

# ENVIRONMENTAL ASSESSMENT WORKSHEET

This Environmental Assessment Worksheet (EAW) form and EAW Guidelines are available at the Environmental Quality Board's website

at: <http://www.eqb.state.mn.us/EnvRevGuidanceDocuments.htm>. The EAW form provides information about a project that may have the potential for significant environmental effects. The EAW Guidelines provide additional detail and resources for completing the EAW form.

**Cumulative potential effects** can either be addressed under each applicable EAW Item, or can be addresses collectively under EAW Item 19.

**Note to reviewers:** Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. **Project title:** Grey Cloud Channel Restoration Project

2. **Proposer:** South Washington Watershed District

**Contact person:** Matt Moore

**Title:** Administrator

**Address:** 2302 Tower Drive

**City, State, ZIP:** Woodbury, MN 55125

**Phone:** (651) 714-3729

**Fax:** (651)714-3721

**Email:** [mmoore@ci.woodbury.mn.us](mailto:mmoore@ci.woodbury.mn.us)

3. **RGU:** South Washington Watershed District

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4. **Reason for EAW Preparation:** (check one)

Required:

EIS Scoping

Mandatory EAW

Discretionary:

Citizen petition

**RGU discretion**

Proposer initiated

**If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):**

Not Applicable.

5. **Project Location:**

**County:** Washington County

**City/Township:** Grey Cloud Island Township

**PLS Location** (¼, ¼, Section, Township, Range): N½, NW¼, Section 24, T27N, R22W

**Watershed (81 major watershed scale):** Mississippi River Watershed

**GPS Coordinates:** NA

**Tax Parcel Number:**

PIN: 2402722220003

PIN: 2402722210004

PIN: 2402722210019

PIN: 2402722210021

PIN: 2402722210022

**At a minimum attach each of the following to the EAW:**

- **County map showing the general location of the project;**  
Exhibit 1: Project Location Map – Washington County
- **U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable); and**  
Exhibit 2: Project Location Map – USGS 1:24000
- **Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan.**

Exhibit 3: Grey Cloud Channel – Existing Conditions

Exhibit 4: FEMA Flood Zones

Exhibit 5: DNR Regional Corridor & Regionally Significant Ecological Areas

Exhibit 6: Project Vicinity Surficial Geology and Karst Locations

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**Appendix B:** Grey Cloud Channel Restoration Project Preliminary Plan

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**Appendix D:** Grey Cloud Township, Washington County Zoning Map

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**Appendix K:** Northern Long-eared Bat Fact Sheet and Maps

**Appendix L:** State Historic Preservation Office Correspondence

**Appendix M:** Grey Cloud Crossing Preliminary Construction Roadway Detour

## 6. Project Description:

- a. **Provide the brief project summary to be published in the *EQB Monitor*, (approximately 50 words).**

The Grey Cloud Channel Restoration Project, located east of the main channel of the Mississippi River, on Grey Cloud Island, Washington County, proposes to restore the ecological functions of a break-out reach by reestablishing flow connectivity. Project activities include construction of a new crossing and upgrades to Grey Cloud Island Drive South (County Road 75).

- b. **Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities.**

### **Project Background**

The Grey Cloud Channel Restoration Project (Project) involves portions of a 2.8 mile long waterbody that is a historic “flow-through” breakout reach of the Mississippi River. This channel is located within the Lower Pool 2 of the Upper Mississippi River. The mouth the Grey Cloud Channel begins at Mississippi River Mile (RM) 827.6 and ends at the confluence of the larger backwater portion of the Mississippi River immediately north of Grey Cloud Island (see **Exhibit 1-2 for Project location**). Grey Cloud Island Drive South (County Road 75) crosses the channel an estimated 1,800 feet downstream from the channel origin. Also within the backwater area, downstream of the confluence with the channel, two other roads potentially influence the flow of water through the channel. These roads are Grey Cloud Island Drive South which re-crosses the backwater area and Grey Cloud Trail South.

Historically, this side channel, was hydrologically connected to the main channel of the Mississippi. **Appendix A** provides a series of historical aerial photographs of the Grey Cloud Channel. In the early 1900’s a wooden bridge crossed the Grey Cloud Channel. The construction date of the wooden bridge is unknown. In 1923, the bridge was replaced with culverts of unknown size and overlaid with fill. The Grey Cloud Channel was further affected by the construction of Lock and Dam 2 by the U.S. Army Corps of Engineers (USACE) and the formation of Pool 2 behind the dam. Lock and Dam 2, located downstream of the channel, near Hastings went into service in 1931. Influences of the Lock and Dam 2 on Pool 2 of the Mississippi River extend to downtown St. Paul. The highest peak flow experienced in the general vicinity of the channel mouth on the Mississippi River occurred on April 16, 1965 at an estimated 171,000 cubic feet per second (cfs). During this historic flood, an emergency road raise to Grey Cloud Island Drive South was undertaken. The exact height of additional fill to raise the road at that time is unknown. Construction plans in 1965 did not include culverts, and is likely the original culverts were completely buried as a result of the emergency road raise, which created the present no-flow conditions through the Grey Cloud Channel.

The water quality and the ecological condition of the Grey Cloud Channel has degraded over time. Longitudinal connectivity has diminished because of complete loss of culvert function. Current water quality issues are highlighted in aerial imagery illustrating an algae bloom present in the channel (**Exhibit 3**) (Sept. 2010).

Restoring the ecological functions and services historically provided by this natural flow-through channel system of the Mississippi River is a priority for many federal, state, and local agencies. From a regional perspective, the Grey Cloud Channel Restoration Project is part of a larger ecosystem restoration effort for the Lower Pool 2 of the Upper Mississippi River System. The Lower Pool 2 Restoration Project is further discussed under **item #9** of this EAW. This project has been in conceptual development phases for over a decade. Some of these project development efforts include University of Minnesota capstone projects conducted by U of MN engineering students in 2005 and 2006<sup>1</sup>.

In April 2011 the SWWD formed a Technical Advisory Committee (TAC), which has been an integral part of project advising throughout the initial phases of the Project. The Project TAC is comprised of representatives from the U.S. Army Corps of Engineers (USACE), the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), the Minnesota Department of Natural Resources (DNR), Washington County, and Grey Cloud Island Township. The TAC has supported the concept of restoring the channel and met regularly during the project development stage of the project. Through these meetings the need was established for a formal feasibility study. The committee approved the final study goals for the project, design criteria, design selection and the preferred structure alternative of a three-sided concrete structure versus a culvert structure. The TAC made the recommendation to proceeding with the Project based on the findings of the study on May 30, 2012.

The *Grey Cloud Slough Restoration Feasibility Study* (Feasibility Study) was prepared for the SWWD by Houston Engineering, Inc. (HEI) June 7, 2012, accepted by the SWWD Board August 15, 2012, and amended September 27, 2012. This feasibility report is available on the SWWD website: <http://www.swwdmn.org/pdf/GreyCloudReportFinal.pdf>. The Feasibility Study considered alternatives for structures that would reestablish longitudinal connectivity of the Grey Cloud Channel with the Mississippi River. Currently, a preferred structure has been selected and design concepts are further being refined. Structure design concepts for this environmental review are further discussed below in the “Project Description”. This EAW assesses the Grey Cloud Restoration Project with a focus on project considerations to:

- Recreational navigability;
- Post-project sedimentation;
- Water quality benefits;
- Ecosystem services; and
- Accessibility and alternative routes to Grey Cloud Island Drive South during Project construction.

Funding for the Project has been secured through SWWD, Washington County Public Works Department, and a Clean Water Fund grant from the Minnesota Board of Water and Soil Resources (BWSR).

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<sup>1</sup> Quality Management Defenders Team (Neal Bauer, Mike Jabs, Anne Salazar, Tom Zearley), *Grey Cloud Island Water Quality Project*, Biosystems and Agricultural Engineering 4114: Capstone Design Project, December 2005. And, University of Minnesota Engineering Co. Team (Matt Beyer, Tim Davis, Matt Hoese, Ben Krause, Derek Newbauer), *Grey Cloud Island Slough Crossing Project*, University of Minnesota Department of Civil Engineering Capstone Design, May 9, 2006.

### **Project Description:**

The feasibility study for the Grey Cloud Channel Restoration Project presented a range of alternatives for structures to meet the project goals and design criteria<sup>2</sup>. The primary project goal is to restore the ecological integrity of the Grey Cloud Channel by reestablishing the conveyance of water from the main River channel through the Grey Cloud Channel at the Grey Cloud Island Drive South crossing. Secondary project considerations include maintaining transportation and re-establishing recreational boating. Design criteria for the Project are outlined below:

- Restoration of ecological functions and services (primary)
  - Longitudinal and lateral ecological connectivity
  - Passage of fish and other aquatic species
  - Sediment transport and waterway geomorphic stability
  - Water quality
- Transportation (secondary)
  - Level of service
  - Safety
  - Frequency of overtopping and flood characteristics
- Recreational boating (secondary)
  - Design vessel (boat length, height, beam width, and draft)
  - Design event (normal water level resulting from median summer flow (686.66 NAVD 88))

Washington County and SWWD are the project partners that have made the final structure alternative determination. Decisions are made in cooperation with the Grey Cloud Island Township and the project engineer consultant (HEI), in conjunction with the regulatory agencies (e.g., DNR and USACE) based on design criteria that was established by the TAC. The structure alternatives and design concepts for the Project have undergone considerable review in order to establish the structure and design which best meets the project design criteria and purpose and need. The preferred alternative was selected based on the design criteria. Given the site constraints, the three-sided concrete structure has been selected as the preferred structure for the Project. Preliminary plan sheets are provided within **Appendix B**.

The project is currently in preliminary design. For assessing the effects of the project in this environmental review, the project with the smallest waterway opening and the highest road elevation is presented, as these parameters yield the greatest channel constraints and the largest fill and construction impacts. The “Project limits” presented throughout this review encompasses an area represented as the greatest area of construction disturbance proposed by the three-sided concrete structure crossing design. The final design will not exceed the potential effects identified by this approach.

### **Grey Cloud Island Drive South Improvements:**

The proposed alignment will retain the existing 25 mph design speed. The Project will affect approximately 1,090 feet of road, including the bridge and its approaches. The Project will require a raise of approximately 4.2 feet in the existing roadway elevation, from approximately 701.38 to 705.59 feet (NAVD 88). Factors effecting the height of the road include navigational clearance, foundation limitations, and desired freeboard for flood access considerations.

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<sup>2</sup> Presented in Section 2 of the Feasibility Study.

Grey Cloud Island Drive South - Bridge Structure

Design concepts for the three-sided concrete structure, as shown in the preliminary plan sheets (**Appendix B**), are presented in **Table 1**.

*Table 1: Grey Cloud Channel Restoration - Three-sided Concrete Structure Design Concepts*

<b>Bridge Structure Alternative</b>	<b>Structure Description</b>	<b>Span (open water area) (ft)</b>	<b>Low Chord/ Roof Elevation (NAVD 88)</b>	<b>Road Elevation (at centerline) (NAVD 88)</b>
3-Sided Precast Concrete Arch Structure	Bottomless precast concrete arch structure supported on cast-in-place pedestal walls and pile supported footing. Includes precast headwall and wingwalls	42	697.00	705.59

The Project involves work above and below the Ordinary High Water Mark (OHW) of the Grey Cloud Channel, which is listed as Public Water Basin (PWI ID# 19000500). The public water basin includes all of the Lower Pool 2. Correspondence received from the East Metro Area Hydrologist included an OHW map (**Appendix C**) indicating the OHW for the Grey Cloud Channel extrapolated over from the main channel. The OHW is 690.40 NGVD 29 or 690.55 NAVD 88. Elevations provided in this EAW are presented as NAVD 88 (unless noted otherwise); datum conversion is provided below.

*Table 2: Datum Conversions*

MSL 1912 – 0.48’ = NGVD 1929
NGVD 1929 + 0.15’ = NAVD 1988

Construction will involve removing existing fill materials and replacing it with the three-sided concrete structure and ancillary roadway approach improvements. Proposed construction activities consist of removing fill from the existing channel crossing to reopen the channel, and providing fill for the roadway approaches and embankment raises, and bridge structure embankments. The total project magnitude is presented in **Table 3**. The Project will result in 12,900 cubic yards (CY) of net fill; 9,300 CY above and 3,600 CY below the OHW of the Grey Cloud Channel. Fill below the OHW is primarily associated with the increased widths of the inslopes required for the road grade raise and approach work at the crossing. The fill below the OHW is approximately a 0.5 acre area. However, the project also will create a new waterway connection by removing fill to accommodate the crossing which restores approximately 0.06 acres of the channel.

Timing and duration of construction activities:

It is anticipated that final project designs and permitting will be completed in the summer of 2016. Construction is anticipated to begin in the fall 2016/winter 2017 and be completed in early 2018. Construction is anticipated to range from 45-75 working days and involve mobilization of equipment and supplies; site preparation; excavation; structure installation; stabilization of disturbed areas; fill to accommodate road raise; guardrail installation; and final roadway improvements prior to demobilization upon final completion. Construction staging and

disturbances are anticipated to remain within the Project limits. Further details on construction will be developed as plans for the structure are finalized.

c. **Project magnitude:**

**Table 3: Project Magnitude**

<b>Total Project Acreage – Three-sided Concrete Structure</b>	3.38 acres
<b>Linear project length</b>	1,090 feet
<b>Structure span – open-flow area</b>	42 feet
<b>Total Excavation</b>	2,100 CY
<b>Above OHW</b>	700 CY
<b>Below OHW</b>	1,400 CY
<b>Total fill</b>	15,000 CY
<b>Above OHW</b>	10,000 CY
<b>Below OHW</b>	5,000 CY
<b>Net fill</b>	12,900 CY
<b>Above OHW</b>	9,300 CY
<b>Below OHW</b>	3,600 CY
<b>Number and type of residential units</b>	Not applicable
<b>Commercial building area (in square feet)</b>	Not applicable
<b>Industrial building area (in square feet)</b>	Not applicable
<b>Institutional building area (in square feet)</b>	Not applicable
<b>Other uses – specify (in square feet)</b>	Not applicable

d. **Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.**

Purpose

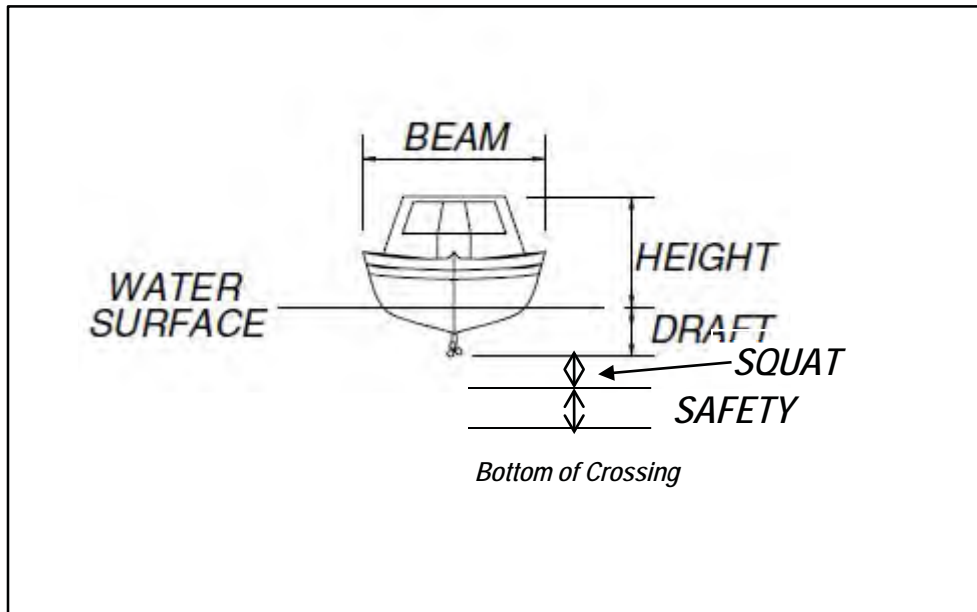
The purpose (primary goal) of the Project is to restore the ecological functions and services provided by the Grey Cloud Channel to a condition more reflective of a “natural<sup>3</sup>” system by reestablishing longitudinal connectivity with the Mississippi River. Secondary Project goals include no overtopping of Grey Cloud Island Drive South for the 1% chance flood event and the ability to allow the reasonable passage of recreational sized (small boat) that meets the following criteria (see **Figure 1**):

- Propeller boat maximum length range 16-21 feet;
- Maximum height 6 feet;
- Beam width 8 feet;
- Draft 2 feet;
- Squat 0.5 feet;
- Vertical safety clearance 3 feet; and
- Horizontal safety clearance 2 feet on each side of beam width.

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<sup>3</sup> A more natural condition is defined as at a minimum, the conveyance, flow, and hydraulic conditions, which existed prior to the installation of the current culverts assuming proper function. Furthermore, restoration of the “majority” of the historic ecological functions and services of the channel is expected by creating conveyance, flow, and hydraulic conditions similar to the condition that existed with a bridge, fully recognizing that this condition is not the historic ecological function and services provided by the meander in the absence of a crossing.

Figure 1: Design Vessel Diagram with Terms



### Need

The Grey Cloud Channel is a naturally formed, flow-through channel system, with flow currently blocked, creating a no-flow condition. Ecological functions and services provided by the Grey Cloud Channel are diminished, in part due to the loss of longitudinal connectivity to the Mississippi River. Longitudinal connectivity within a flowing system like the Grey Cloud Channel is necessary to:

- Provide suitable fish spawning and rearing;
- Allow for the unimpeded movement of fish and aquatic organisms (connectivity);
- Assure “normal” sediment transport and biogeochemical processes; and
- Avoid degraded water quality.

### Beneficiaries

The Grey Cloud Channel Restoration Project will benefit the public, local residents, federal, state, and local stakeholders. Restoration of this channel, meets in part the goals of the State of Minnesota’s Mississippi River Critical Area and the National Park Service’s Mississippi National River Recreational Area, of preserving and enhancing its natural, aesthetic, cultural, and historical value for public use and protect, preserve; and enhance the significant values of the Mississippi River corridor through the Twin Cities metropolitan area.

Local residents and users of this area will benefit from the restoration benefits provided by the project by restoring the use and function of the channel. Restoring flow through the channel results in benefits, including: reducing Chlorophyll-a concentrations which contribute to water quality (algae growth); offers a new recreational opportunity with watercraft access; fish and aquatic invertebrate access; and restoration of the channel’s natural sedimentation regime.

- e. **Are future stages of this development including development on any other property planned or likely to happen?**  Yes  No



**If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.**

Not applicable.

f. **Is this project a subsequent stage of an earlier project?**  Yes  No

**If yes, briefly describe the past development, timeline and any past environmental review.**

Not applicable.

**7. Cover types: Estimate the acreage of the site with each of the following cover types before and after development:**

**Table 4: Cover Types**

	<b>Before</b>	<b>After</b>		<b>Before</b>	<b>After</b>
<b>Wetlands</b>	0	0	<b>Lawn/landscaping</b>	1.65	1.74
<b>Deep water/streams</b>	0.96	0.70	<b>Impervious surface</b>	0.77	0.94
<b>Wooded/forest</b>	0	0	<b>Stormwater Pond</b>	0	0
<b>Brush/Grassland</b>	0	0	<b>Other (describe)</b>	0	0
<b>Cropland</b>	0	0			
			<b>TOTAL</b>	<b>3.38</b>	<b>3.38</b>

\*NWI Classification: R2UBH (Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded).

The project location is an area of high land use cover disturbance, which has likely altered the existing vegetative cover (grasses, shrubs, trees) over the years. The proximity of the roadway and other utilities (i.e., overhead power lines) within the project limits have undergone periodic or regularly scheduled maintenance over several decades (i.e., clearing and mowing of vegetation from the shoulder of the roadway, clearing of tree branches and trees from power lines, clearing of dead or dying trees, etc.). The “Wooded/forest” and “Brush/grassland” is applied only to areas where there have been relatively left undisturbed. Because there has been substantial disturbance as a result of previous mentioned maintenance activities, before and after land cover (outside of the Impervious surface and Deep water/streams) is addressed under Lawn/landscaping which applies if an area is regularly mowed or maintained. Approximately 2,600 square feet (0.06 acres) of the existing channel crossing is proposed to be removed and replaced with the three-sided concrete structure, therefore opening the channel. However, to accommodate roadway and structural design standards, the proposed roadway approaches to the three-sided concrete structure will raise the roadway approximately four feet, requiring increased side slopes extending into areas of the Deepwater/stream area; therefore, the “After” acreage is 0.26 acres less than the “Before” acres.

