional hydrology for their Flood Rate Maps.

-USACE stated that the new hydrology required the use of unsteady modeling. FEMA won't use unsteady modeling due to some overland flow issues in North Dakota. FEMA hasn't made a determination but it is likely they will use only the traditional hydrologic analysis.

-USACE stated that they would continue to coordinate with FEMA to ensure that the various branch offices are on the same page with the work and revised hydrology used at Fargo-Moorhead.

-USACE will follow up with FEMA to determine what 1% chance flood level they are using for their Flood Rate Maps.

4. Benefit between states

-USACE stated that their benefit-cost (b/c) analysis does take into account quantifiable impacts to downstream communities. However, the b/c analysis only analyzed impacts caused by the incremental increase in water due to the diversion. The existing flooding levels were not addressed due to their being in effect before the diversion. The b/c analysis looks at conditions with a diversion and conditions without a diversion for the timeframe in which the diversion would be completed, 10 years from now.

-Temporary and emergency measures are not taken into account when considering downstream impacts.

-Proposed future levees and levee raises that have a high probability of being completed are taken into account.

-Any damage to roads and access due to the incremental increase in water levels are analyzed.

-The b/c analysis found little-to-no increase in the duration of flood levels due to the diversion.

-Fargo and Moorhead are also analyzing impacts and costs and benefits to the Fargo-Moorhead area and downstream communities. They look at what has occurred in the last 10 years and take into account projects that are anticipated to occur. One such project considered likely by Fargo-Moorhead, but not included in USACE's b/c analysis, is the Red Path project. MDNR concurred that this project is likely to go through.

5. Items for follow up:
    a. The DNR will provide the Corps with information on the Brown's Valley Permit.
    b. The Corps will talk with FEMA Region 8 to ensure that Region 8 and 5 are on the same page and that the Corps has a proper understanding of the requirements.
    c. The DNR will provide the Corps with what 1% chance event the state will be supporting with local levees. The Corps updated with "wet" and "dry", the Corps traditional, or the FEMA proposed.

Fargo-Moorhead Metropolitan Area Feasibility Study
Fargo Flood Study Agency Telecon

Telecon Held: July 28, 2010

ATTENDEES

NAME	AGENCY/COMPANY
April Walker (AW)	City of Fargo (FAR)
Mark Bittner (MB)	City of Fargo (FAR)
Bruce Kreft (BK)	North Dakota Fish & Game (NDFG)
Nathan Kestner (NK)	Minnesota Department of Natural Resources (MDNR)
Tom Groshens (TG)	Minnesota Department of Natural Resources (MDNR)
Tom Carlson (TC)	Minnesota Department of Natural Resources (MDNR)
Luther Aadland (LA)	Minnesota Department of Natural Resources (MDNR)
Mike Ell (ME)	North Dakota Department of Health (NDDOH)
Rich Davis (RD)	US Fish & Wildlife Service (USFWS)
Stuart Dobberpuhl (SD)	Moore Engineering (ME)
Aaron Snyder (AS)	US Army Corps of Engineering (USACE)
Jon Sobiech (JS)	US Army Corps of Engineering (USACE)
Elliott Stefanik (ES)	US Army Corps of Engineering (USACE)
Lynn Foss (LF)	Clay County Soil and Water
Dana Allen (DA)	EPA
Robin Coursen (RC)	EPA
Keith Weston (KW)	NRCS North Dakota
Keith Berndt (KB)	Cass County
Randy Gjestvang (RG)	North Dakota Water Commission
Bob Zimmerman (BZ)	City of Moorhead
Gregg Theilen (CT)	Houston Engineering

I. Introductions:

a. All attendees introduced themselves and their party.

II. Overview of latest happenings and schedule

a. USACE updated the team on status of ongoing efforts, including HTRW contract, wetland determinations, flood plain forest data collection, and reminded the team that the comment period was extended to August 9th at which time all comments are due.

III. Latest Status of Impacts

a. Issue 1
    i. USACE provided information for potential impacts to Wolverton creek created when a tie-back levee crosses the creek for the North Dakota alternative.
    ii. Discussion was also provided for the need for an overflow channel from the Wolverton Creek to the Red River.
b. Issue 2
    i. The fish passage structure on the Wild Rice River will have mixing with flows from the Wild Rice River and the diversion channel where flow from the red mixes with the Wild Rice. Fish could potentially be drawn upstream into the flood diversion channel, and end up in the Red River instead of back into the Wild Rice.
        1. Question was posed to the agencies whether it be a better idea to spend money on improving fish passage at some other dam to make it passable 100% of the time versus spending money at this location for fish passage during a small percent of the time knowing that the fish could still end up in the diversion or in the Red?
            a. BK stated that North Dakota would rather follow a systemic approach and spend the money on other dams in the area.
    ii. * USACE will provide diversion channel velocities for different discharges when the project is operating.
    iii. Question was asked whether new information regarding Wolverton Creek and Wild Rice River fish passage require new NEPA documentation. That answer will depend on the severity of the impacts. If the impacts don't

appreciably change, there likely will not be separate documentation. It will be coordinated with the agencies and included in the final.

c. Downstream impacts
    i. Several stakeholders keep hearing from locals and constituents that one way to mitigate for downstream impacts is upstream storage. USACE is not looking at using upstream storage to mitigate for downstream impacts. There are other initiatives occurring independently of this project that are looking at upstream storage.
    ii. Discussion of the current call will focus primarily on natural resources issues. Downstream impacts are still a major issue and continue to be assessed. New information on downstream impacts will continue to be coordinated with the agencies as soon as its available.

IV. Specific Discussion of Mitigation

i. USACE asked the group if they would prefer fish passage, stream restoration (to include re-meandering, riparian buffer zones, and possibly other actions), or a combination of the two as mitigation to offset all of the aquatic habitat footprint impacts.
    1. NK MNDNR made the point that from the MN perspective fish passage is necessary to offset impacts from connectivity but would not approve of using fish passage as mitigation for site specific aquatic footprint impacts.
    2. BK NDFG would like to see fish passage used as the approach for mitigation to offset aquatic habitat footprint impacts, but they are open to using the restoration approach as part of the mitigation. NDFG is concerned whether enough suitable sites can be found, with willing landowners, to do this form of mitigation.
    3. RD FWS wants to see a combination of the two approaches for mitigation.

ii. The group agreed that mitigation should be carried out as close to the impact as possible, if the impact is to the Red River the mitigation should be on the Red River if possible.
    1. There doesn't seem to be much of a need for re-meandering on the Red River because of the existing sinuosity.
    2. North Dakota doesn't have many locations identified for this type of mitigation.
    3. KW NRCS has EPA319 grants for stream restoration on the Maple, Sheyenne and Rush rivers. He noted that there may be willing landowners, but money is typically the constraint for these projects. The landowners are willing. USACE will communicate with Keith to discuss and identify some sites. North Dakota Department Health should also be involved in future discussions.

iii. USACE asked the group if the strategy of looking at Fish Passage at Drayton along with a few site specific stream restorations as a place to start a good idea.
    1. MN DNR re-iterated that they don't want to see fish passage as mitigation for any site specific aquatic habitat footprint impacts. They feel there should be mitigation for geomorphic impacts, downstream impacts and fish passage. MN also noted possible geomorphic impacts to the Red River, that these impacts haven't been adequately addressed in the Draft EIS, and that mitigation could be needed for this impact as well.
    2. North Dakota was ok with this approach for mitigation.

iv. DA and RC with EPA asked if the mitigation plan will be written up and sent out for comments. USACE outlined that this will be the case, and will include acreages, miles, other quantities included in the write-up. Will also include metrics for habitat quality, and provide an assessment resulting in typical "habitat units" used by USACE on all other projects..

v. TG asked if dam removal could be considered as acceptable mitigation for footprint impacts. The group discussed and agreed to look into this possibility.
    1. Drayton, Christine and Hickson dams were mentioned as possible dams to remove.
        a. USACE will look at bank stability in the areas of the mentioned dams and get back to the sponsors.
        b. Need response from MnDNR whether dam removal would be considered acceptable form of mitigation, and whether this fulfills their need of replaced "functions" when considering lost site-specific habitat.

V. Due Outs/Needs from agencies

a. Confirmation from MnDNR whether or not dam removal can be used as a form of mitigation that will offset aquatic footprint impacts.

b. Provide comments on the Draft EIS ASAP (due August 9).

c. Will need additional coordination with agencies during August as USACE moves towards a final EIS.
d. USACE will contact Keith Weston NRCS and Mike Ell North Dakota Department of Health to discuss locations for stream restorations.
e. USACE will get diversion channel velocities for different discharges when the project is operating.
f. USACE will look at bank stability in the areas of the mentioned dams and get back to the sponsors.

VI. Adjourn

Fargo-Moorhead Metropolitan Area Feasibility Study
Fargo Flood Study Agency Meeting

January 13, 2011

ATTENDEES

NAME	**AGENCY/COMPANY**
April Walker (AW)	City of Fargo (FAR)
Mark Bittner (MB)	City of Fargo (FAR)
Bruce Kreft (BK)	North Dakota Fish & Game (NDFG)
Nathan Kestner (NK)	Minnesota Department of Natural Resources (MDNR)
Tom Groshens (TG)	Minnesota Department of Natural Resources (MDNR)
Tom Carlson (TC)	Minnesota Department of Natural Resources (MDNR)
Lynn Schlueter	North Dakota Game and Fish
Rich Davis (RD)	US Fish & Wildlife Service (USFWS)
Steve Hardegen	FEMA Region 8
Ryan Pietramali	FEMA Region 8
Jon Sobiech (JS)	US Army Corps of Engineering (USACE)
Elliott Stefanik (ES)	US Army Corps of Engineering (USACE)
Terry Williams	US Army Corps of Engineering (USACE)
Aaron Buesing	US Army Corps of Engineering (USACE)
Joe Willging	US Army Corps of Engineering (USACE)
Andy Tuthill	US Army Corps of Engineering, CRREL
Nathan Boerboom	City of Fargo
Lee Beauvais	Moore Engineering
Jeff Volk	Moore Engineering
Jason Benson	Cass County
Jack Frederick	MnPCA
Dana Allen (DA)	EPA
Randy Gjestvang (RG)	North Dakota Water Commission
Bob Zimmerman (BZ)	City of Moorhead
Gregg Theilen (CT)	Houston Engineering

I. Introductions:

a. All attendees introduced themselves and their party.

II. Overview of latest happenings and schedule

a. Aaron Snyder with the Corps gave an overview of where ware to date on the project. This discussion included a detailed review of the Executive order 11988 and how it pertains to this project.

b.

III. Latest Status of Impacts

Miguel Wong with Barr Engineering gave a presentation on where we are with the Hydrology and Hydraulics for the project.

He also gave an overview on geomorphologic assessment and considerations. Geomorphic data and sediment transport information will be far more robust in the Supplemental Draft EIS than was in the Draft EIS. He also gave a brief summary on some of the findings and expected conclusions.

IV. Specific Discussion of Mitigation

i. USACE asked the group if they would prefer fish passage, stream restoration (to include re-meandering, riparian buffer zones, and possibly other actions), or a combination of the two as mitigation to offset all of the aquatic habitat footprint impacts.

        1. NK MNDNR made the point that from the MN perspective fish passage is necessary to offset impacts from connectivity but would not approve of using fish passage as mitigation for site specific aquatic footprint impacts.
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        1. Drayton, Christine and Hickson dams were mentioned as possible dams to remove.
            a. USACE will look at bank stability in the areas of the mentioned dams and get back to the sponsors.
            b. Need response from MnDNR whether dam removal would be considered acceptable form of mitigation, and whether this fulfills their need of replaced "functions" when considering lost site-specific habitat.

V. Due Outs/Needs from agencies

a. Confirmation from MnDNR whether or not dam removal can be used as a form of mitigation that will offset aquatic footprint impacts.
b. Provide comments on the Draft EIS ASAP (due August 9).
c. Will need additional coordination with agencies during August as USACE moves towards a final EIS.
d. USACE will contact Keith Weston NRCS and Mike Ell North Dakota Department of Health to discuss locations for stream restorations.
e. USACE will get diversion channel velocities for different discharges when the project is operating.
f. USACE will look at bank stability in the areas of the mentioned dams and get back to the sponsors.

VI. Adjourn

US Army Corps of Engineers
St. Paul District

PROJECT TITLE: fargo Moorhead

COMPUTED BY:

DATE: 1-13-2011

SHEET:

SUBJECT TITLE: Resource Agency meeting

CHECKED BY:

DATE:

CONTRACT NO.:

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Meeting Notes – Biotic Sampling Techniques January 26, 2011

Attendance: Bruce Kreft, Lynn Schlueter, Mike Ell, Tom Groshens, Elliott Stefanick, Jon Sobiech, and Andre Delorme

Elliot started discussion referencing the Biological Monitoring presentation we used at the agency meeting January 13, 2011. The purpose of the meeting was to discuss bio monitoring for the project over the life of the project and more specifically to start this summer season 2011.

Tom Groshens asked that we have a control site upstream of the impacted area for the 500 hundred year event.

Mike Ell stressed the importance of laying out a design that assesses project impacts, and that it is reproducible so folks 20 years from now can use the data we can gather and reproduce similar data for comparisons, we don’t want to generate information that is unusable in the future.

The entire group concluded that this effort will be hard because of the variability that is tied to these types of surveys.

Mike Ell indicated that the biggest concerns are impacts to biology; we need to sample as much as possible. We should start with an optimal process and pair it down as we move forward if we have to.

3 years of sampling is optimal. This could be substituted for 2 years where you replicate within years if necessary.

The two questions we are trying to answer with these surveys are:

1) The quality of the habitat that will be impacted.
2) What is the biota within the upstream and downstream areas.

Is IBI the right approach to be using, it is a hard call since North Dakota is only getting an IBI this year.

There is good protocol for wadable waters but large river protocols aren’t as common, There is a large River Protocol that needs to be looked at from the PCA.

It was agreed upon by the group that whatever method we pick it has to be reproducible. There seemed to be consensus that a proportional approach is what folks are leaning toward. This means we may need to use two different approaches to complete the task.

MN PCA habitat methodology assessment is the preferred method for wadable waters. For big river or non-wadeable waters we need to look at a Qualitative method put out by the Ohio River EPA, Mike Ell Sent out email on this.

Fish Passage

The group expressed an interest to have pre-monitoring at the structure sites so we know quantity of fish passing the impacted areas before structures are built so we can compare these numbers to quantity of passage after project is in place at the structures. The Corps position is we don't see the value in this, we already agree that fish pass freely through those areas so why spend a bunch of money to prove something we already agree on?

There was some discussion and the corps agreed to look at the possibility of doing some pre-monitoring at these sites. (Ex. Acoustic study, cameras, etc.?)

# of species 5 representative species
# of fish to tag 50-100
Mid fall to tag the fish.

Mussels
Delorme pointed out that the Sheyenne River is 2nd only to the Red River in all of North Dakota for mussels. And a close 3rd is the Maple River. There is existing data for the Maple and Sheyenne (near Horace) that will be provided by Andre. We briefly described our strategy for Mussel surveys.

Natural Resource Agency Tele-conference
3-March-11, 1300

Participants: Nathan Kestner and Tom Groshens (MDNR); Lynn Schlueter and Bruce Kreft (NDGF); Mike Ell (NDDoH); Rich Davis (USFWS); Keith Weston (NRCS).

USACE gave a brief overview of the preliminary draft adaptive management write-up. This included review of key questions to address impacts and mitigation effectiveness; criteria to measure impacts and mitigation effectiveness; and monitoring methodology to adaptively evaluate impacts and mitigation effectiveness.

In general, there was no major opposition to the proposed questions that outline how impacts and mitigation effectiveness will be evaluated.

The criteria outlined for impacts to aquatic habitat also were generally acceptable. The agencies requested that criteria be better developed to measure impacts/mitigation for wetlands, bottomland forest, and connectivity. The criteria for connectivity need to address how connectivity mitigation will off-set footprint impacts.

The methodology outlined for evaluating aquatic habitat is generally acceptable. Gear types will include flexibility to cover wadeable and non-wadable streams (i.e., contractor will need mini-boom shocker to cover moderate stream sizes). The agencies requested USACE to consider additional gear types for monitoring. This could include trap nets and seining. In addition, the agencies also requested USACE consider additional methodologies to describe physical habitat within study sites.

FOLLOW-UP: To consider additional gear-types, we should include how we want to use the data to compare impacts or mitigation effectiveness. Please provide suggestions on: 1) level of effort for these other gear types within each survey site; and 2) how you want to see the data used to make comparisons. This should include metrics or criteria for data generated from these alternative gears.

The schedule for doing baseline monitoring for this year is as follows:
1) March 31st, finalize the Scope of Work for biological monitoring for this year
2) April 30th Advertise for contract; receive bids and work through negotiations.
3) May 21, award contract.
4) Recon work begins in June; fish and invertebrate monitoring July - Sept.

Action Items

Agencies to send remaining comments on the monitoring and adaptive management report that was sent to them. This includes the Follow-Up item above.

USACE will provide a revised Adaptive Management Plan to the agencies for review. As a substitute, USACE may send a draft of the Actual Scope of Work for monitoring. Corps will provide draft on or about March 16^{t,} 2011.

For the Revised Draft Report/EIS. USACE should characterize the likelihood that Drayton Dam fish passage gets constructed outside of Fargo mitigation.

USACE will provide the agencies the available existing information on fish migrations. Agencies will review this and provide comments whether they think additional monitoring of fish movement is warranted. MnDNR comment remains that they feel additional baseline monitoring is warranted for fish movements.

USACE to improve the criteria to measure impacts/mitigation for wetlands, bottomland forest, connectivity and geomorphic impacts. Any suggestions here are welcome!

The reference to monitoring every 5 years for wetlands and bottomland forests is too generic. Base it off flood events, not regular intervals.

Flesh out discussion on contingency plans. Also reference new NEPA mitigation guidelines.

BARR

MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA
DULUTH, MINNESOTA
ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI

DATE			SHEET NO.
PROJECT NAME			
COMPUTED	CHECKED	SUBMITTED	PROJECT NUMBER
BY	BY	TO	SUBJECT
DATE	DATE	DATE	

NAME	ORGANIZATION	email
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TERRY WILLIAMS	USACE	Terry.l.williams@usace.army.mil

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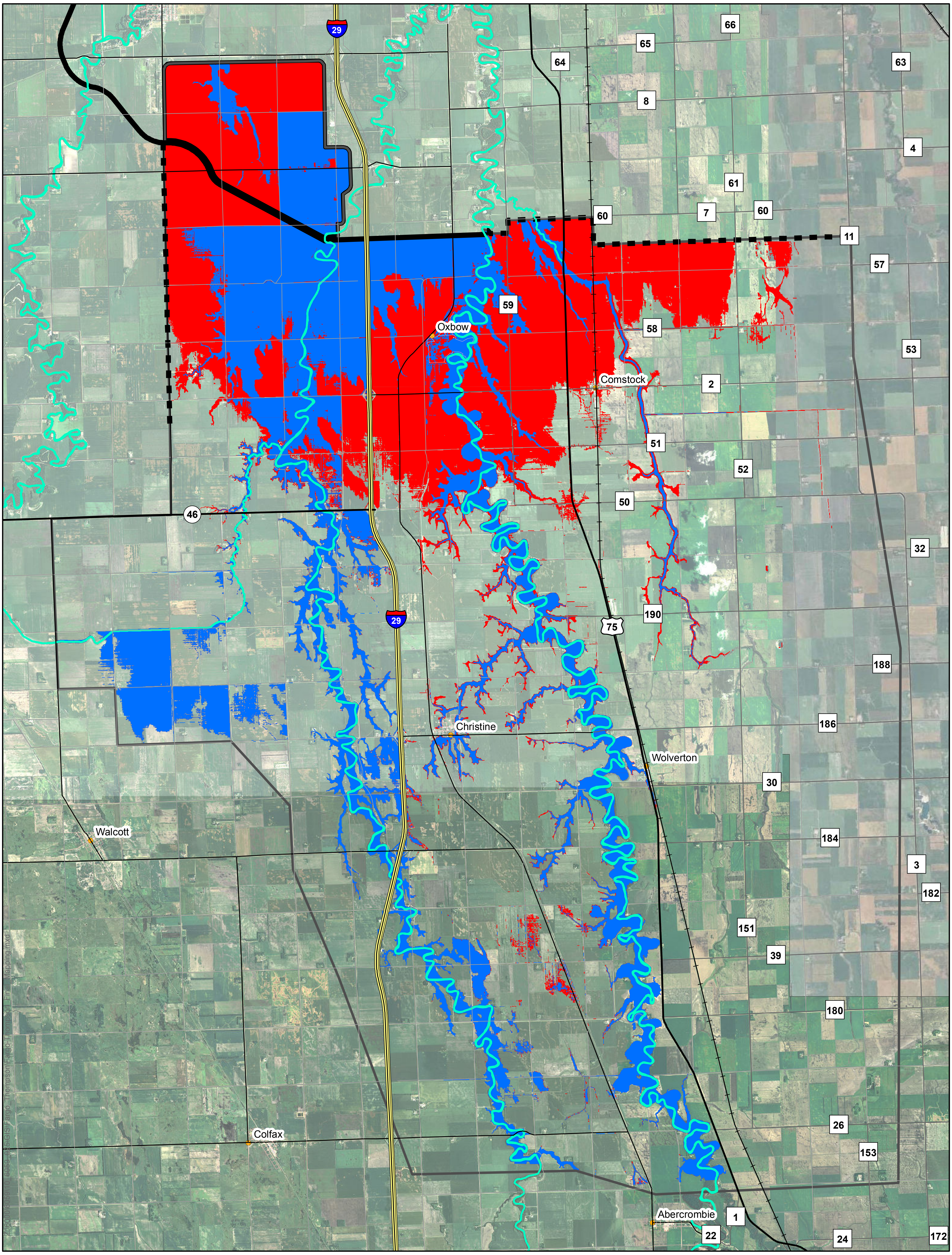


Figure 19

Inundation Map for the Model Existing Conditions and With Project for 2-percent Chance Event in the Red River of the North - South of Diversion Works - LPP

- 🟦 2% Existing (20,363 Acres)
- 🟥 LPP 2% (38,000 Acres)
- ▭ Mapping Extent
- ▭ Storage Area 1
- ━ LPP Diversion
- ╍ LPP Tieback
- ● Cities

0 0.3750.75 1.5 2.25
Miles

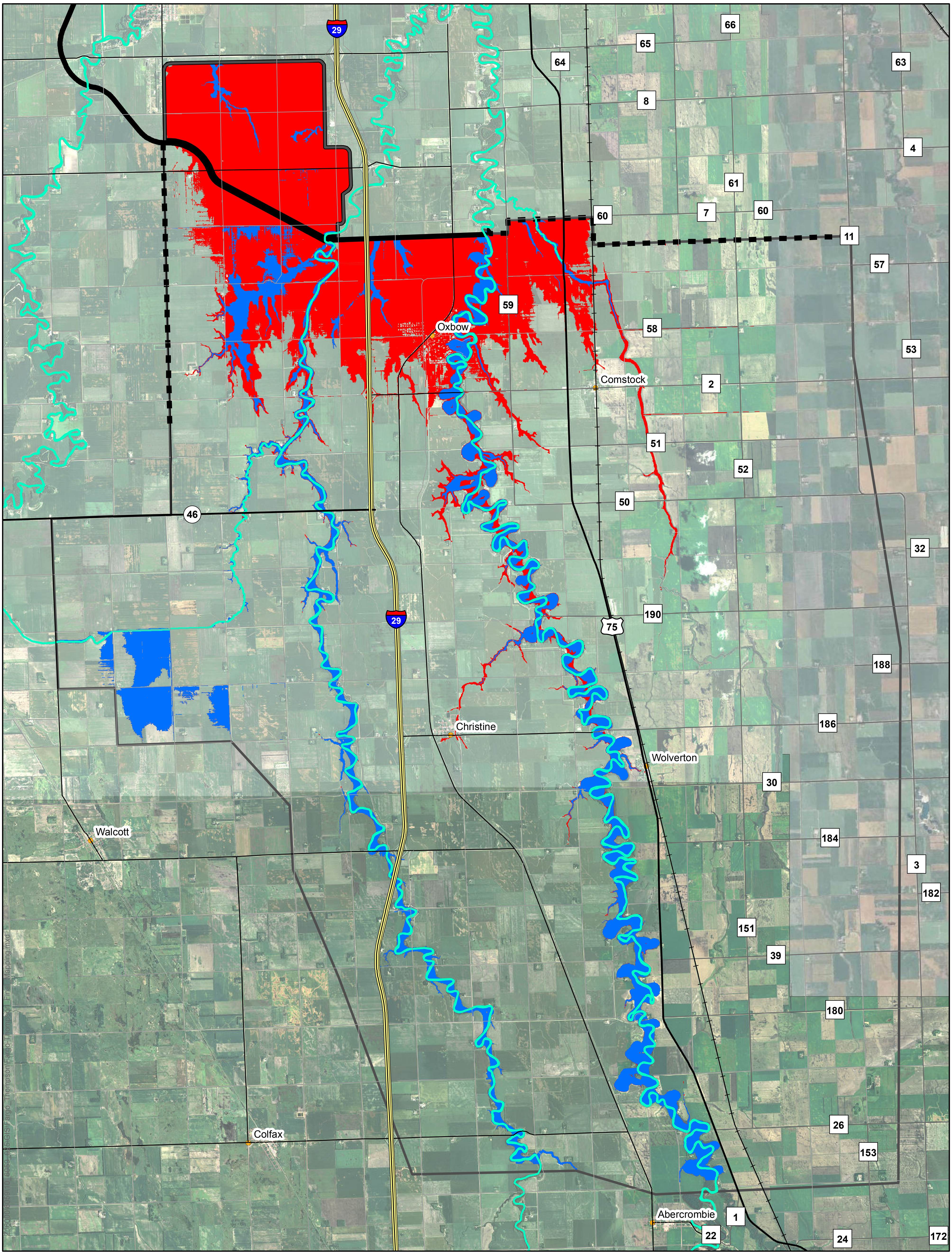


Figure 21

Inundation Map for the Model Existing Conditions and With Project for 10-percent Chance Event in the Red River of the North - South of Diversion Works - LPP

🟦 10% Existing (7,858 Acres)

🟥 LPP 10% (20,841 Acres)

☐ Mapping Extent

☐ Storage Area 1

— LPP Diversion

■ ■ ■ LPP Tieback

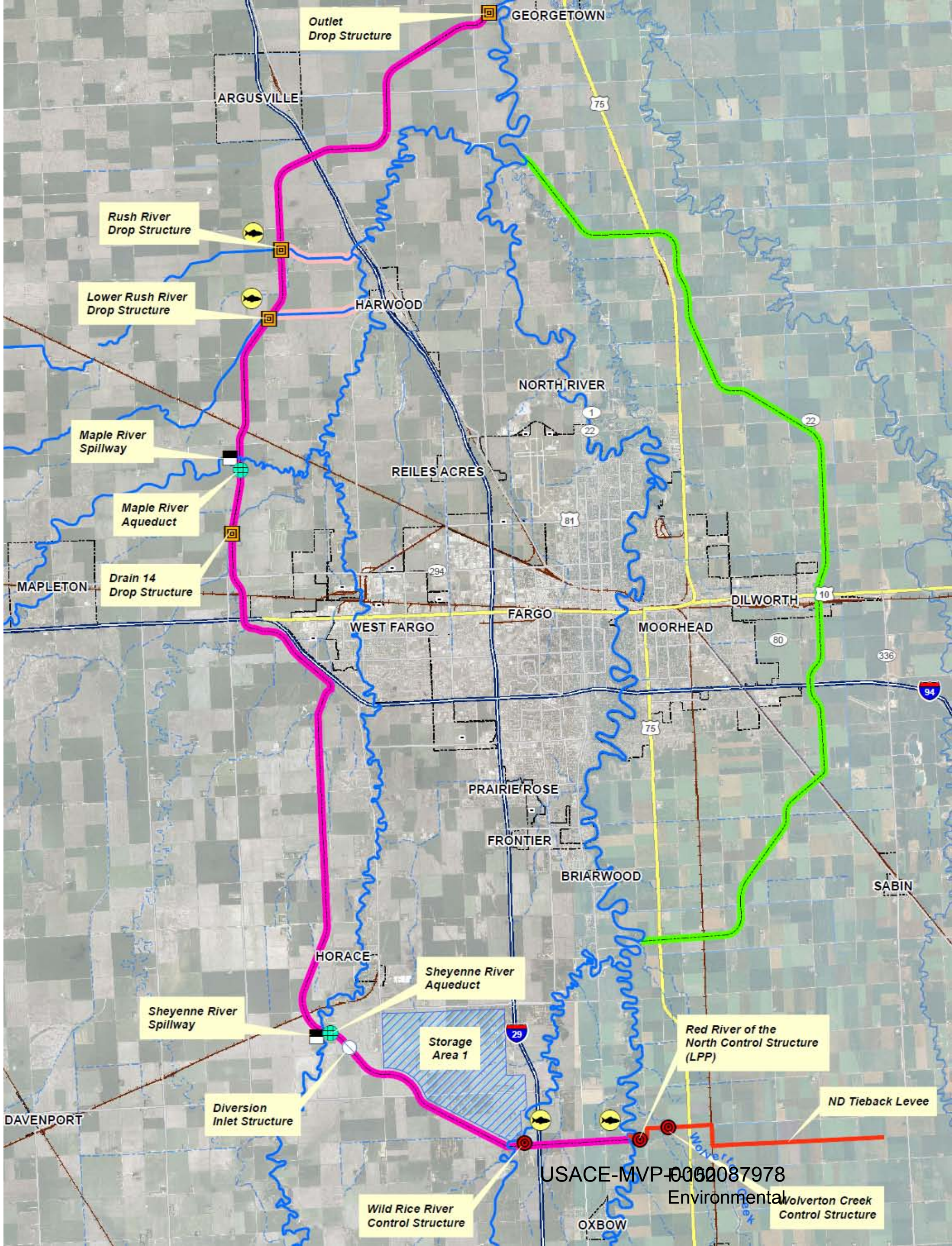
● Cities

0 0.3750.75 1.5 2.25
Miles

DRAFT – SUBJECT TO REVISION

General Layout

- Follows similar diversion alignment to previous EIS
- Structures are generally similar.
- Does include a flood storage area inside the diversion. Also an additional levee.

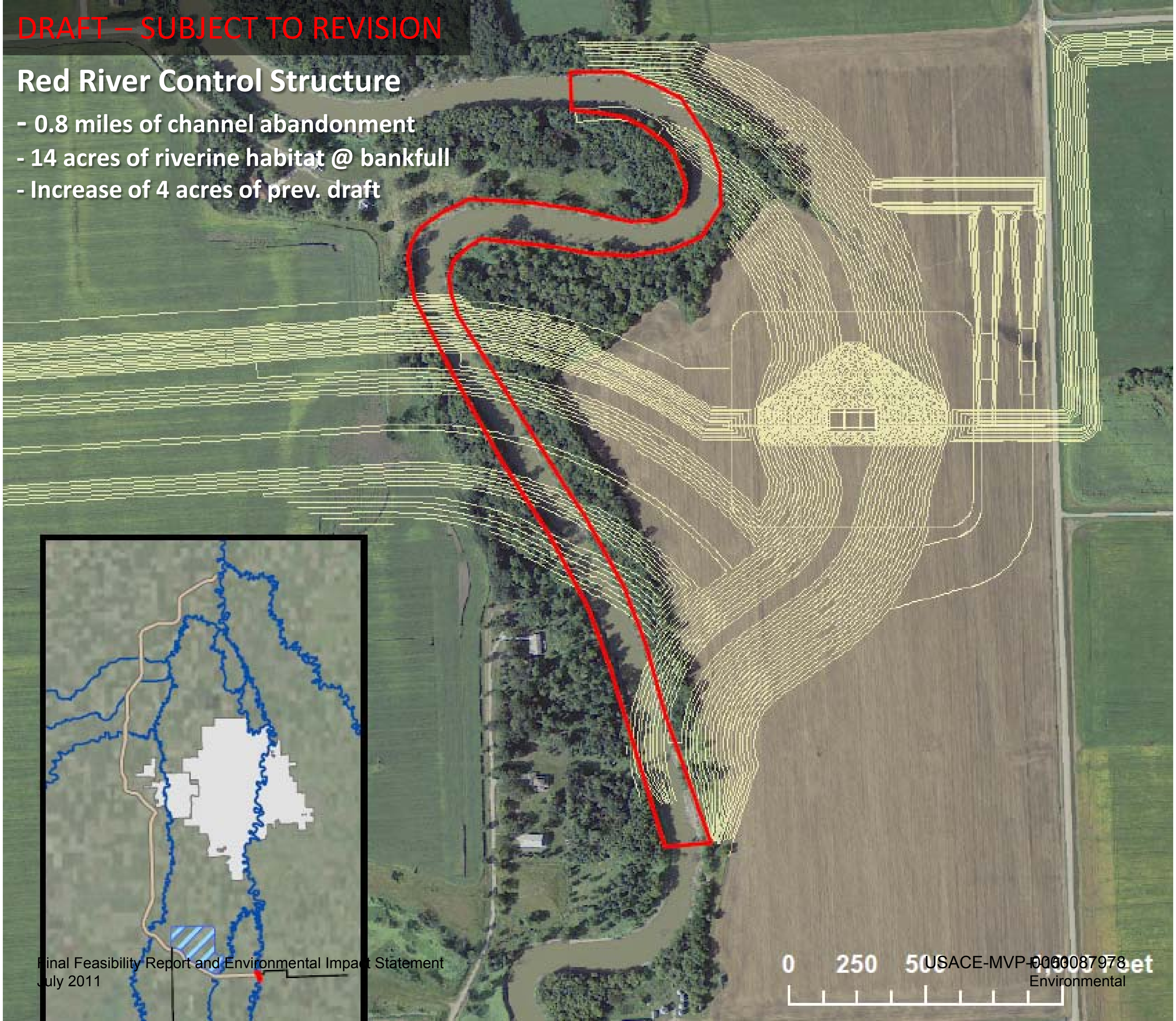


Final Feasibility Report and Environmental Impact Statement
July 2011

DRAFT – SUBJECT TO REVISION

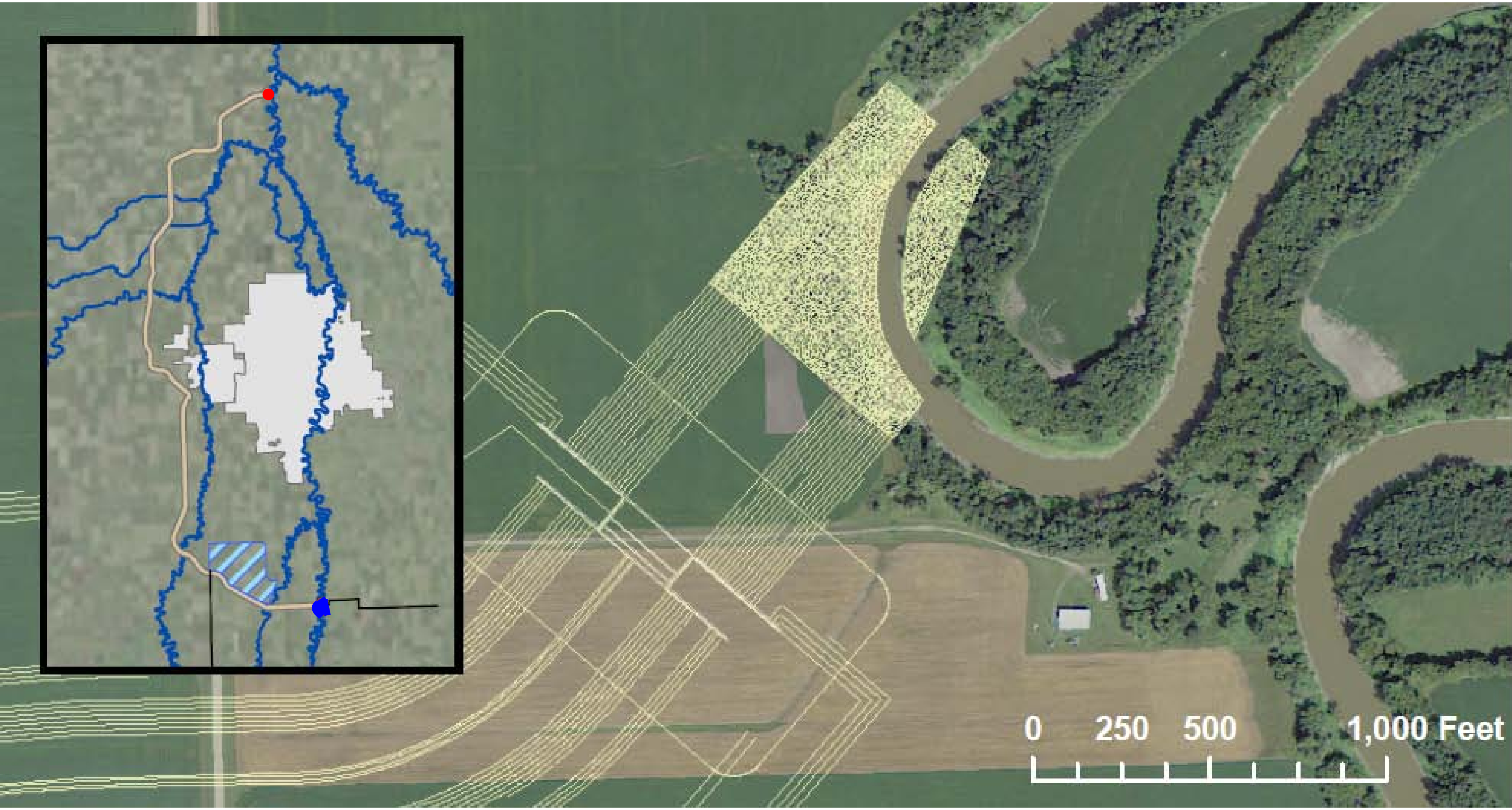
Red River Control Structure

- 0.8 miles of channel abandonment
- 14 acres of riverine habitat @ bankfull
- Increase of 4 acres of prev. draft



Red River Outlet Structure

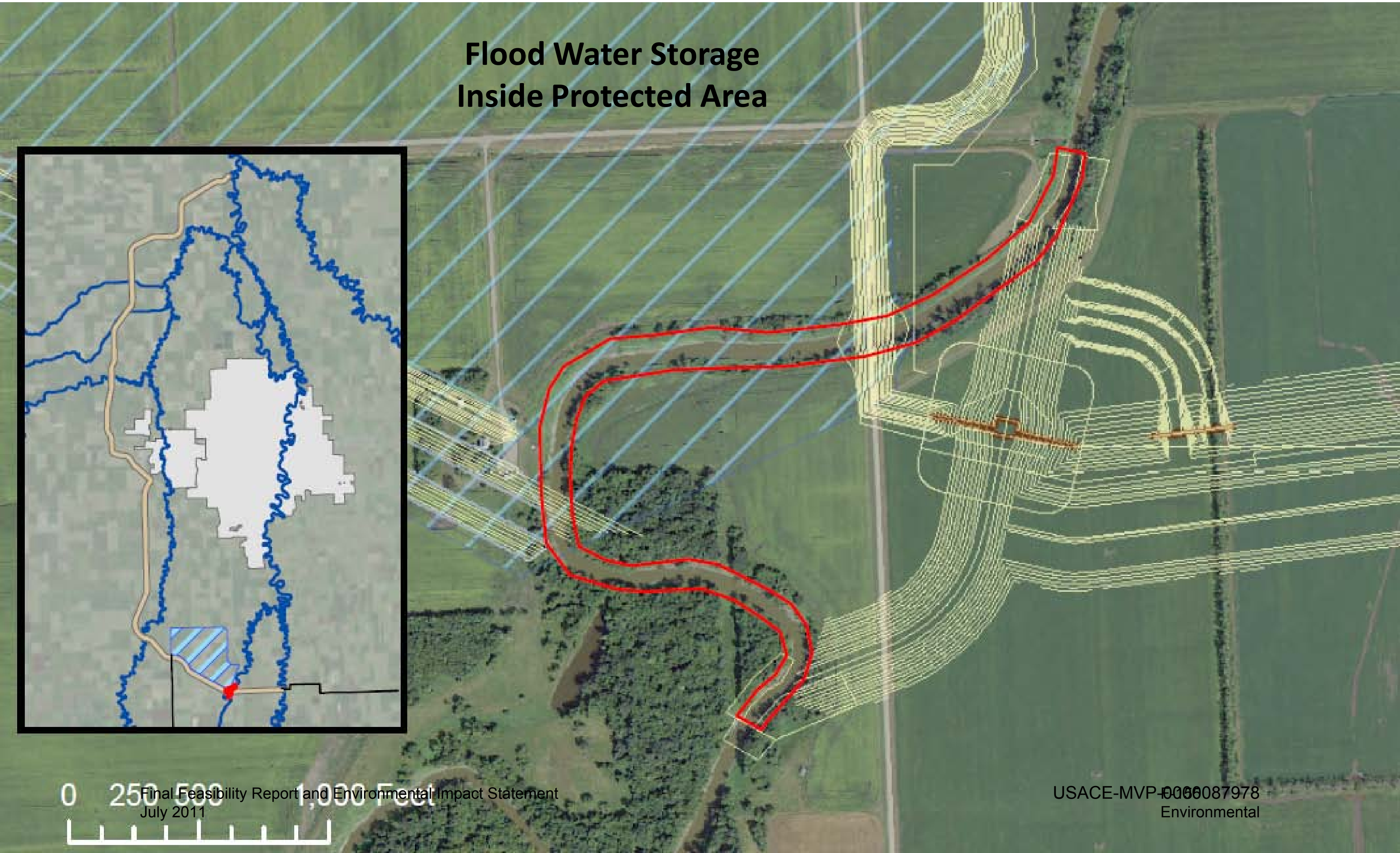
- 0.1 to 0.2 miles of channel influenced
- grading and rock placement on both banks
- erosion and grade control



DRAFT – SUBJECT TO REVISION

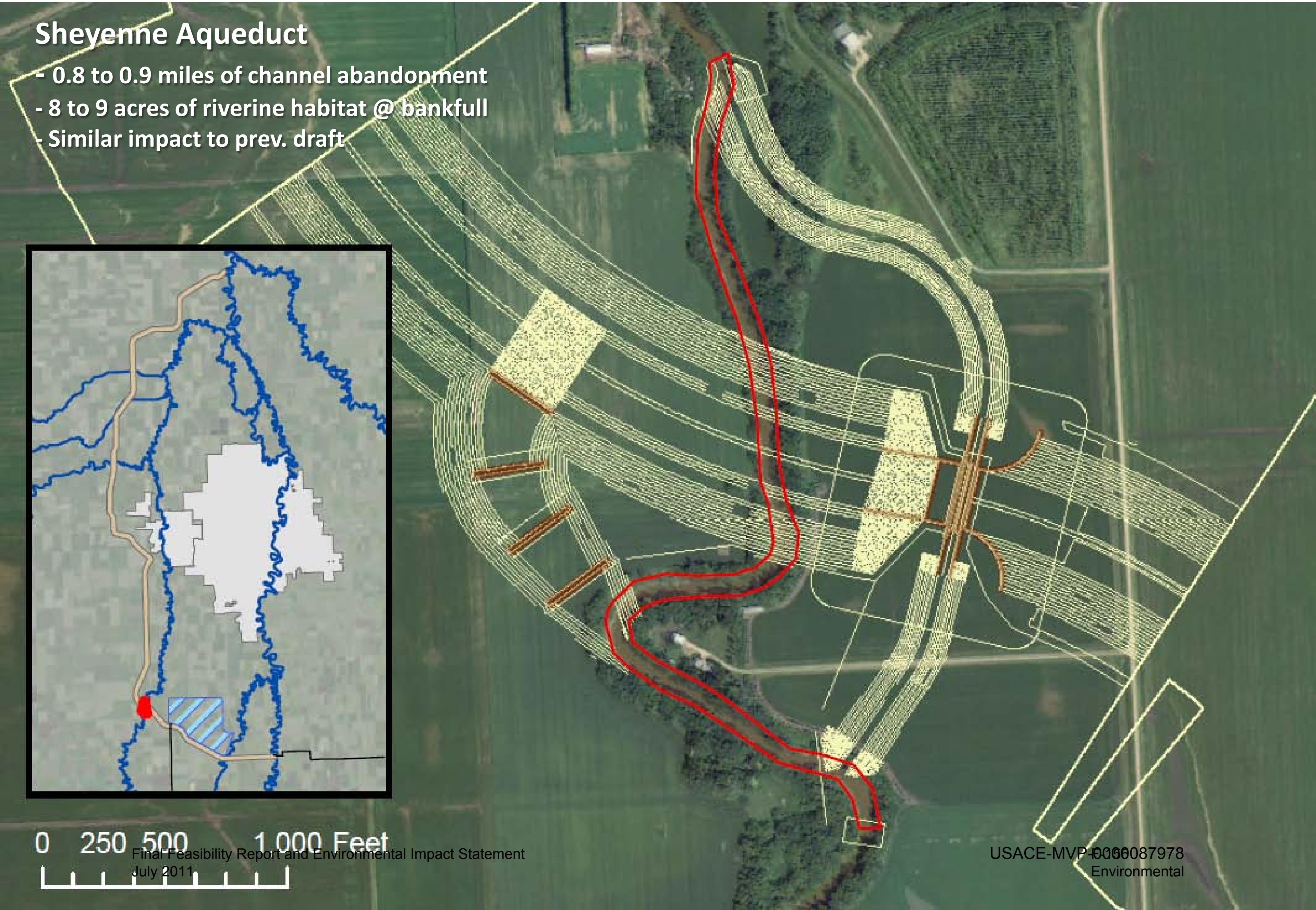
Wild Rice River Control Structure

- 0.8 to 0.9 miles of channel abandonment
- 12 acres of riverine habitat @ bankfull
- Similar to prev. draft



Flood Water Storage Inside Protected Area

DRAFT – SUBJECT TO REVISION



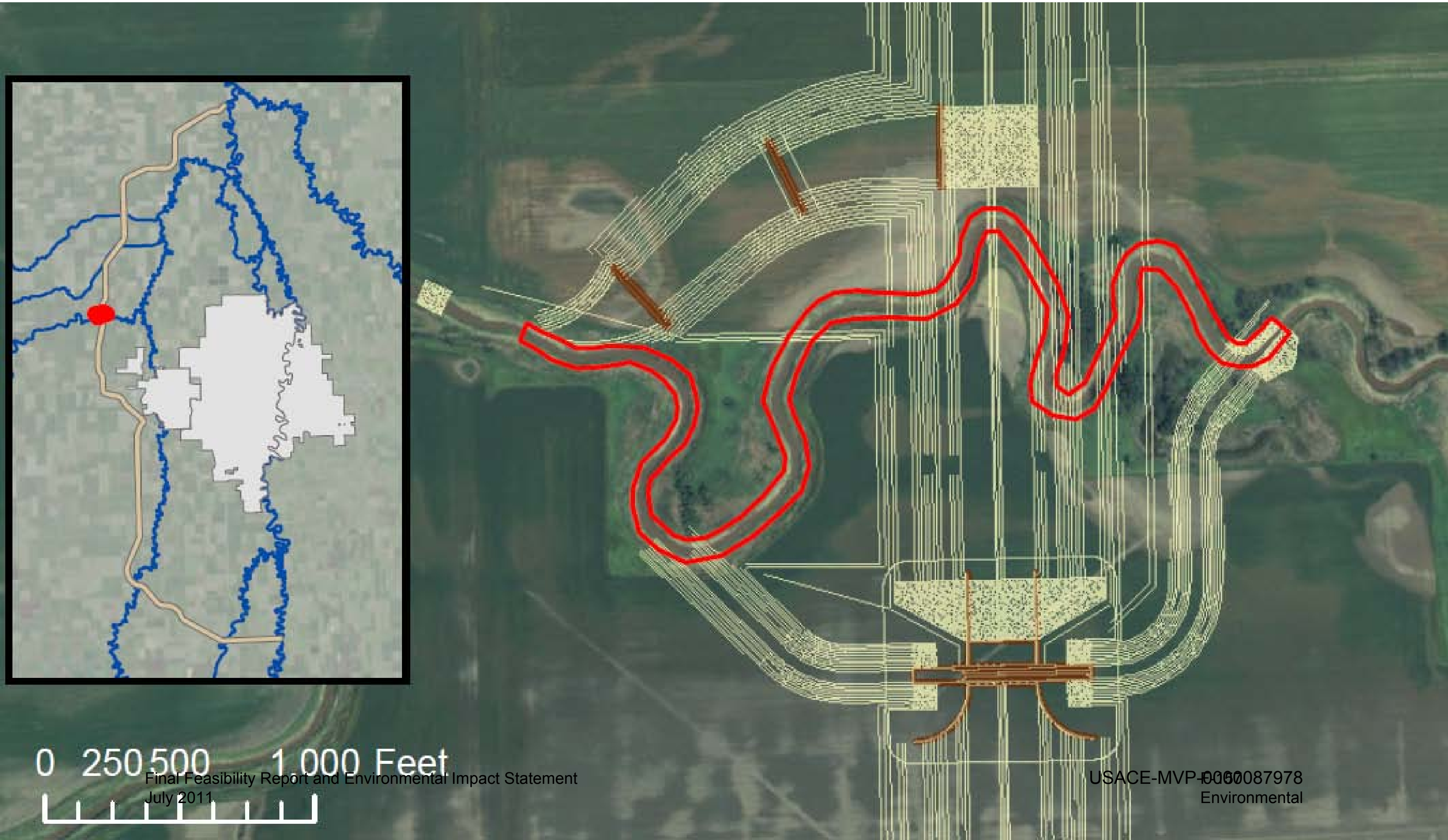
Sheyenne Aqueduct

- 0.8 to 0.9 miles of channel abandonment
- 8 to 9 acres of riverine habitat @ bankfull
- Similar impact to prev. draft

DRAFT – SUBJECT TO REVISION

Maple Aqueduct

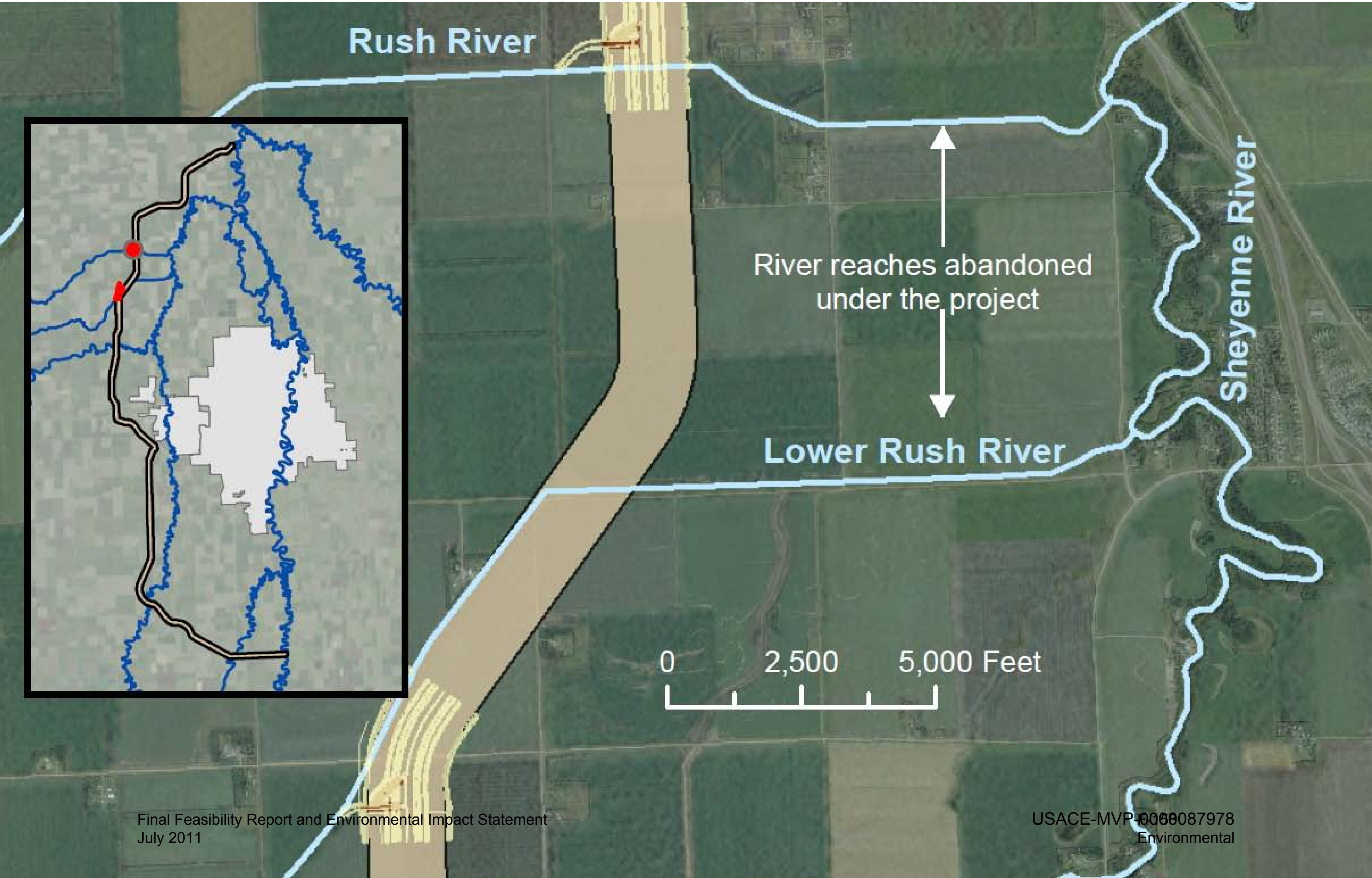
- 1.1 miles of channel abandonment
- 10 to 11 acres of riverine habitat @ bankfull
- Slightly greater impact than previous draft
- Potential to shift diversion a few hundred feet west to reduce amount of impacted channel



DRAFT – SUBJECT TO REVISION

Rush and Lower Rush River abandonment

- 2.1 and 3.4 miles of channel moved to flood diversion
- Less area affected for Rush due to shift east for diversion alignment



DRAFT – SUBJECT TO REVISION

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- Grade control to drop flow to diversion channel
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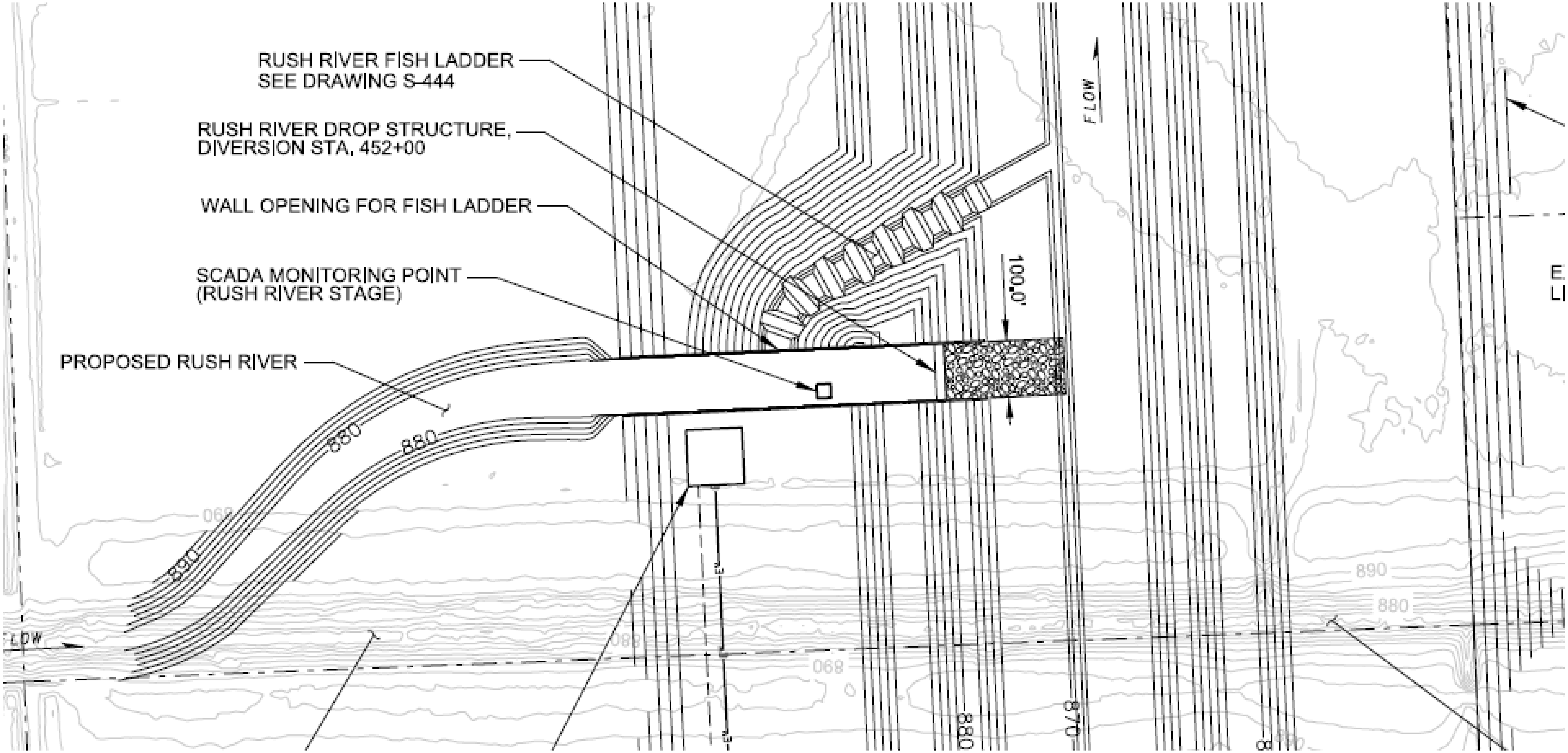

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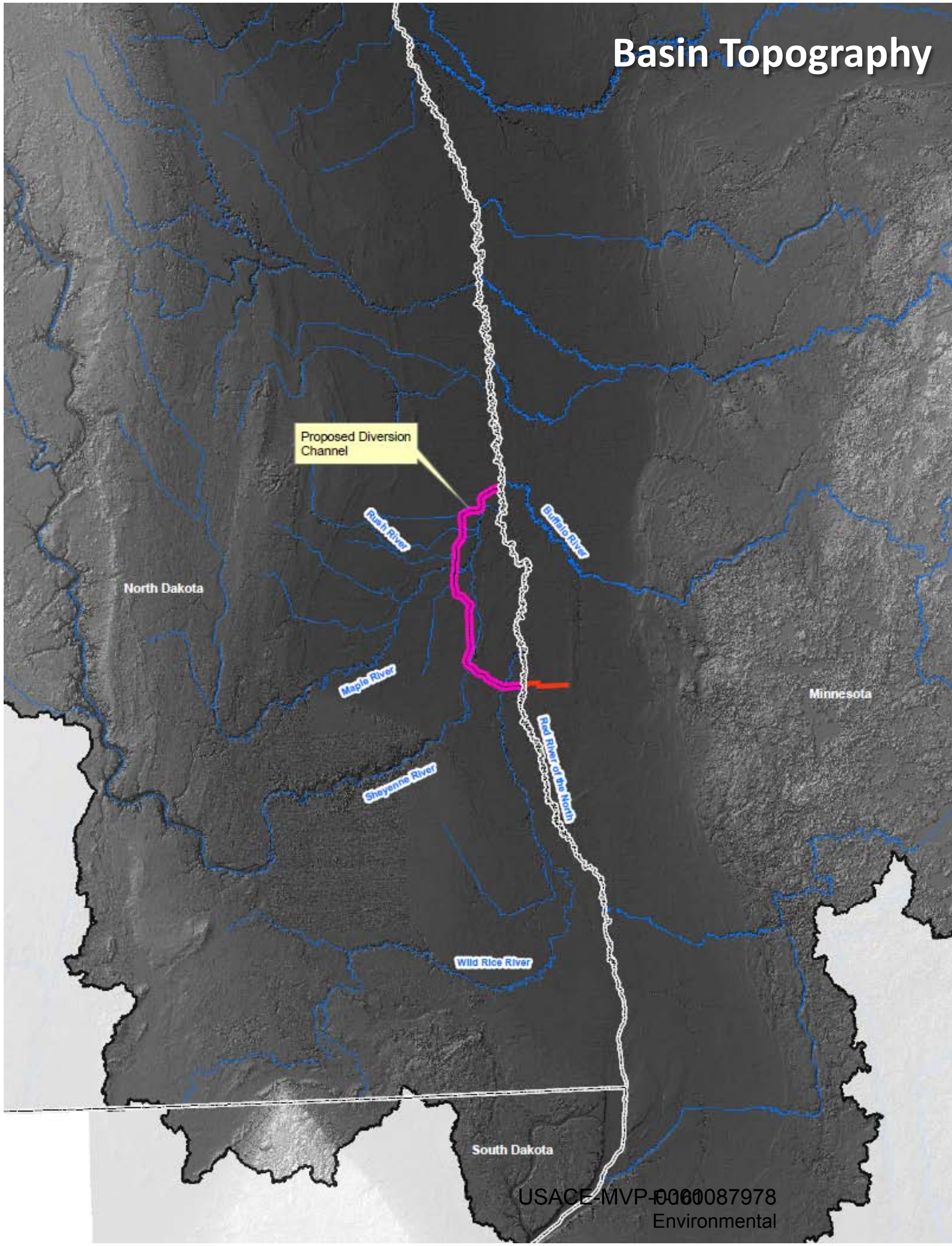

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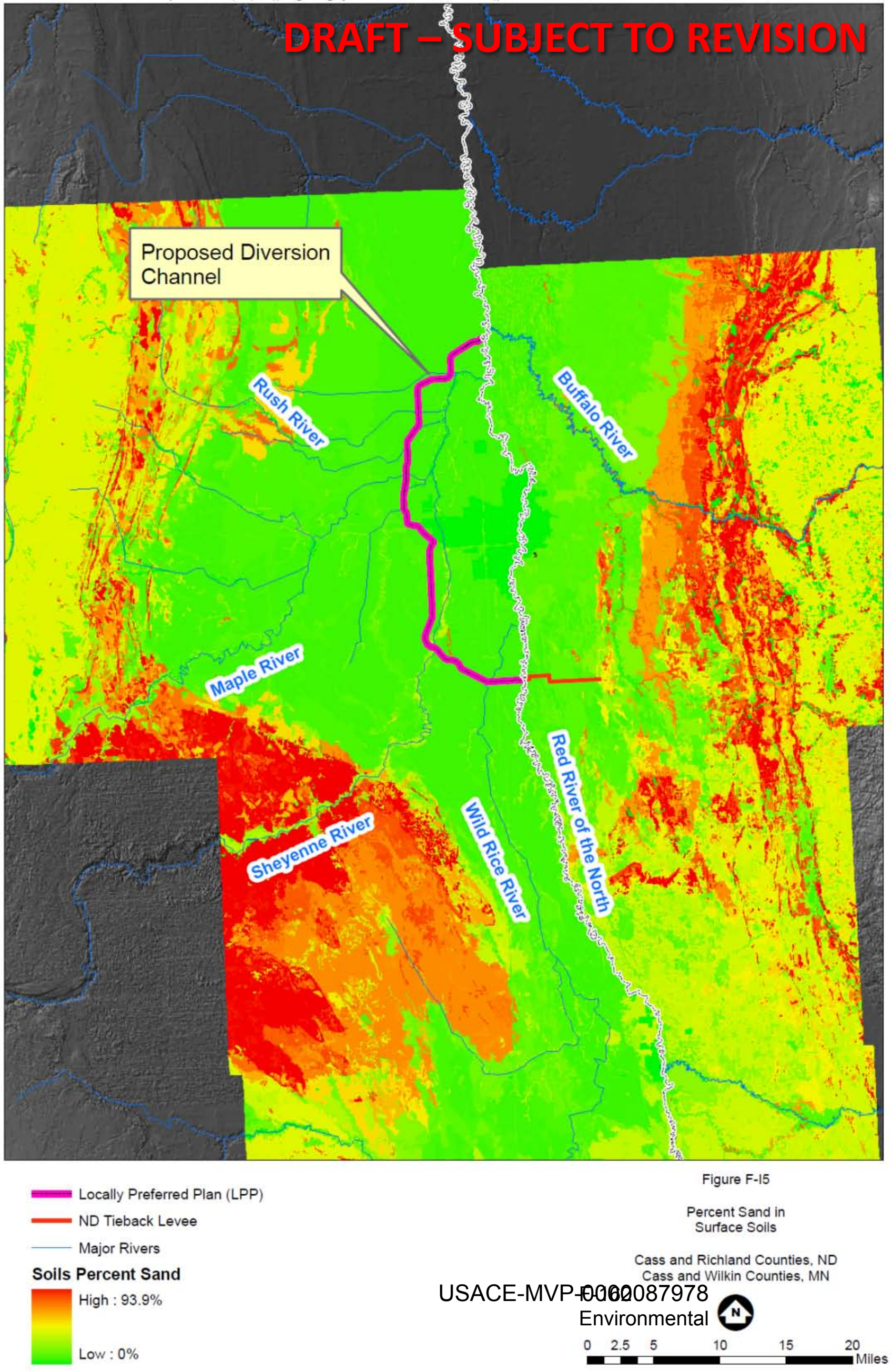
DRAFT – SUBJECT TO REVISION

Figure F-I5

Percent Sand in Surface Soils

Cass and Richland Counties, ND
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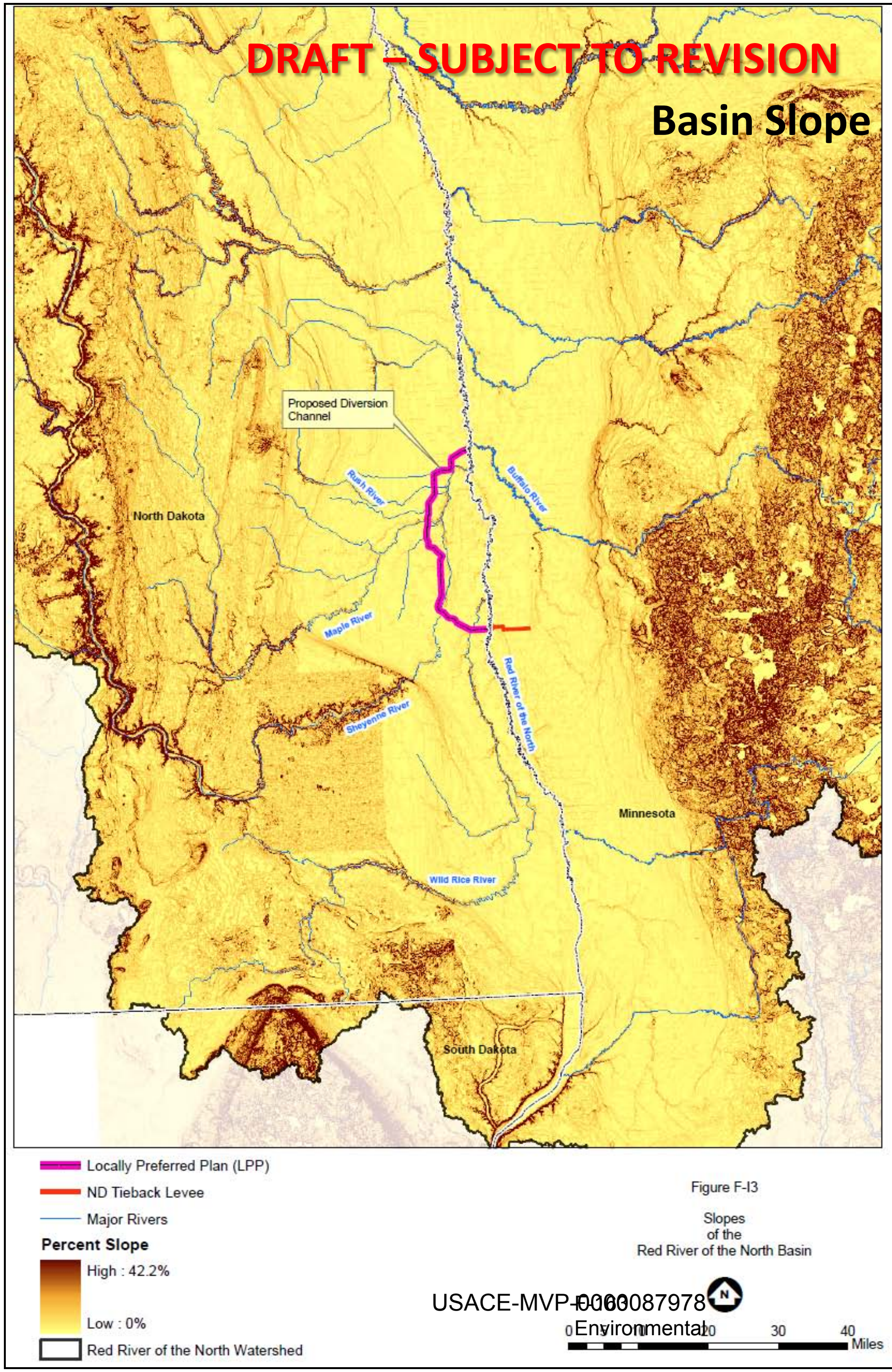

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Basin Slope

Figure F-I3

Slopes
of the
Red River of the North Basin

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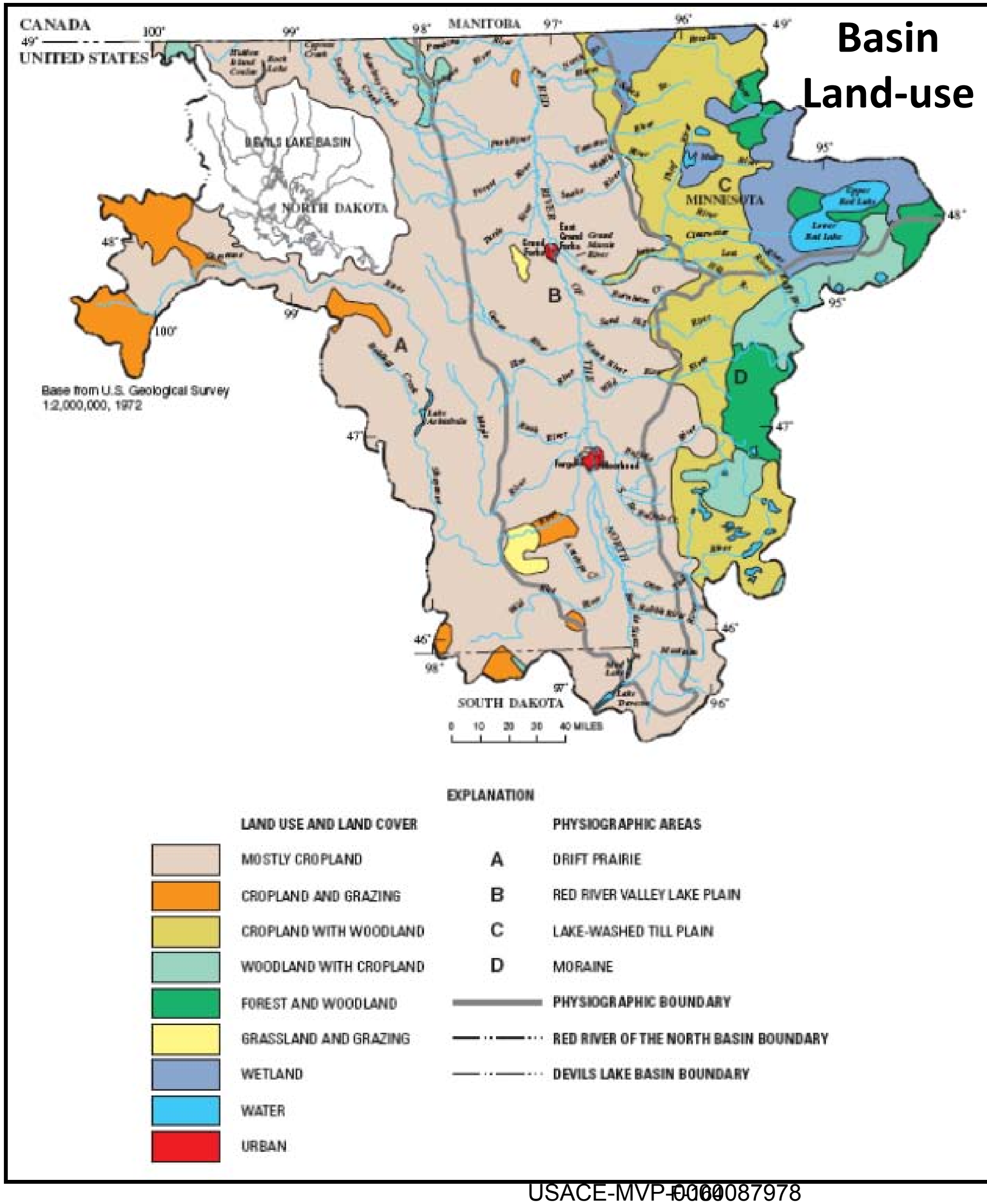
Basin Land-use

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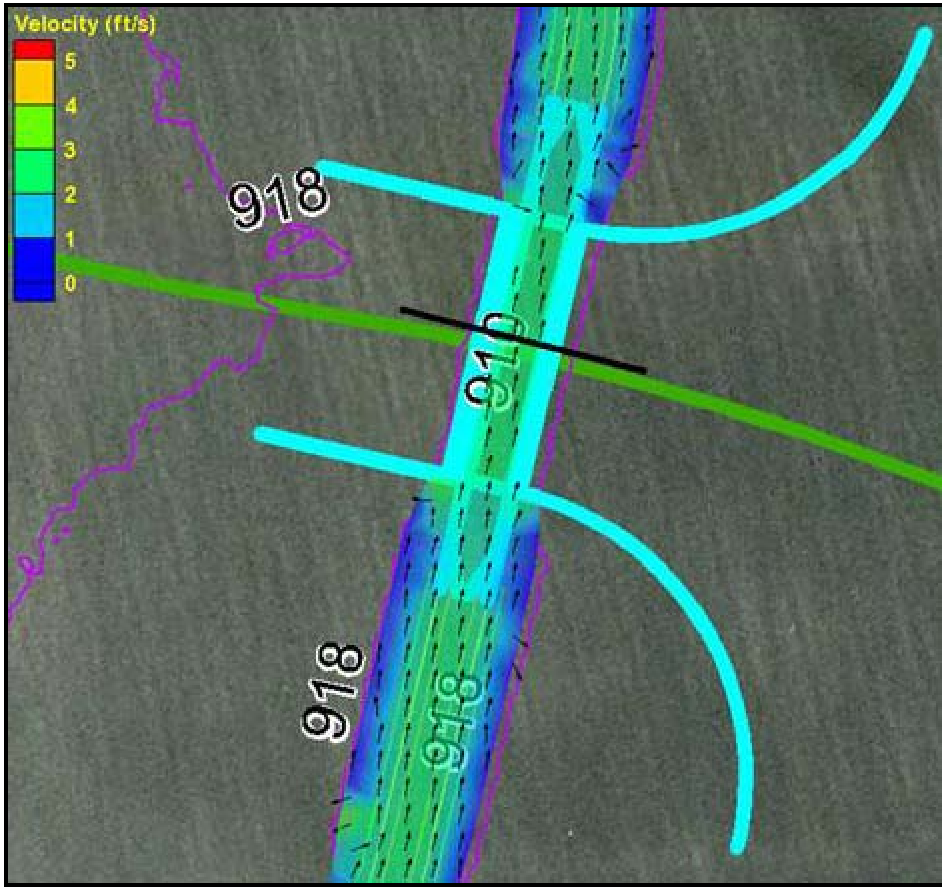

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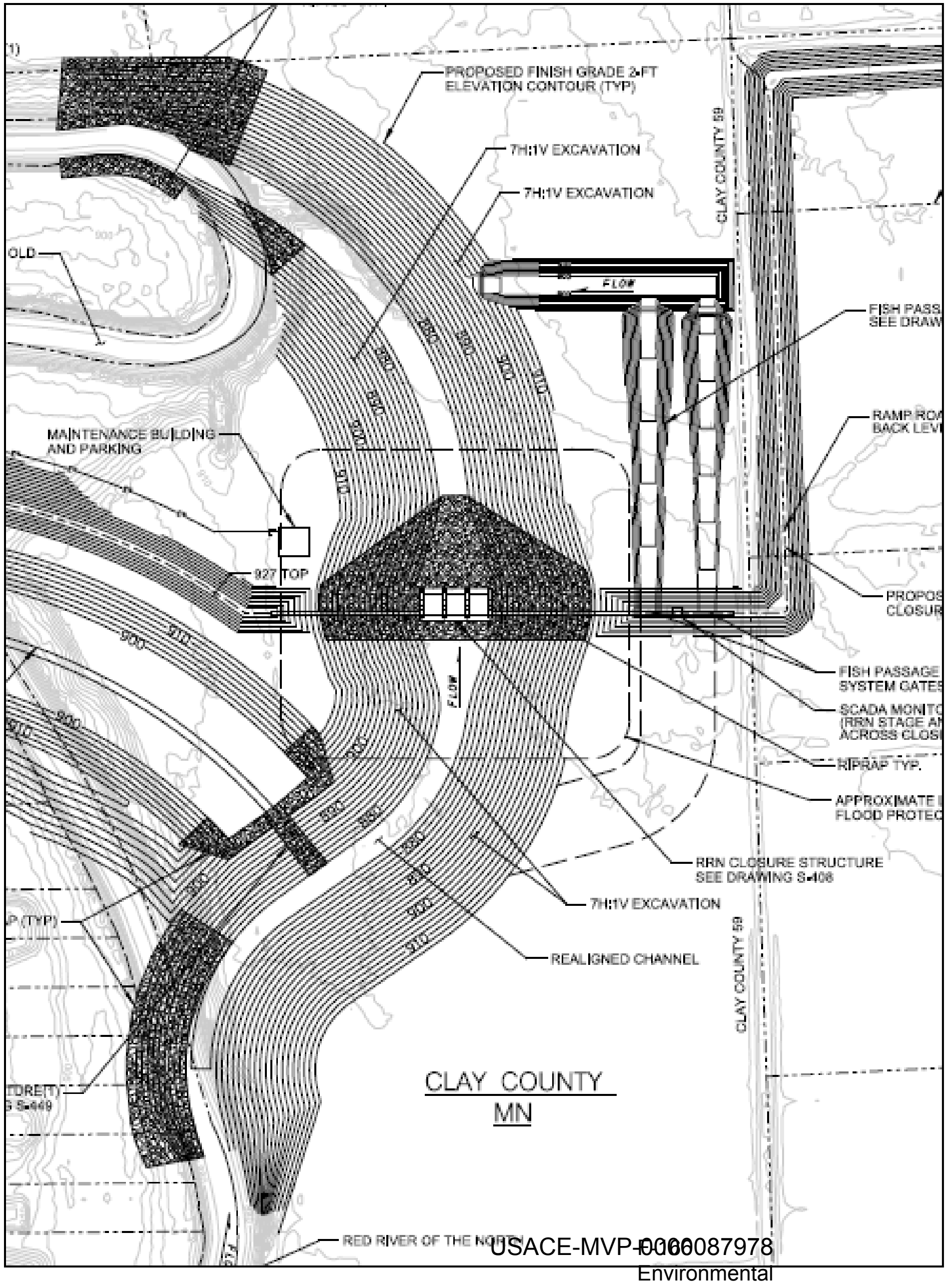

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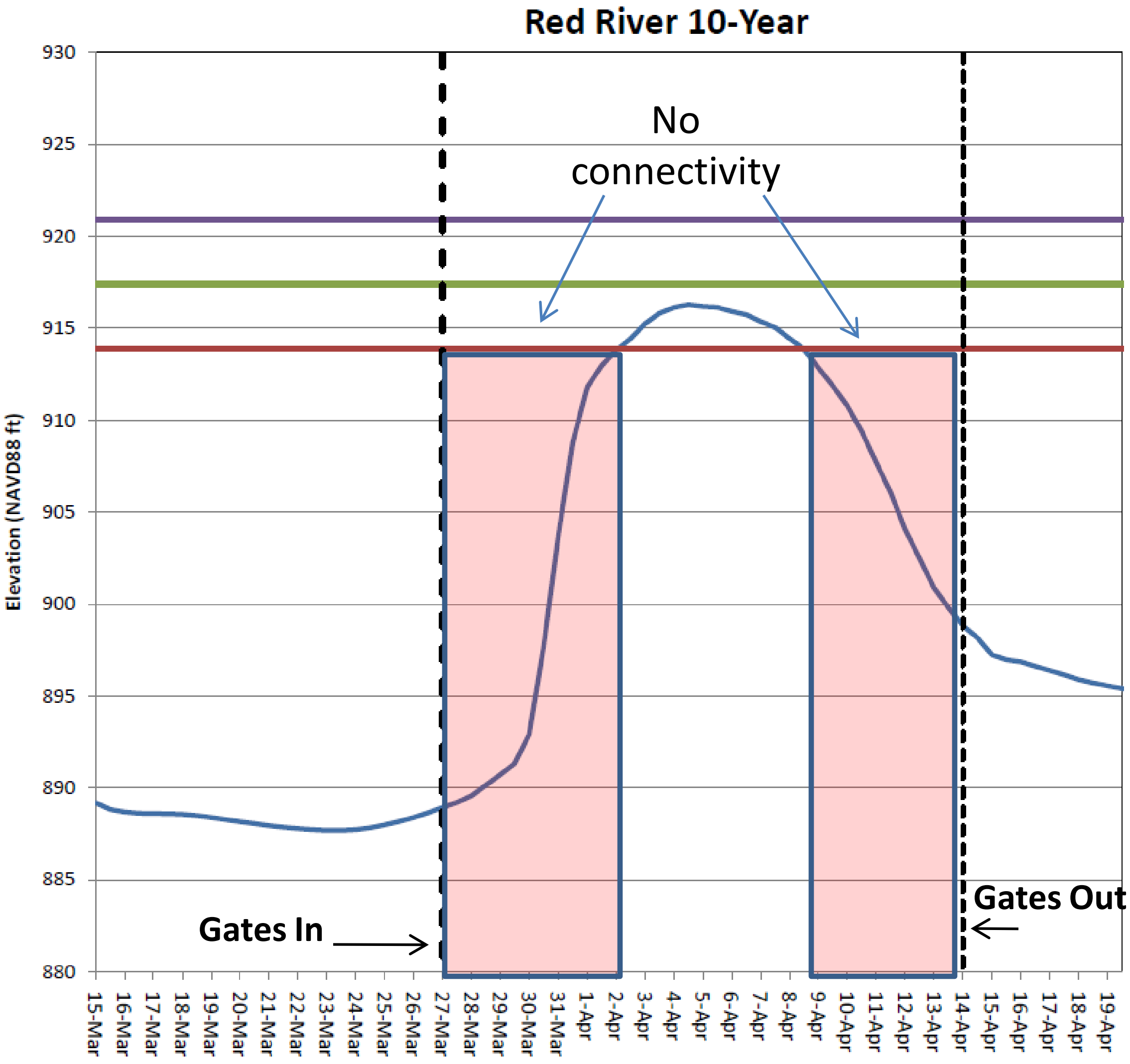

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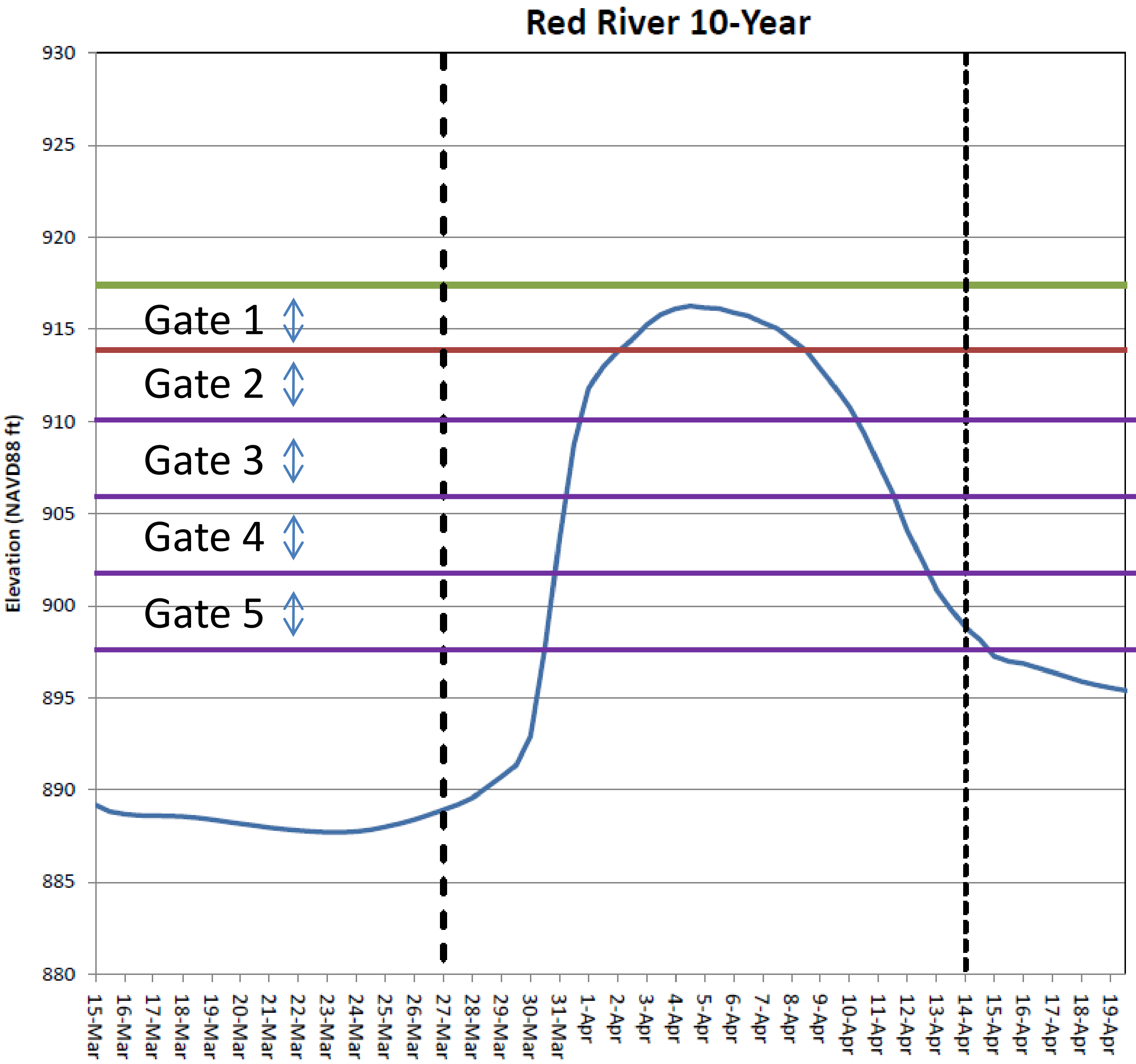

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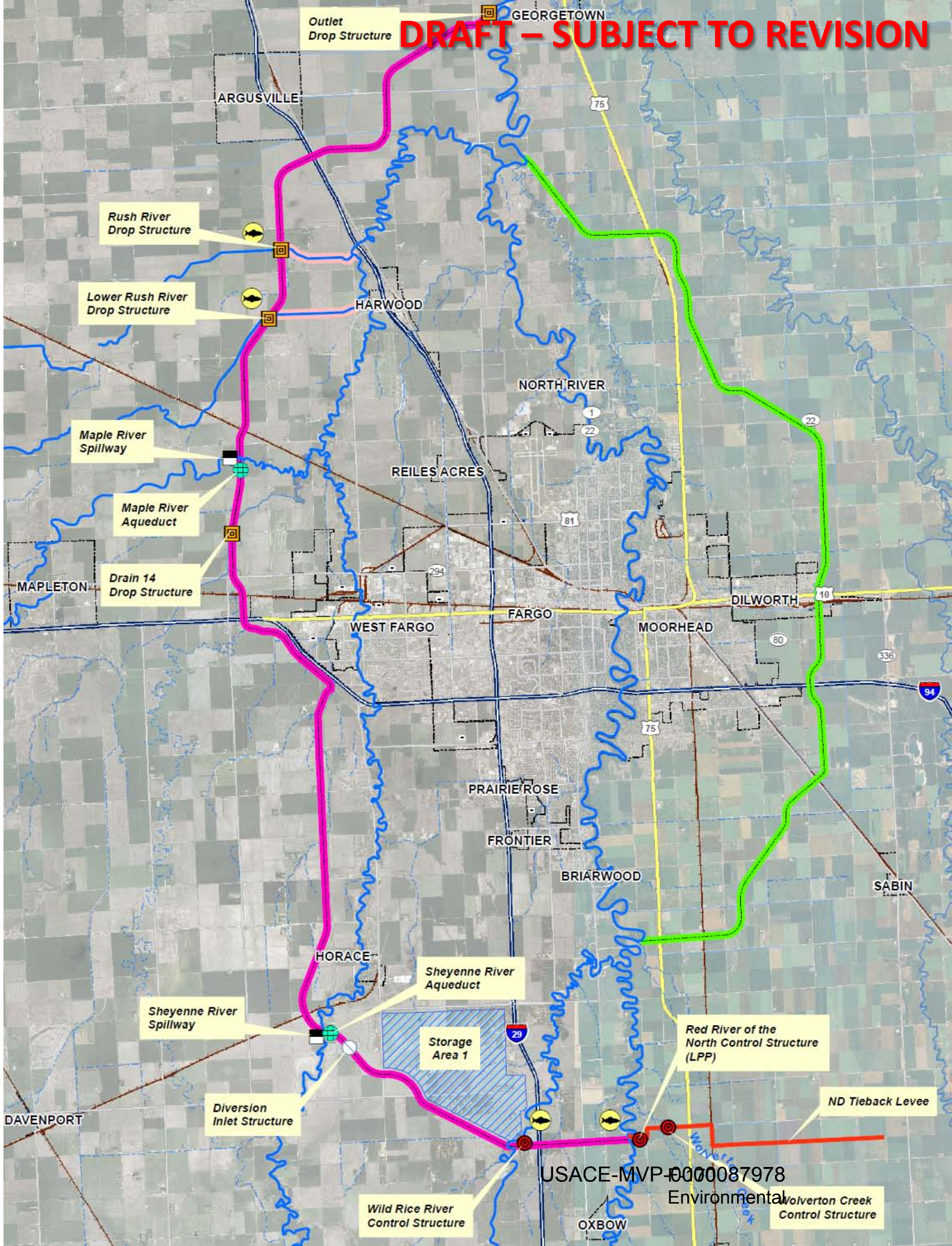

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1 Oct 12	Sign Project Partnership Agreement (soonest)
Spring 2013	Begin Construction

Fargo-Moorhead Metropolitan Area Feasibility Study
Fargo Flood Study Agency Meeting

March 10, 2011

ATTENDEES

NAME	AGENCY/COMPANY
April Walker	City of Fargo
Nathan Boerboom	City of Fargo
Nathan Kestner	Minnesota Department of Natural Resources
Dave Friedl	Minnesota Department of Natural Resources
Tom Carlson	Minnesota Department of Natural Resources
Lynn Schlueter	North Dakota Game and Fish
Mike Ell	North Dakota Department of Health
Elliott Stefanik	US Army Corps of Engineering
Terry Williams	US Army Corps of Engineering
Brett Coleman	US Army Corps of Engineering
Lee Beauvais	Moore Engineering
Keith Berndt	Cass County
Mike Vavricka	MnPCA
Patrick Fridgen	North Dakota Water Commission
Bob Zimmerman	City of Moorhead
Gregg Theilen	Houston Engineering
Miguel Wong	Barr Engineering

I. Introductions:

a. All attendees introduced themselves and their party.