**8. Permits and approvals required: List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.**

**Table 5: Project Permits and Approvals**

<b>Unit of government</b>	<b>Type of application</b>	<b>Status</b>
US Army Corps of Engineers	Section 404 of Clean Water Act/Section 10 of the Rivers and Harbors Act Authorization	To be applied for
MN Department of Natural Resources	Public Waters Work Permit	To be applied for
MN Department of Natural Resources	General Permit No. 1997-0005 for Temporary Water Appropriation	To be applied for if necessary.
Federal Emergency Management Agency	Letter of Map Revision	To be completed by SWWD

**Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 9-18, or the RGU can address all cumulative potential effects in response to EAW Item No. 19. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 19**

**9. Land use:**

**a. Describe:**

- i. **Existing land use of the site as well as areas adjacent to and near the site, including parks, trails, prime or unique farmlands.**

The Project is located along Grey Cloud Island Drive South and is comprised of paved roadway, adjacent forested right-of-way and open water. Adjacent land includes the Grey Cloud Island Drive South alignment, open water and lands used for rural residential. The open water waterbody or “slow moving linear open water habitat” (as classified by the Minnesota Land Cover Classification System), the Grey Cloud Channel, is further discussed under **item #11** of this EAW. Grey Cloud Island Drive South connects adjacent communities to the Grey Cloud Island, which is also used by Aggregate Industries (Larson Quarry) for their limestone quarry.

- ii. **Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.**

The *Washington County 2030 Comprehensive Plan* (September, 2010) was adopted by the County Board as a policy guide for decisions about the physical development of the county. The plan provides policies and strategies for future growth and development related to land use, transportation, parks, housing, natural resources, historic preservation, and public facilities. The Washington County’s land use plan aims to preserve the existing natural resources, retain the county’s existing character, and provide high quality of life. The goals of this plan include utilizing land and related natural resources; support growth of attractive urban communities while preserving rural functions and appearances; and to support economic development by the design of the land use plan.

Washington County is the land use authority in Grey Cloud Island Township. The Project is located in an area of the county that is preserved for post-2030 development. Grey Cloud Island Township is described within this plan as an area residing along the Mississippi River, “containing large-lot residential development, one major rock quarry, and farm fields (Washington County, 2010). The plan notes that the township has a significant amount of floodplain and shoreline; no land use changes are proposed; and the continuation of limestone mining is encouraged. The Project resides within the Mississippi River Critical Area, which is recognized through the county’s zoning designations as an area residing within the Rural Open Space district. The project is also located within the regulatory floodplain. These special land use/zoning districts are subsequently discussed in item #9.a.iii. of this EAW. The county manages the Mississippi River Critical Area consistent with the Critical Areas Act of 1973 and the Governor’s Executive Order No. 79-19.

The *SWWD Watershed Management Plan* (WMP) (May 2011) provides guidance for the SWWD to manage water and natural resources of the watershed through the year 2017. The plan requires an inventory of resources, assessment of resource quality, and establishment of regulatory controls, programs, or infrastructure improvements necessary to manage the resources within the watershed. The SWWD plan commits the district to work closely with cities/townships within the watershed district and the county as they hold the land use planning and zoning responsibilities. Water quantity, water quality, and natural resources within the watershed district are addressed by studies/evaluations/assessments; technical framework development; and on-the-ground watershed improvements. Project and programs for implementing form a Long Range Work Plan for the SWWD.

The Grey Cloud Restoration Project is a capital improvement project, part of the SWWD Long Range Work Plan for the East Mississippi Subwatershed. The water quality goal for the SWWD is to “maintain, or where practical improve, the water quality of wetlands and water bodies within the District (South Washington Watershed District, 2011).” The Project is an “Action” item specifically identified under Policy WQ (water quality)-4 to “replace Grey Cloud Island earthen dam and culverts to restore flow through the Grey Cloud [Channel] and improve water quality (WMP, Chapter 5, page 81).”

The *Lower Pool 2 Restoration Project – Ecosystem Restoration Project Proposal* (July 21, 2010) is part of the Upper Mississippi River System Reach Planning prepared by the Minnesota Department of Natural Resources, Mississippi River Team (Lower Pool 2 Restoration Project, 2010). The plan identifies ecosystem objectives, performance criteria, and indicators for the Upper Impounded Reach of the River. The Lower Pool 2 Restoration Project is a five phased project developed through the coordination of an interagency group of professionals engaged in river management. The planning of the project(s) considered “unique and important ecosystem characteristics, factors limiting natural processes and the distribution and abundance of biota, ecosystem objectives, and performance criteria (Reach Plan for Upper Mississippi River System Ecosystem Restoration, Upper Impounded Floodplain Reach, 2010, p. 4)”. Pool 2 of the Upper Mississippi River comprises an area that spans from river mile 832.0 to 815.0. The Grey Cloud Channel Restoration Project is identified as part of the *Phase III Grey Cloud Slough and Baldwin Lake Connectivity Restoration* of the Lower Pool 2 Restoration Project, which involves the reestablishment of flow down the Grey Cloud Channel through Lower Mooers Lake. As stated in the plan, “the project involves the reestablishment of flow down Grey Cloud Slough through Lower

Mooers Lake...[and] restored connectivity of Grey Cloud Slough...will improve habitat conditions, provide migration corridor, and improve access (Lower Pool 2 Restoration Project, 2010, p. 12)”.

- iii. **Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.**

#### Washington County Zoning

The Grey Cloud Island Township zoning map is provided as **Appendix D**. Lands adjacent to the Project are classified within the *Single family Estate* zoning district, which also resides within the *Shoreland Management District* (Grey Cloud Island Township Zoning Districts, 2010).

As described in the Washington County Development Code, land use within the Single Family Estate District are intended for agriculture and single family residential use. This district provides residential areas in developing rural areas (Washington County , 1997, p. 7).

#### Shoreland Management District

The Project is located within the county’s Shoreland Management District. The Washington County Shoreland Management Regulations (Chapter 6 of the Washington County Development Code) is adopted pursuant to the authorization and policies contained in Minn. Stat., Ch. 103F, and the planning and zoning enabling legislation in Minn. Stat., Ch. 394.

#### Floodplain

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), National Flood Hazard Layer was consulted to review the location of regulatory floodplains in relation to the Project. This data for the Project area is presented on **Exhibit 4**. The Grey Cloud Island Drive South crossing at the Grey Cloud Channel is designated in “Zone X”. Zone X is an area determined to be outside 0.2% annual chance floodplains. The open water areas directly adjacent to the Project are designated as “Zone AE”. Zone AE represents an area subject to inundation by the 1%-annual-chance flood event. Adjacent lands are also rated Zone X, as areas with minimal flood hazard. The Mississippi River, at the mouth of the Grey Cloud Channel is rated AE and is designated as “Floodway”.

#### Mississippi River Designations

The Project is located within or near the following special districts/overlays associated with the Mississippi River:

- Minnesota Mississippi River Corridor Critical Area (MRCCA);
- National Park Service’s Mississippi National River Recreation Area (MNRRA) corridor;
- Designated State Water Trail;
- Regional Ecological Corridors; and
- Regionally Significant Ecological Areas.

The Mississippi River and its adjacent corridor was designated as a state critical area October 18, 1976 through Executive Order No. 130 then reaffirmed and continued March 27, 1979 through Executive Order 79-19. The Minnesota Legislature designated the National Park

Service, Mississippi National River and Recreation Area (MNRRA) as a state critical area in accordance with MN Stat., Chapter 116G in 1991. The MRCCA works in partnership with the MNRRA and share corridor boundaries. Local units of government and regional agencies are required to adopt critical area plans and regulations that comply with Executive Order 79-19. Local units of government and regional and state agencies are to permit development in the corridor only if in accordance with those adopted plans and regulations. This is implemented by Washington County's zoning regulations.

#### Minnesota Mississippi River Corridor Critical Area (MRCCA)

The MRCCA is a joint local and state program that provides coordinated planning and management for 72 miles of the Mississippi River, four miles of the Minnesota River, and 54,000 acres of adjacent corridor lands. The designated MRCCA reaches from Ramsey and Dayton, Minnesota, to the southern boundary of Dakota County on the west/south side of the river and the boundary with the Lower St. Croix National Scenic Riverway on the east/north side of the river, and runs through the heart of Minneapolis-St. Paul.

As described by the DNR, the purpose of designating the Mississippi River as a state critical area include:

- Protecting and preserving a unique and valuable state and regional resource for the benefit of the health, safety, and welfare of the citizens for the state, region, and nation;
- Preventing and mitigating irreversible damage to this resource;
- Preserving and enhancing its natural, aesthetic, cultural, and historical value for public use;
- Protecting and preserving the river as an essential element in the national, state, and regional transportation, sewer and water, and recreational systems; and
- Protecting and preserving the biological and ecological functions of the corridor.

Currently, the MRCCA is divided into five (5) land use districts: Rural Open Space; Unclassified (managed as Rural Open Space), Urban Open Space, Urban Developed, and Urban Diversified. Performance standards and guidelines for each land use district were established under Executive Order 79-19. These are implemented through local zoning ordinances (Mississippi River Corridor Critical Areas, 2016). The current MRCCA districts within the general region of the Project are shown in **Appendix E**. The Project is located within the Rural Open Space district.

In 2009 Minnesota Legislature appointed DNR to establish rules to replace the outdated standards in the Executive Order 79-19 for the MRCCA. Currently, the MRCCA rulemaking schedule anticipates the formal rule adoption process in 2016. With this, there are proposed changes to the land use districts, as shown in the **Appendix F**. As shown in the (attached) *Proposed MRCCA Districts in Preliminary Draft Rules* map, the land use district categories have been further refined. The Project is shown to be located within a *River Neighborhood District*. This project is assessed under existing conditions and this information was provided for additional context.

National Park Service, Mississippi National River Recreation Area (MNRRA) Corridor  
The National Park Service (NPS), MNRRA is a 72-mile long river park located along a stretch of the Mississippi River from Ramsey/Dayton in the north to just south of

Hastings. This area offers fishing, boating, canoeing, birdwatching, bicycling, and hiking recreational activities. There are many unique destinations including visitor centers and museums. The NPS owns 67 acres of the 54,000 acres within the boundaries of this area. City/regional/and state parks, a national wildlife refuge, state scientific and natural areas, along with private homes and businesses are located along this stretch. (National Park Service, accessed January 28, 2016)

#### State Water Trail

The Mississippi River is a designated State Water Trail as is the southern portion of the Grey Cloud Channel (see to DNR map, **Appendix G**).

#### Regional Ecological Corridors

The DNR *Regional Ecological Corridors* was developed with the purpose to help make regional scale land use decisions, especially relating to balancing development and natural resource protection. The Project is not within, but is directly adjacent to the Regional Ecological Corridor overlay (**Exhibit 5**).

#### Regionally Significant Ecological Areas

The DNR *Regionally Significant Ecological Area* was developed with the purpose to help make regional scale land use decisions, especially as it relates to balancing development and natural resource protection. The Project area/this portion of the Grey Cloud Island Drive South crossing is not located within, but is directly adjacent to the Regionally Significant Ecological Area overlay(**Exhibit 5**).

b. **Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.**

The Grey Cloud Channel Restoration Project conforms to land use, zoning, and other applicable plans. The Project fulfills local and regional planning efforts to restore the Grey Cloud Channel to its natural state, as part of the Mississippi River.

#### Land Use

The Project is compatible with existing land uses. The Project is not significantly or permanently altering the land or its current uses whereby its effects result in degrading below current environmental conditions in the area.

#### Plans

- Washington County 2030 Comprehensive Plan

The Project is compatible with Washington County's 2030 Comprehensive Plan, and will not be altering existing land uses. The Project will restore the natural functions of a native flow-through, breakout reach of the Mississippi River. This Project corresponds with goals outlined for the natural resources in the county:

- Utilize land in a manner that minimizes the impact on the county's natural resources
  - The Project will be constructed in a previously impacted area and will restore natural resources within the county.
- Protect surface water resources through coordination and collaboration with state and local water resource organizations;

- There are several project partners and stakeholders incorporated in the development of this project (e.g., USACE, NPS, FWS, DNR, Washington County, and Grey Cloud Island Township).
  - Preserve, manage, and utilize resources to promote a healthy environment for present and future generations.
    - By re-establishing connectivity the resource will improve the health of the local environment, improve water quality and recreation for future generations.
- South Washington Watershed District (SWWD) Watershed Management Plan (WMP)  
The Project is compatible with the SWWD WMP. The Project will fulfill the Watershed's water quality goal(s) for implementing a capital improvement project by replacing the Grey Cloud Island earthen dam (the fill at the crossing of Grey Cloud Island Drive South and culverts to restore flow through the channel and improve water quality.
- Lower Pool 2 Restoration Project – Ecosystem Restoration Project Proposal  
The Project is compatible with the USACE's Lower Pool 2 Restoration Project. The Project will fulfill the project planning efforts to restore Lower Pool 2 of the Upper Mississippi River System by reestablishing the flow through the Grey Cloud Channel, which will improve habitat conditions, provide a migration corridor, and improve access.

### Zoning

- Washington County Districts  
The Project is generally compatible and will comply with the Washington County Development Code. Because the Project restores a flow path that presently does not exist, the project will alter the existing floodplain and regulatory flood elevations downstream. The changes in the predicted 100 year flood elevations calculated in the HEC-RAS modeling were compared to LiDAR elevations and downstream structures were identified on aerial imagery. One structure, located near the mouth of Mooers Lake, was identified as potentially affected by changes in 100 year flood elevations. This structure is located within the effective 100-yr floodplain. Modeling indicates the Project alternatives will increase the 100-yr water surface by less than a tenth of a foot, which is within the model error, compared to the existing condition. The project will require a Letter of Map Revision (LOMR) to address the changes in flood elevations. The SWWD will work with the appropriate agencies to complete the LOMR process. This project will minimize and control erosion to public waters during its construction, as prescribed under the Washington County, Shoreland Management Regulations (Chapter 6 of the Washington County Development Code).
- Mississippi River Designations  
The Project is in compliance with the rules and regulations associated with the special districts and overlays designated for this portion of the Mississippi River. The Project will be in compliance with Washington County's zoning, which corresponds to the regulations defined under the MRCCA/Executive Order 79-19. The restoration of the Grey Cloud Channel will result in the improved channel function and ecosystem services that the channel has historically provided.

- c. **Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.**

The project is compatible with the plans identified in 9b and no mitigation for incompatibilities is required.

**10. Geology, soils and topography/land forms:**

- a. **Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.**

Geology

The bedrock geology underlying most of Washington County, including the Project area, is the Lower Ordovician, Prairie du Chien Group. Thickness of this formation in the vicinity of Project area ranges from 0-100 feet. The Prairie du Chien group is known to contain abundant fractures and openings whereby in some areas sinkholes and caves occur, indicative of “karst” areas. Karst locations are found within the vicinity of the Project area, though outside of the Project limits. The surficial geology in the Project area is primarily Floodplain Alluvium (loamy), Lower Terraces, and the lowest River Warren terrace. Refer to **Exhibit 6** for surficial geology and karst locations in relation to the Project. It is anticipated that the Project will not have adverse impacts or degrade below existing conditions of these karst features.

Geotechnical analyses for the Project confirmed bedrock in borings advanced in August 2012 at depths approximating 34 and 59.5 feet. These depths correspond to approximate elevations of 641.5 and 664.5 feet. The bedrock is dolomite and sandstone of the Prairie du Chien formation. The rock is generally light brown, variably weathered and of variable quality. Further discussion of the geotechnical work conducted for the Project is provided under **item 10.b**.

- b. **Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 11.b.ii.**

**NOTE: For silica sand projects, the EAW must include a hydrogeologic investigation assessing the potential groundwater and surface water effects and geologic conditions that could create an increased risk of potentially significant effects on groundwater and surface water. Descriptions of water resources and potential effects from the project in EAW Item 11 must be consistent with the geology, soils and topography/land forms and potential effects described in EAW Item 10.**



Grey Cloud Township is located within an area of relatively low relief as it resides along the floodplain of the Mississippi River. The channel itself is relatively flat with approximately 3 feet elevation difference from the mouth of the channel to its outlet at Mooers Lake. The United States Department of Agriculture, Natural Resources Conservation Service (NRCS), Web Soil Survey was consulted to assess the soil types present within the Project limits. These mapped soil type locations are presented within **Appendix H** and NRCS soil type descriptions presented in **Table 6**.

*Table 6: NRCS Soil Types*

<b>Map Unit Symbol</b>	<b>Map Unit Name</b>	<b>Hydrologic Soil Group Rating<sup>4</sup></b>	<b>Acres in Project limits</b>	<b>Percent in Project limits</b>
<b>100B</b>	Copaston loam, 0-6% slopes	D	0.4	11.9%
<b>329</b>	Chaska silt loam	B/D	1.1	31.5%
<b>1819F</b>	Doretton-Rock outcrop complex, 25-65% slopes	B	1.2	35.2%
<b>W</b>	Water		0.7	21.4%
<b>Totals for Project limits</b>			3.4	100.0%

NRCS farmland classifications for the soils in the Project limits indicate that the Copaston loam (0.4 acres/11.9% of the project area) are farmlands of statewide importance. The area with this designation is in the northern extent of the Project and mainly comprises the roadway and those areas to be cleared/grubbed. Given the previously disturbed environment in which these soils are found, the Project will not adversely impact native, undisturbed soils or soils with farmland classification(s). These areas are not suitable for farming or farmland.

The current embankment of Grey Cloud Island Drive South crossing has been determined to be primarily composed of fill material. Two geotechnical assessments were conducted for the Project in 2011 and 2012 (refer to **Appendix I** for the resulting boring logs). The first was conducted March 2011 whereby four penetration test borings along Grey Cloud Island Drive South, in the anticipated area of the proposed structure were advanced. The 2011 borings encountered mixed, but generally sandy fill to depths reaching approximately 31 feet. The fill had a wide variability of competence and consistency; the fill locally appeared to contain voids underlain with alluvial soils. The second geotechnical assessment (August 31, 2012) was conducted to compliment the four 2011 borings. Two additional penetration test borings were

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<sup>4</sup> According to the NRCS: Hydrologic soil groups are based on estimates of runoff potential.

Group B: Soils with moderate infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of moderately deep/deep, moderately well drained or well drained soils with moderately fine texture to moderately coarse texture. These soils have a high rate of water transmission.

Group D: Soils have very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soil with a high water table, soils with a claypan/clay layer at or near the surface, and soils that are shallow over nearly impervious material.

extended to refusal on apparent bedrock at depths of 37 and 59.6 feet. Five-foot long rock cores from below the borings' termination depths were obtained to determine material composition.

The borings encountered 14-35 feet of existing embankment fill before terminating in or penetrating localized organic deposits, and alluvial soils. The existing fill is granular, consisting of poorly graded sand to silty sand and was variable in apparent compaction. The alluvial soils encountered below the existing fill were also generally granular, but varied in composition from silty and clayey sand, to poorly graded sand, to poorly graded gravel.

With the large degree of uncertainty in the makeup of the road embankment relative to its structural integrity additional geotechnical analysis will be conducted as the project continues to progress. Slope stability analyses indicated that the existing embankment slopes are marginally stable. Embankment improvements will accommodate for flatter slopes in the submerged zone to provide developing a stable platform for construction above water. These improvements will be driven partly by design requirements of a maximum 3:1 (horizontal:vertical) slope below the normal water level, and a maximum 2.5:1 slope above the normal water level.

## 11. Water resources:

### a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

- i. **Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.**

#### Mississippi River<sup>5</sup>

The Project is located within the Lower Pool 2 of the Upper Mississippi River Basin, extending from RM 832.0 to 815.0. Lower Pool 2 is located above Lock and Dam 2 in an area encompassing Pig's Eye Lake, Baldwin Lake, River Lake, Spring Lake, Mooers Lake, and the Grey Cloud Channel. Lower Pool 2 is very popular for recreational boating and fishing. However, due to the water quality issues, limited fish consumption from these waters is recommended.

Lower Pool 2 is highly dynamic and highly altered. This reach of the river is significantly influenced by the Minnesota River and Lock and Dam 2. The Minnesota River enters pool 2 approximately 16 miles upstream of the project. The MN River Basin adds a contributing watershed of 15,000 square miles from a predominantly

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<sup>5</sup> MDNR publications and the USACE *Lower Pool 2 Restoration Project* report (July 2010) are sources of this discussion.

MDNR websites: *More about the Mississippi River: Fort Snelling to Hastings*,

[http://www.dnr.state.mn.us/watertrails/mississippiriver/nine\\_more.html](http://www.dnr.state.mn.us/watertrails/mississippiriver/nine_more.html).

*Mississippi River Pool 2*, <http://www.dnr.state.mn.us/areas/fisheries/eastmetro/rivers/pool2.html>.

rural landscape. The MN River contributes high concentrations of suspended sediment and large woody debris to this portion of the river reach.

Lock and Dam 2 was developed to provide and maintain a suitable navigation channel for barge traffic on the river in part by holding water levels higher behind the dam. These higher water levels within Pool 2 have increased the backwater areas and provided increased lateral connectivity by providing greater submerged area within the pool. The pool creates a depositional environment for sediment as the transport capacity is reduced by the slower velocities in portions of the pool. Spring runoff normally generates the highest flows and river velocities. In summer months, Lower pool 2 is considered as having low velocity flows.

The MPCA, *Impaired Streams 2012* spatial data was consulted in conjunction with the Proposed 2014 Impaired Waters List to assess the impairments within a one mile radius of the Project. The Project is located within the reach of the Mississippi River, from the Rock Island Railroad Bridge to Lock and Dam 2 (RM 830 to 815.2) (14.47 miles) (ID 07010206-502). The affected designated uses are for:

- Aquatic consumption
  - Pollutant/stressor (year added to list):
    - (1998): mercury in fish tissue; mercury in water column; PCB in fish tissue;
    - (2008): Perfluorooctane Sulfonate (PFOS) in fish tissue; and
    - (2014): PFOS in water column.
- Aquatic life
  - Pollutant/stressor
    - (1998): Total Suspended Solids (TSS)

This river reach is categorized as a 5B stream, which is impaired by multiple pollutants and has (at least) one TMDL study plan approved by the U.S. Environmental Protection Agency. The *Minnesota Mercury – Southwest Region*, is the EPA-approved TMDL for this reach (dated March 27, 2007, ID# 32414) and uses a regional approach and establishes regional allocations (U.S. Environmental Protection Agency, 2007).

#### Grey Cloud Channel

The Grey Cloud Channel is included in the DNR Public Waters Inventory as a Public Water Basin, part of the U.S. Lock and Dam #2 Pool (main channel) (ID 19000500). The Grey Cloud Channel is a historical (long-existing), flow-through (open) breakout reach of the Mississippi River. This channel was formed by the naturally occurring and dynamic processes of the river and was maintained with separate breakout flow from the river. The upstream portion of the channel nearest the main river channel is only 2-3 feet in depth. This is currently caused by suspended sediment deposits entering the stagnant channel area.

The inlet of channel has remained relatively unchanged through time. This can be observed in the historical aerial imagery provided in **Attachment A**. The Grey Cloud Channel is historically characterized with gentle meanders, most notably in the

southern portion of the channel, which are best observed in the 1937-1957 photographs. From 1964-present, the influences of the backwaters<sup>6</sup> from Lock and Dam 2 are observed by the dissipation of those channel meanders as the surface waters widened.

The natural dimensions of the Grey Cloud Channel have been changed through time. This has occurred by the influences of Lock and Dam 2 and loss of flow through the channel system after the 1965 road raise. From the time Lock and Dam 2 was operational (1931) the channel did not receive discharge large enough to be significantly affected by backwater at this location. Early photographs from 1937 and 1940 show channel dimensions relatively uniform throughout the upper and lower Grey Cloud Channel. This is likely and anticipated to be the size of the channel to form under open-flow conditions after the Project has been constructed.

The water quality issues caused by the lack of connectivity with the Mississippi River are one of the primary reasons for the proposed channel restoration. The natural hydrology of the Grey Cloud Channel was changed with the introduction of no-flow conditions through the reach. The primary biological processes that modify water quality is the growth and senescence of algae and aquatic plants and this is associated with residence time of water within the channel and nutrient concentrations in the water column. The stagnant waters allowed for an environment conducive to algal blooms, which are due to phosphorus concentrating in the water column over time and also increases in the normal water temperatures. Indicative of the poor water quality within the channel, large algae blooms are experienced and the amount of milfoil has increased through time. The result is a decrease in indigenous types and abundance of aquatic wildlife and plants.

#### Navigability

Current navigational access is limited by the obstructed culverts at the crossing. This means that navigation and recreational use of the Grey Cloud Channel is through access from either the upstream and downstream connections to the river.

#### Wetlands

A wetland delineation was conducted for the Project. Field work was conducted on October 8<sup>th</sup>, 2015 and assessed the area within the public road right-of-way along Grey Cloud Island Drive S between Grey Cloud Trail South and 99<sup>th</sup> Street South. (Wenck Associates, 2015)

The delineation report concluded that no wetlands were identified within the area of the project. The wetland delineation suggests that the only aquatic resources at the

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<sup>6</sup> “Backwater” is defined as a condition in which the water surface elevation is raised by downstream flow impediments (USACE, Coastal and Hydraulics Laboratory, Glossary, accessed 20160217, <http://chl.erdc.usace.army.mil/glossary>). In the case of the Grey Cloud Channel, the flow impediment is Lock and Dam 2, which impacts the water surface elevation (more so in the southern portion of the channel) and also the suspended sediment that that impeded water carries.

site are those associated with the Grey Cloud Channel and are regulated solely by the USACE and as a Public Water by DNR,

The USFWS, National Wetlands Inventory (NWI) data was consulted in the vicinity of the Project (**Exhibit 7**). The NWI identified an approximate one-acre Freshwater Pond (PUB) location directly south, approximately 100 feet from the Project boundary. This waterbody is described as having a palustrine unconsolidated bottom (PUB). A 0.32 acre Freshwater Emergent Wetland (PEMC) is located approximately 480 feet southeast of the project. This waterbody is defined as a seasonally flooded, palustrine emergent system.

- ii. **Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.**

#### Depth to Groundwater

The Project is located along the Prairie du Chien and Jordan aquifers (Washington County, Minnesota, adopted September 23, 2014). The Prairie du Chien Group limestone aquifer is relatively thick and porous unit, located at a depth of approximately 134-203 feet below ground elevation. The Jordan Sandstone aquifer is also a relatively thick and porous unit, found at a depth of approximately 66-96 feet (Washington County Groundwater Plan, 2014-2024).

Groundwater within the existing embankment is close in elevation to open water areas on either side of the roadway crossing and the groundwater would be expected to be associated with the river in this area. Based on the Project geotechnical assessments, groundwater was estimated to be encountered between 12.5 and 19 feet below ground elevation. These results are fairly consistent with water levels in adjacent open water areas where the normal water level is approximately 14 feet below the embankment crest. Seasonal and annual water level fluctuations do occur and may rise and fall to some extent in sync with adjacent open water levels.

#### MDH Wellhead Protection Area

The Project is not located within a MDH Wellhead Protection Area.

#### Nearby Wells

The Minnesota Department of Health, Minnesota Well Index data was consulted to review the presence of wells in the vicinity of the Project. There are three (3) active domestic wells and seven (7) undefined wells (Unique Well Numbers are listed below) within a 500 foot radius of the Project limits. The locations of wells and Unique Well Numbers are shown in **Exhibit 8** with well logs provided in **Appendix J**.

- 123507 (active domestic)
- 531424 (active domestic)
- 761663 (active domestic)
- 257635 (undefined)
- 257637 (undefined)
- 257688 (undefined)
- 257689 (undefined)
- 257690 (undefined)
- 257691 (undefined)
- 257692 (undefined)

**b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.**

**i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.**

The Project will not be generating any wastewater.

**1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.**

Not applicable.

**2) If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.**

Not applicable.

**3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges.**

Not applicable.

**ii. Stormwater - Describe the quantity and quality of stormwater runoff at the site prior to and post construction. Include the routes and receiving water bodies for runoff from the site (major downstream water bodies as well as the immediate receiving waters). Discuss any environmental effects from stormwater discharges. Describe stormwater pollution prevention plans including temporary and permanent runoff controls and potential BMP site locations to manage or treat stormwater runoff. Identify specific erosion control, sedimentation control or stabilization measures to address soil limitations during and after project construction.**

Stormwater runoff in the Project area after construction is complete is anticipated to be similar to existing conditions. The Project will not be altering the land use patterns of the area. An area no greater than 2.46 acres will be required to be cleared to accommodate grading and for clearing within the Project limits. Any disturbed areas will be stabilized and/or seeded with an approved native seed mix to reestablish the ground and prevent erosion and sedimentation. Additional best management practices (BMPs) will be determined in conjunction with final Project design plans.

A MPCA Construction Stormwater Permit will be applied for and a construction Stormwater Pollution Prevention Plan (SWPPP) developed prior to commencing Project construction activities. The SWPPP will identify the potential construction stormwater discharge concerns and corresponding runoff controls and BMPs that will be implemented during Project construction to prevent, limit, manage, and control potential stormwater pollutants.

- iii. Water appropriation - Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation.**

Dewatering maybe required for some foundations work at the crossing; however, no specific requirements or specifications have been developed. In the event that dewatering is required, it is anticipated that it will not exceed the volume limits authorized by a DNR General Permit for Temporary Water Appropriation. The groundwater table that would be effected by any dewatering would be the near surface groundwater associated with the adjacent river level.

**iv. Surface Waters**

- a) Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed, and identify those probable locations.**

There are no anticipated physical effects or alterations to wetlands from the Project.

- b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss**

**how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.**

Mississippi River

The Project is part of a larger restoration effort for Lower Pool 2 of the Mississippi River and therefore will, in part, contribute to the following benefits:

- Improving a more natural stage hydrograph;
- Improving water clarity;
- Restore a sediment transport regime so the transport, deposition, and erosion rates and geomorphic patterns are within acceptable limits;
- Restore habitat connectivity;
- Restore riparian habitat;
- Restore aquatic off-channel areas; and
- Restore terrestrial floodplain areas.

The Project will not adversely impact or result in the existing conditions of the river to deteriorate.

Grey Cloud Channel

Direct impacts from construction to the Grey Cloud Channel will be temporary and locally confined within the Project limits during construction. Constructing the project requires excavation of the existing embankment and placement of fill to complete the structure design. The Project design requires approximately 1,400 CY of excavation (at a depth of approximately 3 feet) below the OHW which includes removal of roadway embankment within the 42-foot wide structure span (open-flow area) with subsequent 5,000 CY of fill below the OHW. There will be approximately 3,600 CY of net fill below the OHW at an average fill-depth of six (6) feet. Approximately 0.26 acres of open water located within the channel bed and along the road/three-sided structure embankments will be replaced with fill to accommodate for the structure design height and raise the elevation of the roadway alignment. The open-flow area created at the channel crossing is approximately 0.06 acres (2,600 sq. ft.).

Following Project construction, anticipated environmental effects to the Grey Cloud Channel will provide long-term benefits. The channel will be restored to a condition more reflective of a “natural” system and its ecological functions and services will be restored, and consist of the following:

- Restoration of typical stream dynamics, including developing, with time, dynamic sediment balance and waterway geomorphic stability;
- Improved water quality, expressed in reduction of nutrient concentrations in the channel (i.e., total phosphorous and algae (chlorophyll-a) concentrations) relative to upstream (Mississippi River) and downstream;
- Passage of fish and other aquatic species, which will, through time, enhance the aquatic biodiversity and abundance within the channel.

Under existing conditions there is no flow in the channel, and the surface water elevation is controlled by Mooers Lake and Lock and Dam 2. The water surface of the channel north of the Grey Cloud Island Drive South crossing is also flat and



largely defined by the elevation of the water surface of the Mississippi River. The Feasibility Study<sup>7</sup> determined 100-year flood<sup>8</sup> (150,000 cfs) elevations will increase approximately 1.5 feet just downstream from the crossing when compared to existing conditions. This increase will taper off to approximately a 0.3 foot increase on the downstream portion of the channel. All of the increases in 100-year flood elevations occur downstream of the Grey Cloud Drive crossing. Once flow is introduced below the Grey Cloud Island Drive S crossing, there is an increase in the water surface elevation. With the increases in 100 year flood elevations along the Grey Cloud Channel there is one structure near the mouth of Mooers Lake on the north side that is already shown in the effective floodplain. The 10-year flow (83,000 cfs) will increase from existing conditions, ranging from 2.4 – 0.3 feet.

Post-Project Sedimentation

The Grey Cloud Channel is a naturally formed channel that exists as a breakout reach of the Mississippi River. The channel is not subject to the same sedimentation conditions as with short side-channels that are laterally connected with the main river channel or backwater lakes that are initially formed by dredging and excavation. Typically, short side-channels are more directly part of the main river channel and manmade channels are more prone to sedimentation.

Sedimentation and scouring are processes characteristic of natural stream dynamics. The geomorphological process that formed the original channel are expected to return upon the restoration of flow. Sedimentation occurs as a function of the stream balancing flow volumes and sediment loading to reform the natural, stable channel dimension. The Project will not result in the Grey Cloud Channel filling in with sediment, as the channel re-establishes a natural, stable channel dimension. The channel has a difference in water surface elevation (approximately 2-3 feet) between the upstream and downstream ends and will continue to maintain flow after open-flow conditions are reestablished within the channel. Any remaining sediment build-up is minimal – less than an inch per year, as presented in the Feasibility Study.

The total sediment loads presented in the Feasibility Study (**Table 7**) appear large (i.e., tons per year), but over the summer months, this is considered minimal. These results are not atypical and do not indicate concern for excessive sedimentation within the Grey Cloud Channel.

*Table 7: Sediment Transport Results Loading Summary April through September<sup>9</sup>*

<b>Total incoming sediment load (tons)</b>	<b>Accumulated mass April to September (tons)</b>	<b>Percent of sediment deposited in reach</b>	<b>Estimated deposition amount per year</b>
14,381	5,150	36%	0.05 feet

<sup>7</sup> Feasibility Study, pp. 19-21

<sup>8</sup> A flood that has a 1 in 100 chance of being equaled or exceeded in any 1 year and has an average recurrence interval of 100 years.

<sup>9</sup> Feasibility Study, pp. 26.

The Feasibility Study noted sediment deposition through the lower end of the channel. The study also noted sediment deposition occurring through the lower portion of the channel is due to the nominal widening of the channel. This widening of the channel is largely due to the backwater from Lock and Dam 2, and is therefore, not a true change in the geometry of the channel width. Without the presence of Lock and Dam 2 the channel would have a fairly uniform width throughout the reach. This is evident in the historic aerial photography as previously discussed.

The Project will provide for approximately 4-6% of the total Mississippi River flow to enter the Grey Cloud Channel. The Feasibility Study evaluated erosion potential during larger flows. Using the estimated 100-year discharge event, results indicated some scour around the inlet to the channel with some local scour around the bridge. This will be mitigated by placing riprap under and around the structure. The Feasibility Study shows the remaining portion of the channel is “stable” with no erosion and deposition occurring on the downstream end of the reach. The channel is anticipated to remain stable even in larger flood events<sup>10</sup>. The Project will not result in adverse impacts or degrade below existing conditions of the riparian areas within the Grey Cloud Channel. It is anticipated that through time, the project will result in restoration of the biodiversity and ecological integrity of the channel, including the health of the riparian areas.

In conclusion, the Project will not result in excessive sedimentation, scour and erosion that would adversely impact or degrade below existing conditions within the channel. The Project is anticipated to restore natural/typical stable stream dynamics within the channel (e.g., stream dimension, pattern, and profile; balanced sediment transport). It is also important to maintain considerations to the fact that there are larger contributing forces influencing the stream dynamics within the channel, specifically, the influences of the Mississippi River and Lock and Dam 2.

#### Water Quality Benefits & Ecosystem Services

The benefits of the Project will result from the re-established hydrologic regime within the Grey Cloud Channel system. As the residence time of water decreases with the reintroduction of flow through the channel, biological and biogeochemical processes have less time to modify the quality of the water entering the channel. The existing poor water quality conditions developed under the stagnant channel environment will immediately be improved.

Water quality is a primary element of restoration and achieving high water quality will improve many other ecological characteristics in the channel. Because the presence of algae in a waterway is indicative of water quality within that system, the Feasibility Study assessed water quality as a measure of residence time and Chlorophyll-a concentrations (algae) in the channel. As the study revealed, increased discharge or flow at the crossing compared to existing (no-flow) conditions results in a decrease of the algae concentrations through the channel and improvement of the existing water quality.

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<sup>10</sup> Feasibility Study, pp. 27

It is anticipated that the channel will experience the water quality improvements immediately after the project has been constructed. Habitat and biota improvements are anticipated soon after Project completion, and incrementally developing and improving over the long-term.

Reestablishing longitudinal connectivity with the Mississippi will also benefit the channel with the reintroduction and future reestablishment of indigenous fish and vegetation. The Feasibility Study considered structure design criteria that would be necessary to accommodate for fish passage (i.e., a fish's burst velocity, sustained swimming speed, and upstream traverse distance). According to the study, the bridge structure would be passable up to a Mississippi River flow of 59,400 cfs. However, it is likely the structure would be passable for nearly all flows due to the refugia provided by the bridge piers and the riprap substrate.

Temporary construction disturbance associated with the Project is not anticipated to adversely impact the channel water quality and/or degrade it below existing conditions.

#### Recreational Navigability

The Project will open the channel and allow for more readily accessible watercraft navigation through the channel. The project alternatives provide varied levels of navigational clearance based on the lowest chord of the structure. The present condition provides no navigational clearance through the project site and effectively blocks any watercraft that are not able to be portaged around. Therefore, any opening that passes typical watercraft will be an improvement over the present condition. The Project resides within the Mississippi National River and Recreational Area and is recognized to have the highest amount of recreational boating traffic on the Upper Mississippi River System; there is potential for increased urban recreational use (U.S. Army Corps of Engineers, 2011). Exact numbers or estimates are not known at this time.

## **12. Contamination/Hazardous Materials/Wastes:**

- a. **Pre-project site conditions - Describe existing contamination or potential environmental hazards on or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.**

The MPCA, *What's in My Neighborhood?* online database was consulted and there are no known existing contamination or potential environmental hazards on or in close proximity to the Project.

- b. **Project related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify**

**measures to avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.**

Construction of the project may generate minimal solid waste. The Project contractor will be responsible for proper, off-site disposal/recycling of any construction solid waste (e.g. existing culverts and fill material).

- c. **Project related use/storage of hazardous materials - Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any above or below ground tanks to store petroleum or other materials. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.**

Construction of the Project will require machinery and equipment to be mobilized onsite. There will be no storage of any chemicals/hazardous materials onsite. Vehicular fluid from typical construction and operational machinery is the largest source of toxic or hazardous materials. It is anticipated that potential for accidental spill or release of toxic or hazardous materials from construction operations is low, but the project is being constructed within an open water environment. Refueling and general maintenance requiring machinery will be conducted away from surface waters and equipment will be regularly inspected and repaired to prevent inadvertent loss of fuels, oils, or hazardous fluids. The contractor would be required to prepare a Spill Prevention and Response Plan that would address measures to avoid and/or minimize spills or releases of any hazardous material or petroleum products during construction activities. Spills will be reported to the Duty Officer, MPCA, and Washington County.

- d. **Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.**

There will be no generation or storage of hazardous wastes with this Project.

**13. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):**

- a. **Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.**

Fish

The Grey Cloud Channel is located within Pool 2 of the Mississippi River, which recognized as a valuable resource for game fishing within Lower Pool 2 of the Mississippi River. Grey Cloud Island offers shoreline fishing, according to the DNR, anglers use both sides of Grey Cloud Island Drive South at the outlet to Mooers Lake and the Grey Cloud Trail Bridge. According to the DNR, East Metro Area Fisheries Office, Lower Pool 2 contains walleye, sauger, small mouth bass, largemouth bass, white bass, bluegill, crappie, northern pike, and catfish. Walleye and sauger are present, with potential for trophy specimens; Lower Pool 2 is known to have the best population of quality walleye and sauger in the area. These fish species concentrate between St.

Paul airport and I-694 bridge during autumn and winter months. Catfish (flathead catfish and channel catfish) are present, with potential for trophy specimens. Smallmouth bass are slightly over-fished, though present in good numbers. Largemouth bass are limited to the backwater areas like the Grey Cloud Channel, Mooers Lake and downstream waters. Lower Pool 2 is open for fishing year round, though walleye, sauger, largemouth bass and smallmouth bass are catch and release only. (Minnesota Department of Natural Resources, accessed February 2016)

Eurasian water milfoil and zebra mussels are aquatic invasive species that are present within Lower Pool 2 of the Mississippi River. The project does not contribute to the spread or increased risk of increasing propagation of these species as the channel is presently open on both sides of the Grey Cloud Island Drive South crossing and no new vector will be created.