II. Overview of latest happenings and schedule

a. Brett Coleman and Terry Williams with the Corps gave a brief overview of where we are to date on the project.

III. Latest Status of Impacts

Majority of meeting focused on updated impact discussions. Elliott Stefanik with USACE and Miguel Wong with Barr Engineering lead discussions outlining likely impact conclusions for key ecological resources based on revised drawings and potential project operations. PowerPoint files of these presentations are attached. Presentation included extensive open conversation between USACE and the agencies on project features, operations and potential impacts.

IV. Action Items

a. USACE should consider including the most recent Red River discharge data within its frequency analysis for project operations.
b. Per request, USACE will address upstream bank stability issues and upstream floodplain sedimentation within the upcoming EIS.
c. USACE will further evaluate potential connectivity impacts/concerns on Wolverton Creek as a result of upstream staging under the LPP.
d. USACE must continue to make progress on the MN State EIS, including the need to address dam safety issues.
e. Various options will be considered to reduce the amount of upstream staging needed under the LPP, particularly during smaller flood events (e.g., 10-year flood event). One option is to allow more water to pass in to the protected area. Would be valuable to get from appropriate State agencies the amount of water level increase that would be acceptable for smaller flood events.
f. Agencies would appreciate an advance copy of the EIS if at all possible.

V. Adjourn

BARR

MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA
DULUTH, MINNESOTA
ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI

COMPUTED	CHECKED	SUBMITTED	DATE	SHEET NO.
BY	BY	TO	PROJECT NAME	
DATE	DATE	DATE	PROJECT NUMBER	
			SUBJECT	

	NAME	ORGANIZATION	email
1)	MIGUEL WONG	BARR ENGINEERING	mwong@barr.com
	Mike Vavricka	MPCA	michael.vavricka@state.mn.us
	Keith Berndt	Cass County	berndtk@casscountynd.gov
	PATRICK FRIDGEN	ND WATER COMMISSION	pfridgen@nd.gov
	Mike Ell	ND Dept of Health	mell@nd.gov
	Dave Friedl	MN DNR	david.friedl@state.mn.us
	TOM CARLSON	MN DNR	THOMAS.CARLSON@STATE.MN.US
	Nathan Kestner	MN DNR	nathan.kestner@state.mn.us
	Lynn R Schlueter	NDGF	lschlueter@nd.gov
	Brett Coleman	USACE	brett.r.coleman@usace.army.mil
	Gregg Thielman	Houston Engineering, Inc.	gthielman@houstoneng.com
	LEE BEAUVAIS	MOORE ENGINEERING INC.	lbeauvais@mooreengineeringinc.com
	Bob Zimmerman	City of Moorhead	bob.zimmerman@ci.moorhead.mn.us
	April Walker	City of Fargo	awalker@cityoffargocom
	Nathan Boerboom	City of Fargo	nboerboom@cityoffargo,com
	TERRY WILLIAMS	USACE	terryl.l.williams@usace.army.mil

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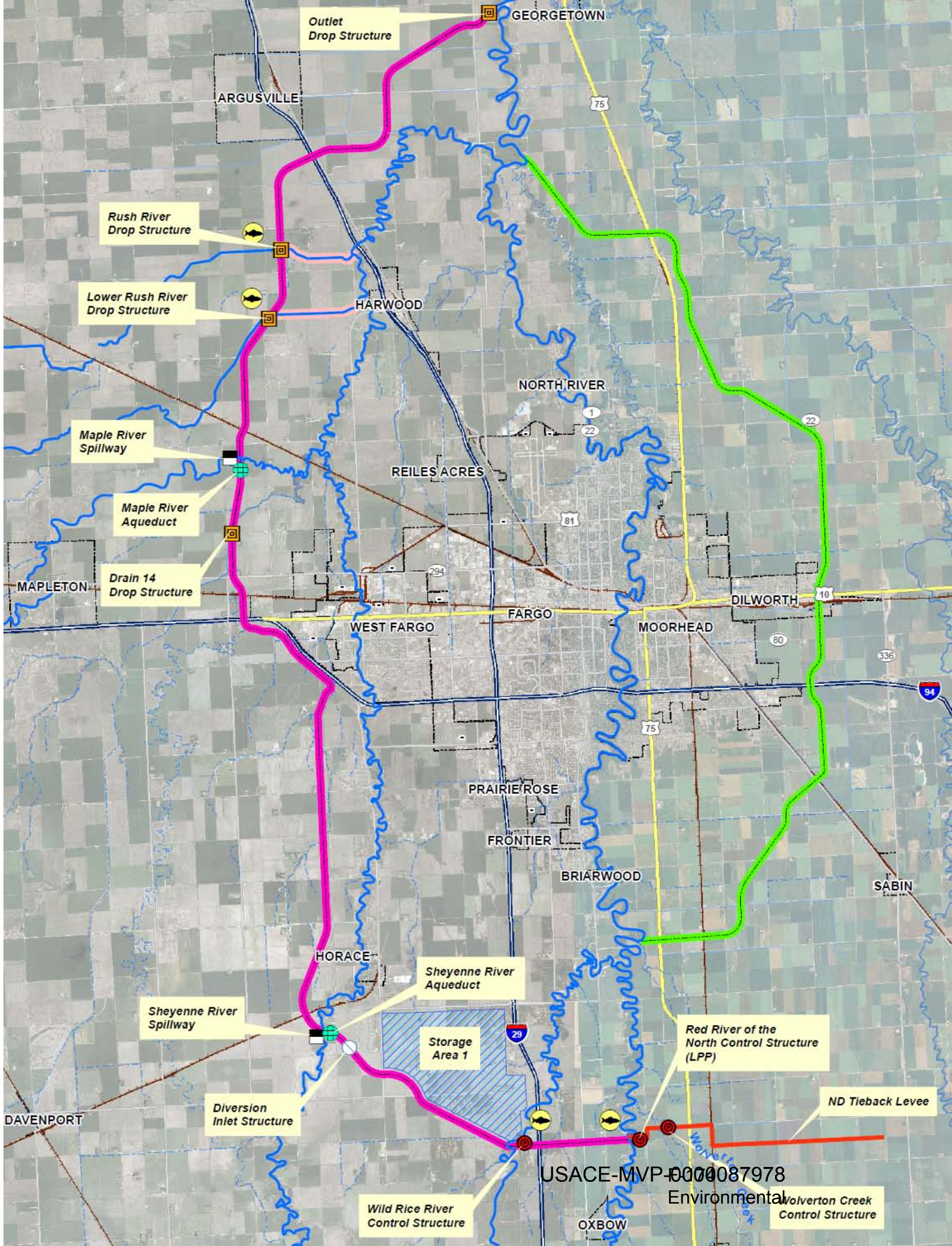
General Layout

- Follows similar diversion alignment to previous EIS
- Structures are generally similar.
- Does include a flood storage area inside the diversion. Also an additional levee.



Final Feasibility Report and Environmental Impact Statement
July 2011

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Red River Control Structure

- 0.8 miles of channel abandonment
- 14 acres of riverine habitat @ bankfull
- Increase of 4 acres of prev. draft

Red River Outlet Structure

- 0.1 to 0.2 miles of channel influenced
- grading and rock placement on both banks
- erosion and grade control

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Wild Rice River Control Structure

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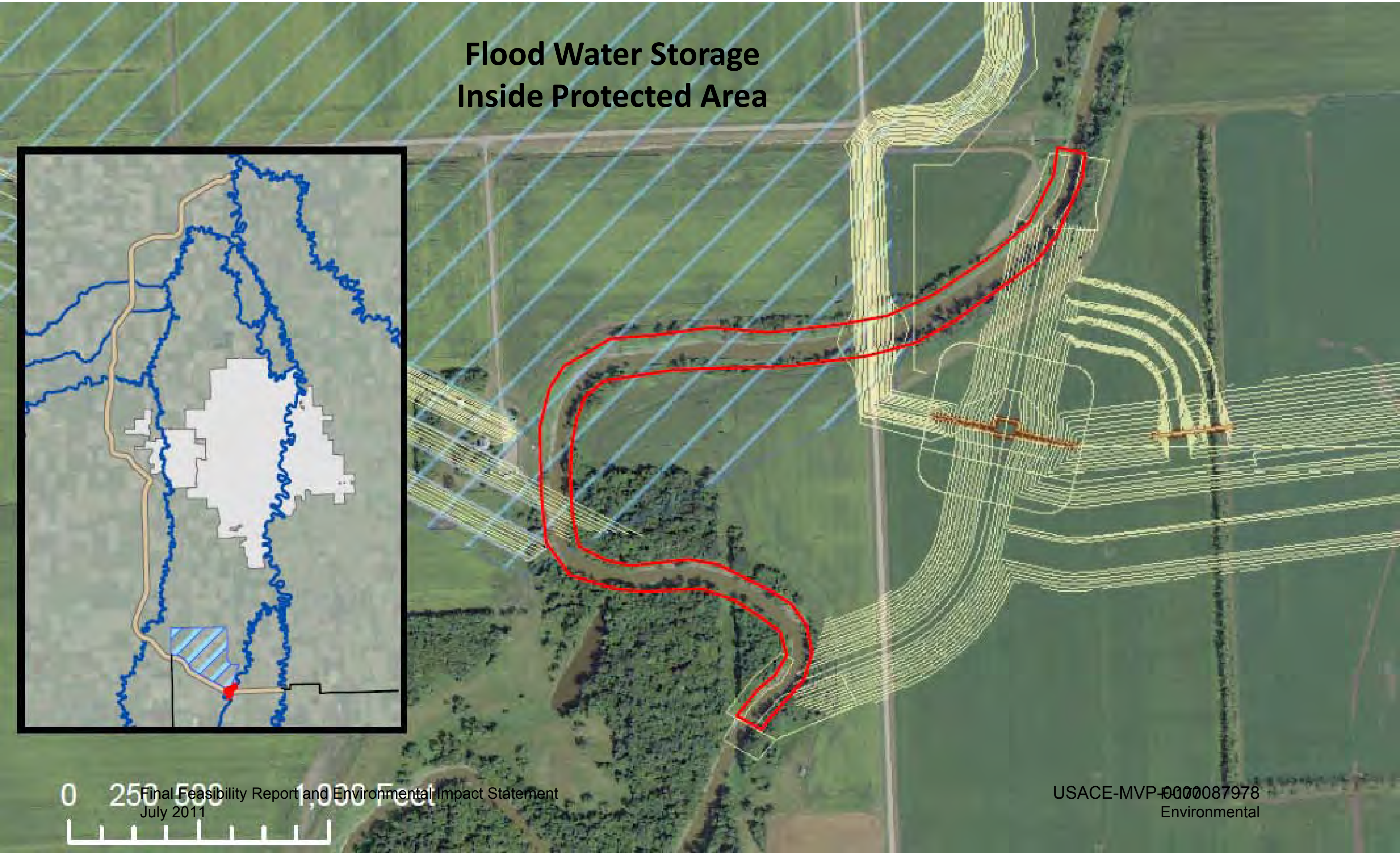
- 12 acres of riverine habitat @ bankfull
- Similar to prev. draft



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Sheyenne Aqueduct

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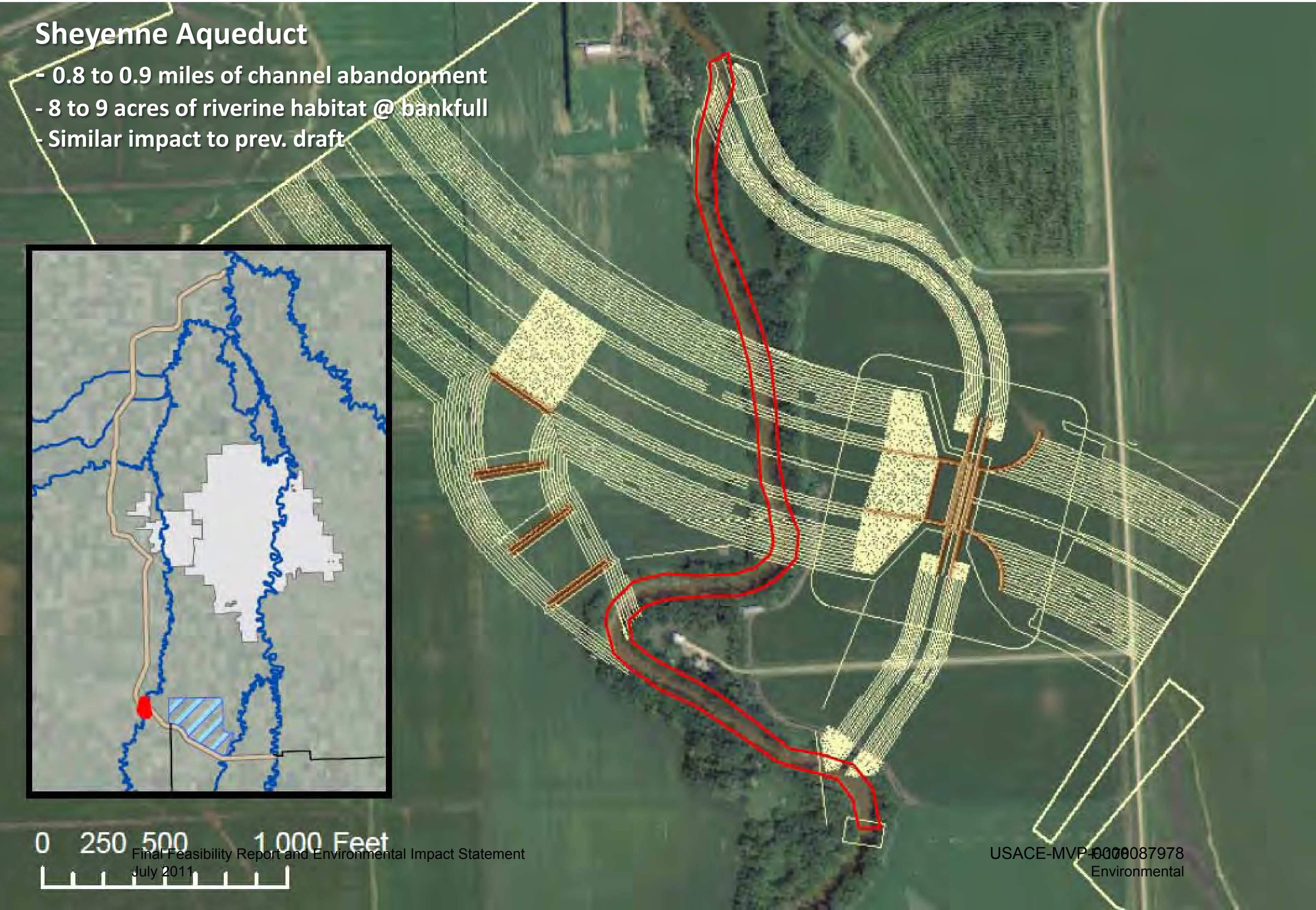
- 8 to 9 acres of riverine habitat @ bankfull
- Similar impact to prev. draft



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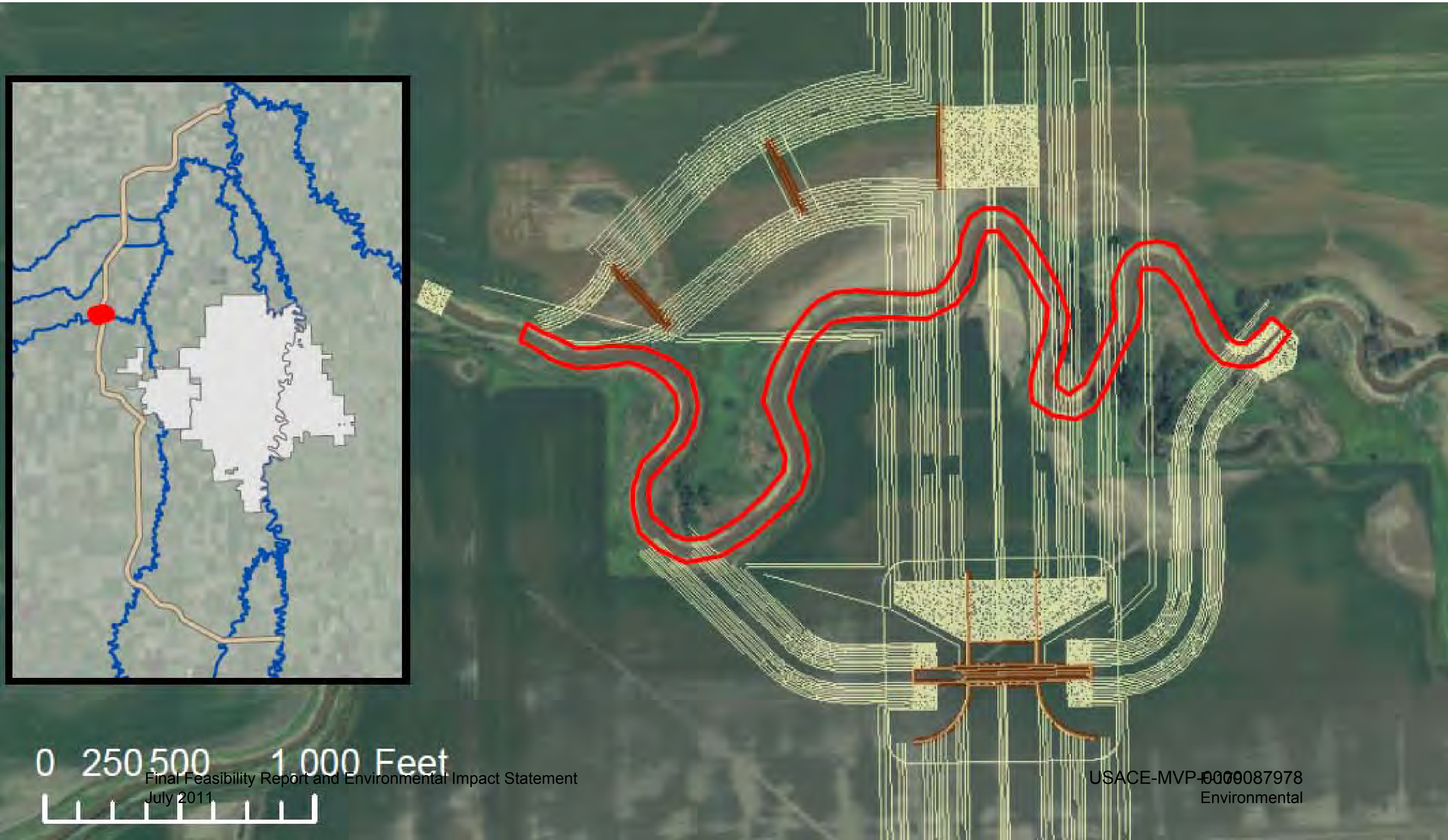
Maple Aqueduct

- 1.1 miles of channel abandonment
- 10 to 11 acres of riverine habitat @ bankfull
- Slightly greater impact than previous draft
- Potential to shift diversion a few hundred feet west to reduce amount of impacted channel



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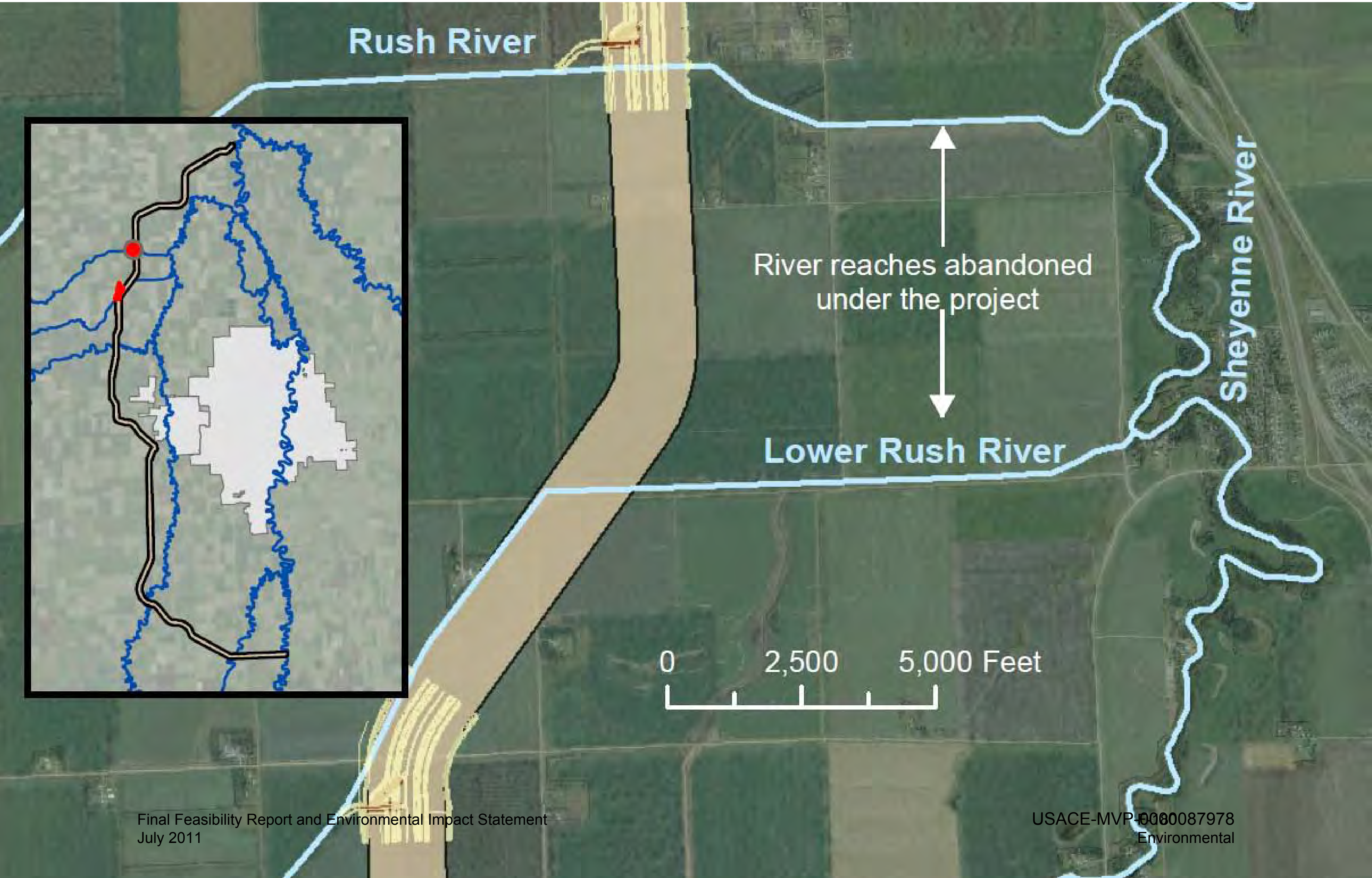

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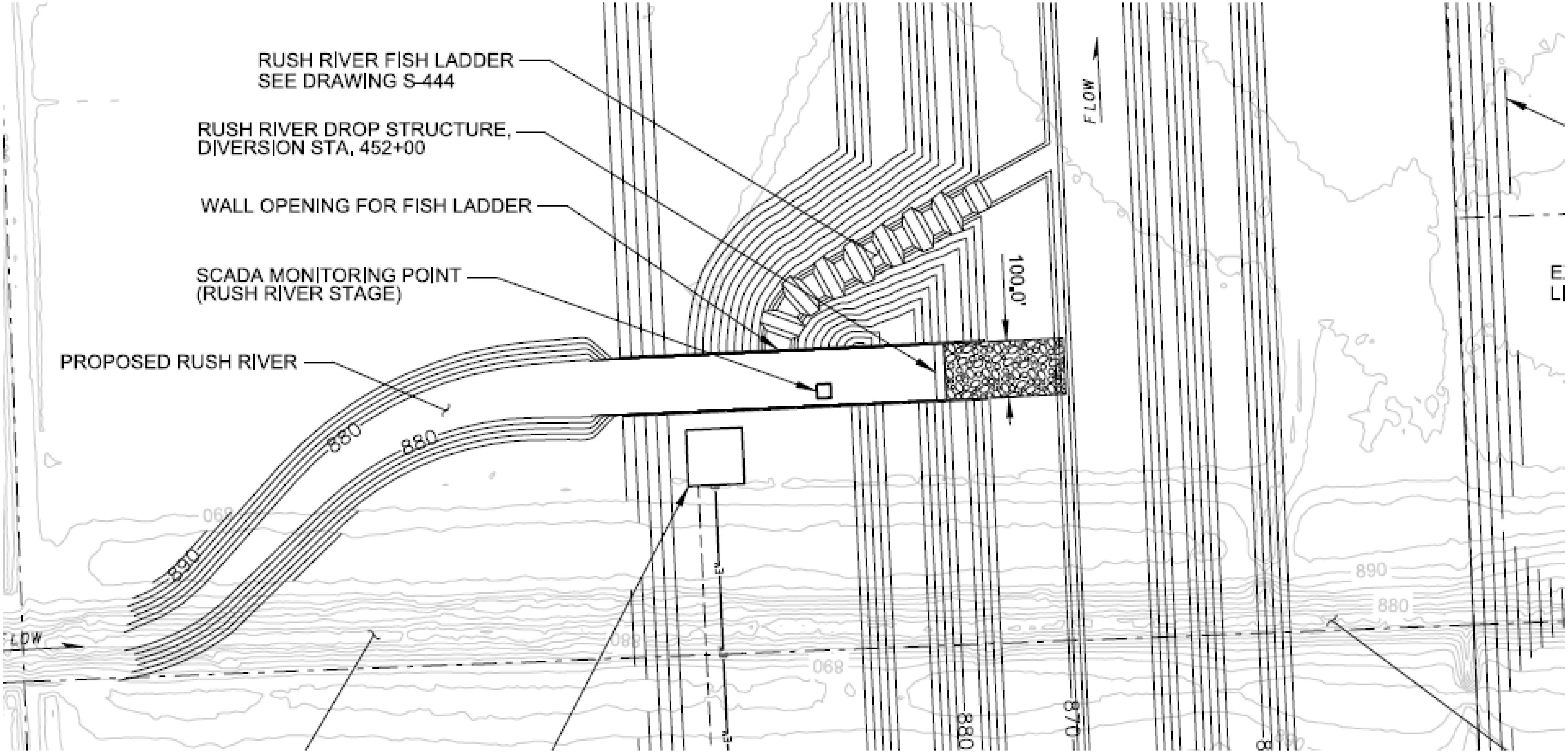

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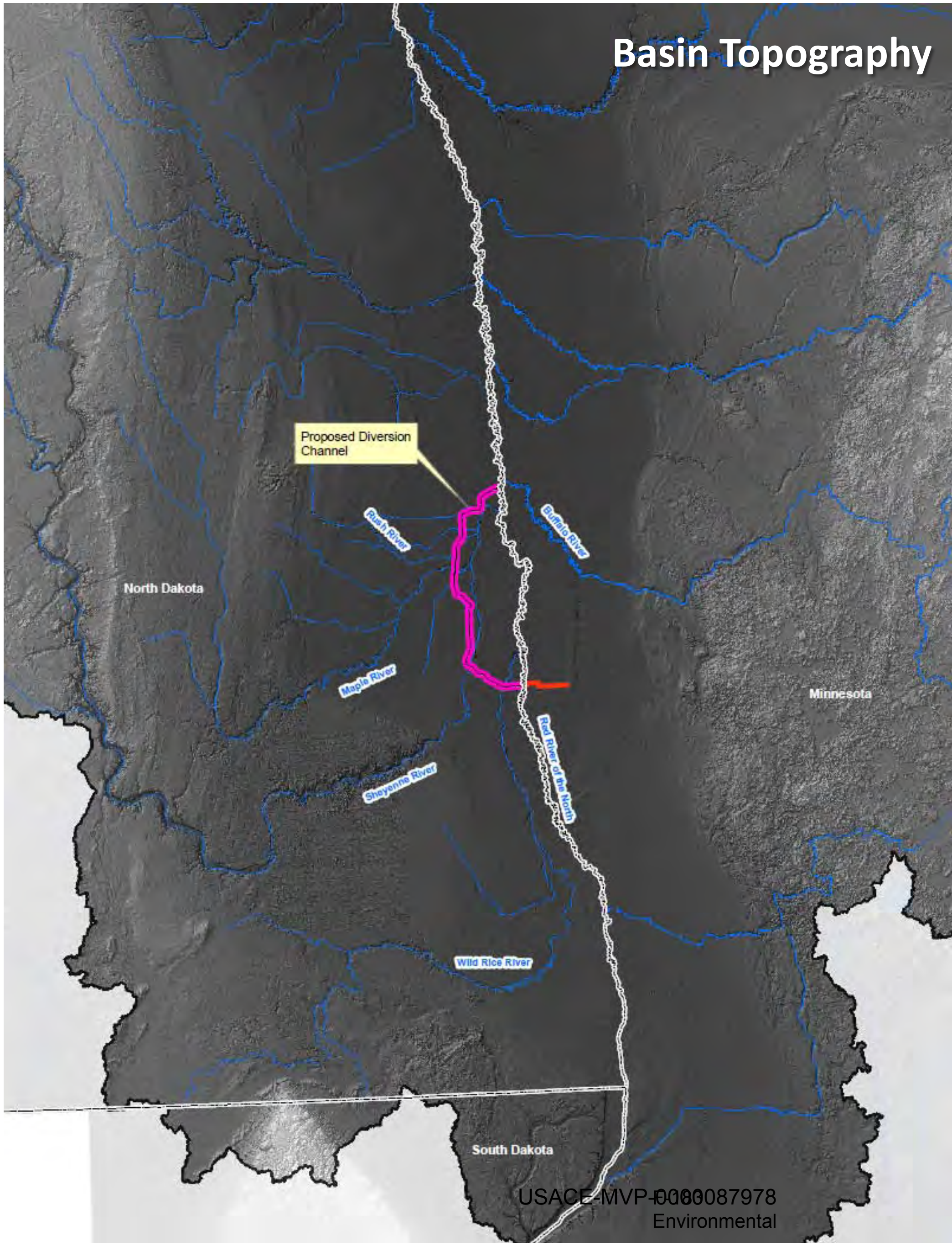

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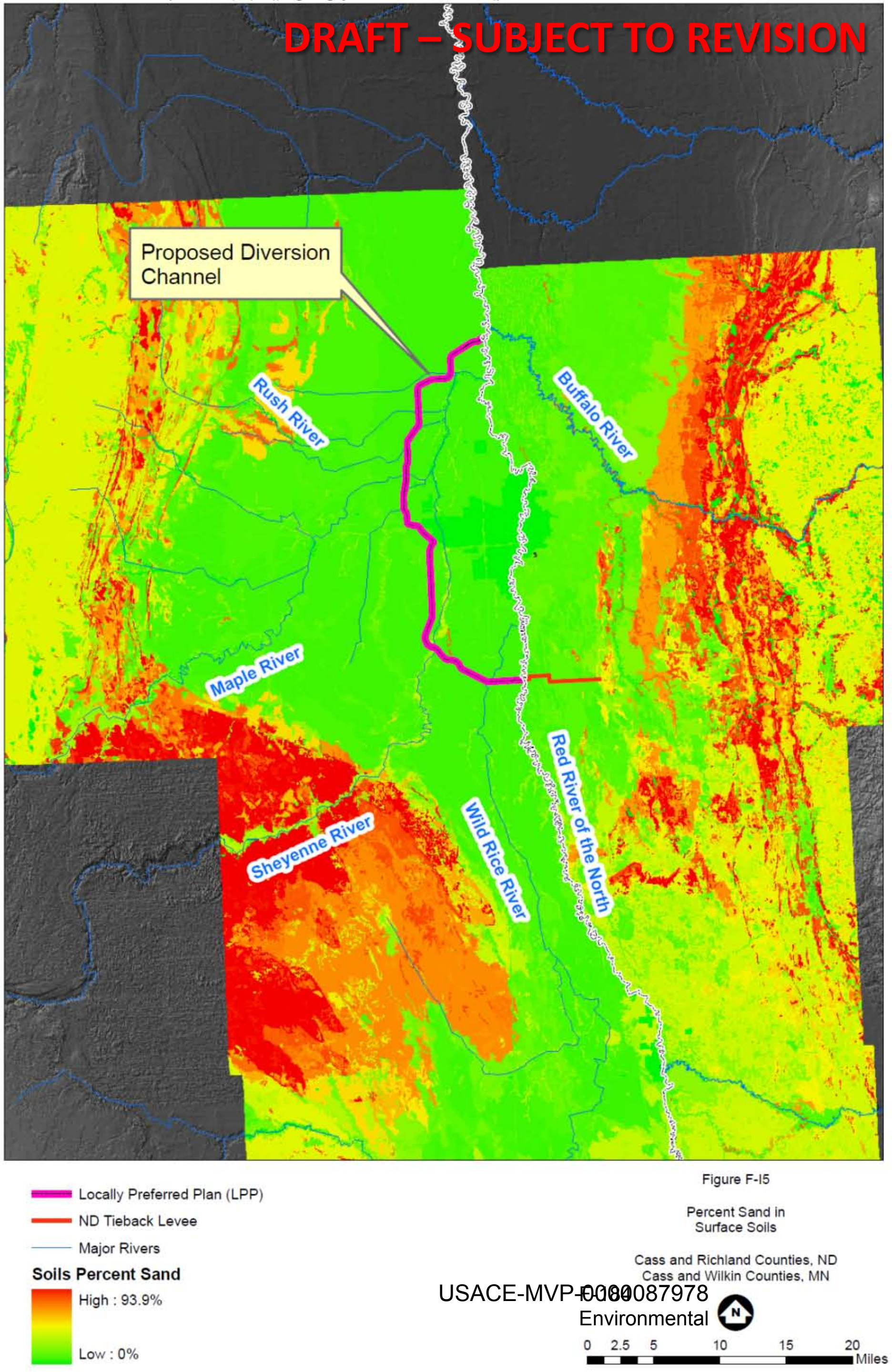

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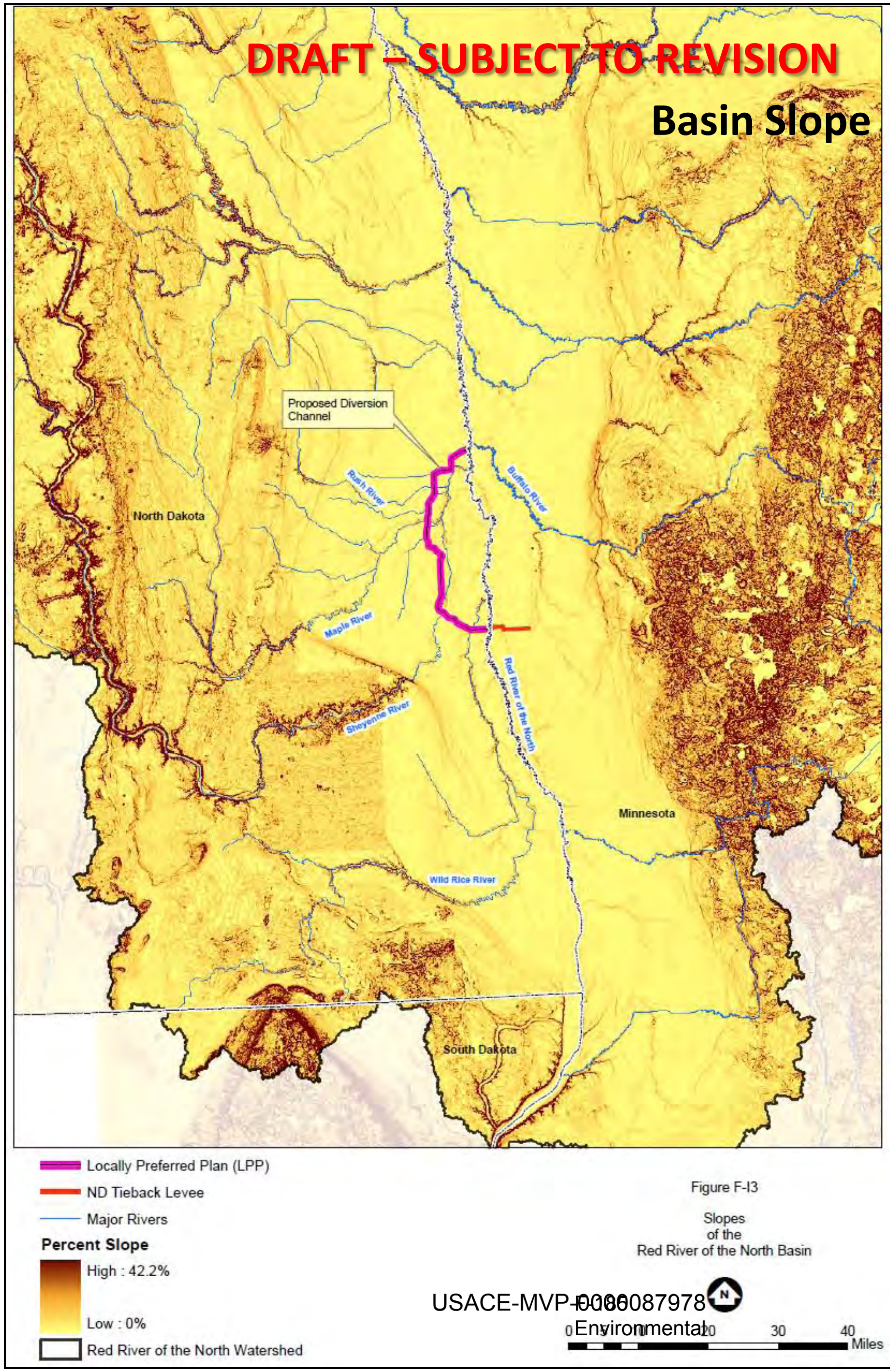

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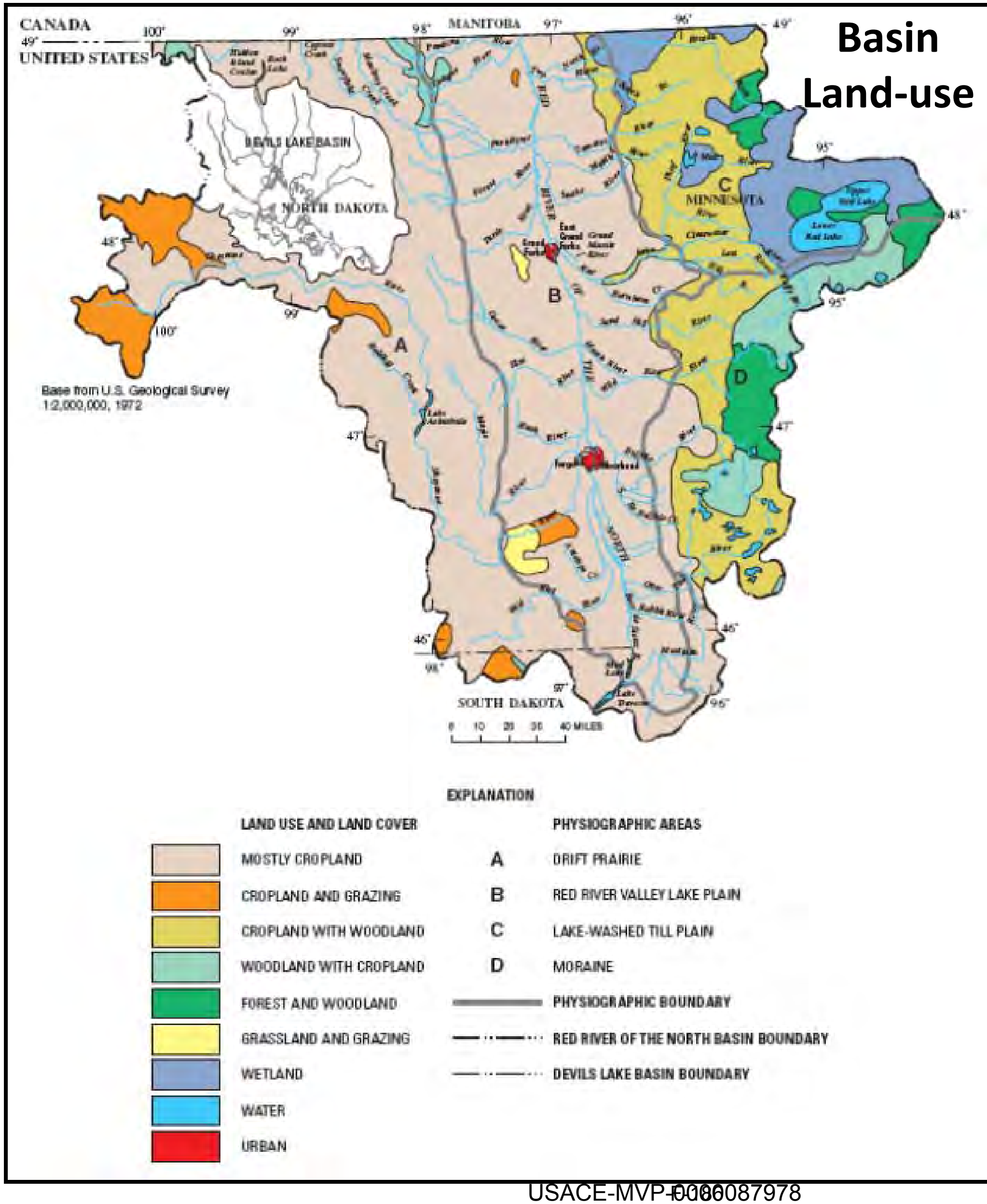

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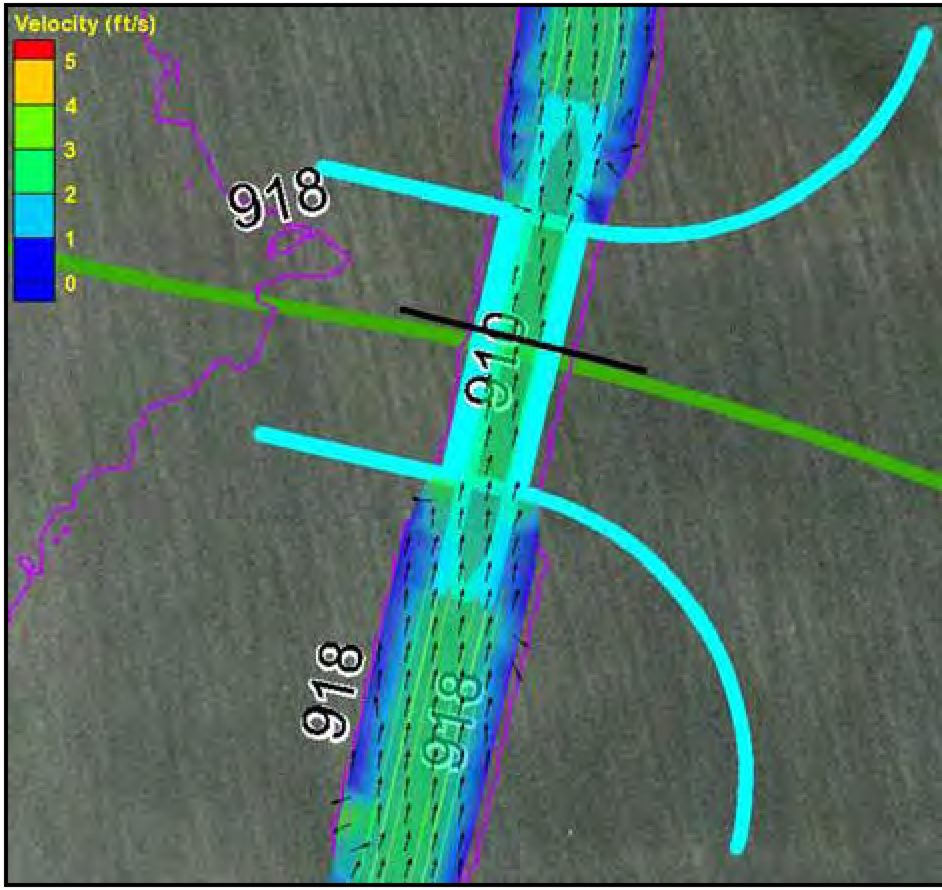

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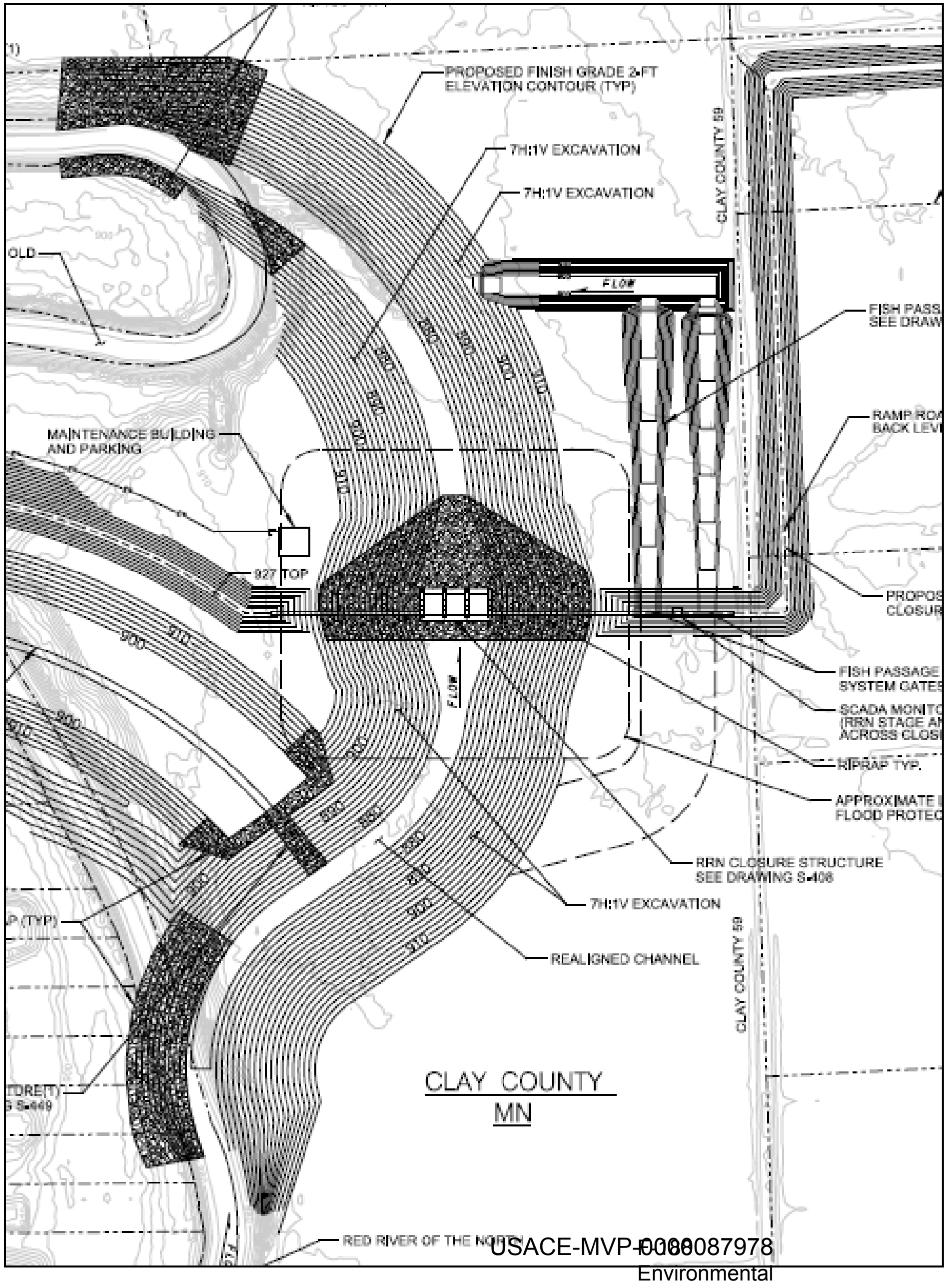

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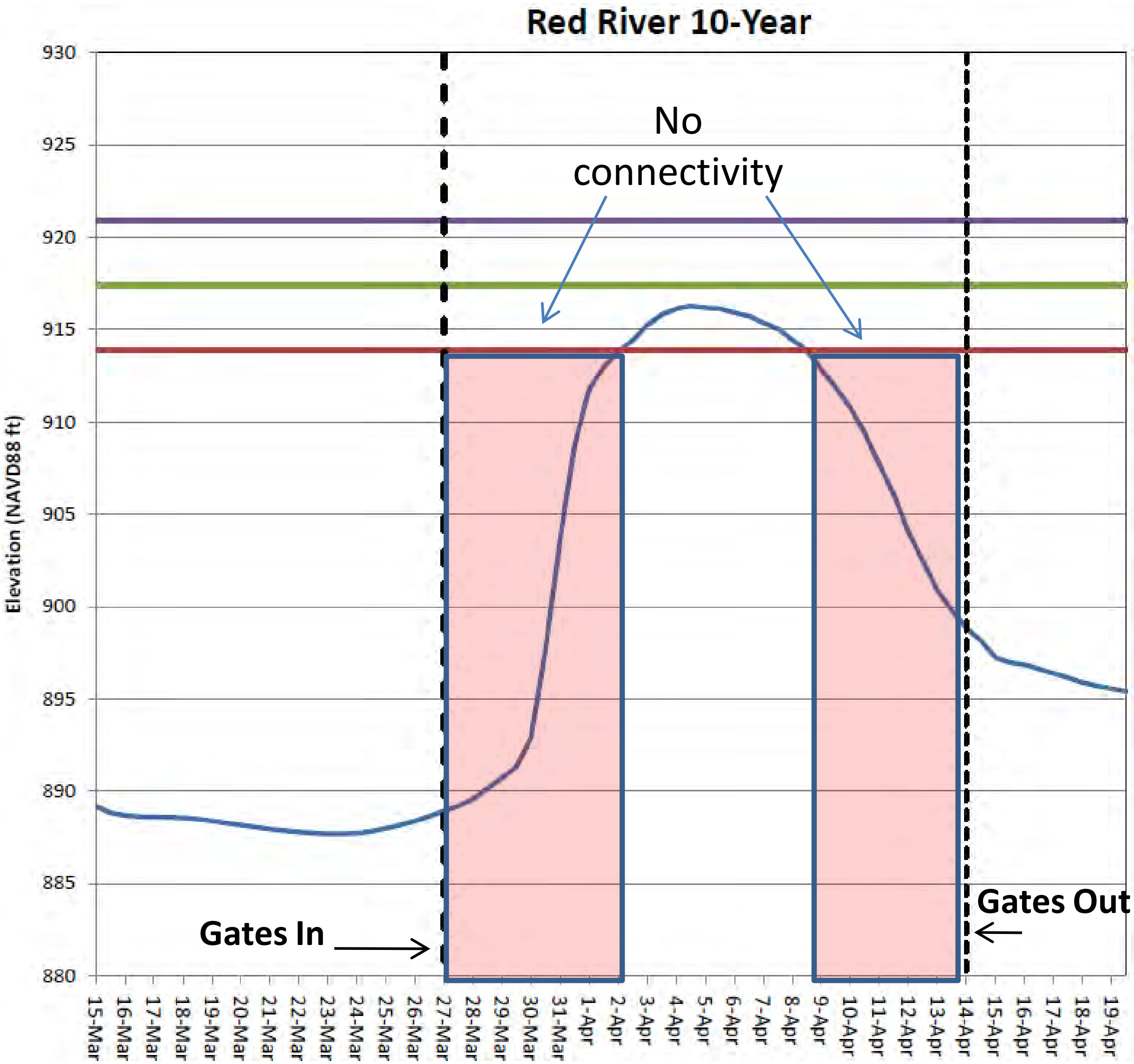

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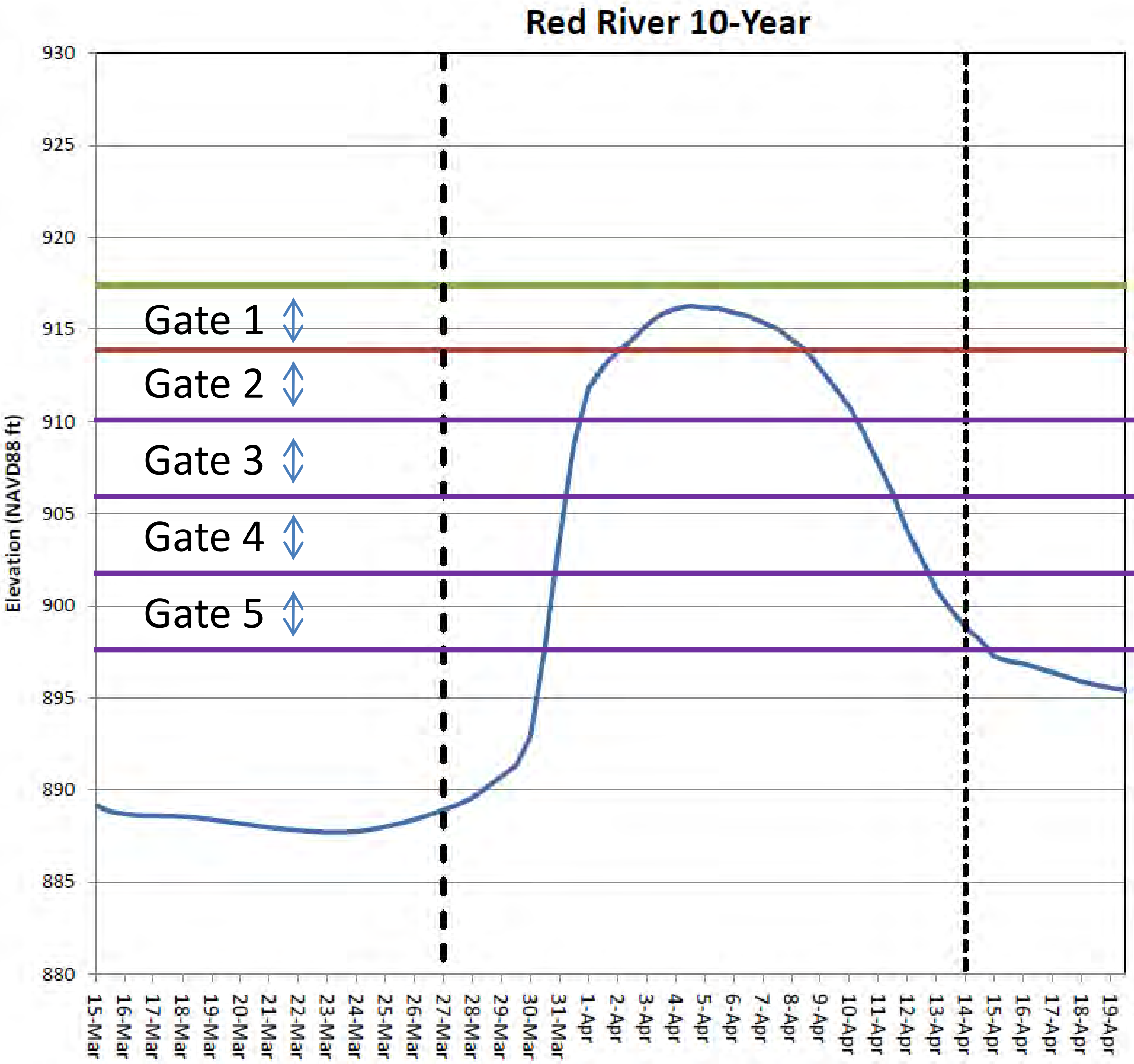

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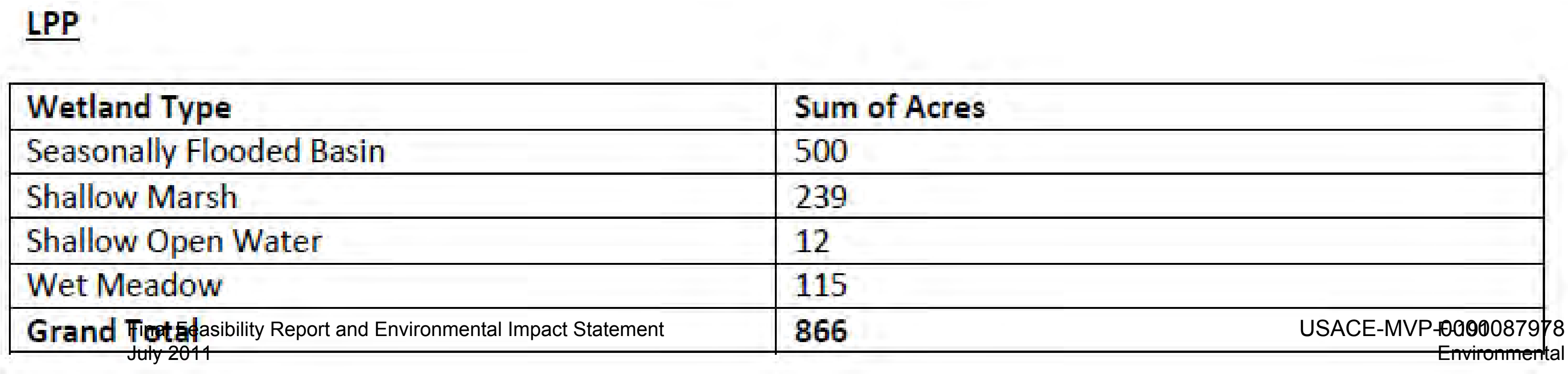

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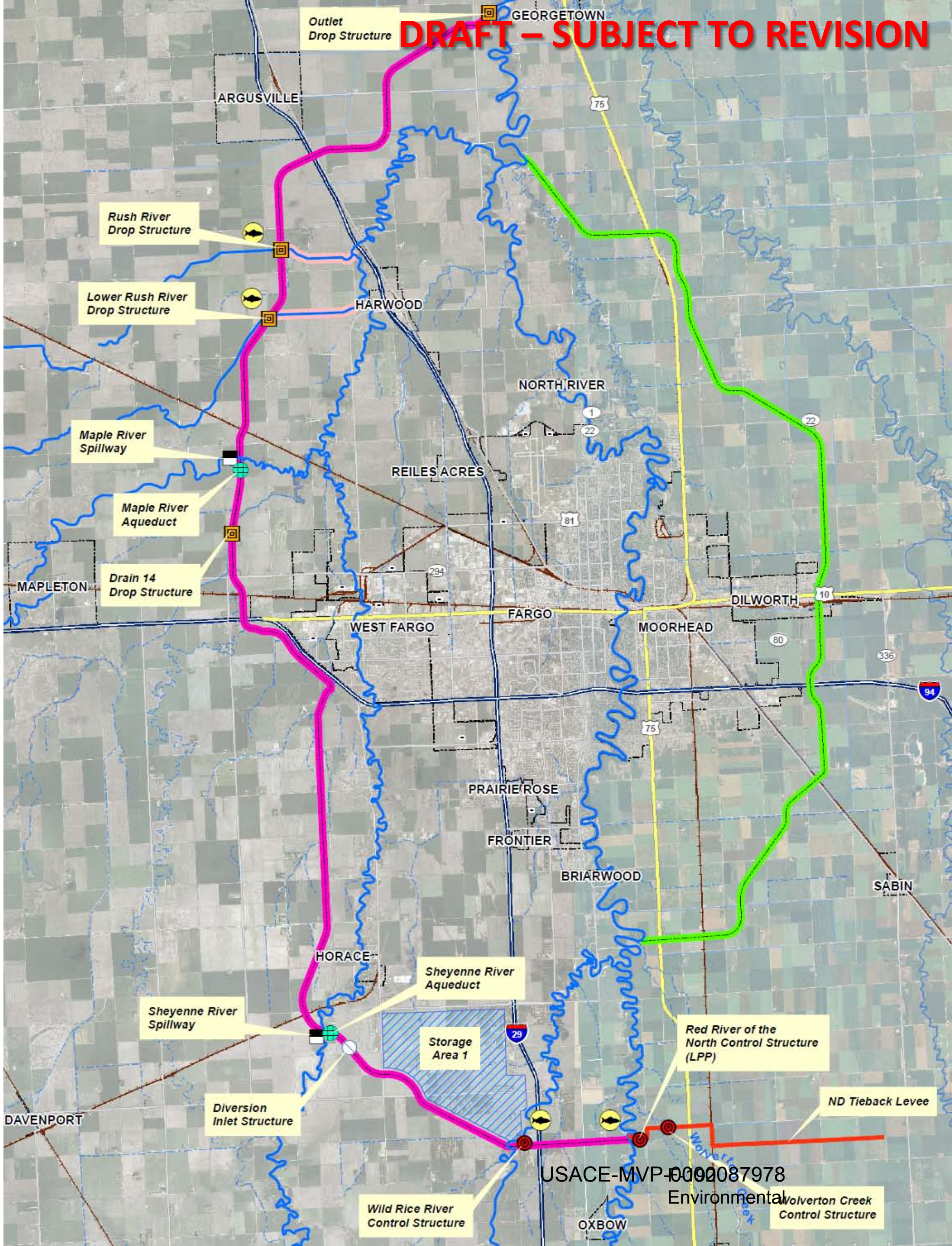

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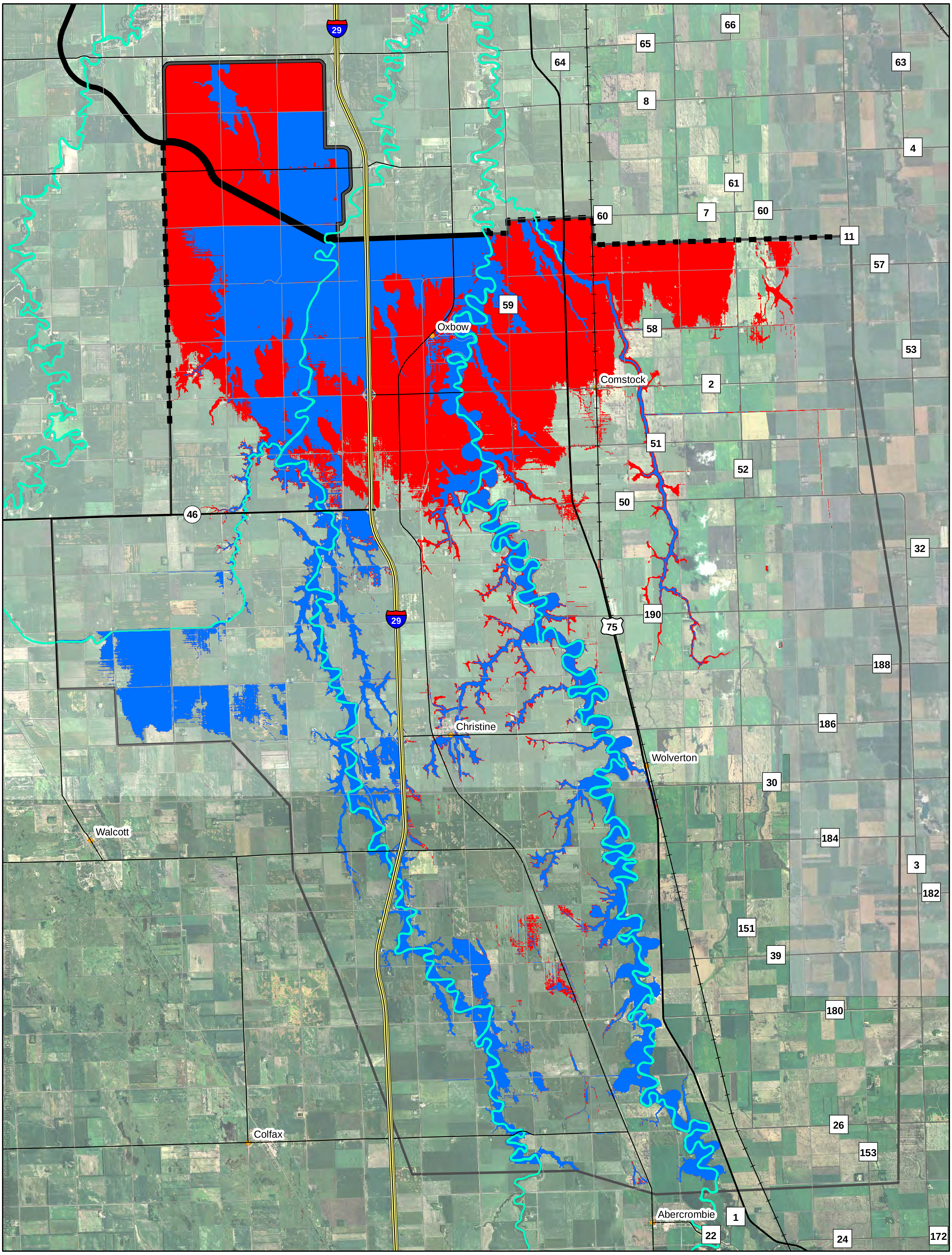

Figure 19

Inundation Map for the Model Existing Conditions and With Project for 2-percent Chance Event in the Red River of the North - South of Diversion Works - LPP

🟦 2% Existing (20,363 Acres)
🟥 LPP 2% (38,000 Acres)
▭ Mapping Extent
□ Storage Area 1
— LPP Diversion
■ ■ ■ LPP Tieback
● Cities

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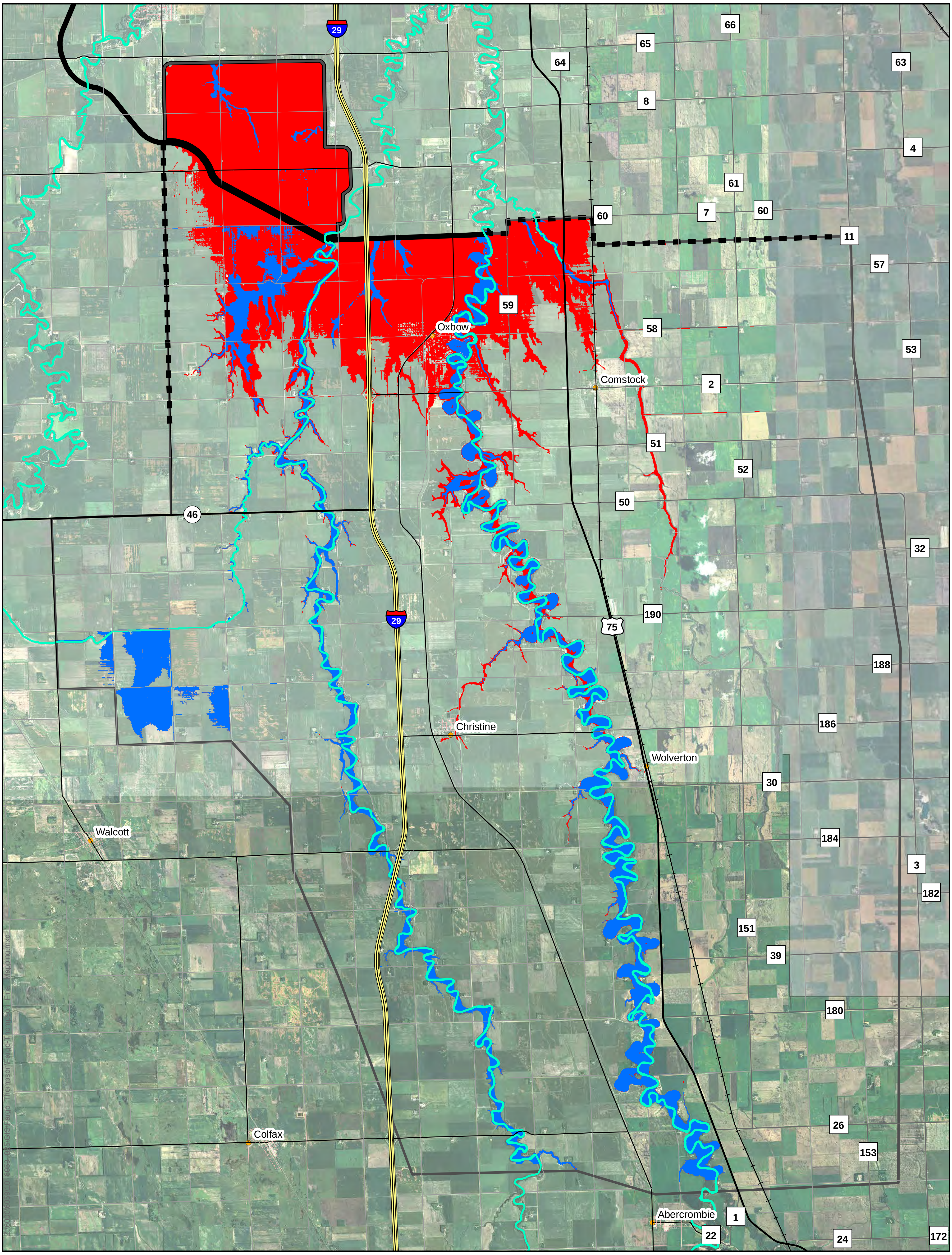


Figure 21

🟦 10% Existing (7,858 Acres)

🟥 LPP 10% (20,841 Acres)

▭ Mapping Extent

▭ Storage Area 1

━ LPP Diversion

╍ LPP Tieback

● Cities

Inundation Map for the Model Existing Conditions and With Project for 10-percent Chance Event in the Red River of the North - South of Diversion Works - LPP

Fargo-Moorhead Metropolitan Area Feasibility Study
Fargo Flood Study Agency Meeting

May 25, 2011

ATTENDEES

NAME	AGENCY/COMPANY
April Walker	City of Fargo
Bruce Kreft	North Dakota Fish & Game
Lynn Schlueter	North Dakota Game and Fish
Nathan Kestner	Minnesota Department of Natural Resources
Tom Groshens	Minnesota Department of Natural Resources
Tom Carlson	Minnesota Department of Natural Resources
Dave Friedl	Minnesota Department of Natural Resources
Rich Davis	US Fish & Wildlife Service
Keith Weston	Natural Resource Conservation Service
Sharon Lean	Natural Resource Conservation Service
Mike Ell	North Dakota Department of Health
Ryan Pietramali	FEMA Region 8
Jon Sobiech	US Army Corps of Engineering
Elliott Stefanik	US Army Corps of Engineering
Terry Williams	US Army Corps of Engineering
Aaron Snyder	US Army Corps of Engineers
Craig Evans	US Army Corps of Engineers
Brett Coleman	US Army Corps of Engineers
Lee Beauvais	Moore Engineering
Patrick Fridgen	North Dakota Water Commission
Randy Gjestvang	North Dakota Water Commission
Bob Zimmerman	City of Moorhead
Gregg Thielman	Houston Engineering

I. Introductions

II. Overview of latest happenings and schedule

a. Brett Coleman with the Corps gave the presentation from the Public Meetings during the week.

III. Discussion Items

Agencies were given several opportunities to ask questions regarding the draft report out for public review. Few questions were asked on the draft report. Brief discussion was held on the following study items:

- Clarification on mitigation contingency planning.
- Status of mitigation sites, and mitigation dollar differences between the 2010 Draft EIS and the 2011 Supplemental Draft EIS.
- Impact conclusion for Wolverton Creek,
- Brief discussion of recent meetings with a potential contractor for the biotic surveys, and the tentative plans for biotic surveys later this summer.
- Brief introduction of the concept of routing the Lower Rush River to the Rush River prior to passing into the Diversion Channel. Purpose is to avoid a drop structure only for the Lower Rush; potentially providing some cost savings.
- Brief discussion of meeting with NRCS the previous day to locate mitigation sites .
- FEMA stated that they are still discussing internally the CLOMAR process and buyouts of Oxbow, Bakke, Hickson.
- Agencies requested to be kept informed on the status of the loss of life and breach analyses.

IV. Due Outs/Needs from agencies

a. Provide comments on the Draft EIS ASAP (due June 20).
b. USACE will update on biological monitoring status, providing agencies an opportunity to participate.
c. USACE will continue planning for mitigation sites, and will coordinate with the agencies as appropriate.

V. Adjourn

1.9 Threatened and Endangered Species

1.9.1 Minnesota Special Status Species Clay County

Minnesota Special Concern Species with Potential to Occur in Clay County

Common Name	Scientific Name	Habitat Utilized	Potential to Occur in Study Area
Mammals			
Plains pocket mouse	*Perognathus flavescens*	Upland prairie, savanna	**No potential.** Required habitat not present in study area.
Prairie vole	*Microtus ochrogaster*	Upland prairie, savanna	**No potential.** Required habitat not present in study area.
Birds			
Bald eagle	*Haliaeetus leucocephalus*	Lake shores, rivers	**Moderate potential.** Generally avoids areas with human activities.
Greater prairie chicken	*Tympanuchus cupido*	Upland prairie	**No potential.** Required habitat not present in study area.
Marbled godwit	*Limosa fedoa*	Native grassland adjacent to a complex of wetlands.	**No potential.** Required habitat not present in study area.
Nelson's sharp-tailed Sparrow	*Ammodramus nelsoni*	Non-forested rich peatland, wet meadows, sedge wetlands.	**No potential.** Required habitat not present in study area.
Yellow rail	*Coturnicops noveboracensis*	Non-forested rich peatland, wet meadows.	**No potential.** Required habitat not present in study area.
Reptiles			
Plains hognosed snake	*Heterodon nasicus*	Upland prairie, savanna, subterrain.	**No potential.** Required habitat not present in study area.
Fish			
Lake sturgeon	*Acipenser fulvescens*	Red River, recovery program has been implemented	**Moderate potential.** Fish Passage is being designed as part of project.
Mussels			
Black sandshell mussel	*Ligumia recta*	Large permanent streams.	**Moderate potential.** Majority of proposed action will be above high water mark on the Red River.
Creek heelsplitter	*Lasmigona compressa*	Small rivers, streams	**No potential.** Species has not been recorded within the study area.
Insects		Large permanent streams.	**Low potential.** Species has not been recorded within the study area.
Arogos skipper	*Atrytone arogos*	Upland prairie	**No potential.** Habitat not present in study area.