### Wildlife

Wildlife resources in the area of the Project are typical of a suburban landscape. Common wildlife species include striped and spotted skunks, short and long-tailed weasel, coyotes, woodchucks, raccoons, ground squirrels, chipmunks, moles, gophers, bats, voles, rates, porcupines, mice, and shrews. Common birds include American kestrel, killdeer, rock dove, mourning dove, common flicker, red-headed woodpecker, horned lark, tree swallow, barn swallow, blue joy, American robin, house wren, starling, house sparrow, red-wing blackbird, common grackle, brown headed cowbird, and American goldfinch. Herons, egrets, hawks, and eagles can be frequently observed within the vicinity as well. No Wildlife Management Areas are found within or directly adjacent to the Project limits.

- b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-805) and/or correspondence number (ERDB \_\_\_\_\_) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.**

### Minnesota Department of Natural Resources – Natural Heritage Information System

The DNR, Natural Heritage Information System (NHIS) (LA-805) was consulted to identify rare features directly within the Project limits and those that may be downstream of the structure crossing. This assessment was conducted to review the area of direct impact associated with construction and the downstream area which will be influenced after construction, once flow through the channel has been reestablished. There is one (1) plant species directly within the Project limits that has the potential to be impacted – the Laurentian Bladder Fern (*Cystopteris laurentiana*). A native plant community is located downstream of the Project on the south side of the Grey Cloud Channel – “Oak - (Red Maple) Woodland Type, Terrestrial Community”.

The Laurentian Bladder Fern (*Cystopteris laurentiana*) is a vascular plant belonging to the Dryopteridaceae family. This plant is on the DNR Watchlist. This plant is a native to MN, Iowa, Wisconsin, Illinois, Michigan, along with other northern most states and northeastern provinces of Canada (Plants Database, accessed January 27, 2016). This fern is commonly found in moist, mostly wooded slopes and ledges in circumneutral soil (Wisconsin Department of Natural Resources, accessed January 27, 2016). According to the NHIS record, this particular siting was first and last observed May 17, 1941; this is a historical siting. Because of the location and last

observation being over 20 years ago, it is not anticipated that this plant species is within or in the near vicinity of the Project limits. The Project will not adversely impact or degrade below existing conditions for the Laurentian Bladder Fern.

The NHIS record of the Oak – (Red Maple) Woodland type (FDs37a) is an approximate 40-acre native plant community located downstream of the Project was last observed July 30, 1987. The site is described as a mixed oak forest on level terrace of Upper Grey Cloud Island, dominated by *Quercus macrocarpa* with some *Populus tremuloides*, *Tilia Americana*, and *Celtis occident – Alis*. Trees were recorded to be of low stature and small diameter with understory brushy with exotic shrubs and thorny native shrubs. The site has had a long history of disturbance by both Native American and non-Native American settlers. Soils are thin sandy-loam mantle over sandstone bedrock currently quarried for stone. The date this record was first completed, or since then, comprehensively revised is June 15, 1993.

This site is recognized on the Minnesota County Biological Survey (MCBS) as *Grey Cloud Island 24* (MCBS site number 46) residing within the Mississippi National River and Recreation Area. The record provides the site with a subnational rank of S4, indicating that the relative rarity or endangerment of this taxon/community in Minnesota is apparently secure and usually a widespread terrestrial community type. The exact status of this site has not been assessed and the site has an element occurrence rank of CD; a site with fair of poor estimated viability.

#### MCBS - Native Plant Communities and Sites of Biodiversity Significance

The Project is not directly within an area with MCBS-Native Plant Communities. There are two Oak Forest (Central) Mesic Subtype native plant communities downstream of the Project on the south side of the channel. The southern portion of the Project is directly within a MCBS – Site of Biodiversity Significance (MCBS-SBS ID 82046000). The site is ranked and described as a site below minimum biodiversity significance threshold. MCBS Sites of Biodiversity Significance and Native Plan Communities are shown in **Exhibit 9**.

#### Northern Long-eared Bat

The Northern Long-eared Bat was recently federally listed as a threatened species under the Endangered Species Act (ESA) (Federal Register, April 2, 2015, Vol. 80, No. 63). The bat was listed under the ESA due to the impacts of the “white-nose syndrome”, a deadly disease that has killed millions of bats since first observed in the state of New York in 2006. White nose syndrome is a disease that has contributed to the population plummet of the Northern Long-eared Bat and has spread considerably throughout the eastern, mid-western and southeastern regions of the United States. In the northeast, the population of the Northern Long-eared Bat has declined by up to 99% (based on hibernacula counts). It is expected the white nose syndrome will continue to spread throughout range of the Northern Long-eared Bat at an uncertain rate, into the future. Other negative impediments to this species include impacts to hibernacula (e.g., trespassing restriction structures at caves and mines that restrict bat movement and can contribute to changes in the microclimate in the mine/cave), wind farm operations, and loss or degradation of summer roosting habitat.

The Northern Long-eared Bat is a medium-sized bat with medium to dark colored fur on its back and tawny to pale-brown colored fur on its underside. Its body length ranges from 3 to 3.7 inches with a 9 to 10 inch wingspan. This bat species is recognized for its notably long ears compared to other bats in its genus, *Myotis*. This species’ USFWS Fact Sheet, Range Map, and White-nose Syndrome Zone Map are provided under **Appendix K**.

During summer, Northern Long-eared Bats tend to be flexible in selecting their roosting areas, generally choosing live or dead trees with suitable bark and/or cavities and crevices. Males and non-reproductive females may select cooler roosting places found in caves and mines. These bats rarely roost in man-made structures, though they have been found, rarely, roosting in structures like barns, sheds, and bridge decks. During winter, the Northern Long-eared Bat hibernate in small crevices or cracks within caves or mines. These bats are found in hibernacula in various sized caves or mines with constant temperatures, high humidity, and no air currents.

Reproduction for the Northern Long-eared Bats begins in late summer or early fall, during the time males begin to concentrate near hibernacula. After copulation, the female bats store sperm until spring when they ovulate; this reproduction strategy is called delayed fertilization. Pregnant bats migrate to roosting areas where they birth a single pup. Common maternal colonies can be found having 30 to 60 or more female and young bats. Generally, the maternal colonies give birth at approximately the same time, late May or early June to late July, varying depending on geographic location. Young Northern Long-eared Bats start flying by 18-21 days after birth and they have a maximum lifespan of approximately 18.5 years.

These bats emerge at dusk to feed, and use echolocation to feed while in flight. These bats harvest moths, flies, leaf hoppers, caddisflies, and beetles on the understory of forested areas and also eat insects resting on vegetation.

- c. **Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.**

The location of the Project resides in a previously disturbed area (i.e., roadway, roadway embankment, roadway channel crossing), and any direct adverse impacts associated with construction is anticipated to be negligible and will not result in decline below existing conditions. After the project has been constructed, the ecological systems and services of the Grey Cloud Channel will be restored. The Project provides for the reintroduction of passage of fish and other aquatic species to the channel. With improvement of water quality, the aquatic habitat within the reach will also improve and encourage the enhancement of aquatic species vigor and abundance within the Grey Cloud Channel.

#### Invasive Species

Lower Pool 2 is known to contain Eurasian water milfoil and zebra mussels. As an associated channel of the Mississippi, it is likely that these species have the potential to enter the channel, indifferent of Project execution. The Project will not result in or adversely impact the potential for introduction or spread of invasive species to the Grey Cloud Channel.

#### Northern Long-eared Bat

The Final 4(d) Rule for the Northern Long-eared Bat was published in the Federal Register January 14, 2016 (FR, Vol. 81, No. 9). This special rule under section 4(d) of the ESA provides flexibility to landowners, land managers, government agencies, and other as they conduct activities in Northern Long-eared Bat habitat.

“Take” is defined by the ESA as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect” any endangered species. Purposeful take is when the reason for the activity/action is to

conduct some form of take. “Incidental take” is defined by the ESA as take that is “incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.” Under an incidental take scenario, the purpose of the activity is not to “take” a bat.

Under the Final 4(d) Rule for the Northern Long-eared Bat, all areas within the range of the northern long-eared bat, all purposeful take is prohibited except:

- Removal of northern long-eared bats from human structures
- Defense of human life
- Removal of hazardous trees for the protection of human life and property.

The DNR/USFWS published a list of townships in Minnesota known to contain Northern Long-eared Bat roost trees and/or hibernacula. The current list was last updated June 6, 2015 and is available online<sup>11</sup>. Washington County is not on the list.

Incidental take from tree removal activities is not prohibited unless it results from removing a known occupied maternity roost tree or from tree removal activities within 150 feet of a known occupied maternity roost tree from June 1 through July 31 or results from tree removal activities within 0.25 miles of a hibernaculum at any time. According to this information provided by the USFWS<sup>12</sup>, the Project may proceed, a permit is not required, and it is not necessary to contact the USFWS over this matter. It is not anticipated that the Project will adversely impact the Northern Long-eared Bat.

**d. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to fish, wildlife, plant communities, and sensitive ecological resources.**

Erosion control measures within the Project limits will control sediment transfer during construction activities. Temporary impacts will be limited to areas directly adjacent to the embankment and the removal fill from the roadway crossing to reopen the channel.

**14. Historic properties:**

**Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.**

A letter of request of a review of the archaeological and historic database for the Project area was sent by email to the State Historic Preservation Office (SHPO), Tuesday, February 09, 2016. The results of the database search stated, “No archaeological sites or historic structures were identified in a search of the Minnesota Archaeological Inventory and Historic Structures Inventory for the search area requested.” This correspondence is provided in **Appendix L**.

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<sup>11</sup> [http://files.dnr.state.mn.us/eco/ereview/minnesota\\_nleb\\_township\\_list\\_and\\_map\\_20150604.pdf](http://files.dnr.state.mn.us/eco/ereview/minnesota_nleb_township_list_and_map_20150604.pdf).

<sup>12</sup> USFWS, *Key to the Northern Long-Eared Bat 4(d) Rule for Non-Federal Activities*, January 13, 2016, <http://www.fws.gov/Midwest/endangered/mammals/nleb/pdf/KeyFinal4dNLEB12Jan2016.pdf>.



It has been determined, based on the modeling and analyses conducted for the Project, that the areas downstream of the Project limits will not be adversely impacted after open flow conditions have been reestablished in the channel when considering existing no-flow conditions. The area directly impacted by the Project will remain within the Project limits. Indirect Project impacts are not anticipated to adversely affect the downstream channel/shore areas where historic and/or archaeological resources may be located.

**15. Visual:**

**Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.**

Lower Pool 2 within this reach of the Mississippi River affords views from the surrounding river bluffs, and river corridor from recreational watercraft. As viewed from the water on main Pool 2, the project is nestled behind a bend in the channel and will generally not be visible. From the land the project duration is expected to occur over 45-75 working days of which Grey Cloud Island Drive South crossing will have construction equipment, earth work and site activities that may disrupt views temporarily and at variable intensity. Construction is phased to minimize the length of disruption and does not anticipate night time construction requiring lighting. Following Project construction, it is anticipated that the final structure design will aesthetically fit the area.

**16. Air:**

- a. **Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants, and any greenhouse gases. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.**

No stationary source emissions are being generated by this project.

- b. **Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.**

The Project will result in air emissions from construction vehicles during construction. Diesel fuel exhaust emissions contain pollutants such as carbon monoxide, nitrogen oxides, reactive organic gasses, and suspended particulate matter, all of which may carry associated health risks. It is not anticipated that the project will result in additional traffic emissions as the road is presently in use and no additional traffic is anticipated to be generated by completion of the project.

- c. **Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 16a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.**

Dust and odors that may be generated will be negligible and confined to the construction period of the Project. Due to the relatively small construction area and temporary impact period where dust and odors may be generated, there are no anticipated concerns for potential receptors or impacts that would pose degradation of quality of life within the Project area. Best management practices to reduce construction dust will be employed.

## 17. Noise

**Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.**

Man-made noises are common occurrence in this area, ranging from commercial and recreational watercraft, railroad operations running parallel to the Mississippi River, roadway traffic. Aggregate Industries is a limestone quarry, an existing source of higher noise levels within the Project area. Quarry operations take place approximately a half-mile south of the Project limits. Daily or frequent source noise are associated with quarry operations consisting of blasting, crushing and loading equipment. Truck hauler traffic associated the quarry utilizes Grey Cloud Island Drive South.

The nearest sensitive receptors to the Project limits are residential dwellings ranging for 250 feet to over 1,000 feet away. Other sensitive receptors consist of recreational watercraft users and recreational users utilizing nearby recreational facilities (e.g., public water access, public parks, and associated river corridor recreation areas).

The Project will not generate noise enough to adversely impact quality of life for wildlife and human activity relative to the Project limits. Noise generated from the construction activities will be a temporary disturbance to wildlife and minor annoyance to humans in proximity to the Project area.

## 18. Transportation

**a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.**

No additional traffic will be generated by the construction of the bridge crossing. An at-grade road crossing exists today; therefore, no traffic congestion is anticipated and no traffic improvements are considered necessary.

The project vicinity is not served by Metro Transit bus service (i.e., bus stops).

Access and availability of other transit modes (e.g., Metro Mobility) will need to be addressed prior to construction.

- b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system.**

*If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW. Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 (available at: <http://www.dot.state.mn.us/accessmanagement/resources.html>) or a similar local guidance.*

An average of 500 vehicles per day will be affected by the construction of a structure at the Grey Cloud Island Drive South crossing. Currently, an average of 20 trucks leave the adjacent Larson Quarry (Aggregate Industries) daily. All of the heavy truck traffic from this site is typically routed north along Grey Cloud Island Drive. Truck traffic accounts for about 10% of the annual production with most of the annual production leaving the site by barge via the Mississippi River.

- c. Identify measures that will be taken to minimize or mitigate project related transportation effects.**

Grey Cloud Island Drive South will be closed during construction of the Project. The duration of this closure is anticipated to be 45-75 working days depending on weather and construction related conditions. A preliminary detour plan is included as **Appendix M**.

A communications plan will be developed to provide information as to how traffic movements (for local business operations, local residents, emergency responders, etc.) will be addressed during this time frame (i.e., defining alternative routes in detour plan).

**19. Cumulative potential effects: (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)**

- a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.**

No additional cumulative effects are anticipated outside of those identified within the previous sections of the document. This project will reverse previous effects of emergency flood measures and restore the channel to its historic functionality.

- b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.**

The Grey Cloud Channel Restoration Project will complement other phases of the USACE Lower Pool 2 Restoration Project which is part of a larger restoration effort for the Upper Impounded Reach of the Mississippi River. The Lower Pool 2 Restoration Project is a five phased project developed through the coordination of an interagency group of professionals engaged in river management. The planning of the project(s) considered "unique and important ecosystem characteristics, factors limiting natural processes and the distribution and abundance of biota, ecosystem objectives, and performance criteria".

- c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.**

The Project restores the natural break-out reach of the Grey Cloud Channel, in conjunction with the regional Lower Pool 2 Restoration Project, efforts are planned to improve river ecosystem within the Pool 2 which offer a significant beneficial environmental effect to the region.

- 20. Other potential environmental effects: If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.**

All potential environmental effects have been addressed above.

**RGU CERTIFICATION.** *(The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

**I hereby certify that:**

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature  Date 03/21/2016

Title Administrator

## References

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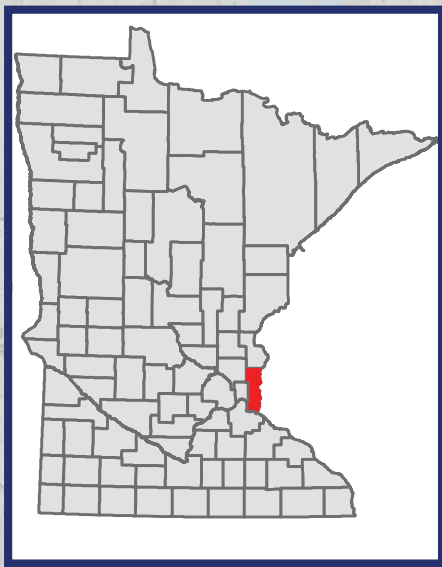
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# Exhibits





**Chisago**

**Ramsey**

**Washington**

**Hennepin**

**Project Location**

**Dakota**

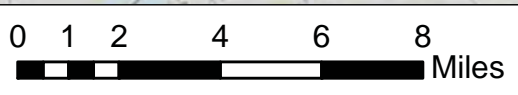


Exhibit 1: Project Location Map, Washington County

Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-03 002	Date: 3/1/2016	Sheet:
			Maple Grove P: 763.493.4522 F: 763.493.5572		

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

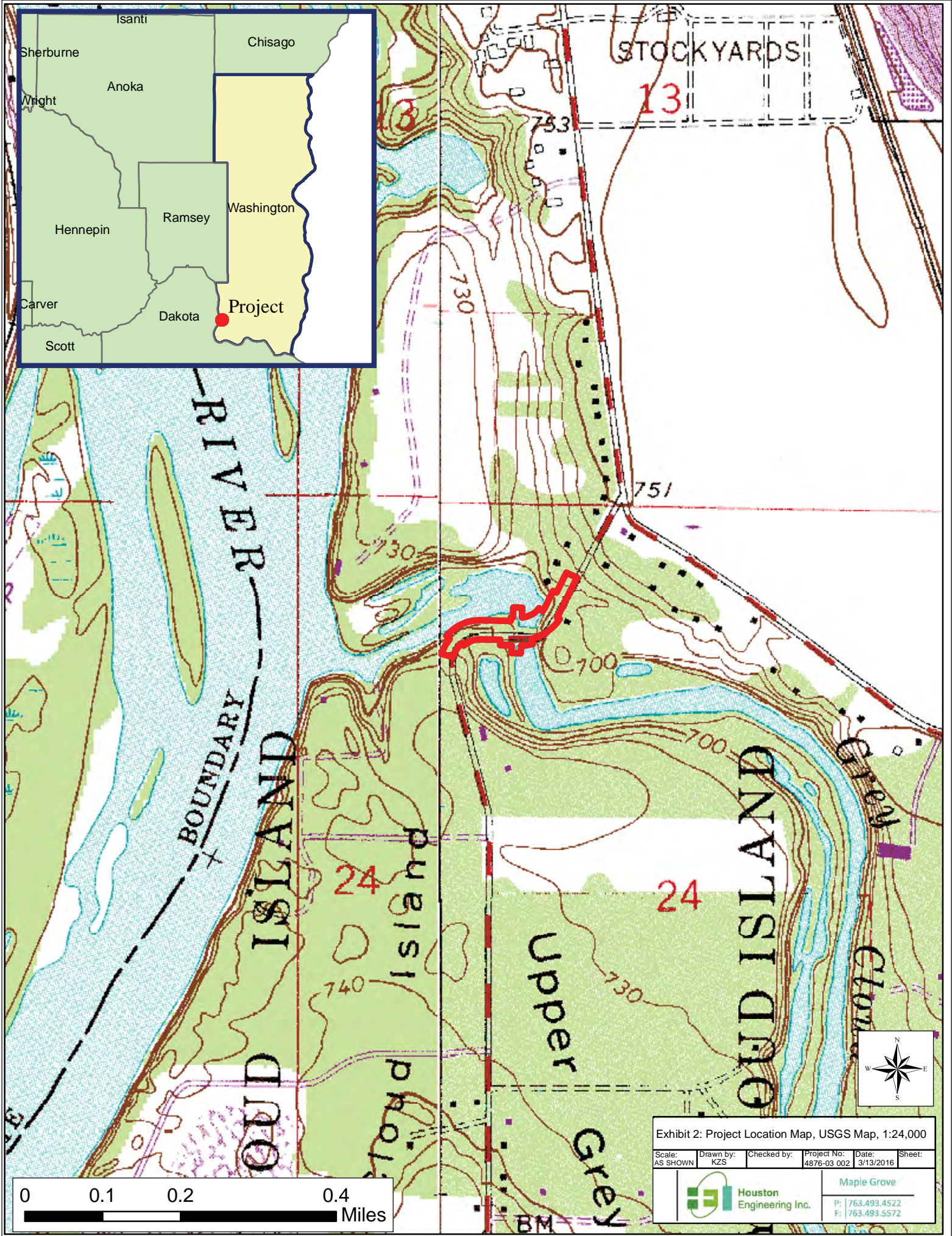


Exhibit 2: Project Location Map, USGS Map, 1:24,000

Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-03 002	Date: 3/13/2016	Sheet:
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Maple Grove  
P: 763.493.4522  
F: 763.493.5572