Minnesota Special Concern Species with Potential to Occur in Clay County

Common Name	Scientific Name	Habitat Utilized	Potential to Occur in Study Area
Insects			
Regal fritillary	*Speyeria idalia*	Upland and lowland prairies.	**No potential.** Habitat used by species not present in study area.
Leonard's skipper	*Hesperia leonardus*	Upland prairie	**No potential.** Required habitat not present in study area.
Powesheik skipper	*Oarisma poweskeik*	Upland and lowland prairies.	**No potential.** Required habitat not present in study area.
Red-tailed prairie leafhopper	*Aflexia rubranura*	Upland prairie	**No potential.** Required habitat not present in study area.
Plants		Low, usually sandy prairies.	**Low potential.** Species has not been recorded within the study area.
Blanket flower	*Gaillaria aristata*	Sandy or other well drained soils with full sun to partial shade.	**Low potential.** Most soils in Minnesota study are not classified as well drained.
Blunt sedge	*Carex obtusata*	Wet meadows, marshes, open-wet woodlands.	**No potential.** Required habitat not present in study area.
Few-flowered spike-rush	*Eleocaris quinqueflora*	Occurs on wetlands, bogs, springs, and other moist areas.	**Low potential.** Moist areas are quite limited within study area.
Felwort	*Gentianella Amarella* ssp.	Frequently is a wetland indicator species. Usually occurs in wetlands, moist edges of woodlands, and moist areas within roadside ditches	**Low potential.** Moist areas are quite limited within study area.
Dry sedge	*Carex xerantica*	Grasslands and prairie slopes	**No potential.** Required habitat not present in study area.
Drummond's campion	*Silene drummondii*	Upland prairies	**No potential.** Required habitat not present in study area.
Clustered broom rape	*Orobanche fasciculate*	Parasitic plant and host plants generally occur in open areas within dry prairies or in loose sandy soils.	**No potential.** Required habitat for host plants not present in study area.
Hall's sedge	*Carex hallii*	Occurs in low prairies and sandy sloughs.	**No potential.** Habitat not present in study area.

Minnesota Special Concern Species with Potential to Occur in Clay County

Common Name	Scientific Name	Habitat Utilized	Potential to Occur in Study Area
Plants			
Least moonwort	*Botrychium simplex*	Rich black ash and cedar swamps and most prairies and disturbed areas.	**No potential.** Required habitat not present in study area.
Small white lady's slipper	*Cypridium candidum*	Open tall grass prairies on dry hillsides with calcareous soils	**No potential.** Required habitat not present in study area.
Red three-awn	*Aristida purpurea* var. *longiseta*	Upland dry or semi-desert grasslands and frequently an indicated of a disturbed site.	**No potential.** Required habitat not present in study area.
Prairie moonwort	*Botrychium campestre*	Occurs in exposed areas within dry prairies and within sand dunes.	**No potential.** Required habitat not present in study area.
Plains reedgrass	*Calamagrrrrostis montanensis*	Dry, upland grasslands	**No potential.** Required habitat not present in study area.
Oat-grass	*Helicotrichon hooker*	Dry meadows	**No potential.** Required habitat not present in study area.
Nuttall's sunflower	*Helianthus nuttallii*	Occurs on moist or recent soils generally in moist meadows, slough margins, and wet roadside ditches.	**No potential.** Required habitat not present in study area.
Northern singlespike sedge	*Carex scirpoiden*	Occurs in wet meadows, and mixed prairies. Often at edge of wet meadows on sunny sites that contain calcareous soils.	**No potential.** Required habitat not present in study area.
Northern gentian	*Gentiana affinis*	Occurs in wet meadows, shores, springs, seepage areas, and low prairies.	**No potential.** Required habitat not present in study area.
Louisiana broom rape	*Orobanche ludoviciana*	Parasitic plant and host plants generally occur in drier areas often in sand or sandy grasslands.	**No potential.** Required habitat for host plants not present in study area.

1.9.2 Minnesota State Threatened and Endangered Species Clay County

Minnesota State Listed Threatened and Endangered Species with Potential to Occur in Clay County

Common Name	State Classification	Scientific Name	Habitat Utilized	Reasons for Decline	Potential to Occur in Study Area
Birds					
Baird's sparrow	Endangered	*Ammodramus bairdii*	**Upland prairie.** Restricted to Northern Great Plains and Southern Canadian Prairie Provinces.	Conversion of native prairies to cropland, gravel mining, and nest parasitism by cow birds.	**Low potential.** No native prairies in study area. Most observations in Minnesota are from Felton Prairie in Clay County
Burrowing owl	Endangered	*Athene cunicularia*	**Upland prairie.** Needs burrows formed by other animals (prairie dogs, badgers, etc.).	Loss of pastures and prairies in western Minnesota. Prior to listing 1n 1984 probably down to 10 breeding pairs. Reintroduction program to date has not been successful.	**Low potential.** No native upland prairie area in study area.
Chestnut-collared longspur	Endangered	*Calcarius omatus*	**Upland prairie**. In Minnesota has been found almost exclusively at Felton Prairie in Clay County. Breeding territory is usually well drained prairie away from trees and shrubs.	Listed reasons include conversion to cropland, gravel mining area, and in recent years wind farm development.	**Low potential.** No native prairie areas within the study area.
Henslow's sparrow	*Ammodramus Henslowii*	Endangered	**Upland and lowland prairie.** Species required uncultivated grassland or old fields with standing dead vegetation and a substantial litter layer.	Listed reasons include; gravel mining, conversion of native prairie to cropland and urban sprawl. Nest failure can be caused by cattle tramping, snakes, and small mammals.	**Low potential**. No native prairie areas within the study area.

Minnesota State Listed Threatened and Endangered Species with Potential to Occur in Clay County

Common Name	**State Classification**	**Scientific Name**	**Habitat Utilized**	**Reasons for Decline**	**Potential to Occur in Study Area**
Sprague's pipit	Endangered	*Anthus spagueii*	**Upland prairie**. Prior to the 1960s, the species was observed annually at Felton Prairie in Clay County. Since 1986, few observation at Felton Prairie or Minnesota in general.	Conversion of native prairies to cropland and gravel mining operations. Conservation efforts need to include protecting and management of remaining native prairie areas.	**Low potential.** No native prairie areas within the study area.
Trumpeter swan	*Cygnus buccinator*	Threatened	**Marsh, littoral zone of lakes.** Was extirpated from Minnesota with lasting breeding population about 1885. Although recovery efforts occurred in the 1960s and 1970, the program gained strength since 1982 and over 350 individuals were released since that time and presently over 2,400 free flyers exist.	Threats are loss of marsh habitat, lead poisoning, collisions with electric power line, and illegal shooting.	**No potential.** No marsh or lakes are located within the study area.
Wilson's phalarope	*Phalaropus tricolor*	Endangered	**Lowland prairie, non-forested rich peatland, wet meadow.** Most frequently found in wet prairie, rich fen, and other grass or sedge dominated wetland. It a shore bird that breeds in the northwest quadrant of the US.	Loss of prairie habitat contributed to its decline. However other factors yet to be determined have also contributed to decline as presently suitable habitat that is un-occupied occurs in Minnesota	**Low potential.** The wetland habitat utilized by the species is not located in the study area

Minnesota State Listed Threatened and Endangered Species with Potential to Occur in Clay County

Common Name	State Classification	Scientific Name	Habitat Utilized	Reasons for Decline	Potential to Occur in Study Area
Invertebrates					
Assiniboia skipper	Endangered	*Hesperia comma assiniboia*	**Upland prairie**. Found in native dry prairie where midheight and short grasses occur. Occurrence in Clay County is primarily Felton Prairie.	Primary threat is overgrazing of prairie areas and conversion of native prairies to cropland and gravel mining areas.	**Low potential**. Study area does not contain any areas with native prairie.
Dakota skipper	Threatened	*Hesperic dactae*	**Upland prairie**. Prefers drymesic to dry prairie with midheight grasses and some topography relief.	Primary threat is conversion of native prairies to other uses including crop production gravel mining, urban development, and recently to wind farms	**Low potential.** Study area does not contain any native prairie areas.
Garita skipper	Threatened	*Darisma garita*	**Upland prairie, savanna**. Northwest Minnesota is the eastern limit of the range it range. It is a grassland species that is dependent upon the survival of its native prairie habitat. It was recorded in Clay County in the late 1960s.	Its decline in abundance is attributable to the conversion of native prairies to cropland, mining areas, and urban development.	**Low potential.** Study area does not contain any native prairie areas.
Uhler's artic	Enangered	*Oenis uhler varuna*	**Upland prairie.** Minnesota is on the eastern edge of its range. One breeding colony has been regularly observed at a large dry prairie site in Clay County.	Conversion of native prairie to cropland and gravel mining areas.	**Low potential.** No upland prairie areas are located within the study area.

Minnesota State Listed Threatened and Endangered Species with Potential to Occur in Clay County					
Common Name	**State Classification**	**Scientific Name**	**Habitat Utilized**	**Reasons for Decline**	**Potential to Occur in Study Area**
Plants					
Hair-like beak rush	Threatened	*Rhynchospora capillacea*	**Non-forested rich peatland.** Predominantly restricted to calcareous fens. These fens are localized, fragile wetlands that are dependant on specific hydrological and geological conditions and are rare in Minnesota. There is a concentration of these fens along the ancient beach ridges of Glacial Lake Agassiz.	Most of these fens have been destroyed by agricultural and gravel mining activities and water management projects.	**Low potential**. This type of wetlands is not located in study area and proposed action would not impact groundwater that discharges to a calcareous fen.
Sterile sedge	Threatened	*Carex sterilis*	**Non-forested rich peatland**. In Minnesota, this species occurs almost exclusively in small, fragile calcareous fens. These fens are localized, fragile wetlands that are dependant on specific hydrological and geological conditions. There is a concentration of these fens along the ancient beach ridges of Glacial Lake Agassiz.	Habitat destruction (conversion to cropland) and water table drawdown (mining) has destroyed most of these fens. The conservation of this species is tied directly to the conservation of these calcareous fens.	**Low potential**. This type of wetlands is not located in study area and proposed action would not impact groundwater that discharges to a calcareous fen.
Whorled nut-rush	Threatened	*Scleria Verticillata*	**Non-forested rich peatland**. This species occurs almost exclusively in small, fragile calcareous fens. These fens are localized, fragile wetlands that are dependant on specific	Most of these fens have been destroyed by agricultural and gravel mining activities and water management projects.	**Low potential.** This type of wetlands is not located in study area and proposed action would not impact groundwater that discharges to a calcareous fen.

			hydrological and geological conditions and are rare in Minnesota. There is a concentration of these fens along the ancient beach ridges of Glacial Lake Agassiz.		

North Dakota Special Status Species with Potential to Occur in Cass County

Common Name	Scientific Name	Habitat Utilized	Potential to Occur in Study Area
Mammals			
Virginia opossum	*Didelphis virginiana*	Wooded areas, especially along rivers and streams.	**Low potential**. Species has not been recorded within the study area.
Southern flying squirrel	*Glaucomys volans*	Heavy deciduous forests.	**Low potential**. Species has not been recorded within the study area.
Water shrew	*Sorex palustris*	Grassy and shrubby areas along banks of streams, ponds, and lakes, and around potholes in bogs or forests.	**Low potential.** Species has not been recorded within the study area.
Eastern spotted skunk	*Spilogale putorius*	Forest edge, riparian woodland, fence rows, and shelterbelts.	**Low potential.** Species has not been recorded within the study area.
Birds			
Whip-poor-will	*Caprimulgus vociferus*	Woods, especially near fields	**Moderate potential.** The species has been reported in the city of Fargo.
Northern cardinal	*Cardinalis cardinalis*	Shrubs and small trees along margins of woods or in forest openings	**Moderate potential.** Species has been reported in Fargo.
Olive-sided flycatcher	*Contopus cooperi*	Forest and woodlands, especially in burned-over areas with standing dead trees in mixed coniferous-deciduous forest.	**No potential.** Species has not been reported to occur within study area
Pileated woodpecker	*Dryocopus pileatus*	Late successional stages of coniferous or deciduous forest, also younger forests that have scattered large, dead trees.	**Low potential.** Species has not been recorded within the study area.
Franklin's gull	*Larus pipixcan*	Lakes, marshes, ponds, and rivers	**Low potential.** Species has not been recorded within the study area.
Hooded merganser	*Lophpdytes cucullatus*	Wood bordered rivers and large creeks, and adjoining oxbows with large populations of small fish.	**Low potential.** Species has not been recorded within the study area.
Northern mocking bird	*Mimus polyglottos*	Parklands, cultivated lands, and second growth habitats	**Low potential.** Species has not been recorded within the study area.

North Dakota Special Status Species with Potential to Occur in Cass County

Common Name	Scientific Name	Habitat Utilized	Potential to Occur in Study Area
Birds			
Blue grosbeak	*Passerina caerulea*	Deciduous woodlands, scattered shrubs in dry fields, thickets near water, farms, old fields, forest edge.	**Low potential.** Species has not been recorded within the study area.
Eastern bluebird	*Sialia sialis*	Forest edge, open woodland interspersed with or adjacent to grazed or mowed grassland. Margins of floodplain and upland deciduous forest.	**Low potential.** Species has not been recorded within the study area.
Solitary vireo	*Vireo solitarius*	Coniferous and mixed open forests and edges.	**No potential.** Required habitat is not located within study area.
Reptiles			
Prairie skink	*Eumeces septentrionalis*	Sandy areas such as sand dunes and sandy grassland.	**No potential.** Habitat used by species not present in study area.
Amphibians			
Mudpuppy	*Necturus maculosus*	Red River	**Low potential.** Species has not been recorded within the study area.
Northern leopard frog	*Rana pipens*	Usually permanent water. In summer inhabits wet meadows and fields.	**Low potential.** Species has not been recorded within the study area.
Fish			
Yellow bullhead	*Ameiurus natalis*	Lakes, ponds, slow moving streams with aquatic vegetation.	**Low potential.** Species has not been recorded within study area but is found in the Red River.
Lake chubsucker	*Erimyzon sucetta*	Ponds, lakes, oxbows, sloughs with clear water.	**No potential.** Habitat used by species not present in study area.
Western silvery minnow	*Hybognathus argyritis*	Larger prairie streams with not much current and sand bottoms.	**Low potential.** Species has not been recorded within the study area.
Silver chub	*Hubopsis storeriana*	Sand-silt, grave-bottomed rivers and lakes.	**No potential.** Habitat used by species not present in study area.
Greater redhorse	*Moxostoma valenciennesi*	Clear, moderate to fast flowing rivers.	**Low potential.** Habitat used by species not common in study area.
Rosyface shiner	*Notropis rubellus*	Medium sized streams in shallow water over gravel.	**Low potential.** Habitat used by species not present in study area. Species found in Red River.

Fish			
River darter	*Percina shumardi*	Large rivers in deep chutes and riffles with swift current and gravel bottoms.	**Low potential.** Species Extirpated from the tributaries but is still found in Red River.
Trout-perch	*Percopsis omiscomaycus*	Lakes, deep flowing creeks, and rivers over sand.	**Moderate potential.** Species is present in the Red River and all of the tributaries in the study area.
Northern redbelly dace	*Phoxinus eos*	Slow flowing creeks with clear water and vegetation.	**Moderate potential.** Species has been identified in the Red, Sheyenne, and Rush Rivers.
Mussels			
Wabash pigtoe mussel	*Fusconaia flava*	Large permanent streams.	**Moderate potential.** Species has been sampled in the Sheyenne River, near study area.
Black sandshell mussel	*Ligumia recta*	Large permanent streams.	**Moderate potential.** Species has been sampled in the Sheyenne River, near study area.
Mapleleaf mussel	*Quadrula quadrula*	Large permanent streams.	**Moderate potential.** Species has been sampled in the Red River, near study area.
Insects			
Belfragi's chlorochroan bug	*Chlorochroa belfragii*	Native wet prairie habitats, swamps, marshes, seeps	**No potential.** Habitat used by species not present in study area.
Acastus checkerspot	*Chlosyne acastus*	Sagebrush scrub, pinyon-juniper woodland, and dry gulches.	**No potential.** Habitat used by species not present in study area.
Ottoe skipper	*Hesperia ottoe*	Mid-grass to tall grass prairies and dry fields.	**No potential.** Habitat used by species not present in study area.
Tawny crescent	*Phyciodes batesii*	Moist forest borders in riparian situations and moist valley bottoms that border riparian woodlands	**No potential.** Habitat used by species not present in study area.
Regal fritillary	*Speyeria idalia*	Virgin tall grass prairies	**No potential.** Habitat used by species not present in study area.
Plants			
Sullivant's milkweed	*Asciepias sullivantii*	Mesic tallgrass prairies	**No potential.** Habitat used by species not present in study area.
Fescue sedge	*Carex festucacea*	Wooded areas.	**Low potential.** Species has not been recorded within the study area.
Richardson's sedge	*Carexrichardsonii*	Low, usually sandy prairies.	**No potential.** Habitat used by species not present in study area.

Plants

Blue cohosh	*Caulophyllum thalictroides*	Most rich woods	**Low potential.** Species has not been reported in study area. In 1982 the species was reportedly located in the vicinity of the study area.
Downy hawthorn	*Crataegus mollis*	Open mesic woods	**Low potential.** Species has not been recorded within the study area
Brook flatsedge	*Cyperus bipartitus*	Cool, spring-fed streams	**No potential.** Habitat used by species not present in study area.
White lady's slipper	*Cypripedium candidum*	Low prairies, wet meadows.	**No potential.** Habitat used by species not present in study area.
Crested woodfern	*Dryopteris cristate*	Swampy woods and thickets, seeps	**No potential.** Habitat used by species not present in study area.
Wolf's spikerush	*Eleocharis wolfii*	Shore and low, wet prairies.	**No potential.** Habitat used by species not present in study area.
Meadow horsetail	*Equisetum pretense*	Moist boggy woods, shady river banks and shores.	**Low potential.** Species has not been recorded within the study area.
Wild geranium	*Geranium maculatum*	Rich eastern, deciduous woods.	**Low potential.** Species has not been recorded within the study area.
Small-flowered lipocarpha	*Lipocarpha micrantha*	Wet sandy areas, sandbars.	**No potential.** Habitat used by species not present in study area.
One-flowered broom rape	*Orobanche uniflora*	Damp woods and thickets.	**Low potential.** Species has not been recorded within the study area.
Downy phlox	*Phlox pilosa*	Mesic prairies of open woods.	**No potential.** Habitat used by species not present in study area.
Prickly gooseberry	*Ribes cyonsbati*	Moist rich woods.	**Low potential.** Species has not been recorded within the study area.
Zigzag goldenrod	*Solidago flexicaulis*	Rich deciduous wood.	**Low potential.** Species has not been recorded within the study area.
Sessile-leaved bellwort	*Uvularia sessilifolia*	Rich deciduous wood.	**Low potential.** Species has not been recorded within the study area.
Bog violet	*Viola conspersa*	Moist woods, stream banks.	**Low potential**. Species has not been recorded within the study area.

1.10 Floodplain Forest Mitigation Field Work

Floodplain Forest field notes: 7/19/2010

Minnesota Diversion Alternative: Red River MN Inlet (beginning of Diversion channel)

Bruce Kreft with the North Dakota Game and Fish and Jon Sobiech gathered data for the impacted area on the Red River where the Minnesota Diversion would begin. The larger tracts of forest are on the East side or Minnesota side which is why we chose to analyze this side only. The tract of forest on the North Dakota side (west side) was a very thin stand and could be seen from the opposite bank, it was determined that the stand was representative of the analyzed stand.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

This area was broken up into two stands, the stand along the river and the stand that runs parallel to another unnamed drainage, both areas would be impacted by the designed project.

The first stand is an 80 foot wide corridor along the Red River; this appears to be a bit larger but similar to the corridor on the North Dakota side of the river. On the land side of the 80 foot wide corridor is a somewhat restored prairie that will also be impacted. The species in the prairie included some native grasses and forbs. There were also a fair number of non-natives and invasives, the stand hasn't been managed for a few years based on observation. The forested corridor is a nice looking stand containing a diverse mix of species including bur oak, green ash, American elm, basswood, with a scattering of prickly ash in the understory and Virginia wild rye as ground cover.

The dominant overstory for this stand is green ash and American elm, with bur oak a dominant overstory species on the north end of the stand. The dominant mid-story species is hackberry and boxelder with average heights at 10 feet, there is also a scattering of prickly ash more notably toward the north end of the stand. The dominant understory species is Virginia wild rye, mint and beggars-tick. Based on a transect conducted the stand consists of 20% bur oak, 40% green ash, 35% American elm, and 5% basswood. The average DBH for the stand is 11 inches and the average height is 45 feet tall.

The average crown cover of the first stand is 90% coverage, with a ground cover of only 25% most likely due to the common flooding in the area.

Overall the stand was fairly healthy (eight of the trees rated out to be fair); the fair species had some die-back on the lower limbs. There were 20 cavities counted along this stand, and approximately 30 snags per acre with an average DBH of 13. The basal area for this stand is 110 ft^2/acre, with approximately 360 trees per acre.

The second stand is a larger more homogeneous stand consisting of a monoculture of fairly small green ash with a few American elm mixed in. It was also noted that there were some large bur oak at the northern end of the stand where there is slightly higher ground. This stand followed an unnamed drainage with running water source approximately 1-2 feet deep and 6-10 feet wide. The dominant overstory of this stand is green ash with a few American elm scattered throughout the overstory, there were also a few hackberry, boxelder and cottonwood within this stand. The mid-story was made up of green ash at an average of 25 feet tall and American elm at 20 feet tall. The understory consisted of wood nettle, mint, mustard, and beggars-tick. The transect revealed that approximately 70% of the stand is green ash with approximately 30% of the stand being American elm, the average diameter of the overstory species for the stand is 10 inches with an average height of 41 feet.

The average crown cover of the second stand is 70% coverage, with a ground cover of only 35%.

Overall the stand was fairly healthy (four of the trees rated out to be fair); the fair species had some die-back on the lower limbs. There were 7 cavities counted along this stand, and approximately 20 snags per acre with an average DBH of 15 inches. The basal area for this stand is 75 ft^2/acre, with approximately 400 trees per acre.

The stands were combined for the HEP analysis for this area.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 8 inches in this area of the Red River.

V3 15% of water surface obstruction in a 15 meter zone from shore.

V4 45 % of the water depth is 24 inches deep or greater.

V5 5 % of the stream has riffles.

V6 All of the subsections in this area have perches for king fishers.

V7 There are no soil banks containing 70-96% sand, it is mostly clayey sand in this area, there are locations within a mile that have steep faces void of vegetation and greater than 1.5 meters in height.

Gray Squirrel

V1 15% of the canopy is hard mast trees (Bur Oak) no other hard mast tree species were found in the stand.

V2 There were 25 Bur Oak trees found in this stand, that was the only hard mast species.

V3 77% of the ground was shaded by canopy cover.

V4 The mean dbh for the stand is 14 inches.

Wood Duck

V1 There were 27 suitable cavities in the entire stand, 3 cavities per acre.

V2 There were no nest boxes found at either site.

V3 the total nesting opportunities equals 3 nesting sites per acre.

V4 Approximately 20% of the water surface is covered by potential brood cover.

Black Capped chickadee

V1 77% of the ground was shaded by canopy cover.

V2 Average height of the overstory trees is approximately 43 feet.

V4 There is approximately 15 snags per acre that would measure between 4-10 inches DBH.

Mink

V1 77 % canopy closure

V2 100 percent of the year there is surface water present

V4 80% canopy closure within 328 feet of water's edge.

Floodplain Forest impacted by Minnesota Diversion Inlets

Floodplain Forest field notes 7/19/2010

Minnesota Diversion Alternative: Red River MN Inlet to Smaller Diversion channel

Bruce Kreft with the North Dakota Game and Fish and Jon Sobiech gathered data for the impacted area on the Red River where the smaller Diversion would leave the river before connecting with MN diversion channel further north. The forest on the Minnesota side of the river was all that was analyzed because permission was not granted for the lands on the North Dakota side in this area. Based on field observations the stands on the North Dakota side are representative of the Minnesota stands we analyzed.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

Overall the stand seemed to vary from a younger very aggressively regenerating stand; this stand was very narrow approximately 100 feet wide before abutting up to an agriculture field. The stand looked very good, the middle of the stand contained much more mature trees and we noted a large infestation of the non-native invasive garlic mustard plant. Garlic mustard is extremely aggressive plant that can take over the entire understory preventing tree species from regenerating. The garlic mustard appeared to have a pretty good foothold already, but the area was less than acre in size where it was found. This area had much larger tree's including several Bur Oak.

Two stand mapping plots were done for this stand information gathered on this field sheet showed that the dominant overstory tree species for this stand is green ash and bur oak; secondary dominant overstory species include American elm, boxelder, and hackberry. Based on the transect conducted the stand consists of 10% elm and 90% green ash. The average diameters at breast height (DBH) for the overstory tree species are 12 inches and the average height is 45 feet. The mid story was dominated by boxelder trees with average heights at 15 feet and hackberry with average heights of 10 feet. There were also bur oak, green ash, boxelder and hackberry seedlings.

The average crown cover is 90% coverage for the entire stand, with a ground cover of only 78%. Other species of interest included Virginia wild Rye.

Overall the stand was very healthy other than the presence of the garlic mustard. The basal area for the stand is 110 ft^2/acre. There is approximately 610 trees per acre, approximately 5 snags per acre, and 7 cavities counted during the stand exam.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 7 inches in this area of the Red River.

V3 10% of water surface obstruction in a 15 meter zone from shore.

V4 85% of the water depth is 24 inches deep or greater.

V5 5 % of the stream has riffles.

V6 All of the subsections in this area have perches for king fishers.

V7 There are no soil banks containing 70-96% sand, it is mostly clayey sand in this area, there are locations within a mile that have steep faces void of vegetation and greater than 1.5 meters in height.

Gray Squirrel

V1 40% of the canopy is hard mast trees (Bur Oak).

V2 28 Bur Oak trees found in this stand.

V3 90% of the ground was shaded by canopy cover.

V4 The mean dbh for the stand is 12 inches.

Wood Duck

V1 There were 10 suitable cavities in the entire stand, there is 1.2 suitable cavities per acre.

V2 There were no nest boxes found.

V3 the total nesting opportunites equals 1.2 per acre.

V4 10% of the water surface is covered by potential brood cover.

Black Capped chickadee

V1 90% of the ground was shaded by canopy cover.

V2 Average height of the overstory trees is approximately 45 feet.

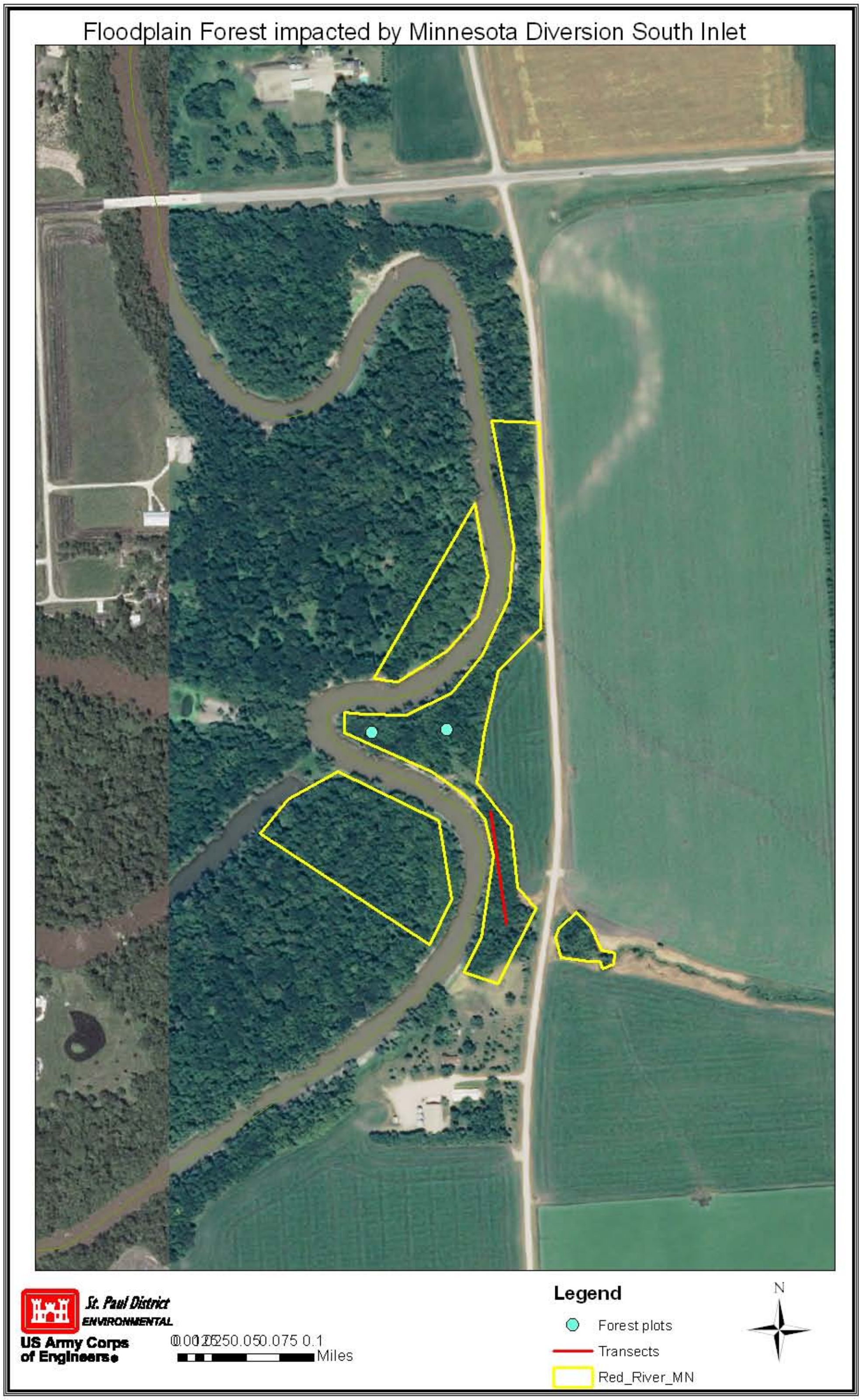
V4 5 snags per acre

Mink

V1 90 % canopy closure

V2 100 percent of the year there is surface water present

V4 90% canopy closure within 328 feet of water’s edge.



Floodplain Forest impacted by Minnesota Diversion South Inlet

Floodplain Forest field notes 7/20/2010

Minnesota Diversion Alternative: Red River Minnesota Outlet (diversion back into the Red River)

Jon Sobiech gathered data for the impacted area on the Minnesota side of the Red River, at the location where the Minnesota Diversion channel would be re-entering the Red River. The North Dakota side was observed from the other bank because permission was not granted for the North Dakota Side. The stands are very similar and representative of each other.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

Two stand mapping plots were done for this stand, information gathered on the field sheets showed that the dominant overstory tree species for this stand is green ash, secondary dominant species is American elm and boxelder, with the only other tree species being a few bur oak trees at the edge of the stand near agriculture fields approximately 400 feet from the water's edge. Based on the transect conducted the stand consists of 5% elm, 20% boxelder, and 75% green ash. The average diameters at breast height (DBH) for the overstory tree species are 15 inches and the average height is 56 feet. The mid story was dominated by American elm and green ash trees with average heights at 15-20 feet. Other Mid-story species included boxelder. The understory consisted of several American elm seedlings, stinging nettle, green ash seedlings, wild grape vines, beggars-tick, and reed canary grass.

The average crown cover was 63% coverage for the entire stand, with a ground cover of 50% most likely due to the common flooding in the area. The stand was very monotypic only consisting of the aforementioned species there were no other tree species present other then the few bur oak trees near the agriculture fields.

Overall the stand was very healthy (all 20 trees in the transect rated good), with very little invasive species present. The basal area for the stand is 105ft^2/acre. There are approximately 580 trees per acre, approximately 40 snags per acre, and 11 cavities counted during the stand exam.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 6 inches in this area of the Red River.

V3 5% of water surface obstruction in a 15 meter zone from shore.

V4 60 % of the water depth is 24 inches deep or greater.

V5 5% of the stream has riffles.

V6 All of the subsections in this area have perches for king fishers.

V7 There are no soil banks containing 70-96% sand, it is mostly clayey sand in this area, there are locations within a mile that have steep faces void of vegetation and greater than 1.5 meters in height..

Gray Squirrel

V1 5% of the canopy is hard mast trees (Bur Oak), There were only a few bur oak in this stand and they were on the very edge.

V2 There were 4 Bur Oak found in this stand.

V3 63% of the ground was shaded by canopy cover.

V4 The mean dbh for the stand is 15 inches.

Wood Duck

V1 There were 11 suitable cavities in the entire stand, 1.4 per acre.

V2 There were no nest boxes found in the area.

V3 the total nesting opportunites equals 1.4

V4 10% of the water surface is covered by potential brood cover.

Black Capped chickadee

V1 63% of the ground was shaded by canopy cover.

V2 Average height of the overstory trees is approximately 56 feet.

V4 40 snags per acre

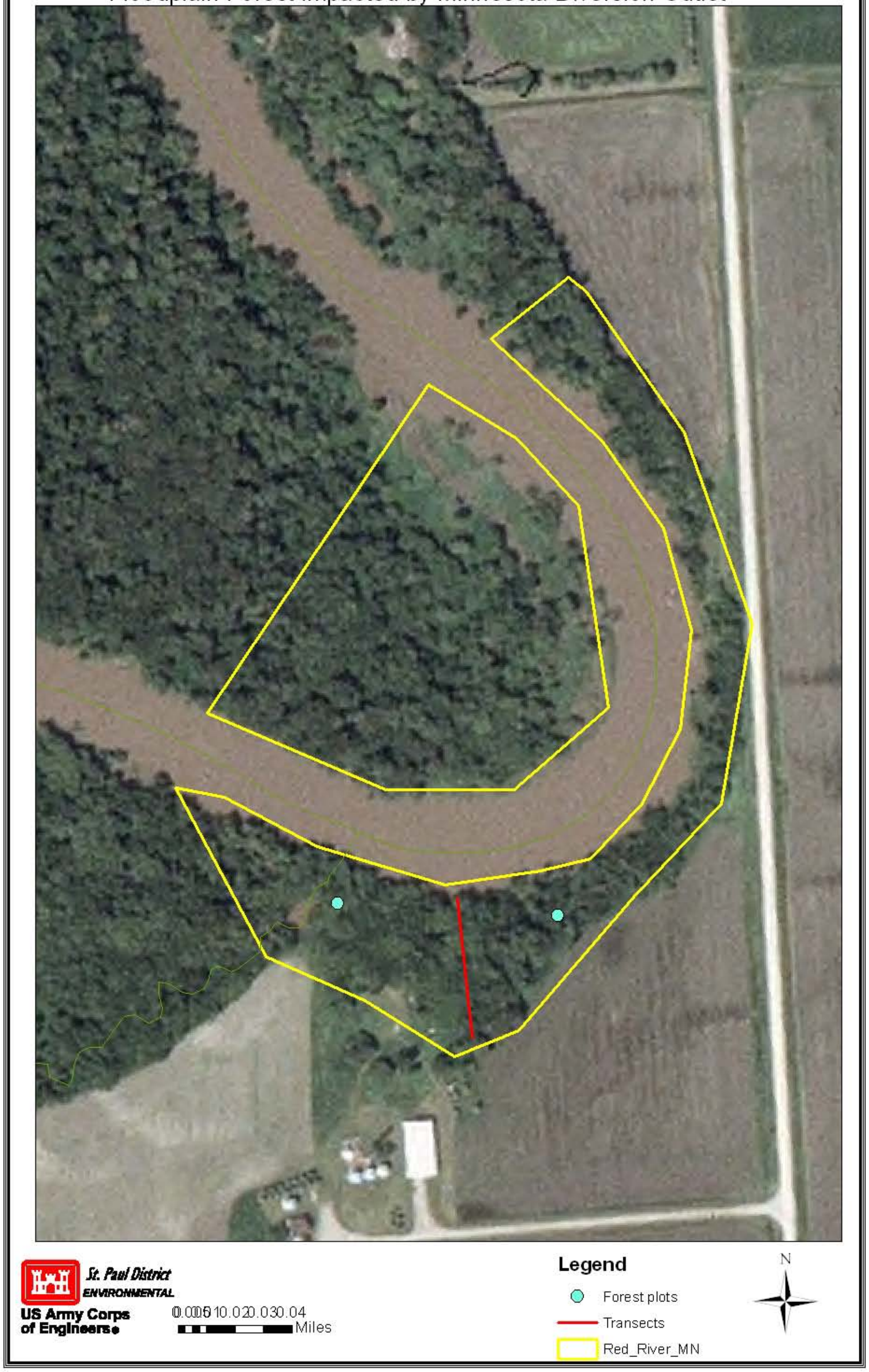
Mink

V1 63 % canopy closure

V2 100 percent of the year there is surface water present

V4 50% canopy closure within 328 feet of water’s edge.

Floodplain Forest impacted by Minnesota Diversion Outlet



Floodplain Forest field notes 7/19/2010

North Dakota Diversion Alternative: Red River North Dakota Inlet (beginning of diversion channel)

Bruce Kreft with the North Dakota Game and Fish and Jon Sobiech gathered data for the impacted area on the North Dakota side of the Red River, at the location where the North Dakota Diversion channel would be placed diverting water out of the Red River. The Minnesota side was observed from the other bank because permission was not granted on the Minnesota side.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

Two stand mapping plots were done for this stand information gathered on this field sheet showed that the dominant overstory tree species for this stand is the Green Ash and Boxelder, a secondary dominant species is the American Elm, with scattered Black Willow near the water's edge and a few large bur oak trees at the edge of the agriculture fields and at the southern end of the stand near a house. Based on the transect conducted the stand consists of 40% elm, 20% boxelder, 15% bur oak, 5% hackberry, and 20% green ash. The average diameters at breast height (DBH) for the overstory tree species are 15 inches and the average height is 52 feet. The mid story was dominated by boxelder trees with average heights at 20 feet. Other Mid-story species included American elm and hackberry. There were a few bur oak seedlings in the understory.

The average crown cover was 90% coverage for the entire stand, with a ground cover of only 5% most likely due to the common flooding in the area. Other species of interest included Virginia wild Rye, nettles, Choke cherry, moonseed, beggars-tick and violets.

Overall the stand was very healthy (only two trees rated lower then good), with very little invasive species. The basal area for the stand is 95ft^2/acre. There are approximately 240 trees per acre, approximately 20 snags per acre, and 15 cavities counted during the stand exam. If the stand was left alone it would continue as a Green Ash, American elm, and boxelder stand with some willows creeping in along the drainage areas and the bur oak encroaching when the flooding doesn't occur so often.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 10 inches in this area of the Red River.

V3 10% of water surface obstruction in a 15 meter zone from shore.

V4 70 % of the water depth is 24 inches deep or greater.

V5 5 % of the stream has riffles.

V6 All of the subsections in this area have perches for king fisher's.

V7 There are no soil banks containing 70-96% sand, it is mostly clayey sand in this area, there are locations within a mile that have steep faces void of vegetation and greater than 1.5 meters in height.

Gray Squirrel

V1 10% of the canopy is hard mast trees (Bur Oak).

V2 There were 15 Bur Oak trees found in this stand.

V3 90% of the ground was shaded by canopy cover.

V4 The mean dbh for the stand is 15 inches.

Wood Duck

V1 There were 15 suitable cavities in the entire stand, 2.4 suitable cavities per acre.

V2 One nest box was found during the surveys.

V3 the total nesting opportunities for this area are 2.6 cavities per acre.

V4 10% of the water surface is covered by potential brood cover.

Black Capped chickadee

V1 90% of the ground was shaded by canopy cover.

V2 Average height of the overstory trees is approximately 50 feet.

V4 20 snags per acre

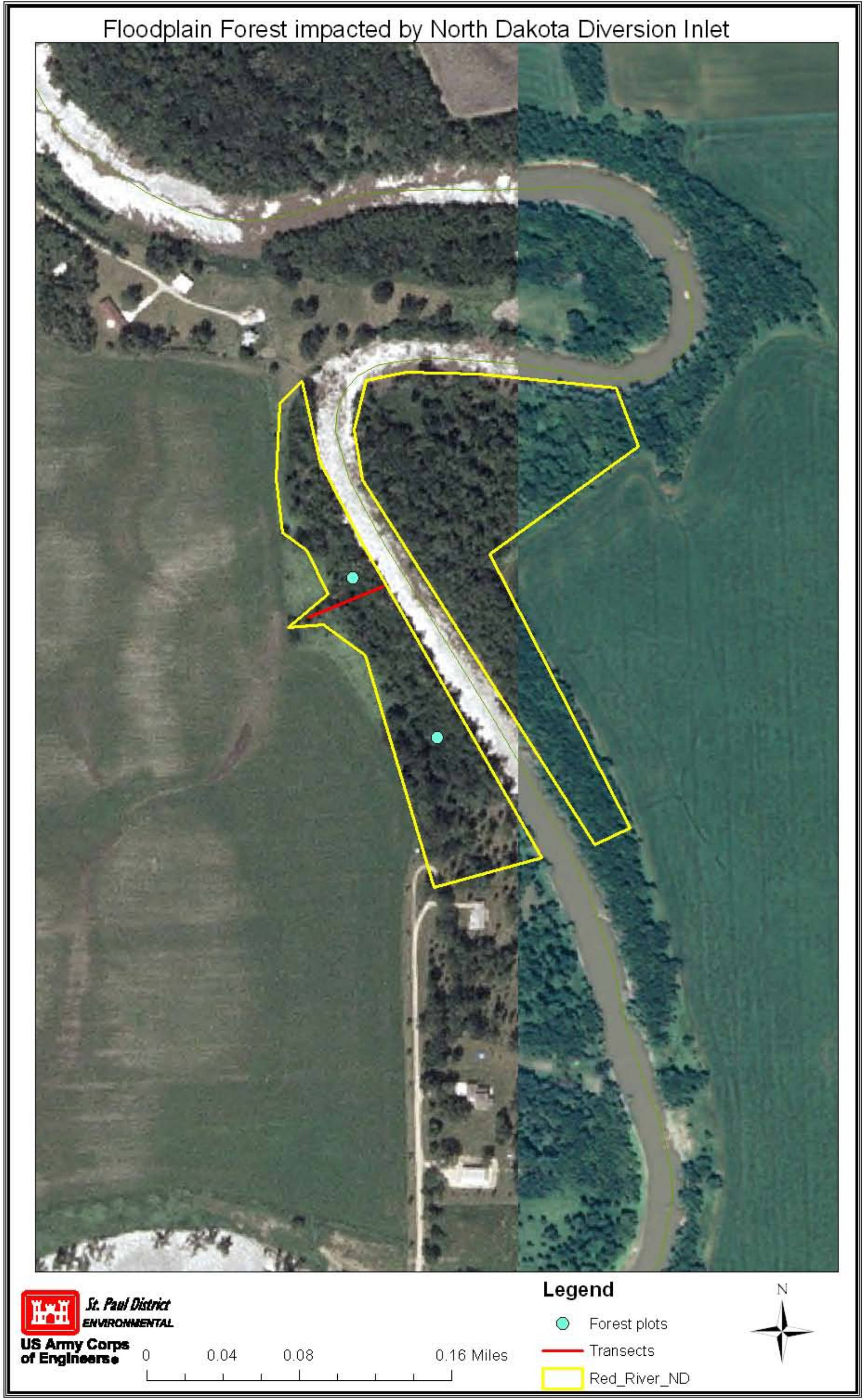
Mink

V1 90 % canopy closure

V2 100 percent of the year there is surface water present

V4 80% canopy closure within 328 feet of water’s edge.

Floodplain Forest impacted by North Dakota Diversion Inlet



Floodplain Forest field notes 7/20/2010

North Dakota Diversion Alternative: Red River North Dakota Outlet (diversion back into the Red River)

Jon Sobiech gathered data for the impacted area on the Minnesota side of the Red River, at the location where the North Dakota Diversion channel would be re-entering the Red River. The North Dakota side was observed from the other bank because permission was not granted for the North Dakota Side. The stands are very similar and representative of each other.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

Three stand mapping plots were done for this stand, information gathered on the field sheets showed that the dominant overstory tree species for this stand is green ash and boxelder, the secondary dominant species is the American elm, there were also a few black willow in the stand. Based on the transect conducted the stand consists of 15% elm, 50% boxelder, and 35% green ash. The average diameters at breast height (DBH) for the overstory tree species are 10 inches and the average height is 45 feet. The mid story was dominated by boxelder, American elm and green ash trees with average heights at 10-20 feet. The understory consisted of beggar- tick, nettle and coneflowers, along the river there was smart weed, dock and reed canary grass.

The average crown cover was 85% coverage for the entire stand, with a ground cover of 45% most likely due to the common flooding in the area which was evident by the still cracking soil indicating that the water had receded recently. The stand was very monotypic only consisting of the aforementioned species there were no other tree species present.

Overall the stand was fairly healthy with some of the trees showing die-back from being suppressed by the larger trees and possibly due to extended flooding. Fourteen of the trees in the transect are in good condition while 6 are in fair condition and one tree was rated poor; the basal area for the stand is 106 ft^2/acre. There is approximately 440 trees per acre, between 20-30 snags per acre, and 30 cavities counted during the stand exam.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 7 inches in this area of the Red River.

V3 5% of water surface obstruction in a 15 meter zone from shore.

V4 60 % of the water depth is 24 inches deep or greater.

V5 5% of the stream has riffles.

V6 All of the subsections in this area have perches for king fishers.

V7 There are no soil banks containing 70-96% sand, it is mostly clayey sand in this area, there are locations within a mile that have steep faces void of vegetation and greater than 1.5 meters in height.

Gray Squirrel

V1 There are no hard mast trees in this stand.

V2 No mast trees

V3 85% of the ground was shaded by canopy cover.

V4 the mean dbh for the stand is 10 inches.

Wood Duck

V1 There were 30 suitable cavities counted in during the walk through of the stand, it was determined that there are 4.3 cavities per acre.

V2 there were no nest boxes found in the area.

V3 total of V1 plus V2 (.18 X V1) + (.95 X V2) = .774

V4 5% of the water surface is covered by potential brood cover, the majority of the water’s edge is completely exposed.

Black Capped chickadee

V1 85% of the ground was shaded by canopy cover.

V2 Average height of the over story trees is approximately 45 feet.

V4 20-30 snags per acre, 10-15 snags per acre between 4-10 inches DBH.

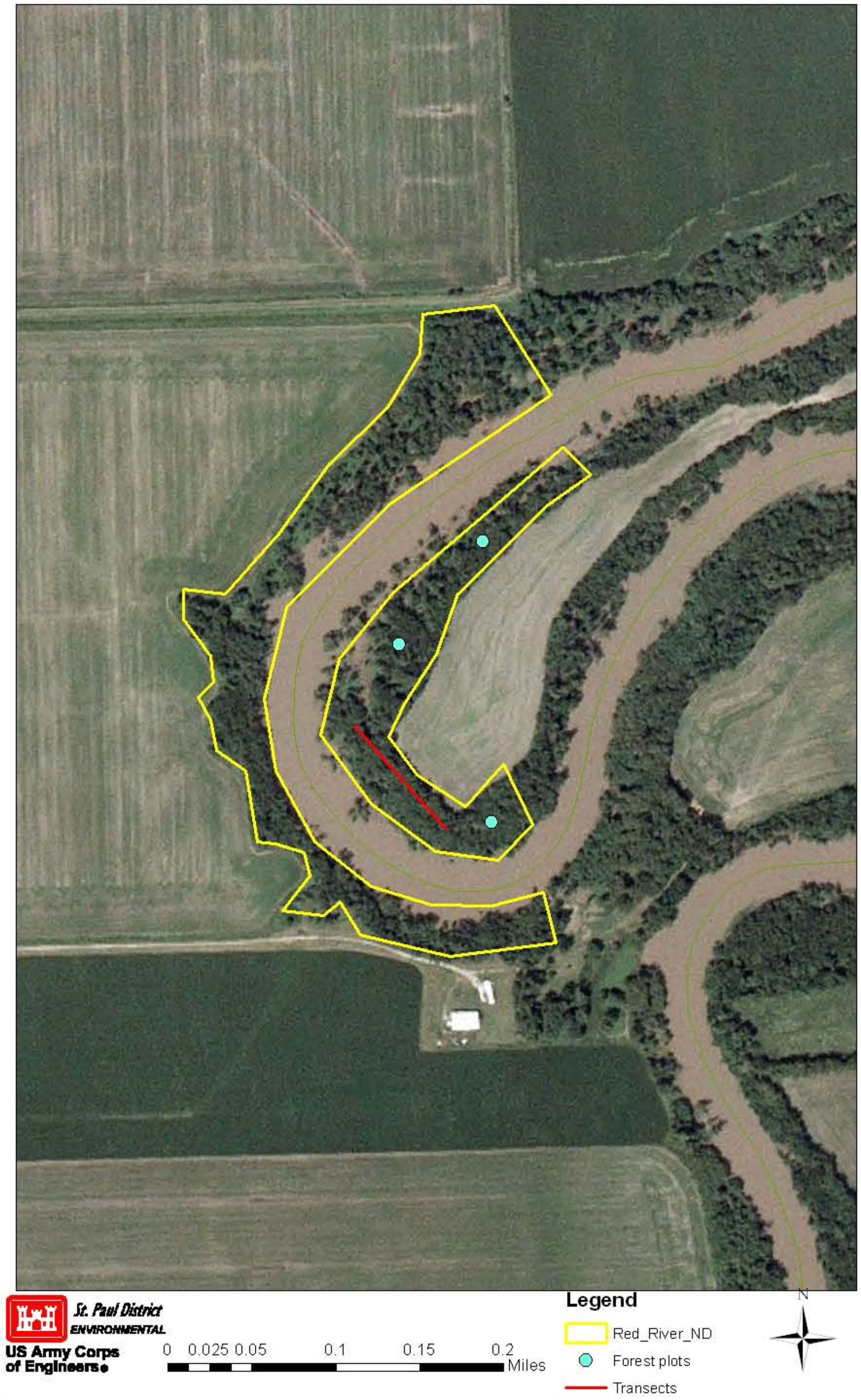
Mink

V1 85 % canopy closure

V2 100 percent of the year there is surface water present

V4 35% canopy closure within 328 feet of water’s edge.

Floodplain Forest impacted by North Dakota Inlet



Floodplain Forest field notes 7/19/2010

North Dakota Diversion Alternative: Sheyenne River

Bruce Kreft with the North Dakota Game and Fish and Jon Sobiech gathered data for the impacted area on the Sheyenne River where the North Dakota Diversion would intersect the river. The larger tract of forest is on the east side of the River so that is the stand that was analyzed. The opposite bank was observed and notes were taking from the surveyed stand.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

Overall the stand was very poor, at the beginning near the home of David and Annette Delaney there were several basswood trees, which was surprising because there were very few basswoods observed anywhere else, it was obvious that some basswood were planted at the homestead many years ago and I think they have spread regenerated in the southern part of the stand. The south end of the stand was on a ridge and it gradually got lower in elevation as we headed downstream (north). The majority of the stand was a scattering of larger boxelder and ash tree with the entire midstory dominated by buckthorn a European invasive species.

Two stand mapping plots were done for this stand, information gathered on this field sheet indicate that the dominant overstory tree species for this stand is American elm and Boxelder, a secondary dominant species is the American basswood. Based on the transect conducted the stand consists of 30% elm, 55% boxelder, 5% buckthorn, and 10% green ash. The average diameters at breast height (DBH) for the overstory tree species are 13 inches and the average height is 51 feet. The mid story was dominated by buckthorn at an average height of 8 feet; there were also some scattered elm in the midstory averaging 10 feet.

The average crown cover was 75% coverage for the entire stand, with a ground cover of 60% which is a result of being shaded out by the buckthorn. The understory consisted of mainly wood nettle and beggars-tick.

Overall the stand was in poor health (only eight trees rated good, with one of them being buckthorn). The other trees rated either poor or fair. The future of the stand looks to be buckthorn with very little other regeneration. The basal area for the stand is 95^2/acre. There are approximately 380 trees per acre, approximately 5 snags per acre, and 11 cavities counted during the stand exam.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 7 inches in this area of the Red River.

V3 10% of water surface obstruction in a 15 meter zone from shore.

V4 30 % of the water depth is 24 inches deep or greater.

V5 5% of the stream has riffles.

V6 All of the subsections in this area have perches for king fisher's.

V7 There are no soil banks containing 70-96% sand, it is mostly clay in this area, however the other nesting requirements are within .5 miles of the area and there are species present so it is assumed that they are nesting in the silty clay.

Gray Squirrel

V1 0% of the canopy is hard mast trees.

V2 There were no hard mast trees found in the stand.

V3 75% of the ground was shaded by canopy cover.

V4 The mean dbh for the stand is 13 inches.

Wood Duck

V1 There were 11 suitable cavities in the entire stand, 3.5 suitable cavities per acre.

V2 No nest boxes were found in the stand.

V3 the total nesting opportunities equals 3.5 per acre.

V4 10% of the water surface is covered by potential brood cover.

Black Capped chickadee

V1 75% of the ground was shaded by canopy cover.

V2 Average height of the overstory trees is approximately 51 feet.

V4 5 snags per acre between 4-10 inches DBH

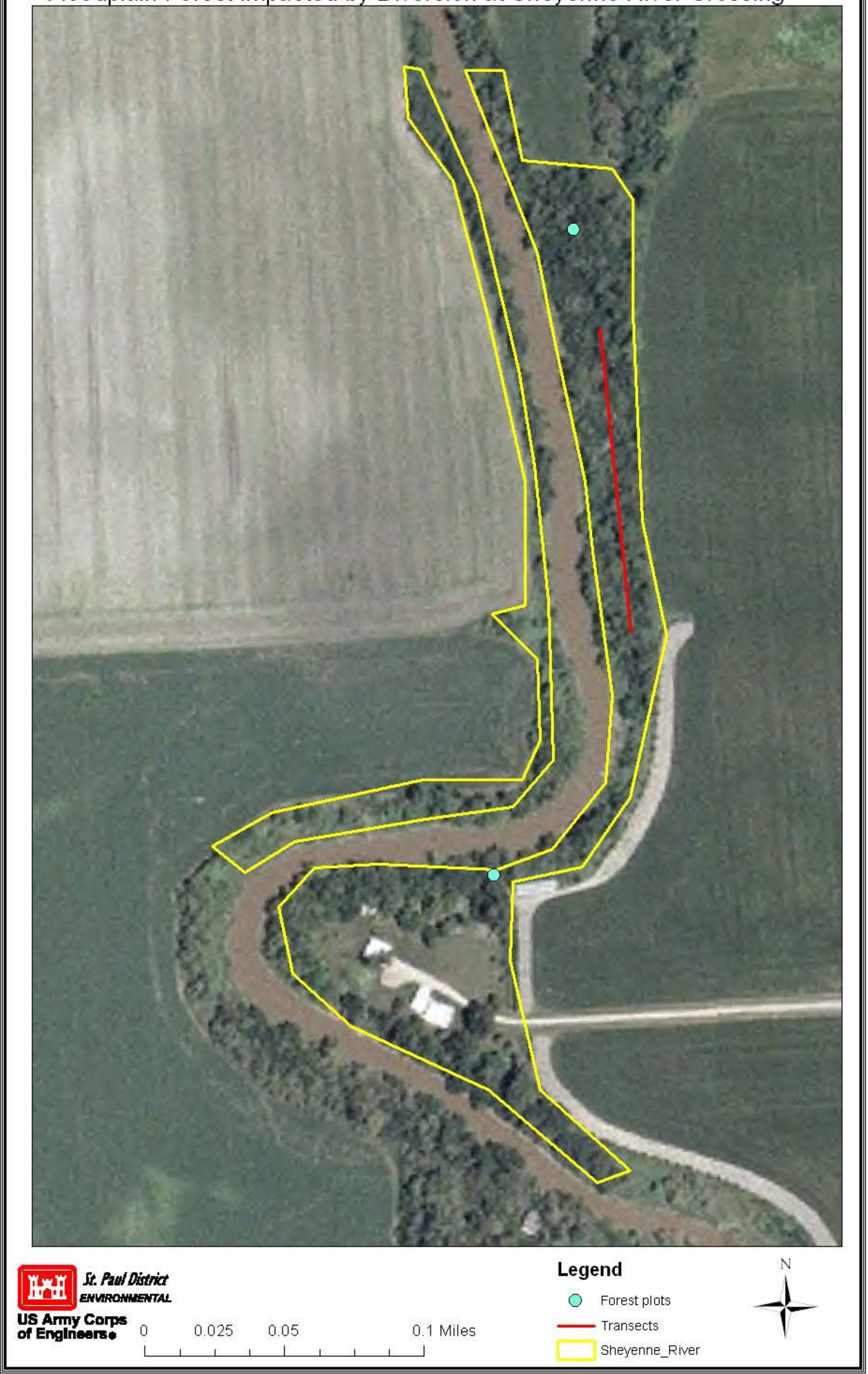
Mink

V1 75 % canopy closure

V2 100 percent of the year there is surface water present

V4 70% canopy closure within 328 feet of water's edge.

Floodplain Forest impacted by Diversion at Sheyenne River Crossing



Floodplain Forest field notes 7/19/2010

North Dakota Diversion Alternative: Wild Rice River Crossing

Bruce Kreft with the North Dakota Game and Fish and Jon Sobiech gathered data for the impacted area on the East side of the Wild Rice River, at the location where the North Dakota Diversion channel would cross the Wild Rice River.

Information gathered included tree identification, size, health, quantity, vegetation identification, Secchi readings, shoreline observations, snag tree counts, cavity counts, and a variety of other criteria to gather information for Habitat Evaluation Procedures models including the Belted King Fisher, Mink, Gray Squirrel, Black Capped Chickadee, and wood duck.

Four stand mapping plots were done for this stand, information gathered on this field sheet indicates that the dominant overstory tree species for this stand are Green ash, bur oak, and boxelder, other overstory tree species observed include American elm and hackberry. Based on the transect conducted the stand consists of 10% elm, 20% boxelder, 15% bur oak, 20% hackberry, and 35% green ash. The average diameters at breast height (DBH) for the overstory tree species are 13 inches and the average height is 46 feet. The mid story was dominated by green ash average height 20 feet, hackberry average height 15 feet, elm average height 25 feet and boxelder average height of 15 feet, there were also scattered choke cherry at an average height of 12 feet tall.

The average overall crown cover for the stand is 85%, with a ground cover that covers 70% of the area. The dominant understory species is beggars-tick, wood nettle, wild grape, violet, and moonseed. An average green ash tree was cored and it was determined to be 45 years old, this tree had a DBH of 15 and is 62 feet tall.

There was obvious snagging and clearing that occurred near this stand, there were several stumps along the shoreline of the river leaving the river's edge pretty much void of any overhanging shrubs or tree cover. A secchi reading was taken at 3 sites and 7 inches of clarity was revealed at all 3 sites.

Overall the stand was very healthy (only one tree rated lower then good), with very little invasive species present in the stand. There is approximately 300 trees per acre, with another 400-500 seedlings and saplings per acre, the basal area for the stand is 125 ft^2/acre. There were between 20-25 snags per acre with 12 cavities counted within the stand. A family of wood ducks was sighted; the ducklings were very small and were obviously hatched within the stand.

Belted Kingfisher:

V2 The Secchi readings averaged out to be 7 inches.

V3 5% of water surface obstruction in a 15 meter zone from shore.

V4 50% of the water depth is 24 inches deep or greater.

V5 5 % of the stream has riffles.

V6 All of the subsections in this area have perches for king fishers.

V7 There are soil banks very near the site that meat the criteria of steep banks, no vegetation, and greater the 1.5 meters in height, however the percentage of sand varies.

Gray Squirrel

V1 20% of the canopy is hard mast trees (Bur Oak).

V2 There were approximately 35 Bur Oak found in this stand 1 species.

V3 85% of the ground was shaded by canopy cover.

V4 The mean dbh for the stand is 13 inches.

Wood Duck

V1 There were 12 suitable cavities counted in the stand, approximately 5 per acre.

V2 There were no nest boxes found during the surveys.

V3 There are approximately 5 nesting opportunities per acre.

V4 5% of the water surface is covered by potential brood cover.

Black Capped chickadee

V1 85% of the ground was shaded by canopy cover.

V2 Average height of the overstory trees is approximately 48 feet.

V4 There are approximately 10-15 snags per acre, average diameter of snags is approximately 12 inches DBH. There are approximately 7-10 snags per acre between 4-10 inches DBH.

Mink

V1 85 % canopy closure

V2 100 percent of the year there is surface water present

V4 70% canopy closure within 328 feet of water's edge.


Floodplain Forest impacted by Wild Rice River Crossing

Floodplain Forest impacted by Minnesota Diversion Outlet

Red River MN Inlet (Diversion back into Red) 7-20-10

US Army Corps of Engineers
St. Paul District

PROJECT TITLE:	COMPUTED BY:	DATE:	SHEET:
SUBJECT TITLE:	CHECKED BY: Sobiech	DATE:	CONTRACT NO.:

Cavities = ||||

[illegible]

SNAG = [illegible]

Number	Species	Distance	Diameter	Condition	Notes
①	Boxelder	3	10	G	Red squirrel
②	G. Ash	17	10	G	
③	"	1	7	G	
④	"	3	7	G	
⑤	"	5	7	G	
⑥	"	1	7	G	
⑦	Boxelder	33	9	G	
⑧	G. Ash	4	5	G	
⑨	Boxelder	4	7	G	
⑩	"	12	8	G	
⑪	"	8	10	G	
⑫	G. Ash	11	8	G	
⑬	"	3	9	G	
⑭	G. Ash	25	8	G	
⑮	"	1	8	G	
⑯	"	8	9	G	
⑰	"	2	8	G	
⑱	A Elm	25	6	G	
⑲	G. Ash	4	8	G	
⑳	Boxelder	7	7	G	
		9.85			

Red River MN Inlet (Diversion back into Red) 7

Stand Map Field Sheet

Pool # ____ Compartment # _____ Location name ________ Cruiser(s) Sobiech
BAF ______ Date 7-20-10

Stand # 1
Workspace

Plot # ___ BA ____ % Understory 60 %Crown 65
Waypoint # ______ * Snags 7/1 * Mast ___/___

Dominant Overstory and #		/ Avg DBH	/ Ave Ht
1) G. Ash |||	3	14	45
2) elm ||	2	7	35
3) Boxelder |||	3	24	60
4)			
5)			
6)			
7)			

Dominant Mid-story	/ Ave Ht	Notable Species
1) elm	20	Moonseed
2) Green Ash	20	
3)		

Dominant Understory	/ Ave Ht
1) Stinging nettle	3
2) elm Seedling	1
3) Ash seedling	1

Stand # 2

Plot # ___ BA ____ % Understory 40 %Crown 60
Waypoint # ______ * Snags 1/6 * Mast ___/___

Dominant Overstory and #		/ Avg DBH	/ Ave Ht
1) Boxelder ||	2	14	50
2) elm |	1	13	50
3) G. Ash ~~||||~~ ~~||||~~	10	15	65
4)			
5)			
6)			
7)			

Dominant Mid-story	/ Ave Ht	Notable Species
1) elm	12	
2) G Ash	15	
3)		

Dominant Understory	/ Ave Ht
1) elm seedling	1
2) Grape	1
3) Reed Canary Grass	

Stand # ________

Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ / ____
2) ______ / ____
3) ______ / ____
Dominant Understory / Ave Ht
1) ______ / ____
2) ______ / ____
3) ______ / ____

Stand # ________

Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht / # Tree
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ / ____
2) ______ / ____
3) ______ / ____
Dominant Understory / Ave Ht
1) ______ / ____
2) ______ / ____
3) ______ / ____

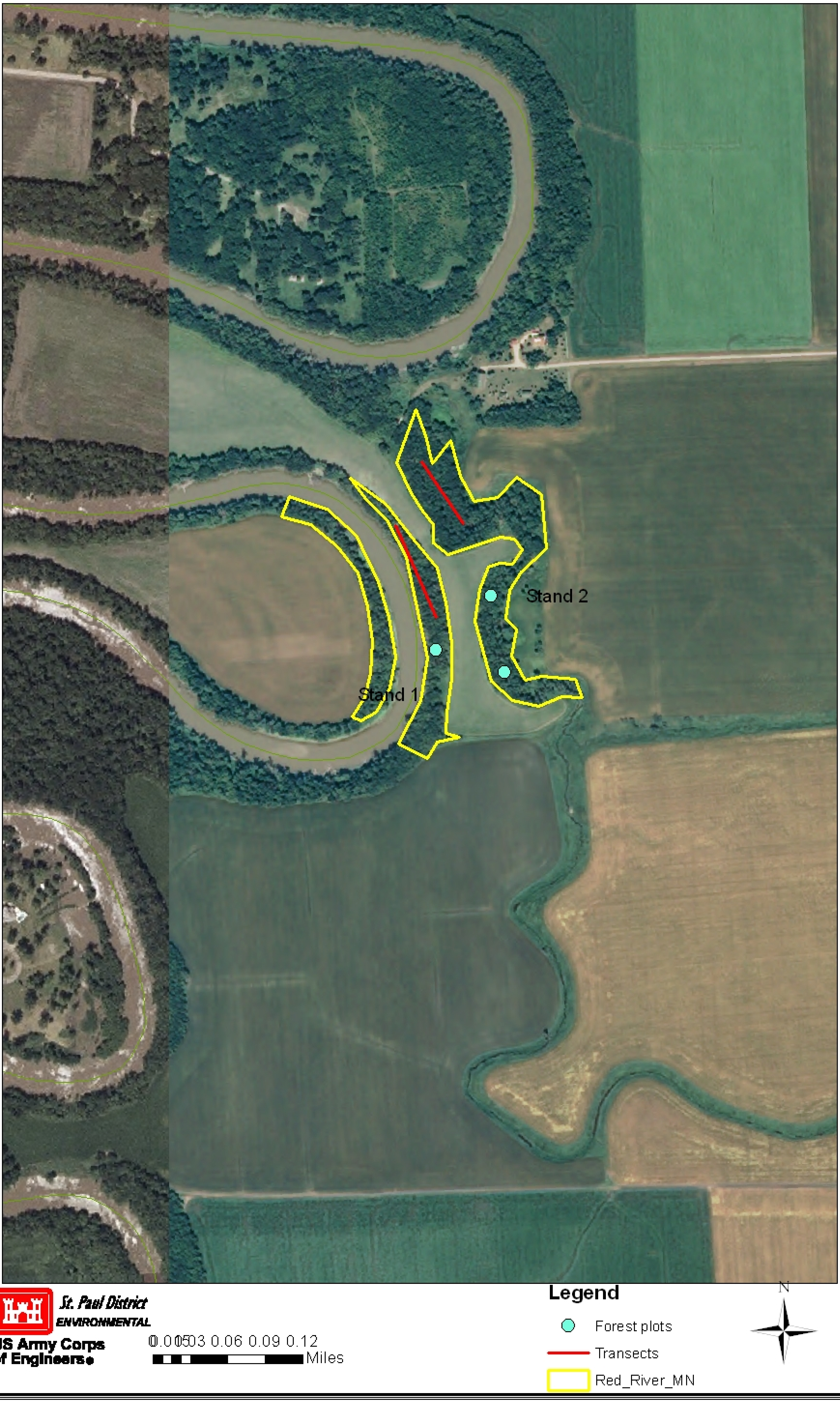
Stand # ________

Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ / ____
2) ______ / ____
3) ______ / ____
Dominant Understory / Ave Ht
1) ______ / ____
2) ______ / ____
3) ______ / ____

Stand # ________

Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ / ____
2) ______ / ____
3) ______ / ____
Dominant Understory / Ave Ht
1) ______ / ____
2) ______ / ____
3) ______ / ____

Floodplain Forest impacted by Minnesota Diversion Inlets



St. Paul District
ENVIRONMENTAL
US Army Corps of Engineers

Cavities ~~||||~~ ||

Red River MN S ~~outlet~~ inlet to Diversion

Number	Species	Distance	Diameter	Condition	Notes
1	G. Ash	9	10	G	Great Elm + Hackberry Regen
2	"	6	7	G	
3	"	9	7	F	
4	"	9	6	F	Wild Rye
5	Elm	12	8	G	
6	G Ash	13	9	F	
7	Elm	14	10	G	
8	G Ash	17	12	G	
9	G. Ash	12	7	G	
10	G. Ash	15	9	G	
11	Elm	15	11	G	
12	G Ash	13	8	G	
13	G Ash	2	9	G	
14	G. Ash	7	9	G	
15	"	7	6	G	
16	"	1	9	G	
17	"	1	9	~~G~~ F	
18	Elm	28	9	G	
19	Elm	6	7	G	
20	Elm	13	7	G	
		10.45	8.45		

Red River Mn ~~outlet~~ inlet to Diversion channel

Stand Map Field Sheet

Pool # ____ **Compartment #** _____ **Location name** ________ **Cruiser(s)** ______________________
BAF ______ **Date** ____________

Stand # 1
Workspace

Plot # ___ **BA** ____ **% Understory** 25 **%Crown** 90
Waypoint # ______ *** Snags** 3 / 13 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) G. Ash ||||| / 6 / 8 / 45
2) Elm |||| / 4 / 7 / 45
3) Boxelder / 1 / 7 / 40
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) Hackberry / 4
2) Boxelder / 12
3) ___ / ___
Dominant Understory / Ave Ht
1) Wild Rye / 2
2) mint / 3
3) ___ / ___

Stand # 2

Plot # ___ **BA** ____ **% Understory** 50 **%Crown** 60
Waypoint # ______ *** Snags** 2 / 12 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) G. Ash | / 1 / 12 / 50
2) Cottonwood | / 1 / 21 / 65
3) Boxelder ||| / 3 / 13 / 40
4) elm / 2 / 12 / 40
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) G. Ash / 25
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) Mint / 3
2) mustard / 3
3) ___ / ___

Notable Species:
edge of native prairie
Carrion flower
snow berry
rye

Stand # 3

Plot # ___ **BA** ____ **% Understory** 25 **%Crown** 80
Waypoint # ______ *** Snags** 2 / 17 *** Mast** - / ___
Dominant Overstory and # / Avg DBH / Ave Ht
1) G. Ash || / 4 / 13 / 45
2) Hackberry | / 2 / 5 / 30
3) elm || / 2 / 7 / 30
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) elm / 20
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) Wood nettle / 3
2) mint / 3
3) mustard / ___

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht / # Tree
1) ___ / ___ / ___ / ___
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) ___ / ___
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ___ / ___ / ___ / ___
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) ___ / ___
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ___ / ___ / ___ / ___
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) ___ / ___
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

11x Cavities

snags ~~|||| |||| ||||~~

Red River MN Outlet to Diversion channel

Picture at beginning

Number	Species	Distance	Diameter	Condition	Notes
1	B. OAK	17	31	G	Thin strip along Lake
2	G. Ash	15	5	f	50 60 feet
3	A. Elm	15	11	G	Prickly Ash
4	B. OAK	16	24	f	
5	B. OAK	18	19	f	Wild Rye
6	B. OAK	6	27	G	
7	Elm	10	4	G	
8	G Ash	~~9~~10	7	G	
9	G. Ash	14	5	G	
10	G. Ash	5	7	f	
11	Basswood	4	7	G	
12	G. Ash	7	7	f	
13	G. Ash	8	8	f	
14	A. Elm	16	8	G	
15	G. Ash	6	7	f	
16	Elm	7	12	G	
17	Elm	26	10	G	
18	Elm	10	11	G	
19	G. Ash	3	~~6~~7	f	
20	Elm	11	9	f	
		11.75 Avg	11.3 Avg		

5 inches [illegible]

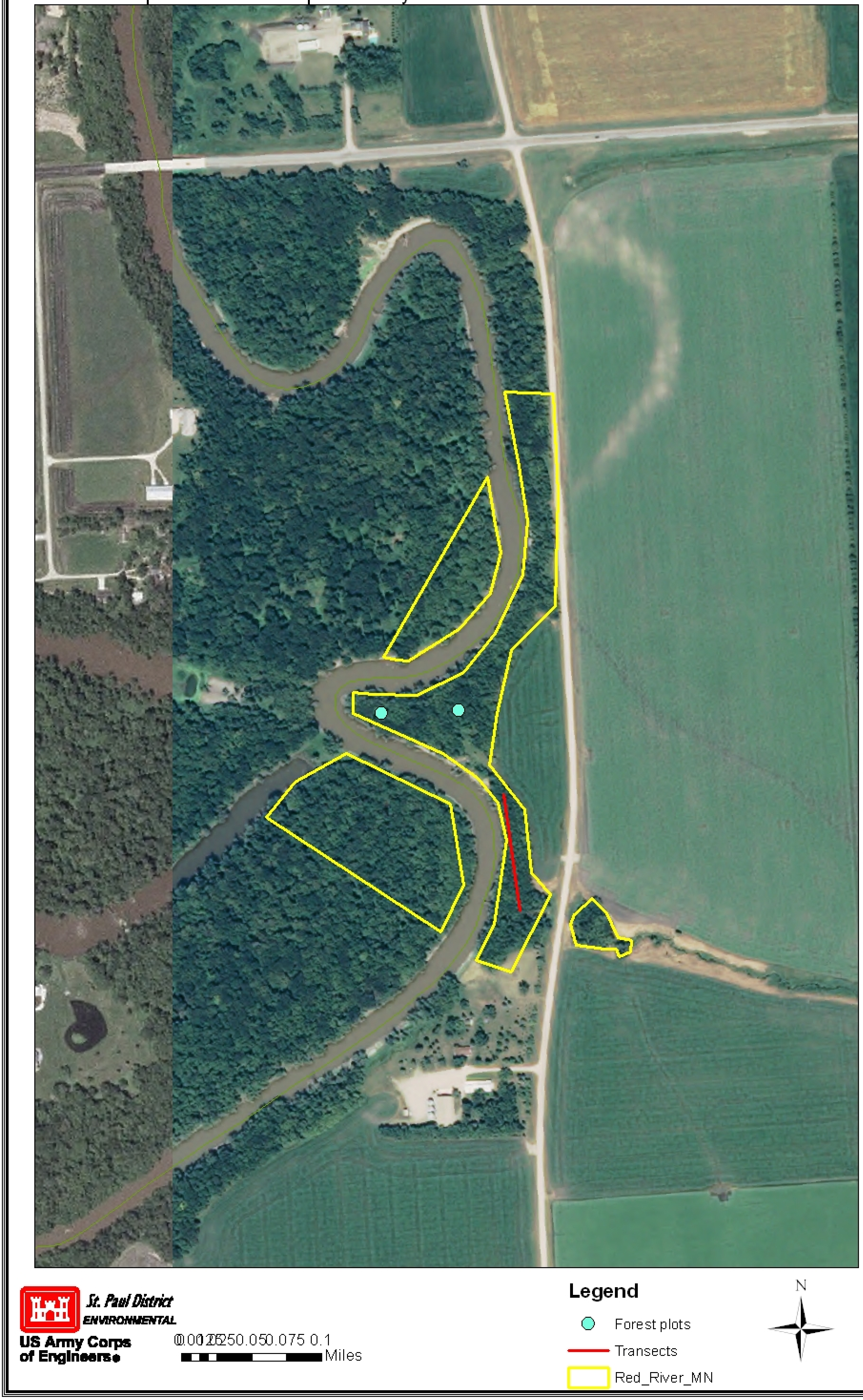
Understory = 10%

Overland = ~~[illegible]~~ 5-10 feet with brush 5%

(~~Aspect~~ brush PSYMPHO)

Picture at end

Floodplain Forest impacted by Minnesota Diversion South Inlet



Red River MN shore South ~~outlet~~ to Diversion inlet

Stand Map Field Sheet

Pool # ____ **Compartment #** _____ **Location name** ________ **Cruiser(s)** Sobiech & Kroll
BAF ______ **Date** 7-19-10

Stand # 1
Workspace

Plot # ___ **BA** ____ **% Understory** 90 **%Crown** 90
Waypoint # ______ *** Snags** 1 / 8 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) B OAK 1 / 1 / 4 / 25
2) HAckberry || / 2 / 7 / 25
3) elm || / 2 / 7 / 35
4) G Ash ||| / 3 / 6 / 25
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**
1) HAckberry / 10 mustard edges
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht
1) GArlic mustard / 3
2) ____ / ____
3) ____ / ____

Stand # 2

Plot # ___ **BA** ____ **% Understory** 65 **%Crown** 55
Waypoint # ______ *** Snags** - / - *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) B OAK ~~[illegible]~~ || / 7 / 20 / 58
2) Boxelder |||| / 4 / 11 / 45
3) G Ash ||| / 3 / 22 / 55
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**
1) boxelder / 15
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht
1) Hackberry / 2
2) G. Mustard / 3
3) Rye / 2

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**
1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht / # Tree
1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**
1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**
1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**
1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

Red River Mn ~~Outlet~~ Inlet to Diversion #2

Number	Species	Distance	Diameter	Condition	Notes
①	G. Ash	17	18	G	mosquito
②	G. Ash	8	14	G	
③	G. Ash	1	11	G	
④	Elm	12	7	G	
⑤	elm	9	7	G	
⑥	G. Ash	13	6	G	
⑦	''	5	7	G	
⑧	''	4	9	G	
⑨	''	6	7	G	
⑩	''	5	9	F	
⑪	''	9	10	F	Bur Oaks started at end
⑫	''	3	8	F	
⑬	''	10	6	G	
⑭	''	4	7	G	
⑮	''	8	6	G	
⑯	''	16	9	~~G~~ F	
⑰	''	5	11	F	
⑱	''	12	27	F	
⑲	''	16	7	F	
⑳	''	8	9	F	
		8.55	9.75		

Floodplain Forest impacted by North Dakota Diversion Inlet

RR [illegible]

Stand Map Field Sheet

Pool # ____ **Compartment #** ____ **Location name** ________ **Cruiser(s)** Sibrell

BAF ______ **Date** 7-19-10

Stand # 1

Workspace

Plot # ___ **BA** ____ **% Understory** 5 **%Crown** 85

Waypoint # ______ *** Snags** 0 / 0 *** Mast** 0 / 5

Dominant Overstory and # / Avg DBH / Ave Ht

1) G.Ash / 4 / 27 / 72
2) Box elder / 2 / 6 / 15
3) Elm / 2 / 14 / 65
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**

1) Boxelder / 20
2) Elm / 22
3) Hackberry / 15

Dominant Understory / Ave Ht

1) Violet /
2) Bur oak seedlings / 15
3) Virginia wild rye /

Stand # 2

Plot # ___ **BA** ____ **% Understory** 5 **%Crown** 95

Waypoint # ______ *** Snags** 4 / 9 *** Mast** – / –

Dominant Overstory and # / Avg DBH / Ave Ht

1) Boxelder / 7 / 9 / 35
2) Willow / 1 / 24 / 53
3) G.Ash / 2 / 30 / 15
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**

1) Boxelder / 25
2) Elm / 20
3) ____ / ____

Dominant Understory / Ave Ht

1) ____ / ____
2) ____ / ____
3) ____ / ____

Red [illegible]

wild turkey

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____

Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___

Dominant Overstory and # / Avg DBH / Ave Ht

1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**

1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht

1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____

Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___

Dominant Overstory and # / Avg DBH / Ave Ht / # Tree

1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**

1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht

1) ____ / ____
2) ____ / ____
3) ____ / ____

Black willow
Hackberry
Bur oak
Green ash
Box elder
American elm

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____

Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___

Dominant Overstory and # / Avg DBH / Ave Ht

1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**

1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht

1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ________

Plot # ___ **BA** ____ **% Understory** ____ **%Crown** ____

Waypoint # ______ *** Snags** ___/___ *** Mast** ___/___

Dominant Overstory and # / Avg DBH / Ave Ht

1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____

Dominant Mid-story / Ave Ht **Notable Species**

1) ____ / ____
2) ____ / ____
3) ____ / ____

Dominant Understory / Ave Ht

1) ____ / ____
2) ____ / ____
3) ____ / ____

11.8
37.2

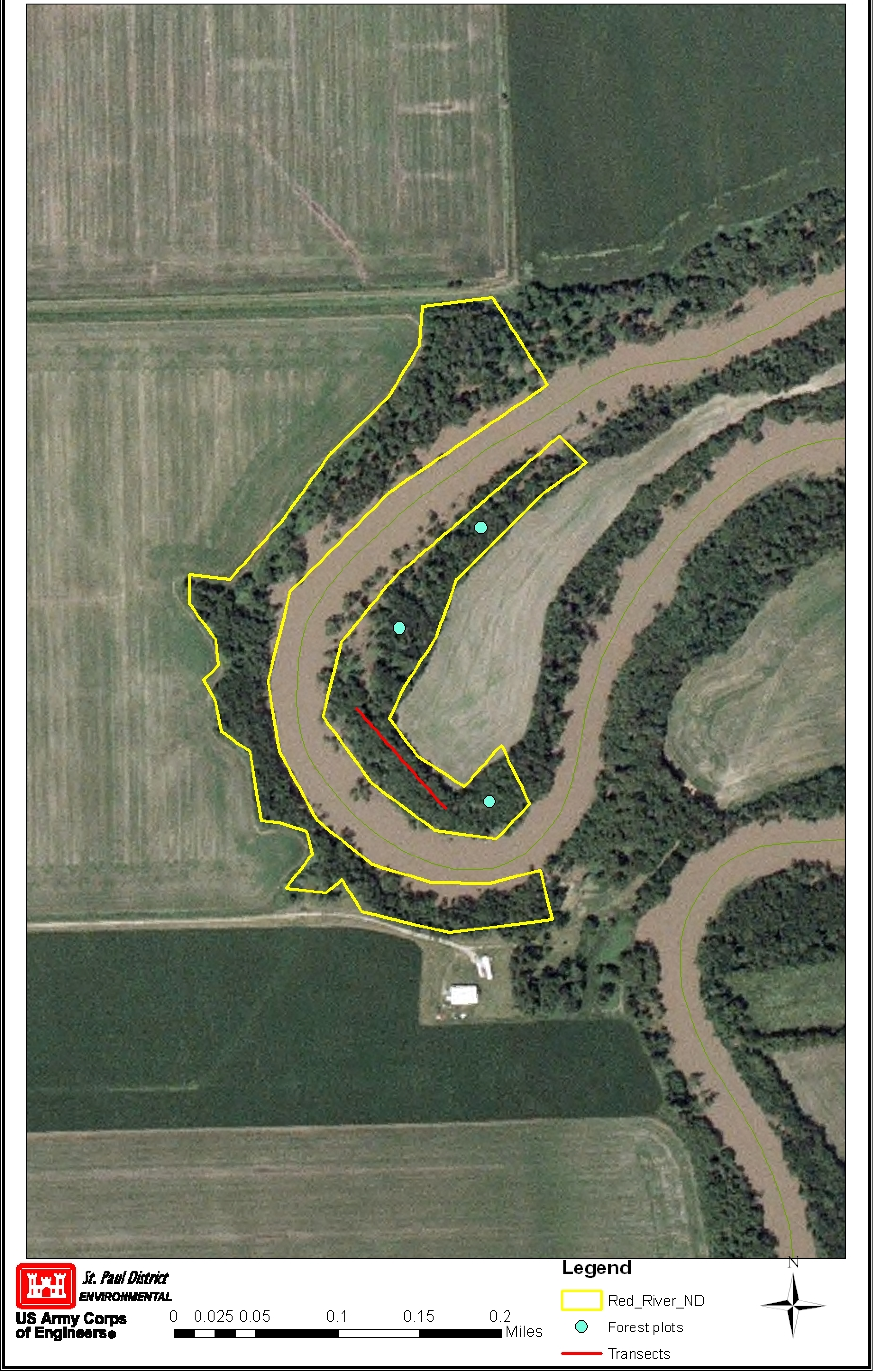
CAVities ~~||||~~ X ||||

ND Outlet

Section Reading 10 inches 3 locations

Number	Species	Distance	Diameter	Condition	Notes
1	Elm	3 feet	~~9~~ 9	P	Dying
2)	[illegible]	11	6.5	G	
3	Boxelder	6	5.5	G	
4	Box	3	7.5	G	
5	G. Ash	12.5	8	G	
6	elm	27	10.5	F	split
7 8	G. Ash	12	5.5	G	
9	elm	8	15	G	
10	elm	3	11	G	
11	G. Ash	17	8	G	
12	elm	5	13	G	
13	boxelder	20	5	G	
	elm	23	17	G	
	G. Ash	24	5	G	
	B. OAK	35	40	G	edge of Field
	B. oak	15	28	G	
	elm	9	8	G	
	Hackberry	6	4	G	
	elm	11	9	G	Choke cherry
	B. OAK	12	31	G	

Floodplain Forest impacted by North Dakota Inlet



Cavities: ~~||||~~ ~~||||~~ ~~||||~~ Wood duck boxes
~~||||~~ ~~||||~~ ~~||||~~

US Army Corps of Engineers
St. Paul District

PROJECT TITLE: Red River AD Inlet (Diversn back into Red R.)

SUBJECT TITLE:

COMPUTED BY:

DATE: 7-20-10

SHEET

CHECKED BY:

DATE:

CONTRACT NO.:

Number	Species	Distance	Diameter	Condition	Notes
①	Box Elder	6	8	G	
②	"	10	6	G	
③	"	5	6	G	
④	"	8	10	G	
⑤	G. Ash	15	12	G	
⑥	"	8	18	G	
⑦	Boxelder	8	8	G	
⑧	G. Ash	7	8	Poor	
⑨	"	16	14	G	
⑩	Boxelder	14	8	f	
⑪	G. Ash	18	14	G	
⑫	Boxelder	9	5	G	
⑬	elm	7	6	G	
⑭	G. Ash	13	26	G	
⑮	Boxelder	11	8	f	
⑯	G. Ash	18	9	f	
⑰	Boxelder	7	8	f	
⑱	"	10	10	f	
⑲	elm	12	8	G	
⑳	Elm	5	12	F	

ND ~~inlet~~ outlet

Stand Map Field Sheet

Pool # ___ **Compartment #** ___ **Location name** ___ **Cruiser(s)** Sobiech
BAF ___ **Date** 7-20-10

Stand # 1

Workspace

Plot # ___ **BA** ___ **% Understory** 60 **%Crown** 95
Waypoint # ___ *** Snags** 3 / 24 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) G. Ash ~~卌~~ 卌 / 10 / 7 / 45
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) Boxelder / 18
2) G. Ash / 20
3) elm / 15
Dominant Understory / Ave Ht
1) ? / ___
2) nettle / 2
3) ___ / ___

Stand # 2

Plot # ___ **BA** ___ **% Understory** 30 **%Crown** 70
Waypoint # ___ *** Snags** 2 / 20 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) elm IIII / 4 / 10 / 45
2) Boxelder III / 3 / 20 / 50
3) G Ash II / 2 / 9 / 52
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) elm / 20
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ? / ___
2) Cone flower / 3
3) nettle / 2

Stand # 3

Plot # ___ **BA** ___ **% Understory** 10 **%Crown** 85
Waypoint # ___ *** Snags** 3 / 26 *** Mast** T
Dominant Overstory and # / Avg DBH / Ave Ht
1) G. Ash IIII / 4 / 9 / 50
2) elm II / 2 / 9 / 45
3) Boxelder 卌II / 7 / 8 / 40
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) Boxelder / 25
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

Stand # ___

Plot # ___ **BA** ___ **% Understory** ___ **%Crown** ___
Waypoint # ___ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht / # Tree
1) ___ / ___ / ___ / ___
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) ___ / ___
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

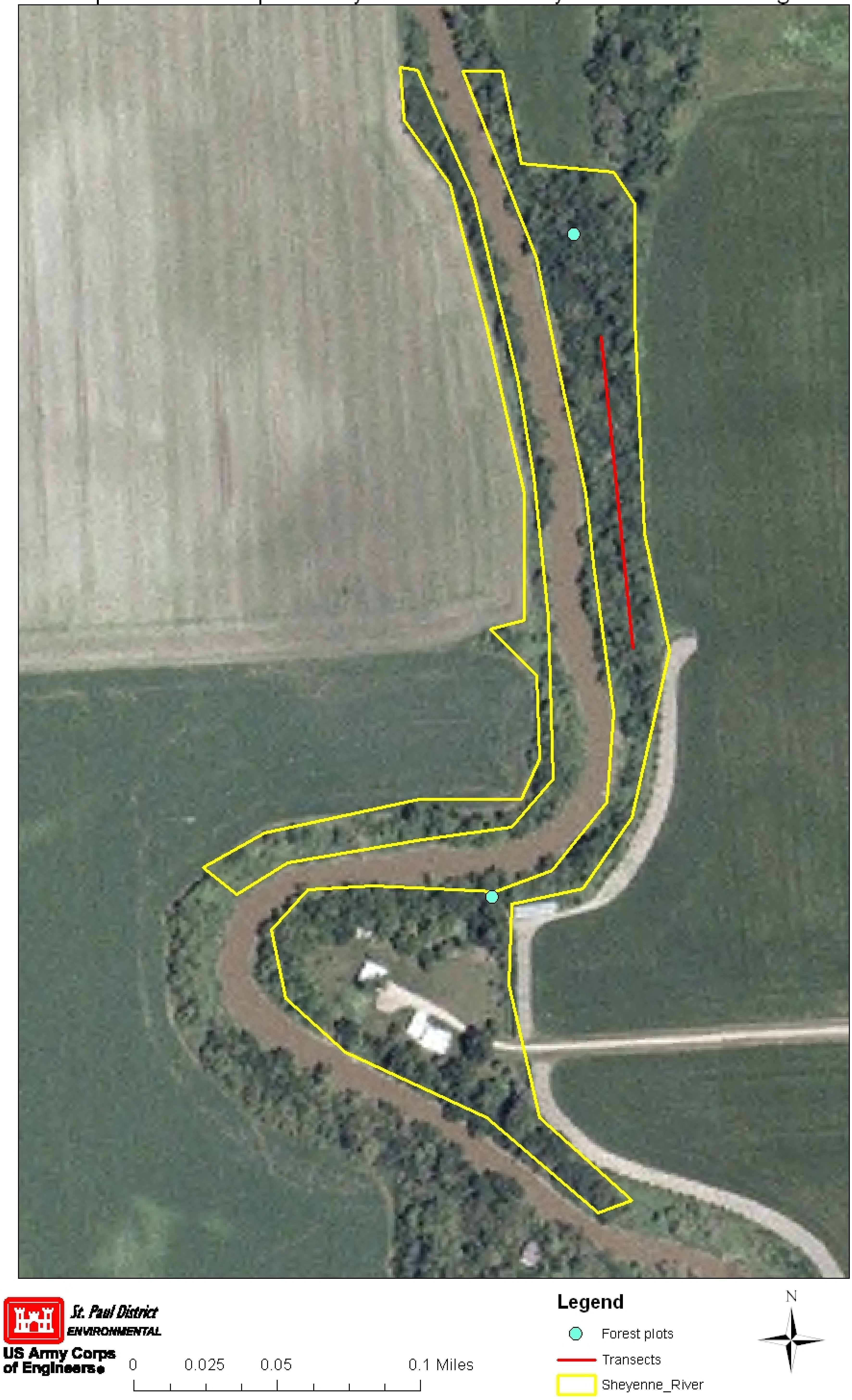
Stand # ___

Plot # ___ **BA** ___ **% Understory** ___ **%Crown** ___
Waypoint # ___ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ___ / ___ / ___ / ___
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) ___ / ___
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

Stand # ___

Plot # ___ **BA** ___ **% Understory** ___ **%Crown** ___
Waypoint # ___ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ___ / ___ / ___ / ___
2) ___ / ___ / ___ / ___
3) ___ / ___ / ___ / ___
4) ___ / ___ / ___ / ___
5) ___ / ___ / ___ / ___
6) ___ / ___ / ___ / ___
7) ___ / ___ / ___ / ___
Dominant Mid-story / Ave Ht **Notable Species**
1) ___ / ___
2) ___ / ___
3) ___ / ___
Dominant Understory / Ave Ht
1) ___ / ___
2) ___ / ___
3) ___ / ___

Floodplain Forest impacted by Diversion at Sheyenne River Crossing



#1 RAn Parallel to River

#2 Buckthorn throughout site

BASSwood near southern end?

Sheyenne River

Number	Species	Distance	Diameter	Condition	Notes
1	Elm	17	17	f	
2	Buckthorn	12	~~5.5~~ 4	G	
3	Box elder	13	26	f	
4	Boxelder	6	17	P	
5	Boxelder	22	11	G	
6	G. Ash	10	8	G	
7	Boxelder	9	9	f	
8	Boxelder	15	7	f	
9	Boxelder	14	21	f	
10	elm	15	5	P	
11	G Ash	10	18	G	
12	Elm	13	10	G	
13	Elm	16	5	G	
14	Boxelder	4	13	f	
15	Boxelder	18	14	f	
16	Boxelder	2	17	f	
17	Boxelder	2	17	f	
18	elm	2	6	G	
19	Boxelder	2	15	P	
20	Elm	13	15	G	

Sheyenne River

Cavity 𝍸I 𝍸I

Buckthorn [illegible] [illegible]

Stand Map Field Sheet

Pool # ____ Compartment # _____ Location name ________ Cruiser(s) Kreft and Sobral
BAF ______ Date 7-19-10

Stand # 1
Workspace

Plot # ___ BA ____ % Understory 70 %Crown 75
Waypoint # ______ * Snags 1 / 10 * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) Elm / 96 / 13 / 54
2) Box elder / 3 / 17 / 45
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) Buckthorn / 10 basswood
2) elm / 10
3) ______ /____
Dominant Understory / Ave Ht
1) Wood nettle / 2
2) ______ /____
3) ______ /____

Basswood

Stand # 2

Plot # ___ BA 10 % Understory 50 %Crown 75
Waypoint # ______ * Snags 0 / [illegible] * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) Elm / 4 / 13 / 55
2) Basswood / 3 / 12 / 50
3) Box elder / 3 / 14 / 45
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) elm / 10
2) Buckthorn / 6
3) ______ /____
Dominant Understory / Ave Ht
1) nettle /____
2) Boxelder seedl. /____
3) ______ /____

Stand #________
Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ /____
2) ______ /____
3) ______ /____
Dominant Understory / Ave Ht
1) ______ /____
2) ______ /____
3) ______ /____

Stand #________
Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht / # Tree
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ /____
2) ______ /____
3) ______ /____
Dominant Understory / Ave Ht
1) ______ /____
2) ______ /____
3) ______ /____

Stand #________
Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ /____
2) ______ /____
3) ______ /____
Dominant Understory / Ave Ht
1) ______ /____
2) ______ /____
3) ______ /____

Stand #________
Plot # ___ BA ____ % Understory ____ %Crown ____
Waypoint # ______ * Snags ___/___ * Mast ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ______ / ____ / ____ / ____
2) ______ / ____ / ____ / ____
3) ______ / ____ / ____ / ____
4) ______ / ____ / ____ / ____
5) ______ / ____ / ____ / ____
6) ______ / ____ / ____ / ____
7) ______ / ____ / ____ / ____
Dominant Mid-story / Ave Ht Notable Species
1) ______ /____
2) ______ /____
3) ______ /____
Dominant Understory / Ave Ht
1) ______ /____
2) ______ /____
3) ______ /____

Floodplain Forest impacted by Wild Rice River Crossing

St. Paul District
ENVIRONMENTAL
US Army Corps of Engineers

Wild Rice River

Number	Species	Distance ft	Diameter	Condition	Notes
1	elm	12	14	G	
2	G Ash	15	7	G	
3	G. Ash	13	15	F	
4	G Ash	12	5	G	
5	G. Ash	10	10	G	
6	〃	13	9	G	
7	HAckberry	10	7	G	
8	B. OAK	9	25	G	
9	B. OAK	16	25	G	
10	HAck.berry	14	8	G	
11	boxelder	6	6	G	
12	HAck.berry	11	9	G	
13	Boxelder	17	9	G	
14	Boxelder	8	7	G	
15	boxelder	12	7		
16	HAckberry	18	11	G	
17					
18	B. OAK	5	36	G	
19	elm	10	7	G	
20	G. Ash	12	12.5	G	
	G. Ash	16	13	G	

12 feet spacing

Wild Rice

CAvity 𝍸 ||| | ||

Stand Map Field Sheet

Pool # ____ **Compartment #** ____ **Location name** ____ **Cruiser(s)** Kreft Subject
BAF ____ **Date** 7-19-2016

Stand # 1 Avg Ht: 48.5

Workspace

Plot # ____ **BA** ____ **% Understory** 90 **%Crown** 80
Waypoint # ____ *** Snags** 1 / 20 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) G. Ash / 4 / 9 / 45
2) B. OAK / 3 / 34 / 105
3) Box elder / 1 / 7 / 30
4) HAckberry / 1 / 12 / 35
5) Elm / 2 / 8 / 45
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____
Dominant Mid-story / Ave Ht **Notable Species**
1) G. Ash / 20 [illegible]
2) elm / 25 Hackberry seed.
3) Boxelder / 15 sedge
Dominant Understory / Ave Ht
1) Cn Moonseed / ____
2) St Nettle / ____
3) unknown / ____

Stand # 2 Avg Ht 40

Plot # ____ **BA** ____ **% Understory** 50 **%Crown** 90
Waypoint # ____ *** Snags** 2 / 17 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) Boxelder 𝍸 || / 7 / 8 / 30
2) G. Ash || / 4 / 16 / 50
3) Hackberry / 1 / 6 / 35
4) B. OAK / 1 / 30 / 65
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____
Dominant Mid-story / Ave Ht **Notable Species**
1) Boxelder / 15 sparse midstory
2) ____ / ____
3) ____ / ____
Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ____

Avg Ht: 46

Plot # 3 **BA** ____ **% Understory** 75 **%Crown** 75
Waypoint # ____ *** Snags** 1 / 12 *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) G Ash / 10 / 10 / 45
2) B. OAK / 3 / 26 / 60
3) HAckberry / 2 / 8 / 30
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____
Dominant Mid-story / Ave Ht **Notable Species**
1) Choke cherry / 12
2) HAckberry / 12
3) ____ / ____
Dominant Understory / Ave Ht
1) Nettle / ____
2) ____ / ____
3) ____ / ____

Stand # ____

Plot # 4 **BA** ____ **% Understory** 75% **%Crown** 90
Waypoint # ____ *** Snags** ___ / 20 *** Mast** 4 / 34
Dominant Overstory and # / Avg DBH / Ave Ht / # Tree
1) G. Ash 𝍸 |||| / 9 / 13 / 50
2) B. OAK | / 1 / 34 / 55
3) Boxelder / 1 / 21 / 41
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____
Dominant Mid-story / Ave Ht **Notable Species**
1) Hackberry / 15 sedge
2) ____ / ____
3) ____ / ____
Dominant Understory / Ave Ht
1) Violet / ____
2) ____ / ____
3) ____ / ____

50

Stand # ____

Plot # ____ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ____ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____
Dominant Mid-story / Ave Ht **Notable Species**
1) ____ / ____
2) ____ / ____
3) ____ / ____
Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

Stand # ____

Plot # ____ **BA** ____ **% Understory** ____ **%Crown** ____
Waypoint # ____ *** Snags** ___/___ *** Mast** ___/___
Dominant Overstory and # / Avg DBH / Ave Ht
1) ____ / ____ / ____ / ____
2) ____ / ____ / ____ / ____
3) ____ / ____ / ____ / ____
4) ____ / ____ / ____ / ____
5) ____ / ____ / ____ / ____
6) ____ / ____ / ____ / ____
7) ____ / ____ / ____ / ____
Dominant Mid-story / Ave Ht **Notable Species**
1) ____ / ____
2) ____ / ____
3) ____ / ____
Dominant Understory / Ave Ht
1) ____ / ____
2) ____ / ____
3) ____ / ____

B. OAK
37
30
26
34
4/13 3
12
4 3

species = Timber
feeding

SNAGGING [illegible]

3 20-28
snags
Acre

G. Ash 15 DBH 62 age 45 yrs

1.11 Scoping Document

Scoping Document

Fargo-Moorhead Metropolitan Area Flood Risk Management Environmental Impact Statement

US Army Corps of Engineers®

Prepared by:

U.S. Army Corps of Engineers
St. Paul District
190 Fifth Street East, Suite 401
St. Paul, Minnesota 55101-1638

September 2009

Printed on ♻ Recycled Paper

Fargo-Moorhead Metropolitan Area
Flood Risk Management
SCOPING DOCUMENT

Environmental Impact Statement

September 2009

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U.S. Army Corps of Engineers
St. Paul District
190 Fifth Street East, Suite 401
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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

This Scoping Document was prepared to address alternatives, issues and other important information pertaining to the problematic flooding in the Fargo, North Dakota-Moorhead, Minnesota metropolitan area.

As directed by congress, the U.S. Army Corps of Engineers, St Paul District (USACE), is preparing an Environmental Impact Statement (EIS) under the terms of the National Environmental Policy Act (NEPA) for the Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study.

The Fargo-Moorhead Metropolitan Area is located in the Red River of the North Basin. This study is authorized by a September 30, 1974, Resolution of the Senate Committee on Public Works.

A Reconnaissance Report for the Fargo-Moorhead metropolitan area was approved by the Corps Mississippi Valley Division on April 08, 2008. Based on the recommendations contained in the Reconnaissance Report, the City of Fargo, the City of Moorhead, and the Federal Government entered into a Feasibility Cost Share Agreement on September 22, 2008. The feasibility study is cost shared 50/50 between the two non-Federal sponsors and the Federal Government. Funds to initiate the feasibility study were provided in the Consolidated Appropriations Act, 2008, approved December 26, 2007 (Public Law 110-161).

The study will produce a decision document in the form of a feasibility report and associated NEPA document in accordance with the Corps Planning Guidance Notebook, ER 1105-2-100, and the Project Management Plan. The feasibility study will investigate measures to reduce flood risk and analyze the potential for Federal participation in implementing a flood damage reduction project in the Fargo-Moorhead Metropolitan Area.

The feasibility study will focus on reducing flood risk in the entire Fargo-Moorhead Metropolitan area.

The USACE issued a Notice of Intent in the Federal Register on May 5, 2009.

1.2 RIOR STUDIES, REPORTS, AND PROJECTS

a. Reports

Since the 1940s, the Corps of Engineers and others have prepared numerous reports on the Red River of the North basin. The following reports contain the most relevant information for the current effort:

1. House Document 185, 81st Congress, 1st Session, dated May 24, 1948. This report proposed a comprehensive plan for the Red River of the North basin. The plan included channel improvements, levees and floodwalls in Fargo and Moorhead. Other components of the plan included the Orwell Reservoir on the Ottertail River in Minnesota; channel improvements on the lower Sheyenne, Maple and Rush Rivers in North Dakota; channel improvements on the Mustinka, Ottertail, Wild Rice, Marsh and Sand Hill Rivers in Minnesota; channel improvements

along the Bois de Sioux and upper Red Rivers near Wahpeton, North Dakota/Breckenridge, Minnesota; and local flood protection works on the Red River in Grand Forks, North Dakota/East Grand Forks, Minnesota. The study found that channel improvements along the lower 31.6 miles of the Wild Rice River in North Dakota were economically justified, but the majority of affected local interests did not support the project, so it was not recommended. The report specifically recommended no further investigations in the Buffalo River basin and several other basins in Minnesota.

2. Section 205, Flood Control Reconnaissance Report, Red River of the North at Fargo, North Dakota, Corps of Engineers, May 1967. This study evaluated the potential to build a portion of the levee in Fargo that had been approved as part of the 1948 comprehensive plan but was later omitted from the constructed project. The study concluded that the proposed project was not economically feasible and did not warrant further Federal involvement at that time.

3. Fargo-Moorhead Urban Study, Corps of Engineers, May 1985. This study was a cooperative Federal, State and local planning effort aimed at developing viable solutions to water and related land resource problems, needs and concerns for 1980 to 2030. The study area encompassed 13 townships in Cass County, North Dakota, and Clay County, Minnesota. The study addressed water supply, water conservation, flood risk management, energy conservation and water resources data management. The study evaluated the potential to construct levees, floodwalls and channel modifications in Fargo and Moorhead. The report concluded that extremely long levees or floodwalls would be required to ring the urban areas to provide adequate protection from larger floods, and the costs would greatly exceed the damages prevented. Therefore, Federal participation in Fargo and Moorhead flood risk management projects was not recommended. However, the report did support further studies for flood control in Harwood and Rivertree Park, North Dakota.

4. “Living with the Red,” International Joint Commission, November 2000. In June 1997, following record-setting flooding on the Red River of the North, the governments of Canada and the United States asked the International Joint Commission (IJC) to examine and report on the causes and effects of damaging floods in the Red River basin, and to make recommendations on means to reduce, mitigate and prevent harm from future flooding.” The IJC established the International Red River Basin Task Force to undertake the necessary studies. The task force produced its report in April 2000. The IJC’s report, entitled “Living with the Red,” was completed in November 2000. These reports included discussion of the flooding in the Fargo-Moorhead area. The report cited hydraulic and hydrologic analyses conducted after the 1997 flood that indicated flood risks in the Fargo-Moorhead area were likely greater than previously thought. The report supported a basin-wide flood mitigation approach including reduction in flows, strengthening of existing protection structures, and use of other techniques. The report recommended that Federal, State and local governments should “expedite the study of flood risk potential and implement plans for flood protection measures for the Fargo-Moorhead area.”

5. Reconnaissance Study, Red River Basin, Minnesota, North Dakota, South Dakota, Corps of Engineers, September 2001. This study, supported by supplemental information, was approved

in October 2002. The study recommended three initial feasibility studies to be followed by additional studies throughout the basin. Only the initial three studies were approved in 2002. The additional proposed studies would be considered for approval on the basis of additional 905(b) analyses. The Fargo-Moorhead and Upstream feasibility study, currently underway, was one of the initial studies recommended and approved in the reconnaissance study.

6. Final Environmental Impact Statement (FEIS) for the Red River Valley Water Supply Project, U.S. Department of the Interior, Bureau of Reclamation, December 21, 2007. The purpose of the proposed project is to meet the comprehensive water quality and quantity needs of the Red River Valley through the year 2050. The needs were identified as municipal, rural and industrial water; water quality; aquatic environment; recreation; and water conservation measures. The preferred alternative would import water to the Red River basin from the Missouri River via the Garrison Diversion and the Sheyenne River.

7. Fargo-Moorhead Downtown Framework Plan Update, Fargo-Moorhead Council of Governments, City of Fargo, and City of Moorhead, June 2007. This report builds upon earlier planning efforts in both Fargo and Moorhead. Many of the concepts presented depend on implementation of effective flood risk management strategies.

b. Current Studies

The following studies are being conducted:

1. Fargo-Moorhead and Upstream Feasibility Study, Corps of Engineers. The study began in August 2004. The study area is the entire headwaters of the Red River of the North upstream (south) of the Fargo-Moorhead metropolitan area. The major tributaries are the Mustinka, Bois de Sioux, and Ottertail Rivers in Minnesota and the Wild Rice River in North Dakota. The study is evaluating alternatives that would restore wetland habitat and reduce flood damages. The major underlying assumption is that a system of surface water storage sites upstream of Fargo-Moorhead would reduce flood stages and flood damages downstream. It is also assumed that water storage could be accomplished in ways that would restore aquatic ecosystems and increase habitat for wildlife. Phase 1 analyses, completed in June 2005, showed that distributed flood storage could provide significant economic benefits, but additional study of environmental benefits is needed to justify a Federal project. The North Dakota State Water Commission and the City of Moorhead are jointly sponsoring the study. Additional cost-share partners include the Southeast Cass Water Resource District; Richland County Water Resource District; Red River Joint Water Resource District; city of Fargo; Buffalo-Red River Watershed District; Bois de Sioux Watershed District; Minnesota Department of Natural Resources; Minnesota Board of Water and Soil Resources; Minnesota Pollution Control Agency; South Dakota Department of Game, Fish, and Parks; and Red River Basin Commission.

2. Fargo Southside Flood Control Project, City of Fargo, North Dakota. Since the 1997 flood, the city of Fargo and the Southeast Cass County Water Resource District have been planning for a flood risk management project to protect developments in the area south of Fargo and north

and west of the Wild Rice River up to 4 miles south of its confluence with the Red River. Several alternatives have been explored, including combinations of levees, diversion channels, channel modifications, and flood storage.

3. Oakport Township, Minnesota. The Buffalo-Red River Watershed District is working on a flood risk management reduction project for Oakport Township. The project would be designed to protect areas of town to a level equal to the 1997 flood plus 3 feet. The watershed district is still finalizing levee alignments for two ring levees on either side of Oakport Coulee. The project would also include buying some homes that cannot be protected by the levee system. A Corps of Engineers study performed under the Section 205 Continuing Authority was terminated in December 2002 after it was determined that national economic benefits were insufficient to support further Federal efforts.

4. Flood Insurance Study Update, Federal Emergency Management Agency (FEMA). FEMA is updating the flood insurance maps for the Fargo-Moorhead area. As a result of recent flood events and revised hydrologic and hydraulic modeling, FEMA is likely to increase the 1-percent-chance flood elevation on the order of 1 foot above the current administratively determined elevation.

c. <u>Existing Water Resource Projects</u>

1. The Lake Traverse project, including White Rock Dam and Reservation Dam, provides flood storage at the headwaters of the Bois de Sioux and Red River of the North. The project was authorized by the 1936 Flood Control Act, and construction was completed in 1948. The project is operated by the Corps of Engineers, St. Paul District.

2. Baldhill Dam and Lake Ashtabula provide water storage for flood control and water supply on the Sheyenne River. The project was authorized by the 1944 Flood Control Act, and construction was originally completed in 1951. The dam was modified in 2004 to raise the flood control pool by 5 feet. (The pool raise was part of the Sheyenne River project.)

3. The Orwell Dam provides water storage for flood control and water supply on the Ottertail River. The dam was included in the Corps' 1947 comprehensive plan for the Red River basin and authorized by the Flood Control Acts of 1948 and 1950. Construction of the dam was completed in 1953; it provides 8,600 acre-feet of storage.

4. Fargo levees: The Corps participated in a permanent flood control project completed in Fargo in 1963. The project was recommended in the Corps' 1947 comprehensive plan for the Red River basin and authorized by the Flood Control Acts of 1948 and 1950. The project included four channel cutoffs, the Midtown Dam, and a 3,500-foot levee east of Fourth Street South between First Avenue South and Tenth Avenue South. The top of levee is at approximately a 40.0-foot stage. The city later extended the levee south to Thirteenth Avenue. Fargo has several other publicly and privately owned sections of levee throughout the city. The current line of protection has top elevations that vary from a stage of 30 feet to 42 feet, but several reaches are

at or below 37 feet. (Note: the proposed new FEMA 1-percent-chance flood stage is expected to be approximately 39.3 feet.)

5. Moorhead levees: There are no federally constructed levees in Moorhead. The Corps proposed an 1,800-foot-long levee in the 1947 comprehensive plan for the Red River basin. It was authorized by the Flood Control Acts of 1948 and 1950, but the city declined to participate in the project. The city has built four small levees and several lift stations and control structures on storm water lines that can be closed or operated during high-water events. The city has also installed valves on the sanitary sewer lines at several individual flood-prone residences to prevent floodwater from inundating the system. The city also builds emergency levees when necessary.

6. The Sheyenne River project was authorized by the 1986 Water Resources Development Act. The project originally included four components: a 5-foot raise of the Baldhill Dam flood control pool; a dam to provide approximately 35,000 acre-feet of storage on the Maple River; a 7.5-mile flood diversion channel from Horace to West Fargo, North Dakota; and a 6.7-mile flood diversion channel at West Fargo. The Southeast Cass Water Resource District and the St. Paul District, Corps of Engineers, signed cost share agreements for the West Fargo Diversion project in 1988 and the Horace to West Fargo Diversion in 1990. The projects were essentially completed in 1993 and 1994. A pump station was added to the West Fargo project in 2003 and emergency generators were provided in 2007. The Maple River dam was deauthorized in 2002 for Federal participation, and the Southeast Cass Water Resource District completed the project without Federal assistance in 2007. These projects protect the cities of Horace and West Fargo and the west side of Fargo from Sheyenne River flooding. From Horace to West Fargo, the system is designed for a 1-percent-chance event plus 2 feet. At West Fargo, the channel and left bank levee contain the 1-percent-chance event plus 2 feet, and the right bank levee is higher, providing the city with protection from the Standard Project Flood plus 3 feet. Although these features reduce the risk associated with Sheyenne River flooding, these cities are still potentially affected by floods on the Wild Rice and Red Rivers that are larger than the 1% chance event.

7. A Section 208 (1954 Flood Control Act) clearing and snagging project was completed in Fargo-Moorhead in 1991 to remove trees affected by Dutch elm disease. Dead and dying trees were removed along a 9.7-mile reach of the Red River of the North.

8. Three Section 14 (1946 Flood Control Act) emergency streambank protection projects were completed in Fargo between 2001 and 2003. Erosion from the Red River of the North occurred at three separate project locations. At Reach A, erosion along 4,100 feet of riverbank threatened a levee near 37th Avenue. At Reach B, erosion along a 950-foot reach threatened Kandi Lane and North Broadway and utilities located beneath them. At Reach C, erosion along a 1,900-foot reach threatened Elm Street between 13th and 17th Avenues North and the utilities located beneath it. The erosion progressed to within 50 feet of the roadway. The projects involved shaping the banks and placing rockfill or granular fill and riprap along the eroded areas.

9. Two Section 206 (1996 Water Resource Development Act) aquatic ecosystem restoration projects were implemented to improve fish passage over two dams on the Red River within the metropolitan area. Rock slope fishways were constructed at the 12th Avenue North Dam and the 32nd Avenue South Dam in 2002 and 2004, respectively. A similar fishway was constructed at the Midtown Dam in 1998 without Corps construction assistance.

10. A Section 205 (1948 Flood Control Act) small flood control project is under construction for Fargo's Ridgewood neighborhood. The project will tie into a recently reconstructed floodwall at the Department of Veterans Affairs hospital.

1.3 DEFINITION OF AN ENVIRONMENTAL IMPACT STATEMENT

An EIS is a written document required by NEPA to be prepared for "major federal actions significantly affecting the quality of the human environment." Major federal actions are defined in the regulations implementing NEPA as actions "with effects that may be major and which are potentially subject to Federal control and responsibility" (40 CFR 1508.18). An EIS describes the purpose and need for an action, any alternatives that were considered in detail (including no action), the nature of the environment to be affected, and the nature and significance of the environmental effects of a proposed action and alternatives. Mitigation measures must also be described for any effects determined by the agency to be significant under the standards set in the regulations.

1.4 DEFINITION OF SCOPING

Scoping is a vital part of the NEPA process, and is one of the first steps undertaken when planning an EIS.

- It is an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7).
- It provides agencies with a method to determine the scope of analysis in an EIS, meaning the nature of the actions, the alternatives, and the impacts to be analyzed.
- It helps agencies to "identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review" (40 CFR 1501.7).
- It involves Federal, State, and local agencies, affected Indian tribes, the proponent of an action, and other interested persons (40 CFR 1501.7).
- It is one of the 17 methods of reducing excess paperwork, and one of the 12 methods for reducing delay, as outlined in the regulations implementing NEPA (40 CFR 1500.4 and 1500.5).

No standard format for scoping exists. Agencies have wide discretion in conducting scoping, as long as they get the results needed to continue the NEPA process. The USACE chose to hold meetings with other agencies and officials, and with the public. In addition, written comments were solicited through the Federal Register notices, announcements in local media, and the USACE web pages.

1.5 HOW THIS SCOPING DOCUMENT WILL BE USED

For a complex project such as the Fargo-Moorhead Metro study, it is important to define at the outset what specific environmental studies need to be reviewed or conducted before a decision is made. This Scoping Document, based on oral and written input from Federal, State, and local agencies, and other interested persons, describes the scope of actions, alternatives, and impacts to be studied in the Fargo-Moorhead Metro EIS and identifies the significant environmental issues that will be studied in detail, as well as those that are not significant or that have been covered elsewhere.

1.6 INPUT ANALYZED FOR THIS SCOPING DOCUMENT

Input analyzed for this Supplemental Scoping Document came from four sources:

1. Meetings with Federal, State, local agencies, and other entities.

2. A series of four public meetings, two held in November 2008 and two held in May 2009.

3. A scoping meeting held in May 2009.

4. Written comments submitted by agencies, organizations, and the interested public.

1.7 PROJECT STATUS UPDATE

1.7.1 Purpose and Need

The Purpose and Need Statement reads as follows: "The purpose of the proposed action is to reduce flood risk, flood damages and flood protection costs related to the flooding in the Fargo-Moorhead Metropolitan area."

1.7.2 Objectives

1. Reduce flood risk and flood damages in the Fargo-Moorhead metropolitan area.

2. Restore or improve degraded riverine and riparian habitat in and along the Red River of the North, Wild Rice River (North Dakota), Sheyenne River (North Dakota), and Buffalo River (Minnesota).

3. Provide additional wetland habitat in conjunction with other project features.

4. Provide recreational opportunities in conjunction with other project features.

1.7.3 Alternative Update

The proposed alternatives to address the flooding in the Fargo-Moorhead Metro area are as follows: The USACE will identify and evaluate the proposed actions and alternatives in the EIS, which will be prepared according to federal NEPA regulations. The USACE will evaluate in detail only those alternatives that meet the purpose and need, as discussed earlier. The alternatives to be evaluated by this EIS are described below.

Alternatives

No Action: Continue emergency measures

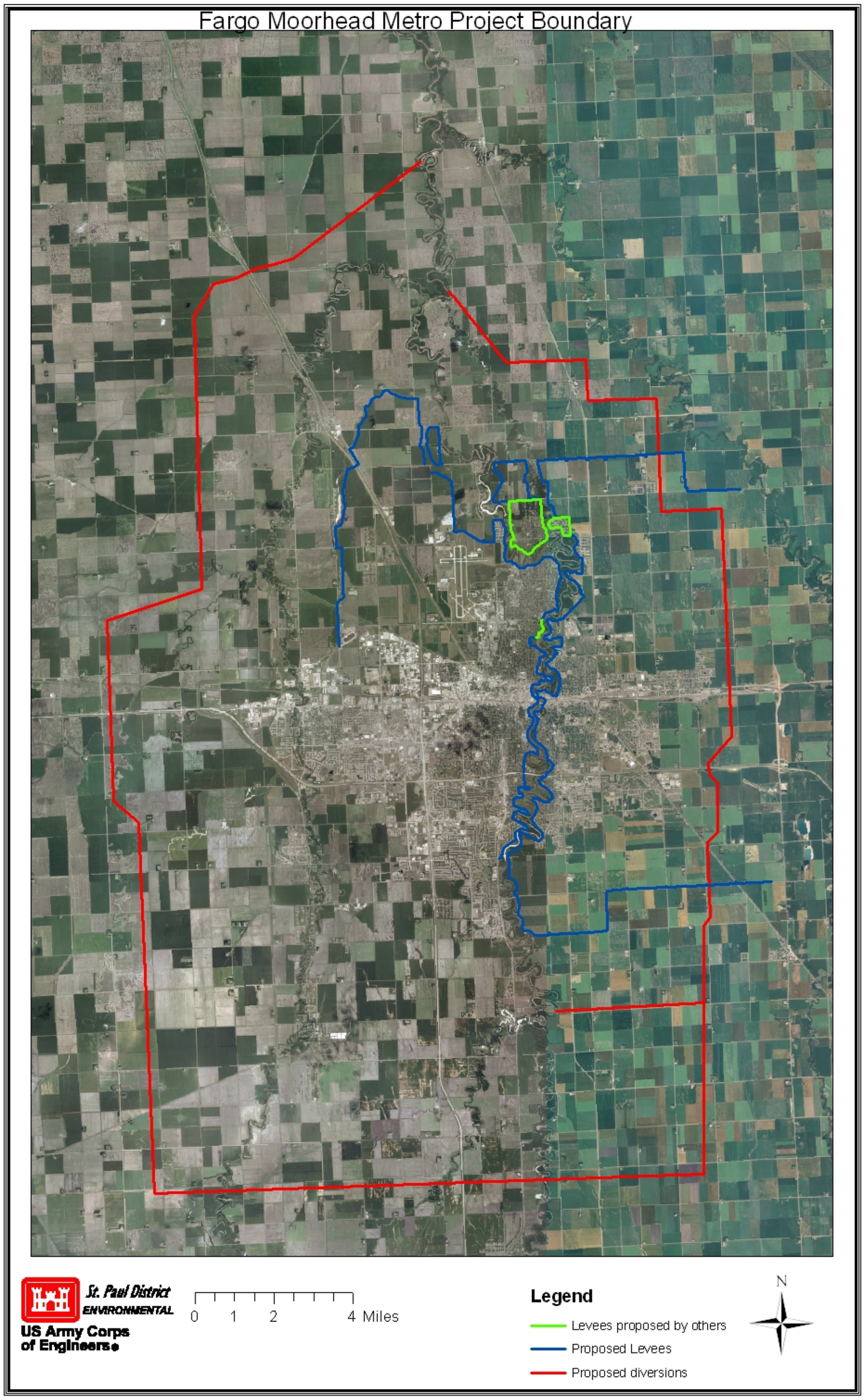
- Nonstructural measures
  - Buy and relocate flood-prone structures
  - Flood-proofing
  - Elevate structures
  - Flood warning systems
  - Flood insurance
  - Wetlands
  - Grasslands
  - Pay landowners for water retention

- Flood barriers
  - Levees
  - Floodwalls
  - Invisible floodwalls
  - Gate closures
  - Pump Stations

- Increase conveyance
  - Diversion channels around the study area
  - In Minnesota
  - In North Dakota
- Increase conveyance in Oakport Coulee
- Cutoff channels (to short-cut existing meanders)
- Flattening the slopes on river bank
- Replacing Bridges
- Underground tunnels
- Interstate 29 viaduct
- Dredge river deeper and wider

- Flood storage
  - Large dams upstream
  - Distributed storage
  - Controlled field runoff
  - Storage ponds, also used for water conservation

Figure 1 Fargo-Moorhead Metro Feasibility Study Area



2.0 SCOPING AND PUBLIC MEETING INFORMATION

2.1 PURPOSE OF MEETINGS

As part of the scoping process, the USACE, conducted 4 public meetings: two in Fargo N.D. and two in Moorhead, MN. In addition, an agency scoping meeting was held in Fargo, North Dakota. These meetings were held in November 2008 and May 2009 by the USACE to facilitate public involvement for the project and to supplement the NEPA scoping process conducted for the Fargo-Moorhead Metro project.

The introductory meetings held in Moorhead, MN on November 17, 2008 and Fargo, ND on November 18, 2008 were held to introduce the public to the Fargo-Moorhead metro feasibility study, and to inform the public about the activities that would be undertaken in the following months to formulate a plan of action for the Fargo-Moorhead Metro region.

The purpose of the May meetings was to update the public on the current status of the study, to seek any comments regarding the alternatives that the USACE would be carrying into the next phases of the study, and to identify any issues associated with those alternatives. The public was also asked if there were any additional alternatives, concerns, or issues that should be examined. These meetings served to fulfill part of the USACE scoping requirements under NEPA. In addition to accepting oral and written comments at the meetings, the USACE also accepted comments by mail and electronic mail (e-mail).

The goals of the public involvement process are to inform and educate the public and to solicit feedback throughout the planning and design process. The methods used to achieve the goals of the public involvement plan include informing and educating the public about the project in order to identify their concerns. This public involvement process also functions for NEPA scoping as required by the Council on Environmental Quality (CEQ). Scoping requirements are quite specific as described in 40 CFR, Section 1501.7. Of particular importance are the requirements to invite participation by affected Tribal, Federal, State, and local agencies, and other interested individuals or groups; to determine the scope and the significant issues to be analyzed in depth in the Environmental Impact Statement (EIS); and to determine alternatives to be addressed in the EIS.

The meeting notes in Appendix A provide a summary of the oral and written comments received during the comment period for the public scoping meetings. These meeting notes identify the general themes and trends of verbal and written comments received at the meetings. Appendix B contains the written comments that were received at the meetings or during the comment period. Appendix C contains the verbal questions and answers from the public meetings and the scoping meeting.

2.2 MEETING INFORMATION

The meeting dates, times, the approximate number of attendees and meeting locations are shown in Table 1. At the meetings, the USACE presented an overview of the project and project status, identified how comments should be submitted, and then opened the meeting for questions and answers followed by formal comments and statements. The USACE also accepted mailed (or e-mailed) written comments.

TABLE 1

PUBLIC SCOPING MEETINGS SCHEDULE

Location	Date	Time	Attendees	Meeting Location
Moorhead , MN	November 17, 2008	7:00 p.m.	50	City Council Chambers
Fargo, ND	November 18, 2008	7:00 p.m.	40	Prairie Rose Inn
Fargo, ND	May 19, 2009	5:30 p.m.	115	The Centennial Hall Fargo N.D.
Fargo, ND	May 20, 2009	10:00 a.m.	44	The Centennial Hall Fargo N.D
Moorhead, MN	May 20, 2009	5:30 p.m.	140	Hanson Theatre University of Minnesota Moorhead Campus, MN

3.0 UPDATED SCOPING SUMMARY

3.1 GEOGRAPHIC SCOPE OF ANALYSIS

The geographic scope of analysis for the environmental impacts of the proposed action and alternatives consists of the Fargo-Moorhead Metropolitan region, located within the area from approximately 12 miles west to 5 miles east of the Red River and from 20 miles north to 20 miles south of Interstate Highway 94. This includes the Red River and the downstream portions of the Buffalo River, Wild Rice River (ND), Sheyenne River, Maple River, Rush River and other contributing streams that enter the Red River in the study area (Figure 1). In North Dakota the study area includes a portion of Cass County and the cities of Fargo, West Fargo, Hickson, Oxbow, Wild Rice, Frontier, Briarwood, Prairie Rose, Horace, Reiles Acres, and Harwood. In Minnesota the study area includes a portion of Clay County and the cities of Moorhead, Dilworth, Oakport, Rustad, Kragnes and Georgetown.

3.2 SCOPE OF ALTERNATIVES

The following measures will be evaluated in the EIS, and their potential effectiveness discussed. Detailed analyses and project design may result in changes in project features.

1. **Future Without the Proposed Project**: The measures identified with this alternative are the base condition upon which other alternatives are to be compared for impact assessment under NEPA. This alternative assumes that the types of emergency measures currently being pursued in the project area will continue to be implemented as necessary due to flooding. These emergency measures include such actions as raising levees to protect the cities of Fargo, ND and Moorhead, MN as well as surrounding cities, constructing temporary levees and floodwalls in various areas, and sandbagging.

2. **Levee/Floodwalls:**
   This feasibility study evolved from the City of Fargo's initial request that the Corps study a levee and floodwall plan to protect the city's downtown area. The communities in the study area have historically relied on both temporary and permanent levees to prevent flood damages, and they have been largely successful.

   The City of Fargo is developing a levee/floodwall plan for a large area south of Interstate Highway 94 between the Red River, Wild Rice River and Sheyenne River. The plan, called the Fargo Southside Flood Control Project, is being designed to be certified to FEMA as providing 100-year level of protection to the area. For this feasibility study, the proposed Fargo Southside Flood Control Project will be considered as one potential alternative.

   The City of Fargo has also investigated levee/floodwall alternatives to provide a continuous line of protection to the entire city at a 100-year level of protection. Their preliminary plans also proposed levees on the Moorhead side to mitigate for potential increased water levels caused by the Fargo levees. These studies have shown that the flood plain is very flat and only slightly above the 100-year flood elevation, so there is very little ground high enough to match a "100-year plus freeboard" elevation. Consequently, levees must be extended several miles away from the river in order to provide sufficient height to account for risk and uncertainty. It would be difficult to provide a certifiable level of protection higher than 100-year level using levees due to the general lack of high ground to tie into.

Levees and other properly designed and constructed flood barriers can prevent damages from most flood events that do not exceed their maximum design event. However, flood events may overtop the barriers or cause unexpected breaches at levels below the design event, leading to catastrophic failure of the system. For that reason, there is always residual flood risk to areas "protected" by flood barriers, and that risk is often misunderstood or ignored by people using those areas. Levees may confine the river and significantly affect river stages upstream, particularly for very large flood events.

This feasibility study will evaluate levee and floodwall features alone and in concert with other potential measures as part of a flood risk management system for the study area.

3. Diversion Channels:

Diversion channels could be used to route flood flows around the metropolitan area, thus reducing stages in the natural channel through town. Diversions have been employed successfully on other projects in the Red River Basin, including projects at Breckenridge, MN, Grand Forks, ND / East Grand Forks, MN and, most notably, Winnipeg, Manitoba. A diversion channel is being proposed as part of the recently approved Roseau, MN project.

During Phase 1 of this study, a preliminary design was developed for a diversion channel on the Minnesota side of the Red River. Other potential alignments will be investigated during the study (Figure 1), including alignments in both Minnesota and North Dakota, and incorporating the existing Sheyenne Diversion from Horace to West Fargo.

Diversions generally provide better risk reduction than levee/floodwall alternatives, because they cannot fail suddenly and catastrophically like a flood barrier can. If a diversion fails to perform, flood stages are no higher than they would have been without the project in place. However, diversions do not eliminate flood risk, and they are not fool-proof measures. Significant residual risk often remains from flood events larger than the design event, and there is potential for blockage of the channel due to ice and debris.

Diversions must be carefully designed to avoid increasing stages upstream or downstream. They must also be designed to avoid or minimize environmental impacts. It would be possible to build aquatic habitat into a diversion alternative, thereby increasing wetland functions in the study area.

4. Nonstructural Measures:

a. Relocation of Structures:

This measure allows for moving structures as part of the project and buying the land upon which the structures are located. It makes most sense when structures can be relocated from a high flood hazard area to an area that is completely out of the flood plain. As discussed above, this is not possible within Fargo and may not be possible within Moorhead. Therefore, any structure relocation would consist of moving the structure from an area of high flood hazard to an area of lower flood hazard and then using the nonstructural measure of elevation to achieve the desired level of flood risk reduction within the metro area. Development of relocation sites where structures could be moved to achieve the planning objectives and retain such aspects as community tax base, neighborhood cohesion, etc would be investigated as being part of any relocation project. This measure is applicable anywhere in the metro area.

b. Buyout and Demolition of Structures:

This measure requires buying the structure and the land as part of the project. The structure is either demolished or sold to others and relocated to a location beyond the flood plain, all as part of the project. This measure will be considered, and is applicable anywhere in the metro area. Ecosystem restoration and/or recreational amenities could be pursued on the purchased lands for either this option or the Relocation of Structures option.

c. Elevation of Structures:

This measure requires lifting the structure above a particular flood event. In the metro area, the most acceptable elevation measure might be on extended foundation walls. Since most of the structures to be elevated have basements under them, the concept would be to elevate the basement off the ground. Then, depending on the design flood elevation, the elevated basement could be fully developed if the basement floor was above the Flood Insurance Rate Map (FIRM) base flood elevation (BFE) or the design flood elevation, whichever is higher. Basements could be kept undeveloped and wet flood-proofed to equalize hydrostatic force, or could be developed with more comprehensive wet flood-proofing concepts. Owners with fully developed pre-elevated basements would be compensated if the post-elevated basement cannot be developed. This measure is applicable anywhere in the metro area unless the required elevation is greater than 15 feet above the adjacent grade. Velocity and hydrodynamic force would also have to be considered. This measure is generally applicable throughout the metro area depending on flood depth and floodway location.

d. Removal of Basement:

This measure requires filling the existing basement without elevating the remainder of the structure. This would occur if the structure's first floor was above the BFE or above the design elevation, whichever is higher. Adding on to the side of the structure as part of the project would be possible with this measure so as to compensate the owner for the lost basement space. If the add-on is not possible due to lot constraints or because the owner opposed it, compensation for the lost basement space would be in order to the owner. This measure would only be applicable where the design flood depth is relatively small [first floor already above the design depth]. Hydrodynamic force would also be a consideration. This measure is applicable throughout the metro area.

e. Dry Flood Proofing

This measure concerns water-proofing the structure. This can be done to residential structures as well as all other types. This measure achieves flood risk reduction but it is not recognized by the National Flood Insurance Program (NFIP) for any flood insurance premium rate reduction if applied to residential property. Based upon tests at the Corps Engineering Research and Development Center (ERDC), a "conventional" built structure can generally only be dry flood proofed up to three feet on the walls. A structural analysis of the wall strength would be required if it was desired to achieve higher protection. A sump pump is required and perhaps a French drain system is installed as part of the project. Closure panels are used at openings. This concept does not work with basements. It will not work with crawl spaces in the metro area due to the long duration of flood. This measure will work in the metro area if design flood depths are generally less than three feet and on an appropriate structure as discussed. Hydrodynamic force would also be a consideration. This measure has potential applicability throughout the metro area.

f. Wet Flood Proofing

This measure is applicable as either a stand alone measure or as a measure combined with other measures such as elevation as discussed above. As a stand alone measure, all construction materials and finishing materials need to be water resistant. All utilities must be elevated above the design flood elevation. Because of these requirements, wet flood proofing of finished residential structures is generally not recommended. Wet flood proofing is quite applicable to commercial and industrial structures when combined with a flood warning, flood preparedness, flood response plan. This measure is generally not applicable to large flood depths and high velocity flows.

g. Berms, Levees, and Floodwalls

This measure is applicable to locations within the metro area. As nonstructural measures, berms, levees and walls are generally no higher than 6 feet above grade and are not certifiable for the NFIP meaning that flood insurance and flood plain management requirements of the NFIP are still applicable in the protected area. These nonstructural measures are intended to reduce the frequency of flooding, but not eliminate flood plain management and flood insurance. These measures can be used for all types of structures in the metro area. They can be around a single structure or a small group of structures. With application of these measures to be nonstructural, they cannot raise the water surface elevation of the 100 year flood by any more than 0.00 feet. These measures must be placed with velocity in mind.

h. Flood Warning, Preparedness, Evacuation Plans and Pertinent Equipment Installation

These measures are applicable to the metro area. All of the above nonstructural measures with the exception of buyout and of relocation to a completely flood free site require the development and implementation of flood warning/preparedness planning. The development of such plans and the installation of pertinent equipment such as data gathering devices [rain gages, stream gages], data processing equipment [computer hardware and software], and dial out devices [cellular, land line] can be part of the project.

i. Land Acquisition

Land acquisition can be in either the form of fee title or permanent easement with preference to fee title. Land use after acquisition is open space use via deed restriction that prohibits any type of development that can sustain flood damages or restrict flood flows. Land acquired as part of a nonstructural project can be converted to a new use such as ecosystem restoration and/or recreation that is open space based such as trails, canoe access, etc. Conversion of previously developed land to open space means that infrastructure no longer needed, such as utilities, streets, sidewalks, etc., can be removed as part of the project. The conversion to new use [ecosystem restoration and/or recreation] can also be part of the project. By incorporating "new uses of the permanently evacuated flood plains" into the nonstructural flood risk reduction project, the economic feasibility of the buyout or relocation is enhanced. This is due to partial transfer from flood risk reduction costs to ecosystem restoration, and also by adding benefits [and costs] of recreation. This will be determined by use of the "Separable Costs/Remaining Benefits" guidance. Other Federal agencies such as the NRCS have permanent easement programs to restore wetlands in "evacuated" flood plains that could be used in a collaborative mode with a Corps nonstructural program.

j. Flood Plain Management Plans

A flood plain management plan [FPMP] is required of the Corps non-Federal project sponsor. The intent of a FPMP is to "protect" the Corps partnered project from diminishing the frequency of flood risk reduction provided by the project. This is a non-Federal sponsor-required activity but, if done during the feasibility phase of study, can be cost shared on the same basis as the feasibility study. This makes sense for the local sponsor from the cost share and also from the holistic flood risk reduction perspective. This latter perspective makes sense for the Corps as well. By integrating the FPMP with the feasibility study, both the FPMP and the ultimate project are bettered. This should be done within this feasibility study.

k. Vertical Construction for Residential Occupancy

This concept refers to condominium living within flood plains, where the at-grade floor is used for open-space uses and the upper stories (which are all above even the most infrequent flood) are used for residence. This vertical construction is proposed for consideration within the metro area, especially in Fargo, because no area within a close proximity to Fargo is high enough above the Red River flood plain, or that of its tributaries, for flood-free residential construction. This may be the same for Moorhead. This concept to change residential construction from single family homes to vertical construction will probably face tough political/social criticism. However, it merits consideration if the metro area is to achieve a No Flood Risk status in the long term.

5. Flood Storage

Flood storage involves both preserving natural flood plain areas and also building dams and other water retention facilities to hold water during flood events. Natural storage in the floodplain occurs as the water rises and fills up low-lying areas adjacent to the rivers. Constructed flood storage projects (impoundments) can be located on the main channel of a river or "off-channel" on a ditch or other man-made connection to a river. Impoundments may be designed to remain dry until a flood event or to retain a pool during non-flood times for conservation or water supply purposes. The effectiveness of flood storage depends on many factors, including distance from the benefited area, volume of water retained, timing of the storage, size of the drainage area controlled, and the amount of runoff contributed from the controlled area during each particular flood event.

There are three existing Corps-owned flood storage projects in the Red River Basin that benefit the study area: Lake Traverse, Orwell Lake, and Lake Ashtabula. Opportunities exist to build additional flood storage, but previous studies have found insufficient Federal interest to support Federal involvement in such projects. The studies have also shown that flood storage alone cannot provide an acceptable level of risk reduction for the Fargo-Moorhead metropolitan area.

The St. Paul District's Fargo-Moorhead and Upstream Area Feasibility Study is currently assessing the viability of multi-purpose projects to provide both flood storage and aquatic ecosystem restoration. Phase 1 of that study determined in 2005 that it may be possible to build 400,000 acre-feet of flood storage in the watershed using projects of 2,000 to 20,000 acre-feet each. An impoundment downstream of White Rock Dam near the ND/SD border that could provide up to 60,000 acre-feet of storage was also considered. (Note: this is the most storage the study team thought possible, due to limits of topography and landowner willingness.) Such a system of impoundments could reduce the flood stage in Fargo-Moorhead by up to 1.6 feet. The economic benefits of the system have not been fully assessed, but preliminary analyses showed that the National economic development benefits in the Fargo-Moorhead metropolitan area would equal less than one third of the cost, so it appears unlikely that there is sufficient Federal interest based solely on flood damage reduction. It should be noted, however, that lack of Federal economic justification does not imply that flood storage should not be built or is not justified from a Regional or local perspective. On the contrary, it is probable that local jurisdictions will find compelling reasons to construct flood storage projects.

Despite the lack of Federal financial involvement, the Cass County Joint Water Resource District recently built a dam on the Maple River upstream and approximately 35 miles southwest of Fargo, ND. The Bois de Sioux Watershed District in the headwaters of the Red River Basin and the Buffalo-Red River Watershed District are also designing and constructing flood storage projects. These smaller projects provide incremental benefits, but they are not sufficient to prevent major flood damages in the Fargo-Moorhead Metro area.

It is likely that additional flood storage will be built upstream of the study area, but that storage alone is not likely to adequately reduce flood risk to the study area over the next 50 years.

6. Tunneling

A series of tunnels underneath the city was proposed. Potential advantages cited for the concept include: this would require very little real estate acquisition, very little bridge or road building or modification, and the soil in the project area is very soft and would be easy to bore.

7. Bridge Replacement or Modification

Bridges can restrict the flow during flood events. The study will assess the effects of existing bridges and consider modifying them or re-constructing bridges to allow more flow through and prevent the backing up of water.

8. Interstate 29 viaduct

Reconstructing the Interstate 29 corridor to serve as an open viaduct during floods was proposed. The reconstructed corridor would function as an interstate highway during non-flood times.

9. Dredging and Widening the River

Digging the Red River channel deeper and wider will allow for more flow to pass through the Fargo-Moorhead Metro area was proposed. This alternative could also be looked at underneath existing bridges to prevent the damming effect the bridges can create.

10. Wetland and Grassland Restoration

Restoration of grassland and wetlands to reduce peak runoff and serve as water storage during flooding events was proposed.

11. Cut-off channels

Building cut-off channels across meanders in the cities was proposed. This would provide the water a straighter path through the city and potentially reduce peak stages.

12. Sustainability Alternative

This alternative would include a combination of non-structural (Alternatvie 4), wetland restoration (Alternative 10) upper basin storage (Alternative 5) and cropping-landuse changes.

13. Combinations of the Above Alternatives

The alternatives listed above will be assessed in combination with other alternatives.

3.3 SCOPE OF ISSUES TO BE ADDRESSED IN THE EIS

The USACE has identified issues that would need to be addressed in the EIS through input from public scoping meetings in 2009 and internal and interagency meetings, discussions, and correspondence. Many issues, such as cultural resources and relations with other states and nations, must be addressed due to some form of legal requirement (law, Executive Order, regulation, treaty, or other agreement) and will be covered in the EIS to the extent necessary to ensure that these legal requirements are fully met. Examples include procedural coordination concerning any identified threatened or endangered species and cultural resources.

Based on the scoping process and the analysis of written and oral comments received as part of the scoping meetings, the USACE has determined which issues will be evaluated and which will be summarized in the EIS.

3.3.1 Significant Issues to be Evaluated in the EIS

The following issues were identified by the USACE through input from public scoping meetings and agencies as significant, requiring evaluation in the EIS. The importance of these issues may change as the EIS process proceeds.

3.3.1.1 Downstream Water Quality

This issue includes questions about sulfates, total dissolved solids, mercury, and other water quality parameters in the Sheyenne, Wild Rice, Buffalo, Rush, and Red Rivers.

3.3.1.2 Downstream and Upstream Water Quantity

This issue includes downstream and Upstream flooding both with and without storm events, questions regarding specific water levels at specific locations on the Sheyenne, Wild Rice, and Red Rivers, and discussions on water storage impacts.

3.3.1.3 Buffalo River Aquifer

This issue concerns the East side diversion alternative. There is concern that the Buffalo River Aquifer may be negatively impacted.

3.3.1.4 Social Issues

This issue includes impacts to neighborhoods, homeowners, farmers, and other residents within the study area.

3.3.1.5 Economic Issues

This issue includes questions about infrastructure impacts (such as sewers, roads, and levees), as well as specific issues around tax base, economic viability of businesses (including farms), and the effects on agriculture and other businesses. It also includes issues about cost-benefit and other standard economic analyses.

3.3.1.6 Flood Fighting

This issue includes how the current and historical flood fights affect the planning for a permanent flood control project.

3.3.1.7 Environmental

This issue includes potential effects on any threatened or endangered species that may occur in the geographic scope of analysis. This issue will be analyzed due to legal requirements related to Federal threatened and endangered species.

3.3.1.8 Wetlands

This issue includes the potential for reclaiming wetlands or, at a minimum, maintaining the existing wetlands.

3.3.1.9 Land use and Floodplain growth

This includes floodplain development, protecting land for development purposes, and existing land use versus future land uses.

3.3.1.10 Downstream Erosion and Sedimentation

This issue includes impacts to riverbanks and shorelines on the Red Rivers and its tributaries within the study area. It involves questions about bank stabilization (mitigation), severity of erosive effects, overbank flooding, elevation of the floodplain, effects on river stage, short- and long-term water level changes and combined discharges.

3.3.1.11 Cultural Resources

This issue includes potential effects on archaeological and historical resources (including traditional cultural properties) that may be eligible for the National Register of Historic Places. This issue will be analyzed due to legal requirements.

3.3.1.12 Fish Passage

This issue includes how fish passages will be impacted by selected alternatives. Will existing passage ways be influenced?

3.3.1.13 Flooding

This issue includes the environmental benefit of some lighter level of flooding; some fish species depend on it.

3.3.1.14 Downstream Aquatic Resources

This issue includes topics related to fishery health, effects on riverbank (riparian) vegetation, Red and Sheyenne River fishery, mussels and plankton, and other nutrients.

3.3.1.15 Fargo Southside Project

This includes the Fargo Southside project being developed by the city of Fargo; many folks think this project and the Fargo-Moorhead Southside project have similar purposes.

3.3.1.16 Executive Order 11988

This issue includes undeveloped lands that may be inside the protected area as a result of the project constructed.

3.3.1.17 Natural Resources Habitat

This issue includes natural resource habitat along the entire impacted area.

3.3.1.18 Slope Stability

This issue includes slope stability along all impacted river corridors in the study area.

3.3.2 Issues to be Summarized or Not Addressed in this EIS

The following issues were identified as not significant, not significantly impacted by the project or beyond the scope of analysis for this EIS. They will be summarized in the EIS or dismissed as not significant.

3.3.2.1 Noise

Noise was not identified as a significant issue.

3.3.2.2 Air

Air was not identified as a significant issue.

3.3.2.3 Mineral Resources

Mineral resources were not identified as a significant issue.

3.3.2.4 Energy Production

Energy production was not identified as a significant issue.

3.4 ADDITIONAL COMMENTS

Many oral and written comments were received at the public meetings, along with numerous technical questions that were responded to at the meetings by USACE and the sponsors from Fargo and Moorhead.

APPENDIX A

COMMENT SUMMARY
SCOPING MEETINGS

TABLE OF CONTENTS

SCOPING MEETING COMMENT SUMMARY
Fargo Moorhead Metro Study

This appendix summarizes the general trends and themes of verbal comments presented at the meetings and contained in written comments during the public comment period. Comments have been divided into categories or issues. Written comments are included in Appendix B. Where a comment was summarized from a written comment, the written comment identification code is noted. The written comment identification code is composed of:

- Submittal date code (e.g., April 20, 2009=090420).
- Name of commenter (if known).

This code allows the reader to identify and review written comments in Appendix B related to the summaries presented here. Comments without the code were summarized from verbal comments made at the meetings. Written comments read at the meetings are summarized under the written comments section for each issue and can be found in Appendix C. Some comments can be found under more than one issue.

1.0 TIMING/SCHEDULE

1.1 VERBAL COMMENTS SUMMARIZED FROM SCOPING MEETINGS

What is driving the timeline? How is this coordinated with the Fargo Southside Project?

If the diversion project proceeded in 2012, what would be the completion date?

It appears that the earliest the project would be constructed would be 10 years from now. How can we protect ourselves in the meantime?

2.0 SCOPE OF ALTERNATIVES/GEOGRAPHIC SCOPE OF ANALYSIS

2.1 UPPER BASIN STORAGE

2.1.1 Verbal Comments Summarized From Scoping Meetings

Waffle Storage concept should be reconsidered where farmers are paid for storage when needed.

I don’t understand levees. What is wrong with building dams like the Garrison Dam?

Timing is also an issue if water can be retained at its origin. The time between the pre-crest level and the post-crest level was a few hours – if water can be retained even that long, the peak should decrease.

Are we still considering the “waffle plan”?

2.1.2 Written Comments Submitted During the Comment Period

090417_Fitzpatrick – I am thinking of 2 to 3 overflow canals, dug to the overflow level of the river that would carry the extra water to a large pit, where the water would be pumped out and used for productive uses throughout the summer.

090519_Bach - What about off-line storage on North Dakota side south of Wild Rice? Has that been looked at? Probably need 8 to 10 sections of land, dig 20 feet deep.

090520_ Mark Nokken – Water retention to keep floods at a manageable level.

090521_Sandt – All fields should have gates on them holding water back during flood events; this would be controlled by a water board.

090606_Tweeten – Build successive weir pools upstream of affected areas. During low-flow periods the basin of the pools could be native grass to support nesting birds and other wildlife, which after time could be valued as a hunting resource.

090525_Keller – I feel permanent flood protection must include multiple solutions; in conjunction with a diversion channel I would like to see a series of large holding ponds up and down the river in both Minnesota and North Dakota.

090606_Breker – I am interested in the economic analysis in all potential upstream water retention.

090606_Ista – We need assistance to build retention on the Wild Rice River to decrease flows.

090622_NWF – The waffle project, combined with wetland restoration is also a viable alternative. The waffle plan is simple, existing roads serve as levees to store water in farmers' fields. One square mile holding water 1 foot deep will store more than 200 million gallons of water.

090624_NDWF – We ask that you please include Red River basin and watershed-wide solutions that incorporate wetlands and grasslands.

The multiple functions wetlands and grasslands can provide in holding snow, runoff water and rain can reduce pressure on levees and dams.

These natural resources can also reduce river and stream flows enough to decrease the impacts of dramatic flooding on communities.

090629_Bezek_MNDNR – The employment of water retention should be included in the mix of alternatives. Opportunities exist to increase and improve ecosystem and wetland restoration, wildlife habitat and provide recreational opportunities through the use of multipurpose water retention areas.

090630_Fetch - I propose two methods that seem to be much less expensive than a diversion and have merit in lowering flooding. One is the "waffle concept" that has been researched in detail by scientists at the University of North Dakota in Grand Forks. Clearly we can use the existing ditches by controlling runoff through the culverts in the spring.

A second method that I propose is a retention strategy that could use low-lying farmland adjacent to major rivers to hold water. If low-lying land adjacent to the Red River was purchased and a series of perpendicular ditching was cut (20 to 30 feet deep and perhaps the same width extending several hundred feet) using large backhoes or D5 Caterpillar equipment, water could be diverted and held, and pumped out later.

090709_EPA – A range of alternatives should be developed including waffle approach, enlarging floodways through land use as well as levee and channel diversions, nonstructural approaches that restore natural floodplain connectivity, including enhancement or creation of wetlands and other flood reduction techniques.

090811_FPC – We ask the Corps to review management of current water storage in dams when a 100-year+ flood is predicted. If necessary change the law or guidelines to maximize benefits for floods over the 100-year mark.

No Date_Stern – Two-way pipeline to reservoir behind Garrison – flood relief in spring, water supply in summer during dry years.

Anonymous – Build retention areas along the rivers that feed the Red. That’s where it starts. Pay the farmers to hold the water. This will cause no permanent damage to land compared to diversions or channel extensions or oversized dikes. Some floodwalls or smaller dikes will be needed in some areas.

2.2 INCREASE CONVEYANCE

2.2.1 Verbal Comments Summarized From Scoping Meetings

Can we just widen the river that’s there?

Could the regional solution include the Sheyenne Diversion, or does the existence of the Sheyenne Diversion make us go into Minnesota with a new diversion?

Where would a Minnesota diversion go?

The Sheyenne Diversion project created ponding where there was no flood problem before. Beware of creating unanticipated problems.

Could we increase conveyance through town?

Has any thought been given to buying out a larger portion of the river to create a larger river to convey more water?

Have you thought about using the I-29 corridor as a diversion?

Are you talking about diverting the entire river or would the water be diverted at a certain elevation?

How do bridges constrict the flow?

Has a study been completed that will identify the reason for the increase in flooding frequency? Could the river be dredged to create a deeper river that would increase conveyance?

If bridges are a constriction along the river, why are we not looking at reconfiguring the pilings like on the LA River? Can we have a standardized measuring system for stages given that there are variations in stage measurements? I am in favor of dredging and straightening of the Red River.

How do you accommodate traffic over a 2,000-foot-wide ditch? Why wouldn’t the diversion channel go through Fargo on the west?

The diversions go through dry land. Why can’t they be located in areas where the land is wet?

2.2.2 Written Comments Submitted During the Comment Period

090519_Kathy Laney – I vote for a diversion: long-term solution, allows Fargo-Moorhead to still be a river city, provides protection to surrounding small communities. Start now! If we could sell our home we would move out of community.

090519_Charles D. Dunnell – Number one choice is: diversion channel, second choices modify or add onto the West Fargo diversion.

090520_Olson - I resent the diversion planned on my property: (Stanley Township, South of County 14, Sections 25 and 26). This is devastating to the beautiful farmstead (which has been in our family since the 1880s) the tranquility and beauty of the river, the adjacent wooded area and the farm acreage. It is difficult for me to believe that this type of devastation could be handed to me.

It is not true that I am not interested in flood control. If need be, I will approve the planned dike (wet side) on the west rim of the property.

I chose to not develop my property. Others did, knowing they were in harm's way.

090520_A Saharieff – Please consider: dredging the river under the three bridges; Main Avenue, NP Avenue, and the Railroad trestle. Also design and build torpedo-shaped flow accelerators in front and behind the bridge support abutments. Flow must be enhanced for levees to work. Please consider dredging and cross cutting the river channel

090520_Koppang – I drew out the diversion option on the Minnesota side during a lull in this year's flood battle. My drawing closely mimics the drawing the Corps provided at the public meeting for the east side diversion.

090520_Neuhauser - One of three options would be to divert the water around town, but this would be expensive due to land acquisitions, bridge and road construction, and very time consuming.
What I am proposing is a tunnel system underneath the city. Very small land acquisition, very little bridge and road construction, and the soils are easy to bore through.

090520_Deanne Sperling – Diversion seems the most practical solution.

090520_Gary Shramstad – I suggest a diversion of the Sheyenne from McVille to the Red River north of Grand Forks. This would alleviate flooding on the Sheyenne and Red, since the Sheyenne headwaters are north of Bismarck. It would also solve the problem of Devils Lake overflowing.

090520_Reinke - Having attended the flood presentation at Moorhead State I believe the only real resolve to the long-term flood problem must involve some type of diversion.

Water retention and other forms of water control may offer some form of relief, but they are only band-aids to the overall problem.

It was an excellent presentation.

090519_Cousins - I feel any plan must include a diversion channel. The cities that have one seem to do well – Breckenridge, West Fargo and Winnipeg. I would like to see a combination plan, levees and a diversion channel.

A 500-foot-wide, 20 feet deep below field elevation, and a 2,000-foot top width diversion channel seems excessive.

What is the cfs for a 100-year flood and what cfs would the diversion channel handle?

What is the proposed water depth and velocity of the diversion channel?

Would a diversion channel be detrimental to anyone downstream?

090521_Linnertz – Run a diversion from the Red River around the west side of West Fargo, to include the Red, Wild Rice, and Sheyenne Rivers. Continue the same to the confluence of the Red and Sheyenne.

090521_Linnertz – Create the Red River Diversion to the east as referenced in the meeting, and create an extension of the West Fargo Diversion utilizing Drain 41.

090602_Majkrzak – I propose you consider the I-29 right-of-way as an open viaduct during major floods and as a roadway during normal flows. I also suggest a split in I-29 to create a North Dakota side and a Minnesota side; these would serve as mini diversion channels holding and forcing flows north protecting the cities from overland flooding from small creeks and coulees from the east and west directions.

090606_Lahren – Why do you need a 500-foot-wide bottom for a diversion?

090606_Sell – The diversion is the only answer! But it doesn't need to be 500 feet wide; it should be 50 feet wide. We need a 100-year solution!! The alternative of the North Dakota diversion from the Wild Rice River to north of Harwood is very good.

090608_Bergan – We need 100-year solution; the only method of flood protection that is sure to work is a diversion around Fargo-Moorhead. A 500-foot-wide bottom seems too wide; a 50-foot width is what we need. The North Dakota side may be better for political reasons.

090619_Bergan – We now know that the Main Avenue bridge acts as a dam at about 40 feet, attached pictures. At about 41 feet the water will back up and flow around both ends of the bridge and into the cities. The diversion is the only answer.

090621_Siemens – I don't understand why folks are so reluctant to put permanent flood protection in place. All the water that went through Fargo went through Winnipeg this spring. The flood waters were a non-event in Winnipeg thanks to the diversion.

Putting up floodwalls, levees, etc., is a collection of band-aids that you can never be sure will really do the job; they also require a lot of maintenance.

Defacing riverfront property with walls, levees, etc., is a horrible thing. What will happen to property values in the nicest neighborhoods in Fargo?

Originally they said it could not be done in Winnipeg either; but people with vision, foresight and determination made it happen.

It is not a question of can we do it or should we do it, the only questions should be HOW QUICKLY CAN WE GET A DIVERSION BUILT?

090622_Bergan – I have attached proposed design criteria for protection of Fargo Moorhead metro to 50 feet.

1. Where would it start and end? Wild Rice River west of I-29 and end north of Argusville.
2. What areas would be protected? Both side of the river for the length of the diversion and to some extent about 10 miles south of the inlet.
3. What cities/areas would be protected? Fargo, Moorhead, West Fargo, Oakport, Briarwood, Round Hill, Hickson, Horace, Oxbow, Harwood, and more.
4. How much would be diverted? The total flow of the Wild Rice and the overland flooding from there to West Fargo which is about one-half the flow of the Red River. Additional amounts from the Red River could be added if needed at a later time to maintain the best balance.
5. How much will the Federal Government pay? 65 percent or $650 million of a $1 billion project.
6. Where will the other money come from? States of North Dakota and Minnesota and the cities of Fargo and Moorhead.
7. Does it work? It has worked as advertised in West Fargo, Winnipeg and other areas.
8. How soon could it be started? If a diversion could be selected as the method it should shorten the process.
9. Will it take a lot of farmland out of production? No, estimate it will only take 600 acres out and change 4,000 from corn to alfalfa.
10. Why are we having these large floods? Wet cycle- see Devils Lake - 8 of 10 record floods in the last 40 years.
11. What happens if the flood exceeds the capacity of the diversion? It overflows to the west and north over farmland.
12. Does it dump water on Harwood? No – will enter the Red way north of Harwood and it is the same amount of water.
13. What is the size? It is estimated to be 20 to 30 feet deep and average 75 feet wide at the bottom and maybe 500 to 700 feet at the top.
14. Can eminent domain be used to acquire the land? Yes – same as would be needed for a levee system.
15. What is the probability of a crest over the 2009 level? The National Weather Service on 4-4-09 indicated a 10 percent chance of 44.6 feet for the second crest.
16. Should we build more dams? Valley City had a major flood this year and about 100 percent of the water from its drainage area is stored in Devils Lake or flows into the Baldhill Dam. Spillways washing out such as Clausen Springs.

Facts for a split flow diversion

1. The 1826 flood was 40 percent larger than the 1997 flood in Winnipeg. April 4, 2009, the National Weather Service said there was a 10 percent chance of a 44.6-foot crest in Fargo. Fargo-Moorhead, not just property along the river could be flooded.
2. A plan is needed to allow us a chance to survive a flood of this magnitude.
3. A 700-year flood can occur at any time – it could be next year.
4. We are in a wet cycle.
5. The Red River soil is unstable.
6. Fargo-Moorhead is the last major community in the valley with no significant permanent protection.

7. Sending one-half the water into a diversion would make fighting a large flood manageable.
8. Must have a zero possibility of over a 40-foot flood so that the Main Avenue bridge does not act as a dam.
9. The design could route any water over say 22 feet until you reach say 30 feet down the diversion then about one-half the entire flow.
10. The flow in a diversion is expected to be below ground level. Spoil banks would be more like a dike on the east side of the diversion.
11. Topping the diversion would flow west and north into fields.
12. Topping the proposed Corps levees would inundate the cities.
13. Physics – the amount of water is not increased at the outlet by the diversion.
14. Levees have many failure modes such as design flaws, shifting soil, water over or under, through, etc.
15. Squeezing the water (i.e., in levees) increases the height of the flood.
16. The slopes can be used to grow alfalfa.
17. Buyouts along the river are not required.
18. Residents of Fargo-Moorhead can feel secure during a flood.
19. Stress would be reduced and lives saved (relocating the elderly and sick).
20. Will increase values along the river and in the cities.
21. The 2009 flood had a huge negative impact on the Fargo-Moorhead economy – West Acres Mall closed for days.

090622_Feist - Please consider the diversion plan as the permanent solution for flood control, for the Fargo-Moorhead metropolitan area. One only has to look to Winnipeg to see how successful that diversion has been at protecting their city from flood waters.

090623_Satrang - I am writing to let you know that I support a diversion for flood protection of Fargo-Moorhead and the surrounding areas. The Corps of Engineers has requested public comments. The diversion is the only sure protection. We need something that will protect us against a 500-year flood level! The only method of flood protection that is sure to work is a diversion around Fargo/Moorhead. Please urge the Corps to focus all efforts on a diversion.

The 500-foot width projected for the bottom of the diversion by the Corps is too wide. A much narrower bottom width would work well based upon comparisons to the original Winnipeg diversion. This should reduce the cost significantly and would give it a favorable cost benefit ratio.

A diversion should start on the North Dakota side at the Wild Rice River as suggested by the Corps, and should be started on the west side of I-29.

Dikes and floodwalls are a very poor solution to a very complex problem.

090623_Solberg - I am writing in support of a diversion channel as the best option to protect Fargo-Moorhead from the Red River floods.

There are other alternatives out there, but I feel that the diversion channel should be the favored solution.

090624_Furness – I would like to add my voice to the growing number of people who are advocating for a significant diversion solution to the increasingly frequent flooding of the Red River.

I have been encouraging officials to search for solutions involving a combination of water storage, dike protection and diversion. Diversion, if feasible, seems like the best long term solution.

090629_Boe – We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090629_Bolin - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090629_Cosette - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090629_Finch – Why not dredge the river wider and deeper? Cement the bottom and sides to hold the banks.

090629_Halvorson - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090629_Schock - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090629_Tillman - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide, it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Altendorf - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Bender - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Bredell – I wanted to let you know that I support a diversion for the Fargo-Moorhead area. A dike system is a band-aid that will fail in time.

090630_Cronin - I am in total agreement with the group of people proposing a North Dakota diversion channel west of the city of Fargo. I have several reasons to support their position:
1) A large amount of the water entering the Red River channel comes from the west. It is logical to keep it on the west side instead of going the long way around the city.
2) Keeping the diversion in North Dakota limits the amount of political infighting that will happen when water crosses any type of border.

3) In addition to the Wild Rice River a west side channel could collect water from the Sheyenne, Maple and Rush. It offers a greater choice of design and function.
4) Being able to provide solutions to more rivers brings more people on board with the project. I don't think that many people outside of Fargo are excited about paying for Fargo's flood control with a sales tax. I know many people in my area would be in full support of the taxes and project if it offered diversion like protection for us. I also think that people would be more comfortable about helping drain Devils Lake through the Sheyenne if there was diversion protection.

090630_Forknell - As a resident of North Dakota, I am in strong support of the recently presented diversion that would run through North Dakota. The only method of flood protection that is sure to work is a diversion. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Hannaher - I am writing this note to you today to encourage you to consider a diversion as opposed to a levee system to protect the Fargo-Moorhead area.

The facts are in and my concerns are focused on the long term reliability of a levee system given that we have a soil structure that really has no structure. In my opinion even if we put pilings down to bedrock to support a levee system the risk will always be there for wash outs due to water pressure between the pilings. Those weak points would not manifest until a flood occurs again and would put the city at risk.

090630_Hegg - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn’t need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Hoefs - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn’t need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Mitchell- We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn’t need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

I have lived along the river for the past 35 years and 27 of those years there were only three floods, now since 97 it seems like every other year there is concern for our towns and property. This diversion is the only thing that makes sense to me; diking only raises the levels beside the worry of a breaching. I feel the Corp of Engineers should take a serious look at this proposal and consider the long range of PERMANENT flood control.

090630_Moen - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn’t need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Passolt - Please put the diversion project (Western Diversion) that ex-Gov.Schaefer is promoting as your #1 Option to protect Fargo-Moorhead and surrounding area.

I've read several articles about some of the alternatives and my current house is located in an area where they were proposing a dike in my backyard even before the flood of 2009. It's a good thing the proposed dike wasn't built because it would've been too low.

I believe the Western Diversion is the answer to these issues; please make it your #1 Option.

090630_Pfeiffer - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090630_Werlinger - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090701_Gates - I own a home in Fargo, and like many others in the community, I am concerned that a dike/levee solution will not provide the necessary protection that our cities require. I am sure you are aware, the best way to ensure our community is not faced with billions of dollars in flood damages when a 42 to 43 foot flood hits is a diversion through Minnesota or North Dakota.

I do not see how a levee system can offer a 99.9 percent assurance, especially considering the unpredictable nature of the Red River.

How can dikes or levees protect to 45 feet when the automobile and railroad bridges downtown start holding back water at 41 feet?

A diversion can keep the river well below 40 feet in even the worst flood, and the damage would be minimal in the event of a failure.

A diversion system can be designed that not only protects against major floods, but can keep the river below 25 feet through town during "nuisance" floods as well. The area's best parks, golf courses, and trails begin taking on damage at this level. Conversely, a dike/levee project will require many riverside property buyouts, lessen the recreational and visual appeal of the river, and it does not provide a solution for the "nuisance" floods that have become so common during the summer months.

090701_Ortmeier - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

It seems only logical to use the form of a diversion ditch rather than levees to avoid catastrophic failure due to breach.

Levee system will only funnel a higher volume of water THROUGH the communities where it can do the most damage if a breach occurs.

090702_Dickerson - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090712_Dufault - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

I live in West Fargo and it has already proved invaluable that we have a diversionary channel. It's just really too bad that the rest of the city has not had this done yet.

090714_Engler - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090715_Clasen - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090715_Heidt - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090715_Hoefs - I would like to urge you to strongly consider a diversion to protect Fargo-Moorhead from future flooding. There are many flood control options on the table right now, and I believe a diversion plan may not be getting due consideration. Given the enormous expense of fighting floods and funding flood protection the public deserves a thorough review of this proven method of flood control.

090717_Bergman - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090717_Holscher - I am writing to inform you of my support for the split flow diversion that has been recommended by the Flood Protection Coalition for the Fargo-Moorhead Community. For permanent flood protection, the advantages of the diversion far outweigh the advantages of a levee or other type of system.

Major areas that I like about the diversion are:

1. If the water level would exceed the diversion, the flooding goes to fields to the north and west and not inundating the cities of Fargo, Moorhead, West Fargo, et al.
2. There is the ability to add containment for some of the spring runoff that could be used in dry years which could negate the need for a pipeline to the Garrison Diversion.
3. We can do it all right here in North Dakota and eliminate the red tape of having to work with two states which means getting it done in a more timely fashion.

090722_Fujimoto - We need a 100-year solution! The only method of flood protection that is sure to work is a diversion. But it doesn't need to be 500 feet wide; it should be 50 feet wide. The alternative of the North Dakota diversion to start at the Wild Rice River and end north of Harwood is very good.

090722_Jensen - Here are my observations as a non-engineer:

1. The Grand Forks temporary dikes were overwhelmed in 1997.
2. The Grand Forks permanent dikes held in 2009.
3. The flood levels are becoming more unpredictable.
4. Fargo and Grand Forks temporary and permanent dikes are expensive.
5. Failure of a dike is ruinous to a community and its businesses and their futures.
6. A dike has a structural limit.
7. Diversions in West Fargo and Winnipeg have a clear history of success.
8. Diversions do not need to be rebuilt and do not increase upstream water levels.
9. Increasing upstream water levels will adversely affect farmlands.
10. Diversions assist the river to flow more freely.
11. A temporary dike can be constructed to assist a diversion. A diversion cannot be constructed rapidly to assist a dike system.