**Mississippi River**

**Project Limits**

**Grey Cloud Channel**

**Mooers Lake**

GREY CLOUD ISLAND DR S

99TH ST S

GREY CLOUD ISLAND DR S

PIONEER RD S

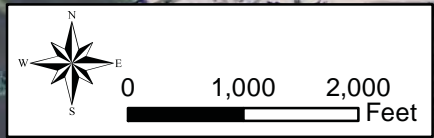
GENEVA AVE S

105TH ST S

GREY CLOUD ISLAND DR S

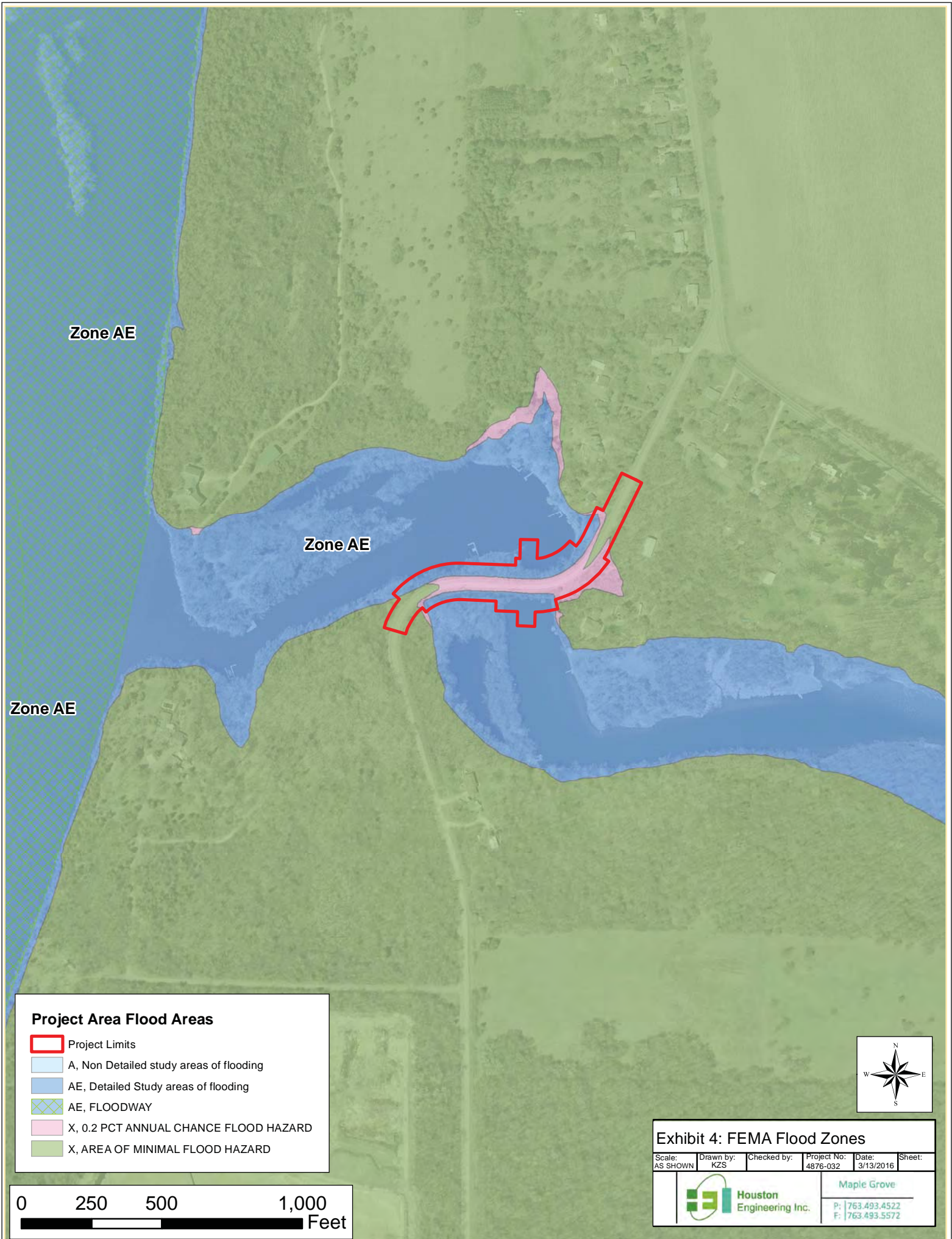
GREY CLOUD TRL S

GREY CLOUD TRL S



Aerial Imagery: September 2010 NAIP FSA

Exhibit 3: Grey Cloud Channel Limits - Existing Conditions					
Scale: AS SHOWN	Drawn by: KZS	Checked by: JL	Project No.: 4876-032	Date: 3/13/2016	Sheet:
<b>Houston Engineering Inc.</b>				<b>Maple Grove</b>	
				P: 763.493.4522 F: 763.493.5572	



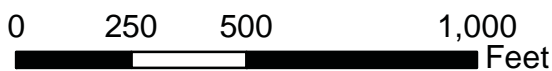
Zone AE

Zone AE

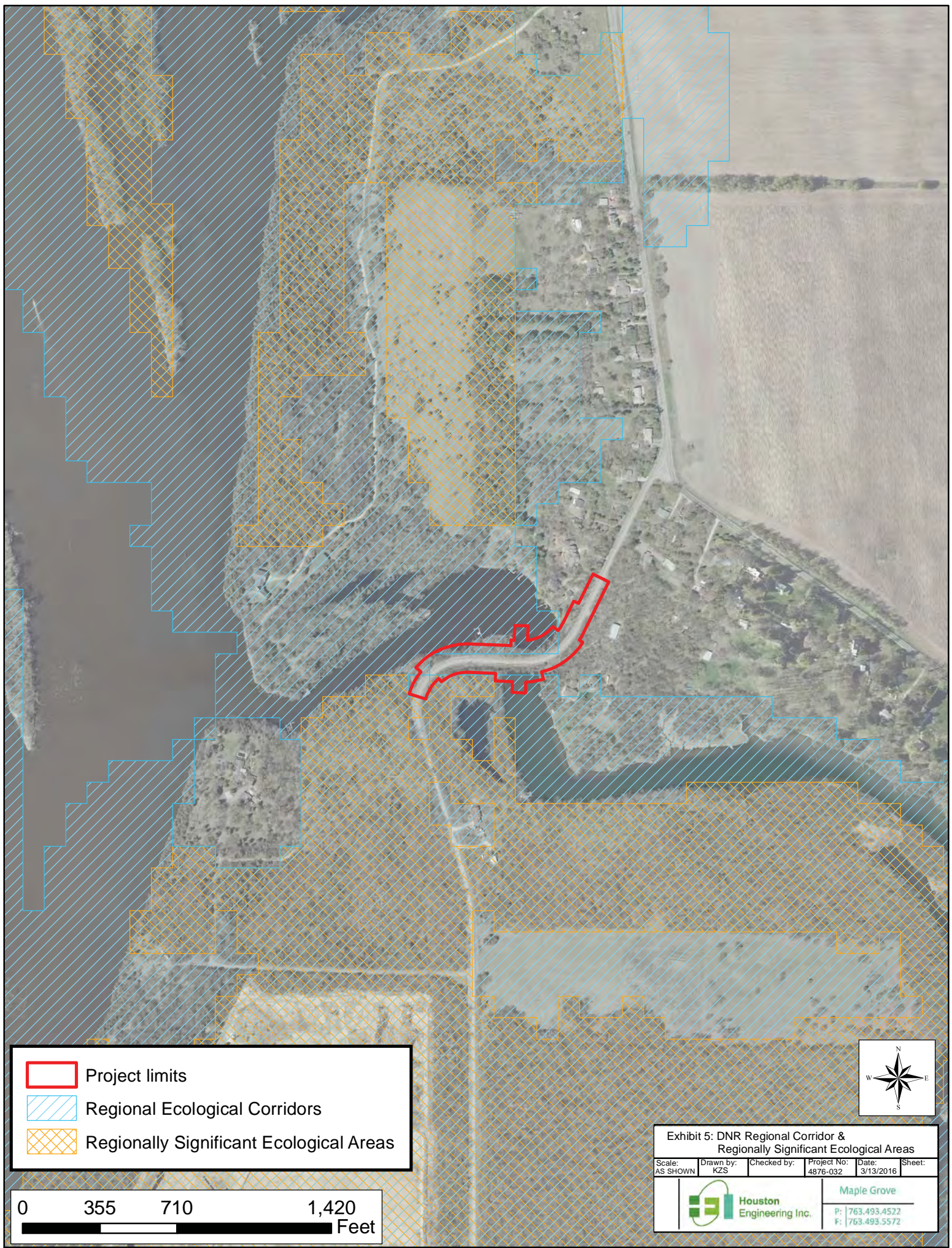
Zone AE




**Project Area Flood Areas**

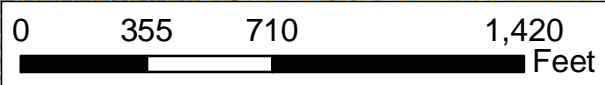
- Project Limits
- A, Non Detailed study areas of flooding
- AE, Detailed Study areas of flooding
- AE, FLOODWAY
- X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD
- X, AREA OF MINIMAL FLOOD HAZARD




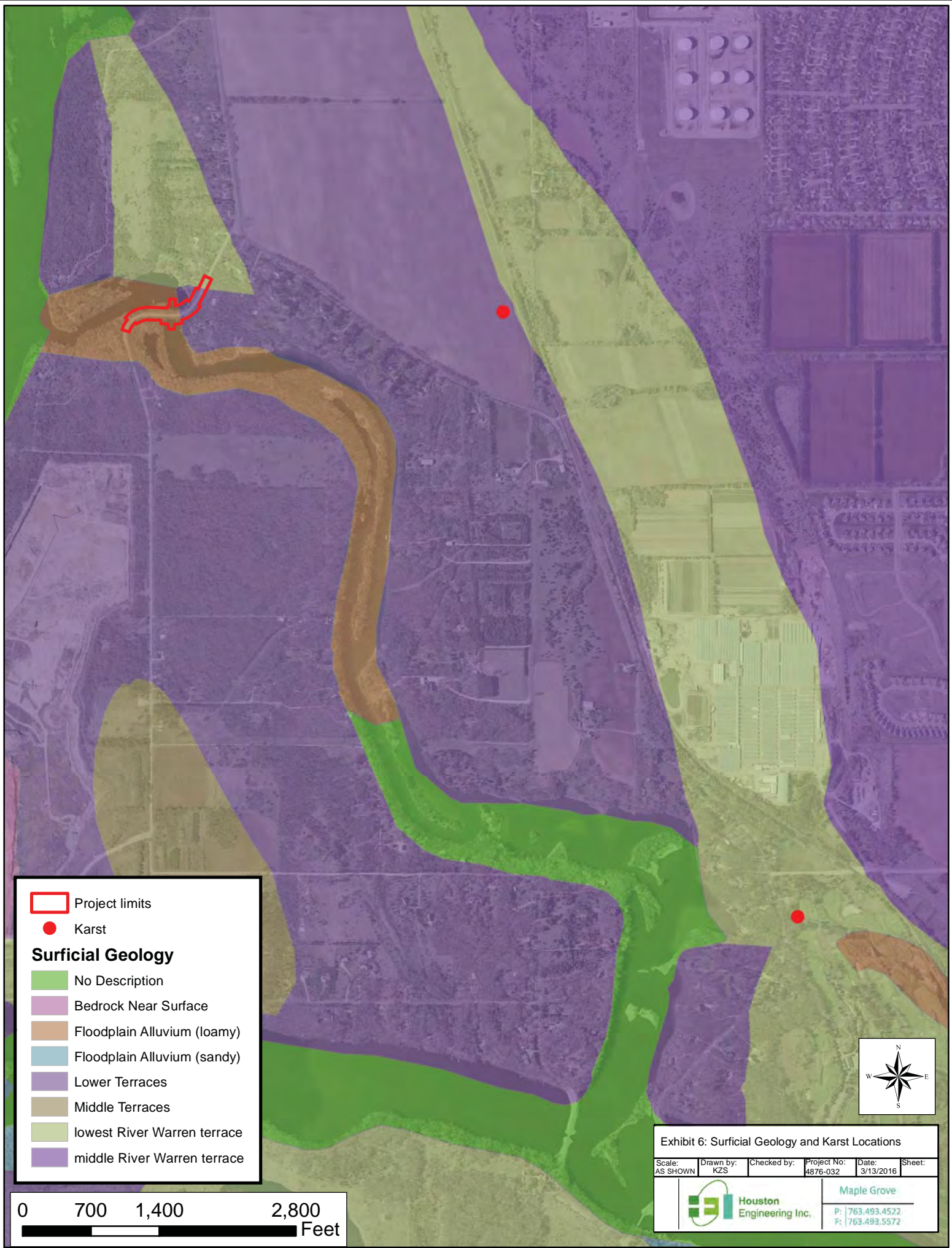
<b>Exhibit 4: FEMA Flood Zones</b>					
Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-032	Date: 3/13/2016	Sheet:
<b>Houston Engineering Inc.</b>			<b>Maple Grove</b> P: 763.493.4522 F: 763.493.5572		





	Project limits
	Regional Ecological Corridors
	Regionally Significant Ecological Areas











<b>Exhibit 5: DNR Regional Corridor &amp; Regionally Significant Ecological Areas</b>					
Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-032	Date: 3/13/2016	Sheet:
 <b>Houston Engineering Inc.</b>				<b>Maple Grove</b> P: 763.493.4522 F: 763.493.5572	



 Project limits  
 Karst

**Surficial Geology**

-  No Description
-  Bedrock Near Surface
-  Floodplain Alluvium (loamy)
-  Floodplain Alluvium (sandy)
-  Lower Terraces
-  Middle Terraces
-  lowest River Warren terrace
-  middle River Warren terrace

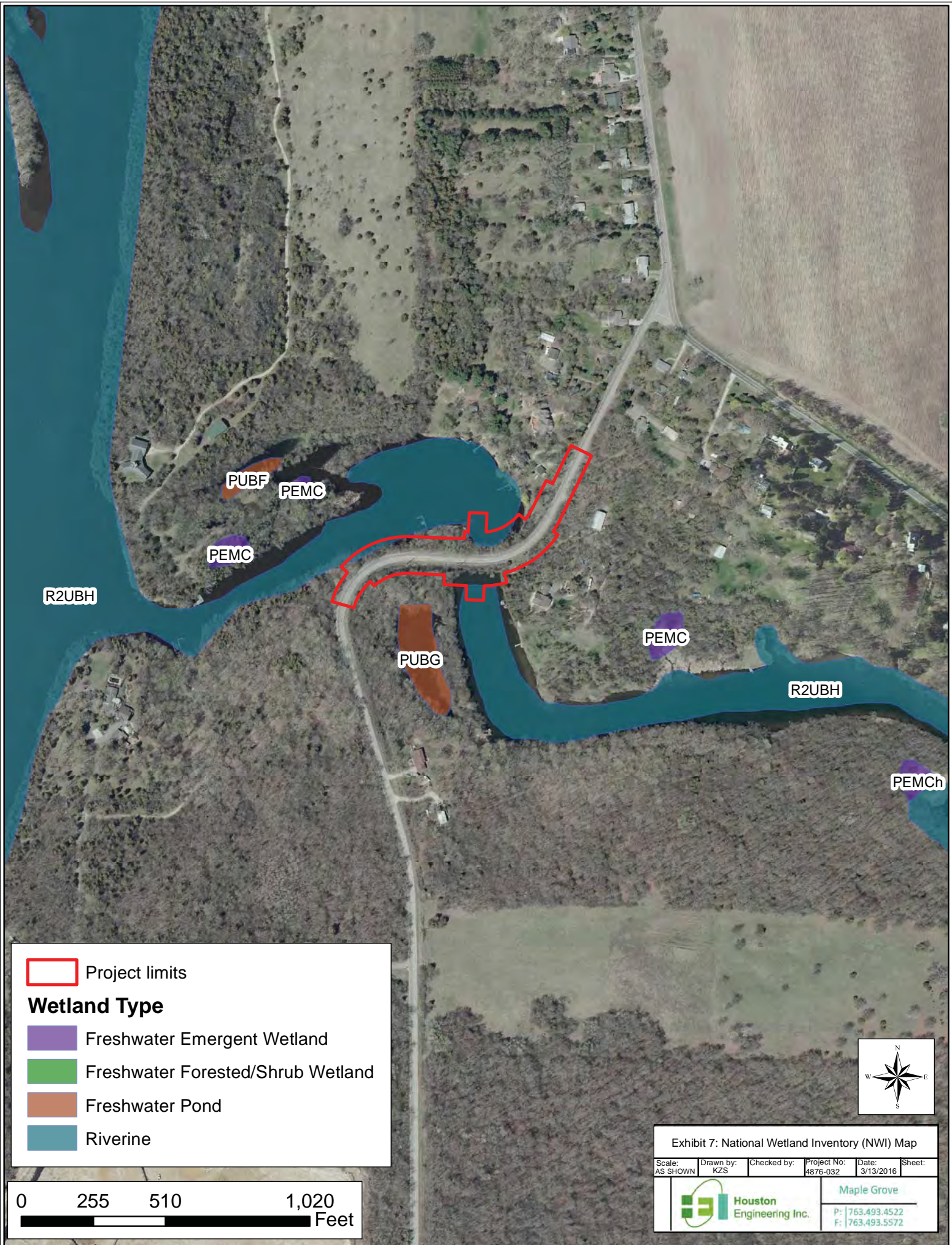


**Exhibit 6: Surficial Geology and Karst Locations**

Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-032	Date: 3/13/2016	Sheet:
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 **Houston Engineering Inc.**

Maple Grove  
 P: 763.493.4522  
 F: 763.493.5572



Project limits

**Wetland Type**



Freshwater Emergent Wetland



Freshwater Forested/Shrub Wetland



Freshwater Pond



Riverine

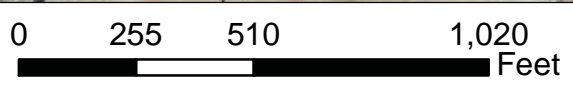





Exhibit 7: National Wetland Inventory (NWI) Map

Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-032	Date: 3/13/2016	Sheet:
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**Houston Engineering Inc.**

**Maple Grove**  
 P: 763.493.4522  
 F: 763.493.5572



	500 ft from Project limits
	Wells
	Project Limits

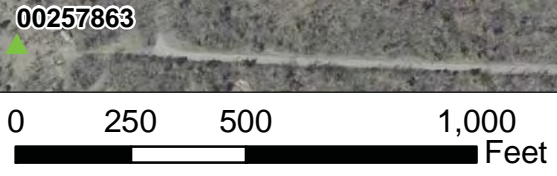
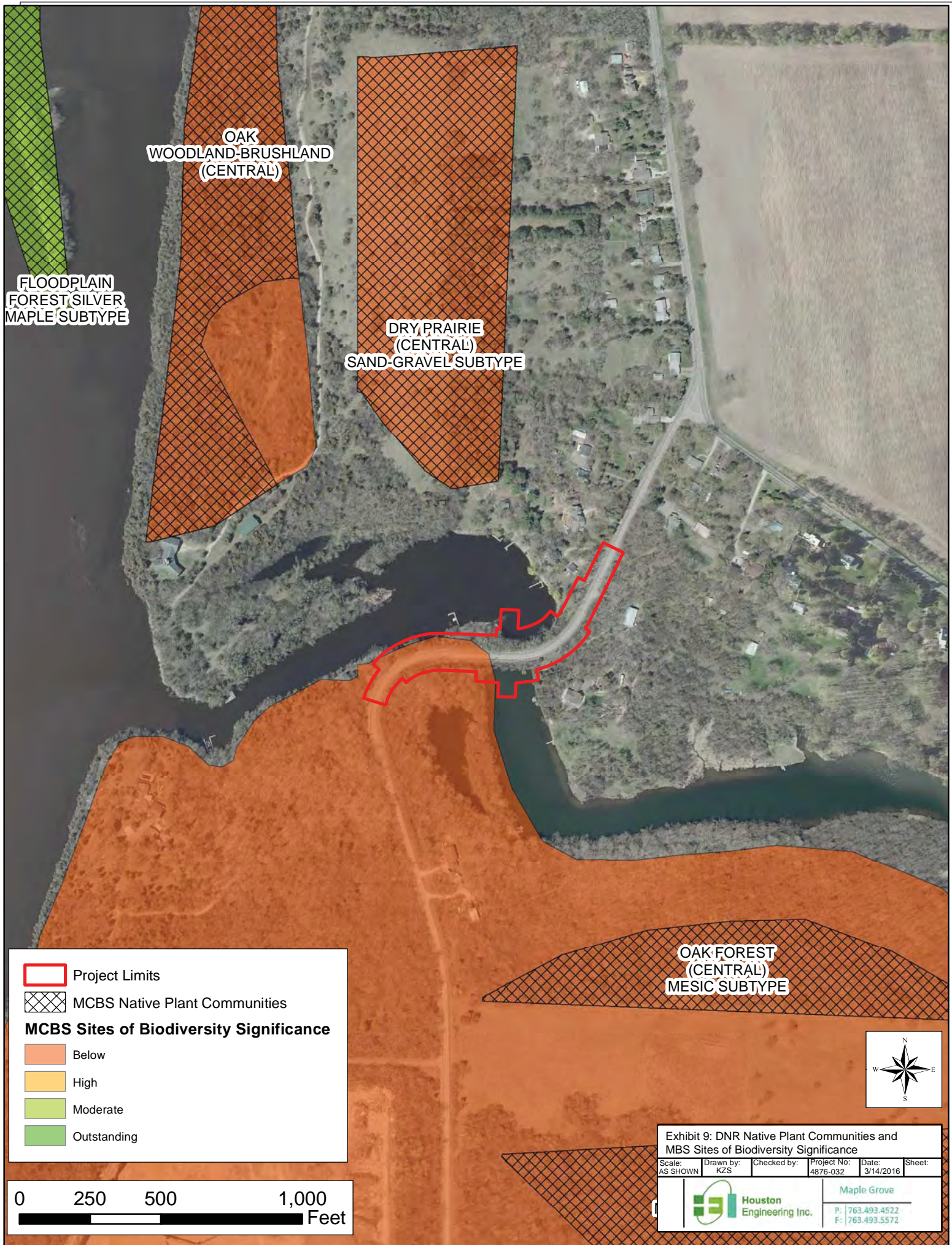