Choosing a diversion appears to be the best option. Choosing the cheap or easy option does not stand the test of time well. Please use wisdom in your decision.

090811_FPC – The Flood Protection Coalition proposes a 20,000-cfs diversion increasing in size as it flows north on the North Dakota side, diverting the Wild Rice and adding water from the Red only if the cost is justified.

A control structure on the Red should be avoided if possible because it will potentially raise the river level to the south and provide little or no benefit to that area.

An option to any North Dakota plan could be to divert only the Wild Rice River west of I29 to reduce costs.

Please evaluate whether or not the area of the Sheyenne diversion under the I-94 Bridge can be made deeper and wider to get by without replacing the bridge until the next time the interstate is worked on.

We feel very strongly that any flood protection plan must protect our community from a 500-year event and a diversion on the North Dakota side of the river is the only viable option.

2.3 FLOOD BARRIERS

2.3.1 Verbal Comments Summarized From Scoping Meetings

Why do we need floodwalls in Harwood Groves if you're going to build a diversion?

If a levee is constructed, up to what level will it be constructed? If I want a permit to construct my own levee can I construct it to the level of the 1997 flood?

What is the value in building levies above the 40-foot stage?

2.3.2 Written Comments Submitted During the Comment Period

090519_Mathern - Our home was right next to the dike – we support a permanent dike plan even it affects our view of river and change to our property.

090520_Neuhauser – One of three options would be to build large flood walls through town.

090521_Sandt – Water tubes similar to those used in the flood this year should be on hand to be used for helping with flooding.

090606_Wolf – How are you determining where the levees will be constructed if that is the chosen alternative?

090811_FPC – The Flood Protection Coalition believes the levee system designed for a 100 year flood as proposed in the preliminary Corps plan is not acceptable and is not comparable to a diversion system that will protect us from a 500 year flood.

2.4 POLITICAL

2.4.1 Verbal Comments Summarized From Scoping Meetings

2.4.2 Written Comment Submitted During the Comment Period

090520_Olson - The Fargo Flood Plan is too restricted in scope. It appears as if developing the area is a priority, rather than flood control. My assumption is that politics has entered in. Individuals with prestige are spared intervention of flood control. This was verbalized at one meeting.

090521_Sandt – I suggest developing a Water Commission Board that has the authority to drain lands when it is appropriate to decrease flooding.

2.5 OTHER GEOGRAPHIC SCOPE OF ALTERNATIVES

2.5.1 Verbal Comment Summarized From Scoping Meetings

2.5.2 Written Comments Submitted During the Comment Period

090520_Jill Johnson-Davidson – We would like our property protected. No one interviewed my neighborhood last September (Woodlawn Point, Moorhead). Proud survivors, who live with river. What is least damage: dredge or diversions – both have impact. End building permits on spongy wetland. Permit and enforce coordinated farm runoff. What is best for the river and her health? Don't only listen to or believe city officials especially about buyouts – ask residents directly. Why are there more floods, higher crests – what are the contributing factors that can be mitigated. Moorhead's goal was to protect infrastructure not homes or people. Fargo diked extensively; raised water in our neighborhoods. We were not contacted in September – based on our location, I would think we would be. Diversion number one choice. Explore contributing causes of why floods have increased. We love the river – for us, the river is not the problem – the flood is not the problem.

090519_Cousins - I would like to see a combination plan, levees and a diversion channel.

090520_A Saharieff - Design and build torpedo-shaped flow accelerators in front and behind the bridge support abutments. Flow must be enhanced for levees to work.

090520_Chuck Stenso – Buy out homes on west side of River Drive. Build berm to 46 to 48 feet along west curb. Area could have bike path/picnic area.

090606_Headrick – How will Corps handle existing structures, such as Sheyenne diversion; could they be altered to work better for full region protection, or will they be left as is?

090606_Koski – How can you adjust your project for a river that flows north into a frozen drainage channel?

090622_NWF – Evaluate wetland restoration and other nonstructural approaches as an alternative for flood control and protection.

From our perspective, levee construction and diversions are very expensive, threaten downstream communities with additional flood hazard and offer no environmental benefits.

Wetland restoration can reduce flood peaks, shift timing of events, while providing benefits to include clean water, larger fish and wildlife populations and enhance recreational opportunities.

Evidence suggests that wetland drainage over time had significantly impacted flooding in the Red River basin. The area has experienced 8 of the 10 all-time record flood crests in the past 30 years.

The study must develop a Wetland Restoration Alternative.

The prairie pothole region provides viable wetland restoration opportunities.

090624_NDWF – We ask that you please include Red River basin and watershed-wide solutions that incorporate wetlands and grasslands.

The multiple functions wetlands and grasslands can provide in holding snow, runoff water and rain can reduce pressure on levees and dams.

These natural resources can also reduce river and stream flows enough to decrease the impacts of dramatic flooding on communities.

090709_EPA – A range of alternatives should be developed including waffle approach, enlarging floodways through land use as well as levee and channel diversions, nonstructural approaches that restore natural floodplain connectivity, including enhancement or creation of wetlands and other flood reduction techniques.

Land use planning and floodway zoning in the Fargo Metro area should be disclosed in this study.

No Date_Dave Anderson – I believe we must utilize every measure – barriers, diversion, and storage to ensure the greatest level of protection

3.0 SCOPE OF ISSUES

3.1 INFRASTRUCTURE PROTECTION

3.1.1 Verbal Comment Summarized From Scoping Meetings

What are the realistic options other than a diversion?

Why build homes where the low ground and flooding is?

Could you explain what an invisible wall is? How will a cut-off channel make things better?

I'm trying to build something in my backyard – how high should I build it? Who will provide me with that guidance?

Could you talk more about nonstructural solutions such as buyouts?

Moorhead still has walkout basements, could those be flood proofed as part of the project?

3.1.2 Written Comments Submitted During the Comment Period

090624_Moberg - My question or concern is that the city of West Fargo is considering doing a development of 240 homes out by me, on the outside of the diversion and if the development is not done correctly this development is going to have problems during the next flood and it might also impact my flooding problem. So I am wondering how we go about making sure that the city of West Fargo is doing this correctly and not impacting the existing flooding problem we already have.

3.2 WATER QUALITY/WATER USERS

3.2.1 Verbal Comments Summarized From Scoping Meetings

3.2.2 Written Comments Submitted During the Comment Period

090606_Haugen – Is there an aquifer newly discovered South of Moorhead, west over the proposed diversion, and east of the Red? We wouldn't cause potential damage to clean water source in times of drought?

090629_Bezek_MNDNR – The potential for impacts to the Buffalo Aquifer need to be addressed in the consideration of alternatives.

3.3 WATER QUANTITY

3.3.1 Verbal Comments Summarized From Scoping Meetings

We thought the 1997 flood was much larger than a 100-year event.

Do all new developments build ponds to hold water, i.e., to not impact flood levels?

Winnipeg has 700-year level of protection from its bypass channel. Is that an option for Fargo-Moorhead?

What is the depth of water at Fargo vs farther north—does the river get deeper as it goes north?

Do any of your rules require that your projects be neutral down river (i.e. not making conditions worse downstream)?

3.3.2 Written Comments Submitted During the Comment Period

090522_Vaa – I am concerned about the hydrograph that was presented at the public meetings depicting that the peak flow from the 2009 event was higher then the 1897 event. I believe that this is misleading to the public and contributes to the perception that they have survived the worst flood event in recorded history. This can be attributed to the fact that in 1897 the width of the river at the Veterans Memorial Bridge was about 1 mile wide, and in 2009 the width is less than ¼ mile wide.
I think the Corps should include in their presentations that the 2009 flood is not the flood of record.

090525_Keller – I feel that the Minnesota diversion alternative would protect folks in Fargo-Moorhead metro I fear it will cause additional issues for residents downstream.

3.4 FLOOD FIGHTING

3.4.1 Verbal Comments Summarized From Scoping Meetings

3.4.2 Written Comments Submitted During the Comment Period

090519_Bach - Is the goal of the project to eliminate the need for any temp/emergency levees/diking? If so, is there a protection level and are those costs included in the diversion costs?

090520_Miller - Is there a temporary flood fight design and plan which is being replaced by he permanent flood damage reduction considerations described in the article? (US Army Corps of Engineers unveils flood protection plans, by Helmut Schmidt)
Is there a flood hazard mitigation project listed in one or both communities and/or their respective county's hazard mitigation plan for floods?

3.5 SOCIAL ISSUES

3.5.1 Verbal Comments Summarized From Scoping Meetings

Will my house be impacted?

There will be a water war if Fargo puts 9 inches of water onto Minnesota.

What effect will the project have on the people who live at the confluence of the Wild Rice and the Red River area and those upstream?

Will your June 22nd deadline and project timeline be distributed within a public notice? Does this include an EIS as well?

On the topic of growth, will you be able to show us the growth plan for both cities? Will this include the cities' strategies for addressing flooding issues?

The diversion plan is routed toward Highway 75 – there would be issues with affecting the floodplain of the Buffalo River in this area. There are also potential issues with ditch systems that would require a hearing process.

There are two omissions in the presentation – you didn't address the land use problem. Farmers want to drain the land as quickly as possible, which is understandable, but it exacerbates flooding.

3.5.2 Written Comments Submitted During the Comment Period

090520_Olson - The Fargo Flood Plan is too restricted in scope. It appears as if developing the area is a priority, rather than flood control. My assumption is that politics has entered in. Individuals with prestige are spared intervention of flood control. This was verbalized at one meeting.

I resent the diversion planned on my property: (Stanley Township, South of County 14, Sections 25 and 26). This is devastating to the beautiful farmstead (which has been in our family since the 1880's), the tranquility and beauty of the river, the adjacent wooded area and the farm acreage. It is difficult for me to believe that this type of devastation could be handed to me.

It is not true that I am not interested in flood control. If need be, I will approve the planned dike (wet side) on the west rim of the property.

I chose to not develop my property. Others did, knowing they were in harm's way. Now I am needing to sacrifice my property when my family worked so hard to keep its ownership. Our family never asked for any assistance from the Federal, State, county, township or local governments. We kept working. By the way, the buildings on the farmstead have never experienced flood water.

090522_Vaa – I have concerns that this study might influence my possibility of a buyout. Could buyouts affect future plans for levee alignments?

090811_FPC – It is our understanding that the diversion option sizes have recently been changed; and, therefore, we believe more public comment is warranted.

3.6 ECONOMIC ISSUES

3.6.1 Verbal Comments Summarized From Scoping Meetings

What will the feasibility study cost the locals?

Will the feasibility study make any recommendations on how to finance this project?

How do we know that the Federal funding will be there for the study and the project?

Where does the money go?

How much of the $625 million in the first estimate is attributed to the Southside Project? How would you characterize the economic value of the project?

In determining costs, are costs just related to physical damage, or is unemployment resulting from the flood keeping people from work factored in?

Is there a diversion channel that would reduce the costs per mile?

Does the $600-million estimate comprise the current Southside estimate?

3.6.2 Written Comments Submitted During the Comment Period

090519_ Mathern - Our hospital was evacuated by Governor's order. There was a loss of $750,000 net income during this time though very little property damage; such losses need to be included in the cost benefit analysis

090520_Paul & Deborah Kukowski – Thank you for the information. Concern: Economic and noneconomic impact of any diversion project on the communities and agriculture industry north of Kragnes, Minnesota.

090520_Koppang – Is there a breakdown of damages for Moorhead versus Fargo, or Minnesota communities versus North Dakota communities?

Are there cost breakdowns on a per capita basis for various local and/or state governmental entities involved under the two scenarios?

The damage estimates for 100-year flood seemed to indicate much more affected developed acreage in North Dakota versus Minnesota; the disparity seemed to grow for the 500-year event.

Will the damage estimates be used to determine the amount of dollars an individual local government is responsible for, once that project has an estimated price tag?

090606_Breker – I am interested in the economic analysis in all potential upstream water retention.

090608_ Bergan – How can the diversion have less total benefit?

090811_FPC – Fargo, North Dakota, voters recently showed their commitment by voting overwhelmingly to approve a tax increase to help pay for permanent flood protection.

Property values in our downtown and riverfront areas can be enhanced with a diversion system where they would be impacted downward by a levee system.

3.7 ENVIRONMENTAL

3.7.1 Verbal Comment Summarized From Scoping Meetings

How much impact analysis has been done in regard to wetlands and waters at this point?

You should consider channel stability, erosion and deposition in both the Red River as well as tributaries as a result of the project.

What will happen with fish passage in the area? How will they be affected by channel diversions? Is the U.S. Fish and Wildlife Service present?

The environmental impacts from flood fighting will be looked at as a temporary impact?

More probability should be incorporated to assess both environmental and economic risks. Environmental analysis should include the flood fight (temporary levies in place) as well as the alternative of no temporary action (no dikes or levies).

The city of Moorhead has concerns with the Buffalo Aquifer and wants to ensure that it is not impacted. A number of utilities cross the area where the concept diversion was planned; please take this into account.

North Dakota has a list of conservation priorities – there may be an interest in preserving some level of flooding for the benefit of the river ecosystem. Some fish species will be dependent on a natural flooding regime in certain areas.

Have you looked at the Minnesota Department of Natural Resources Heritage Information system?

What about wetland reclamation between Lake Traverse and Fargo Moorhead?

3.7.2 Written Comments Submitted During the Comment Period

090528_Erik_Jones – With regards to an eastern diversion channel, there would be issues with affecting the floodplain of the Buffalo River. There are also potential issues with ditch systems which would require a hearing process.

Potential impacts to the Buffalo River floodplain are related to breakouts from the Buffalo River in the Kragnes area. The latest flood insurance study (tentatively published yet this year) has breakouts along the Buffalo River in the reach of the Buffalo River between about 80th Avenue North and 120th Avenue North. Considerations in the design of the diversion would be to take a careful look at the height of spoil banks along the diversion ditch. The preliminary diversion ditch cross-section had 14-foot-high spoil banks which may prevent the breakouts from the Buffalo River and hold enough water in the Buffalo River to affect the 100-year flood elevation.

3.8 STUDY AREA

3.8.1 Verbal Comments Summarized From Scoping Meetings

3.8.2 Written Comments Submitted During the Comment Period

090521_Linnertz- The flood control mentions nothing about the area of the Sheyenne River from the egress of the West Fargo Diversion to the Red River, this area floods terribly and should be included in the study area.

090622_NWF – We urge you to expand the study area to include all upstream watershed basins.

3.9 FARGO SOUTHSIDE PROJECT

3.9.1 Verbal Comments Submitted During the Comment Period

Southside Project
a. Building levee (and storage) does not depend upon channel approval.
b. Will Fargo begin levees before 1st phase Corps is finished?

Will the Southside Development be incorporated into your analysis as built?

Your project should take place before Fargo proceeds with its Southside project.

How does this study interface with the Fargo Southside (FSS) project?

If regional protection is the goal, why is Fargo's Southside Levee not on the table for a Corps project?

Execute Order 11988 on Floodplain Management (minimizing development in the floodplain) should be considered. Growth impacts from the Southside Project may open up the need for a more comprehensive analysis.

Can you confirm that there will be no impact from the FSS project?

FSS channel extensions will directly impact some landowners. What will happen if they are built and then the Corps diversion is built later?

FSS project is proposing 3 miles of channel extensions. Aren't these environmentally problematic?

There is concern that the whole FSS proposed package may not be implementable, especially the channel extensions in Minnesota.

Will the Corps look at the future with and without the FSS project?

Would Fargo build the FSS project without all of the proposed features?

Will the Southside Project solve the flood problem?

Could you talk about how the Southside Project will be synchronized with the USACE project? If Southside goes forward, how does it affect your project?

What is the impact of the Fargo Southside Flood Protection Plan? Will that area be factored into your benefit-cost ratio?

What impact does the Rose Creek project (the Fargo Southside Project) have on the Moorhead levees and the overall project?

3.9.2 Written Comments Submitted During the Comment Period

090519_Pat Staples – Please coordinate Southside Fargo Project with your plan. This needs to be synchronized!! Diversions appear to be the best long-term solution.

090606_Armfeld – Unless the Southside project is an important and a part of your plan why proceed?

090622_NWF – The Corps needs to consider the simultaneous actions of the FMM project and the Southside project, which calls into question requirements under NEPA regarding connected actions. These two actions are similar and would need to be handled in such a way.

090707_NDSWC – The North Dakota State Water Commission has pledged $75 million toward the Fargo Southside Flood control project. We would request an expedited analysis of the FSFC project and its role in the various alternatives with regards to the Fargo Moorhead Metro project.

We would like to see any alternatives to be designed for larger events than those with 1-percent chance of occurrence.

We would like to see a host of alternatives developed to not only include levee options but diversions as well.

090709_EPA – We are concerned that the study goals and planning objectives for the Fargo Moorhead Metro study appear to be inextricably linked with the Fargo-Southside Flood Control Project.

090811_FPC – It should be noted the planned south side flood protection would not be needed and would save $175 million.

3.10 TECHNICAL ISSUES

3.10.1 Verbal Comments Summarized From Scoping Meetings

What are the new 100-year and 500-year FEMA flood stages?

I don’t understand how a 100-year flood could have a 1 in 4 chance of occurring over the next 30 years.

Did you factor in all historic events to figure out the 100-year and 500-year stages?

What is the level of protection we’re looking for?

Are you designing a passive system or an active system?

It seems like we’re doing the studies backwards—shouldn’t we do the macro study first?

If we already know the micro solutions, why do the macro study?

I question the 1:4 odds you presented. The projects we’re talking about will protect us.

Clarify “channelization.”

Any other alternative routes would need to take place before the end of the feasibility phase, correct?

Will nonstructural solutions involve any efforts to lower the peak?

Will this only deal with flooding on the Red River, or will this be a regional study, e.g., including the Wild Rice River?

Will you be allowing limited flooding, or mitigating all flooding, e.g., agricultural field flooding? An indirect effect of flood protection may be to prevent all flooding in rural areas, which should be considered in your analysis.

Would the diversion have a grassed bottom or concrete? Who performs long-term maintenance? How will you ensure that the diversion does not result in a 30-mile-long stagnant pool of water?

How did you determine where your starting point and ending point would be for the Minnesota (east) diversion? Where does the water end up?

What is the current base flood elevation?

Flood fighting should not be counted in the No-Action alternative. No flood protection measures in place should be the baseline for initial water surface elevations

3.10.2 Written Comments Submitted During the Comment Period

090606_Ista – How far downstream do you measure impacts?

090606_Lahren – Why do you need a 500-foot-wide bottom for a diversion?

090714_Rhuland - I have a question about the $625-million levee plan that was discussed at the recent meetings. I assume that there is a map available detailing what this project would look like in my neighborhood. Is that true? If so, can I get a look at what the area by Southwood Drive, 11th Street, and the Fargo Country Club looks like? In addition, how many homes would need to be removed for this project?

090811_FPC – We are concerned that any diversion plans are thoroughly studied with an effort to keep costs as low as possible. In addition, in order to evaluate the benefit-cost ratios properly, all possible benefits need to be discovered and properly applied to the ratios.

The benefits from reducing a 500- or 700-year flood to a winnable level should be included minus the costs of fighting the lower level flood. The cost effectiveness to fight a 100-year flood one time in 500 years versus making a larger diversion needs to be ascertained.

3.11 POLITICAL

3.11.1 Verbal Comments Summarized From Scoping Meetings

All of the cities that are developing should talk about their future plans before they build something that will be in the path of our project.

Cutoffs in Minnesota cannot be built without eminent domain, and Fargo cannot condemn land in Minnesota. They need to start working with a Minnesota partner.

How have you been working with mayors, other elected officials and other organizations?

Does USACE have a say in how we protect ourselves? I currently have a clay dike in my backyard and I could raise it – does USACE have anything to say about that?

Who is the decision maker that will identify which plan will be presented to Congress?

Why doesn't USACE have more jurisdictions over the root of the problem, which is the drainage of the landscape upstream?

Will you be looking at impacts downstream towards Canada?

FEMA, USFWS, EPA and the USACE should meet to discuss issues. At first glance, EPA believes that there may be similar and connected actions between the Southside and USACE projects.

Are there other stakeholders that should be involved?

Fargo and Cass County have proceeded with identifying buyouts, but Moorhead has not. What is the involvement of USACE and what is the hierarchy for decision making?

The goal of the FSS project is to get FEMA certification to avoid the need for flood insurance.

Is there a potential for FEMA's policies regarding flood insurance and grandfathering rates to change?

How does the future flood map affect development?

3.12 LAND USE AND FLOODPLAIN GROWTH

3.12.1 Verbal Comments Summarized From Scoping Meetings

Why build homes where the low ground and flooding is?

Benefit-cost ration — is that taking into account urban sprawl and future development?

Execute Order 11988 on Floodplain Management (minimizing development in the floodplain) should be considered. Growth impacts from the Southside Project may open up the need for a more comprehensive analysis.

When you look at the "future without project" do you look at future development in the area?

3.12.2 Written Comments Submitted During the Comment Period

090629_Bezek_MNDNR – It is recommended that structural flood protection measures not be utilized to promote development in currently undeveloped areas prone to flooding.

090709_EPA – The current land use planning and floodway zoning for Fargo and Moorhead should be disclosed in this study. Growth and redevelopment planning for the region should also be examined.

Indirect effects analysis should address the growth-inducing effects of the project related to changes in pattern of land use including impacts on farmland and other agricultural lands and population density. Changes in land use patterns should disclose local land use policies for Fargo and Moorhead related to residential and commercial building in or near floodways.

3.13 OTHER

3.13.1 Verbal Comments Summarized From Scoping Meetings

Great team. Great presentation. Very credible Federal presentation. ☺

Very informative – Thank you

Very good presentation

Good start. Flood stage info- 39.5 on maps and graphs

Thank you for your time and efforts to help our community. I will pray for you and all your endeavors.

Lots of good information. Very Interesting. Thank you

Great job. Please notify of next meeting. Thanks.

Informative!! Thanks!

You done good!

Thanks for an outstanding presentation!

Why not protecting or including Forest River in the floodplain?

Kevin did an excellent job!

Might be good to know what the above sea level drop is between Wild Rice and Sheyenne confluence with the Red.

Hoping for protection in Harwood Groves area ASAP. Not waiting for additional 5 years.

What have we learned from the floods in Iowa last summer?

It seems like common sense to hold off on other projects until this regional plan is complete.

What other projects does the Corps have right now?

Why is the Corps coming in now?

What is in Phase 1—what will we know in April 2009?

Are the slides available in printed form, or can they be e-mailed out to people upon request?

Our comments are due on June 22nd…are we commenting on diversion channels, levees, etc.? Do you want us to reiterate our comments in writing?

Are you looking at executing an Official Cooperating Agency Agreement?

Why can't you build dikes on buyout land? Why wasn't Fargo flooding addressed with the Grand Forks project?

3.13.2 Written Comments Submitted During the Comment Period

090526_Bigger- Where would be the best place to find information regarding alternatives, sizes of diversion channels, etc.

090606_Headrick – How much info will be on your website as you continue to work on the study over the next 4 months?

No Date_Elise & John Leitch – Hurry, Hurry, Hurry!

090519_Shirley Syverson – Good informational meeting.

090519_Daniel Holm – Excellent presentation! Good materials, appreciate the effort to get feedback from the group

090520_Calvin Singleton – Need info, flood proofing by fill with clay.

090520_ Patte Kratky – As co-president of league of women voters of the Red River Valley and member of River Keepers, I offer my services to the planning boards, as a concierge. Please contact me at 701-235-8200 ext 7-204 currently or at my email address, a message maybe left at 218-233-8382 or email. We were displaced by the flood and are repairing our home. LWV is non-partisan, non-profit grass roots organization.

090709_EPA – The purpose and need for this project should clearly describe the current problem, and future problems that will result if the project is not implemented. EPA recommends that the signatories to the MOU for this project have an opportunity to comment on the "Purpose and Need" prior to alternatives development.

APPENDIX B

WRITTEN COMMENTS
SCOPING MEETINGS

Moorhead, Minnesota November Meeting

- Anonymous Comments

Fargo, North Dakota November Meeting

- Anonymous Comments

Fargo, North Dakota May Agency Scoping Meeting

- Robin Coursen EPA
- Nancy Steinberger, FEMA
- Rick Archer, Ulteig
- 090528_Erik_Jones
- 090622_NWF
- 090624_NDWF
- 090629_Bezek_MN_DNR
- 090707_NDSWC
- 090709_EPA

Fargo, ND and Moorhead, MN May Meetings and Other Comments Received

- 090417_Fitzpatrick
- 090520_Koppang
- 090520_Miller
- 090520_Neuhauser
- 090520_Neuhauser
- 090608_Sandt
- 090608_Sandt
- 090606_Tweeten
- 090606_Tweeten
- 090521_Linnertz
- 090522_Vaa
- 090528_Vaa
- 090525_Keller
- 090526_Bigger
- 090602_Majkrzak
- 090606_Armfeld
- 090606_Breker
- 090606_Haugen
- 090606_Headrick
- 090606_Ista
- 090606_Keller
- 090606_Koski
- 090606_Lahren
- 090606_Sell
- 090606_Wolf
- 090608_Bergan
- 090619_Bergan
- 090621_Siemens
- 090622_Bergan
- 090622_Feist
- 090623_Satrang
- 090623_Solberg
- 090624_Furness
- 090624_Moberg
- 090629_Boe
- 090629_Bolin
- 090629_Cossette
- 090629_Finch
- 090629_Halvorsen
- 090629_Schock
- 090629_Tillman
- 090630_Altendorf
- 090630_Bender
- 090630_Bredell
- 090630_Cronin
- 090630_Fetch
- 090630_Forknell
- 090630_Hannaher
- 090630_Hegg
- 090630_Hoefs
- 090630_Mitchell

- 090630_Moen
- 090630_Passolt
- 090630_Pfeiffer
- 090630_Werlinger
- 090701_Gates
- 090701_Ortmeier
- 090702_Dickerson
- 090712_Dufault
- 090714_Engler
- 090714_Rhuland
- 090715_Clasen
- 090715_Heidt
- 090715_Hoefs
- 090717_Bergman
- 090717_Holscher
- 090722_Fujimoto
- 090722_Jensen
- 090811_FPC
- 090606_Matthew Breker
- 090606_Jim Armfeld
- No Date_Dave Anderson
- No Date_Elise & John Leitch
- 090606_Charles Koski
- No Date_John Stern
- 090519_Kathy Laney
- 090519_Shirley Syverson
- 090606_Daryl Lahren
- 090519_Daniel Holm
- 090519_Charles D. Dunnell
- 090519_Pat Staples
- 090520_A Saharieff
- 090606_Diane Ista
- 090520_ Patte Kratky
- 090520_ Mark Nokken
- 090520_Jill Johnson-Davidson
- 090520_Calvin Singleton
- 090520_Gary Shramstad
- 090606_Deb Haugen
- 090520_Paul & Deborah Kukowski
- 090606_Barbara Headrick
- 090520_Chuck Stenso
- 090520_Deanne Sperling
- 090606_Stanley Wolf
- Nancy Steinberger
- Rick Archer
- Anonymous
- 090520_Reinke
- 090519_Cousins
- 090519_Bach
- 090519_ Mathern
- 090519_Mathern
- 090519_Mathern
- 090520_Olson

Appendix B
Written Comments
Scoping Meetings

Moorhead, Minnesota November 17, 2008 Public Meeting

Fargo, North Dakota November 18, 2008 Public Meeting

Fargo, North Dakota May 20, 2009 Agency Meeting

Fargo, North Dakota May 19, 2009 Public Meeting

Moorhead, Minnesota May 20, 2009 Public Meeting

Fargo-Moorhead Metro Feasibility Study
Public Meetings, Moorhead Nov 17th, 2008

1) Informative!! Thanks!
2) You done good!
3) Thanks for an outstanding presentation!
4) The projected cost is likely far in excess of potential benefit. Your study should take place before Fargo proceeds with its Southside flood project.
5) Lots of good information. Very Interesting. Thank you
6) Great job. Please notify of next meeting. Thanks.
7) Southside Project
    a. Building levee (& storage) does not depend upon channel approval.
    b. Will Fargo begin levees before 1st phase corps is finished?
8) Great team. Great presentation. Very credible Federal presentation. ☺
9) Very informative – Thank you
10) Very good presentation
11) Good start. Flood stage info- 39.5 on maps and graphs
12) Thank you for your time and efforts to help our community. I will pray for you and all your endeavors.

Fargo-Moorhead Metro Feasibility Study
Public Meetings,
Fargo, North Dakota Nov 18th, 2008

1)
    a. Question doing macro study after implementing micro solutions.
    b. Question assumption that floods are going to get much worse in future as evidence does not support this.
    c. Waffle Storage concept should be reconsidered where farmers are paid for storage when needed.
2) Why not protecting or including Forest River in the floodplain?
3) Kevin did an excellent job!
4) Might be good to know what the above sea level drop is between Wild Rice and Sheyenne confluence with the Red.
5) Hoping for protection in Harwood Groves area asap. Not waiting for additional 5 yrs.

Fargo-Moorhead Metro Feasibility Study
Agency Meeting,
Fargo, North Dakota May 20th, 2009

Robin Coursen EPA

EPA is concerned that these two projects are about to commence two separate EISs with basically the same purpose and need; to control flooding in the Fargo-Moorhead metropolitan area. Further, EPA believes that the Fargo Southside Project is a connected action to the Fargo-Moorhead Project. As part of the scoping process for the Fargo Southside Project and in accordance with 40 CFR Section 1508.25, EPA recommends that FEMA as lead agency, should determine (in consultation with other resource agencies) whether the Fargo Southside Project is a similar or connected action to the Fargo-Moorhead Flood Control Project and whether it requires a single comprehensive EIS. In addition, FEMA should also consult with the U.S. Army Corp of Engineers (COE) to determine whether the project is a “single and complete project” (33 CFR 330.2(i) and whether it meets the test of “Independent Utility” when considering simultaneous, possibly connected, actions for flood control that COE will be permitting for both of these projects. The Corps and the Cities of Fargo and Moorhead are jointly conducting this study. The study will assess the feasibility of measures to reduce flood risk in the entire metropolitan and surrounding area. The study will consider an array of potential alternatives including non-structural flood-proofing, diversion channels, levee/floodwall systems, and flood storage.

EPA believes that the Fargo-Moorhead Project is connected with Fargo Southside in its environmental results (flood control for the region) and impacts (particularly wetlands and riparian habitat). We are concerned that the completion of the Fargo Southside EIS independent of the Fargo-Moorhead Flood Control Project will:

1. Minimize analysis of full cumulative environmental effects resulting from both projects
2. Unacceptably influence or limit the alternatives analysis for the Fargo-Moorhead Flood Control Project
3. Cause duplicative expenditure of public resources by both State and Federal agencies involved with both projects
4. Not comprehensively address the regional flood control problem and
5. Not result in good decision making that is in conformance with CEQ NEPA regulations.

Although the Southside Flood Project and the Fargo and Moorhead Flood Risk Management Project are projects led by different agencies—FEMA and COE respectively, EPA strongly recommends that both agencies consider that these projects are connected or similar actions as described under 40 CFR Sec. 1508.25 of the CEQ regulations.

Nancy Steinberger FEMA Region 8 Denver Federal Center
Please keep me in the loop on H & H modeling efforts. FEMA is currently working on models for the Sheyenne and Maple Rivers. We have a preliminary digital flood insurance rate map coming to Fargo in Summer 09 and a Cass County DFIRM shortly thereafter (1 year out).
“No Action” should not include flood fighting. Emergency measures can cause a rise in flood elevations. If that’s the baseline, the project could slip through as not causing a rise even if it does. Flood permits from all affected communities will be required. A CLOMAR and LOMR will be required.

Rick Archer, Ulteig Engineering, INC
Recent 2009 flooding has resulted in discrepancies between projected river gage water surface elevations with recorded flood discharges. This may be due to different stream set-up conditions (Sheyenne) than what original flood plain model is showing, or due to flood fight efforts. I would like COE to look more closely at Hydraulic conditions that may be leading to WSE discrepancies.

EPA Region 8 Draft of Fargo scoping comments 08/27/09

Studies:
It would be helpful to understand how the information in previous studies, reports and projects will be integrated and utilized in the Feasibility Study and what additional studies, e.g. hydrologic basin wide flow regimes, climate/precipitation analysis, are anticipated to be undertaken. Do the studies conducted to date answer many of the questions that have been asked in this scoping document by reviewers? E.g. what percent of high flows are due to increased flow rates from precipitation? What percent of high flows are due to increased flow rates from wetland drainage/and or lack of wetland drainage where agricultural development and urban sprawl has taken over wetland/upland storage. A look at the entire basin is necessary to examine the effectiveness of wetland restoration or waffling or other non-structural alternatives.

Regarding Climate Change studies: What does the most current data show for anticipated flood frequency, timing and severity?

Purpose and Need:
The Purpose and Need statement is fairly good; not too narrow, not too broad.

Objectives of the project should be discussed with the purpose and need and could include reducing peak flows, slowing runoff, sustainable cost effective solutions that mimic natural processes, and exploring opportunities for recreation/open space.

EPA suggests that this document discuss how the process of alternatives development will proceed and how alternatives will be screened. EPA recommends that the purpose and need statement be accompanied by some criteria to measure whether or not alternatives meet the purpose and need and objectives of the project. Such criteria could be utilized for screening purposes and could include but not be limited to the following: Meets project purpose and need and objectives, sustainability and or ability to mimic natural processes, technical feasibility/implementability, capital costs, O and M and/or adaptive management costs, ability to phase if project costs are incremental, cost benefits or economic value (ecological/recreational/carbon offsets for riparian and wetland restoration).

How will the cooperating agencies be involved with this process?

Alternatives Analysis:

The alternatives analysis should include a ***Sustainability Alternative*** that looks at a number of approaches. Sustainable development and the use of zoning, agricultural/conservation easements to maintain/enlarge the floodway should be addressed. How will redevelopment and new growth be encouraged to develop in a manner that protects the homes, roads, and other infrastructure from flood risk and/or damage. This alternative could also explore nature mimicry to address flooding through non structural measures such as wetland, riparian habitat, and grasslands. This alternative could also explore the secondary benefits of recreational development (wetlands to open space/fish habitat) and possibly crop selection for high water usage (from upland grasslands or former agricultural land used for distributed storage areas).

Strategic Planning:

Since the costs of such projects are the primary obstacles to implementation, the Corps could explore ways to tier the EIS so that funding could happen incrementally. The Phase I of the Feasibility Study indicates that you are already considering this type of scenario.

090528_Erik_Jones

From: Erik Jones
To: Sobiech, Jonathan J MVP;
cc: Bruce Albright;
Subject: RE: Fargo Moorhead Metro Scoping Meeting
Date: Thursday, May 28, 2009 5:10:07 PM
Attachments: Figure13D_SurfaceWaterResourcesMap_Northern.pdf
Figure13A_SurfaceWaterResourcesMap_Western_portrait.pdf
Figure13C_SurfaceWaterResourcesMap_Moorhead.pdf

Jon,

Here is the additional information pertaining to the question below:

Erik Jones, Houston Engineering
Q. The diversion plan is routed towards Highway 75 - there would be issues with affecting the floodplain of the Buffalo River in this area. There are also potential issues with ditch systems which would require a hearing process.
A. Please provide us of additional information.

Additional Info:

As shown on the preliminary MN diversion route map as distributed at the meeting (labeled "PLATE 1"), the following legal County Ditches would be affected (from south to north): Clay County Ditches Nos. 33, 32, 9, 41, Lateral 1 of County Ditch 41, 35, 51, and Lateral 1 of County Ditch 20. If the diversion route were moved further north/south, additional legal ditch systems could be affected. I've attached a series of maps showing the various ditch locations. From north to south they are labeled "Northern", "Moorhead", and "Western" corresponding to planning regions within the Watershed's Management Plan. Following MN drainage law (Minnesota Statutes 103E.)These systems might proceed under 103E.227 IMPOUNDING AND DIVERSION OF DRAINAGE SYSTEM WATERS. The Watershed District would need to confirm the statute under which the proceeding would follow but I believe 103E.227 would be correct.

For portions of some of the ditch systems, it may make sense to abandon (MN Statutes 103.811) and other systems may require a redetermination of Benefits due to the drainage area being severed by the diversion ditch. A redetermination would need to follow Minnesota Statute 103E.351.

All of these proceedings require one hearing regardless of the statute. This would be required for each system, although the hearings may be able to be grouped together or in series if it makes sense.

More detail on Minnesota Drainage Law (MS 103E) can be found at the following link:

https://www.revisor.leg.state.mn.us/statutes/?year=2008&id=103E

Potential impacts to the Buffalo River Floodplain are related to breakouts from the Buffalo River in the Kragnes area. The latest Flood insurance study (tentatively published yet this year) has breakouts along the Buffalo River in the reach of the Buffalo River between about 80th Avenue North and 120th Avenue North. Considerations in the design of the diversion would be to take a careful look at the height of spoil banks along the diversion ditch. The preliminary diversion ditch cross-section had 14 foot high spoil banks which may prevent the breakouts from the Buffalo River and hold enough water in the Buffalo River to affect the 100-year flood elevation.

If you have questions, let me know.

Thanks,

Erik S. Jones, PE LSI Project Manager

1401 21st Avenue North, Fargo, ND 58102
Phone: 701.237.5065 / Fax: 701.237.5101
Direct Phone: 701.499.2055

Email: ejones@houstoneng.com
Website: www.houstoneng.com
Note: We have moved.New address above

-----Original Message-----
From: Sobiech, Jonathan J MVP [mailto:Jonathan.J.Sobiech@usace.army.mil]
Sent: Thursday, May 28, 2009 2:32 PM
To: chad.severts@state.mn.us; michele.walker@dnr.state.mn.us; tom.grashens@dnr.state.mn.us; bob.bezek@dnr.state.mn.us; thomas.carlson@dnr.state.mn.us; julie@redriverbasincommission.org; rgjestvang@nd.gov; pfridge@nd.gov; C. Gregg Thielman; allison.myhre@mail.house.gov; andy.martin@klobuchar.senate.gov; bkreft@nd.gov; nancy.steinberger@dhs.gov; jeanine.petterson@dhs.gov; mike.hillenburg@dhs.gov; kris.carlson@ulteng.com; jvolk@moorengineeringinc.com; david.overbo@co.clay.mn.us; john.frederick@state.mn.us; brrwd@bville.mn.net; markbrodshaug@gmail.com; Erik Jones; Coursen.Robin@epamail.epa.gov; truskowski.brent@epa.gov; steven.hardegen@dhs.gov
Subject: Fargo Moorhead Metro Scoping Meeting

I have attached a draft of the notes from the Scoping meeting, I would like all of the folks that commented to review it to make sure we captured your comments accurately, if you could look it over and get it back to me NLT 5-June 09 that would be great. I will look at the comments incorporate them and send out the final memo for record. Thanks to all of you for participating. Again I ask that you send me any other contacts that are necessary for this EIS. Thanks. Jon

Jonathan Sobiech
Forester
US Army Corps of Engineers
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St Paul, MN 55101
Office phone 651-290-5428
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090622_NWF

NATIONAL WILDLIFE FEDERATION®

Northern Rockies and Prairies Regional Center

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June 22, 2009

Terry J. Birkenstock, Chief,
Environmental and Economic Analysis
Branch, 190 Fifth Street East, St. Paul,
MN 55101–1638

Re: Scoping Comments on Proposed Flood Risk Management Project on the Red River of the North

Dear Mr. Birkenstock:

On behalf of the National Wildlife Federation, we offer these scoping comments on the Environmental Impact Statement being prepared by the Corps of Engineers on the Flood Risk Management Project on the Red River of the North.

In the Notice of Intent (74 Fed. Reg. 20684, May 5, 2008), the Corps of Engineers proposed to evaluate measures for reducing flood risk in the Fargo-Moorhead Metropolitan Study Area. Alternatives to be evaluated include, but are not limited to, levees and floodwalls, diversion channels, non-structural flood proofing, relocation of flood prone structures, and flood storage.

In order to evaluate a full range of alternatives, we urge the COE to 1) expand the study area to include all upstream watershed basins and 2) evaluate wetland restoration and other non-structural approaches as an alternative for flood control and protection.

In preparing this scoping letter, we have been impressed by the amount and quality of the literature available that evaluates wetland restoration and other non-structural mechanisms as an alternative to structural approaches to flood control. From our perspective, levee construction and diversions are very expensive, threaten downstream communities with additional flood hazard and offer no environmental benefits. In contrast, wetland restoration can reduce flood peaks and shift the timing of flood events even while providing a broad array of ancillary benefits including cleaner water, larger fish and wildlife populations and enhanced recreational opportunities. We note too, that such benefits have real economic value.

In addition to much research on the positive benefits of wetland restoration, related studies have also demonstrated that wetland drainage in the Red River basin have significantly increased both the timing and size of Red River floods and also that wetland drainage continues to effect thousands of acres annually. Wetland restoration will help offset these destructive land use practices that are so costly in terms of water quality, wildlife and flood costs.

Because wetland restoration and better watershed management are an economical, ecological and sustainable method for flood control, we strongly urge for the Army Crops of Engineers to go beyond the "quick-fix", expensive and finite solution of levees and diversions, and consider looking "upstream" to a watershed/wetland approach to managing flooding on the Red River.

A. The EIS Must Utilize a Larger Study Area and Evaluate the Impacts of Wetland Drainage on Flood Frequency, Flood Timing and Flood Severity.

The Notice of Intent suggests that the EIS being prepared by the Corps will only evaluate flood impacts and alternatives measures to prevent flooding within the Fargo-Moorhead Metropolitan Area. This limited study area will not allow the Corps to accurately evaluate the causes of increased flooding in the Red River Basin or the full range of alternative remedies, including wetland restoration and other watershed management possibilities. Ample evidence demonstrates that wetland drainage throughout the Red River basin has significantly contributed to increased flood frequencies and flood peaks.

The prairie pothole wetlands of the northern Great Plains are one of the world's great natural resource treasures. Within this 300,000 square mile area, retreating glaciers left tens of thousands of small depressions that seasonally fill with water and provide habitat for millions of waterfowl, shore birds and other wildlife species. Almost since farming began in this region in the mid 1800's, wetland drainage has been employed to increase tillable acreage and to facilitate other agricultural activities. The cumulative impacts of this wetland drainage have been staggering. Over the last 100 years, and especially since the end of the Second World War, over 50% of the region's wetlands have been drained with over 90% in some watershed basins.

In addition to the severe impacts to wildlife and water quality, wetland drainage has also impacted the timing, frequency and severity of floods throughout the region. Wetland drains and channels literally crisscross the entire region and dramatically accelerate spring run-off and reduce upstream, upland water storage capacity.

For example, much of the damage caused by the extensive flooding along the Mississippi River in 1993 resulted from levee failure as the river reestablished historic connections to the floodplain as well as the loss of upstream wetland storage and the alteration of the landscape that encouraged water to quickly drain into the nearest river or stream. Indeed, a recent study by The Wetlands Initiative noted that the wetlands lost in the upper Mississippi River had the capacity to retain all of the water that caused the 1993 flooding. Thus, although elaborate storage dam and levee systems can "reclaim" the floodplain for agriculture and human settlement in most years, the increasingly frequent and inevitable large floods the Great Plains and Midwest are seeing impose high disaster costs to society.

Evidence strongly suggests that wetland drainage has significantly impacted flooding in the Red river basin. In fact, the Red River basin has experience 8 of the 10 all time record flood crests in the past 30 years. One study dealing with watershed contributions to the Red River was published 28 years ago by soil scientists at North Dakota State University. It found an average 60% increase in stream flow rates and concluded that:

> Significant increases in flow to the Maple, Wild Rice and Goose Rivers have occurred over the last 30 to 40 years. Flow rates were shown to be related to climate (precipitation), however, there appears to be no chance in precipitation patterns to account for increase in flow rates. Predicted flow rates were shown to be closely related to basin size due to land drainage in the Maple River and Goose River basins.

Since this study was published, wetland drainage has continued throughout the Red River.

Based on this information, the EIS should enlarge the study area to include all upstream river basins above Fargo-Moorhead. In taking this step, the EIS will necessarily have to evaluate the impacts on flood crests, flood frequencies and flood severity of wetland drainage. Through this evaluation, the EIS can then take the next and most critical step – evaluating the benefits of wetland restoration in terms of reducing these flood impacts.

B. The EIS Must Develop a Wetland Restoration Alternative

Restoring upstream storage capacity must be studied as an alternative to flood mitigation for the Red River. Several studies have demonstrated the effectiveness and feasibility of restoring wetlands or using upland depressions to temporarily store water during a flood event. One such study concluded that, "non-structural means as temporary storage of runoff on agricultural lands in the upland areas of the watershed during periods when flood risks are high, may provide ecological benefits…at the same time diminishing the threat of downstream flooding."[1] Another study concluded that, "floodwater attenuation is one of the most widely recognized ecosystem services provided by restored wetlands…" The potential storage capacity on USDA program lands in the PPR alone is, conservatively, 56,513 ha-m (458,151 acre-feet) of water, if filled to maximum capacity.[2] Additionally, restoring drained and farmed wetlands could increase the water retention capacity of a watershed in the PPR of Minnesota, "by up to 63%."[3] Depressional wetlands in the Devils Lake basin of North Dakota have the potential to store around 72% of the total runoff volume from a 2-year frequency runoff event and 41% of a 100-year frequency runoff event.[4]

1. The Restoration of Wetlands can significantly reduce flood frequency and severity while also providing vital ecosystem benefits.

The benefits of wetland restoration are numerous. Wetlands provide various ecosystem services to farmers and communities, recreational opportunities, global warming mitigation, and most importantly, flood control. One study concluded that, "wetlands on [USDA] program lands [in the PPR] have significant potential to intercept and store precipitation that otherwise might contribute to "downstream" flooding.[5] Additionally, the "conversion of cultivated cropland to grassland cover as part of conservation programs results in a reduction in surface runoff and, ultimately, reduces the rate at which a basin refills and overflows.[6]

An Army Corps study on the Charles River in Massachusetts concluded that the floodplain wetlands were so effective for flood control the Corps purchased the wetlands rather than drain them to build a levee system. Maintaining the 3,400 ha of wetlands in the Charles River basin rather than draining them saved Boston an additional $17 million in flood damages per year.[7] Another study looking at the relationship between upstream wetland drainage and downstream flooding concluded that, the increase in peak stream flow was significant for all sizes of streams when wetlands were removed.[8]

Utilizing wetlands for flood protections provide a multitude of additional benefits. Increasing wetland habitat will provide stability to migrating and nesting bird habitats as well as numerous other species of wildlife. This in turn creates opportunities for hunting, fishing, bird watching, hiking and other types of recreation. Wetlands also serve as nature's kidneys, filtering polluted water and releasing cleaner water into both nearby ground and surface waters. This improves water quality. Wetlands further serve to recharge ground and surface waters, meaning that while they prevent flooding in wet times, they serve to replenish and retain adequate water supplies and stream flow during drier times. As climate change increases the severity and frequency of both floods and droughts, these functions will become crucial to maintaining healthy aquatic systems and to protecting communities from the impacts of climate change. Wetlands play at least two critical roles in mitigating the effects of climate change, "one in the management of greenhouse gases (especially carbon dioxide) and the other in physically buffering climate change impacts."[9] Studies show the great potential for wetlands to act as carbon sinks to sequester carbon, thus mitigating the impacts of global warming. USGS data suggests that terrestrial carbon capture may be greater in wetlands over smaller acreage than the potential capture on a larger area of cropland.[10]

Given the multitude of benefits in addition to flood protection that wetland restoration provides, especially in light of the many challenges presented by climate change, it is the most effective, affordable, and ecologically sound solution for the Red River basin, and must be given the full consideration of the Army Corps of Engineers, when preparing the EIS for the proposed flood protection plan, found at 74 FR 20684.

2. The Prairie Pothole Region (PPR) Provides Viable Wetland Restoration Opportunities

The prairie landscape, prior to major drainage and alteration after European settlement, was defined by its wetlands.[11] This system of wetlands is still vitally important today, but in need of restoration to provide the functions it once provided. The significance of the prairie wetland landscape is exemplified in the Prairie Pothole Region (PPR) of the United States and Canada. This area extends over 300,000 square miles from north central Iowa and western Minnesota through North and South Dakota, into eastern Montana and north into Canada. The unique Prairie Pothole ecosystem is the result of retreating glaciers, which left the landscape dotted with pothole wetlands.[12] Despite the harsh climate of wet/dry cycles, winter freezing and varied salinity, "the PPR is an extremely productive area for both agricultural products and wildlife."[13] The PPR ecosystem is of "unparalleled importance to breeding waterfowl and many other species of wetland wildlife," in addition to acting as a nutrient sink, storing runoff to reduce flooding, sequestering carbon and providing other "environmental and socio-economic values."[14] The PPR hosts more than 300 species of birds which rely on this region – "177 species for breeding and nesting habitat and another 130 for feeding and resting during spring and fall migrations."[15] The PPR is a vital resting and replenishing area for migratory birds. Waterfowl banded in the PPR have been found in 46 other states, 10 Canadian provinces and 23 other countries.[16] In addition to birds, muskrats, foxes, deer and a variety of other wildlife rely on the PPR.[17]

Besides a rich wildlife habitat, the PPR captures precipitation and mitigates flooding. Historically, over "80% of the land surface drained into potholes rather than streams and rivers," where the water would then evaporate or seep into the ground, recharging underground aquifers.[18] Grasslands further reduced the runoff of water and sediment, creating a more stable water level and enabled the area to host a diverse community of native grasses, sedges, rushes and other submersed vegetation.[19] Given the multitude of benefits provided by the PPR, the InterGovernmental Panel on Climate Change (IPCC) concluded in a special report that, "Any additional stress [to the PPR] would be of great concern and could be accommodated only through active programs to protect, enhance, and increase wetland areas in this region."[20]

3. The Waffle Project, combined with Wetland Restoration is also a viable alternative.

One effort currently being studied and potentially implemented in the Red River basin is called the Waffle Project. The Energy & Environmental Research Center (EERC) "recognized the need for alternative methods of flood protection to augment existing flood protection measures. This sentiment was mirrored by other major organizations and agencies in the Red River Basin, and it was determined that innovative concepts of nonstructural measures should be explored to augment the design capacities of structural measures planned to protect against future floods similar in scope to, or greater than, the 1997 flood."[21]

As Minnesota Public Radio reported in 2006, "the waffle plan is simple. Existing roads serve as levees to store water in farmers' fields. The potential for storage is amazing. One square mile storing water a foot deep would hold more than 200 million gallons of water."[22] Because this plan looks to slow the movement of water entering the system at any time, the chances of flooding are greatly minimized. The additional benefit of the plan would allow the retained water to recharge the aquifer and prevent droughts in the future. The Waffle Plan is also a more affordable solution to mitigating flood damage, with the pricetag to implement the Plan across the Red River basin "estimated at $50 million. The protective dike system in Grand Forks cost $397 million."[23] And, the estimated cost of levees or a diversion channel along the Red River far exceed Grand Forks at $625 million and $909 million, respectively.

In this economy, haphazard spending for a levee or diversion project is not only unwarranted, but also irresponsible management of resources, both economically and ecologically. And the extraneous building costs are not a one-time expense. Levees will require continued spending for maintenance and upkeep, and they are uncertain to retain flood waters in our world of extreme weather patterns, so greater structures may have to be built in the future, at greater costs, in order to seize the swelling waters of the Red River.

When the Waffle Project is implemented in conjunction with continued wetland restoration, a successful and long-term flood protection plan results. Programs such as the Waffle Project, Wetland Reserve Program, and other studies and programs through Ducks Unlimited, US Fish & Wildlife, and numerous other agencies and organizations, provide ample data and opportunity to implement wetland restoration as a significant option to prevent flooding downstream.

C. The EIS Must Utilize a Larger Study Area and Consider Wetland Restoration Alternatives in Order to Comply With the National Environmental Policy Act.

An additional requirement for the Army Corps to consider in its EIS are the simultaneous actions of the Fargo-Moorehead Metro Project and the Southside Flood Control Project, which calls into question requirements under NEPA regarding connected actions. An assessment of cumulative impacts is required by the Council on Environmental Quality (CEQ) regulations under NEPA.[24] Cumulative effects are defined as," the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions ."[25]

When considering whether there are cumulative effects or connected actions, an agency must look at the scope of the proposed project and must consider 3 types of actions: connected actions, cumulative actions and similar actions.[26] A connected action means that there is a close relationship between actions which must be considered in a single EIS. Similarly, a single EIS must be prepared for cumulative actions, which when viewed with other actions "have cumulatively significant impacts and should therefore be discusses in the same impact statement."[27] A similar action is one, when viewed with other proposed or reasonably foreseeable actions have similarities that would be reasonable to analyze together in a single impact statement.[28] In the context of the Fargo-Moorhead and Southside Projects, given their timing, scope, relatedness, and proximity, the projects would be considered cumulative actions, and are required, by NEPA, to be considered under a single EIS.[29]

Thank you for considering the comments on the Notice of Intent. Please feel free to contact any us if you would like additional information.

Thomas France

Thomas France, Regional Executive Director

Endnotes:

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[1] A. Manale, (Summer 2000). Flood and Water Quality Management trough Targeted, Temporary Restoration of Landscape Functions: Paying upland farmers to control runoff, *Journal of Soil and Water Conservation 55.3*, 285.

[2] USGS, Robert A. Gleason & Brian A. Tangen, *Ecosystem Services Derived from Wetland Conservation Practices in the United States Prairie Pothole Region with an Emphasis on the U.S. Department of Agriculture Conservation Reserve and Wetlands Reserve Programs* ch. D: Floodwater Storage, http://pubs.usgs.gov/pp/1745/pdf/pp1745web.pdf (accessed June 10, 2009).

[3] *Id.*

[4] *Id.*

[5] Gleason & Tangen, *supra* n. 2.

[6] *Id.*

[7] William J. Mitsch & James G. Gosseling, *Wetlands*, 347 (John Wiley & Sons, 2007).

[8] *Id.*. at 349.

[9] The Ramsar Convention on Wetlands, *Wetland Values and Function: Climate Change Mitigation*, http://www.ramsar.org/info/values_climate_e.htm (last updated Dec. 21, 2000).

[10] USGS, *Prairie Wetlands are Important for Carbon Storage*, http://biology.usgs.gov/cro/Fact%20Sheets/carbonnewban.pdf (last updated July 2002).

[11] Susan M. Galatowitsch & Arnold G. van der Valk, *Restoring Prairie Wetlands: An Ecological Approach*, vii (Iowa St. U. Press 1994).

[12] USGS, *Wetlands of the Prairie Pothole Region: Invertebrate Species Composition, Ecology, and Management*, http://www.npwrc.usgs.gov/resource/wetlands/pothole/prairie.htm (last updated Aug. 3, 3006).

[13] *Id.*

[14] Rex R. Johnson, Fred T. Oslund & Dan R. Hertel, (May/June 2008). The past, present and future of prairie potholes in the United States, *Journal of Soil and Water Conservation 63*(3), 85A.

[15] U.S. Fish & Wildlife Service, *Press Release:* ***Prairie Pothole Region to Receive $21 Million for Habitat Acquisition***, http://www.fws.gov/mountain-prairie/PRESSREL/04-16.htm (March 8, 2004).

[16] *Id.*

[17] Gary L. Pearson, *Draining the Great Marsh*, USA Today (Nov. 1985).

[18] Johnson, et. al., *supra* n. 14.

[19] *Id.*

[20] InterGovernmental Panel on Climate Change, *The Regional Impacts of Climate Change* ch. 8: North America, http://www.ipcc.ch/ipccreports/sres/regional/202.htm (accessed June 22, 2009).

[21] Bethany Bolles, Xixi Wang, Lynette de Silva, Heith Dokken, Gerald Groenewold, Wesley Peck & Edward Steadman, *An Innovative, Basinwide Approach to Flood Mitigation: The Waffle Project*, http://www.undeerc.org/Waffle/info/pdfs/bb-floodmitigation.pdf (accessed June 4, 2009).

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[22] Bob Reha, *Waffle Plan researchers convinced they can lower flood levels*, Minnesota NPR, http://minnesota.publicradio.org/display/web/2006/04/13/waffleredux/ (April 17, 2006).
[23] *Id.*
[24] *See* Council on Environmental Quality, *Considering Cumulative Effects Under the National Environmental Policy Act* (Jan. 1997).
[25] 40 CFR § 1508.7
[26] 40 C.F.R. § 1508.25
[27] 40 C.F.R. § 1508.25(a)(2).
[28] 40 C.F.R. § 1508.25(a)(3).
[29] 42 USC §§ 4321, et. seq. *See also*, *Kleppe v. Sierra Club*, 427 U.S. 390, 96 S.Ct. 2718 (1976).

Beauchamp, Francis MVP

From:	Jennifer Kross [jkross@ducks.org]
Sent:	Wednesday, June 24, 2009 10:12 AM
To:	Evans, Craig O MVP; Snyder, Aaron M MVP
Subject:	Red River Flood input from North Dakota Wildlife Federation
Attachments:	NDWF Flood Protection Response 6 18 09.pdf; Brun et al 1981 Stream Flow.pdf

NDWF Flood rotection Response. Brun et al 1981 Stream Flow.pd...

Mr. Evans and Mr. Snyder,

Attached is a letter from the North Dakota Wildlife Federation with comments regarding Red River flood protection efforts. Also attached is a copy of a document on stream flow changes in the Red River Valley. Thank you for accepting our input. I am also sending a copy of this letter to Mayor Dennis Walaker, Mayor Mark Voxland, Senator Kent Conrad, Senator Byron Dorgan, and Representative Earl Pomeroy for their information.

Please contact me if you would like to further discuss this issue.

Jennifer

Jennifer P. Kross

Ducks Unlimited, Communications Biologist

Great Plains Regional Office

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Email: jkross@ducks.org <mailto:jkross@ducks.org>

Jennifer P. Kross on behalf of
North Dakota Wildlife Federation
320 17th Ave. NE
Jamestown, ND 58401
701-368-9329
June 24, 2009
RE: Flood protection planning for Fargo/Moorhead

ATTN: Craig Evans and Aaron Snyder
U.S. Army Corps of Engineers
St. Paul District
Sibley Square at Mears Park
190 5th Street East, Suite 401
St. Paul, MN 55101-1638

Mr. Evans and Mr. Snyder,
On behalf of the North Dakota Wildlife Federation (NDWF) I am writing to encourage you to incorporate use of natural resources and wetlands in efforts to protect Fargo/Moorhead from future flooding. Multiple factors led to the flooding that occurred in Fargo/Moorhead this year and the NDWF believes that it is necessary to use multiple solutions that span the entire watershed for flood protection planning.

North Dakota has a wealth of natural resource managers and professionals who can advise on flood solutions that involve wetland and grassland use throughout the Red River basin. The North Dakota Game and Fish Department and the staff at National Wildlife Refuges in the basin have experience and expertise to provide long-term, sustainable solutions that will reduce flood waters that devastate our communities as well as enrich our state's wildlife habitat.

One significant example where wetlands helped save a community from devastating flooding occurred in 2000 when the Turtle River flooded. The U.S. Fish and Wildlife Service opened up Kellys Slough National Wildlife Refuge and diverted 20,000 acre feet of water to the refuge. The water absorbed by the wetlands provided much need relief for the town of Manvel. Roger Hollevoet manager of U.S. Fish and Wildlife Service at Devils Lake Wetlands Management District was quoted as saying, "wetlands are more or less nature's natural sponges. They are a valuable component of flood control."

In the Turtle River case it was rain water that caused flooding, but wetlands can be used for multipurpose water management and help to absorb excessive snow melt and spring runoff. The multiple functions wetlands and grasslands can provide in holding snow, runoff water and rain can reduce pressures on levees and dams. These natural resources can also reduce river and stream flows enough to decrease the impact of dramatic flooding on communities.

When planning flood control for the Fargo/Cass County area we ask that you please include Red River Basin and watershed wide solutions that incorporate wetlands and grasslands. We are available for consult on how to implement these strategies.

Sincerely,

Jennifer P. Kross

Jennifer P. Kross
Executive Board Member
North Dakota Wildlife Federation
701-368-9329
jkross@ducks.org

CC: Mayor Dennis Walaker
Mayor Mark Voxland
Senator Kent Conrad
Senator Byron Dorgan
Representative Earl Pomeroy

Enclosure: (1) *Stream Flow Changes in the Southern Red River Valley of North Dakota* by L. J. Brun, J. L. Richardson, J. W. Enz and J. K. Larsen

1981

090624_NDWF

Stream Flow Changes in the Southern Red River Valley of North Dakota

L. J. Brun, J. L. Richardson, J. W. Enz and J. K. Larsen

Climatic events in recent years have had major impact on the economic well-being of many North Dakotans. The summer flood of 1975 destroyed thousands of acres of crops in the southern Red River Valley, caused major soil erosion, destroyed bridges, and damaged homes, farmsteads, and other property. The statewide spring and summer drought of 1980 was comparable to that of 1934 and 1936, resulting in complete crop failure in some areas. These events are directly attributable to extreme climatic situations.

At the same time, flooding has occurred in recent years when the climatic conditions would not be regarded as extreme and in areas where flooding previously has not been a serious problem. Old time residents of Enderlin, along the Maple River, state that flooding had never been a problem until about 20 years ago. Now, houses in a major section of the town have been abandoned because of repeated flooding.

The problem of flooding is a controversial and emotional issue. There are charges and statements as to causes and solutions for the problem. Many are unsubstantiated and erroneous. In this report the authors address three conditions frequently discussed in relation to flooding problems. These are:

1. Have stream and river flow increased?
2. Has there been a climatic change that can be related to increased stream and river flow?
3. Has agricultural land drainage affected stream and river flow?

Changes in Flow

Discharge data from nine gaging stations were analyzed to determine if changes in flow over time have occurred. Locations are shown in Figure 1. There were three comparisons of flow with time using linear regression. This simple statistical test will tell if flow rates are increasing, decreasing or unchanged over the time period measurements have been made. These comparisons were:

1. Mean annual flow for the water year (Oct. 1 of one year through Sept. 30 of the following year) versus time in years.
2. The maximum daily flow in a given water year versus time in years.
3. The mean spring flow (for March, April and May) in a given water year versus time in years.

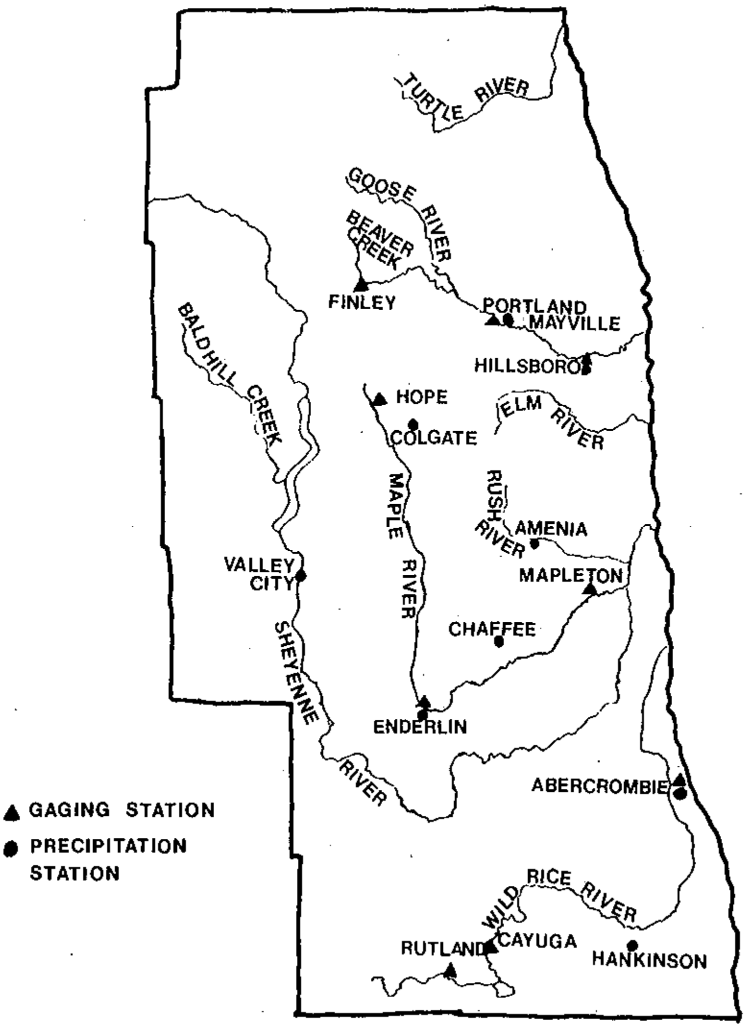

FIGURE 1. Locations of stream gaging stations and precipitation stations used in stream flow analysis.

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Brun and Richardson are associate professors, Enz is assistant professor, Larsen is research assistant, Department of Soils.

The analyses were done by indexing the first water year as 1 and incrementing each following water year by 1 through the period of record. Flow was then correlated with the indexed years for the nine gaging stations. Discharge or flow is expressed in cubic feet per second. Results are shown in Table 1.

A consistent pattern for all three comparisons emerged. At nearly all locations, the regression equations indicate that the flow rates have increased with time. They further indicate that the flows have increased faster at stations further downstream. In fact, at the last gaging station on a river the relationship between flow and time is usually statistically significant. For example, this means there is a 99 per cent probability that the mean annual flow at Hillsboro has increased with time and only a 1% probability that these data would have occurred by chance.

The headwaters of the Maple River near Hope show a negative correlation, implying flow has decreased with time. However, the Colgate precipitation data for this short time period also have a negative correlation with time (Table 3) which is the reason for this observation.

The Climate Factor

The flow analyses show flow rates have increased on a year-to-year basis except for the Maple River near Hope. The question is to determine if the increased flows could be due to a climatic factor. To address this question two analyses were performed again, using linear regression. If it can be shown that flow rates are related to climate and also shown that the climatic factor (precipitation) has increased in a fairly regular manner over the last 20 to 40 years, a reasonable explanation would exist for the increase in flow rates.

In Table 2 there is a comparison of Mean Annual Flow with Mean Annual Precipitation (both for the water year) and Mean Spring Flow (based on March, April and May) with Winter plus Spring Precipitation (Nov. through the following May). In all cases a positive correlation exists and in many cases there is a statistically significant relationship indicating flow rates increase as precipitation increases. While Table 2 shows flow rates are related to precipitation, it still leaves much of the observed variation in flow unexplained.

Next is a comparison of Mean Annual Precipitation (for the water year) with time as shown in Table 3. At some stations comparisons were made over different time periods to correspond to the available stream flow data. For example, the precipitation data at Colgate were evaluated for three time periods corresponding to the flow data at Hope, Enderlin and Mapleton. There is no detectable pattern or change with a similar number of positive and negative correlations.

So far our analysis has shown:

1. Flow rates have increased with time.

TABLE 1. Comparison of flow rates (ft³/s) with time (water year) at nine sites in southeastern ND where r is the correlation coefficient, n the number of years and SIG the level of statistical significance.

WATER YEAR	LOCATION	EQUATION	r	n	SIG.
		MEAN ANNUAL FLOW (MAF)-TIME (T)			
OCT 64-SEP 65 TO OCT 77-SEP 77	MAPLE RIVER NR HOPE	MAF = −0.32 (T) + 5.36	−0.73	14	1%
OCT 56-SEP 57 TO OCT 77-SEP 78	MAPLE RIVER NR ENDERLIN	MAF = 1.56 (T) + 20.8	0.27	22	25%
OCT 44-SEP 45 TO OCT 74-SEP 75	MAPLE RIVER NR MAPLETON	MAF = 3.46 (T) + 18.1	0.40	31	2.5%
OCT 59-SEP 60 TO OCT 78-SEP 79	WILD RICE RIVER NR RUTLAND	MAF = −0.017 (T) + 9.60	−0.01	20	--
OCT 56-SEP 57 TO OCT 78-SEP 79	WILD RICE RIVER NR CAYUGA	MAF = 0.16 (T) + 17.2	0.05	23	--
OCT 32-SEP 33 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE	MAF = 1.34 (T) + 41.7	0.21	46	20%
OCT 64-SEP 65 TO OCT 78-SEP 79	BEAVER CREEK NR FINLEY	MAF = 0.11 (T) + 9.12	0.08	15	--
OCT 39-SEP 40 TO OCT 74-SEP 75	GOOSE RIVER NR PORTLAND	MAF = 0.71 (T) + 17.5	0.19	36	25%
OCT 31-SEP 32 TO OCT 78-SEP 79	GOOSE RIVER AT HILLSBORO	MAF = 2.24 (T) + 12.8	0.38	46	1%
		MAXIMUM DAILY FLOW (MDF)-TIME (T)			
OCT 64-SEP 65 TO OCT 77-SEP 78	MAPLE RIVER NR HOPE	MDF = −21.1 (T) + 33.8	−0.63	14	2.5%
OCT 56-SEP 57 TO OCT 78-SEP 79	MAPLE RIVER NR ENDERLIN	MDF = 69.4 (T) + 364	0.29	22	20%
OCT 44-SEP 45 TO OCT 74-SEP 75	MAPLE RIVER NR MAPLETON	MDF = 84.6 (T) + 585	0.34	31	5%
OCT 59-SEP 60 TO OCT 78-SEP 79	WILD RICE RIVER NR RUTLAND	MDF = 5.59 (T) + 140	0.12	20	--
OCT 56-SEP 57 TO OCT 78-SEP 79	WILD RICE RIVER NR CAYUGA	MDF = 7.24 (T) + 217	0.13	23	--
OCT 32-SEP 33 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE	MDF = 28.5 (T) + 851	0.21	46	20%
OCT 64-SEP 65 TO OCT 78-SEP 79	BEAVER CREEK NR FINLEY	MDF = −2.75 (T) + 484	−0.03	15	--
OCT 39-SEP 40 TO OCT 74-SEP 75	GOOSE RIVER NR PORTLAND	MDF = 13.0 (T) + 883	0.10	36	--
OCT 31-SEP 32 TO OCT 78-SEP 79	GOOSE RIVER AT HILLSBORO	MDF = 75.3 (T) + 54.2	0.39	46	1%
		MEAN SPRING FLOW (MSF)-TIME (T)			
OCT 64-SEP 65 TO OCT 77-SEP 78	MAPLE RIVER NR HOPE	MSF = −0.75 (T) + 15.1	−0.50	14	10%
OCT 56-SEP 57 TO OCT 78-SEP 79	MAPLE RIVER NR ENDERLIN	MSF = 4.66 (T) + 55.1	0.27	22	25%
OCT 44-SEP 45 TO OCT 74-SEP 75	MAPLE RIVER NR MAPLETON	MSF = 6.87 (T) + 86.6	0.34	31	10%
OCT 59-SEP 60 TO OCT 78-SEP 79	WILD RICE RIVER NR RUTLAND	MSF = 0.38 (T) + 22.4	0.07	20	--
OCT 56-SEP 57 TO OCT 78-SEP 79	WILD RICE RIVER NR CAYUGA	MSF = 1.54 (T) + 33.7	0.15	23	--
OCT 32-SEP 33 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE	MSF = 3.41 (T) + 120	0.18	46	25%
OCT 64-SEP 65 TO OCT 78-SEP 79	BEAVER CREEK NR FINLEY	MSF = 0.73 (T) + 30.4	0.13	15	--
OCT 39-SEP 40 TO OCT 74-SEP 75	GOOSE RIVER NR PORTLAND	MSF = 2.24 (T) + 66.6	0.16	36	--
OCT 31-SEP 32 TO OCT 78-SEP 79	GOOSE RIVER AT HILLSBORO	MSF = 7.57 (T) + 42.6	0.34	46	2.5%

2. Flow rates increase as precipitation increases.
3. There has been no significant increase or decrease in precipitation over the period in which flow rates have increased.

Land Drainage

Considerable surface drainage of agricultural land in North Dakota has occurred within the last 30 to 40 years. Water that once was held in fields, depressions and sloughs now is free to drain into streams and rivers. However, little information can be found on the magnitude of change due to drainage. To evaluate this question the natural drainage basin and the drained land in the Maple River and Goose River catchment basins above the Glacial Lake Agassiz Plain were determined. United States Geological Survey maps were used to calculate the total acreage in each catchment basin. A ground survey was conducted during the summer of 1979 to determine the acreage in the natural drainage basin and the additional acreage that now drains in the basin as a result of land drainage. These data, shown in Table 4, indicate the current drainage basin is much greater due to land drainage.

The effects of drainage on flow rates at Enderlin and Portland were evaluated. The acreage in the natural drainage basin and the acreage in the current drainage basin were compared with the mean annual flow, the maximum daily flow and the mean spring flow obtained from the prediction equations in Table 1. In using the flow prediction equations we have assumed drainage started near the time when flow records began and has proceeded annually in a fairly uniform manner.

The regression analysis shows the increase in predicted flow is strongly related to increase in drainage area in each basin (Table 5). The analysis indicates that approximately 50 per cent of the increase in predicted mean annual flow, 36 per cent of the increase in predicted maximum daily flow, and 70 per cent of the increase in predicted mean spring flow is due to increased drainage area. In the second part of Table 5 we assumed the same proportion of land drainage upstream from Mapleton and Hillsboro as there was upstream from Enderlin and Portland, respectively. Any error in

TABLE 2. Comparison of flow rates (ft^3/s) with precipitation (in) at six sites in southeastern ND where r is the correlation coefficient, n the number of years and SIG the level of statistical significance.

WATER YEAR	LOCATION	EQUATION	r	n	SIG.
	MEAN ANNUAL FLOW (MAF) - MEAN ANNUAL PRECIPITATION (MAP)				
OCT 64-SEP 65 TO OCT 77-SEP 78	MAPLE RIVER NR HOPE-COLGATE	MAF = 0.10 (MAP) + 1.13	0.25	14	--
OCT 56-SEP 57 TO OCT 77-SEP 78	MAPLE RIVER NR ENDERLIN-ENDERLIN	MAF = 2.62 (MAP) – 17.15	0.42	22	5%
OCT 32-SEP 33 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE-HANKINSON	MAF = 8.23 (MAP) – 91.52	0.45	46	1%
OCT 56-SEP 57 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE-ABERCROMBIE	MAF = 8.57 (MAP) – 98.82	0.45	22	5%
OCT 39-SEP 40 TO OCT 74-SEP 75	GOOSE RIVER NR PORTLAND-MAYVILLE	MAF = 3.50 (MAP) – 37.57	0.34	36	5%
OCT 32-SEP 33 TO OCT 77-SEP 78	GOOSE RIVER AT HILLSBORO-HILLSBORO	MAF = 2.11 (MAP) + 26.29	0.11	41	--
	MEAN SPRING FLOW (MSF) - WINTER + SPRING PRECIPITATION (PWS)				
OCT 64-SEP 65 TO OCT 77-SEP 78	MAPLE RIVER NR HOPE-COLGATE	MSF = 0.05 (PWS) + 9.06	0.01	14	--
OCT 56-SEP 57 TO OCT 77-SEP 78	MAPLE RIVER NR ENDERLIN-ENDERLIN	MSF = 9.01 (PWS) + 39.73	0.17	22	--
OCT 32-SEP 33 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE-HANKINSON	MSF = 26.11 (PWS) – 7.56	0.26	46	10%
OCT 56-SEP 57 TO OCT 77-SEP 78	WILD RICE RIVER NR ABERCROMBIE-ABERCROMBIE	MSF = 33.99 (PWS) – 52.61	0.30	22	20%
OCT 39-SEP 40 TO OCT 74-SEP 75	GOOSE RIVER NR PORTLAND-MAYVILLE	MSF = 41.82 (PWS) – 188.51	0.65	36	1%
OCT 32-SEP 33 TO OCT 77-SEP 78	GOOSE RIVER AT HILLSBORO-HILLSBORO	MSF = 52.53 (PWS) – 146.53	0.37	41	2.5%

TABLE 3. Comparison of precipitation (in) with time (water year) at nine sites in southeastern ND where r is the correlation coefficient, n the number of years and SIG the level of statistical significance.

PRECIPITATION (PPT) - TIME (T)

WATER YEAR	LOCATION	EQUATION	r	n	SIG.
OCT 64-SEP 65 TO OCT 77-SEP 78	COLGATE	PPT = – 0.31 (T) + 21.14	– 0.30	14	25%
OCT 56-SEP 57 TO OCT 77-SEP 78	COLGATE	PPT = – 0.01 (T) + 18.53	– 0.01	22	--
OCT 44-SEP 45 TO OCT 77-SEP 78	COLGATE	PPT = 0.02 (T) + 17.64	0.05	35	--
OCT 44-SEP 45 TO OCT 77-SEP 78	VALLEY CITY	PPT = – 0.03 (T) + 19.44	– 0.08	35	--
OCT 32-SEP 33 TO OCT 77-SEP 78	HILLSBORO	PPT = 0.02 (T) + 19.41	0.06	43	--
OCT 63-SEP 64 TO OCT 77-SEP 78	CHAFFEE	PPT = 0.00 (T) + 20.10	0.00	15	--
OCT 56-SEP 57 TO OCT 77-SEP 78	ENDERLIN	PPT = – 0.11 (T) + 22.56	– 0.11	22	--
OCT 39-SEP 40 TO OCT 74-SEP 75	MAYVILLE	PPT = 0.03 (T) + 18.87	0.09	36	--
OCT 32-SEP 33 TO OCT 77-SEP 78	HANKINSON	PPT = 0.05 (T) + 18.83	0.14	46	--
OCT 56-SEP 57 TO OCT 77-SEP 78	AMENIA	PPT = – 0.02 (T) + 21.48	– 0.03	22	--
OCT 50-SEP 51 TO OCT 77-SEP 78	AMENIA	PPT = 0.10 (T) + 19.13	0.17	28	--
OCT 56-SEP 57 TO OCT 77-SEP 78	ABERCROMBIE	PPT = – 0.10 (T) + 22.75	– 0.13	22	--

this assumption would be small since the ground survey of the drainage basins above Enderlin and Portland are a large part of the Mapleton and Hillsboro basins, respectively. The current drainage upstream from Mapleton was estimated to be 64 per cent greater than the natural drainage, while the current drainage upstream from Hillsboro was estimated to be 180 per cent greater the natural drainage. This gave even higher correlations of predicted flow to acreage than the previous case (Table 5).

TABLE 4. Acreage in Maple River and Goose River basins and changes due to land drainage.

Total Catchment Basin	Natural Drainage Basin	Drained Land Estimate	Total Current Drainage Basin
	Maple River		
636,000 acres	126,800 acres (19.9%)	80,700 acres (12.7%)	207,500 acres (32.6%)
	Goose River		
609,800 acres	110,700 acres (18.2%)	199,000 acres (32.6%)	309,700 acres (50.8%)

TABLE 5. Comparison of predicted flow rates (ft^3/s) to natural drainage and current drainage area where r is the correlation coefficient.

Flow	Predicted flow rates for:				r
	Enderlin		Portland		
	Natural Drainage	Current Drainage	Natural Drainage	Current Drainage	
	126,800 acres	207,500 acres	110,700 acres	309,700 acres	
	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3/s)	
Mean Annual	22.36	55.12	18.21	43.06	0.72
Maximum Daily	433.4	1891	896.0	1351	0.60
Mean Spring	59.76	157.6	68.84	147.2	0.84

	Predicted flow rates for:				
	Mapleton		Hillsboro		
	Natural Drainage	Current Drainage	Natural Drainage	Current Drainage	
	1.00 Weighted acres	1.64 Weighted acres	1.00 Weighted acres	2.80 Weighted acres	
	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3/s)	
Mean Annual	21.56	125.4	15.04	115.8	0.79
Maximum Daily	669.6	3208	129.5	3528	0.86
Mean Spring	93.47	299.6	50.17	390.8	0.93

Conclusions

Significant increases in flow on the Maple, Wild Rice and Goose Rivers have occurred over the last 30 to 40 years. Flow rates were shown to be related to climate (precipitation); however, there appears to be no change in precipitation patterns to account for the increase in flow rates. Predicted flow rates were shown to be closely related to changes in basin size due to land drainage in the Maple River and Goose River basins. It appears that land drainage is a factor aggravating the flooding problem in eastern North Dakota; however, no attempt was made to quantify its overall significance.

Acknowledgement

The authors express their appreciation to Mr. Russell E. Harkness, US Geological Survey, Water Resources Division, Bismarck, ND for providing computer printouts of stream flow data used in this analysis.

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Fargo/Moorhead Feasibility Study Scoping Comments
Bob Bezek [Bob.Bezek@dnr.state.mn.us]

Jon,

In response to the initial meeting you had in Fargo and your request for some input based on that meeting, comments were solicited from Department staff. While I did get some input back it was very general in nature. I think it would have been helpful to have a formal request to respond to. That being said, following is a summation of the comments we received.

1. Continue to consult Natural Heritage data.

2. It is anticipated that a channel diversion through agriculture land will not have significant impacts to wildlife resources for production or movement. Depending on the type of vegetation and management practices employed some benefits may be realized in a diversion channel.

3. Levees and floodwalls along the river may effect the movement of some species of wildlife such as geese, but would not be significant in either a negative or positive way.

4. The employment of water retention should be included in the mix of alternatives. Opportunities exist to increase and improve ecosystem and wetland restoration, wildlife habitat and provide recreational opportunities through the use of multipurpose water retention areas.

5. Attached for consideration is Technical Paper 12 (Wetland Hydrology & Biodiversity in the Red River Basin, Minnesota) developed by the Red River Flood Damage Reduction Work Group.

6. The potential for impacts to the Buffalo Aquifer need to be addressed in the consideration of alternatives.

7. Many regional flood mitigation efforts are either under way or planned by groups such as the Red River Water Management Board and the Red River Basin Commission. Every effort should be made to identify all possible partners to leverage money and benefits where ever possible.

8. It is recommended that structural flood control measures not be utilized to promote development in currently undeveloped areas prone to flooding.

Again, these are just some initial comments. Once you compile the comments you have received from others it might help to route those to our staff as well. Thanks for the opportunity to provide input Jon.

Best Regards, Bob Bezek

Robert J. Bezek
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North Dakota State Water Commission
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July 7, 2009

US Army Corps of Engineers
ATTN: Craig Evans
190 East 5th St, Suite 401
St. Paul, MN 55101

Dear Mr. Evans:

The purpose of this letter is to provide some initial comments on the Fargo-Moorhead Metropolitan Area Feasibility Study. Your efforts to study permanent flood control options in the Fargo-Moorhead, and surrounding areas are an important first step in providing much-needed flood protection for that area.

As you know, the State of North Dakota, through the Water Commission, has pledged $75 million toward the Fargo Southside Flood Control (FSFC) Project. With that in mind, I would respectfully request an expedited analysis of the FSFC Project, and its role in various alternatives. This might allow local sponsors to proceed with construction on this component as soon as possible, with the understanding that the costs would be part of the non-federal share of the overall Fargo-Moorhead Metro Area project costs.