Exhibit 8: Water Well Locations					
Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-032	Date: 3/18/2016	Sheet:
 Houston Engineering Inc.				Maple Grove P: 763.493.4522 F: 763.493.5572	



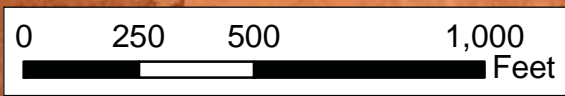


**Legend**

- Project Limits
- MCBS Native Plant Communities

**MCBS Sites of Biodiversity Significance**

- Below
- High
- Moderate
- Outstanding



**Exhibit 9: DNR Native Plant Communities and MBS Sites of Biodiversity Significance**

Scale: AS SHOWN	Drawn by: KZS	Checked by:	Project No: 4876-032	Date: 3/14/2016	Sheet:
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**Houston Engineering Inc.**      **Maple Grove**

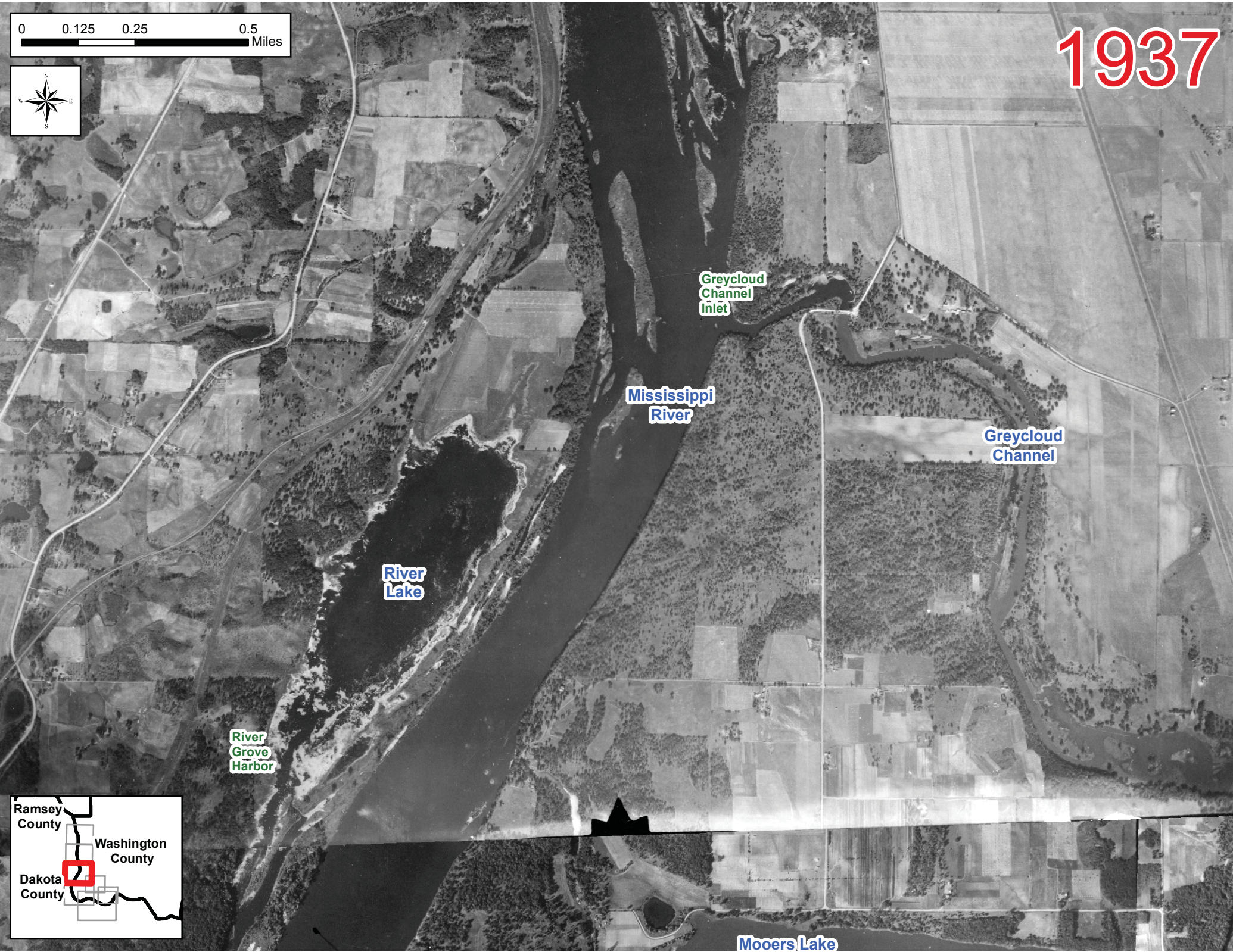
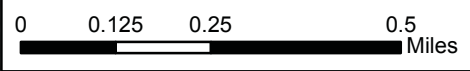
P: 763.493.4522  
F: 763.493.5572

# Appendices

# Appendix A

Grey Cloud Channel –  
Historical Aerial Photographs  
1937 - 2013

1937



Mississippi River

Greycloud Channel Inlet

Greycloud Channel

River Lake

River Grove Harbor

Moors Lake



1940

0 0.125 0.25 0.5 Miles



Greycloud Channel Inlet

Mississippi River

Greycloud Channel

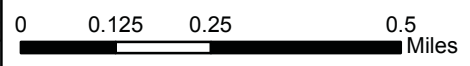
River Lake

River Grove Harbor

Mooers Lake



1957



Greycloud Channel Inlet

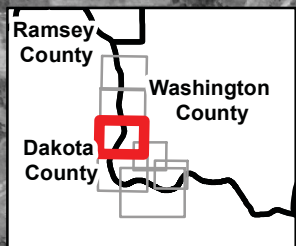
Mississippi River

Greycloud Channel

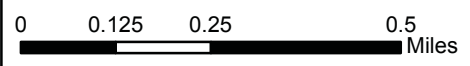
River Lake

River Grove Harbor

Mooers Lake

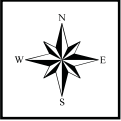
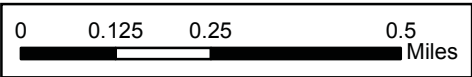


1964



8-7-64





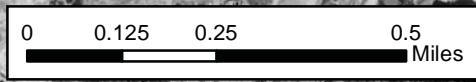
1970

Greycloud  
Channel  
Inlet





1991



Mississippi River

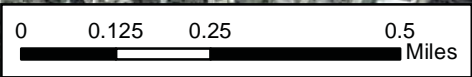
Greycloud Channel Inlet

Greycloud Channel

River Lake

River Grove Harbor

Moors Lake



2003

Greycloud Channel Inlet

Mississippi River

Greycloud Channel

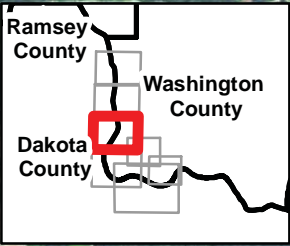
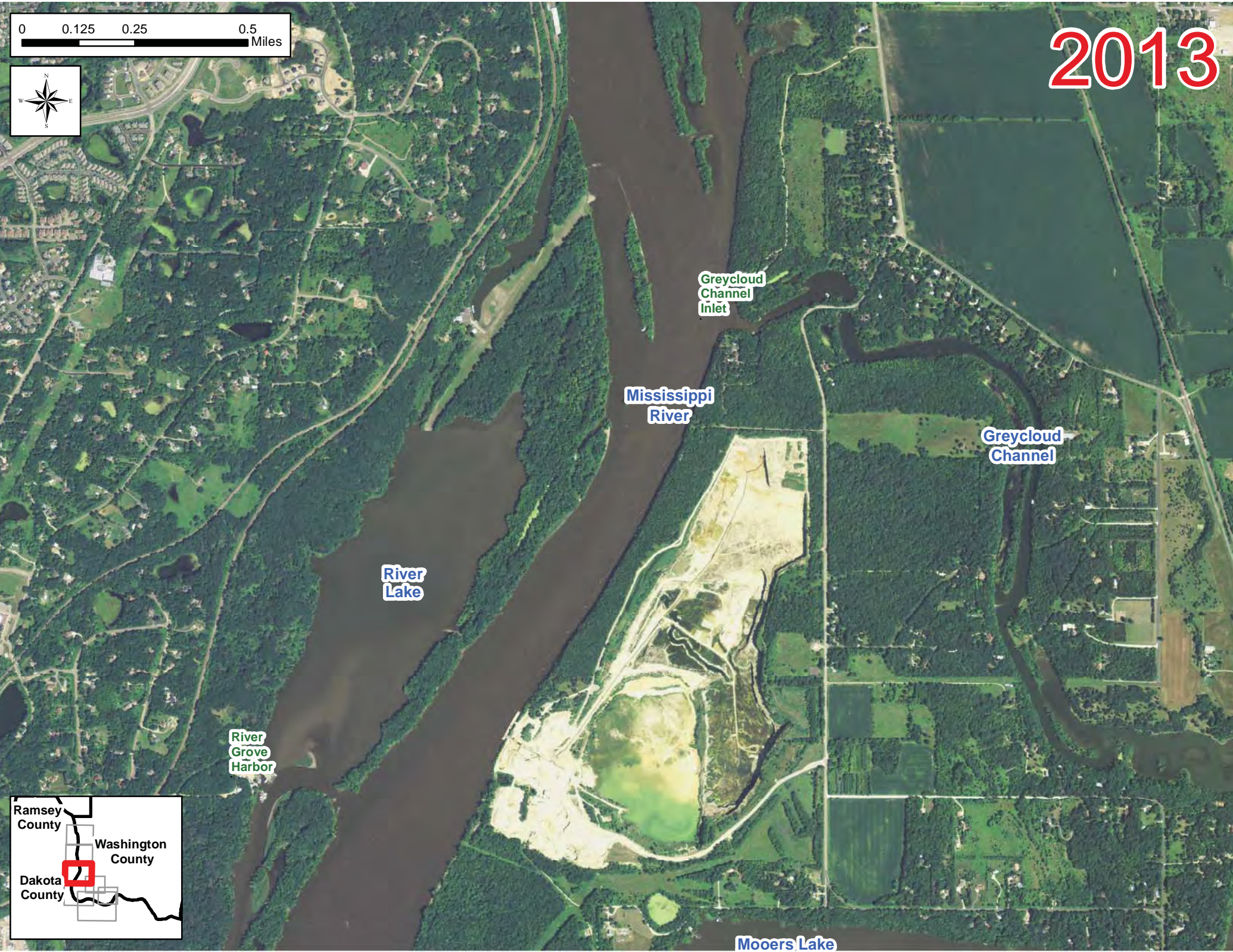
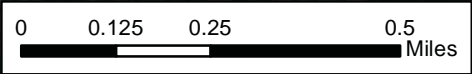
River Lake