In addition, considering the magnitude of 2009 spring flood events, and those of years past, I would also respectfully request that any flood protection alternatives developed be designed for larger events than those with a one percent chance of occurrence. As an example, the Grand Forks-East Grand Forks project was constructed to provide protection for up to a 250-year event.

Furthermore, I would encourage the Corps to develop a range of alternatives that will provide a host of options for the project area. These should include not only levee alternatives, but diversion options as well.

Once again, Fargo and Moorhead were fortunate enough to escape a record flood event this past spring. But who knows how many more times those communities can pull off the seemingly impossible. For that reason, I support your commitment to this process, and I applaud your expedited approach, as time is of the essence.

Our agency looks forward to working with the Corps in the coming months and years, with the ultimate goal of providing permanent flood control for the Fargo-Moorhead metro area. If you have any questions, please feel free to contact Randy Gjestvang in our Red River office at 701-282-2318, or email rgjestvang@nd.gov.

Sincerely,

Dale L. Frink
State Engineer

DLF:pmf:ds/1955

JOHN HOEVEN, GOVERNOR
CHAIRMAN

DALE L. FRINK
SECRETARY AND STATE ENGINEER

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JUL 0 9 2009

Mr. Jonathan Sobiech
US Army Corps of Engineers
190 East 5th St, Suite 401
St Paul, MN 55101\

RE: Fargo-Moorhead Metropolitan Feasibility
Study, North Dakota and Minnesota

Dear Mr. Sobiech:

Thank you for the opportunity to provide you with early scoping comments on the Fargo-Moorhead Metropolitan Feasibility Study. This project, which is a cooperative effort between the communities of Fargo and Moorhead with the U.S. Army Corps of Engineers (USACE), will address the high risk of flood damage to urban infrastructure from the Red River of the North, the Wild Rice River, the Buffalo River, and the Sheyenne River. In addition, the project will address opportunities for ecological and wildlife habitat restoration in these watersheds.

Since this project spans two EPA regional offices, we have coordinated with Region 5 and together we have determined that Region 8 will remain the project lead. EPA Region 8 is very interested in the proposed project and in becoming a cooperating agency for the eventual Environmental Impact Statement (EIS). Several sections of EPA Region 8 will be involved in reviewing the project information, including water quality, watershed, and Clean Water Act 404 permits.

Our overriding concern about scoping for this project has been that the study goals and planning objectives appear to be inextricably linked with the Fargo-Southside Flood Control Project. However, the Federal Emergency Management Agency (FEMA) recently determined that they will no longer be developing an EIS for the larger Fargo-Southside project. Rather, they will do an Environmental Assessment for a discrete part of that larger project which includes only Drain 27 and 53. EPA believes that this will lead to better alternatives development for the Fargo-Metrowide Feasibility Study to address a regional system for flood risk reduction.

Our specific comments for scoping are enclosed. Thank you for the opportunity to comment. If you have any questions, please contact me at (303) 312-6004 or you may also contact the project lead, Robin Coursen, at (303) 312-6695.

Sincerely,

Larry Svoboda, Director
NEPA Program
Ecosystems Protection and Remediation

Enclosure

Cc: Brent Truskowski, EPR-W

Fargo-Moorhead Feasibility Study
EPA Pre-Scoping Comments

Purpose and Need:
The purpose and need statement for this project should clearly describe the current "problem" (flooding), and further, the future problems that will result if the project this not implemented (impacts to the riverine ecology, riparian habitat, wetlands, agricultural impacts, economic impacts, health and safety, etc.). EPA recommends that the signatories to the MOU for this project have an opportunity to comments on "purpose and need" prior to alternatives development.

Alternatives:
An alternative analysis that rigorously explores a range of options as well as a combination of options for addressing flooding should be developed. This should include, but not be limited to alternatives that examine watershed-wide or diffuse storage (Waffle approach), enlarging floodways through land use as well as levee and channel diversions. We also encourage you to examine non-structural approaches that restore natural floodplain connectivity, including the enhancement or creation of wetlands and other flood reduction techniques based on fluvial geomorphic principles. Such techniques could include restoration of natural channel dimensions, planform and gradient.

The current land use planning and floodway zoning for Fargo and Moorhead should be disclosed in this study. Growth and redevelopment planning for the region should also be examined and included in these alternatives. Such planning could reduce the cost of flood protection, protect floodways and minimize flood damage. For example, evaluate where there are opportunities for cluster development that would reduce infrastructure costs and preserve open space and floodways.

Finally, the criteria for describing impacts and ranking these alternatives should be comprehensive and clearly described.

Indirect Effects:
The indirect effects analysis should address the growth-inducing effects of the project related to changes in the pattern of land use (including impacts on prime farmland and other agricultural lands), and population density. Changes in land use patterns should disclose local land use policies for Fargo and Moorhead related to residential and commercial building in or near floodways.

Red River Basin Collaboration:
We acknowledge your representation on the International Joint Commission Red River Board and we recommend that the USACE assure on-going collaboration with the following organizations regarding river basin flood issues and any trans-boundary environmental concerns.

Red River Basin Commission: Lance Yohe, Director
http://www.redriverbasincommission.org/

International Water Institute: Chuck Fritz, Director
http://www.internationalwaterinstitute.org/

Climate Change Data:

EPA recommends that the affects of climate change on future flooding be incorporated into the analysis for this study. For your information, a recently released report from John Holdren, President Obama's Director of Science and Technology Policy highlights new information regarding climate change stress on water resources in the west. Thirteen science based agencies participated in development of this report. EPA recommends that the USACE consider this report, among other, in the feasibility study for this project. See http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts.

090417_Fitzpatrick

Beauchamp, Francis MVP

From: Davidson, Mark D MVP
Sent: Saturday, April 18, 2009 11:45 AM
To: 'michael fitzpatrick'
Subject: RE: Busy now

Mike,

I have passed your e-mail onto the 2 Fargo-Moorhead Metro Feasibility Study project managers. Thanks!

Mark

-----Original Message-----
From: michael fitzpatrick [mailto:fitzrite@msn.com]
Sent: Friday, April 17, 2009 7:59 PM
To: Davidson, Mark D MVP
Subject: RE: Busy now

Mark,
Thanks for getting back. I am thinking of a system of 2 or 3 overflow canals, dug to the overflow level of the river, which would carry extra water away from the river to a deep pit which is then pumped out and the water used for productive uses over the course of the summer and fall so that it is empty for the following spring. I would suggest or reccomend using solar powered pumps. The goal being to conserve some of that extra water which is going to be a valuable resource and relieve the flooding. If you get a free minute or if the project manager gets a free minute, please let me know what you think. I have seen where there are some federal grants to work with for projects like this.

Mike

> Subject: Busy now
> Date: Fri, 17 Apr 2009 10:51:44 -0500
> From: Mark.D.Davidson@usace.army.mil
> To: fitzrite@msn.com
>
> Mike - right now we are very busy with the flood fight.
> I wouldn't be able to talk to you for a few weeks.
>
> If you write down your ideas concerning the flooding in the Red River
> area I will pass them on to the project manager for the Fargo-Moorhead
> flood study.
> Thanks!
>
> Mark
>
> -----Original Message-----
> From: michael fitzpatrick [mailto:fitzrite@msn.com]
> Sent: Friday, April 17, 2009 8:40 AM
> To: Davidson, Mark D MVP

> Subject:
>
> Dear Mr Davidson,
> My name is Michael Fitzpatrick and I live in Saint Paul. I have an
> idea to propose and discuss regarding the flooding of the Red River.
> Is it possible to discuss this over the phone or only via email?
Please respond.
> Thankyou.
>
> Mike
>

090520_Koppang

Beauchamp, Francis MVP

From: Awsumb, Lance G MVP
Sent: Tuesday, May 26, 2009 3:41 PM
To: Snyder, Aaron M MVP; Evans, Craig O MVP; Bluhm, Kevin W MVP; McGrath, Jeffrey L MVP
Subject: FW: Cost/benefit breakdown

Guys,
I spoke with the gentleman who sent the below email and told him I could forward his question to the right person. I don't know how much information I can give him, so I have not responded. I think maybe this should go with the formal comments, as well.
If you would like me to respond, let me know.

Thanks,

Lance

-----Original Message-----
From: Roger Koppang [mailto:koppang@cord.edu]
Sent: Wednesday, May 20, 2009 11:50 PM
To: Awsumb, Lance G MVP
Subject: Cost/benefit breakdown

Lance,

I attended the community meeting tonight presented by your group, the U.S. Army Corps of Engineers (St Paul District), at the Hansen Theater at Moorhead State University Moorhead. Just before leaving, I asked you a question concerning the breakdown of damages in the event of 2 catastrophic flood levels in the Fargo/Moorhead community. One level, the "100 year flood", had estimated worst case scenario costs of $2.2 billion. The second scenario, a "500 year flood", had estimated worst case damages of $6.5 billion.

My question: Is there a breakdown of those damages for Moorhead versus Fargo, or Minnesota communities versus North Dakota communities? The 500 year flood scenario seemed to indicate significant damage estimates even in West Fargo, for instance. Also, are there cost breakdowns on a per capita basis for the various local and/or state governmental entities involved under the two scenarios? The damage estimates for a 100 year flood seemed to indicate much more affected developed acreage in North Dakota versus Minnesota. The disparity seemed to grow under the 500 year flood scenario.

In the event a large scale flood prevention/flood control project goes forth, would these same damage estimates (which could also be viewed as potential benefits) breakdowns, presented in a ratio format, be used in determining the amount of dollars an individual local government is responsible for, once that project has an estimated price tag? It seems the benefits gained should determine the costs to a community.

Before I left you tonight, I mentioned my questions could be considered "divisive", yet in reality there are 2 very different communities significantly involved in this process. Those 2 communities are in 2 different states, with two different sets of prevailing economic conditions, and most likely 2 very different methods of funding any local share of a joint project.

Your groups presentation was very thorough and informative. I look forward to the next one. For what it's worth, I drew out the Diversion option during a lull in this year's flood battle. My drawing seems to closely mimic your group's diverson option. My plan had estimated land acquistion costs of $25-$30 million. It began down by Rustad, MN, and re-entered the Red River channel north of Kragness, MN. The only real obstacle in my plan was the Moohead airport. I guess another not so obvious, but still very significant obstacle might be the Buffalo River Aquifer. My point in telling you this is not to portray myself as a forward thinking, visionary individual, but rather to illustrate my belief that a diversion canal on the Minnesota side of the Red River seems so straight forward, so logical, so doable, so obvious. I also do acknowledge there's much more than basic land acquistion in a project of this scope, but the attraction of such a concept is the notion of making every flood a smaller flood, and even possibly making the truly epic floods manageable.

Thanks for your time and your efforts.

Roger Koppang
629 Maple Lane
Moorhead, MN 56560

090520_Miller

Beauchamp, Francis MVP

From: Miller, D Les NWP
Sent: Wednesday, May 20, 2009 12:25 PM
To: Evans, Craig O MVP
Subject: Flood Protection Plans - Fargo-Moorhead - Temporary Plans Also

Follow Up Flag: Follow up
Due By: Monday, May 25, 2009 10:00 AM
Flag Status: Flagged

Hi Craig,

When I read the article below I was wondering about the following:

- Is there a temporary flood fight design and plan which is being replaced by the permanent flood damage reduction considerations described in the article?
- Is there a flood hazard mitigation project listed in one or both communities and/or their respective county's hazard mitigation plan for floods?

Thanks,

Les

D. Leslie Miller, P.E. (Les)
Flood Preparedness Program Manager
U.S. Army Corps of Engineers, Portland District Readiness Branch (CENWP-OD-E)
333 SW First Avenue
Portland, OR 97204-3495
Office: 503-808-4400
FAX: 503-808-4405
d.les.miller@usace.army.mil

US Army Corps of Engineers unveils flood protection plans
By Helmut Schmidt
The Forum, Fargo, N.D.
May 20, 2009

Fargo-Moorhead residents got their first shot Tuesday at brainstorming solutions for permanent flood protection.

About 75 residents and several dozen local officials heard the U.S. Army Corps of Engineers unveil two possibilities for flood control: a $909 million, 30-mile Red River diversion channel; and $625 million in levees along the Red River in the metro.

The levee plan includes Fargo's $161 million Southside Flood Control Project.

"The time for new ideas is right now," said project co-director Craig Evans, speaking during a two-hour informational and comment-gathering session at Fargo's downtown Centennial Hall.

"Maybe somebody out there has a nugget we haven't thought of," Evans said.

Evans said annual flood damage in Fargo-Moorhead averages $64 million.

But costs could leap if there is a catastrophic failure of flood protection. Such a failure would cost the area about $2.1 billion in a 100-year-flood, $5 billion in a 250-year flood and $6.5 billion in a 500-year flood, corps figures show.

The Red River at Fargo has exceeded flood stage in 51 of the past 107 years, and every year from 1993 through 2009, a corps report said.

That means the odds of having a Red River flood greater than the 2009 flood are one in five for someone who takes out a 30-year mortgage, the corps estimates.

The aim of the study is to get "the highest level of protection we can justify," Evans said, whether that's 50-year or 500-year flood protection.

If Congress authorizes the corps to build a project, the federal government would pay 65 percent of the costs, with the remainder picked up by local governments.

The diversion plan being studied is the shortest route and likely the least expensive, running through Minnesota from the confluence of the Wild Rice and Red rivers south of Fargo, north to a point northwest of Kragnes, according to the speakers and a corps report.

The diversion would be a massive project involving 17 highway and four railway bridges, Evans said. It would be 20 feet deep and 500 feet wide across the bottom, requiring 2,000 feet of right of way along its path to handle the dredged earth.

Other diversions in North Dakota and Minnesota will also be studied.

Kevin Bluhm, a corps spokesman, said the alternatives will be more fully worked up in the next four months with a cost-benefit analysis. Then the corps will return to the area in September or October to gather more input.

A corps timetable has the study finalized by September 2010, and sent to Congress by that December. April 2012 would be the earliest work would start, Bluhm and Evans said.

Completion of the project will depend on how quickly funding is provided by Congress.

Julie Olson, a resident of Maple Prairie, a subdivision south of Fargo on the Red River, said she knows the more global project will take time. In the meantime, she hopes Southside Flood Control moves ahead.

"It's a huge process. It's not going to happen overnight," she said.

As part of the study, the corps will test soil in the area this summer, Bluhm said.

South Fargo resident Eric Bach said he thought the corps plan was "pretty preliminary … but it's good to get it out in public."

Jerry Baldwin worries his home on Fargo's Southwood Drive may be sought for a buyout, but he hopes the corps can find "a long-term solution for the area."

Fargo City Engineer Mark Bittner said the corps' plans were not a big surprise, but he said costs were lower than expected.

"Seems to me there's a positive cost-benefit, which is good," Bittner said.

090520_Neuhauser

Bill Neuhauser P.E.
21494 Coaley Bay drive
Detroit Lakes, MN
218-847-9718

Craig Evans
U.S. Army Corps of Engineers

You have ask for other options to getting the water around Fargo/Moorhead, the way I looked at this is that there are three ways to get water around an object. One is to divert it around with a diversion, which can be very expensive with land acquisitions and bridge and road constructions and not too mention very time consuming. Second is to go through town with large flood walls: This has similar disadvantages as the diversion mostly the cost. And then the third method I'm going to propose to you.

The third method is not necessary a new method, in fact it has been used in numerous places around the world to solve issues similar to ours. The cost for this is the big question that will probably involve asking contractors for their input. I have found instances for this method being use or being proposed to be used in cities like Bangkok, Cincinnati and Seattle.

The job at hand is not necessary to divert all of the flows of the Red River around the FM area, but instead an amount the will drop the flows through town to a manageable height.

Looking at the graphs from the 2009 flood the flows at the high pt were around 31k at the 40.82. There are two questions that need to be answered here? Just what is the flow that the Corps wants to design for? And what gauge height would be acceptable to flow though the city?

What I'm proposing is a series of tunnels under the city. Now before you stop reading think about the cost advantages to this. Very small land and ROW acquisition is required, none or very little road and bridge building would be required and the current soils under Fargo/Moorhead are glacier till which we all know is very soft and very easy to bore though. All three of the links below are for tunnels and all but one are though granite! Meaning very expensive! The real challenge to this is finding a path under the city that would miss any existing pilings. My first thought was to tunnel under the interstate but when I thought of the pilings this wouldn't work.

My preliminary design calls out for about 80,000 ft of tunnels and with three 30ft dia tunnels this would get us about 15k of flow. This is assuming a 15ft drop from the upstream to down stream. Large pumps would probably need to be added to this design but this 15k number is assuming gravity flow.   We would dig down at a slope to 70 or 80 ft deep and then hold the bottom of the tunnel until the north end of the city and which time we would then let the water percolate or pump back up to the surface. Don't hold me to these numbers the software I used to calc this is not design to calculate tunnel flows but culverts.

You ask for other solutions, well this is thinking outside the box! We could call it the FM tube!

Thanks for your time
Bill Neuhauser P.E.
21494 Coaley Bay Dr.
Detroit Lakes, MN 56501

http://www.ita-aites.org/cms/fileadmin/filemounts/general/pdf/ItaAssociation/Organisation/Members/MemberNations/Thailand/U-1BMA.pdf

http://www.enquirer.com/editions/2001/08/12/loc_the_big_drain_giant.html

http://www.discovery.org/a/8231

Phraya River Project.

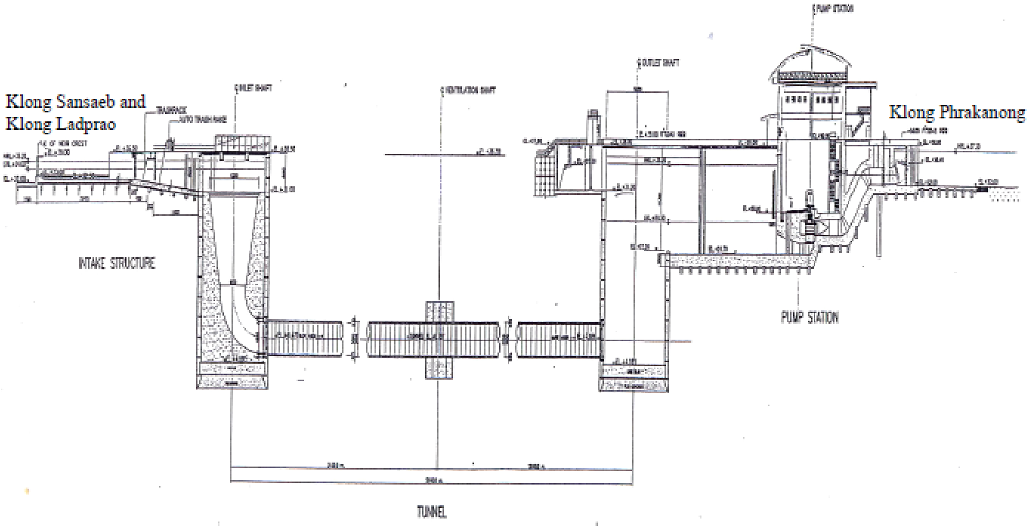

Figure 2. Longitudinal section of BMA water drainage tunnel project.

090520_Neuhauser

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 11:50 AM
To: 'billneu@arvig.net'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: RE: Alternative flood protection idea for Fargo

Attachments: FM Flood alternative.doc

FM Flood alternative.doc

Mr. Neuhauser,
Thank you for the suggestion and information on the innovative tunnels. There is a similar system in San Antonio, Texas that we are aware of. We really appreciate every new idea, and it will be considered. As we continue our study, we would like the public to be involved as much as possible.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: bill neuhauser [mailto:billneu@arvig.net]
Sent: Wednesday, May 20, 2009 9:21 AM
To: Evans, Craig O MVP; Snyder, Aaron M MVP
Subject: Alternative flood protection idea for Fargo

Please see attached doc.

Bill Neuhauser P.E.

090608_Sandt

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Monday, June 08, 2009 9:42 AM
To: 'jay'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: RE: Please Pass these comments on at the Flood meetings

Mr. Sandt,
We are considering all possible alternatives, and I did not mean to imply that we wouldn't consider your suggestions. I just wanted to point out that the Corps has limited authorities, and it seemed more appropriate to me that your issues be addressed through the political process than through our techincal study.

The Corps has no position on your first suggestion to set up a new Water Commission Board. If such a board is established, we will be happy to work with it, but we have no role in that political issue.

We are looking at flood storage in another feasibility study, the Fargo-Moorhead and Upstream study that began in 2004. We are also aware of the EERC's "waffle plan" study that seems very similar to your #2 suggestion. Because those concepts would need to be implemented across the entire basin, they are geographically out of our Fargo-Moorhead Metro study scope. Initial work has shown us that it will be difficult to find economic justification for the type of storage you suggest, and the model of storing water temporarily on farmed land does not fit our existing authorities to build permanent Federal projects. These types of projects are more likely to be built and managed by a local watershed district or county drainage authority.

Your third suggestion is for local action to prepare for flood-fighting. Again, this is not a Corps responsibility. We can provide assistance during floods, but we do not provide equipment for each community to store and maintain.

Thanks, again, for your interest in this study.

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: jay [mailto:jay@iconcmo.com]
Sent: Monday, June 08, 2009 8:38 AM
To: Evans, Craig O MVP
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Re: Please Pass these comments on at the Flood meetings

Dear Craig:

I am confused as to the answer provided. The first statement says that they will be considered in the study process then the next statement says they are beyond the scope of the study. The second statement I disagree with because the Army Corp of Engineers should be taking all the viable options that are available to limit the following: widen the river, dams, diversions, holding areas, etc. Having water gates in the area that are controlled would act as a holding area which I believe is one of the options currently on the table or at least been brought up by local leaders. While these items can be passed on to legislature, an opinion from the Corp does speak louder than one citizen which has already advised the local authorities of these options.

Secondly, any study that is done that is costing millions of dollars should look at every alternative that might be feasible. Correct me if I am wrong but normally there is an initial study which sort of separates the best options from the rest of the pack. Then a second study is done on those very best options to find out what would be the best solution. Not looking at all the options on the first pass through and dismissing them as "beyond the scope" is saying that they don't even get looked at in the first round to be disqualified with a viable reason. It would be a different story if the initial view of the mentioned options were not feasible, but to not even look at them is ignoring a possible solution that would work by itself or in conjunction with others. In addition, it is proven that holding water onto farming fields does decrease flooding which is the goal overall. If anything can decrease flooding it should be looked at and not dismissed because it is out of scope.
Thank you.
Jason Sandt

Evans, Craig O MVP wrote:

> Mr. Sandt,
> Thank you for sending us your suggestions. We will consider them in our study process.
>
> All three issues you raised appear to be beyond the scope of our study. I encourage you to share your ideas with your local and state political representatives who may be able to influence those issues.
>
> For more information on the study:
>
> We have a project information paper posted on our Website:
> http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455
>
> We also have a project Website where we'll post our slides and handouts from

the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

From: jay [mailto:jay@iconcmo.com]
Sent: Wednesday, May 20, 2009 4:20 PM
To: Engineering Proxy
Subject: Please Pass these comments on at the Flood meetings

To all City Leaders and Other Government Officials:
City of Moorhead
City of Fargo
Army Corp of Engineers
State of MN
State of ND

There are 3 issues that should be addressed out side of the proposed solutions that the Corp has suggested. These suggestions would take less time to implement and money until the future project is in place several years down the road.

1. Development of a Water Commission Board that has the authority to drain fields and outer areas when it is appropriate to decrease flooding and keep river levels under control. Water run off does increase the river levels and should be addressed just like in other states by a Water Commission that has the authority to supervise the drainage from fields. Run off water is more of a threat in level areas like FM than other areas across the USA because everything just sits around until spring.
2. The next thing goes in hand with the above item. All fields should have gates on them that can be controlled by the Water Board and

fines should be imposed for anyone that is tampering with those gates or digging ditches to drain their fields. Although I can respect the farmers ambition to get into the fields in spring this does not justify ruining other people's property to do it.

3. The next item is to have the water tubes that were used in the flood this year for a few homes on hand in various sizes within the city storage facilities. There is a company that does this and the cities can contract with them. The company even guarantees that the system will work.

The reason I am emailing this is because I can not attend in person to bring these issue forward but I would welcome your input or any questions on my comments here. I would like to know any feedback from these suggestions and what the agencies do with these comments. Thank you.

Jason Sandt 701-866-1388

--
Thank you for contacting Icon Systems
Jay - Icon
Phone 1-800-596-4266
Fax 218-236-0235
Company Website: http://www.iconcmo.com
http://churchsoftware.blogspot.com/2007_11_14_archive.html

090606_Tweeten

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 11:36 AM
To: 'able.management@yahoo.com'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: RE: Fargo-Moorhead flood mitigation public input

Mr. Tweeten,
Thank you for your suggestions and very valuable information. We will consider your input in our study process. Water storage is currently being studied in our ongoing Fargo-Moorhead Upstream Feasibility Study. For the Metro study, we are considering storage as a supplement to other flood mitigation measures. With the topography of the land being as flat as it is, it would difficult for storage to be a stand alone alternative. As we continue our study, we would like the public to be involved as much as possible.

For more information on the study:

We have project information papers posted on our Website:

Metro study:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

Upstream study:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=907

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

----- Original Message -----
From: Joel at Able Executive Management Services
<able.management@yahoo.com>
To: Bluhm, Kevin W MVP
Sent: Wed May 20 10:16:35 2009
Subject: Fargo-Moorhead flood mitigation public input

Here is my suggestion for the Corps' efforts to control flooding of the

090606_Tweeten

Red River of the North around Fargo.

Build successive weir pools upstream of affected areas. In low-flow periods the basin of the pools will be native grasses used by ground nesting birds and other wildlife. After their establishment they'll be valued as a hunting resource.

Underlying the increase in flood damage is the loss of natural wetlands through current farming practices. Efforts to make low lying fields productive by tiling to the network of drainage ditches leading to the river exacerbates this.

While the acquisition of larger tracts may be required, there are advantages to the construction of successive weir pools over building a diversion channel: (1) Acquisition of the land is less complicated than the need for a continuous channel. The problem in acquiring the rights of way for a channel is that one landowner may resist and hold up the entire project. The specific placement of a given weir pool need not be dictated by a single landowner. This should lead to a lower price per acre. It will lead to lower legal bills and less time in court, too. (2) The solution is closer to the natural stream cycle. While it does not restore the watershed to its native state, the creation of grassland flood zones emulates the natural model. (3) Cost of the weirs is offset by reduced disruption of highway and railroad bridges required of the channel (4) Introduction of this environmental plan may coincide with other economic and commercial interests. Specifically, the location of waste disposal. Determination of landfill sites would articulate nicely with the engineering required of such a project.

Thank you for the opportunity to be included in the participation process.

Joel Tweeten
2641 Vernon Avenue South
St. Louis Park MN 55416
952-393-2193

090521_Linnertz

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Thursday, May 21, 2009 11:33 AM
To: 'thomas.linnertz@sba.gov'
Cc: Snyder, Aaron M MVP
Subject: Re: Fargo Flood control

Attachments: image001.gif

image001.gif

Tom,
Thanks for your suggestions. We intend to look at alternatives like the ones you mention, and I'll pass your e-mail on to our team.

We will also be looking for other ways to reduce the flood risk in your area, and some buyouts may be possible under a non-structural plan. We won't know for several months.

Please feel free to contact me any time if you have more thoughts on our study.

Thanks,
Craig Evans
Senior Planner
St. Paul District
USACE
651-290-5594

From: Linnertz, Thomas J.
To: Evans, Craig O MVP
Cc: Tom Linnertz (H)
Sent: Thu May 21 09:53:20 2009
Subject: Fargo Flood control

Craig:

I am sorry I was unable to attend the flood control meeting in Fargo on Tuesday due to conflicts in scheduling. I have read the story in the paper. I Live in the Lakshure Develoment approximately 2 miles south of Harwood. The flood control mentions nothing about the area of the Sheyenne River from the egress of the West Fargo Diversion to the Red River. This area floods terribly. This area also remained in flood stage for somewhere around 3 weeks after the flood was declared over in Fargo.

This Sheyenne River area needs also to be addressed or the properties purchased and the same made into a flood way. The situation continues to worsen as more efficient methods of field drainage and drain tile are installed.

I have two suggestions

1.   Run the Red River Diversion around the west side of West Fargo, to include the Red, Wild Rice Sheyenne. Continue the same to confluence of the Red and Sheyenne. I am quite sure this suggestion would be very expensive and possibly meet with tremendous rejection from anyone in the Sheyenne basin area around West Fargo and Harwood. I believe this may have been discussed before and it was determined not economically feasible.

2.   Create the Red River Diversion as per the meeting, and create an extension of the West Fargo Diversion utilizing what I believe is called drain 41. this would then run from the egress of the West Fargo Diversion, across/under co Rd 17, roughly diagonal to Drain 41 some where between 12th Ave and Co Rd 19 and west of 57th st N., through Lakeshure Addition and under I-29 just south of Harwood. I am just a lay person but when looking at this on Google Earth it appears to be an almost natural drain way or possibly and earlier channel of the Sheyenne River. This would involve buyout of possibly only the a few homes close the egress of the present West Fargo Diversion and then protection or buyout of the homes at Lakeshure Addition. I live in Lakeshure Addition properly handled this could become quite a effective drain way. Also, while I like my house, I am not so enamored with it that I would not take a fair market buyout.

Please don’t hesitate to contact me if you have any questions. Cell 701-793-7312

Tom Linnertz

Senior Business Development Specialist

North Dakota District Office, SBA (NDDO)

U.S. Small Business Administration (SBA)

657 2nd Ave N, Suite 218, PO Box 3086

Fargo, North Dakota 58108

Ph 701-239-5131 x 215

Fax 202-481-5852

Email: Thomas.Linnertz@sba.gov

Web: www.sba.gov/nd

Beauchamp, Francis MVP

From: Vaa, Galen [Galen.Vaa@courts.state.mn.us]
Sent: Friday, May 22, 2009 1:08 PM
To: Snyder, Aaron M MVP
Subject: Fargo/Moorhead regional flood study

Dear Mr. Snyder:

I attended your presentation concerning the above subject matter at MSUM on Wednesday. You and your colleagues should be commended for a very fine review of this complicated issue. I have talked to a number of my neighbors (I live in Crestwood subdivision, exactly 3.3 linear miles south of I-94 on the Minnesota side of the Red River) and they all were impressed with your unbiased and fair presentation of the findings and possible solutions. However, I have two concerns.

My first concern in personal in nature. Unfortunately, my home was substantially damaged this spring and it is situated in the 100 year flood plain. Thus, I have applied for a FEMA buyout and the officer from Clay County who is handling this matter has informed me that my chances for a buyout look pretty good at this time. But, I have a "what if" question concerning this matter, based upon a comment you made at the Wednesday meeting at MSUM. "What if" your organization ultimately recommends that the proposed levee alternate should be implemented and not the diversion alternative. If that is the case, I am wondering if it would be possible for someone from the Corps to roughly estimate where this levee would be located in relationship to Crestwood Subdivision where my home is located. I looked at the diagram the Corps had prepared for the "levee" alternative and it appeared that the levee would be located either on the road which forms the eastern boundary of Crestwood Subdivision, or, would be located even a short distance east of the road.

Basically, I don't want my possibility of getting a buyout jeopardized by misinformation concerning the "potential" location of this "possible" levee. As you are aware, property that is bought out by FEMA usually cannot be used for any purpose, even flood prevention purposes. My home and lot are located directly next to the Red River. My lot is about 250 feet deep and my house is about 150 feet from the river bank and the west side of the house is about 50 feet from the established floodway. When I purchased the property in 1985, the lot was 300 feet deep, but erosion and slumping has consumed about the west 50 feet. I am assuming that even if a levee is ultimately built in accordance with a future Corps recommendation, that said levee would not be built that close to the river. One of the reasons for FEMA's consideration of a buyout of my property is the fact that backyard is subject to erosion and slumping and is unstable.

Could someone from the Corps confirm that any future levee, if it is recommended and ultimately built, would be built on the township road that presently serves Crestwood or east of the road, and not close to the river across my present lot; thus, the officials at Clay County would not have to worry that a FEMA buyout for my house/lot might frustrate future plans to build a levee in the area? Again, I reside in Lot 11 of Crestwood Subdivision, which is located on the Red River (Minnesota side) just 1/3 mile south of the convent bride road (60th St. South in Moorhead), and at a latitude equivalent to 55th Ave South on the Fargo side of the river.

My second concern relates to the hydrology graph which the Corps has prepared that was shown at the MSUM meeting, which estimates the "peak flow" of the Red for various past flood events. This graph shows that the 2009 flood had a peak flow slightly higher than the 1897 flood. I believe that this is misleading to the public and contributes to the public perception that we have survived the worst flood event of recorded history and we therefore don't have to worry so much in the future.

Years ago, I was on the governing Board of the Clay County Historical Society. I have always enjoyed an interest in the history of the settlement of this region and the study of historic flood events that helped shape that history. The Clay County museum has some very specific historical records relating to the 1897 flood, which establish that the 40.3 foot crest occurred notwithstanding the fact that the width of the river at the Veterans Memorial Bridge in downtown Fargo extended from Broadway Avenue in Fargo on the west, and east to 8th Street in Moorhead, a distance of about a mile. The crest at the same VMB in 2009 of 40.82 feet involved a river whose width had been constricted to less than ¼ mile by the erection of dikes. Certainly, the "peak flow" of the Red in 1897 was significantly in excess of the "peak flow" in 2009, in light of the tremendous width of the Red in 1897, compared to 2009.

Also, a close friend of mine (Jay Leitch) who is a Moorhead resident, has written an authoritative book on the Red River entitled "A River Runs North". This book discusses the truly historic flood of 1826, in which the undiked Red River likely obtained a crest of at least 42.5 feet (and perhaps more) in Fargo. If you are ever in Winnipeg, you should visit "The Forks" area, which is a museum located at the confluence of the Red and Assiniboine in downtown Winnipeg. That region was settled in 1826, and accurate flood records show that the crest in that year was fully 9.1 meters (10 feet) higher than the next highest crest. It is a truly sobering exhibit for anyone living in the Red

River Basin!!

In light of the above, I suggest that you include in your presentation the fact that the 2009 flood is NOT the highest flood in Fargo in recorded history, according to historical documents. I believe that this information will instill a greater feeling in the local population and our local officials that something major needs to be done to prevent a real disaster if a flood similar to 1897 or 1826 should revisit this area.

Thank you for your consideration of the above. I look forward to hearing back from you concerning my first concern.

Galen J. Vaa

6273 -7th St. SW

Moorhead, MN, 56560

Beauchamp, Francis MVP

From: Vaa, Galen [Galen.Vaa@courts.state.mn.us]
Sent: Thursday, May 28, 2009 8:19 AM
To: Snyder, Aaron M MVP
Subject: Fargo/Moorhead Regional Flood Study

Dear Mr. Snyder:

Unfortunately, my email to you dated May 22, 2009 contains a typographical error. The reference to the great flood in Winnipeg in 1826, refers to a crest of fully 9.1 meters (10) feet higher than any other recorded crest. Actually, the record crest in Winnipeg in 1826 was 3.1 meters (10) feet higher than the next highest crest according to their historical records.

I look forward to your response to my email of May 22nd. Thank you.

Galen J. Vaa

090525_Keller

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 11:40 AM
To: 'lskeller@cableone.net'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: RE: Flood control idea for Red River Valley

Mr. Keller,

Thank you for your suggestions and very valuable information. We will consider them in our study process. At our public meetings on May 19th and 20th, we tried to stress there is no plan that is a silver bullet; multiple alternatives could be implemented together to make the best plan. As we continue our study, we would like the public to be involved as much as possible.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Lon Shelley CableOne [mailto:lskeller@cableone.net]
Sent: Monday, May 25, 2009 4:22 PM
To: Evans, Craig O MVP
Subject: Flood control idea for Red River Valley

Craig,

The latest idea I've been hearing about involves creating a large diversion channel around F-M on the Minnesota side. While I do feel this option will provide a permanent solution for residents of the F-M metro, I fear it will cause additional issues for residents downstream. For an example, research the recent events for residents living north of Winnipeg. There were several news reports of people becoming overwhelmed with the rapidly moving water coming from the Red and the diversion.

Due to the topography of the land, I feel permanent flood protection must include multiple solutions. In conjunction with a diversion channel to protect the major metropolitan areas, I'd like to see a series of large holding ponds up and down the river, both in North Dakota and Minnesota. I feel the best way to control flooding on the Red is to first control how fast the water enters the channel. Of course this means landowners (farmers) will be affected, but the solution does not mean they will have to permanently give up their land. During times of heavy flooding, landowners could be financially compensated as portions of their lands are used to hold excess flood waters. During normal or dry conditions, farmers would work their land as usual. Since major flooding is not an annual event, landowners should not have to be burdened too often.

Using a series of retention ponds may also have a beneficial financial impact on the proposed diversion, as the size and scope of that project could potentially be scaled back. Plus, these ponds could be constructed more quickly, giving a more immediate solution and allowing more time to complete the diversion.

Thank you for time,

Lon Keller
641 41st Ave S
Moorhead, MN 56560

090526_Bigger

Beauchamp, Francis MVP

From: Brant Bigger [b_bigger@netzero.com]
Sent: Tuesday, May 26, 2009 12:06 PM
To: Evans, Craig O MVP
Subject: RE: F-M flood meetings

Thank you for the information. The slides from the meeting indicate there's a mailing list for information. Can you please add me to that list? Thanks again, Brant.

Brant B. Bigger 13248 US Hwy 10
Lake Park, MN 56554-9631
218-234-6906
b_bigger@netzero.net

---------- Original Message ----------
From: "Evans, Craig O MVP" <craig.o.evans@usace.army.mil>
To: "Brant Bigger" <b_bigger@netzero.com>
Cc: "Snyder, Aaron M MVP" <Aaron.M.Snyder@usace.army.mil>, "Schmit, Thomas A MVP" <Thomas.A.Schmit@usace.army.mil>
Subject: RE: F-M flood meetings
Date: Thu, 21 May 2009 15:13:26 -0500

Hi Brant,
We did not publish any maps showing the preliminary alignments of either the levees or the diversion. In general, the levees would follow the river banks and tie into high ground east and west of the river. We plan to look at diversions in both MN and ND that would start near where the Wild Rice River enters the Red and end at the Red somewhere northwest of Kragnes, MN. That's as specific as we can really be right now. You can expect more specifics this fall.

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings (look for that info next week):
http://www.internationalwaterinstitute.org/feasibility/index.htm

I hope you find this information helpful. Please let me know if you have any other questions about the Fargo-Moorhead Metro Feasibility Study.

Thanks,
Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Brant Bigger [mailto:b_bigger@netzero.com]
Sent: Thursday, May 21, 2009 12:53 PM
To: Evans, Craig O MVP
Subject: F-M flood meetings

Hello Craig,

I was unable to attend either of the informational meetings held in Fargo & Moorhead this week. I've looked on the Corps's website, but can't find any information about the proposed levees &/or diversion. Can you direct me to the correct information. I'm mainly looking for general information about the size of the diversion, its possible route & other items of that nature.
Thank you for your time & the hard work you & the rest of the Corp are putting into this project.

Brant B. Bigger 13248 US Hwy 10
Lake Park, MN 56554-9631
218-234-6906
b_bigger@netzero.net

090602_Majkrzak

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Tuesday, June 02, 2009 4:41 PM
To: Schmit, Thomas A MVP; Snyder, Aaron M MVP
Subject: FW: Red River Flooding

Thomas,
Please add this to our "ideas" folder and add Mr. Majkrzak to the e-mail list.

thanks,
Craig

-----Original Message-----
From: Evans, Craig O MVP
Sent: Tuesday, June 02, 2009 4:40 PM
To: 'Dave Majkrzak'
Subject: RE: Red River Flooding

Thanks for your suggestions, Dave. It was a pleasure visiting with you today. I'll add this concept to our list of alternatives, and we'll put you on our e-mail list for further updates.

Sincerely,
Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Dave Majkrzak [mailto:dave.majkrzak@crary.com]
Sent: Tuesday, June 02, 2009 4:19 PM
To: Evans, Craig O MVP
Subject: Red River Flooding

Thank you for your phone time discussing the flooding problems in the Fargo/Moorhead area of the Red River.

To summarize: I am proposing you consider the I-29 right of way as a potential open viaduct during major floods, and as a roadway during normal times. I also suggested a "split" in the Interstate I-29 traffic to create a ND side, and a MN side North/South "beltway". These driving road beltways would also be mini diversion channels, holding and forcing the water to flow north, protecting the cities from overland flooding from small creeks and coulees from the West, and East directions.

The goal of this would be to split the Red River flows into four (or maybe three, if the MN side was not deemed necessary) channels. These channels would be the Red River, the I-29 viaduct, the West side beltway/diversion and the East side beltway/diversion. Possible transportation funds would be available as well, as the beltway driving needs would be a big asset to both cities.

Please put me on your distribution list.

Thank You.   Phone 701-499-5926

David Majkrzak, P.E.

802 Sheyenne Street

West Fargo ND 58078

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 9:21 AM
To: 'jimmel@ideaone.net'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Fargo-Moorhead Metro Feasibility Study reply

Mr. Armfeld,

Thank you for attending one of our public meetings in May. This e-mail is in response to your following question: "Unless the southside project is an important and a part of your plan why proceed?"

We are still in the preliminary stages of the Fargo-Moorhead Metro Feasibility study, but we know that our project needs to include the southern part of Fargo. We are currently on a parallel course with the city of Fargo's Southside Flood Control project. The city prefers to keep moving on their study so they will be ready to build something as soon as possible, regardless what happens with the Federal study. The Corps sees the proposed Fargo Southside project as one alternative to be considered along with the other concepts we will assess.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

090606_Breker

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 9:33 AM
To: 'mjbreker@yahoo.com'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Response to question from Fargo-Moorhead Metro Feasibility Study

Mr. Breker,

Thank you for attending one of our public meetings in May. This e-mail is in response to your following question: "As a Fargo resident and farmer from the southern Red River Valley, I have interests in protecting both Fargo and my farm and cropland. I am interested in the economic analysis of all potential upstream water retention. Please contact me regarding the above."

The Fargo-Moorhead Metro Feasibility study is concentrating on actions we could take in the metropolitan area. The Corps is working on another study to look at potential water retention upstream of Fargo-Moorhead--the Fargo-Moorhead and Upstream Feasibility Study. We will incorporate information from the upstream study into our planning in the Metro study, and we will continue to look for flood storage opportunities.

For more information on the studies:

We have project information papers posted on our Website:

Metro study:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

Upstream study:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=907

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

090606_Haugen

Beauchamp, Francis MVP

From:	Evans, Craig O MVP
Sent:	Saturday, June 06, 2009 10:33 AM
To:	'dlhaugen@cableone.net'
Cc:	Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject:	Response to question from Fargo-Moorhead Metro Feasibility Study

Ms. Haugen,

Thank you for attending our public meeting in Moorhead on May 20. This e-mail is in response to your following question: "Is there an aquifer newly discovered south of Moorhead, west over the proposed diversion, and east of the Red? We wouldn't cause potential damage to clean water source in times of drought?"

We are aware of the potential for our alternatives to affect groundwater, and we want to avoid any adverse impacts to aquifers. We are taking soil borings and working with the Minnesota Department of Natural Resources and other agencies to determine where aquifers exist. Our preliminary diversion alignment was chosen to be west of the known Buffalo aquifer.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and comments,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 10:11 AM
To: 'Barbr.headrick@gmail.com'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: FW: Response to question from Fargo-Moorhead Metro Feasibility Study

Ms. Headrick,

Thank you for attending our public meeting in Moorhead on May 20. This e-mail is in response to your following questions: "How much will be on website as you work on study over next 4 months? How will Corps handle currently existing structures, such as the Sheyenne diversion in West Fargo, could they be altered to work better for the full region or must your project deal with it as is?"

Concerning your first question of updating the website: we may post some new information or correct some information that is no longer valid. Due to time constraints, the website will not have set update intervals.

Regarding currently existing structures: Since the study is in the preliminary stages, we are just beginning to study diversion alternatives in North Dakota. We will consider modifications to the Sheyenne diversion in addition to other possible diversion alignments in North Dakota and Minnesota.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

090606_Ista

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 9:57 AM
To: 'djista@loretel.net'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Response to question from Fargo-Moorhead Metro Feasibility Study

Ms. Ista,

Thank you for attending our public meeting in Moorhead on May 20. This e-mail is in response to the written comments you provided at the meeting regarding downstream impacts and the need for additional flood storage.

Regarding your question about measuring downstream impacts: we will measure the impacts of the project as far downstream as the impacts exist. We will also be studying the impacts upstream of a flood control project. Hence we are not only studying the Fargo-Moorhead metropolitan area, we will be studying any part of the Red River Valley that is affected from flood mitigation efforts in the F-M area. Our intent is to minimize any impacts, and the project will need to compensate for any economic impacts that rise to the level of a real estate "taking."

Regarding flood storage, we are considering flood storage in another feasibility study, the Fargo-Moorhead and Upstream Feasibility study that started in 2004. We are finding it difficult to show economic justification for Federal participation in flood storage in the upper Red River Basin, but we continue to look for opportunities to combine flood storage with ecosystem restoration in ways that may allow for Federal projects. We are also building hydrologic models that can assist local jurisdictions when they consider non-federal flood storage projects.

For more information on the Fargo-Moorhead Metro study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

Diane Ista – How far downstream do you measure impacts? We need assistance to River which would reduce the flows to the Red. djista@loretel.net See full comment in the written comment section.

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 11:40 AM
To: 'lskeller@cableone.net'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: RE: Flood control idea for Red River Valley

Mr. Keller,

Thank you for your suggestions and very valuable information. We will consider them in our study process. At our public meetings on May 19th and 20th, we tried to stress there is no plan that is a silver bullet; multiple alternatives could be implemented together to make the best plan. As we continue our study, we would like the public to be involved as much as possible.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Lon Shelley CableOne [mailto:lskeller@cableone.net]
Sent: Monday, May 25, 2009 4:22 PM
To: Evans, Craig O MVP
Subject: Flood control idea for Red River Valley

Craig,

The latest idea I've been hearing about involves creating a large diversion channel around F-M on the Minnesota side. While I do feel this option will provide a permanent solution for residents of the F-M metro, I fear it will cause additional issues for residents downstream. For an example, research the recent events for residents living north of Winnipeg. There were several news reports of people becoming overwhelmed with the rapidly moving water coming from the Red and the diversion.

Due to the topography of the land, I feel permanent flood protection must include multiple solutions. In conjunction with a diversion channel to protect the major metropolitan areas, I'd like to see a series of large holding ponds up and down the river, both in North Dakota and Minnesota. I feel the best way to control flooding on the Red is to first control how fast the water enters the channel. Of course this means landowners (farmers) will be affected, but the solution does not mean they will have to permanently give up their land. During times of heavy flooding, landowners could be financially compensated as portions of their lands are used to hold excess flood waters. During normal or dry conditions, farmers would work their land as usual. Since major flooding is not an annual event, landowners should not have to be burdened too often.

Using a series of retention ponds may also have a beneficial financial impact on the proposed diversion, as the size and scope of that project could potentially be scaled back. Plus, these ponds could be constructed more quickly, giving a more immediate solution and allowing more time to complete the diversion.

Thank you for time,

Lon Keller
641 41st Ave S
Moorhead, MN 56560

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 9:40 AM
To: 'bonniek@i29.net'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Response to question from Fargo-Moorhead Metro Feasibility Study

Bonnie and Charles Koski,

Thank you for attending one of our public meetings in May. This e-mail is in response to your following question: "How can you adjust your project for a river that flows north into frozen drainage channel?"

Your question raises one of the many challenges in designing permanent flood mitigation in the Red River Valley. As we look at various alternatives, we will consider downstream conditions and factor them into our designs.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

Charles Koski – Any project should consider redundancies to allow for modification of any catastrophic failure le diversion and modified flood barrier and or storage. How can you adjust your project for a river that flows north into frozen drainage channel?
bonniek@i29.net

090606_Lahren

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 9:42 AM
To: 'dlahren@aol.com'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Response to question from Fargo-Moorhead Metro Feasibility Study

Mr. Lahren,

Thank you for attending one of our public meetings in May. This e-mail is in response to your following question: "Why do you need a 500 ft wide base at the bottom of the diversion?"

The design of the diversion alternative is in the preliminary stages. The 500 feet is only preliminary and was used as a width that would carry an approximate volume of water around the metropolitian area. In the upcoming months we will be conducting further study into this topic, as well as optimizing the width and depth of a proposed diversion alternative.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 12:32 PM
To: 'FM Flood Group'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: RE: Flood protection for Fargo

Mr. Sell,

Thank you for sharing your comments with us. We will consider them as we continue to refine our diversion alternatives along with several other concepts that could reduce flood risk in the study area.

Regarding the channel widths, I'm not sure where the channel is only 100 feet wide. I know that at the 32nd Ave. South Dam the channel is closer to 180 feet wide during most of the year, but during flood events it is significantly wider than that. The natural channel is also deeper than a diversion would likely be, so keep in mind that width is only one factor in our design. We will look at various cross sections to optimize the design.

As we continue our study, we would like the public to be involved as much as possible.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: FM Flood Group [mailto:fmflood@twoface.dreamhost.com]
Sent: Friday, June 05, 2009 2:21 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Rob Sell (robsell@gmail.com) by the FM Flood Control Group

Mr. Craig Evans:
Sorry about that, I meant to paste in something else and then I accidentally sent it out.

I have a tough time believing the corps recommendation that a a diversion would need to be 500 feet wide. why would we need a diversion 5 times as wide as the river is? I believe that the diversion study should be re-evaluated.

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

In F-M the river is about 100 feet wide, in Winnipeg the river is about 450 feet wide (nearly 5 times as wide). The red river valley is full of ditches (drains). The diversion would just be a bigger ditch. A bottom width of about 50 feet appears to be what would be required based on the 2009 flow. The flow at Fargo was 29,100 cubic feet per second at 40.82 feet this spring. The cost with a smaller diversion could be significantly reduced and should give it a favorable cost benefit ratio.

The proposal of the Corp to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.

Sincerely
Rob Sell

090606_Wolf

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Saturday, June 06, 2009 10:23 AM
To: 'Ducksoup25@yahoo.com'
Cc: Snyder, Aaron M MVP; Schmit, Thomas A MVP
Subject: Response to question from Fargo-Moorhead Metro Feasibility Study

Mr. Wolf,

Thank you for attending our public meeting in Moorhead on May 20. This e-mail is in response to the written questions you provided at the meeting: "I live in section 6, Oakport Township, Clay County. I see that there is a proposed levee that encompasses the area between 70th Ave NW and 80th Ave NW from the river to Broadway St. Question: How did this levee become part of the proposal: At present there are only a dozen or more homes in the protected area, an area of about 300 acres. I live just north of the levee area - how will this affect my property?"

The layout of the proposed levee system is very preliminary, and we we are in the process of refining it. We must show that each levee section is economically justified, so if the section to which you refer doesn't make sense, our analyses should show that.

It is too early to say what impacts any of our proposals will have on properties downstream or upstream of the project. Our intent is to minimize impacts, and we would be required to compensate for any economic impacts that rise to the level of a real estate "taking."

You can expect more specifics on the levee layout and any potential impacts this fall.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

090608_Bergan

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Monday, June 08, 2009 10:01 AM
To: 'Ron Bergan'
Cc: Schmit, Thomas A MVP; Snyder, Aaron M MVP
Subject: RE: Fargo diversion comments

Mr. and Mrs. Bergan,
Thank you for your suggestions and very valuable information about diversion alternatives. We will consider your comments in our study process.

For more information on the study:

We have a project information paper posted on our Website:
http://www.mvp.usace.army.mil/fl_damage_reduct/default.asp?pageid=1455

We also have a project Website where we'll post our slides and handouts from the public meetings:
http://www.internationalwaterinstitute.org/feasibility/index.htm

Thanks again for your interest and ideas,

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Ron Bergan [mailto:ronb@facnd.com]
Sent: Sunday, June 07, 2009 6:15 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP
Subject: Fargo diversion comments

To the Army Corps of Engineers,

We need a 100 plus year solution. The only method of flood protection that is sure to work is a diversion around Fargo-Moorhead.

The failure of floodwalls, dikes, dams this spring is proof that these methods will not protect us for the next 100 years. We know this soil is very unstable, dikes settle and structures are damaged with the movement of the soil. Rodents, humans, etc do damage to the structures. The Oak Grove High School damage was a result of the new flood wall failure. From the Fargo Forum "eroding Clausen Springs Dam near Kathryn" and "LaMoure County keeping an eye on eroding dam - with an eroding spillway". Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river; roads, dikes, etc have been damaged or destroyed. Building 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point.

Even with permanent dikes, flood walls, etc we could have a failure, especially at the extreme predictions of possible heights projected for F-M in the 2009 flood fight. Our experience this year has made us realize that a flood over 45′ is possible. In that case F-M and surrounding area could suffer like Grand Forks did in 1997.

What will the height of the river be if the river hits a flood stage of 43′ with the Main Avenue bridge acting like a dam? Would that be 2′ to 4′ higher? If so would the river level be 46 feet?

The red river valley is full of ditches (drains). The diversion would just be a bigger ditch.

We do not have to send all the water in the Red River around the towns. At a flood level of maybe 25′, water could begin to flow into the diversion and maybe at 30′ the water flowing through the towns would equal the 2009 flood of 40.82′. The difference between a 40.82′ flood level and the flow rate at a 30′ flood level, would only require an area 20′ by 40′ to divert the water above the 30′ flood level if the speed is the same.

The 500 foot width projected for the bottom of the diversion by the Corps seems very wide. A bottom width of about 50′ appears to be what would be required based on three times the flow between 30′ and 41′ flood levels and also a comparison to the original Winnipeg diversion which was built to handle 60,000 cfs. The flow at Fargo was 29,100 cfs at 40.82′ this spring. This would reduce the cost significantly and should give it a favorable cost benefit ratio. The Winnipeg diversion is 30′ deep. The Winnipeg diversion worked great in the 1997 flood. In F-M the river is 100′ wide compared to 450′ in Winnipeg (nearly 5 times as wide).

Some information from Biot Report #392: August 26, 2006 about the Winnipeg expansion of the diversion after the 1997 flood: The diversion was widened to 350′ but not deepened. It increased the floodway capacity from 60,000 cfs to 140,000 cfs. The original diversion cost in today's dollars was $350 to $500 million. The expansion involved replacing 12 bridges, two railroad crossings and excavation of 27 million cubic yards of earth. It has been used to divert water in 20 of 37 years.

The North Dakota side may be better for political reasons. It would offer better protection from overland flooding as this appears to be greater on the ND side of the river. The diversion should start at the Wild Rice River as suggested by the Corps, but should be started on the west side of I29 at drain 47 and take all of its flow plus part of the Red River flow. Comparing the flow at Hixon to Fargo this would indicate about 15,000 cfs should be diverted. That is the amount needed to keep the river at 30 feet. Looking at topographical maps for the area the water will flow from the Wild Rice at Interstate 29 and around

West Fargo and north to the Red with no problems. The crossing of the Sheyenne will require structures or controls to only allow a limited amount of water to go through West Fargo. It may be best to use the West Fargo diversion and increase its capacity for the part around West Fargo. The area required for the flow under bridges should be approximately 70′ at bottom and 100′ at the top compared to the maybe 500′ width at the top needed to have gently sloping sides.

The land can continue to be used for farming with alfalfa hay grown on the slopes as Winnipeg does now.

Property will have to be acquired by eminent domain; either homes and land along the river and drains for levees, or farmland for the diversion.

Dikes, floodwalls, etc will raise the level of the river. As you force the water through a narrower space the water has no where else to go but up. Will that mean the river will be 6″ or 2′ higher? The exact amount will depend on the narrowest spot, river height, flow rates etc. Any extra height causes great concerns.

A diversion will lower the level through F-M. The higher the water the more difficult it is to protect F-M and the greater risk of a catastrophic failure. There is basically no chance of failure of a diversion.

The cost benefit ratio of the levee system was 1.1 for the $625 million dollar proposal and the diversion was shown at .65 which would equal $590 million. How can the diversion have less total benefit? It would cover a much greater area. We could save many of the homes now being considered for destruction. It would also save the view for many homeowners and therefore provide an economic benefit by the higher values. River frontage is the highest valued land for residential usage. It would add value to the total length on both sides of the river. Was the cost of maintaining and the repair and replacement of dikes, floodwall, etc calculated in the cost benefit ratios? The estimated 70 miles of protection for the area will require a lot of mowing, trimming, etc each year. Was the improved drainage for farmland along the diversion included? The dikes, floodwall and such things are unsightly. How was the possibility of failure to the levee system added to the benefit for the diversion? A failure at 43′ plus would totally flood at least one city - Corps projection $3 billion cost. The National Guard would not be patrolling the levees and instant response teams will not be at the ready. We believe the diversion would be worth at least twice the benefit of the other systems.

Was the time lost at work and the extra costs and lost business (stores closed 6-8 days, MeritCare, nursing homes, etc evacuations, school shutdowns, loss of visitors and events, etc), considered in the cost benefit ratio? How about the stress on all our people or the value of the ability for the area to grow?

Even if the diversion costs $1 billion, the $200 million Fargo is proposing for flood protection should cover its share. The diversion should be selected immediately as the preferred method.

What if Devils Lake overflows and erodes the 18’ of sediment in the old channel from previous times? This would most likely happen when we were experiencing flooding downstream so that it may also cause a failure of the Baldhill dam at Valley City.

If the estimate of 50 feet at the bottom is close and using some of these methods and suggestions, maybe it could be completed for $600 million. This is about the same cost as the $660 million budget for the recent expansion of the Winnipeg diversion to handle a 700 year flood.

Thanks for your consideration of our comments,

Ron and Mary Alice Bergan
311 11 Ave S
Fargo, ND 58103
701-237-3226

090619_Bergan

Beauchamp, Francis MVP

From: Ron Bergan [ronb@facnd.com]
Sent: Friday, June 19, 2009 4:50 PM
To: Evans, Craig O MVP
Cc: Schmit, Thomas A MVP; Snyder, Aaron M MVP
Subject: Fargo - main avenue flood problem at 40 feet

Attachments: G4TD2931.JPG; G4TD2944.JPG; G4TD2949.JPG; G4TD2956.JPG

G4TD2931.JPG G4TD2944.JPG G4TD2949.JPG G4TD2956.JPG

To the Army Corps of Engineers;

We now know that the main avenue bridge acts as a dam at about 40 feet, see the pictures. At about 41 feet the water will be backed up and flow over both ends of the bridge and into our cities. The diversion is the only answer.

I now believe the river was only at 40 feet; but, with a one inch dam created by the main avenue bridge, it caused the water to be between 1 ½' and 2' up on the beams and a river reading of 40.82' at 13 Avenue south. See the pictures taken today 6-19 by Brad Grosz of the branches caught up in the beams and structure. We have seen lots of branches in all areas we can see from walking on both sides of the bridge. I estimated the area between main avenue and I 94 covered by water at 40' to be 364 acres (roughly measured with the computer maps). One foot of restriction would add 17 feet of height to the water in this area in 24 hours! The river probably flows faster from the pressure as the water gets higher and my calculation is just a ballpark number. We are getting an engineer to look at these calculations.

Winnipeg expanded their diversion because the 1826 flood was 40% larger than the 1997 flood. We have also learned today that their $600 million expansion is significantly under budget. A levee system has a much higher chance of failure and a failure at a high flood level will put both cities under water.

We are asking the Corps to extend the public comment period two weeks. We have a committee of top business people and a well known person who just agreed yesterday to lead the effort and hope we can get more time to develop and present information to the Corps. We will have a press conference next week. We believe the election to approve the flood protection sales tax which is June 30, 2009 will generate lots of discussion and comments for the Corps.

We believe the diversion has a much higher benefit to F-M and it does not have to cost more, I think it will be less costly. We should not have to be totally devastated to get some federal money.

Thanks for your consideration,

Ron Bergan, ceo

Fargo Assembly Co.

3300 7 Ave N

Fargo, ND 58102

Office 701-356-7400   Cell 701-361-0715

090621_Siemens

Beauchamp, Francis MVP

From: Snyder, Aaron M MVP
Sent: Sunday, June 21, 2009 8:18 AM
To: Schmit, Thomas A MVP; Evans, Craig O MVP
Subject: FW: Flood Protection

FYI - you probably got this already though.

Aaron M. Snyder
USACE Planner and Project Manager, PMP
MVD Plan Formulation Regional Technical Specialist
651-290-5489
612-518-0355 (Cell)
Aaron.M.Snyder@usace.army.mil

-----Original Message-----
From: Herb Siemens [mailto:herbanni@i29.net]
Sent: Friday, June 19, 2009 4:51 PM
To: Snyder, Aaron M MVP
Cc: fmflood@fmfloodcontrol.com
Subject: Flood Protection

Project Manager Snyder,

My wife and I moved to Fargo from Winnipeg 10 years ago.

I don't understand why people are so reluctant to put proper permanent flood protection in place. All the water that went thru Fargo (plus a lot more) went thru Winnipeg this spring. The "flood waters" were a non event in Winnipeg this year because of the diversion that they have in place. Without the diversion Winnipeg would have been in a horrible mess, but everything worked the way it was supposed to and there were no problems.

Putting up floodwalls, levee's, etc. is a collection of bandaids that you can never be sure will really do the job, they also require a lot of maintenance. Plus, they are very unsightly. Can you imagine walls & levee's along the river in Linden Wood Park, It won't be nearly as much fun to go there when you have to look at those things. The Fargo Parks Board say that they have spent over $1 million already this year on protection, cleanup etc. That number does not include lost revenue. As of today June 18 the river is going above flood stage again, the campground is closed. Everything will have to be cleanded up again and they continue to loose revenue.

Defacing river front property with walls, levee's etc is a horrible thing, what will happen to property values in the nicest neighborhood's in Fargo. In adition, the insecurity that people feel - worrying about floods takes a terribel toll on them and is very costly to businesses.

Originally they said it could not be done in Winnipeg either; but people with vision, forsight and determination made it happen. After the flood of '97 it was not very difficult to get all levels of government together to agree to double the size of the floodway. that expansion is basically complete now and helped save the City of Winnipeg again this spring. They have used the diversion there more than 20 times in the last 37 years, that is real proof of the cost benefit.

It is not a question of can we do it or should we do it, the only questions should be HOW QUICKLY CAN WE GET A DIVERSION BUILT?

Herb & Anni Siemens
404 8th Street South
Fargo, ND
58103

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Monday, June 22, 2009 3:43 PM
To: 'Ron Bergan'
Cc: Schmit, Thomas A MVP; Snyder, Aaron M MVP; Lesher, Michael D MVP; Sobiech, Jonathan J MVP; 'awalker@cityoffargo.com'; bob.zimmerman@ci.moorhead.mn.us; Buffalo Red River Watershed District; Jody Bertrand; Mark Bittner
Subject: RE: Fargo flood protection

Mr. Bergan,
Thank you for your e-mails. I forwarded the bridge information and photos to our hydraulic engineer to make sure our models accurately reflect existing conditions. We will consider your suggestions for diversion alternatives as we continue our study.

The Corps cannot endorse or comment on the information you propose to present to the press. We are conducting hydrologic modeling to inform the planning process, and we will use those models to assess several alternative widths, depths and alignments for diversions and levees. The preliminary cost estimate released in May was based on only one possible configuration, and it is by no means the final answer.

Regarding your request to extend our comment period two more weeks: we will accept your input when you can get it to us. However, we must begin the process of narrowing down the alternatives in order to stay on schedule. The June 22 date was set to ensure that we could address people's major concerns as we proceed with the study within the original schedule. Any significant comments received later in the process may delay completion of the study.

Thanks, again, for your interest in the feasibility study. I look forward to hearing more from you as soon as possible.

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Ron Bergan [mailto:ronb@facnd.com]
Sent: Monday, June 22, 2009 3:08 PM
To: Evans, Craig O MVP
Cc: Schmit, Thomas A MVP; Snyder, Aaron M MVP
Subject: Fargo flood protection

Dear Craig,

We are developing some information for a press conference to support a diversion. We would consider any changes to our press material you think we should make. We know there are many details to work out such as finding a low cost way to cross the rivers.

Did you get the pictures I emailed you late Friday? They showed that the water was up on the beams of the Main Avenue Bridge and that that it makes a good dam. It appears we can not go over about 41 feet without flooding both cities. I will resend without the pictures.

Ron

Proposed Design Criteria for Protection of F-M to 50 Feet

Flood Level	River Level with Diversion	Diversion Level	River Level with Levees
25’	22’ or less	100% above 22”	25’
30’	22’	100% above 22’	Greater than 30’
35’	25’	100% above 25’	Greater than 35’
41’	30’	Difference used to calculate size needed	42-44’
45’	32.5’	30’	45’ Topped

50′ 35′
35′ Topped

Cost Comparison for Diversion

	F/M	Old Winnipeg	New Winnipeg
Volume	15,000 cu ft/sec	60,000 cu ft/sec	140,000 cu ft/sec
Depth	20-30′	30′	30′
Bottom Width	50′-100	150′ (est.)	up to 350′
Top (field level)	500-700′	700-1000′	900-1200′
Spoil Bank Height	20′ (est.)	20′ (est.)	30′ (est.)
Highway Bridges		12	12
Railroad Bridges		4	4
Drop in Elevation	35′ ?	26′	26′
Cost (in millions of dollars)	$600 (est.)	$350-$500 *	$600**

*In today's dollars

** Nearing completion and under budget

QUESTIONS AND ANSWERS ABOUT A DIVERSION

1. Where would it start and end? Wild Rice River west of I 29 and end north of Argusville.
2. What areas would be protected? Both side of the river for the length of the diversion and to some extent about 10 miles south of the inlet.
3. What cities/areas would be protected? Fargo, Moorhead, West Fargo, Oakport, Briarwood, Round Hill, Hickson, Horace, Oxbow, Harwood, and more.
4. How much would be diverted? The total flow of the Wild Rice and the overland flooding from there to West Fargo which is about one half the flow of the Red River. Additional amounts from the Red River could be added if needed at a later time to maintain the best balance.
5. How much will the Federal Government pay? 65% or $650 million of a $1 billion project.
6. Where will the other money come from? States of ND and Minn and the cities of Fargo and Moorhead.
7. Does it work? It has worked as advertised in West Fargo, Winnipeg and other areas.
8. How soon could it be started? If a diversion could be selected as the method it should shorten the process.
9. Will it take a lot of farmland out of production? No, estimate it will only take 600 acres out and change 4000 from corn to alfalfa.
10. Why are we having these large floods? Wet cycle- see Devils Lake - 8 of 10 record floods in the last 40 years.
11. What happens if the flood exceeds the capacity of the diversion? It overflows to the west and north over farmland.
12. Does it dump water on Harwood? No - will enter the Red way north of Harwood and it is the same amount of water.
13. What is the size? It is estimated to be 20 to 30 feet deep and average 75 feet wide at the bottom and maybe 500-700 feet at the top.
14. Can Eminent Domain be used to acquire the land? Yes - same as would be needed for a levee system.
15. What is the probability of a crest over the 2009 level? The national Weather Service on 4-4-09 indicated a 10% chance of 44.6 feet for the second crest.
16. Should we build more dams? Valley City had a major flood this year and about 100% of the water from its drainage area is stored in Devils Lake or flows into the Baldhill Dam. Spillways washing out such as Clausen Springs.
17. Should we hold the water on the land? This can work to a limited extent, but when it starts going overland it washes out the roads - see 2009 news articles.
18. Can the Corps assure us the levee system will not fail? No!

FACTS FOR A SPLIT FLOW DIVERSION

1. The 1826 flood was 40% larger than the 1997 flood in Winnipeg. April 4, 2009 the National Weather Service said there was a 10% chance of a 44.6 foot crest in Fargo. F-M, not just property along the river, could be flooded.
2. A plan is needed to allow us a chance to survive a flood of this magnitude.
3. A 700 year flood can occur at any time - it could be next year.
4. We are in a wet cycle.
5. The Red River soil is unstable.
6. F-M is the last major community in the valley with no significant permanent protection.
7. Sending one half the water into a diversion would make fighting a large flood manageable.
8. Must have a zero possibility of over a 40 foot flood so that the Main Avenue bridge does not act as a dam.
9. The design could route any water over say 22 feet until you reach say 30 feet down the diversion then about one half the entire flow.
10. The flow in a diversion is expected to be below ground level. Spoil banks would be more like a dike on the east side of the diversion.
11. Topping the diversion would flow west and north into fields.
12. Topping the proposed Corps levees would inundate the cities.
13. Physics - the amount of water is not increased at the outlet by the diversion.
14. Levees have many failure modes such as: design flaws, shifting soil, water over or under, through, etc.
15. Squeezing the water ie in levees increases the height of the flood.
16. The slopes can be used to grow alfalfa.
17. Buyouts along the river are not required.
18. Residents of F-M can feel secure during a flood.
19. Stress would be reduced and lives saved (relocating the elderly and sick).
20. Will increase values along the river and in the cities.
21. The 2009 foot flood had a huge negative impact on the F-M economy - West Acres Mall closed for days.

Beauchamp, Francis MVP

From: Matthew Feist [matthew.feist@gmail.com]
Sent: Monday, June 22, 2009 6:00 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP; DWalaker@cityoffargo.com; governor@nd.gov
Cc: fmflood@fmfloodcontrol.com
Subject: Public Input on Flood Control Measures for the Fargo-Moorhead Area

Hello,

I am writing this letter in conjunction through the efforts of the fmfloodcontrol.com website. It has come to my attention that today is the last day for public input to the Army Corps of Engineers, thus I am writing this letter now.

Please consider the diversion plan as the permanent solution for flood control, for the Fargo-Moorhead metropolitan area. One only has to look to Winnipeg to see how successful that diversion has been at protecting their city from flood waters. I also believe that the cost of the diversion can be reduced through modifying the width, depth and length of the diversion needed to protect the area. The use of local contractors and laborers would also surely reduce the total costs. Though I admit, I am not an expert in these matters.

With the City of Fargo about to vote on its sales tax initiative, we will be able to fund an estimated $200 million dollars, which would cover 22% of the total project's cost estimated $909 million dollar cost. With the City of Moorhead, State of Minnesota, and State of North Dakota covering the remaining 13% (along with the 65% federal share), I don't understand why the diversion isn't being strongly considered as the optimal solution. We need a permanent solution for flood control to ensure that the Fargo-Moorhead metropolitan area never has to deal with another 1997 or 2009 flood, or even worse, had we not had the freezing temperatures half way through the battle, a complete loss of the city.

Thank you for your time and consideration,

Matthew J. Feist

090623_Satrang

Beauchamp, Francis MVP

From: sat711rang@aol.com
Sent: Tuesday, June 23, 2009 12:00 AM
To: Evans, Craig O MVP
Subject: A Diversion Is Best For Main Street Fargo Moorhead

Mr. Craig Evans,

I am writing to let you know that I support a diversion for flood protection of F-M and the surrounding areas. The Corps of Engineers has requested public comments. The diversion is the only sure protection. We need something that will protect us against a 500 year flood level! The only method of flood protection that is sure to work is a diversion around Fargo/Moorhead. Please urge the Corps to focus all efforts on a diversion.

My wife and I live on the Red River. The failure of floodwalls, dikes, and dams this spring is proof that these methods will not protect Fargo-Moorhead. Soils in the Valley are unstable, dikes settle and structures are damaged with the movement of the soil. The Oak Grove High School damage was a result of the new flood protection system failing. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse are sliding into the river; roads, dikes, etc have been damaged or destroyed.

The 500 foot width projected for the bottom of the diversion by the Corps is too wide. A much narrower bottom width would work well based upon comparisons to the original Winnipeg diversion. This should reduce the cost significantly and would give it a favorable cost benefit ratio. The Winnipeg diversion is 30’ deep. It has been used to divert water for 37 years. The Winnipeg diversion worked great in the 1997 flood when I lived in Drayton. I remember being interviewed on the radio after fighting the Drayton Flood Fight for 42 continuous hours without sleep. I warned that Winnipeg was in for big trouble. At the time I did understand the safety of their diversion project and its structural advantages for a successful flood fight.

A diversion should start on the North Dakota side at the Wild Rice River as suggested by the Corps, and should be started on the west side of I29. It may work to use the West Fargo diversion and increase its capacity for the part around West Fargo. Dikes and floodwalls are a very poor solution to a very complex problem. The extra height combined with the valleys unstable ground causes great long term concerns and it doesn’t give us peace of mind that we are protected. A diversion will reduce the amount of water moving through the cities. In addition it would be 30 miles of water storage and that’s significant and should be calculated. We could save the homes being considered for destruction. It would also save the view for many homeowners, including mine, and therefore provide economic benefit through higher=2 0home values and our quality of life. River frontage is the highest valued land for residential usage. A diversion will add value to the total length of both sides of the Red River.

The diversion should be selected immediately as the preferred method. Dams and control structures within the diversion could be added to provide water for dry years. It could be filled from spring runoff. If the other dams used for water storage were full, the diversion could be kept dry and even farmed for that year.

Fighting this years flood cost my business many thousands of dollars and because of your strong leadership we were successful at staying dry. I know that you will do what you feel is best for our city. As someone who has done business and lived in the Valley for many years, a diversion is the best option. West Fargo sleeps well at night with theirs and Fargo and Moorhead need a diversion and we need it really soon.

Thank you for having this process to express our opinions.

Kent Satrang
311 11th Avenue South
Condo Unit 104
Fargo, North Dakota

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 23, 2009 9:31 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Richard Solberg (rsolberg@statebanks.com) by the FM Flood Control Group

Mr. Craig Evans:
I am writing in support of a diversion channel as the best option to protect Fargo-Moorhead from the Red River floods.

While several suggestions have been made â€” all of them with hefty price tags, and none of them satisfying every community or individual with property at stake â€” I believe the diversion channel is likely the best option for permanent flood protection. A diversion channel is the long, long-term solution we need.

Of course, we have the option to do nothing â€” not really an option, as weâ€™ll continue to have to put up sandbag dikes more frequently than weâ€™d all like. An extensive levee system is also on the drawing board, but that solution will significantly devalue properties on the river, adversely affecting our property tax base. Levees will cut through the beautiful river corridor at the heart of our cities; and levees deteriorate and fail. The â€œwaffleâ€ plan to contain water in fields has potential but needs testing â€” and buy-in from area farmers.

Yes, a diversion channel may or may not be a more costly action â€” but you have only to look at the success stories of West Fargo and Winnipeg to see the positive impact that a diversion channel can bring.

I believe a diversion channel should be the favored solution for permanent flood control in Fargo-Moorhead. Letâ€™s make this work and provide our communities the protection they need against further â€œ100-yearâ€ or â€œ500-yearâ€ floods.

Sincerely
Richard Solberg

Beauchamp, Francis MVP

From: BruceFurn@aol.com
Sent: Wednesday, June 24, 2009 10:57 AM
To: Evans, Craig O MVP
Subject: (no subject)

Dear Craig,

I would like to add my voice to the growing number of people who are advocating for a significant diversion solution to the increasingly frequent flooding of the Red River.

I have been encouraging officials to search for solutions involving a combination of water storage, dike protection and diversion. Diversion, if feasible, seems like the best long term solution.

I understand the cost versus benefit analysis and how that affects a final decision. I'm simply asking the Corps of Engineers to keep an open mind and investigate all options. I believe that is your normal operating procedure.

Good luck with your effort and thanks for encouraging input for many sources.

Have a Great Day!
Bruce Furness

090624_Moberg

Beauchamp, Francis MVP

From: Mike Moberg [mike_moberg@msn.com]
Sent: Thursday, June 25, 2009 11:52 AM
To: Evans, Craig O MVP
Subject: RE: Question about building

Thanks for the quick response, I will try and get a hold of Keith.

Thanks

> Subject: RE: Question about building
> Date: Wed, 24 Jun 2009 19:15:51 -0500
> From: craig.o.evans@usace.army.mil
> To: mike_moberg@msn.com
> CC: berndtk@casscountynd.gov; aaron.m.syder@usace.army.mil
>
> Mr. Moberg,
> I recommend that you talk to someone at Cass County to see if the
> proposed development is within West Fargo or under county
> jurisdiction. Either way, the developer should be following applicable
> flood-plain regulations to minimize flood risk to new buildings. The
> Corps does not regulate building construction in flood plains unless
> the project involves filling in wetlands, which would require a permit
under Section 404 of the Clean Water Act.
>
> Our point of contact at Cass County is the County Engineer, Mr. Keith
> Berndt (701-298-2372). I'm sure Mr. Berndt can give you a better
> answer than we can, or at least put you in touch with the right
person.
>
> Thanks,
> Craig Evans
> Senior Planner & Project Manager
> St. Paul District
> U.S. Army Corps of Engineers
> Office: (651) 290-5594
> Mobile: (612) 518-3413
> e-mail: craig.o.evans@usace.army.mil
>
> -----Original Message-----
> From: Mike Moberg [mailto:mike_moberg@msn.com]
> Sent: Wednesday, June 24, 2009 6:13 PM
> To: Evans, Craig O MVP; aaron.m.syder@usace.army.mil
> Subject: Question about building
>
> Craig or Aaron, I got your names from the Fargo-Moorhead Feasibility
> study web site, I don't know who to contact from the Corp about my
> question, so I thought I would start with you.
>
> I live north of west fargo, just outside the diversion, and in 2009 my
> house and neigborhood was surrounded by water for 25 days. In the past
> 12 years I have had to ring dike my house 4 times, and I don't even

> live on the Sheyenne river.
>
> My question or concern is that the city of West Fargo is considering
> doing a development of 240 homes out by me, on the outside of the
> diversion and if the development is not done correctly this
> developement is going to have problems during the next flood and it
might also impact my flooding problem.
> So I am wondering how we go about making sure that the city of West
> Fargo is doing this correctly and not impacting the existing flooding
> problem we already have.
>
> If you are not the correct people to talk to could you please give a
> contact person.
>
> Thanks,
>
> Mike Moberg
>
>
>
> ________________________________
>
> Microsoft brings you a new way to search the web. Try Bing(tm) now
> <http://www.bing.com?form=MFEHPG&publ=WLHMTAG&crea=TEXT_MFEHPG_Core_ta
> gline_t
> ry bing_1x1>

090629_Boe

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Monday, June 29, 2009 12:09 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Steve and Julie Boe (sboe@cableone.net) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

In F-M the river is about 100 feet wide, in Winnipeg the river is about 450 feet wide (nearly 5 times as wide). The red river valley is full of ditches (drains). The diversion would just be a bigger ditch. A bottom width of about 50 feet appears to be what would be required based on the 2009 flow. The flow at Fargo was 29,100 cubic feet per second at 40.82 feet this spring. The cost with a smaller diversion could be significantly reduced and should give it a favorable cost benefit ratio.

The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.

Sincerely
Steve and Julie Boe

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Monday, June 29, 2009 4:47 AM
To: Evans, Craig O MVP
Subject: Flood protection for Moorhead

This email was sent on behalf of W Bolin (wildbill918@hotmail.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
W Bolin

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Monday, June 29, 2009 4:25 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of David Cossette (dcossett@midamsteel.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
David Cossette

090629_Finch

Beauchamp, Francis MVP

From: ROGER FINCH [finchro@msn.com]
Sent: Monday, June 29, 2009 7:29 PM
To: Evans, Craig O MVP
Subject: Flood control

Why not dredge the Red River deeper and wider? Over the years it has filled in with sediment, trees, etc. To avoid having the banks sink into the river after dredging, you could cement the bottom and sides. It may not be THE answer, but every bit helps!

In the summer time when the river is low, you could dam off say 1/2 mile at a time. You would have two dams, one on each end of the construction site. You could pump the water from the south end, past the construction area, and release it down stream, past the north dam. After dredging and cementing each section, you release the dam to the South. The dam to the North now becomes the back up dam and you billed another north dam 1/2 mile further north etc.

This way you don't have to acquire additional land or right of way. On Modern Marvels, I have watched them dam up oceans in order to build bridges. The Red River should be a piece a cake!

Respectfully submitted,
Roger Finch
Moorhead, MN.

090629_Halvorsen

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Monday, June 29, 2009 11:59 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Karrie Ann Halvorson (khalvorson@facnd.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Karrie Ann Halvorson

090629_Schock

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Monday, June 29, 2009 5:49 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Jane Schock (jschock@nodakmutual.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Jane Schock

090629_Tillman

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Monday, June 29, 2009 7:58 AM
To: Evans, Craig O MVP
Subject: Flood protection for Moorhead

This email was sent on behalf of Joe Tillman (josephtillman@live.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Joe Tillman

090630_Altendorf

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 2:23 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Steve Altendorf (Steve_Altendorf@msn.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Steve Altendorf

090630_Bender

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 2:07 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Glenn A Bender (glenn@van-raden.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Glenn A Bender

090630_Bredell

Beauchamp, Francis MVP

From: Bredell Brad and Michelle [bredellmic@yahoo.com]
Sent: Tuesday, June 30, 2009 8:04 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP
Cc: fmflood@fmfloodcontrol.com
Subject: flood control

Hi, I wanted to let you know that I support a diversion for the Fargo-Moorhead area. A dike system is a band aid that will fail in time. Wasn't the only major dike breach a PERMANANT flood wall at Oak Grove? Let's do it right the first time.

Thanks,

Brad Bredell
Fargo ND
701-306-3258

090630_Cronin

Beauchamp, Francis MVP

From: CRONIN PATRICK [pdcronin@ideaone.net]
Sent: Tuesday, June 30, 2009 2:29 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP; dwalaker@cityoffargo.com
Cc: fmflood@fmfloodcontrol.com
Subject: diversion proposal

To whom it may concern:

I am a ND resident but live outside of Fargo. In fact, I live in the area between West Fargo and Harwood where the Sheyenne Diversion reenters the river channel. Our area has seen many floods in recent years because of high levels on the Red, Sheyenne, Maple and Rush rivers.

The Sheyenne Diversion works great for West Fargo and is a good example of how well a diversion functions. Even with the higher Baldhill Dam and the addition of the Maple River Dam my area still flooded. It is unfortunate that the Sheyenne Diversion did not go further north so that it would protect my home as well my neighbors and those in and beyond Harwood.

I am in total agreement with the group of people proposing a ND diversion channel west of the city of Fargo. I have several reasons to support thier position:

1) A large amount of the water entering the Red River channel comes from the west. It is logical to keep it on the west side instead of going the long way around the city.
2) Keeping the diversion in North Dakota limits the amount of political infighting that will happen when water crosses any type of border.
3) In addition to the Wild Rice river a west side channel could collect water from the Sheyenne, Maple and Rush. It offers a greater choice of design and function.
4) Being able to provide solutions to more rivers brings more people on board with the project. I don't think that many people outside of Fargo are excited about paying for Fargo's flood control with a sales tax. I know many people in my area would be in full support of the taxes and project if it offered diversion like protection for us. I also think that people would be more comfortable about helping drain Devils Lake through the Sheyenne if there was diversion protection.

Thanks for all your effort in finding solutions to this problem.

Patrick Cronin
313 Ramona Ave
West Fargo, ND 58078

(701)281-1090

090630_Fetch

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 9:30 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Tom Fetch (Tom.Fetch@agr.gc.ca) by the FM Flood Control Group

Mr. Craig Evans:
I live in Winnipeg currently, but grew up in Fargo and have property near Hickson. I have been flooded out twice, and nearly flooded two other times since 1989. Clearly the drainage system has changed dramatically in the past two decades and the river levels fluctuate very quickly even with relatively low precipitation and snow amounts.

Although Winnipeg is mainly protected by the diversion and this appears to be the main agenda topic for the fmfloodcontrol website, I would also propose two other methods that seem to be much less expensive and have merit in lowering flooding. One is the "waffle concept" that has been researched in detail by scientists at the University of North Dakota in Grand Forks. Clearly we can use the existing ditches by controlling runoff through the culverts in the spring. In combination with other methods, this would be a cheap and quick fix to do. A second method that I propose is a retention strategy that could use low lying farmland adjacent to major rivers to hold water. If low lying land adjacent to the Red River was purchased and a series of perpendicular ditching was cut (20-30 feet deep and perhaps the same width extending several hundred feet) using large backhoes or D5 Caterpillar equipment, water could be diverted and held, and pumped out later. This would be conceptually similar to a diversion, except that these trenches could be cut next to the river to hold the water and there would be no need to raise or construct new bridges or roadways. A primary cost item in the diversion in Winnipeg is that many bridges and railways had to be built.
Sincerely
Tom Fetch

090630_Forknell

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 11:55 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Jon Forknell (jforknell@abs-usa.com) by the FM Flood Control Group

Mr. Craig Evans:
To Whom It May Concern,

As a resident of North Dakota, I am in strong support of the recently-presented diversion that would run through North Dakota.
The only method of flood protection that is sure to work is a diversion. Permanent levees can fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure.

The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely,

Jon Forknell
3726 River Drive S

Fargo, ND 58104
Cell:
E-mail: jforknell@abs-usa.com
Sincerely
Jon Forknell

090630_Hannaher

Beauchamp, Francis MVP

From: Paul Hannaher [PHannaher@hannahers.com]
Sent: Tuesday, June 30, 2009 9:07 AM
To: Evans, Craig O MVP; Snyder, Aaron M MVP; DWalaker@cityoffargo.com; tim.pawlenty@state.mn.us; mark.voxland@ci.moorhead.mn.us; rep.morrie.lanning@house.mn
Cc: fmflood@fmfloodcontrol.com
Subject: My support for more study of a diversion for the Fargo Moorhead region.

Good Morning Gentlemen,

I am writing this note to you today to encourage you to consider a diversion as opposed to a levee system to protect the Fargo-Moorhead area.

The facts are in and my concerns are focused on the long term reliability of a levee system given that we have a soil structure that really has no structure. In my opinion even if we put pilings down to bedrock to support a levee system the risk will always be there for wash outs due to water pressure between the pilings. Those weak points would not manifest until a flood occurs again and would put the city at risk.

This diversion plan also includes more of our friends and neighbors in surrounding smaller towns.

The city leaders of Fargo-Moorhead have proven to be a great team that makes smart decisions. We will all have to live with those decisions. Thank you for your service.

My opinion being shared; let me thank you for your team effort to keep that river tamed this spring. We don’t want to EVER do that again.

Sincerely,

Paul

Paul Hannaher

Vice President

Hannaher's and OFUSA -Fargo

4324 20th Ave SW

Fargo, ND 58103

701.277.7222

www.hannahers.com <http://www.hannahers.com/>

P Please consider the environment before printing this email.

090630_Hegg

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 12:57 AM
To: Evans, Craig O MVP
Subject: Flood protection for Moorhead

This email was sent on behalf of Bob J Hegg (bobhegg@cableone.net) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.
Sincerely
Bob J Hegg

090630_Hoefs

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 6:26 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Mylon Hoefs (mlhoefs@cableone.net) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Mylon Hoefs

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 2:27 AM
To: Evans, Craig O MVP
Subject: Flood protection for Moorhead

This email was sent on behalf of Carole Mitchell (MitchCarole@aol.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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I have lived along the river for the past 35 years and twenty seven of those years there were only 3 floods, now since 97 it seems like every other year there is concern for our towns and property. Most people cannot take the stress or the loss of there property year after year forceing them to look for alternate places to live. This diversion is the only thing that makes sense to me, diking only raises the levels beside the worry of a breaching. I feel the cor of engineers should take a serious look at this proposal and consider the long range of PERMANET flood control.

Sincerely
Carole Mitchell

090630_Moen

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 3:59 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Brenda Moen (bkmslade@gmail.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Brenda Moen

Beauchamp, Francis MVP

From: dan passolt [danpassolt@yahoo.com]
Sent: Tuesday, June 30, 2009 10:34 PM
To: governor@nd.gov; tim.pawlenty@state.mn.us; DWalaker@cityoffargo.com; mark.voxland@ci.moorhead.mn.us; rep.morrie.lanning@house.mn; Evans, Craig O MVP; Snyder, Aaron M MVP
Subject: flood control-diversion

Please put the diversion project(Western Diversion) that ex-Gov.Schaefer is promoting as your #1 Option to protect FM and surrounding area. I have lived and worked in this area for over 30 years and prior to that was a student at UND. I've experienced several floods thru-out that time and experienced the trauma the area goes thru during and after the flood. In 1997-99 I was the Const. Mgr on the Grand Forks 1st and 2nd Congressional District 189 New Home Construction Project. I was fortunate to get an inside look at what it takes to re-build a city(it's not something a city should have to go thru and it's not fun). I'm hoping my current home of Fargo will never have to go thru this.
I've read several articles about some of the alternatives and my current house is located in an area where they were proposing a dike in my back yard even before the flood of 2009.
It's a good thing the proposed dike wasn't built cuz it would've been too low. I also own a business in West Fargo and have experienced how the Sheyenne diversion works during a flood. It's a huge selling point to people moving to the area when you can say if they buy in West Fargo they are protected from the flood waters. It works-we all know that! It's a managable system that isn't complex! It protects all of Horace and West Fargo!
Since the Sales Tax has been approved a project will be funded by area wide buyers when they shop, and it only seems fair to then protect area wide with a diversion and not just dikes here and there.
You need to think of the future, the managability, the complexity, the magnitude and the fairness of any system you pick. I believe the Western Diversion is the answer to these issues please make it your #1 Option.

Dan Passolt
Homeland Developers
701-219-0150

090630_Pfeiffer

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 1:52 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Juergen Pfeiffer (juergen.pfeiffer@yahoo.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method. It will only take the prevention of one catastrophic flood to make this diversion pay for itself. A well- build diversion will provide peace of mind every spring for generations to come and that cannot be expressed in dollars. The people of Fargo-Moorhead and surrounding communities will be proud today and into the future for a wise and overdue decision being made today by leaders in our community.

Sincerely
Juergen Pfeiffer

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, June 30, 2009 1:14 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Kory Werlinger (kjwerli@yahoo.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Kory Werlinger

090701_Gates

Beauchamp, Francis MVP

From: Jason Gates [jason.gates@fargoautomation.com]
Sent: Wednesday, July 01, 2009 11:08 AM
To: Snyder, Aaron M MVP
Subject: Fargo Moorhead Flood Protection

Mr. Snyder,

I own a home in Fargo, and like many others in the community, I am concerned that a dike/levy solution will not provide the necessary protection that our cities require. I am sure you are aware, the best way to ensure our community is not faced with billions of dollars in flood damages when a 42-43 foot flood hits is a diversion through Minnesota or North Dakota.

If the local, state, and federal governments are going to spend upwards of $750,000,000 on a flood protection system, then this system must offer a 99.9% assurance that it will not fail. I do not see how a levy system can offer this assurance, especially considering the unpredictable nature of the Red River. For instance, how can dikes or levies protect to 45 feet when the automobile and railroad bridges downtown start holding back water at 41 feet? Because of the topography of the valley, it makes no sense to force the water higher through town, a flood marginally higher than the one we had this spring would have a high probability of disaster, all it takes is one failure in the system and large portions of the city become submerged. A diversion can keep the river well below 40 feet in even the worst flood, and the damage would be minimal in the event of a failure.

Economically, the region has a lot to gain from a diversion; property values and recreational use through the Red River corridor would benefit. A diversion system can be designed that not only protects against major floods, but can keep the river below 25 feet through town during "nuisance" floods as well. The area's best parks, golf courses, and trails begin taking on damage at this level. Conversely, a dike/levy project will require many riverside property buy outs, lessen the recreational and visual appeal of the river, and it does not provide a solution for the "nuisance" floods that have become so common during the summer months.

Please take these thoughts into consideration as you analyze the various flood control options for our community.

Thank You,

Jason Gates, PE

090701_Ortmeier

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Wednesday, July 01, 2009 1:25 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Thomas C Ortmeier, MD (ortmeiert@yahoo.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.
It seems only logical to use the form of a diversion ditch rather than levees to avoid catastrophic failure due to breach. Using the ground for walls instead of artificial levees would give a much greater margin of safety and protection. In addition, a levee system will only funnel a higher volume of water THROUGH the communities where it can do the most damage if a breach occurs. If you review photos from the 2009 Fargo flood crest, the water was already lapping at the bottom of the Veterans Memorial Bridge. Levees would only make that problem worse and pose a larger threat to Fargo\'s major downtown infrastructure. I fully support the ND diversion project.

Sincerely
Thomas C Ortmeier, MD

090702_Dickerson

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Thursday, July 02, 2009 2:57 PM
To: Evans, Craig O MVP
Subject: Flood protection for Moorhead

This email was sent on behalf of Laura Dickerson (mhddickerson@yahoo.com) by the FM Flood Control Group

Mr. Craig Evans:

We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Laura Dickerson

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Sunday, July 12, 2009 12:42 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Natalie Dufault (personatali@ymail.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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I live in West Fargo and it has already proved invaluable that we have a diversionary channel. It\'s just really too bad that the rest of the city has not had this done yet. I really hope that this goes through, as it is necessary for all of our livelihood...

Sincerely,

Natalie Dufault
Sincerely

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Tuesday, July 14, 2009 11:50 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Karen (Engler) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Karen

090714_Rhuland

Beauchamp, Francis MVP

From: Evans, Craig O MVP
Sent: Wednesday, July 15, 2009 9:21 AM
To: 'Dave Ruhland'
Cc: Snyder, Aaron M MVP
Subject: RE: Fargo/Moorhead Levee Option

Mr. Ruhland,
Thanks for your interest in the Fargo-Moorhead Metro Feasibility study. We are still working with very preliminary alignments, and we are not ready to share them with the public yet. We will have more details to share in October, when we plan to have more public meetings. Please realize that the alignments will continue to shift, even after October, as we optimize levee heights and investigate soil conditions. Given the preliminary nature of our alternatives, I cannot say at this time how many homes would need to be removed. Also remember, we are looking at a number of different concepts, including levees, diversions, storage and non-structural measures that may be used in combination with each other, and that will affect the answers to your questions as well.

Thanks for your patience as we continue the study.

Craig Evans
Senior Planner & Project Manager
St. Paul District
U.S. Army Corps of Engineers
Office: (651) 290-5594
Mobile: (612) 518-3413
e-mail: craig.o.evans@usace.army.mil

-----Original Message-----
From: Dave Ruhland [mailto:daveruhland@yahoo.com]
Sent: Tuesday, July 14, 2009 3:41 PM
To: Evans, Craig O MVP
Subject: Re: Fargo/Moorhead Levee Option

Craig,

Do you have any information about the below request?

Thanks,

Dave

--- On Fri, 5/22/09, Dave Ruhland <daveruhland@yahoo.com> wrote:

> From: Dave Ruhland <daveruhland@yahoo.com>
> Subject: Fargo/Moorhead Levee Option

To: craig.o.evans@usace.army.mil
Date: Friday, May 22, 2009, 10:54 AM

Hi Craig,

I have a question about the $625 million levee plan that was discussed at the recent meetings. I assume that there is a map available detailing what this project would look like in my neighborhood. Is that true? If so, can I get a look at what the area by Southwood Drive, 11th street, and the Fargo Country Club looks like? In addition, how many homes would need to be removed for this project?

Thanks,

Dave Ruhland
806 Southwood Drive
Fargo

Beauchamp, Francis MVP

From:	fmflood@fmfloodcontrol.com
Sent:	Wednesday, July 15, 2009 12:07 AM
To:	Evans, Craig O MVP
Subject:	Flood protection for Fargo

This email was sent on behalf of Renee Clasen (egglady_nd@yahoo.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

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Sincerely
Renee Clasen

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Wednesday, July 15, 2009 12:44 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Lindsey Heidt (lheidt99@hotmail.com) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

In F-M the river is about 100 feet wide, in Winnipeg the river is about 450 feet wide (nearly 5 times as wide). The red river valley is full of ditches (drains). The diversion would just be a bigger ditch. A bottom width of about 50 feet appears to be what would be required based on the 2009 flow. The flow at Fargo was 29,100 cubic feet per second at 40.82 feet this spring. The cost with a smaller diversion could be significantly reduced and should give it a favorable cost benefit ratio.

The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.
Sincerely
Lindsey Heidt

Beauchamp, Francis MVP

From: Dave Hoefs [davehf@facnd.com]
Sent: Wednesday, July 15, 2009 10:14 AM
To: Evans, Craig O MVP
Subject: Fargo-Moorhead Flood Control

Mr Evans:

I would like to urge you to strongly consider a diversion to protect Fargo-Moorhead from future flooding. There are many flood control options on the table right now and I believe a diversion plan may not be getting due consideration. Given the enormous expense of fighting floods and funding flood protection the public deserves a thorough review of this proven method of flood control.

Thank you,

David Hoefs
Senior Engineer
Fargo Assembly Company
Phone: 701-298-3803 ext. 361 / 701-356-7386 direct
Fax: 701-298-9597
Email: davehf@facnd.com

090717_Bergman

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Friday, July 17, 2009 2:11 PM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of John Bergman (jbergman@pinnip.com) by the FM Flood Control Group

Mr. Craig Evans:
Dear ND Officials

We need a 100 year solution! The best method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

In F-M the river is about 100 feet wide, in Winnipeg the river is about 450 feet wide (nearly 5 times as wide). The red river valley is full of ditches (drains). The diversion would just be a bigger ditch. A bottom width of about 50 feet appears to be what would be required based on the 2009 flow. The flow at Fargo was 29,100 cubic feet per second at 40.82 feet this spring. The cost with a smaller diversion could be significantly reduced and should give it a favorable cost benefit ratio.

The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.

We can make the diversion project become a reality if we all work together for this very important project.

If you should need help to get this project started you can contact me at 701-293-3281.

Thanks! John Bergman

090717_Holscher

Beauchamp, Francis MVP

From: LOREN MICHELLE HOLSCHER [holscher6@msn.com]
Sent: Friday, July 17, 2009 2:55 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP; governor@nd.gov; dwalaker@cityoffargo.com
Cc: fmflood@fmfloodcontrol.com
Subject: FM Permanent Flood Control

I am writing to inform you of my support for the split flow diversion that has been recommended by the Flood Protection Coalition for the FM Community. For permanent flood protection, the advantages of the diversion far outweigh the advantages of a levee or other type of system.

Major areas that I like about the diversion are one, if the water level would exceed the diversion, the flooding goes to fields to the north and west and not inundating the cities of Fargo, Moorhead, West Fargo, etal. Two, there is the ability to add containment for some of the spring runoff that could be used in dry years which could negate the need for a pipeline to the Garrison Diversion. Three, we can do it all right here in North Dakota and eliminate the red tape of having to work with two states which means getting it done in a more timely fashion.

Thank you for the opportunity to convey my support.

Loren Holscher
1738 7th St S
Fargo, North Dakota

090722_Fujimoto

Beauchamp, Francis MVP

From: fmflood@fmfloodcontrol.com
Sent: Wednesday, July 22, 2009 11:47 AM
To: Evans, Craig O MVP
Subject: Flood protection for Fargo

This email was sent on behalf of Leah Fujimoto (LFuji@cableone.net) by the FM Flood Control Group

Mr. Craig Evans:
We need a 100 year solution! The only method of flood protection that is sure to work is a diversion. Permanent levees could fail, especially at the extreme predictions of possible heights that were projected for F-M in the 2009 flood fight. Levees pose a greater risk of a catastrophic failure. The 2009 flood made us realize that a flood over 45 feet is possible. Homes have been destroyed because they were sliding into the river, the old Trollwood and Edgewood clubhouse were sliding into the river, roads, dikes, etc have been damaged by the unstable soil along the river. Building anything 50 plus feet above the river bed and on the banks of the Red River is sure to fail at some point. It would not be necessary to reroute all of the water in the Red River around the towns. The Winnipeg diversion has worked great and protected their city in 1997. The floodway capacity was at 60,000 cfs in 1997. The original diversion price adjusted to today was $350 to $500 million.

In F-M the river is about 100 feet wide, in Winnipeg the river is about 450 feet wide (nearly 5 times as wide). The red river valley is full of ditches (drains). The diversion would just be a bigger ditch. A bottom width of about 50 feet appears to be what would be required based on the 2009 flow. The flow at Fargo was 29,100 cubic feet per second at 40.82 feet this spring. The cost with a smaller diversion could be significantly reduced and should give it a favorable cost benefit ratio.

The proposal of the Corps to start at the Wild Rice River and end way north of Harwood is very good. The diversion would offer better protection from overland flooding on the ND side of the river. Property will have to be taken by eminent domain; either homes along the river and drains for dikes and flood walls etc., or farmland for the diversion. The $909 million for the diversion would seem to have much greater benefits than the levees. We need to find a way to get a favorable cost benefit ratio or find another way to fund the diversion It should be selected immediately as the preferred method.
Sincerely
Leah Fujimoto

090722_Jensen

Beauchamp, Francis MVP

From: Mark Jensen [mark.jensen@und.nodak.edu]
Sent: Wednesday, July 22, 2009 10:23 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP; governor@nd.gov; DWalaker@cityoffargo.com; fmflood@fmfloodcontrol.com; Honeybun
Subject: Flood control method - a Fargo citizen.

Ladies and Gentlemen,
I am writing to express my "man in the street" level observations and conclusion regarding the Fargo flood control method.

I am trained in biology and organic chemistry. I teach surgery at UND medical school. This means I live in a world of observations and data to make the best decision in a complex environment.

Here are my observations as a non-engineer:
1. The Grand Forks temporary dikes were overwhelmed in 1997.
2. The Grand Forks permanent dikes held in 2009.
3. The flood levels are becoming more unpredictable.
4. Fargo and Grand Forks temporary and permanent dikes are expensive.
5. Failure of a dike is ruinous to a community and its businesses and their futures.
6. A dike has a structural limit.
7. Diversions in West Fargo and Winnipeg have a clear history of success.
8. Diversions do not need to be rebuilt, and do not increase upstream water levels.
9. Increasing upstream water levels will adversely affect farmlands.
10. Diversions assist the river to flow more freely.
11. A temporary dike can be constructed to assist a diversion. A diversion cannot be constructed rapidly to assist a dike system.

Choosing a diversion appears to be the best option.
Choosing the cheap or easy option does not stand the test of time well.
Please use wisdom in your decision.

Thank you for listening to me,
Mark Jensen, north Fargo resident.
4584 Riverwood Drive North
Fargo, ND 58102
701-277-1625.

090811_FPC

Beauchamp, Francis MVP

To: Sobiech, Jonathan J MVP
Subject: RE: flood protection for Fargo-Moorhead

-----Original Message-----
From: Ron Bergan [mailto:ronb@facnd.com]
Sent: Tuesday, August 11, 2009 4:23 PM
To: Evans, Craig O MVP; Snyder, Aaron M MVP
Cc: DWalaker@cityoffargo.com; mark.voxland@ci.moorhead.mn.us
Subject: flood protection for Fargo-Moorhead

August 11, 2009

To the Army Corps of Engineers;

Fargo, North Dakota voters recently showed their commitment by voting overwhelmingly to approve a tax increase to help pay for permanent flood protection. The Flood Protection Coalition for the F-M Community appreciates the work the Corps is doing to evaluate options for permanent flood protection. However, it is our understanding that the diversion option sizes have recently been changed; and, therefore, we believe more public comment is warranted.

It has been communicated that your study now only has on the North Dakota side a 30,000 cfs and a 40,000 cfs diversion both of which are larger at the north end. This compares to 25,000 cfs, 35,000 cfs and 45,000 cfs previously designed and still included in the study on the Minnesota side of the Red River. We are concerned that the plans being studied do not include a minimum sized plan with the proper specifications on the west side of the river. We are also concerned that any diversion plans are thoroughly studied with an effort to keep costs as low as possible. In addition, in order to evaluate the cost benefit ratios properly, all possible benefits need to be discovered and properly applied to the ratios.

The Flood Protection Coalition for the FM Community proposes a 20,000 cfs diversion increasing in size as it flows north on the North Dakota side, diverting the Wild Rice and adding water from the Red only if the cost is justified. This or any diversion plan should block the water from going east into Fargo and West Fargo; and, if the design capacity is exceeded, the water would flow to the west and north. The 500 year flood map shows water in this overflow area. The clay from the diversion could be used to build ring dikes around any affected properties and to raise roads and should be part of the costs/benefits. A control structure on the Red should be avoided if possible because it will potentially raise the river level to the south and provide little or no benefit to that area.

An option to any North Dakota plan could be to divert only the Wild Rice River west of I29 to reduce costs. Not having a control structure on the Red River will lower the river level to the south and increase the benefit area. A study should show whether this would keep the river through F-M at a level at which the flood fight can be won even in a 500 year event. The peak flows at Hickson were 13,300 cfs in 1997 and 14,400 cfs in 2006 until this year. The provisional data for this year of 21,800 cfs does not fit with the data from other sites for this year. If it is correct, is it at about the 500 year flood level.? The Wild Rice, Sheyenne and Maple rivers appear to drain a larger area than the drainage area of the Red that flows through F-M; and, they have a much shorter route to the Red in the Fargo area when they are flowing overland, which would happen in a 500 year flood. We have shown that we can fight and win even a 40.82′ flood (29,100 cfs); the costs are low if we only do this once in 500 years. The costs were increased greatly in 2009 by the 43′ and 44′ crest predictions.

The Winnipeg diversion was increased from 60,000 cfs to 140,000 cfs by removing only 21 million more cubic meters of soil compared to the 76 million cubic meters removed originally; and no additional land was acquired. The 13 mile West Fargo diversion should be used and expanded for part of the plan. Please evaluate whether or not the area of the Sheyenne diversion under the I94 Bridge can be made deeper and wider to get by without replacing the bridge until the next time the interstate is worked on. The spoil banks could be used to increase the head pressure going under the bridge.

We also ask the Corps to review management of current water storage in dams when a 100 plus year flood is predicted. If necessary change the law or guidelines to maximize benefits for floods over the 100 year mark. The goal should be: when the inflow reaches the maximum controlled outflow the reservoir is empty, and continue the maximum outflow until such time as the storage is needed to reduce the peak. Calculate at that time if all or how much of the flow can be restricted. If we have extra water for some time before the peak, that is better than a higher peak. Fish can be restocked if needed.

The Flood Protection Coalition for the F-M Community believes the levee system designed for a 100 year flood as proposed in the preliminary Corps plan is not acceptable and is not comparable to a diversion system that will protect us from a 500 year flood. We feel very strongly that any flood protection plan must protect our community from a 500 year event and a diversion on the North Dakota side of the river is the only viable option. As long as the diversion has a favorable cost benefit ratio and a large area benefits, then the bigger the diversion the better. We also would like to point out that a levee system will not be as durable or last as long as a diversion system. It is clear that levees fail and deteriorate as well as move water levels higher. We are also very concerned that an unsightly dike system in downtown Fargo-Moorhead will build walls between our communities and reverse the decades old effort to bring the communities together. Lastly, property values in our downtown and riverfront areas can be enhanced with a diversion system where they would be impacted downward by a levee system.

The benefit of saving the stated $61 million for proposed buyouts of riverfront property may, if protected from flooding by a diversion, increase to a value of $100 million. We believe the buyout money and the loss of property taxes are used in calculating benefits; but, are the Park District damages and loss of revenue included for all the summer floods? We think that the extensive drainage (500 plus miles of public drains in Cass and Clay counties) plays a big role in the summer floods. It should be noted the planned south side flood protection would not be needed and would save $175 million. Property taxes will also be lost in the south side plan and upkeep will be required. The benefits from reducing a 500 or 700 year flood to a winnable level should be included minus the costs of fighting the lower level flood. The cost effectiveness to fight a 100 year flood one time in 500 years versus making a larger diversion needs to ascertained.

Because homes do not have to be acquired along the river for levees or to raise the dikes, their value will be enhanced with a diversion and the absence of a large dike between the homes and the river. The integrity and beauty of the Red River, including the riparian forest, will be sustained for future generations.

Thanks for your consideration,

Flood Protection Coalition for the F-M Community Steering Committee,

Ed Schafer

Ron Offutt

Steve D. Scheel

Doug Burgum

Dick Solberg

Bruce Furness

Ron Bergan

Erv Inniger

Fargo-Moorhead Public Meeting
Written Comments
May 2009

090606_Matthew Breker – As a Fargo resident and farmer from the southern Red River Valley, I have interests in protecting both Fargo and my farm and cropland. I am interested in the economic analysis of all potential upstream water retention. Please contact me regarding the above. mjbreker@yahoo.com

090606_Jim Armfeld – Unless the Southside project is an important and apart of your plan why proceed? jimmel@ideaone.net (email address may be wrong)

No Date_Dave Anderson – I believe we must utilize every measure – barriers, diversion, and storage to ensure the greatest level of protection. dave@fmdowntown.com

No Date_Elise & John Leitch – Hurry, Hurry, Hurry! jel@cableone.net

090606_Charles Koski – Any project should consider redundancies to allow for modification of any catastrophic failure le diversion and modified flood barrier and or storage. How can you adjust your project for a river that flows north into frozen drainage channel?
bonniek@i29.net

No Date_John Stern – Outside the box idea: 2 way pipeline to reservoir behind Garrison – flood relief in spring, water supply in summer during dry years.
John.sherri.stern@gmail.com

090519_Kathy Laney – I vote for a diversion: long term solution, allows FM to still be a river city, provides protection to surrounding small communities. Start Now! If we could sell our home we would move out of community. Kathy.laney@live.com

090519_Shirley Syverson – Good informational meeting.

090606_Daryl Lahren – Why do you need a 500 ft wide base at the bottom of the diversion?
dlahren@aol.com

090519_Daniel Holm – Excellent presentation! Good materials, appreciate the effort to get feedback from the group. bowfrog@hotmail.com

090519_Charles D. Dunnell – Number one choice is: diversion channel, are we as smart as the Canadians!? This would keep old river bed for its beauty as it runs through the cities. Number two choice: could West Fargo diversion be modified/ added on to, so it would take water at Red River? dunnellc@yahoo.com

090519_Pat Staples – Please coordinate Southside Fargo Project with your plan. This needs to be synchronized!! Diversions appear to be the best long term solution. patstaples@cableone.net

Comments and Questions from Moorhead Public Meetings

090520_A Saharieff – Please consider: dredging the river under the 3 bridges; Main Ave, NP Ave, & the Rail Road tressle. Also design & build torpedo shaped flow accelerators in front and behind the bridge support abutments. Flow must be enhanced for levees to work. Please consider dredging and cross cutting the river channel

090606_Diane Ista – How far downstream do you measure impacts? 30 miles downstream are small communities that are very important to the agricultural economy as well as the social and cultural structure needed in our rural communities. These communities cannot take any more directed water; we are in danger of losing small towns. This will increase the infrastructure needed of FM as they move there. More farmland under concrete. No more water downstream!! We need assistance to build retention on the MN Wild Rice River which would reduce the flows to the Red. More water from diversion if tributaries to red reduce flow. djista@loretel.net

090520_ Patte Kratky – As co-president of league of women voters of the Red River Valley and member of River Keepers, I offer my services to the planning boards, as a concierge. Please contact me at 701-235-8200 ext 7-204 currently or at my email address, a message maybe left at 218-233-8382 or email. We were displaced by the flood and are repairing our home. LWV is non-partisan, non- profit grass roots organization. Patty4st04@aol.com

090520_ Mark Nokken – Water retention to keep floods at a manageable level. mnokken7@yahoo.com

090520_Jill Johnson-Davidson – We would like our property protected. No one interviewed my neighborhood last September, (Woodlawn Point, Moorhead). Proud survivors, who live with river. What is least damage: dredge or diversions – both have impact. End building permits on spongy wetland. Permit and enforce coordinated farm runoff. What is best for the river and her health? Don't only listen to or believe city officials especially about buyouts – ask residents directly. Why are there more floods, higher crests – what are the contributing factors that can be mitigated. Moorhead's goal was to protect infrastructure not homes or people. Fargo diked extensively; raised water in our neighborhoods. We were not contacted in September – based on our location, I would think we would be. Diversion number one choice. Explore contributing causes of why floods have increased. We love the river – for us, the river is not the problem – the flood is not the problem.
codirectorjjd@yahoo.com

090520_Calvin Singleton – Need info, flood proofing by fill with clay.
singleton@wapa.gov

090520_Gary Shramstad – I suggest a diversion of the Sheyenne from McVille to the Red River north of Grand Forks. This would alleviate flooding on the Sheyenne and Red, since the Sheyenne headwaters are north of Bismarck. It would also solve the problem of Devils Lake overflowing.

090606_Deb Haugen – Is there an aquifer newly discovered south of Moorhead, west over the proposed diversion, and east of the Red? We wouldn't cause potential damage to clean water source in times of drought? dlhaugen@cableone.net

090520_Paul & Deborah Kukowski – Thank you for the information. Concern: Economic and non-economic impact of any diversion project on the communities and agriculture industry north of Kragnes, MN. paulski@anyconnect.com

090606_Barbara Headrick – How much will be on website as you work on study over next 4 months? How will Corps handle currently existing structures, such as the Sheyenne diversion in West Fargo, could they be altered to work better for the full region or must your project deal with it as is? Barbr.headrick@gmail.com

090520_Chuck Stenso – Buy out homes on west side of River Dr. Build berm to 46-48 feet along west curb. Area could have bike path/picnic area.

090520_Deanne Sperling – Diversion seems the most practical solution.
dmsperling@hotmail.com

090606_Stanley Wolf – I live in section 6, Oakport Township, Clay County. I see that there is a proposed levee that encompasses the area between 70th Ave NW and 80th Ave NW from the river to Broadway St. Question: How did this levee become part of the proposal: At present there are only a dozen or more homes in the protected area, an area of about 300 acres. I live just north of the levee area – how will this affect my property.
Ducksoup25@yahoo.com

Nancy Steinberger – Please keep me in the loop on H & H modeling efforts. FEMA is currently working on models for the Sheyenne and Maple Rivers. We have a preliminary Digital Flood Insurance Rate Map coming to Fargo in the summer of 09' and a Cass county DFIRM shortly there after (about 1 yr out). No action should NOT include flood fighting. Emergency measures can cause a rise in flood elevations. If that's the baseline, the project could slip through as not causing a rise even if it does. Flood permits from all affected communities will be required. A CLOMR and LOMR will be required.
Nancy.steinberger@dhs.gov

Rick Archer – Recent 2009 flooding has resulted in discrepancies between projected river gage water surface elevations with recorded flood discharges. This may be due to different stream d/s setup conditions (Sheyenne) than what original floodplain model is showing, or due to flood fight efforts. I would like Corps of Engineers to look more closely at hydraulic conditions that may be leading to water surface elevation discrepancies.

Anonymous – Build retention areas along the rivers that feed the Red. That's where it starts. Pay the farmers to hold the water. Flood costs should be less overall. Varies yearly. The longer the farmers hold the water the more money he gets. These farmers are losing income and need to be paid for their sacrifices. That sacrifice will vary every year, dry years nothing, low flood years only land close to FgoMhd will be paid. Extremely wet years, all areas will hold water for a time – the length of time that water is held determined by the flood level in FgoMhd, 34', 36', 38'? Whatever levees can handle in FMhd. That controls how long water is held and amount of compensation paid to a farmer for his delay in planting – longer he holds water, the bigger his loses, and the more compensation he gets – (later planting, less yield) ($ amount changes every 2 wks?)

These wet years, crop yields would be less and holding water would be like insurance, they would get some income from their land – guaranteed. Public resistance to flood control would be less – nothing permanently destroyed or damaged. Environmental problems be less. No permanent damage to land compared to diversions or channel extensions or oversized dikes. Some floodwalls or smaller dikes will be needed in some areas. This is one piece of the pie that should be studied. You solve a problem before it is a problem, not after it has become one. That is what we're all trying to do, so let's resolve it at the start. Before the flood water gets here.

090520_Reinke - Having attended the flood presentation @ Moorhead State I believe the only real resolve to the long term flood problem must involve some type of diversion.

Water retention and other forms of water control may offer some form of relief, but they are only band aids to the overall problem.

It was an excellent presentation.

Gary C. Reinke
5327 BSouth Univ. Drive
Fargo, ND 58104
701 293 7084
GaryC_Reinke@msn.com

090519_Cousins I am a retired Clay Co. Engineer.

I have lived in Fgo-Mhd since 1950, except for 9 yrs. I feel a permanent flood is essential as it seems floods are becoming worse and the 2009 flood costs the area many, many millions of dollars plus tremendous private suffering.

I feel a levee plan has maximum height restrictions and I fell we are approaching that elevation. I feel any plan must include a diversion channel. The cities that have one seem to do well – Breckenridge, West Fargo and Winnipeg. I would like to see a combination plan, levees and a diversion channel.

I have several questions which will be answered as the study progresses. A 500 foot wide, 20 feet deep below field elevation, and a 2000 foot top width diversion channel seems excessive. I assume this is wider than the Red River. What is the CFS for a 100 year flood and what CFS would the diversion channel handle? What is the proposed water depth and velocity of the diversion channel? Would a diversion channel be detrimental to anyone downstream?

I thank you for your study and look forward to reviewing your recommendation.

John A. Cousins
1508 52 ½ Ave. No.
Moorhead, MN 56560
218 233 2384
Jac.bev@juno.com

090519_Bach - Is the goal of the project to eliminate the need for any temp/emerg. levees/ diking? If so, is there a protection level and are those costs included in the diversion costs?

What about off-line storage on ND side south of Wild Rice? Has that been looked @? Probably need 8-10 sections of land dig 20' deep.

Eris Bach
5505 16th St S
Fargo, ND 58104
ebach@srfconsulting.com

090519_ Mathern - Our hospital was evacuated by Governor's order. There was a loss of $750,000 net income during this time though very little property damage; such losses need to be included in the cost benefit analysis.

Tim Mathern
Prairie St. John's Hospital
510 4th St S
Fargo, ND 58103
701 476 7825
tmathern@prairie-stjohns.com

090519_Mathern State match dollars need to be directed toward a comprehensive regional flood prevention plan.

Senator Tim Mathern
429 16th Ave. S
Fargo, ND 58103
701 235 9817
tmathern@nd.gov

090519_Mathern - Our home was right next to the dike – we support a permanent dike plan even it it affects our view of river and change to our property.

Tim Mathern
429 16th Ave. S
Fargo, ND 58103
701 893 5016

090520_Olson - I am interested in flood control. Let the Army Corps of Engineers do the job: Once over and done. The cost is high but is worth every cent. To go through flooding is wasteful when a permanent solution can be attained.

The Fargo Flood Plan is too restricted in scope. It appears as if developing the area is a priority, rather than flood control. My assumption is that politics has entered in. Individuals with prestige are spared intervention of flood control. This was verbalized at one meeting.

I resent the diversion planned on my property: (Stanley Township, South of County 14, Sections 25 and 26). This is devastating to the beautiful farmstead (which has been in our family since the 1880's) the tranquility and beauty of the river, the adjacent wooded area and the farm acreage. It is difficult for me to believe that this type of devastation could be handed to me.

It is not true that I am not interested in flood control. If need be, I will approve the planned dike (wet side) on the West rim of the property.

I chose to not develop my property. Others did, knowing they were in harm's way. Now I am needing to sacrifice my property when my family worked so hard to keep its ownership. We worked so hard. Our family never asked for any assistance from the Federal, State, county, township or local governments. We kept working. By the way, the buildings on the farmstead have never experienced flood water. This really shows that Norwegians knew where to place their building sites.

Respectfully submitted by:

Irene L. Olson
2510 100th Ave South
Horace, ND 58047
218 233 3203

APPENDIX C

Written Questions and Answers from Scoping and Public Meetings

Appendix C
Question and Answers
During Scoping Meetings

Moorhead, Minnesota November 17, 2008 Public Meeting

Fargo, North Dakota November 18, 2008 Public Meeting

Fargo, North Dakota May 19, 2009 Public Meeting

Fargo, North Dakota May 20, 2009 Agency Meeting

Moorhead, Minnesota May 20, 2009 Public Meeting

Fargo-Moorhead Metro Feasibility Study
Public Meetings, Moorhead MN Nov 17th, 2008

Q: What are the new 100-yr and 500-yr FEMA flood stages?
A: 100-yr is 39.5’ on the Fargo gage; 500-yr is approx. 41-42’; the old 100-yr was 38.3’

Q: We thought the 1997 flood was much larger than a 100-yr event.
A: During the event it may have been reported as a much larger event. After all analysis was completed, we determined that it was approximately a 100-yr event. The 1997 flood in Grand Forks was approximately a 125-yr event there.

Q: I don’t understand how a 100-yr flood could have a 1 in 4 chance of occurring over the next 30 years.
A: That’s the way the statistics work. . .

Q: Did you factor in all historic events to figure out the 100-yr and 500-yr stages?
A: Yes.

Q: Do all new developments build ponds to hold water, i.e. to not impact flood levels?
A: Kevin: The Corps assumes in our analyses that the local folks will use best management practices, and the Federal project will not make things worse for others, including ag producers.
A: Bob Z: All subdivisions must include ponds designed to hold a 100-yr runoff event and all houses must be elevated above the 100-yr elevation.

Q: Winnipeg has 700-yr level of protection from their bypass channel. Is that an option for F-M?
A: Yes. We will consider diversion channels.

Q: If regional protection is the goal, why is Fargo’s Southside Levee not on the table for a Corps project?
A: April: The FSS project will have no impacts if all of the features are built.

Q: What have we learned from the floods in Iowa last summer?
A: We will be looking at all of the risks and put together a system to reduce them.

Q: What will the feasibility study cost the locals?
A:

Q: Asked to Bob Zimmerman: Can you confirm that there will be no impact from the FSS project?
A: I’m comfortable with the analyses Fargo has done, but I have not run the models myself.

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Public Meetings, Moorhead MN Nov 17th, 2008

Q: FSS channel extensions will directly impact some landowners. What will happen if they are built and then the Corps diversion is built later?
A: Both projects would stay in place, and we would expect them to both contribute benefits. We do consider impacts to landowners in our analyses of social effects, but our focus will be on doing the most good for the region while impacting as few people as necessary.

Q: Can we just widen the river that's there?
A: There are many issues with channelization, especially from an environmental perspective. The odds of obtaining a permit for channel widening are slim to none. All of our projects must be environmentally acceptable and go through the NEPA process to disclose and mitigate for any adverse environmental impacts.

Q: It seems like common sense to hold off on other projects until this regional plan is complete.
A: Bob Z. and Mike L.: Even with anything we would propose for a regional solution, there will still be a need for a levee on the south side of Fargo because the land is so low.

* * *

Moorhead City Council Member asked the following questions:

Q: What are the realistic options other than a diversion? Storage is too expensive upstream, and levees can't solve the whole problem.
A: We agree with your summary of the options.

Q: FSS project is proposing 3 miles of channel extensions. Aren't these environmentally problematic?
A: Mike L.: The environmental agencies generally do not like them, but they are more acceptable at a higher elevation that will be used less frequently.

* * *

Q: There is concern that the whole FSS proposed package may not be implementable, especially the channel extensions in Minnesota.

Q: Could the regional solution include the Sheyenne Diversion, or does the existence of the SD make us go into MN with a new diversion?
A: Mike L.: There are many complications with tributaries on the ND side. The complication in MN is higher ground, therefore higher expense.
A: Aaron: We will look at all alternatives to make sure we pick the best one.

Q: Where would a MN diversion go? Will my house be impacted?
A: We're not there yet, and we won't be in April either.

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Q: What is the level of protection we're looking for?
A: We have to determine what makes economic sense, but we want as high a level as we can justify.
Q: Will the Corps look at the future with and without the FSS project?
A: Kevin: We'll work with our sponsors to determine what the appropriate future condition is.
A: Mike L.: I haven't thought about this yet.

Q: From Mike L. to April W: Would Fargo build the FSS project without all of the proposed features?
A: April: We're shooting for the least impact possible. It would be allowable under floodplain planning to raise water surface up to 9 inches.
A: Mark Bittner: Fargo has looked at diversions, and they're very expensive. There's a good chance the Corps will not find anything economically justified, and even if they do, the cost will be high, and it will take a long time to get funded.

Statement from Moorhead City Council member: There will be a water war if Fargo puts 9 inches of water onto Minnesota.

At this point, Kevin halted the discussion and summarized many of the issues. He asked folks to remember that the Corps study is different than FSS levee, and we're looking for a regional solution.

Q: Why build homes where the low ground and flooding is?

Q: The Sheyenne Diversion project created ponding where there was no flood problem before. Beware of creating unanticipated problems.

Q: Are you designing a passive system or an active system?
A: We want the system to be as passive as possible, but it will likely include pump stations that will need operations and maintenance.

Q: All of the cities that are developing should talk about their future plans before they build something that will be in the path of our project.

Q: Will the feasibility study make any recommendations on how to finance this project?
A: We will ask the sponsors to self-certify that they have the capacity to do the project. The Feasibility study will lay out all expected costs so the cities will know what is needed.

Q: How do we know that the Federal funding will be there for the study and the project?
A: We don't know that. We have to go through the steps to get a project authorized and then funded. All we have authority to do now is study the problem.

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Q: What other projects does the Corps have right now.
A: FMMFS and Devils Lake are our two biggest projects in the RRN right now. We also have the Roseau project going into construction; Montevideo, MN; Ada, MN study, and several other smaller studies. (Forgot to mention Wahpeton-Breckenridge and Fargo-Ridgewood).

Q: Why is the Corps coming in now?
A: Local leaders asked us to study the regional flood problem.

Q: What is in Phase 1—what will we know in April 2009?
A: We will be able to show a list of alternatives that we plan to study and another list of alternatives we plan to drop from consideration.

That concluded the group Q&A session for 17-Nov.

* * *

Gaylen Vaa, 6273 7th St. SW, Moorhead (Briarwood) says cutoffs in Minnesota cannot be built without eminent domain, and Fargo cannot condemn land in MN. They need to start working with a MN partner.

Fargo-Moorhead Metro Feasibility Study
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Q: How does this study interface with the Fargo Southside (FSS) project? The goal of that project is to get FEMA certification in order to avoid the need for flood insurance.
A: We're looking at the whole region—FSS is only one component. FSS is still necessary even if a bigger project is built. Anything we'd do on a larger scale would augment the other smaller projects. We will look to make sure the FSS features are still needed. The system would still have to convey smaller floods through town and have the larger features take flow off of the larger events. There is a city-wide meeting next Monday at the Civic Center.

Q: Here's the obvious question: why do we need floodwalls in Harwood Groves if you're going to build a diversion.
A: You're asking about a detail of the FSS project, and we need to talk about the larger system.

Q: It seems like we're doing the studies backwards—shouldn't we do the macro study first?
A: Macro scale may take several years. Micro scale will still be necessary.

Q: If we already know the micro solutions, why do the macro study?
A: The small projects provide a low level of risk reduction. We still need a larger system.

Q: I question the 1:4 odds you presented. The projects we're talking about will protect us.

Q: Where does the money go?
A: The Corps is spending the money for its work. Phase 1 will determine whether we want to continue.

Q: Could we increase conveyance through town?
A: Mike L.: There are things we could do, but many of them would have significant environmental issues. Bridges could be raised and openings improved.
Kevin: with channelization features we have to factor in environmental considerations.

Q: B/C ratio—is that taking into account urban sprawl and future development?
A: That's a little sticky from a Federal perspective. We count benefits for reducing flood risk to homes, commercial and public infrastructure, and agriculture. Future developments (intensification benefits) are highly scrutinized, because we don't want to promote growth in flood plains. We will include intensification benefits in the Regional Economic Analysis, but not in the Federal B/C ratio.

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Q: Clarify “channelization.”
A: Channelization involving wholesale clearing and straightening of the natural river channel is problematic. Smaller cutoffs at higher elevations are less environmentally damaging.

Q: I don’t understand levees. What is wrong with building dams like the Garrison Dam?
A: We don’t have really good places to build dams. We are still looking at smaller dams, but they will have limited effectiveness. Channelization of the natural channel has problems. We are considering diversion channels.

Q: What is the depth of water at Fargo vs farther north—does the river get deeper as it goes north?
A: The volume of water does increase as you go downstream and pick up more tributaries.

Q: Are we still considering the “waffle plan?”
A: Scott Jutila: we have looked into that along with other types of distributed storage (in the FMUS study). It is relatively inefficient—we can’t completely solve the problem using distributed storage. It may be part of the long-term solution, but not the total solution.
Lee Klapprodt: I concur with Scott. We need a combination of things including watershed management and flood infrastructure.

Q: Is there a potential for FEMA’s policies re: flood insurance and grandfathering rates to change?
A: April W.: FEMA will currently grandfather people in if you carry flood insurance now (a loyal customer). That doesn’t mean rates won’t increase, but they won’t move you to a higher rate class through re-mapping. There are no guarantees that FEMA will continue this practice.

Q: How does the future flood map affect development?
A: The City of Fargo provided preliminary FEMA data to developers so they could act accordingly. Local standards require first floor elevation 2.5’ above the current base flood.

Q: What is the current base flood elevation?
A: The current elevation is 38.3 feet at the Fargo river gage. The new BFE will be 1’ to 2.5’ above the existing BFE, depending on where in town you are.

Fargo-Moorhead Metro Feasibility Study
Public Meetings, Fargo ND May 19th, 2009

Date: 05/19/09
Location: Fargo Centennial Hall, Public Meeting
Agenda
5:30 PM Open House
7:00 PM Presentation
7:55 PM Question & Answer

Q. The coverage area is the Fargo metropolitan area, but County officials have not been present. How have you been working with mayors, other elected officials and other organizations?
A. Our official sponsors are listed as the Cities of Fargo, Moorhead and the Buffalo Red Watershed District. Initially a meeting was set up with a large number of stakeholders and coordination continues to take place. Some work may occur in rural areas, but the focus continues to be the metropolitan areas.

Q. How much of the $625 million in the first estimate is attributed to the Southside Project? How would characterize the economic value of the project? Will the Southside Project solve the flood problem?
A. Southside Project totals approximately $160 million of the estimate. Benefits are correlated to the level of protection provided by the project. If flood protection is high enough, flood protection could be extended out beyond the City proper. This project is intended to address regional flood issues. USACE wants to ensure that solving one problem won't cause another one.

Q. It appears that the earliest the project would be constructed would be ten years from now. How can we protect ourselves in the meantime? Does the USACE have a say in how we protect ourselves? I currently have a clay dike in my backyard and I could raise it – does the USACE have anything to say about that?
A. It's a good question that crosses several different jurisdictions including municipal code, state and Federal law. Please provide us with your name and we will research the issue for you because others may also benefit who are in a similar situation. (Mike) The USACE will not likely have an issue with retaining a levy, but you should check with FEMA and your City. (City, Walker) If you are in the floodplain, there is a permit required. The City wants to ensure that your levy is designed properly and does not lie within the floodway.

Q. Could you explain what an invisible wall is? How will a cut-off channel make things better?
A. (Refers to slide) An invisible flood wall, such as those built in Grand Forks, are incorporated into structures and not noticeable as a flood protection measure. In some cases, the structural measures are only present during a flood, but the essence is that invisible measures are incorporated into the landscape. Such measures tend to be operation intensive. Channel cut-offs will shorten the time that it takes for the river to flow through the City which results in a lower water elevation.

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Q. In determining costs, are costs just related to physical damage, or is unemployment resulting from the flood keeping people from work factored in?
A. Flood damages are typically the primary driver, however, other costs such as those you mention are factored in. The National Economic Development criteria requires an evaluation of the cost to the Federal government but also the effects on the regional economy. Both losses will be looked at with this project. Productivity of the workforce and social stresses are real and evaluated in total costs, however this becomes very tricky. Often Congress asks for total costs without the social impacts but since Hurricane Katrina, the Federal government is much more sensitive to those issues.

Q. I live at the confluence of the Wild Rice and the Red River – what effect will the project have on the people how live in that area and those upstream.
A. The alternative we've looked at so far will reduce water surface elevations at the area you're talking about. The diversion needs to be looked at in detail to ensure that the water is not conveyed so quickly through the City that it will have a downstream impact.

Q. If a levy is constructed what level will it be constructed at? (For the City) If I want a permit to construct my own levy can I construct it to the level of the 1997 flood?
A. The specific elevation targeting is part of our overall plan development process. We are not there yet, so providing that information at this time would only be a guess. We'll be working on that in the near future. (City, Walker) The City does have a cost-share program, but will not cost-share for those homes on the buyout list. The City will allow you to raise the elevation of your property with a permit. The FEMA maps will be changed soon.

Q. I'm trying to build something in my backyard – how high should I build it? Who will provide me with that guidance?
A. (Refers to flood frequency slide) I would suggest you look at a graph like this and assess the risk of constructing something at a certain elevation. If you look at the recent history, there are higher stages and more frequent flooding in recent years. If you're concerned about the long-term viability of what you're building, you'll incorporate this into your plans. (City, Mark) We've had a number of flood failures in recent years. When making a decision, you need to look not only at your property, but also your neighbors' property to ensure that you're not causing more problems than you're fixing. We had a $125 million worth of damage with the 2000 rain event – even homes with protection were damaged. Building levies also affects the drainage in your yard and you need to take this into consideration.

Q. The diversion costs $900 million – that's $30 million a mile. Is there a diversion channel that would reduce the costs per mile? Any other alternative routes would need to take place before the end of this phase, correct?

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A. Part of the reason that the Minnesota side was looked at initially was that it was the shortest flow path and also fewer crossings. On the North Dakota side we would cross more highways and ultimately create a longer diversion channel. We will look at a number of alternatives, but this is a start. We will try to develop all of our alternatives that are reasonable and plausible by September. We hope to come back to you to present you with these alternatives when this is complete.

Q. The diversion will circumvent the City; has any thought been given to buying out a larger portion of the river to create a larger river to convey more water?
A. Making the river convey more water more quickly conflicts with the ecosystem preservation goals of the USACE. Straightening of rivers was once common, but is not often done anymore.

Q. The inherent problem that you have is trying to convey water down a frozen river. Have you thought about using the I-29 corridor as a diversion?
A. We haven't looked at that in detail. We have consulted with DOT and there are safety concerns about using right-of-way for flood control. Remember also, our concept diversion channel had a footprint of 2000 feet wide. The current interstate system does not have that sort of capacity so there are constraints in that particular area.

Q. Who is the decision maker that will identify which plan will be presented to Congress?
A. The initial decision maker is the Commander of the St. Paul District, USACE. The Commander will look to the project managers for affirmation that the stakeholders support the project, the USACE planning process has been followed and that the project makes sense. After a plan is submitted, Congress needs to make an appropriation for the project that will allow the construction to go forward.

Q. Are the slides available in printed form, or can they be e-mailed out to people upon request?
A. Yes – we will have the slides up on the website, but they are not up yet. Google "Fargo Moorhead Flood Study" and the first hit you have will likely be the website. Both the slides and the handouts will be posted by the beginning of next week. Please let us know if you need anything else.

Q. Why doesn't the USACE have more jurisdictions over the root of the problem which is the drainage of the landscape upstream?
A. We've been studying drainage issues around the Red River and also Devils Lake. While storage has been looked at as a possible solution, the problem is that the costs and land acreage required to address the issue are enormous. Further, the soil in this area is very fertile and using the land for storage takes it out of production. The use of the land for agriculture versus flood storage needs to be taken in to consideration with the cost-benefit analysis.

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Q. Could you talk about how the Southside Project will be synchronized with the USACE Project? If Southside goes forward, how does it affect your project?
A. As mentioned during the talk, the Southside Project is a non-Federal project and the local sponsor is working hard to ensure that the Southside Project does not adversely affect the USACE project. The USACE needs to be cognizant of the opportunities in the Southside area that may be in the Federal interest, however, we are not at that point yet. The City has an interest in moving forward with a project as soon as possible. (City, Mark) The City wants to ensure 100-year protection over the Southside area, although the City believes that 100-year protection is also necessary for the rest of the City. It appears that right now, we should be able to achieve a positive cost-benefit ratio for the Southside project. We want to get as much Federal money as we possibly can, but we don't want to jeopardize potential Federal funding; we will be working closely with the USACE to ensure that the Southside project does not increase flood stages.

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Q. Will the Southside Development be incorporated into your analysis as built?
A. No

Tom Grashens, MN DNR
Q. Will non-structural solutions involve any efforts to lower the peak?
A. No

Robin Coursen, EPA
Q. Will this only deal with flooding on the Red River, or will this be a regional study e.g. including the Wild Rice River?
A. This will be a regional study but focusing on the metro area. We want to understand the big picture.

Robin Coursen, EPA
Q. Will you be looking at impacts downstream towards Canada? Executive Order 11124 requires you to address transnational impacts.
A. No – we will limit the project area to focus on the Fargo metropolitan area. We will follow that guidance but assume that the impacts crossing into Canada will be minimal, if adverse at all. This will be addressed with the report. Noted that coordination will be performed with Canadian officials, (Robin will provide contacts she has).

Q. Does the $600 million estimate comprise the current Southside estimate?
A. That takes the Southside project in addition to protective levies on both sides of the river.

Brent Truskowski, EPA
Q. Are you talking about diverting the entire river or would the water be diverted at a certain elevation?
A. Just flows above a level specified in the alternative analysis.

Q. Will your June 22nd deadline and project timeline be distributed within a public notice? Does this include an EIS as well?
A. Public notice has been issued already. We have combined the EIS and Feasibility Study in the past, but haven't decided for this project yet.

Brent and Robin, EPA
Q. What is driving the timeline? How is this coordinated with the Fargo Southside Project?

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A. USACE wants to be responsive to the needs of the area to expedite the project and minimize the need to mobilize for another flood fight. Congressional authorization would like come in 2010 through a Water Resources Development Act bill. If we miss the opportunity in 2010, the next WRDA bill will presumably occur in 2012. (City, Mark) The City of Fargo believes that it would be ideal to coordinate the two projects to the greatest extent possible.

Brent Truskowski, EPA
Q. How much impact analysis has been done in regards to wetlands and waters at this point?
A. A fairly rough estimate – the goal is to minimize impacts looking at channel alignments, etc. based on the alternatives. We would like to hear about areas of special interest or concern at this point.

Brent Truskowski, EPA
Q. You should consider channel stability, erosion and deposition in both the Red River as well as tributaries as a result of the project.
A. USACE will look at that.

Robin Coursen, EPA
Q. What will happen with fish passage in the area? How will they be affected by channel diversions? Is the U.S. Fish & Wildlife Service present? FEMA, USFWS, EPA and the USACE should meet to discuss issues. 40 CFR Section 1508.25 "similar and connected actions" of the project. At first glance, EPA believes that there may be similar and connected actions between the Southside and USACE projects.
A. USACE will look at that in conjunction with the project looking at fisheries, riparian woodlands, etc. USFWS is not present. USACE will coordinate future meetings with EPA, FEMA and USFWS.

Brent Truskowski, EPA
Q. Will you be allowing limited flooding, or mitigating all flooding e.g. agricultural field flooding? An indirect effect of flood protection may be to prevent all flooding in rural areas which should be considered in your analysis.
A. We currently don't know how the National Economic Development Plan will materialize. The extent of the protection provided will be dictated by the design. We will consider your suggestion in the analysis.

Robin Coursen and Brent Truskowski, EPA
Q. Execute Order 11988 on Floodplain Management (minimizing development in the floodplain) should be considered. Growth impacts from the Southside Project may open up the need for a more comprehensive analysis.
A. Noted – the analysis will include evaluation of these alternatives.

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Nancy Steinberger, FEMA
Q. Flood fighting should not be counted in the No-Action alternative. No flood protection measures in place should be the baseline for initial water surface elevations.
A. The economic analysis will include this baseline. For the environmental analysis, this needs to be resolved.

Bob Bezek, MNDNR
Q. The environmental impacts from flood fighting will be looked at as a temporary impact?
A. That is our assumption at this time.

Tom Grashens, MNDNR
Q. By treating the economic and environmental assessments differently (in regards to the presence of temporary flood protection), aren't you hedging your bets? You should be consistent in your methodology. More probability should be incorporated to assess both environmental and economic risks. Environmental analysis should include the flood fight (temporary levies in place) as well as the alternative of no temporary action (no dikes or levies).
A. The likelihood of future flood fights is very real, but the long-term reliability of such measures are uncertain, therefore the economic assessment is based on the higher likelihood of the probability of failure. We acknowledge the perception, but we want to be realistic.

Dan Cimarosti, Corps NWO
Q. When you look at the "future without project" do you look at future development in the area?
A. That issue is problematic because USACE does not want to promote growth in the floodplain, but that is where the growth is projected by the City. Typically we would not look at that, but we need to obtain additional guidance from headquarters on this issue.
EPA

Q. On the topic of growth, will you be able to show us the growth plan for both cities? Will this include the City's strategies for addressing flooding issues?
A. Yes, growth projections will be included geographically, but not included in the analysis. We will rely on the City for the assessment of their strategies for managing future development.

Cliff McClain, Buffalo Watershed District
Q. The City of Moorhead has concerns with the Buffalo Aquifer and want to ensure that it is not impacted. A number of utilities cross the area where the concept diversion was planned, please take this into account.
A. We would ask that you provide us with information on the water utilities. Additional assessment will be performed to ensure that impacts will not occur to the aquifer. The

current alignment shows that the aquifer lies to the east of concept channel diversion, but this will be looked at in further detail.

Bruce Kreft, ND Fish and Game
Q. North Dakota has a list of conservation priorities – there may be an interest in preserving some level of flooding for the benefit of the river ecosystem. Some fish species (catfish, sturgeon) will be dependent on a natural flooding regime in certain areas.
A. This has been noted and will be looked at.

MN DNR
Q. Have you looked at the MDNR Heritage Information system?
A. Yes. This has been looked at and will be utilized in the future.

Erik Jones, Houston Engineering
Q. The diversion plan is routed towards Highway 75 – there would be issues with affecting the floodplain of the Buffalo River in this area. There are also potential issues with ditch systems which would require a hearing process.
A. Please provide us of additional information.

USACE
Q. USACE: Are there other individuals that should be involved?
A. Canadian counterparts to FEMA, USACE and EPA should be involved. Officials from Manitoba should also be contacted. Tribes should also be invited to attend. Transportation officials from both States should be involved as well as Federal Highway officials. 401B Certification from the State of North Dakota will likely be necessary.

Q. Our comments are due on June 22nd…are we commenting on diversion channels, levies, etc.? Do you want us to reiterate our comments in writing?
A. Feel free to comment on any aspects of the project, but also provide us with additional ideas for alternatives. We will provide meeting minutes, but you are welcome to submit in writing as well.

Q. Are you looking at executing an Official Cooperating Agency Agreement?
A. We may, but we're sorting that out, but we can talk about that at future meetings.

Fargo-Moorhead Metro Feasibility Study
Public Meeting, Moorhead MN May 20th, 2009

Date: 05/20/09
Location: Moorhead State University Hanson Hall, Public Meeting

Agenda

5:30 PM	Open House
7:00 PM	Presentation
7:50 PM	Question & Answer

Q. If the diversion project proceeded in 2012, what would be the completion date?
A. Levy projects will proceed quicker than a diversion project, but everything depends on availability of funds from Congress. Three or four years would be an ideal timeline, but may be optimistic.

Q. There are two omissions in the presentation – you didn't address the land use problem. Farmers want to drain the land as quickly as possible, which is understandable, but it exacerbates flooding. Timing is also an issue if water can be retained at its origin. The time between the pre-crest level and the post-crest level was a few hours – if water can be retained even that long, the peak should decrease.
A. It certainly is an issue that is debated – especially with larger flood events. The assumption at this time is that storage will likely need to be provided through local projects as opposed to a USACE project. Would storage reduce the size and need for a super-structure? That's likely true, but it won't provide the entire solution.

Q. In 1897, the land in downtown Fargo was not built out to the river – that land was all filled in. A flood stage of 40 feet was recorded. When the Freedom Bridge was constructed, the river was constricted to a fraction of its previous width which has exacerbated flooding. If this flood occurred in 1897 without the bridge, a flood of that magnitude with the bridge would certainly be much worse. The only reason that this area was spared in the recent flood was the cold weather. The flood stage is misleading with an official change of the flood stage from 17 feet to 18 feet – this may be a conspiracy to alter the records. Levies may not help in the flooding. The flow is too restricted especially with the Freedom Bridge in town acting as a dam. Ice dams along bridges are another concern that, when they happen, will flood out the entire community regardless of the levy. Fargo-Moorhead needs the equivalent conveyance capacity to the preexisting river. Question – how do bridges constrict the flow and what is the value in building levies above the 40 foot stage?
A. We will look at a number of options including levies, diversions and non-structural solutions. Non-structural solutions include raising structures such as bridges.

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Public Meeting, Moorhead MN May 20th, 2009

Q. Do any of your rules require that your projects be neutral down river (i.e. not making conditions worse downstream)?
A. Those are referred to as “induced damages” and are monitored very closely. USACE will be obligated to mitigate the effects of the project that would adversely affect others downstream.

Q. What is the impact of the Fargo Southside Flood Protection Plan? Will that area be factored into your cost-benefit ratio?
A. We’re starting to look at that and acknowledge that it is a delicate situation. The City does not want to move forward with a project and jeopardize a potential future Federal project, but still has an interest in constructing a project soon. The City could move forward with the project on their own, but will likely wait to see what happens with the Feasibility Study.

Q. Has a study been completed that will identify the reason for the increase in flooding frequency? Could the river be dredged to create a deeper river that would increase conveyance?
A. There has been a tendency in the past to look at straightening channels and increasing conveyance as a preferred way to construct a flood control project, but this happens at a high cost to the environment. As to the frequency, there are both wet and dry cycles over time. There appears to be a wet cycle right now, but it is unclear how long it will last. We will look at these issues in detail in conjunction with the study.

Q. The options that you’ve looked at are mostly structural. Could you talk more about non-structural solutions such as buyouts?
A. Since Katrina, the focus has changed on this issue. In metropolitan areas, the dollars add up quickly for relocation efforts. If we look at pockets or neighborhoods and problem areas, the relocation tends to make sense for structures in high risk areas. We can also look at raising homes to provide protection, but this approach hasn’t been very popular in the Midwest given the high number of basements. National experts will be brought in to advise on non-structural solutions.

Q. If bridges are a constriction along the river, why are we not looking at reconfiguring the pilings like on the LA River? Can we have a standardized measuring system for stages given that there are variations in stage measurements? I am in favor of dredging and straightening of the Red River – it’s legal, efficient and will be 30% cheaper. Do we want to save homes or lily-pads?
A. Not aware of the LA River model, but we can talk to you individually about this during the open house. All of the modeling and plans will be completed in 1988 datum. There will be better continuity on stage data in the future, but there has been a reluctance locally to change. There is a national initiative to standardized datum to 1988 (NAVD 88). We have the standardization of data on this list of considerations for the study.

Fargo-Moorhead Metro Feasibility Study
Public Meeting, Moorhead MN May 20th, 2009

Q. How do you accommodate traffic over a 2000 foot wide ditch? Why wouldn't the diversion channel go through Fargo on the west?
A. Yes – bridges will be reconstructed. We estimate at least seventeen road crossings and four rail crossings. The way the channel is configured, the bridge won't need to be 2000 feet long, but will be fairly large. We've looked at the diversion on the west and it may be a possibility, however, the Minnesota side is the shortest path from point A to point B. We'll be looking at both sides.

Q. What impact does the Rose Creek project (the Fargo Southside Project) have on the Moorhead levies and the overall project? Moorhead still has walkout basements, could those be flood-proofed as part of the project?
A. The Fargo Southside Project will be looked at as part of the study from a permitting standpoint, but the applicant (the City of Fargo) would be required to show that the project either does not change the stage or mitigates the impacts. Any type of levies that would be put in place through a local effort would be evaluated as a part of the study. USACE credits communities for flood protection work that is in place or will be in place in the near future. Flood-proofing walkouts may be part of a non-structural solution. (City) City supports the flood-proofing of structures but it would likely require a permit, and funding has not been identified that would be available to homeowners to do so.

Q. Fargo and Cass County have proceeded with identifying buyouts, but Moorhead has not. What is the involvement of USACE and what is the hierarchy for decision making?
A. FEMA will likely be involved in buyouts. (City) The City is looking at this issue and it will be discussed at the City Council level. Approximately 70 individuals have stepped forward for potential buyouts in Moorhead; interested parties are encouraged to contact the City. The City will seek funding from the Minnesota Department of Natural Resources as well as FEMA for future buyouts. (Clay County) For those outside of Moorhead, Clay County is also compiling a list of interested individuals.

Q. Would the diversion have a grassed bottom or concrete? Who performs long-term maintenance? How will you ensure that the diversion does not result in a 30 mile long stagnant pool of water?
A. Grassed bottom. USACE negotiates maintenance with the communities and that is specified in the plan and agreement. At the conceptual stage, the diversion would flow only during high water and should dry out over the summer. The details of any project are forthcoming.

Q. Why can't you build dikes on buyout land? Why wasn't Fargo flooding addressed with the Grand Forks project?
A. If you take money from FEMA for a buyout, you cannot build on that land at all – this includes private projects or USACE projects (with few exceptions). We'll be coordinating with FEMA on our project. USACE had been working directly with Grand

Forks since the 1980's to identify flood protection for the City. It was coincidental that the flood event occurred at about the same time as progression on the project.

Q. The diversions go through dry land. Why can't they be located in areas where the land is wet?
A. This is a starting point for discussion looking at the shortest route around the City. Some people will be impacted by any project that would be constructed. Looking at a large scale solution will mean that certain individuals will have to sacrifice in order to ensure that everyone benefits to the greatest extent possible. There are real consequences to these decisions. The Minnesota (east) diversion is not the only route that can be constructed but is part of an initial look at solutions.

Q. How did you determine where your starting point and ending point would be for the Minnesota (east) diversion? Where does the water end up?
A. The concept is that the diversion would start at the Wild Rice River and enter back in before the Buffalo River near the Sheyenne. We would ensure that with any diversion, that the individuals living downstream will not be adversely affected.

Q. What about wetland reclamation between Lake Traverse and Fargo Moorhead?
A. Anything we can do to increase capacity in the watershed will help the problem, but not solve it. This will be looked at as part of the project and will be evaluated.

Fargo-Moorhead Metropolitan Area
Flood Risk Reduction Project
Wetland Determination Report
Fargo, North Dakota/Moorhead, Minnesota

Wetland Determination Report For:
U.S. Army Corps of Engineers
Civil Works

US Army Corps of Engineers
St. Paul District

Wetland Determination Performed by:
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July 13, 2011

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Introduction

During the 2010 growing season, the St. Paul District Army Corps of Engineers (ACOE) Regulatory Branch performed a wetland determination on behalf of St. Paul District ACOE Civil Works for the proposed corridor alternatives for the flood diversion of the Red River of the North around the Fargo-Moorhead metropolitan area (Note: hereinafter "Diversion" will be used and refers to all alternatives). Project location and alignment corridors for both the North Dakota and Minnesota alternatives are shown on Figure 1. Documentation of the wetland and other aquatic resources potentially impacted by the proposed Diversion was provided for Final Environmental Impact Statement (FEIS) required by the National Environmental Policy Act (NEPA). Additional project information can be found in detail in the FEIS.

Note: Forested wetland resources were not identified for this report. All forested resources, including forested wetlands, were identified and assessed under a separate section of the FEIS, therefore they were not included in this effort. In addition, areas of wetland outside of the diversion right-of-way footprint were not identified.

Methods

ACOE utilized the procedures outlined in the *1987 US Army Corps of Engineers Wetlands Delineation Manual* (Manual) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0)* (Supplement) to perform the wetland determination. The Corps Training Team utilized the routine (Level 3) method (Manual Part IV, Section D, Subsection 3) outlined in the Manual with substantial effort spent with off-site review and field data collection made at representative locations. Therefore, the results of this effort comprise a determination of wetland locations, rather than a wetland delineation.

Definitions of key terms as used in this report relevant to wetland determinations:

Normal circumstances – The soil and hydrologic conditions that are normally present, without regard to whether the vegetation has been removed. (Manual)

Managed plant communities – Many natural plant communities throughout the Great Plains have been altered and are managed to meet human goals. Examples related to the Red River Valley include periodic disking or plowing, planting of non-native species such as agricultural cultivars and the use of herbicides. (Supplement)

Wetland hydrology – An area has wetland hydrology if it is periodically inundated or has soils saturated to the surface at some time during the growing season. (Manual)

Growing season – The growing season has begun on a site in a given year when either (1) two or more species of non-evergreen vascular plants exhibit biological activity (growth such as bud break or emergence from the ground), or (2) the soil temperature measured at the 12-in. depth is 41°F (5°C) or higher. For this region of North Dakota/Minnesota in the Red River Valley, the start of the growing season averages during early- to mid-April and is typically two to three weeks earlier than safe planting dates for agricultural crops. (Supplement)

Off-Site Review

The following information was included in the off-site review:

- "Wetland Delineation Precipitation Data Retrieval from a Gridded Database" website, Minnesota Climatology Working Group
- Aerial photography obtained by the Corps:
    - USDA Farm Services Agency (FSA) Aerials 2003 -2006 and 2009-2010
- LiDAR data (2010)
- USDA digital Soil Survey Mapping/Web Soil Survey

Note: While the National Wetlands Inventory (NWI) mapping is an excellent tool that is used on a regular basis for initial identification of potential wetland areas, there are limitations with this mapping in agricultural regions. Through an interagency agreement developed in the 1970s between the U.S. Fish and Wildlife Service and the U.S.D.A. Natural Resources Conservation Service, "NWI maps, by design, do not show many farmed wetlands in most of the country [leading] to a significant underestimate of the amount of wetland in agricultural regions" (National Wetlands Newsletter, Vol. 19, No. 2, 1997). Therefore, NWI was not relied upon for identifying wetland resources along the project corridors.

Off-site procedures followed the concepts outlined in the Wetland Mapping Conventions for the State of Minnesota in the 1994 Interagency Cooperative Agreement and the Joint Mapping Conventions for North Dakota and South Dakota. However, due to the time constraints for reviewing the extremely large project area and because the State Mapping Conventions were developed prior to the advent of LiDAR and did not take into account the accuracy afforded with this data, professional judgment was ultimately employed in applying the Mapping Conventions on a qualitative rather than quantitative level. Not all land could be reviewed with every aerial available to measure the percentage of normal years with wet signatures that a particular wetland area exhibited. Rather, as noted below, LiDAR elevation data was correlated to areas with repeated signatures of wetness. (Note: October 2010 update to the North/South Dakota State Mapping Conventions and proposed update to Minnesota State Mapping Conventions both include the use of LiDAR data.)

The NRCS *Hydrology Tools* for *Wetland Delineation Procedure* (August, 1997) and Corps of Engineers guidance *Assessing and Using Meteorological Data to Evaluate Wetland Hydrology* (April, 2000) both recommend evaluation of precipitation for the 3 months prior to the date of the imagery and field site visits to assist in making determinations of normal circumstances. In general, for this northern portion of the country, aerial photography flights to create FSA slides are conducted during the last week of June or first week of July. Unless a specific date was provided for any aerials reviewed, July 1 was used as the date for determining antecedent precipitation, with April, May and June used as the 3-months prior. Using the "Wetland Delineation Precipitation Data Retrieval" website developed by the Minnesota Climatology Working Group (http://climate.umn.edu/wetland/), antecedent precipitation was obtained for the 3-months prior to every aerial photograph reviewed and site visit and then analyzed relative to the range of normal for that period (dry, normal or wet).

The presence of signatures due to wetness was identified in each of the aerials reviewed. As indicated in the State Mapping Conventions, a photo identified as taken following 'wet' antecedent precipitation, in this case 2005, was used to identify all possible locations of wetland areas. Remaining available aerials were then reviewed for recurring signatures of wetness. It appears that crops were planted later than usual in 2010, leaving the 2010 aerial with more ground surface visible than if the crops were in a later stage of growth and obscuring the ground surface. The July 2010 aerial best shows the lower lying areas in the landscape with regular signatures of wetness throughout the review. Finally, using ArcMap 10 with the detailed topographic mapping available from the LiDAR data and the 2009/2010 FSA aerial photographs (normal years), wetland lines were digitized around the lowest spots on the landscape corresponding to regular signatures of drown outs, crop stress, altered or late planting, brighter green areas in dry years and/or low albedo (areas of darker soil). (Albedo is the fraction of the total light striking a surface that is reflected back from that surface. An object that has a high albedo (near 1) is very bright; an object that has a low albedo (near 0) is dark.)

A note about soil saturation in aerial photography: While some might argue that X-ray vision is required to 'see' soils saturated within 12" on aerial photography, areas of low albedo in some years of aerial review exhibit a strong correlation to both the lower elevations identified in LiDAR and other signatures of wetness such as crop stress and drown outs. Furthermore, soils in the project area are predominantly mapped as fine-textured clays or silty clays, a high percentage of which are hydric soils from which some of the surface water is drained. Therefore, soils lower in the landscape would remain wet longer, resulting in areas with lower albedo due to wetness.

Figures LPP 1-4 of 4 and FCP 1-3 of 3 in Appendix A were developed to display the wetland polygons located within the project corridors, overlaid on 2009 FSA Aerial photography. Antecedent precipitation prior to the 2009 aerial flight was a normal.

On-Site Field Review

Antecedent precipitation was analyzed prior to each field review, as well as in relation to dates of aerial photography. On July 1-2, 2010, the team reviewed all Diversion Corridor alignments to ground-truth the images and signatures previously identified on aerial photography as wetland areas. Antecedent precipitation for this field review was normal. Following this ground-truthing field review, the team completed the off-site mapping of all the wetlands within the study area through July 2010. During July 27-30, 2010 the team returned to the study area to complete representative transects/data collection and functional assessments, using the Manual, the Supplement and Minnesota Routine Assessment Methodology for Evaluating Wetland Functions (MnRAM), Version 3.3, refining the extent of wetlands within all off-site mapped areas. Antecedent precipitation prior to the final field review at the end of July 2010 was wet, with nearly two inches of rain falling on July 27-28, 2010 in the project area. This precipitation provided the team with first-hand observations of the geomorphic positions in the landscape to which water flows.

Due to time constraints and similarity of the vast majority of wetlands within the study area, Corps staff chose not to delineate or assess functionality on every area determined to be wetland. Instead, at least one randomly-chosen area representative of each type of wetland found within the Diversion alignments was verified through data collection along a transect and assessed for typical functionality. Sample points were taken to document the vegetation, soils, and hydrology indicators within representative upland and wetland locations. As part of the field verification process, soil pits were dug to at least 16 inches to describe the soil colors, using Munsell soil color charts, and to observe any hydrology indicators. Vegetation was documented using the standard plot sizes of a 30-foot radius for trees and woody vines, a 15-foot radius for saplings/shrubs, and a 5-foot radius for herbaceous species and woody seedlings. Percent areal cover was recorded for each plant species and dominants were determined using the "50/20 Rule." Ditch depths throughout the project corridors were estimated for use in lateral effect calculations.

Wetland plant communities were classified using the USACOE - St. Paul District, Eggers and Reed "Wetland Plants and Plant Communities of MN and WI" (1997). The wetland indicator status of plants was determined using the National List of Plant Species That Occur in Wetlands – Region 3 (1988). In accordance with the Great Plains Regional Supplement, the + and – have NOT been removed from the vegetation indicator status.

The determined wetland boundaries are depicted in Appendix A as Figures LPP 1-4 of 4 and FCP 1-3 of 3, overlaid on the 2009 Farm Services Agency (FSA) aerial imagery.

Assessment of impacts to aquatic resources as a result of the proposed Red River Diversion channels included completion of MnRAM V. 3.3 analyses on representative sites within the Diversion Corridors. As stated above, time constraints and similarity of wetlands within the study area allowed Corps staff to assess representative wetlands of each type found within the Diversion alignments. (Note: Although forested wetlands were not identified for this document, a short statement about the functionality of forested wetlands in the project area is included.)

Results

Off-Site Results and Discussion

Soil series in the project area are provided in Tables 1a and 1b. Table 1a lists soils found within the Minnesota Diversion, where at least 63% of the area is hydric soil. Table 1b lists soils found within the North Dakota Diversion, where over 90% of the area is hydric soil. Soils of the study area are dominantly associated with lake plains and floodplains and formed in calcareous clayey lacustrine sediments. They are very deep, poorly and very poorly drained and slowly permeable. Slope gradients are commonly less than 1 percent but range from 0 to 6 percent, with steeper slopes associated with side slopes of streams. Runoff is negligible except where accommodated by slope. Saturated hydraulic conductivity is slow. A system of surface drains associated with road ditches, section lines and agricultural fields remove surface (ponded) water from most soils[1]. A seasonal high water table is at the surface to about 3.0 feet below the surface at some time during the period of March through July; in lower lying depressional areas the water table is 1.0 foot above the surface to 2.0 feet below the surface at some time during the

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[1] Land leveling is commonly practiced by agricultural producers in this region and aids in removing ponded water.

period of February through August. (Source: Official Soil Series Descriptions. USDA, NRCS. 2010).

Table 1a – Soils in Minnesota Diversion Corridor

Soil Series	Taxonomic Class	Map Units Present	Hydric	Approx. % of Corridor
Augsburg	Coarse-silty over clayey, mixed over smectitic, superactive, frigid Typic Calciaquolls	**a)** Augsburg silt loam	Yes	1
Bearden	Fine-silty, mixed, superactive, frigid Aeric Calciaquolls	**a)** Bearden silty clay loam; **b)** Bearden silt loam, 0-2% slopes	No	26
Colvin	Fine-silty, mixed, superactive, frigid Typic Calciaquolls	**a)** Colvin silty clay loam	Yes	11
Fargo	Fine, smectitic, frigid Typic Epiaquerts	**a)** Fargo silty clay, 0-2% slopes; **b)** Fargo silty clay, Swales; **c)** Fargo silty clay loam	Yes	48
Hegne w/Fargo inclusion	Fine, smectitic, frigid Typic Calciaquerts	**a)** Hegne-Fargo silty clays	Yes	1
Overly	Fine-silty, mixed, superactive, frigid Pachic Hapludolls	**a)** Overly silty clay loam	Partial	3
Wahpeton	Fine, smectitic, frigid Typic Hapluderts	**a)** Wahpeton silty clay. 0-2% slopes	No	2
Wheatville	Coarse-silty over clayey, mixed over smectitic, superactive, frigid Aeric Calciaquolls	**a)** Wheatville silt loam, 0-2% slopes	No	8

Table 1b – Soils in North Dakota Diversion Corridor

Soil Series	Taxonomic Class	Map Units Present	Hydric	Approx. % of Corridor
Bearden	Fine-silty, mixed, superactive, frigid Aeric Calciaquolls	**a)** Bearden silty clay loam	Partial	2
Cashel	Fine, smectitic, calcareous, frigid Aquertic Udifluvents	**a)** Cashel silt clay	Partial	2

Dovray	Fine, smectitic, frigid Cumulic Vertic Epiaquolls	**a)** Dovray silty clay	Yes	5
Fairdale	Fine-loamy, mixed, superactive, calcareous, frigid Mollic Udifluvents	**a)** Fairdale silt loam	Partial	1
Fargo	Fine, smectitic, frigid Typic Epiaquerts	**a)** Fargo silty clay; **b)** Fargo silty clay loam; **c)** Fargo silty clay, 1-3% slopes;	Yes	67
Hegne w/Fargo inclusion	Fine, smectitic, frigid Typic Calciaquerts	**a)** Hegne-Fargo silty clays	Yes	18
Overly	Fine-silty, mixed, superactive, frigid Pachic Hapludolls	**a)** Overly silty clay loam	Partial	3
Wahpeton	Fine, smectitic, frigid Typic Hapluderts	**a)** Wahpeton silty clay. 0-2% slopes	No	2

As mentioned, surface drains, typically two feet or less deep with flat side slopes, are constructed[2]. Except for lower lying depressions, the drains, in concert with land leveling, remove ponded water from most soils. Given the slow permeability of the area soil, their shallow and random pattern[3], the drains have a lesser effect on lowering the water table over larger areas of the landscape. Nonetheless, the lateral drainage effect of surface drains on the water table was estimated (Table 2) using the van Schilfgaarde equation (Hydrology Tools for Wetland Determination. Engineering Field Handbook, Chapter 19. USDA, NRCS. August, 1997 and Hydrology Tools for Wetland Determination, Minnesota Supplement 19-57 to the Engineering Field Handbook. USDA, NRCS. April, 2005). To calculate lateral effect, variables such as ditch depth were estimated by field visit (July 27-29, 2010) and soil parameters were estimated from the Web Soil Survey. The ditch depths analyzed in Table 2, below, represent the range of ditch depths observed during the field review. The "T" factor, or the duration of time for the drain to lower the water table one foot below the soil surface, was set at 14 days. Fourteen days is the required duration for determining wetland hydrology on hydrologically altered sites (Supplement).

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[2] Subsurface drainage, such as tiling, is not a common practice in the study area.

[3] As used here, random means ditches that follow landscape drainage patterns, as opposed to a systematic arrangement of parallel drains.

Table 2 – Lateral drainage effect of surface drains of Red River Valley

Ditch depth (feet)	Lateral effect on each side of ditch
2	80
3	105
4	120
5	135
6	145
7	150

The surface drainage was initiated during European settlement of this area in order to make production of agricultural crops possible, and much of the land within the proposed diversion alignments is currently used for agricultural purposes. Although the surface drainage systems (ditches and land leveling) make agricultural production possible in many areas in most years, the ditches and land leveling have not eliminated wetland hydrology from entire fields during the growing season in most years. Many wetlands are farmed in most years, and crops are often lost or suffer wetness-related stress.

The NRCS *Hydrology Tools* for *Wetland Delineation Procedure* (August, 1997) and Corps of Engineers guidance *Assessing and Using Meteorological Data to Evaluate Wetland Hydrology* (April, 2000) both recommend evaluation of precipitation for the 3 months prior to the date of an aerial photograph to assist in making determinations of normal circumstances. Unless a specific date was identified for an aerial, July 1 was the date used to calculate antecedent precipitation for the three months prior to the photo. Antecedent precipitation was analyzed using the Wetland Delineation Data Retrieval website: http://climate.umn.edu/wetland/. Detailed data were obtained using the Moorhead Station (#215584). Table 3 below provides the antecedent precipitation analysis for the aerials reviewed.