River Grove Harbor

Moors Lake

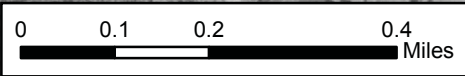


2013



Mooers Lake

1937

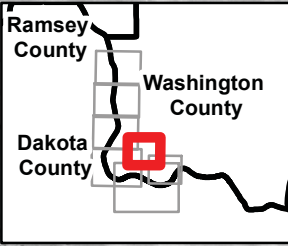


Greycloud Channel

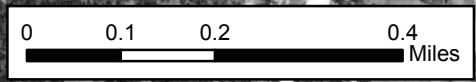
Mooers Lake

1-27-N

92



1940

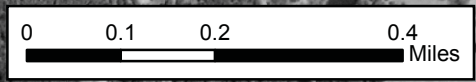


Greycloud  
Channel

Mooers  
Lake



1957



Greycloud Channel

Mooers Lake

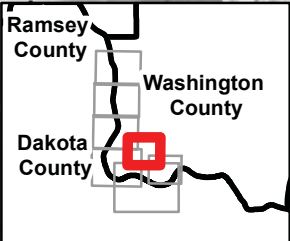


0 0.1 0.2 0.4 Miles



Greycloud Channel

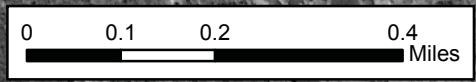
Mooers Lake



1964



1970

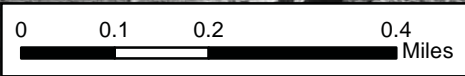


Greycloud Channel

Mooers Lake





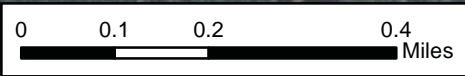


1991

Greycloud Channel

Mooers Lake



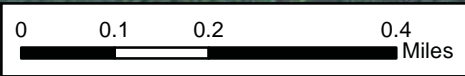


2003

Greycloud Channel

Mooers Lake





2013

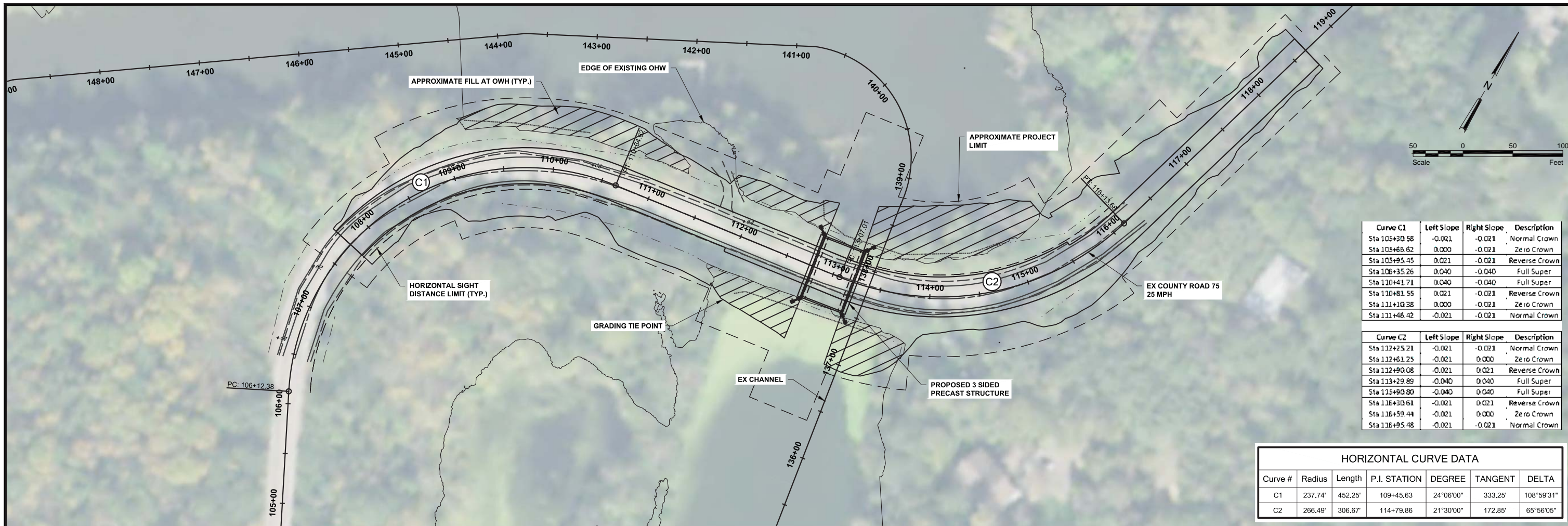
Greycloud Channel

Mooers Lake

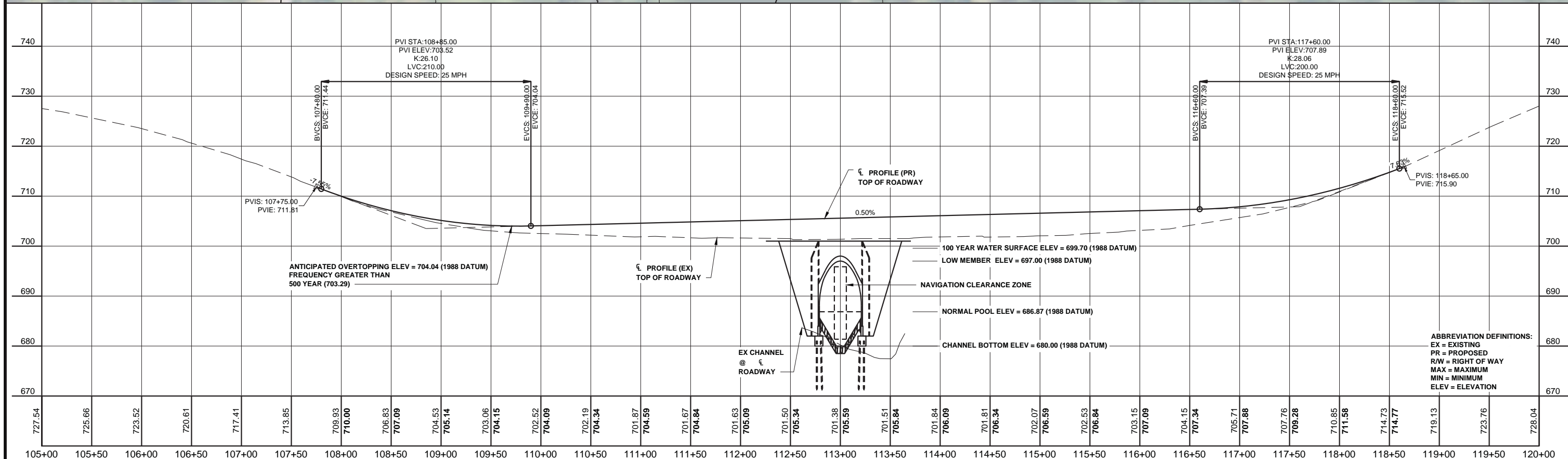


# Appendix B

Grey Cloud Channel  
Restoration Project  
Preliminary Plan Set

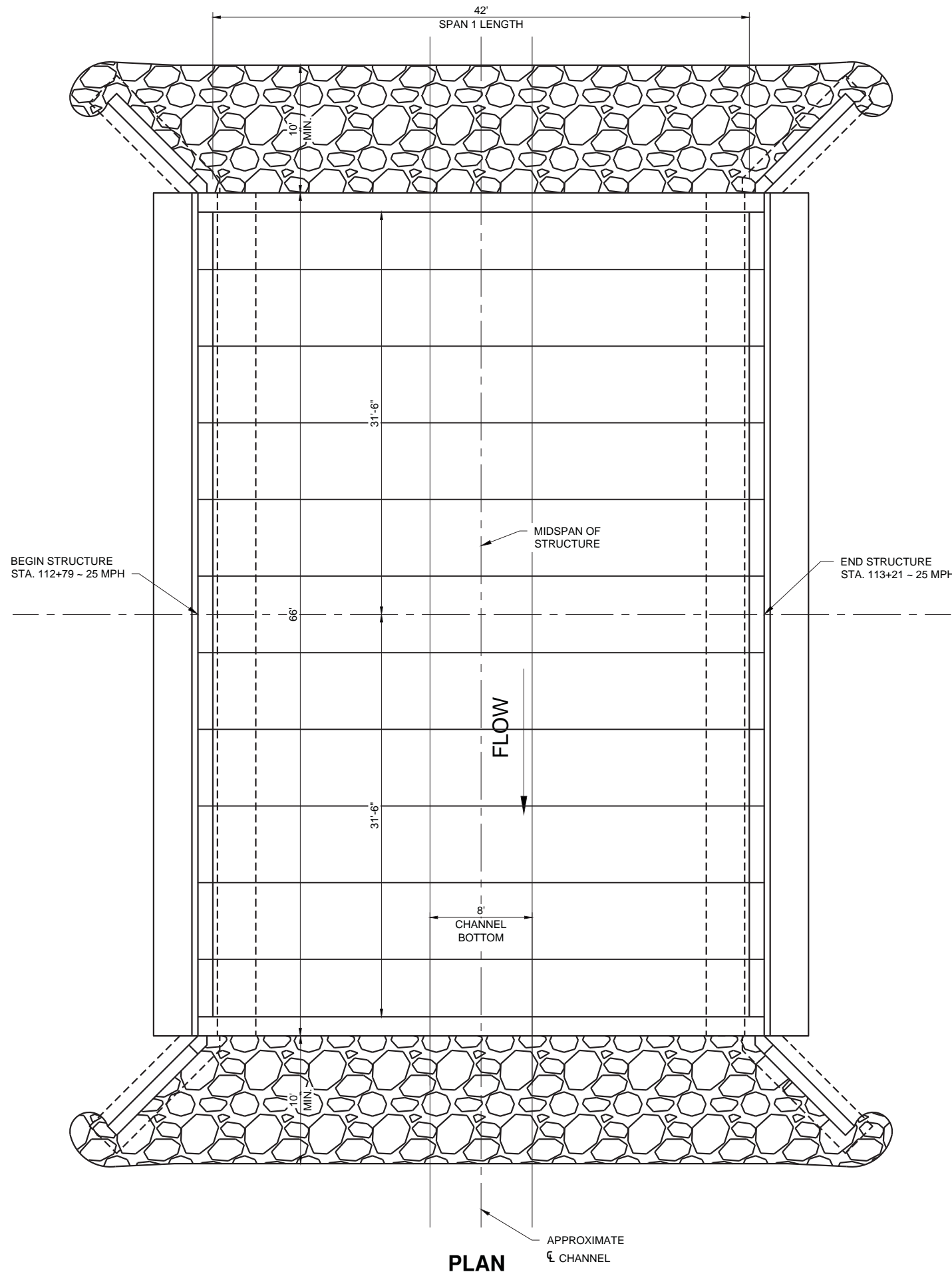


HORIZONTAL CURVE DATA						
Curve #	Radius	Length	P.I. STATION	DEGREE	TANGENT	DELTA
C1	237.74'	452.25'	109+45.63	24°06'00"	333.25'	108°59'31"
C2	266.49'	306.67'	114+79.86	21°30'00"	172.85'	65°58'05"



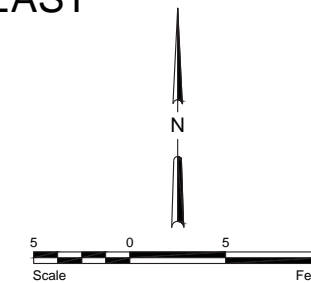
ABBREVIATION DEFINITIONS:  
 EX = EXISTING  
 PR = PROPOSED  
 RW = RIGHT OF WAY  
 MAX = MAXIMUM  
 MIN = MINIMUM  
 ELEV = ELEVATION

H:\Fargo\BHW\4800\4876\_032\CAD\Plans\Plan & Profile\Conspan EAW.dwg, Layout: 3/11/2016 8:38 AM: (aruud)



WEST

EAST



**PLAN**

APPROXIMATE  
CHANNEL

H:\Fargo\1846\18461818\_4876\_0325CAD\Plan\CONTECH\_SPAN\_1\38\_Rise\_08\_Bottom\_L\DWG\Layout\3.11.2018 7:53 AM (rsad)

	Fargo
	P: 701.237.5065 F: 701.237.5101
CR 75, GREY CLOUD ISLAND TOWNSHIP WASHINGTON COUNTY, STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION	
<b>3 SIDED PRECAST STRUCTURE</b> CR 75 OVER GREY CLOUD SLOUGH 0.4 MI. WEST OF CO. RD. 75 42'-0" SPAN	
<b>GENERAL PLAN</b> SEC. 24 T27N R22W GREY CLOUD ISLAND TOWNSHIP, WASHINGTON COUNTY	
APPROVED _____ STATE BRIDGE ENGINEER DATE: _____	
DES: WJK	DR: SMH
CHK: JLM	CHK: WJK

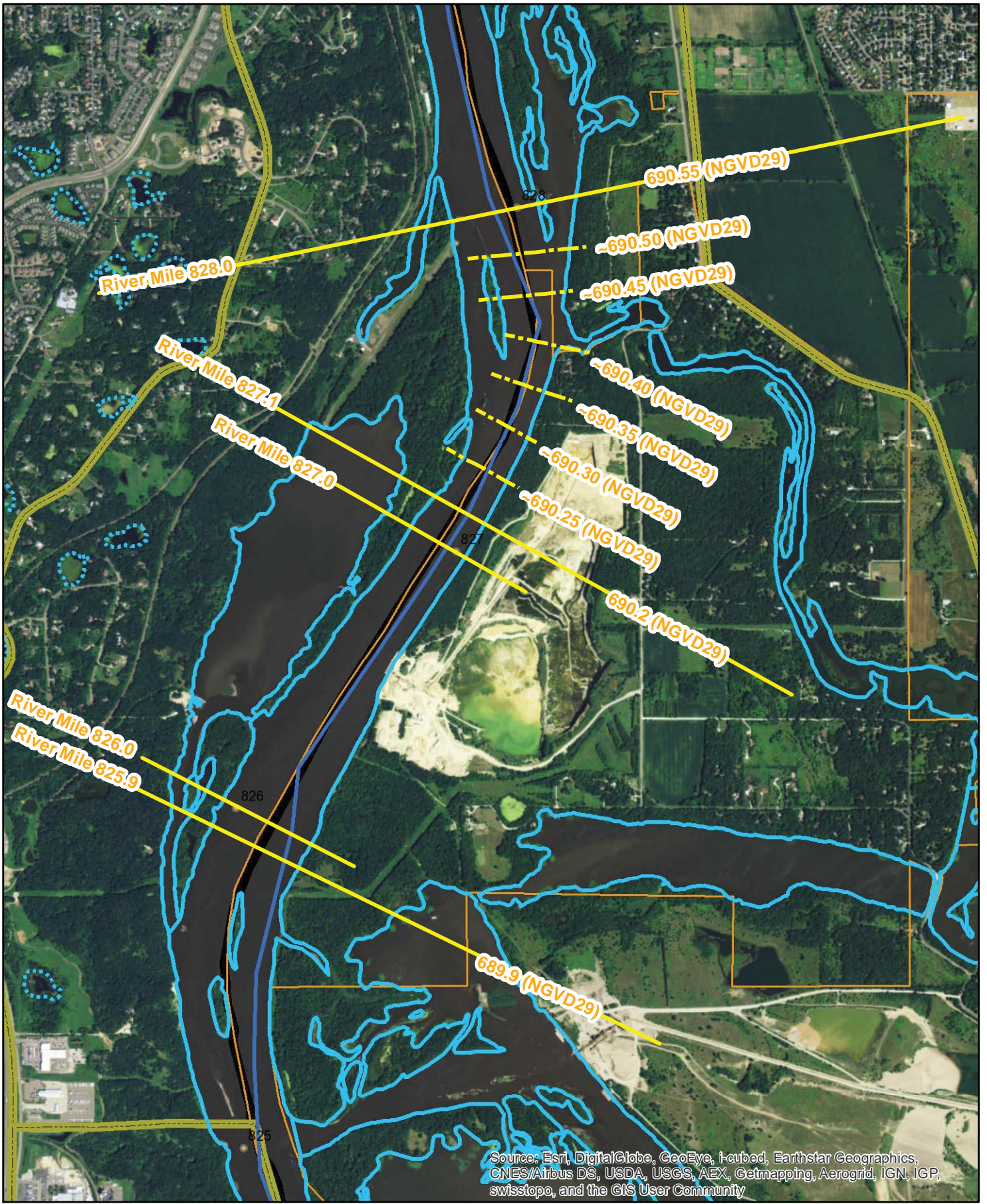
**PRELIMINARY**



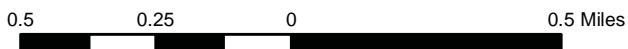
# Appendix C

OHW Elevations: Mississippi  
River – North of Grey Cloud Island





**OHW Elevations  
 Mississippi River  
 North of Grey Cloud Island**

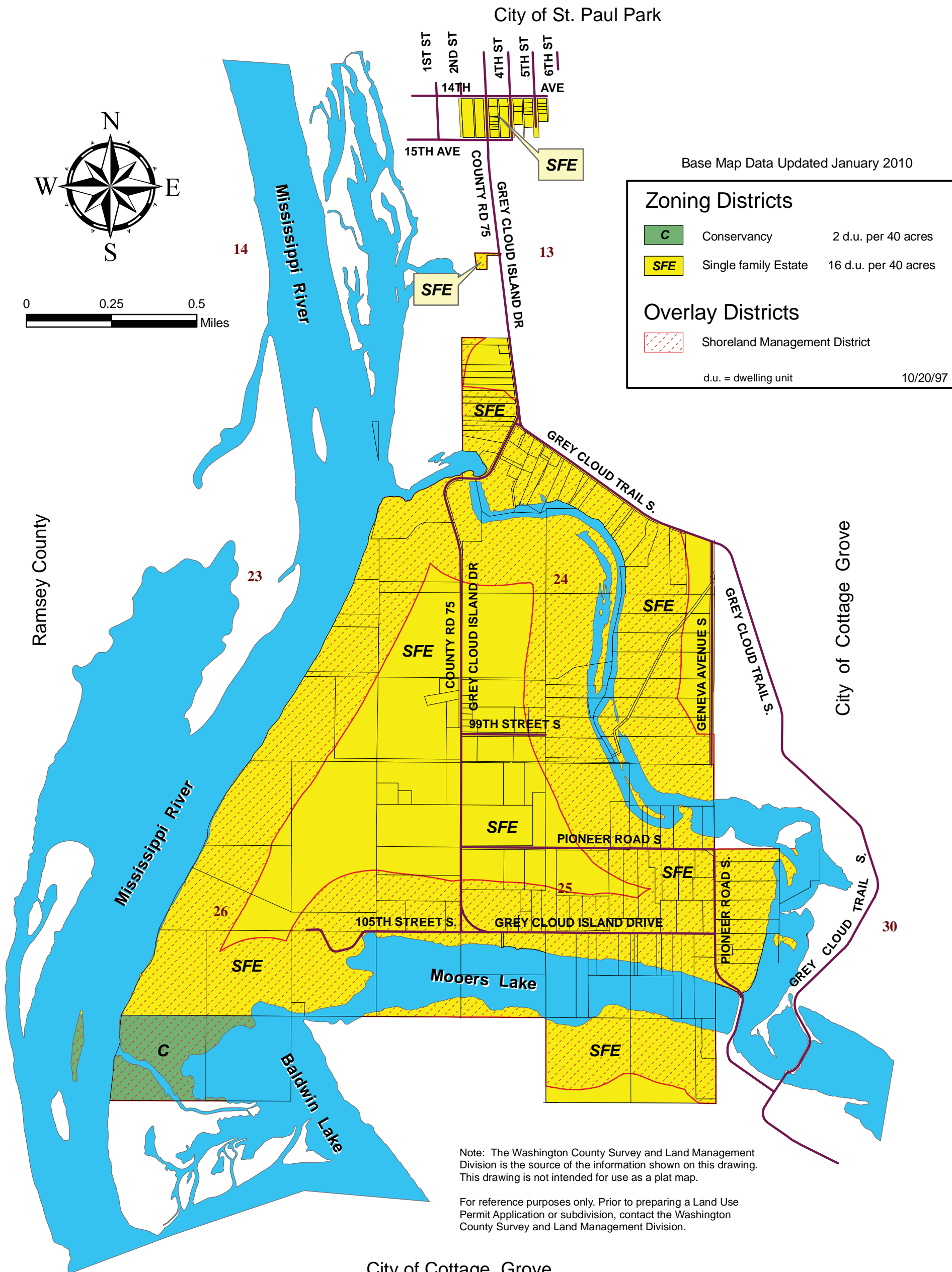


# Appendix D

Grey Cloud Township, Washington  
County Zoning Map

# Grey Cloud Island Township

## Washington County Zoning Districts



Base Map Data Updated January 2010

### Zoning Districts

- C** Conservancy 2 d.u. per 40 acres
- SFE** Single family Estate 16 d.u. per 40 acres

### Overlay Districts

- Shoreland Management District**

d.u. = dwelling unit 10/20/97

City of Cottage Grove

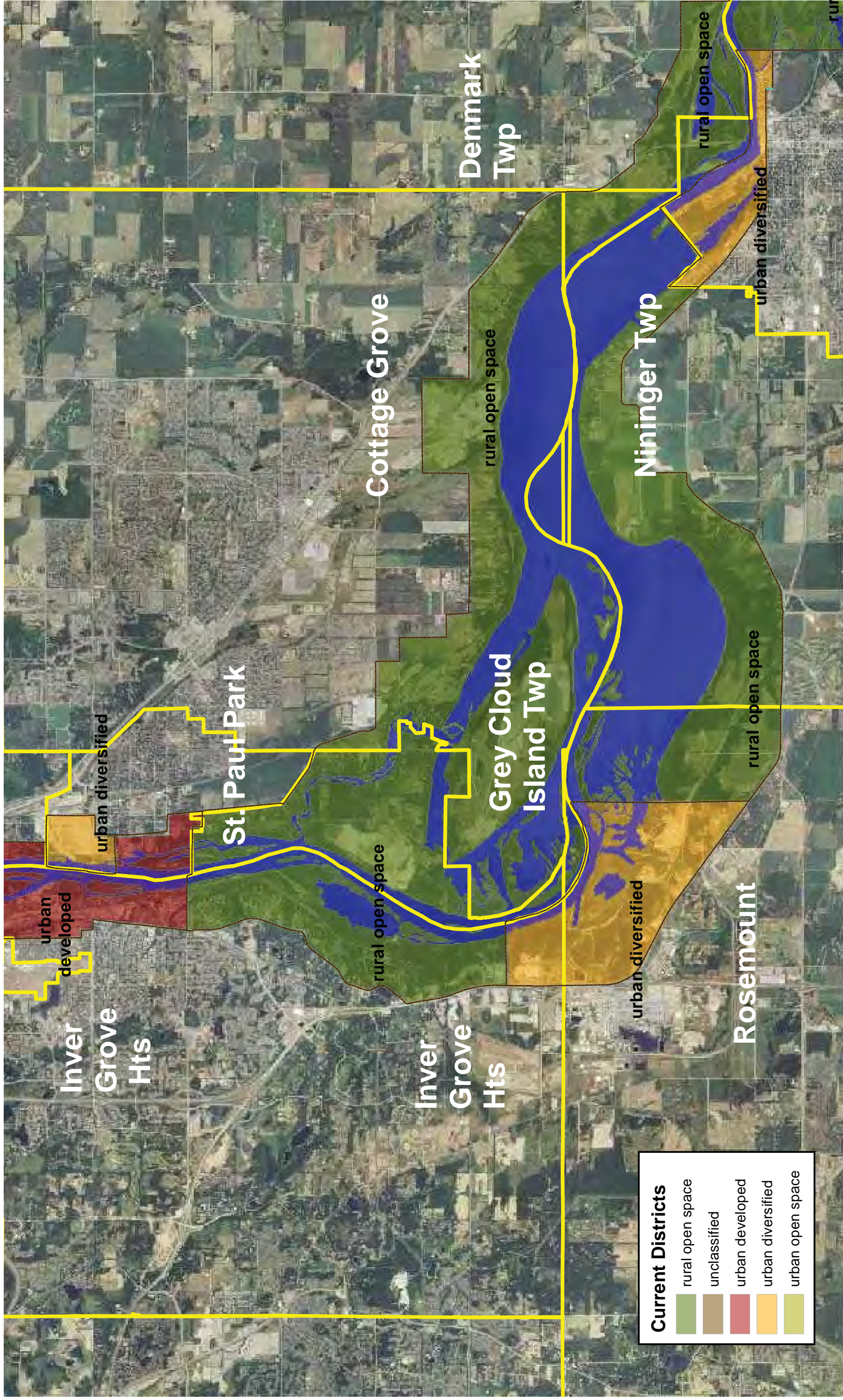
prepared by:  
Washington County Public Works Department  
**Survey and Land Management Division**  
Stillwater, MN

651-430-6875

# Appendix E

Mississippi River Corridor Critical Area  
(MRCAA) – Current Districts

# MRCCA Rulemaking Current Districts



# Appendix F

Mississippi River Corridor Critical Area  
(MRCAA) – Proposed Districts

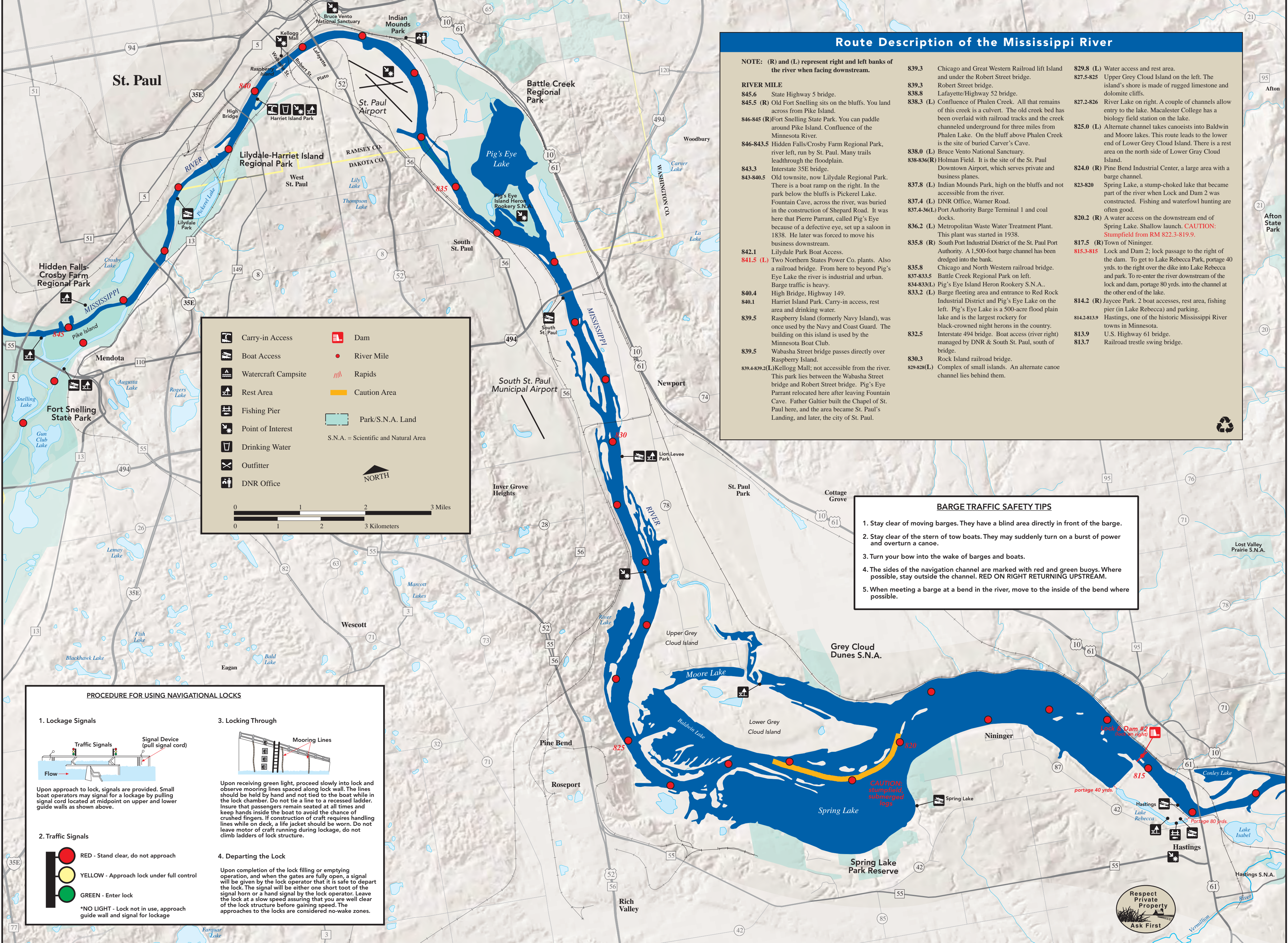


# Appendix G

State Water Trail (Fort Snelling to  
Hastings)



# A STATE WATER TRAIL GUIDE TO THE MISSISSIPPI RIVER (Fort Snelling to Hastings)



## Route Description of the Mississippi River

**NOTE:** (R) and (L) represent right and left banks of the river when facing downstream.

**RIVER MILE**

845.6 State Highway 5 bridge.

845.5 (R) Old Fort Snelling sits on the bluffs. You land across from Pike Island.