Table 3 – Antecedent Precipitation (April, May, June) for July FSA Aerial Photos

Date of Imagery	Antecedent Precipitation
July 1, 2003	Wet
July 1, 2004	Normal
July 1, 2005	Wet
July 1, 2006	Dry
July 1, 2009	Normal
July 1, 2010	Normal

FSA aerial photography is generally flown during late June or early July. The intent of this photography is related to compliance with USDA Farm Programs; the main purpose is not for assessing hydrology and aiding the determination of wetland areas. However, they remain the most readily available aerials to view the landscape on an annual basis. These mid-summer flights generally miss nearly three months of the growing season, during which areas inundated or saturated within 12" of the surface meet the definition of wetland hydrology. Decisions made about whether an area is wetland based solely upon the FSA aerials would, therefore, result in a very conservative estimate of wetland. Again, use of LiDAR, correlated with repeated signatures of wetness later in the growing season as shown on the FSA aerials, provides the best available data to make a determination of the full extent of wetlands on the landscape. The question for determining the extent of wetlands is not wetland hydrology based on mid-summer imagery. Rather, the question is the extent of wetland hydrology during the growing season in most years, which, as previously stated, begins in the Fargo-Moorhead area during early- to mid-April. Aerial photographs, LiDAR, the extent and location of hydric soils, and extent and estimated effect of drainage infrastructure when taken together offer an estimate of wetlands based on multiple parameters.

Upon review of available aerial imagery, Web Soil Survey and detailed topographic (LiDAR) data resources, extensive areas of hydric soils exhibiting regular wetland signatures were noted throughout the proposed Diversion corridors, as shown on Figures LPP 1-4 of 4 and FCP 1-3 of 3 in Appendix A. Using LiDAR data correlated to regular signatures of wetness such as saturated soil, crop stress and drown-outs, wetlands were identified in the lower lying areas and digitized as polygons in ArcMap 10. Table 4 below provides a summary of the total area of wetlands, by type, identified within the Diversion corridors.

Table 4 - Summary of the extent of wetlands (acres), by type, within the proposed Diversion corridors.

Wetland Type	**North Dakota/LPP Corridor (Total area: 8054 ac)**	**North Dakota/ND35K Corridor (Total area: 6560 ac)**	**Minnesota/FCP Corridor (Total area: 6415 ac)**
Approximate total acres hydric soil	7250	5900	4040
Farmed, seasonally flooded basin	790	720	800
Wet meadow	140	120	50
Shallow marsh	50	40	50
Shallow open water	10	10	10
Total Wetland Acreage	990	890	910
% Wetland	12%	14%	14%

On-Site Field Results and Discussion

Normal Circumstances

The corridors, especially in North Dakota, are dominantly hydric soil, with insufficient drainage infrastructure to eliminate wetland hydrology during the growing season in most years; as discussed, crops can be planted but are often lost in the lower lying areas in many years. It is the professional opinion of the wetland scientists involved with this review that the soils and hydrology normally present in the areas identified as wetlands in both off-site and on-site review will support a dominance of hydrophytes if normal farming operations were to cease.

Farmed, Seasonally Flooded Basins

The vast majority of wetland resources found within the project area are "managed plant communities" classified as farmed, seasonally flooded basins. These seasonally flooded basins are lower lying areas within actively planted agricultural fields from which shallow surface drains and land leveling have not eliminated wetland hydrology during the growing season in most years. Many of these lower lying areas are themselves shaped into shallow field ditches channeling water from the remainder of the fields. Prior to European settlement of the study area, this lake plain (see soils discussion) was dominated by wetland communities; these seasonally flooded basins are generally the remnants of the historic wetland areas.

Wetland boundaries were identified during off-site review using the LiDAR elevation data correlated to repeated signatures of wetness, and verified with the on-site ground-truth review. The hydric soil field indicators observed include A12 – Thick Dark Surface and F6 – Redox Dark Surface, while the hydrology indicators observed include D2 - Geomorphic Position, B8 – Sparsely Vegetated Concave Surface and, during the off-site review, C9 – Saturation Visible on Aerial Imagery.

Wet Meadows and Shallow Marshes

Wet meadows may have surface water only early in the growing season and are typically saturated into the latter part of the summer. Wet meadows in the study area are dominated by reed canarygrass (*Phalaris arundinacea*), sedges, other grasses and forbs. Shallow marshes typically have at least 6 inches of surface water throughout the growing season, and in the study area are dominated by cattail species (*Typha sp.*). Many field-side and roadside ditches traverse the area (see discussion of lateral effect), and, where these areas also exhibit the characteristics of wetlands, they were classified as wet meadows or shallow marshes, depending upon the predominant vegetation and depth of water present.

Wetland boundaries were identified during off-site review using the LiDAR elevation data correlated to repeated signatures of wetness, and verified with the on-site ground-truth review. The hydric soil field indicators observed include A12 – Thick Dark Surface and F6 – Redox Dark Surface, while the hydrology indicators observed include D2 - Geomorphic Position, A3 – Saturation, and, during the off-site review, B7 – Inundation Visible on Aerial Imagery and C9 – Saturation Visible on Aerial Imagery.

Shallow Open Water

In the North Dakota Diversion study area, there are a few shallow open water basins, where standing water from 3 to 6 feet is normally present throughout the growing season. Most of these areas appear to be excavated ponds, some of which are used as stormwater retention basins, except for one small pond adjacent to the Wild Rice River. There is one shallow open water area in the Minnesota Diversion study area just south of Interstate 94, which is a MnDOT mitigation area/stormwater basin. No sample points were taken at these locations; they are distinct features on the landscape with easily discernible topographic breaks.

Functional Assessment Discussion

Wetlands in this area have been significantly impacted by agricultural practices, including drainage, tillage and loss of the natural vegetation. The wet meadow, shallow marsh and floodplain forest areas, although usually left untouched by direct tillage, have been affected by the agricultural runoff containing sediment.

Wetlands found within those active agricultural lands provide limited levels of functionality within this environment due to the extensive drainage and overall alteration that has taken place in the region. The majority of wetlands within the review area are depressional field ditches and depressional isolated wetlands of the farmed, seasonally flooded basin type (see photos on Figures LPP 1-4 of 4 in Appendix A). Due to the extensive drainage systems, these seasonally flooded wetlands generally provide low function for Maintenance of Hydrologic Regime and Maintenance of Wetland Water Quality. Because the wetlands are found within agricultural fields, they also function at a low level in Maintenance of Character of Wildlife Habitat, and Aesthetics/Recreation/Education/Cultural benefit. Without natural vegetation, there is no opportunity to provide wildlife habitat and the wetlands don't provide any aesthetic or recreational 'value' to the human landscape.

The depressional wetland areas within agricultural fields do, however, generally provide moderate to high functionality for Flood/Storm-water Attenuation and also for Downstream Water Quality. Those wetlands that have been shaped into shallow field ditches provide a moderate level of flood/stormwater attenuation because they are able to hold some of the water on the landscape for at least a short period of time. Shallow isolated depressional wetlands provide a high level of functionality for flood/stormwater attenuation, as they are able to hold the water on the landscape until it can evaporate or infiltrate, rather than run off to nearby over-stressed water courses. All field wetlands provide a moderate level of functionality for protection of downstream water quality because they are able to filter at least some of the nutrients from the agricultural runoff before the water enters nearby waterways. The depressional wetlands generally do not provide any level of function for amphibian or fish habitat or shoreline protection, therefore functional analysis was not applicable in these areas.

Note: As previously stated, locations of forested wetland resources were not identified for this report. All forested resources, including forested wetlands, were identified and assessed under a separate section of the FEIS, therefore they were not included in this effort. However, a brief statement of floodplain forest functionality is included for reference. Floodplain forest wetlands provide a moderate level of functionality for maintenance of the hydrologic regime, as they are able to gradually feed the river system with water stored in the soils following flood events. The forested floodplains also provide a moderate level of shoreline protection and floodwater resistance by increasing the surface roughness resulting in an increased detention of high flows and reduced erosion, and ultimately reducing peak flows downstream. In addition, the forest canopy provides the wetland with the opportunity to provide a moderate level of function for wildlife habitat.

Conclusion

Based upon a preponderance of the evidence collected during both off-site and on-site review, extensive wetland areas exist throughout the Diversion corridors, as shown on Figures LPP 1-4 of 4 and FCP 1-3 of 3 in Appendix A and summarized in Table 4.

Data Sources:

Web Soil Survey. U.S.D.A. SSURGO Data obtained from:
http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Wetland Delineation Precipitation Data Retrieval, website developed by the Minnesota Climatology Working Group (http://climate.umn.edu/wetland/)

Literature Referenced/Technical Documents:

Environmental Laboratory. 1987. *1987 U.S. Army Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

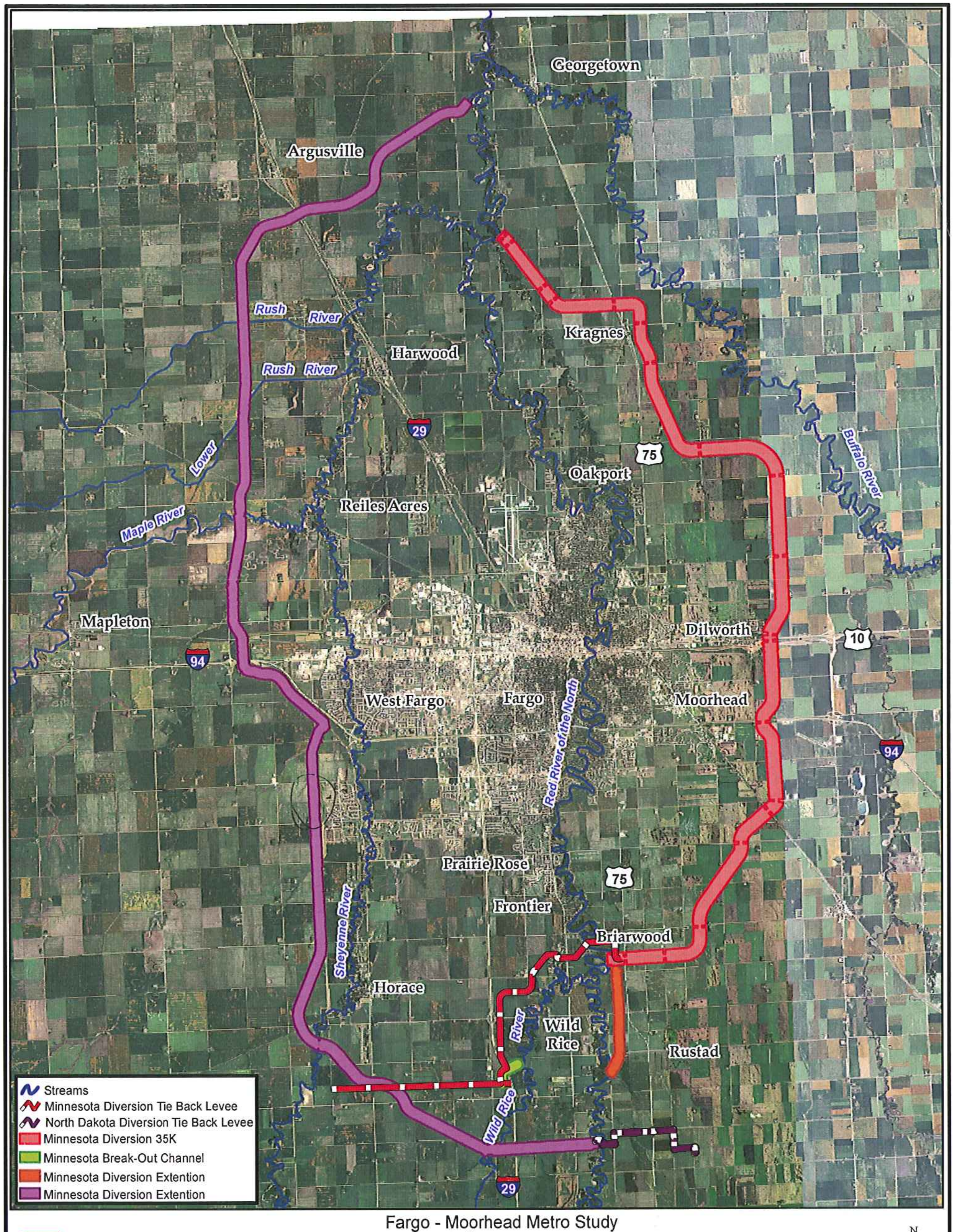
U.S. Army Engineer Research and Development Center. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region*. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Eggers, Steve D. and Donald M. Reed. 1997. *Wetland Plants and Plant Communities of Minnesota and Wisconsin*. US Army Corps of Engineers, St. Paul District. 263pp, unclassified.

Appendix A

Figures

Figure 1: Fargo-Moorhead Metro Study - Alignments
Figures LPP 1 through 4 of 4: North Dakota Wetland Areas, including on-site photos
Figures FCP 1 through 3 of 3: Minnesota Wetland Areas



St. Paul District
GIS CENTER
US Army Corps of Engineers®

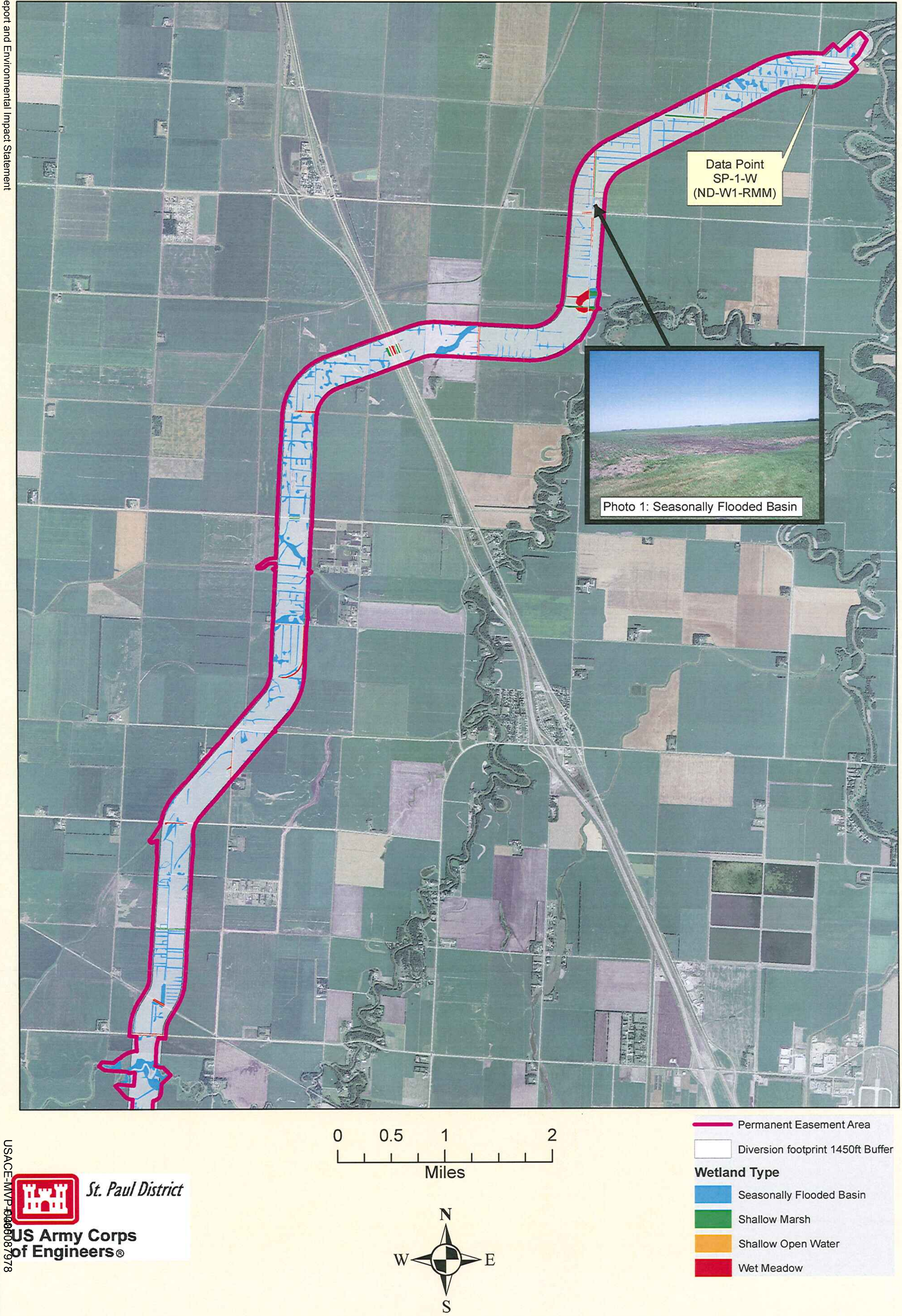
Fargo - Moorhead Metro Study

Alignments

Figure 1

BGW 12JAN2010 mvd\mvp\projects\SA\ActiveFolders\SA_Fargo-Moorhead_Metro_FDR-153666\GIS\MXD\NDDivAlign12Jan2010.mxd

Fargo Moorhead Flood Risk Reduction Project
LPP 1 of 4



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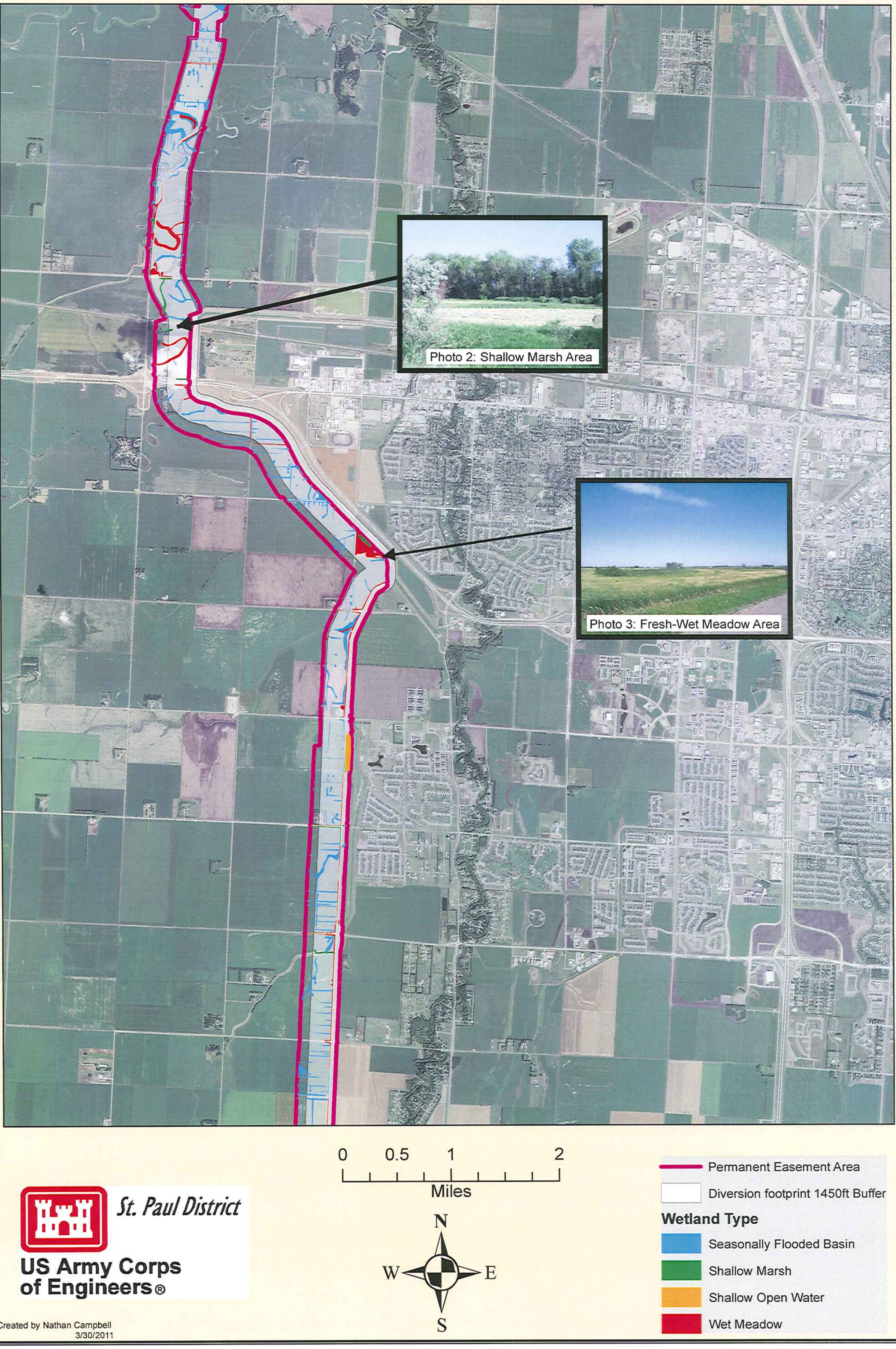
Fargo Moorhead Flood Risk Reduction Project
(North Dakota Diversion Page 2 of 4)



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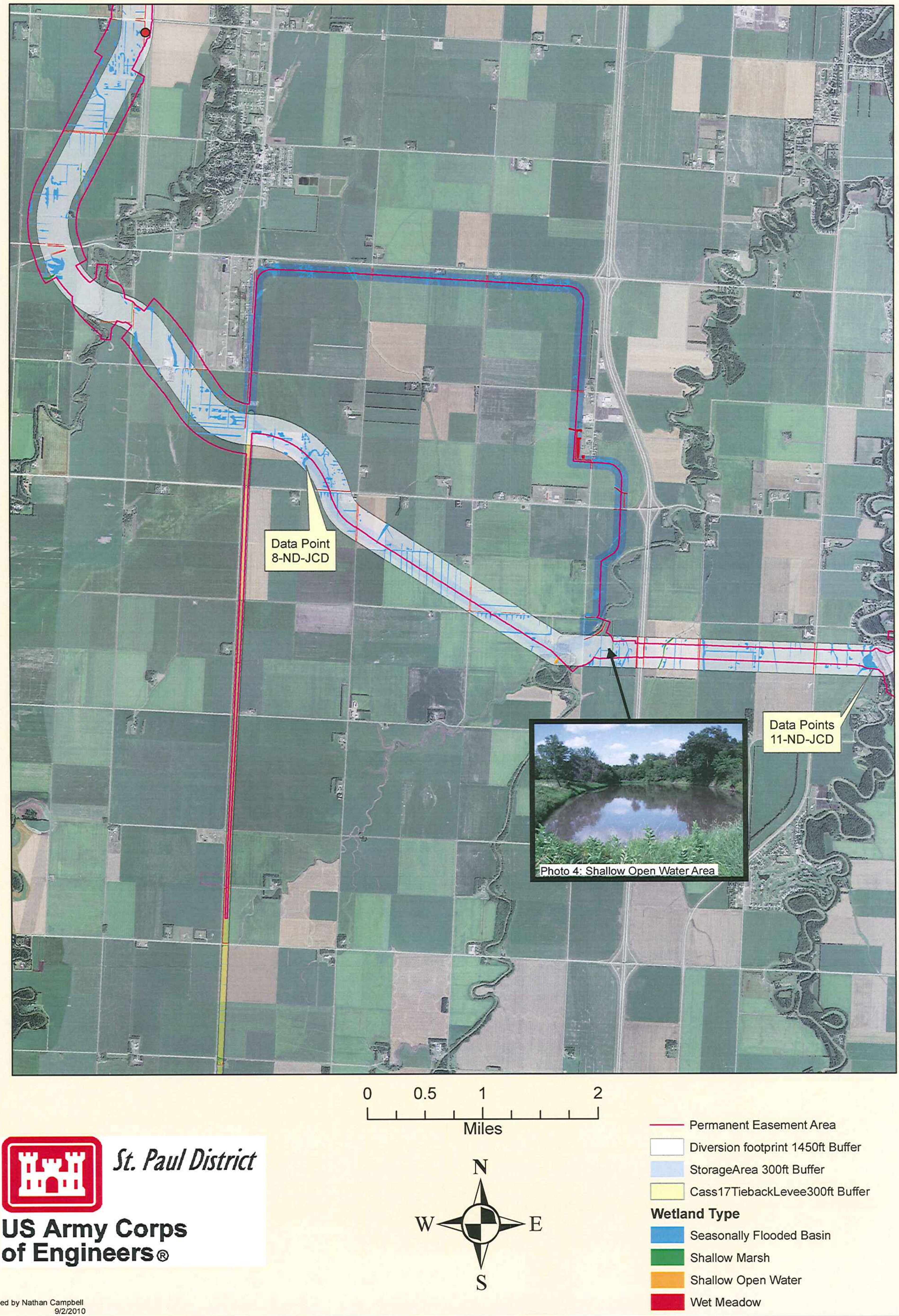
3/30/2011

Fargo Moorhead Flood Risk Reduction Project
(LPP Page 3 of 4)



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9/2/2010

Fargo Moorhead Flood Risk Reduction Project
(LPP Page 4 of 4)

0 0.4 0.8 1.6
Miles

N
W E
S

- Permanent Easement Area
- NDTieback_Levee_200ft_Buffer

Wetland Type
- 🟦 Seasonally Flooded Basin
- 🟩 Shallow Marsh
- 🟧 Shallow Open Water
- 🟥 Wet Meadow

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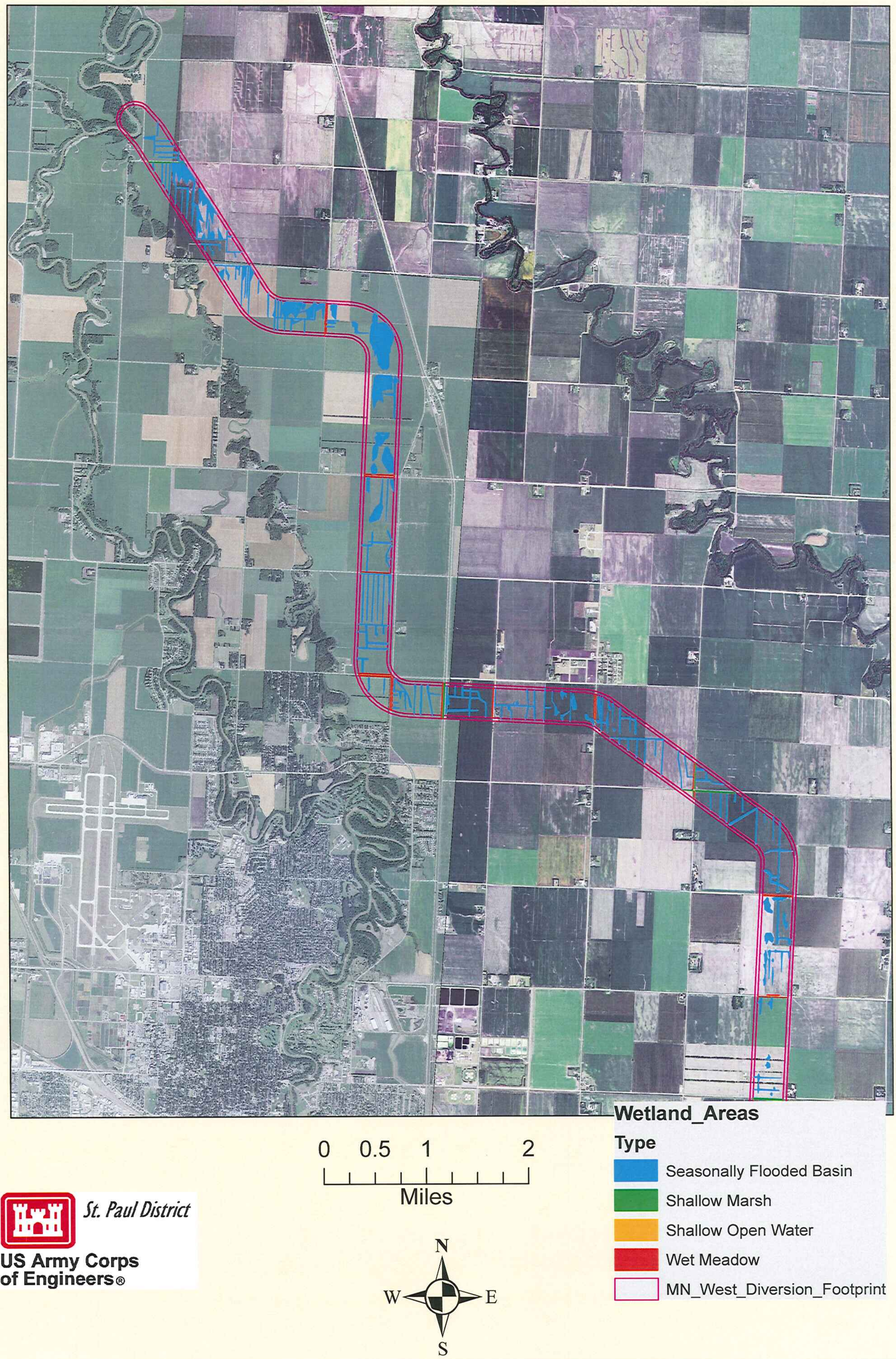
Fargo Moorhead Flood Risk Reduction Project
FCP 1 of 3



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FCP 2 of 3

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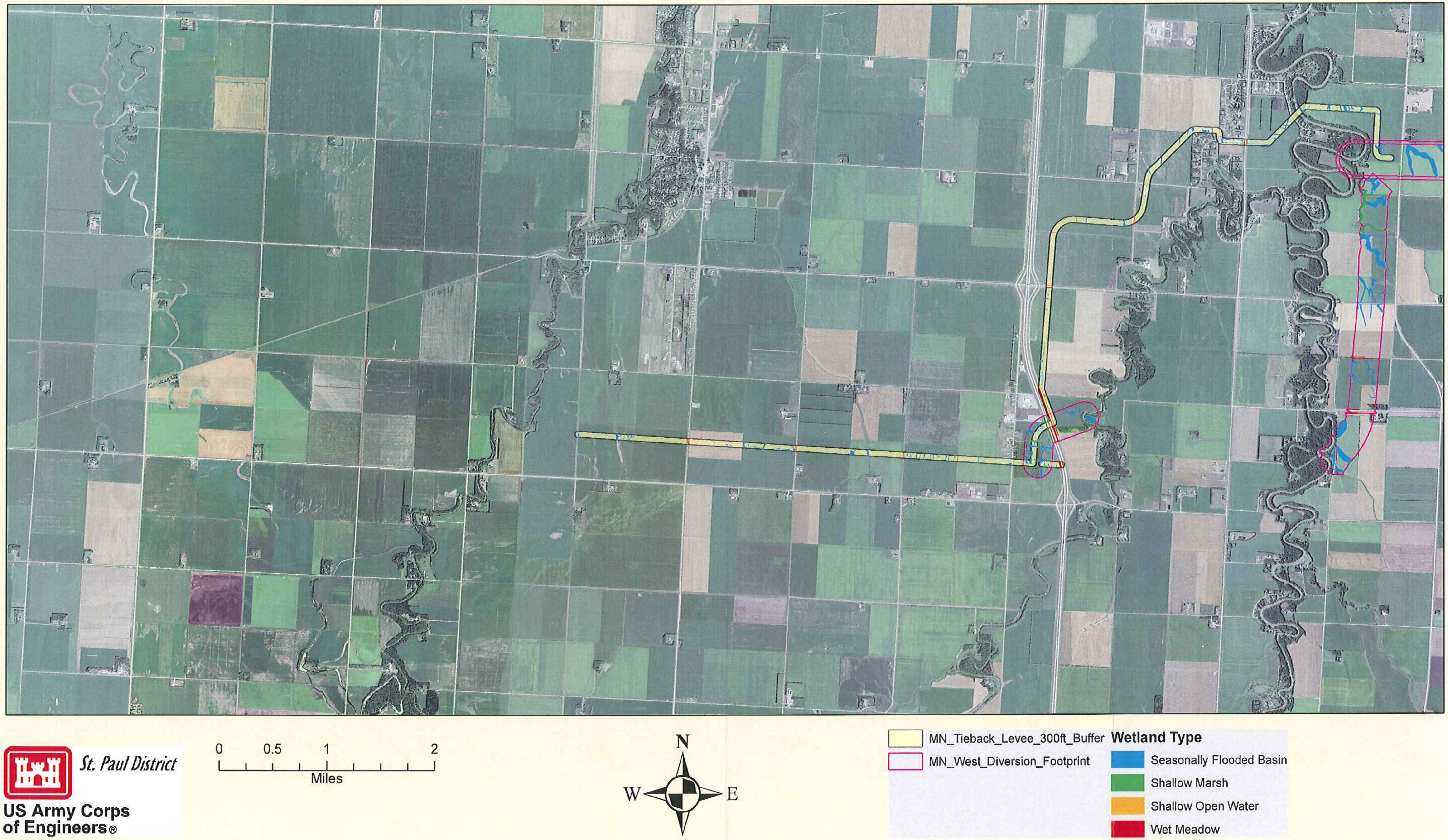
Fargo Moorhead Flood Risk Reduction Project
FCP 3 of 3



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Appendix B

USDA Official Series Descriptions (OSDs) for Predominant (>10% area) Project Area Soils:

Bearden
Colvin
Fargo
Hegne

LOCATION BEARDEN ND+MN SD

Established Series
KWT-CJH
11/2002

BEARDEN SERIES

The Bearden series consists of very deep, somewhat poorly drained, moderately to slowly permeable soils that formed in calcareous silt loam and silty clay loam lacustrine sediments. These soils are on glacial lake plains and have slopes of 0 to 3 percent. Mean annual air temperature is 39 degrees F, and mean annual precipitation is 18 inches.

TAXONOMIC CLASS: Fine-silty, mixed, superactive, frigid Aeric Calciaquolls

TYPICAL PEDON: Bearden silty clay loam on a plane slope of less than 1 percent under cropland. When described the soil was moist throughout. (Colors are for moist soil unless otherwise stated)

Ap--0 to 7 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure parting to moderate fine granular; very hard, friable, slightly sticky and slightly plastic; common fine roots; many fine pores; few threads of carbonates; strong effervescence (8 percent calcium carbonate); slightly alkaline; abrupt smooth boundary. (Combined A horizons 6 to 14 inches thick)

ABk--7 to 18 inches; dark gray (10YR 4/1) and very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) and dark gray (10YR 4/1) dry, gray (10YR 6/1) dry in the lower part; weak coarse and medium subangular blocky structure; very hard, friable, sticky and plastic; common fine roots; many fine pores; few fine masses of carbonates; disseminated carbonates throughout with the amount increasing with depth; violent effervescence (15 to 20 percent calcium carbonate); moderately alkaline; clear irregular boundary. (0 to 14 inches thick)

Bk1--18 to 28 inches; light olive brown (2.5Y 5/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots; many fine pores; violent effervescence (25 percent calcium carbonate); moderately alkaline; clear wavy boundary.

Bk2--28 to 36 inches; olive brown (2.5Y 4/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry; few fine prominent gray (5Y 5/1) and few fine and medium prominent very dark brown (10YR 2/2) redoximorphic depletions; weak coarse subangular blocky structure parting to moderate fine and very fine subangular blocky; hard, friable, sticky and plastic; few fine pores; few masses of carbonates; violent effervescence (15 percent calcium carbonate); moderately alkaline; clear wavy boundary. (Combined Bk horizons 0 to 54 inches thick)

C1--36 to 46 inches; light olive brown (2.5Y 5/4) laminated silty clay loam, light yellowish brown (2.5Y 6/4) dry; common medium and fine prominent gray (5Y 5/1) redoximorphic depletions and common medium faint dark yellowish brown (10YR 4/4) redoximorphic concentrations; few black non-manganese spots; massive; very hard, friable, sticky and plastic; masses of gypsum crystals; few masses of carbonates; strong effervescence (15 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

C2--46 to 60 inches; light olive brown (2.5Y 5/4) laminated silty clay loam; light yellowish brown (2.5Y 6/4) dry; common prominent gray (5Y 5/1) redoximorphic depletions and many fine and medium distinct dark yellowish brown (10YR 4/4) and prominent strong brown (7.5YR 5/6) redoximorphic concentrations; massive; very hard, firm, sticky and plastic; few masses of carbonates; strong effervescence (15 percent calcium carbonate); slightly alkaline.

TYPE LOCATION: Pembina County, North Dakota, about 2 miles north and 3 miles east of St. Thomas; 640 feet east and 160 feet south of the northwest corner, sec. 29, T. 160 N., R. 52 W.

RANGE IN CHARACTERISTICS: The mollic epipedon ranges from 7 to 20 inches thick. The soil is slightly alkaline or moderately alkaline. Saline phases are recognized.

The Ap or A horizon has hue of 10YR, 2.5Y, 5Y, or is neutral, value of 2 or 3 and 3 to 5 dry, and chroma of 1 or less. It typically is silty clay loam but some is loam, silt loam, clay loam or silty clay. The A horizon contains 1 to 10 percent carbonates. Some pedons have tongues of A horizon extending into Bk horizon.

The ABk horizon has hue of 10YR, 2.5Y or is neutral, value of 2 to 5 and 3 to 6 dry, and chroma of 2 or less. It is silt loam or silty clay loam. It is slightly alkaline or moderately alkaline.

The Bk horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 7 and 5 to 7 dry, and chroma of 1 to 4. It is silt loam or silty clay loam. It contains 15 to more than 30 percent carbonates. Most of this is disseminated. Some pedons contain few or common, faint to prominent redoximorphic features in this horizon. Some pedons have Bky or BCk horizons.

The C horizon has hue of 2.5Y or 5Y, value of 4 to 7 and 5 to 8 dry, and chroma of 2 to 4. In some pedons below 30 inches the hue is neutral and the chroma is 1 or less. The texture of the C horizon typically is silty clay loam or laminated silt loam and silty clay loam. In some pedons below a depth of 40 inches the textures range from gravelly coarse sand to clay. Some pedons do not have a C horizon within a depth of 60 inches.

COMPETING SERIES: These are the Cubden, Gunclub, McIntosh and Saunders series (it is assumed the Cubden series is competing pending on update in the classification). Cubden and McIntosh soils formed in a silt mantle over glacial till and have 2C horizons containing 15 percent fine sand and coarser. Gunclub soils have clay till within depths of 40 to 60 inches. Saunders soils are poorly drained and have silty clay and clay textures within a depth of 40 inches.

GEOGRAPHIC SETTING: Bearden soils are on level and nearly level glacial lake plains. Slopes are 0 to 3 percent. The soils formed in calcareous silt loam and silty clay loam lacustrine sediments. The climate is cool, subhumid. The mean annual air temperature ranges from 36 to 45 degrees F, and the mean annual precipitation from 15 to 24 inches. Frost-free period ranges from 90 to 145 days. Elevation ranges from 650 to 2000 feet above sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Antler, Beotia, Colvin, Gardena, Glyndon, Hegne, Overly and Perella soils. Antler soils are on adjacent interbeach areas where lake sediments are moderately deep over till. They are fine-loamy. Beotia, Colvin, Overly and Perella soils are in a drainage sequence with Bearden soils. Beotia and Overly soils are at higher elevations in the lake plain. They do not have calcic horizons within depths of 16 inches and have Bw horizons. Colvin and Perella soils are in swales and lower lying flats and basins. Colvin soils are poorly drained. Perella soils do not have calcic horizons within a depth of 16 inches. Glyndon soils are on adjacent areas. They are coarse-silty. Gardena soils are on nearby lake plains at higher elevations. They do not have calcic horizons within depths of 16 inches and are coarse-silty. Hegne soils are on adjacent lake plains. They are fine.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained. Runoff is negligible to high. Permeability is slow to moderate. A seasonal high water table is at depths of 1.5 to 3.5 feet at some time during the period of April through June.

USE AND VEGETATION: Soils are nearly all cropped to small grains and row crops such as sugar beets. Native vegetation was big bluestem, switchgrass, western wheatgrass, and a variety of forbs.

DISTRIBUTION AND EXTENT: The Red River Valley in eastern North Dakota and northwestern Minnesota, and in glacial lake plains in northeastern South Dakota and central North Dakota. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bismarck, North Dakota

SERIES ESTABLISHED: Ransom County, North Dakota, 1906.

REMARKS: Diagnostic horizons and features recognized in this pedon are: mollic epipedon - the zone from the surface of the soil to the depth of 7 inches (Ap horizon); calcic horizon the zone from 7 to 36 inches (ABk, Bk1, and Bk2 horizons); characteristics associated with wetness - calcic horizon (ABk, Bk1, and Bk2 horizons).

Were the soil has previously correlated as moderately well drained it should be recorrelated to the Rondell series (Aquic Calciudolls).

ADDITIONAL DATA: Type location laboratory data S54NDak-34-1; additional data ND51-P-6, S53ND-9-5, S53ND-9-6, S57ND-18-1, and S54ND-34-2.

National Cooperative Soil Survey
U.S.A.

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LOCATION COLVIN             ND+MN MT SD
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Established Series
CJH
06/2001

COLVIN SERIES

The Colvin series consists of very deep, poorly and very poorly drained, moderately to slowly permeable soils formed in silt loam and silty clay loam sediments. These soils are in concave shallow swales and depressions on glacial lake plains, in outwash channels, on stream terraces and in drainageways on till plains. Slope ranges from 0 to 2 percent. Mean annual air temperature is 41 degrees F and mean annual precipitation is 18 inches.

TAXONOMIC CLASS: Fine-silty, mixed, superactive, frigid Typic Calciaquolls

TYPICAL PEDON: Colvin silty clay loam on a level concave slope less than 1 percent under native grass. When described the soil was moist throughout. (Colors are for moist soil unless otherwise stated)

A--0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak coarse prismatic structure parting to moderate medium granular; hard, friable, sticky and plastic; many roots; many fine pores; strong effervescence; slightly alkaline; clear wavy boundary. (6 to 16 inches thick)

Bkg1--10 to 20 inches; gray (5Y 6/1) and olive gray (5Y 5/2) silty clay loam, gray (N 6/0) and white (N 8/0) dry; very weak medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and plastic; common roots; common fine pores; few masses of carbonates; violent effervescence; moderately alkaline; gradual wavy boundary.

Bkg2--20 to 30 inches; light olive gray (5Y 6/2) and olive gray (5Y 5/2) silty clay loam, light gray (5Y 7/1) and gray (5Y 6/1) dry; common medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; very weak fine subangular blocky structure; hard, friable, slightly sticky and plastic; few roots; common pores; strong effervescence; moderately alkaline; gradual wavy boundary. (Combined Bkg horizons 8 to 54 inches thick)

Cg--30 to 60 inches; olive gray (5Y 5/2) silty clay loam, light gray (5Y 7/2) dry; many coarse prominent yellowish brown (10YR 5/8) and few medium prominent yellowish red (5YR 5/6) redoximorphic concentrations; massive; hard, friable, sticky and plastic; strong effervescence in upper part, gradually decreases to slight effervescence at 50 inches; moderately alkaline.

TYPE LOCATION: LaMoure County, North Dakota; about 1 mile south and 2 miles east of Marion; about 75 feet north and 65 feet east of the southwest corner, sec. 18, T. 136 N., R. 60 W.

RANGE IN CHARACTERISTICS: The mollic epipedon ranges from 7 to 24 inches in thickness. The top of the calcic horizon is at depths of less than 16 inches. In some pedons the lower part of the mollic epipedon is part of the calcic horizon. The 10- to 40-inch particle-size control section typically has 20 to 30 percent noncarbonate clay and ranges from 18 to 35 percent. It contains less than 15 percent fine sand and coarser. Saline phases are recognized.

The A horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 2 or 3 and 3 or 4 dry, and chroma of 1 or less. It typically is silt loam or silty clay loam, but the range includes clay loam and silty clay. It is neutral to moderately alkaline. Some pedons have an Ak or ABk horizon. Where present they have hue similar to the A horizon, and value of 3 or 4 and 4 to 6 dry, and chroma of 1 or 2.

The Bkg or Bk horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 3 to 7 and 5 to 8 dry, and chroma of 2 or less. Chroma of 3 is allowed below a depth of 30 inches. It is silt loam or silty clay loam, but clay loam is allowed below a depth of 25 inches. It is slightly alkaline to strongly alkaline. It typically has a calcium carbonate equivalent of 20 to 50 percent. Some pedons have Bky, Bkz or BC horizons.

The Cg horizon has hue of 2.5Y or 5Y, value of 3 to 6 and 5 to 7 dry, and chroma of 1 to 4. It is silt loam or silty clay loam, but clay loam is allowed below a depth of 25 inches. The Cg horizon below depths of 40 inches typically has similar textures. However, in some pedons the texture ranges from sand to clay below a depth of 40 inches. The Cg horizon is massive, laminated or has weak grades of blocky structure. It typically contains few to many redoximorphic features with chroma of 3 to 8. It is slightly alkaline or moderately alkaline. Crystals of gypsum and other soluble salts are in some pedons. Some pedons do not have a C horizon within a depth of 60 inches.

COMPETING SERIES: These are the Bear Lake, Colake, Ojata, Regan and Winger series. Bear Lake soils have sola more than 60 inches thick and have lime nodules in the Bkg horizon. Colake soils do not have redoximorphic features within a depth of 40 inches. Ojata soils are strongly saline with conductivity exceeding 16 mmhos/cm. Regan soils contain more than 15 percent fine sand or coarser in the lower half of the control section. Winger soils have loamy glacial till in the lower part of the control section.

GEOGRAPHIC SETTING: Colvin soils are in level concave shallow swales and depressions on glacial lake plains, in outwash channels, on stream terraces and in drainageways on till plains. Slopes are 0 to 2 percent. The soils formed in silt loam and silty clay loam sediments. The mean annual air temperature ranges from 36 to 48 degrees F, and mean annual precipitation from 15 to 25 inches. Frost-free period ranges from 90 to 145 days. Elevation ranges from 650 to 2000 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ojata soils and Antler, Bearden, Borup, Gardena, Hegne, Lamoure, Overly, Perella and Rauville soils. Ojata soils are on nearby saline swales and depressions. Antler soils are on nearby interbeach areas. They are fine-loamy and have 2C horizons within depths of 20 to 40 inches of firm glacial till. Bearden, Overly and Perella soils are in a drainage sequence with Colvin soils. Bearden and Overly soils are on higher elevations. Overly soils have Bw horizons and do not have carbonates or calcic horizons within depths of 16 inches. Borup soils are on nearby lake plains where sediments contain less clay and more very fine sand. Hegne soils are on nearby lake plains where sediments are clays. Lamoure and Rauville soils are on nearby bottom lands and flood plains of outwash valleys and streams. Perella soils are on similar landscapes as Colvin soils. Perella soils do not have calcic horizons within depths of 16 inches.

DRAINAGE AND PERMEABILITY: Poorly and very poorly drained. Runoff ranges from negligible to medium depending on slope and surface texture. Water runs onto these soils and ponds for a time during wet seasons. The soils commonly are too wet to cultivate unless drained. Soils on stream terraces occasionally flood from stream overflow. Permeability is moderate to slow. An apparent seasonal high water table is at a depth of 0.0 to 1.5 feet at some time during the period of March through July in the poorly drained phase. It is at a depth of 1 foot above the surface to 1 foot below the surface at some time during the period of November through July in the very poorly drained phase.

USE AND VEGETATION: Soils are cropped to small grains. Undrained areas are used for pasture and hay. Native vegetation is slim sedge, wooly sedge, prairie cordgrass, and a variety of forbs and other sedges.

DISTRIBUTION AND EXTENT: Central and eastern North Dakota, western Minnesota and northeastern South Dakota. The soil is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bismarck, North Dakota

SERIES ESTABLISHED: Sargent County, North Dakota, 1961.

REMARKS: Diagnostic horizons and features recognized in this pedon are: mollic epipedon - the zone from the surface of the soil to a depth of 10 inches (A horizon); calcic horizon - the zone from 10 to 30 inches (Bkg1 and Bkg2 horizon); characteristics associated with wetness - calcic horizon (Bkg1 and Bkg2 horizons).

ADDITIONAL DATA: S66NDak-14-2; S66NDak-14-7; S66NDak-14-8; S67NDak-50- 3; S67NDak-50-4.

National Cooperative Soil Survey
U.S.A.

LOCATION FARGO ND+MN MT

Established Series
NDP-CJH
03/2005

FARGO SERIES

The Fargo series consists of very deep, poorly drained and very poorly drained, slowly permeable soils that formed in calcareous, clayey lacustrine sediments. These soils are on glacial lake plains, floodplains, and gently sloping side slopes of streams within glacial lake plains. Slopes range from 0 to 6 percent. Mean annual air temperature is 42 degrees F, and mean annual precipitation is 19 inches.

TAXONOMIC CLASS: Fine, smectitic, frigid Typic Epiaquerts

TYPICAL PEDON: Fargo silty clay on a level plane slope of less than 1/10 percent under cropland. When described the soil was dry from 0 to 8 inches and moist from 8 to 60 inches. (Colors are for moist soil unless otherwise stated)

Ap--0 to 8 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to strong fine granular; very hard, blocks friable, granules firm, very sticky and very plastic; many fine roots; many fine pores; neutral (pH 7.2); abrupt smooth boundary. (Combined A horizons 5 to 15 inches thick)

Bw--8 to 13 inches; black (10YR 2/1) and very dark gray (10YR 3/1) crushed and rubbed silty clay, very dark gray (10YR 3/1) and dark gray (10YR 4/1) crushed and rubbed, dry; moderate medium subangular blocky structure parting to strong very fine angular blocky; extremely hard, firm, very sticky and very plastic; many fine roots; many fine pores; faces of peds have shiny waxy sheen when moist; cracks filled with A material throughout; neutral (pH 7.0); abrupt wavy boundary.

Bss--13 to 21 inches; very dark gray (2.5Y 3/1) and very dark grayish brown (2.5Y 3/2) silty clay, gray (2.5Y 5/1) and dark grayish brown (2.5Y 4/2) dry; dark grayish brown (2.5Y 4/2) crushed and rubbed, grayish brown (2.5Y 5/2) dry; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; moderate coarse prismatic structure parting to strong fine and very fine angular blocky; extremely hard, firm, very sticky and very plastic; common fine roots; common pores; slickensides on vertical faces of peds; faces of blocks have waxy sheen when moist; slight effervescence in lower part, noneffervescent on tongues; cracks filled with A material throughout; slightly alkaline (pH 7.6); abrupt irregular boundary. (Combined Bw and Bss horizons 8 to 27 inches thick)

Bkg--21 to 32 inches; olive gray (5Y 5/2) silty clay, light gray (5Y 7/2) dry; common fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; weak medium subangular blocky structure parting to moderate fine angular blocky and granular; hard, friable, sticky and plastic; few roots; common fine pores; cracks filled with A material extend into this horizon; common fine masses of carbonates; strong effervescence; moderately alkaline (pH 8.0); clear wavy boundary. (0 to 26 inches thick)

Cg1--32 to 48 inches; grayish brown (2.5Y 5/2) silty clay, light gray (2.5Y 7/2) dry; common medium distinct brown (10YR 4/3) redoximorphic concentrations and gray (5Y 5/1) redoximorphic depletions;

weak medium subangular blocky structure parting to moderate very fine angular blocky and granular; very hard, firm, very sticky and very plastic; few fine roots; common pores; strong effervescence; moderately alkaline (pH 8.0); gradual wavy boundary.

Cg2--48 to 68 inches; olive (5Y 4/3) and pale olive (5Y 6/3) silty clay, pale olive (5Y 6/3) and pale yellow (5Y 8/3) dry; many medium prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; laminated, fractures to moderate very fine blocky structure; very hard, firm, very sticky and very plastic; few medium masses of carbonates; slight effervescence; moderately alkaline (pH 8.0); gradual wavy boundary.

Cg3--68 to 80 inches; pale olive (5Y 6/3) silty clay; pale yellow (5Y 8/3) dry; common medium prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; laminated, fractures to moderate very fine subangular blocky structure; very hard, firm, very sticky and very plastic; common medium masses of carbonates; few fine masses of iron-manganese; slight effervescence; moderately alkaline.

TYPE LOCATION: Traill County, North Dakota; about 9 miles south and 6 miles east of Hillsboro; 1170 feet south and 410 feet east of the northwest corner, sec. 29, T. 144 N., R. 49 W. Latitude 47 degrees, 15 minutes, 42.7 seconds N, Longitude 96 degrees, 55 minutes, 13.5 seconds W. Halstad SW, ND USGS 7.5 minute quadrangle.

RANGE IN CHARACTERISTICS: The 10- to 40-inch particle size control section averages between 40 and 60 percent clay and less than 15 percent fine sand and coarser. It is free of rock fragments. The mollic epipedon ranges from 8 to 40 inches in thickness. The depth to carbonates ranges from 11 to 42 inches. Saline phases are recognized.

The A horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 2 and 3 or 4 dry, and chroma of 1 or less. It is clay, silty clay or silty clay loam. It is neutral or slightly alkaline.

The Bw and Bss horizons have hue of 10YR, 2.5Y or 5Y, value of 2 to 4 and 3 to 5 dry, and chroma of 1 or 2. They are clay, silty clay or silty clay loam. It is neutral to moderately alkaline. They typically have weak or moderate prismatic structure which parts to strong fine and very fine blocky structure. Some pedons do not have the prismatic structure. Slickensides and shiny, waxy surfaces of peds are common. Cracks filled with A material commonly extend through the Bw and Bss horizons and range from 1/2 inch to 5 inches in width. Some pedons have a Bg horizon.

The Bkg horizon has hue of 10YR, 2.5Y or 5Y, value of 3 to 6 and 5 to 8 dry, and chroma of 1 or 2. It is clay, silty clay or silty clay loam. It is moderately alkaline. It contains 10 to 25 percent calcium carbonate equivalent diffused or in masses. Where it has more than 15 percent calcium carbonate equivalent, it does not have more than 5 percent as masses or decrease by more than 5 percent in a lower horizon.

The Cg horizon has hue of 2.5Y or 5Y, value of 3 to 6 and 5 to 8 dry, and chroma of 1 to 3. It is clay, silty clay or silty clay loam. It is moderately alkaline. It typically contains common to many distinct or prominent low to high chroma redoximorphic features. Some pedons contain gypsum crystals in the Cg horizons. Sediments are laminated in the lower part of the Cg horizon at depths of 36 to 60 inches in most pedons. Some pedons have a 2Cg horizon that is silt loam or sandy below a depth of 40 inches.

COMPETING SERIES: This is the Clearwater series. The Clearwater series has 2 to 8 percent rock fragments throughout and formed in till.

GEOGRAPHIC SETTING: Fargo soils are on level and nearly level glacial lake plains and flood plains and gently sloping side slopes of streams within glacial lake plains. Slope gradients commonly are less than 1 percent but range from 0 to 6 percent. The soils formed in calcareous, clayey lacustrine sediments. The climate is cool subhumid. Mean annual air temperature ranges from 36 to 45 degrees F, and mean annual precipitation from 15 to 23 inches. Most of the moisture falls in the spring and summer. Frost-free period ranges from 90 to 140 days. Elevation above sea level ranges from 650 to 1800 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bearden, Cashel, Dovray, Grano, Hegne, Ludden, Overly, Ryan and Wahpeton soils. Bearden and Overly soils are on nearby lake plains and are fine-silty. Cashel soils are on floodplains of larger streams and have fine stratification below the Ap horizon. Dovray and Grano soils are in concave swales and depressions on lake plains. Ludden soils are on floodplains of larger streams. Dovray do not have cracks filled with A material that extend through the Bw horizon. Grano and Ludden soils have carbonates at depths of less than 10 inches. Hegne soils are on slight rises and have calcic horizons within depths of 16 inches. They usually are in complex with Fargo soils. Ryan soils are on nearby areas where the lake sediments contain more salts and have natric horizons. Wahpeton soils are on levees and low terraces of large streams, commonly at slightly higher elevations than the lake plain and are moderately well drained.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained and very poorly drained. Runoff is negligible to high depending on slope. Saturated hydraulic conductivity is slow. A system of legal drains, section lines, road ditches, and field drains remove surface water from most Fargo soils. A seasonal high water table is at the surface to 3.0 feet below the surface at some time during the period of March through July. It is 1.0 foot above the surface to 2.0 feet below the surface at some time during the period of February through August in the ponded, depressional or very poorly drained phases.

USE AND VEGETATION: The soils are nearly all cropped to small grains, soybeans and sugar beets. Native vegetation is western wheatgrass, Kentucky bluegrass and a variety of forbs.

DISTRIBUTION AND EXTENT: Mainly in the Red River Valley of the North in North Dakota and Minnesota; smaller areas in glaciolacustrine areas and in west-central Montana. The soil is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bismarck, North Dakota

SERIES ESTABLISHED: Grand Forks Area, North Dakota, 1902.

REMARKS: Diagnostic horizons and features recognized in this pedon are: mollic epipedon - the zone from the surface of the soil to a depth of 21 inches (Ap, Bw and Bss horizons); Vertisol criteria - cracks filled with A material extend through the Bw and Bss horizons and range from 1/2 to 5 inches in width, slickensides in the 13 to 21 inch layer (Bss horizon); the site will be redescribed in the future to better document the Vertisol criteria.

ADDITIONAL DATA: S51NDak-5-3; S51NDak-5-4; S51NDak-5-8; S51NDak-5-9; S53NDak-9-3; S53NDak-9-4; S54NDak-50-1; S54NDak-50-2; Soil Survey Investigation No. 2, pages 72 to 87. Also S64NDak-9-1; S64NDak-9-4; S64NDak-50-3; S64NDak-50-4; S65NDak-39-1; S65NDak-39-2; S65NDak-39-3; and S65NDak-39-4; and S65NDak-49-1 (Type Location 15 feet to the west of this lab sample) by Soils Department, North Dakota Agriculture Experiment Station.

LOCATION HEGNE MN+MT ND SD

Established Series
HRF-RBH-CJH
03/2005

HEGNE SERIES

The Hegne series consists of very deep, poorly drained soils that formed in clayey calcareous lacustrine sediments on glacial lake plains. These soils have slow or very slow permeability. They have slopes of 0 to 2 percent. Mean annual precipitation is about 20 inches. Mean annual air temperature is about 42 degrees F.

TAXONOMIC CLASS: Fine, smectitic, frigid Typic Calciaquerts

TYPICAL PEDON: Hegne silty clay, from a Hegne-Fargo complex, on a slightly convex slope of about 0.5 percent on a glacial lake plain in a cultivated field. (Colors are for moist soil unless otherwise stated)

Ap-- 0 to 10 inches; black (5Y 2.5/1) silty clay, very dark gray (5Y 3/1) dry; strong fine and medium subangular blocky structure; firm; common fine distinct olive gray (5Y 4/2) redoximorphic depletions; firm; few fine and medium roots; many fine rounded light gray (10YR 7/2) masses of carbonate; slightly effervescent; slightly alkaline (pH 7.6); clear wavy boundary. (7 to 16 inches thick)

Bkssg1-- 10 to 18 inches; about 60 percent olive gray (5Y 4/2), and 40 percent dark gray (5Y 4/1) silty clay; gray (5Y 6/1) and gray (5Y 5/1) dry; moderate medium subangular blocky structure; firm; few fine roots; few distinct intersecting slickensides tilted less than 45 degrees from horizontal; cracks filled with A material 1/4 to 3 inches wide and 2 to 4 feet apart; many fine masses of carbonate; violently effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

Bkssg2-- 18 to 34 inches; olive gray (5Y 5/2) silty clay; light olive gray (5Y 6/2) dry; moderate fine and medium subangular blocky structure; firm; common fine faint dark gray (5Y 4/1) redoximorphic depletions; few very fine roots; few distinct intersecting slickensides tilted less than 60 degrees from horizontal; cracks filled with A material 1/4 to 2 inches wide and 2 to 4 feet apart; many fine masses of carbonate; violently effervescent; moderately alkaline (pH 8.3); clear wavy boundary. (Combined Bkg horizons 10 to 30 inches thick)

Bg-- 34 to 50 inches; olive gray (5Y 4/2) silty clay; weak fine and medium subangular blocky structure; friable; common medium distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; few fine masses of carbonate; violently effervescent; moderately alkaline (pH 8.2); clear wavy boundary. (0 to 20 inches thick)

Cg1--50 to 68 inches; olive gray (5Y 5/2) silty clay; weak fine and medium subangular blocky soil fragments parting to weak fine platy; firm; common medium distinct gray (5Y 5/1) redoximorphic depletions and medium prominent strong brown (7.5YR 4/6) and common fine reddish yellow (7.5YR 6/6) redoximorphic concentrations; few medium carbonate coats on faces of peds; strongly effervescent; moderately alkaline (pH 8.2); clear wavy boundary.

Cg2-- 68 to 80 inches; olive (5Y 5/3) laminated silty clay; laminates part to weak fine platy fragments which part to weak fine subangular blocky fragments; firm; common medium distinct gray (5Y 5/1) redoximorphic depletions and common medium prominent strong brown (7.5YR 5/6) and strong brown (7.5YR 5/8) redoximorphic concentrations; few medium irregular light gray (2.5Y 7/2) carbonate coats on faces of peds; strongly effervescent; moderately alkaline (pH 8.2).

TYPE LOCATION: Marshall County, Minnesota; about 5 miles west and 2 miles north of Stephen; 600 feet south and 2100 feet east of the northwest corner of Sec. 22, T. 157 N., R. 49 W.; USGS STEPHEN quadrangle; Latitude 48 degrees 24 minutes 25 seconds N. and Longitude 96 degrees 59 minutes 22 seconds W.

RANGE IN CHARACTERISTICS: The thickness of the mollic epipedon ranges from 7 to 16 inches. These soils have free carbonates in all parts with calcium carbonate equivalent of 10 to 30 percent throughout. The higher values are in the calcic horizon. The depth to the calcic horizon is less than 16 inches. Typically most pedons do not have rock fragments. The particle-size control section ranges from 40 to 60 percent noncarbonate clay, with an average of 50 percent and less than 5 percent sand. The average linear extensibility is estimated to be about 10.7 centimeters in the upper 40 inches.

The A horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 2 or 3, and chroma of 0 or 1. Texture is silty clay, clay or silty clay loam. Effervescence is slight to violent. Reaction is slightly alkaline or moderately alkaline. Tongues of A horizon extend to depths as much as 36 inches in some pedons.

The Bkssg horizon has hue of 2.5Y, 5Y or 10YR, value of 3 to 6, and chroma of 1 or 2. Chroma of 2 is allowed if there are distinct or prominent redoximorphic concentrations. Texture is clay or silty clay. Effervescence is strong or violent. Reaction is slightly alkaline or moderately alkaline.

The Bg horizon has hue of 2.5Y or 5Y, value of 3 to 6, and chroma of 1 or 2. Chroma of 2 is allowed if there are distinct or prominent redoximorphic concentrations. Texture is clay or silty clay. Effervescence is slight to violent. Reaction is slightly or moderately alkaline.

The C horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 to 3. Distinct or prominent high chroma redoximorphic concentrations are present in most pedons. Texture is clay or silty clay. Silty clay loam textures with more than 35 percent noncarbonate clay are allowed. Effervescence is slight to strong. Reaction is slightly alkaline or moderately alkaline. Masses of gypsum crystals are in the B and C horizon in some pedons. Some pedons have sandy 2C horizons below a depth of 40 inches.

COMPETING SERIES: These are in the Reis series. Reis soils have more than 5 percent sand in the particle-size control section and formed in clayey glacial till.

GEOGRAPHIC SETTING: The Hegne soils have slightly convex to slightly concave slopes of less than 2 percent on glacial lake plains and in a few places these soils are on flood plains. These soils commonly are on the higher lying positions of microrelief topography. They formed in clayey lacustrine sediments of Late Wisconsin age. Mean annual air temperature ranges from 38 to 45 degrees F. Mean annual precipitation ranges from 15 to 27 inches. Frost-free days range from 90 to 140. Elevation above sea level ranges from 650 to 1800 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the poorly drained Fargo soils which formed in similar sediments on glacial lake plains soils. The Hegne soils are found in a complex with these associated soils on slightly higher positions. Fargo soils do not contain a calcic horizon within 16 inches of the surface.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained. Runoff is low or medium. Saturated hydraulic conductivity is slow or very slow. Depth to an apparent seasonal high water table when undrained is as high as 0.5 to 1.5 feet at some time from April to June in most years.

USE AND VEGETATION: Nearly all of these soils are cultivated. Principal crops are small grains and sugar beets. Native vegetation is tall grass prairie.

DISTRIBUTION AND EXTENT: Principally in the Red River Valley of northwestern Minnesota and eastern North Dakota, also in smaller glacial lake basins in western Minnesota and north-central North Dakota. These soils are extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bismarck, North Dakota

SERIES ESTABLISHED: Sargent County, North Dakota, 1961.

REMARKS: The classification of these soils is in question as to whether they should be in the Typic or Aeric subgroup of Calciaquerts. This needs further investigation. This series was previously classified in the Typic Calciaquolls subgroup.

Diagnostic horizons and features recognized in this pedon are: mollic epipedon - the zone from the surface to 18 inches (Ap and A portion of A/Bkg horizons); calcic horizon - the zone from 10 to 34 inches (B portion of A/Bkg and Bkg horizons); vertic criteria - slickensides and cracks filled with A material in the zone from 10 to 34 inches (Bkssg1 and Bkssg2 horizons); aquic moisture regime.

ADDITIONAL DATA: Soil Interpretation Record number is MN0053.

National Cooperative Soil Survey
U.S.A.

Appendix C

Wetland Delineation
Data Sheets

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Red River Div. / ND Corridor City/County: / Cass Sampling Date: 07/29/2010

Applicant/Owner: ACE State: ND Sampling Point: (SP-1-W) ND-WI-RMM

Investigator(s): Greg Larson, Ryan M., M.S. Section, Township, Range: GPS point recorded

Landform (hillslope, terrace, etc.): lake plain Local relief (concave, convex, none): Concave Slope (%): 0-2

Subregion (LRR): F Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Fargo silty clay NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ______, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ______ No X

Are Vegetation ______, Soil X, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ______

Hydric Soil Present? Yes X No ______

Wetland Hydrology Present? Yes X No ______

Is the Sampled Area within a Wetland? Yes X No ______

Remarks: Moderately to high alkaline soils. - Above-normal, wet, antecedent precipitation

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Wheat cultivar			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum ______			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- X Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ______

Remarks: Ag. field - planted to wheat

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Great Plains – Interim Version

SOIL

Sampling Point: SP-1-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-17	2.5Y 2.5/1						lc	
17-27	2.5Y 3/1						lc	
27-37	2.5Y 5/2		10YR 4/6	3	C	PL	lc	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) **(LRR F)**
- ☐ 1 cm Muck (A9) **(LRR F, G, H)**
- ☐ Depleted Below Dark Surface (A11)
- ☒ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ☐ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ High Plains Depressions (F16)
  (MLRA 72 & 73 of LRR H)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR I, J)**
- ☐ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ☐ Dark Surface (S7) **(LRR G)**
- ☐ High Plains Depressions (F16)
  (LRR H outside of MLRA 72 & 73)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
  (where not tilled)
- ☐ Presence of Reduced Iron (C4)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
  (where tilled)
- ☐ Crayfish Burrows (C8)
- ☒ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ________

Water Table Present? Yes ____ No X Depth (inches): ________

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ________

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: 8-ND-JCD City/County: /Cass Sampling Date: 7/29/10
Applicant/Owner: ACOE State: ND Sampling Point: 8-ND-JCD
Investigator(s): JCD, BW, MB Section, Township, Range: GPS point recorded
Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 1
Subregion (LRR): F Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: Fargo silty clay NWI classification: ______
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ~~[illegible]~~ No X (If no, explain in Remarks.)
Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___

Remarks: Intensive ag field, currently in wheat. ~~Ditch~~ Watercourse improved as ditch through field. Wetter than normal antecedent precip.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: N/A)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: N/A)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ___)			
1. Wheat *	60		
2. Polygonum lapathifolium	5		FACW
3. Hibiscus trionum	2		UPL
4. - last year's soybeans - weak	2		NI
5. ~~[illegible]~~ Amaranthus albus	2		FACU
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 30

25 plot - 100% wheat - no WT/water/sat'n
'higher' in landscape

Dominance Test worksheet: N/A
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): ______ (A)
Total Number of Dominant Species Across All Strata: ______ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = N/A

Hydrophytic Vegetation Indicators:
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☒ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: Wheat in w/L clearly stressed - shorter, more sparse than in "upper" level of field. Opportunistic weeds.

SOIL

Sampling Point: 8-ND-JCD

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		

See profile of plot 1 collected along waterway 7/28/10 at 14-MN-JCD

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Stratified Layers (A5) (**LRR F**)
☐ 1 cm Muck (A9) (**LRR F, G, H**)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
☐ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1)
☐ Loamy Gleyed Matrix (F2)
☐ Depleted Matrix (F3)
☒ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)
☐ High Plains Depressions (F16)
(MLRA 72 & 73 of LRR H)

Indicators for Problematic Hydric Soils[3]:

☐ 1 cm Muck (A9) (**LRR I, J**)
☐ Coast Prairie Redox (A16) (**LRR F, G, H**)
☐ Dark Surface (S7) (**LRR G**)
☐ High Plains Depressions (F16)
(LRR H outside of MLRA 72 & 73)
☐ Reduced Vertic (F18)
☐ Red Parent Material (TF2)
☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

☐ Surface Water (A1)
☐ High Water Table (A2)
☒ Saturation (A3)
☐ Water Marks (B1)
☐ Sediment Deposits (B2)
☐ Drift Deposits (B3)
☐ Algal Mat or Crust (B4)
☐ Iron Deposits (B5)
☐ Inundation Visible on Aerial Imagery (B7)
☐ Water-Stained Leaves (B9)
☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☐ Dry-Season Water Table (C2)
☐ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
☐ Presence of Reduced Iron (C4)
☐ Thin Muck Surface (C7)
☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

☐ Surface Soil Cracks (B6)
☒ Sparsely Vegetated Concave Surface (B8)
☐ Drainage Patterns (B10)
☐ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
☐ Crayfish Burrows (C8)
☒ Saturation Visible on Aerial Imagery (C9)
☒ Geomorphic Position (D2)
☐ FAC-Neutral Test (D5)
☐ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? [✓ Yes X] No ____ Depth (inches): ?? 6"/3ft or
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): ____

WT surface water soaking in??

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Recent rains -
However - adjacent to waterway thru field visible in most aerials - lateral extent of w/L fringe

US Army Corps of Engineers

Great Plains – Interim Version

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: 11- ND .JCD - City/County: Cass Sampling Date: 7/28/10
Applicant/Owner: ACE State: ND Sampling Point: ND-11-JCD -wet
Investigator(s): JCD, MB, BW Section, Township, Range: GPS point recorded
Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0-2
Subregion (LRR): F Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: Cashel siltyclay NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)
Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ______ No X
Are Vegetation ______, Soil X, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ~~✓~~
Hydric Soil Present? Yes ✓ No ______
Wetland Hydrology Present? Yes ✓ No ______

Is the Sampled Area within a Wetland? Yes ✓ No ______

Remarks:
Wetter than normal antecedent precip.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30')			
1. boxelder & trees Acer negundo	20	Y	FACW
2. elm, [illegible] ~~[illegible]~~	10	Y	FACW
3. Ulmus amencana			
4.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: N/A)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Soybeans - stressed	50%		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
% Bare Ground in Herb Stratum 50%	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:
soybean field - crop stress

US Army Corps of Engineers Great Plains – Interim Version

SOIL

Sampling Point: 11-ND-JCD-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-24	10YR 2/1		7.5YR 4/6	2	C	M	SiC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR F**)
- ☐ 1 cm Muck (A9) (**LRR F, G, H**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ☐ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☒ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ High Plains Depressions (F16)
  (MLRA 72 & 73 of LRR H)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (**LRR I, J**)
- ☐ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ☐ Dark Surface (S7) (**LRR G**)
- ☐ High Plains Depressions (F16)
  (LRR H outside of MLRA 72 & 73)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
  (where not tilled)
- ☐ Presence of Reduced Iron (C4)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
  (where tilled)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): 6

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: 11-ND-JCD City/County: Cass / ND. Sampling Date: 7/28/10
Applicant/Owner: ACE State: ND Sampling Point: ND-11-JCD-UP
Investigator(s): JCD, BW, MB Section, Township, Range: GPS point recorded
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): convex Slope (%): 2
Subregion (LRR): F Lat: ____ Long: ____ Datum: ____
Soil Map Unit Name: Cashel silty clay NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No ✓
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes ____ No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Wetter than normal precip in 3 mos prior.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1. boxelder 2 trees Acer negundo	20	Y	FACW
2. elm, ~~[illegible]~~ 1 tree American	10	Y	FACW
3.			
4.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Soybeans	100%		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): ____ (A)
Total Number of Dominant Species Across All Strata: ____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

N/A

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Healthy soybean crop – Trees at edge of plot, not indicative of wetland in this location.

US Army Corps of Engineers Great Plains – Interim Version

29 inch hole

SOIL

Sampling Point: 11-ND-JCD-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-18	10YR 2/1		7.5YR 4/6	2%	C	M	SiC	
18-29"	10YR 3/1		7.5YR 4/6	1%	C	M	SiC	calcium carbonate @ 22 inches
			10YR 5/2	1%	D	M		↑ unconfirmed

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) **(LRR F)**
- ☐ 1 cm Muck (A9) **(LRR F, G, H)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ☐ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR I, J)**
- ☐ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ☐ Dark Surface (S7) **(LRR G)**
- ☐ High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ☐ Presence of Reduced Iron (C4)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______

Water Table Present? Yes ______ No ______ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Soil was notably drier than wetland plot just a few feet away. Soybean crop here showing no stress.

US Army Corps of Engineers

Great Plains – Interim Version

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: 14-MN-JCD City/County: ~~Co~~ Clay Sampling Date: 7-28-10
Applicant/Owner: ACE State: ____ Sampling Point: 14-MN-JCD
Investigator(s): JD, BW, MB Section, Township, Range: GPS point recorded
Landform (hillslope, terrace, etc.): floodplain terrace Local relief (concave, convex, none): none Slope (%): 0-2
Subregion (LRR): F Lat: ____ Long: ____ Datum: ____
Soil Map Unit Name: Fluvaquents - Haploborolls complex NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ~~X~~ No X (If no, explain in Remarks.)
Are Vegetation X , Soil X , or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
Are Vegetation ____, Soil X , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks: Seasonally flooded 'basin' - edge of ~~g~~ stream - amidst ~~ca~~ intensive ag cropping. "Wet" antecedent precip.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: N/A)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: N/A)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Pigweed Amaranthus albus	20%	Y	FACU
2. Crab grass Digitaria sp.	2%	N	NA
3. giant Ragweed Ambrosia trifida	3%	N	FAC
4. lambs quarters Chenopodium album	1%	N	FAC
5.			
6.			
7.			
8.			
9.			
10.			
26 = Total Cover 50: 13 20:			
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): ____ (A)
Total Number of Dominant Species Across All Strata: ____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: N/A (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = N/A

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%
____ Prevalence Index is ≤3.0[1]
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Sparsely vegetated concave surface amid wheat field, opportunistic weeds present in sparse abundance

US Army Corps of Engineers
Great Plains – Interim Version

SOIL

Sampling Point: 14-MN-JCD

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1		7.5YR 4/6	2	C	M	SiCl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR F**)
___ 1 cm Muck (A9) (**LRR F, G, H**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)

___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ High Plains Depressions (F16)
(MLRA 72 & 73 of LRR H)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR I, J**)
___ Coast Prairie Redox (A16) (**LRR F, G, H**)
___ Dark Surface (S7) (**LRR G**)
___ High Plains Depressions (F16)
(**LRR H outside of MLRA 72 & 73**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ___ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)

___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Dry-Season Water Table (C2)
X Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
___ Presence of Reduced Iron (C4)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
X Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
X Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
___ Crayfish Burrows (C8)
X Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ FAC-Neutral Test (D5)
___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___________
Water Table Present? Yes ___ No ___ Depth (inches): ___________
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___________

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix D

MnRAM
Results

Wetland Functional Assessment Summary
Fargo Moorhead Diversion

Wetland Name	WS	SA	Location	Hydrogeomorphology	Maint. of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maint. of Wetland Water Quality	Shoreline Protection
MN_W1_MTS	57	4	14-000-00-00-001	Depressional/Isolated (no discernable inlets or outlets)	Low	High	Moderate	Low	Not Applicable
ND_W1_RMM	57	4	00-000-00-00-001	Depressional/Isolated (no discernable inlets or outlets)	Low	High	Moderate	Low	Not Applicable

Wetland Functional Assessment Summary
Fargo Moorhead Diversion

								Additional Information		
Wetland Name	**Location**	**Maint. of Char. of Wildlife Habitat**	**Maint.of Char. Fish Habitat**	**Maint. of Char. Amphibian Habitat**	**Aesthetics/ Recreation/ Education/ Cultural**	**Commercial Uses**	**Ground-Water Interaction**	**Wetland Restoration Potential**	**Additional Stormwater Treatment Needs**	**Wetland Sensitivity to Stormwater and Urban Develop.**
MN_W1_MTS	14-000-00-00-001	Low	Not Applicable	Not Applicab	Low	Not Applicable	Combination Discharge, Recharge	Not Applicable	Low	Exceptional
ND_W1_RMM	00-000-00-00-001	Low	Not Applicable	Not Applicab	Low	Not Applicable	Combination Discharge, Recharge	Not Applicable	Low	Exceptional

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
ND-33 - Wheat Field Drown-o	Depressional/Isolated (no discernable inlets or outlets)	0.20	0.50	0.45	0.17	0.00
		Low	Moderate	Moderate	Low	Not Applicable

							Additional Information		
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Wetland Restoration Potential	Wetland Sensitivity to Stormwater and Urban Development	Additional Stormwater Treatment Needs
ND-33 - Wheat Field Dr	0.28	0.00	0.00	0.10	0.00	Recharge	0.00	0.10	0.17
	Low	Not Applicable	Not Applicable	Low	Not Applicable		Not Applicable	Exceptional	Low

Wetland Community Summary

		Vegetative Diversity/Integrity							
		Community							
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
ND-33 - Wheat Field Drown-o				Seasonally Flooded Basin	0	0.1	0.10	0.10	0.00
							Low	Low	Not Applicable
							0.10	0.10	0.00

☐

☑ *Denotes incomplete calculation data.*

Wetland Functional Assessment Summary
Fargo-Moorhead Red River Diversion

Wetland Name	*WS*	*SA*	*Location*	*Hydrogeomorphology*	*Maint. of Hydrologic Regime*	*Flood/ Stormwater/ Attenuation*	*Downstream Water Quality*	*Maint. of Wetland Water Quality*	*Shoreline Protection*
8-ND-JCD	0	NA	00-138-49-32-001	Depressional/Tributary (outlet but no perennial inlet or drainage entering from upstream subwatershed)	Low	Moderate	Moderate	Low	Not Applicable
7-ND-JCD	57	4	00-137-49-04-001	Depressional/Isolated (no discernable inlets or outlets)	Low	High	Moderate	Low	Not Applicable
11-ND-JCD	0	NA	00-137-48-07-001	Floodplain (outside waterbody banks)	Low	Moderate	Moderate	Low	Not Applicable
0-MN-JCD	57	4	14-137-48-07-001	Floodplain (outside waterbody banks)	Moderate	Moderate	Moderate	Moderate	Moderate
14-MN-JCD	57	4	14-137-48-08-001	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	Low	Moderate	Low	Low	Not Applicable
134-ND-JCD	57	4	00-138-49-35-001	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	Low	Moderate	Moderate	Moderate	Not Applicable

Wetland Functional Assessment Summary
Fargo-Moorhead Red River Diversion

								Additional Information		
Wetland Name	*Location*	*Maint. of Char. of Wildlife Habitat*	*Maint.of Char. Fish Habitat*	*Maint. of Char. Amphibian Habitat*	*Aesthetics/ Recreation/ Education/ Cultural*	*Commercial Uses*	*Ground-Water Interaction*	*Wetland Restoration Potential*	*Additional Stormwater Treatment Needs*	*Wetland Sensitivity to Stormwater and Urban Develop.*
8-ND-JCD	00-138-49-32-001	Low	Not Applicable	Not Applicab	Low	Not Applicable	Recharge	Not Applicable	Low	Exceptional
7-ND-JCD	00-137-49-04-001	Moderate	Not Applicable	Not Applicab	Low	Not Applicable	Recharge	Not Applicable	Low	Exceptional
11-ND-JCD	00-137-48-07-001	Low	Not Applicable	Not Applicab	Low	Low	Recharge	Not Applicable	Low	Exceptional
0-MN-JCD	14-137-48-07-001	Moderate	Not Applicable	Not Applicab	Low	Not Applicable	Recharge	Not Applicable	Moderate	Moderate
14-MN-JCD	14-137-48-08-001	Low	Not Applicable	Not Applicab	Low	Low	Recharge	Not Applicable	Low	Exceptional
134-ND-JCD	00-138-49-35-001	Moderate	Not Applicable	Not Applicab	Low	Low	Recharge	Not Applicable	Moderate	Moderate

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
ND-19 - Shallow Open Water	Depressional/Isolated (no discernable inlets or outlets)	0.33	0.74	0.66	0.39	0.00
		Low	High	High	Moderate	Not Applicable

							Additional Information		
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Wetland Restoration Potential	Wetland Sensitivity to Stormwater and Urban Development	Additional Stormwater Treatment Needs
ND-19 - Shallow Open	0.35	0.00	0.10	0.42	0.00	Recharge	0.00	0.00	0.39
	Moderate	Not Applicable	Low	Moderate	Not Applicable		Not Applicable		Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity								
		Community								
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
ND-19 - Shallow Open Water							0.00	0.00	0.00	
							Not Applicable	Not Applicable	Not Applicable	
							0.00	0.00	0.00	☑

☑ *Denotes incomplete calculation data.*

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Proposed Diversion Cond.	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet), Riverine (within the river/stream banks), Floodplain (outside waterbody banks)	0.52	0.62	0.58	0.47	0.72
		Moderate	Moderate	Moderate	Moderate	High

							Additional Information		
Wetland Name	**Maintenance of Characteristic Wildlife Habitat Structure**	**Maintenance of Characteristic Fish Habitat**	**Maintenance of Characteristic Amphibian Habitat**	**Aesthetics/ Recreation/ Education/ Cultural**	**Commercial Uses**	**Ground-Water Interaction**	**Wetland Restoration Potential**	**Wetland Sensitivity to Stormwater and Urban Development**	**Additional Stormwater Treatment Needs**
Proposed Diversion Co	0.73	0.78	0.05	0.54	0.00	Combination Discharge, Recharge	0.00	0.50	0.47
	High	High	Low	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity								
		Community								
Wetland Name	**Location**	**Cowardin Classification**	**Circular 39**	**Plant Community**	**Wetland Proportion**	**Individual Community Rating**	**Highest Wetland Rating**	**Average Wetland Rating**	**Weighted Average Wetland Rating**	
Proposed Diversion Cond.	00-000-00-00-001	PEMCx	Type 3	Shallow Marsh	15	0.5	0.50	0.50	0.50	
							Moderate	Moderate	Moderate	
		PEMB	Type 2	Fresh (Wet) Meadow	85	0.5	0.50	0.50	0.50	
							Moderate	Moderate	Moderate	
					100		0.50	0.50	0.50	☐

☑ *Denotes incomplete calculation data.*