846-845 (R) Fort Snelling State Park. You can paddle around Pike Island. Confluence of the Minnesota River.

846-843.5 Hidden Falls/Crosby Farm Regional Park, river left, run by St. Paul. Many trails lead through the floodplain.

843.3 Interstate 35E bridge.

843-840.5 Old townsite, now Lilydale Regional Park. There is a boat ramp on the right. In the park below the bluffs is Pickerel Lake. Fountain Cave, across the river, was buried in the construction of Shepard Road. It was here that Pierre Parrant, called Pig's Eye because of a defective eye, set up a saloon in 1838. He later was forced to move his business downstream.

842.1 Lilydale Park Boat Access.

841.5 (L) Two Northern States Power Co. plants. Also a railroad bridge. From here to beyond Pig's Eye Lake the river is industrial and urban. Barge traffic is heavy.

840.4 High Bridge, Highway 149.

840.1 Harriet Island Park. Carry-in access, rest area and drinking water.

839.5 Raspberry Island (formerly Navy Island), was once used by the Navy and Coast Guard. The building on this island is used by the Minnesota Boat Club.

839.5 Wabasha Street bridge passes directly over Raspberry Island.

839.4-839.2 (L) Kellogg Mall; not accessible from the river. This park lies between the Wabasha Street bridge and Robert Street bridge. Pig's Eye Parrant relocated here after leaving Fountain Cave. Father Galtier built the Chapel of St. Paul here, and the area became St. Paul's Landing, and later, the city of St. Paul.

839.3 Chicago and Great Western Railroad lift Island and under the Robert Street bridge.

839.3 Robert Street bridge.

838.8 Lafayette/Highway 52 bridge.

838.3 (L) Confluence of Phalen Creek. All that remains of this creek is a culvert. The old creek bed has been overlaid with railroad tracks and the creek channeled underground for three miles from Phalen Lake. On the bluff above Phalen Creek is the site of buried Carver's Cave.

838.0 (L) Bruce Vento National Sanctuary.

838-836 (R) Holman Field. It is the site of the St. Paul Downtown Airport, which serves private and business planes.

837.8 (L) Indian Mounds Park, high on the bluffs and not accessible from the river.

837.4 (L) DNR Office, Warner Road.

837.4-36 (L) Port Authority Barge Terminal 1 and coal docks.

836.2 (L) Metropolitan Waste Water Treatment Plant. This plant was started in 1938.

835.8 (R) South Port Industrial District of the St. Paul Port Authority. A 1,500-foot barge channel has been dredged into the bank.

835.8 Chicago and North Western railroad bridge.

837-833.5 Battle Creek Regional Park on left.

834-833 (L) Pig's Eye Island Heron Rookery S.N.A..

833.2 (L) Barge fleet area and entrance to Red Rock Industrial District and Pig's Eye Lake on the left. Pig's Eye Lake is a 500-acre flood plain lake and is the largest rookery for black-crowned night herons in the country.

832.5 Interstate 494 bridge. Boat access (river right) managed by DNR & South St. Paul, south of bridge.

830.3 Rock Island railroad bridge.

829-828 (L) Complex of small islands. An alternate canoe channel lies behind them.

829.8 (L) Water access and rest area.

827.5-825 Upper Grey Cloud Island on the left. The island's shore is made of rugged limestone and dolomite cliffs.

827.2-826 River Lake on right. A couple of channels allow entry to the lake. Macalester College has a biology field station on the lake.

825.0 (L) Alternate channel takes canoeists into Baldwin and Moore lakes. This route leads to the lower end of Lower Grey Cloud Island. There is a rest area on the north side of Lower Grey Cloud Island.

824.0 (R) Pine Bend Industrial Center, a large area with a barge channel.

823-820 Spring Lake, a stump-choked lake that became part of the river when Lock and Dam 2 was constructed. Fishing and waterfowl hunting are often good.

820.2 (R) A water access on the downstream end of Spring Lake. Shallow launch. **CAUTION: Stumpfield from RM 822.3-819.9.**

817.5 (R) Town of Nininger.

815.3-815 Lock and Dam 2; lock passage to the right of the dam. To get to Lake Rebecca Park, portage 40 yds. to the right over the dike into Lake Rebecca and park. To re-enter the river downstream of the lock and dam, portage 80 yds. into the channel at the other end of the lake.

814.2 (R) Jaycee Park. 2 boat accesses, rest area, fishing pier (in Lake Rebecca) and parking.

814.2-813.9 Hastings, one of the historic Mississippi River towns in Minnesota.

813.9 U.S. Highway 61 bridge.

813.7 Railroad trestle swing bridge.

## BARGE TRAFFIC SAFETY TIPS

1. Stay clear of moving barges. They have a blind area directly in front of the barge.
2. Stay clear of the stern of tow boats. They may suddenly turn on a burst of power and overturn a canoe.
3. Turn your bow into the wake of barges and boats.
4. The sides of the navigation channel are marked with red and green buoys. Where possible, stay outside the channel. **RED ON RIGHT RETURNING UPSTREAM.**
5. When meeting a barge at a bend in the river, move to the inside of the bend where possible.

## PROCEDURE FOR USING NAVIGATIONAL LOCKS

**1. Lockage Signals**

Upon approach to lock, signals are provided. Small boat operators may signal for a lockage by pulling signal cord located at midpoint on upper and lower guide walls as shown above.

**2. Traffic Signals**

- RED - Stand clear, do not approach
- YELLOW - Approach lock under full control
- GREEN - Enter lock

\*NO LIGHT - Lock not in use, approach guide wall and signal for lockage

**3. Locking Through**

Upon receiving green light, proceed slowly into lock and observe mooring lines spaced along lock wall. The lines should be held by hand and not tied to the boat while in the lock chamber. Do not tie a line to a recessed ladder. Insure that passengers remain seated at all times and keep hands inside the boat to avoid the chance of crushed fingers. If construction of craft requires handling lines while on deck, a life jacket should be worn. Do not leave motor of craft running during lockage, do not climb ladders of lock structure.

**4. Departing the Lock**

Upon completion of the lock filling or emptying operation, and when the gates are fully open, a signal will be given by the lock operator that it is safe to depart the lock. The signal will be either one short toot of the signal horn or a hand signal by the lock operator. Leave the lock at a slow speed assuring that you are well clear of the lock structure before gaining speed. The approaches to the locks are considered no-wake zones.



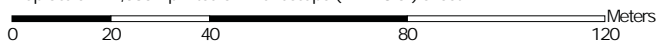
# Appendix H

NRCS – Web Soil Survey Map

Soil Map—Washington County, Minnesota  
(Grey Cloud Channel Restoration Project)



Map Scale: 1:1,530 if printed on A landscape (11" x 8.5") sheet.




0 20 40 80 120 Meters  
0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Minnesota  
Survey Area Data: Version 10, Sep 18, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 16, 2012—Apr 26, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

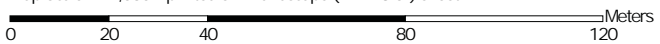
## Map Unit Legend

Washington County, Minnesota (MN163)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
100B	Copaston loam, 0 to 6 percent slopes	0.4	11.9%
329	Chaska silt loam	1.1	31.5%
1819F	Dorerton-Rock outcrop complex, 25 to 65 percent slopes	1.2	35.2%
W	Water	0.7	21.4%
<b>Totals for Area of Interest</b>		<b>3.4</b>	<b>100.0%</b>

Farmland Classification—Washington County, Minnesota  
(Grey Cloud Channel Restoration Project)



Map Scale: 1:1,530 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84



Farmland Classification—Washington County, Minnesota  
(Grey Cloud Channel Restoration Project)









**MAP LEGEND**








**Area of Interest (AOI)**

 Area of Interest (AOI)




**Soils**








**Soil Rating Polygons**






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







**Soil Rating Lines**










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

**Soil Rating Points**

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

**Water Features**

## MAP INFORMATION

 Streams and Canals

### Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Minnesota  
Survey Area Data: Version 10, Sep 18, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 16, 2012—Apr 26, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



## Farmland Classification

Farmland Classification— Summary by Map Unit — Washington County, Minnesota (MN163)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100B	Copaston loam, 0 to 6 percent slopes	Farmland of statewide importance	0.4	11.9%
329	Chaska silt loam	Not prime farmland	1.1	31.5%
1819F	Dorerton-Rock outcrop complex, 25 to 65 percent slopes	Not prime farmland	1.2	35.2%
W	Water	Not prime farmland	0.7	21.4%
<b>Totals for Area of Interest</b>			<b>3.4</b>	<b>100.0%</b>

### Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

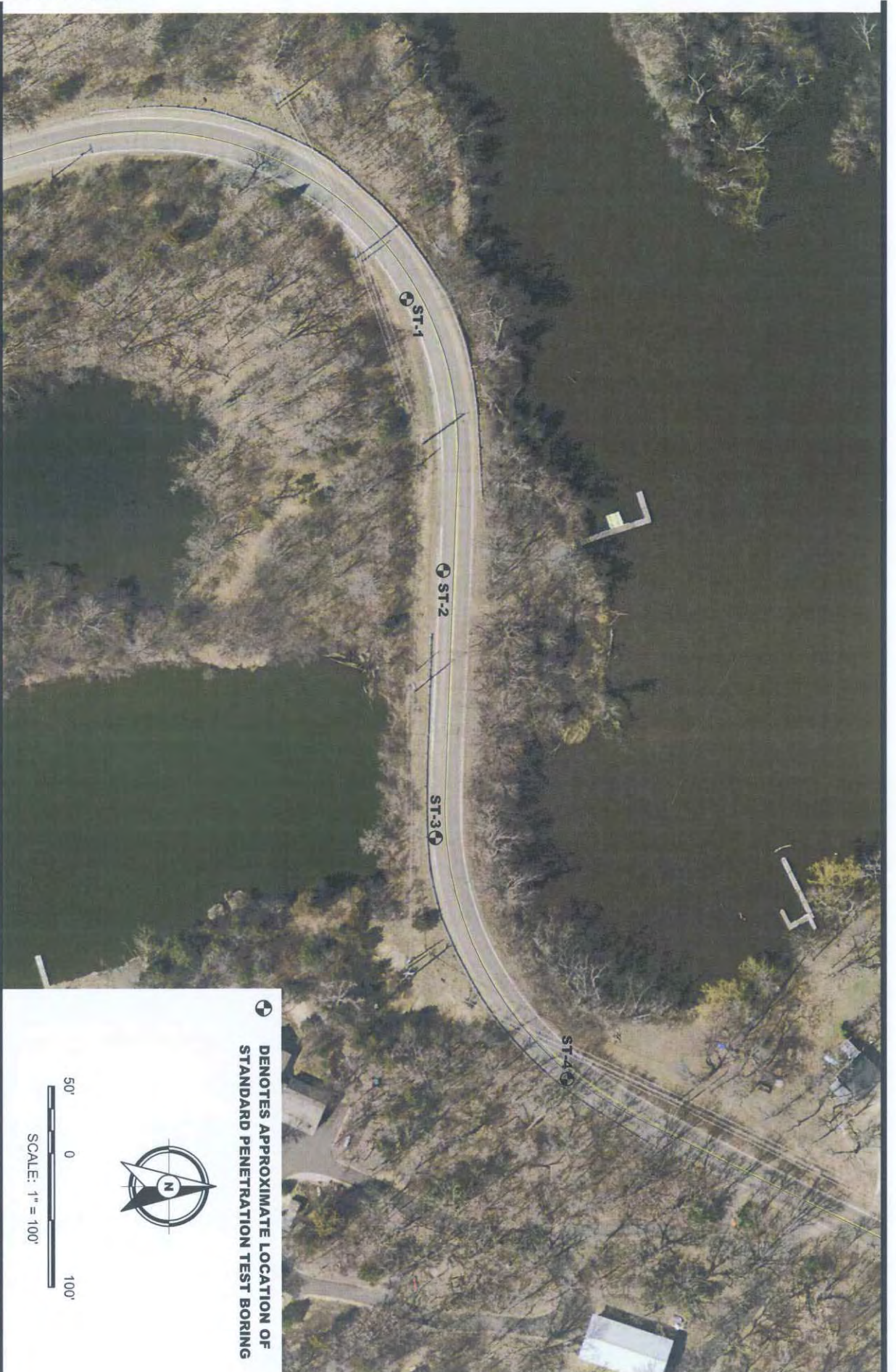
### Rating Options

*Aggregation Method:* No Aggregation Necessary

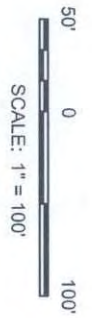
*Tie-break Rule:* Lower

# Appendix I

## Grey Cloud Crossing Geotechnical Boring Logs



 DENOTES APPROXIMATE LOCATION OF  
 STANDARD PENETRATION TEST BORING



**SOIL BORING LOCATION SKETCH**  
 EMBANKMENT CHARACTERIZATION  
 GREY CLOUD ISLAND DRIVE SOUTH FLOOD PROTECTION  
 COUNTY ROAD 75  
 GREY CLOUD ISLAND, MINNESOTA

Project No:	SP1101226A
Drawing No:	SP1101226A
Scale:	1" = 100'
Drawn By:	BJB
Date Drawn:	4/1/11
Checked By:	CDH
Last Modified:	4/1/11

**BRAUN**  
**INTERTEC**  
 11001 Hampshire Avenue So.  
 Minneapolis, MN 55438  
 PH. (952) 995-2000  
 FAX (952) 995-2020

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\01226A.GPJ BRAUN\_V8\_CURRENT.GDT 10/26/11 15:02

Braun Project SP-11-01226A Geotechnical Evaluation Grey Cloud Island Drive S Flood Protection County Road 75 Grey Cloud Island, Minnesota			BORING: <b>ST-1</b>		
DRILLER: J. Chermak			METHOD: 3 1/4" HSA, Autohammer		
DATE: 3/25/11			SCALE: 1" = 4'		
Depth feet	Symbol	Description of Materials (Soil- ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
0.0					
0.5	PAV	6" of bituminous			
1.3	FILL	FILL: 9" of aggregate base.			
	FILL	FILL: Poorly Graded Sand with Silt and Gravel, fine- to coarse-grained, dark brown, moist.			
			7*		*Poor recovery from 2 to 5 feet
			22		P200 = %, full gradation attached
			18		
9.0	FILL	Presumed -			No recovery from 9 to 11 feet
			13		
11.0	SC-SM	SILTY CLAYEY SAND, fine-grained, brown, waterbearing, very loose. (Alluvium)		▽	P200 = %, full gradation attached
14.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown, waterbearing, very loose. (Alluvium)			
			2		
			2		P200 = %, full gradation attached
19.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown, waterbearing, very loose. (Alluvium)			
			2		
21.0		END OF BORING.  Water observed at 12 1/2 feet while drilling.  Water observed at 19 feet immediately after withdrawal of auger.  Water not observed to cave-in depth of 12 feet immediately after withdrawal of auger.  Boring then backfilled.			An open triangle in the water level (WL) column indicates the depth at which groundwater was observed while drilling. Groundwater levels fluctuate.

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\01226A.GPJ BRAUN\_V8\_CURRENT.GDT 10/26/11 15:02

<b>Braun Project SP-11-01226A</b> <b>Geotechnical Evaluation</b> <b>Grey Cloud Island Drive S Flood Protection</b> <b>County Road 75</b> <b>Grey Cloud Island, Minnesota</b>			BORING: <b>ST-2</b> LOCATION: See attached sketch.		
DRILLER: J. Chermak	METHOD: 3 1/4" HSA, Autohammer	DATE: 3/25/11	SCALE: 1" = 4'		
Depth feet	Symbol	Description of Materials (Soil- ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
0.0					
0.5	PAV	6 1/4" of bituminous			
	FILL	FILL: 24" of aggregate base			
2.2					
3.0	FILL	FILL: Silty Sand, fine-grained, yellowish-brown, moist.	25		
	FILL	FILL: Poorly Graded Sand with Silt and Gravel, fine- to medium-grained, dark brown, moist.	25		P200 = %, full gradation attached
			22		
9.0					
	FILL	FILL: Silty Sand, fine-grained, dark brown, moist, loose. (Glacial Outwash)	8		
			2	▽	
14.0					
	SC-SM	SILTY CLAYEY SAND, fine-grained, brown, waterbearing, very loose. (Glacial Outwash)	*		* 1 blow produced 18" of penetration
17.0					
	SM	SILTY SAND, medium- to coarse-grained, brown, waterbearing, loose. (Glacial Outwash)	7		P200 = %, full gradation attached
21.0			7		
		END OF BORING.			
		Water observed at 12 1/2 feet while drilling.			
		Water observed at 19 feet immediately after withdrawal of auger.			
		Water not observed to cave-in depth of 12 feet immediately after withdrawal of auger.			
		Boring then backfilled.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\01226A.GPJ BRAUN\_V8\_CURRENT.GDT 10/26/11 11:15:02

Braun Project SP-11-01226A Geotechnical Evaluation Grey Cloud Island Drive S Flood Protection County Road 75 Grey Cloud Island, Minnesota			BORING: <b>ST-3</b>		
DRILLER: J. Chermak			METHOD: 3 1/4" HSA, Autohammer		
DATE: 3/24/11			SCALE: 1" = 4'		
Depth feet	Symbol	Description of Materials (Soil- ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
0.0					
0.5	PAV	5 1/2" of bituminous			
	FILL	FILL: 36 1/2" of aggregate base			
3.5	FILL	FILL: Poorly Graded Sand with Silt and Gravel, fine- to medium-grained, black and brown, moist.	36		
6.0	FILL	VOID	37		P200 = %, full gradation attached
			WH		Auger and sampler dropped 7 feet.
			WH		
14.0	FILL	Many pieces of wood and Gravel.	1	▽	Poor recovery from 14 to 25 feet
			1		
19.0	FILL	FILL: Poorly Graded Sand with Silt and Gravel, fine- to medium-grained, many pieces of wood, brown, waterbearing.	8		P200 = %, full gradation attached
			11		Refusal at 21 feet, offset 15 feet W and redrilled to 25 feet..
24.0	FILL	Wood fragments			
25.0	FILL	FILL: Poorly Graded Sand with Gravel, fine- to medium-grained, brown, waterbearing.	*		* 50 blows for 6" (set)
26.5	FILL	FILL: Poorly-Graded Gravel with Sand, fine-grained, coarse-grained, with limestone pieces, brown, waterbearing.	30		
29.0	FILL	FILL: Poorly Graded Sand, medium-grained, with pieces of wood, lenses of Lean Clay, brown and gray, waterbearing, loose.	6		
31.0	OL	ORGANIC SILT with SAND, pieces of wood, black, wet, soft.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\01226A.GPJ BRAUN\_V8\_CURRENT.GDT 10/26/11 15:02

<b>Braun Project SP-11-01226A</b> <b>Geotechnical Evaluation</b> <b>Grey Cloud Island Drive S Flood Protection</b> <b>County Road 75</b> <b>Grey Cloud Island, Minnesota</b>			BORING: <b>ST-3 (cont.)</b> LOCATION: See attached sketch.		
DRILLER: J. Chermak		METHOD: 3 1/4" HSA, Autohammer		DATE: 3/24/11	SCALE: 1" = 4'
Depth feet	Symbol	Description of Materials (Soil- ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
32.0					
34.0		ORGANIC SILT with SAND, pieces of wood, black, wet, soft. (continued)	2		OC =
	SP	POORLY GRADED SAND, medium- to coarse-grained, with lenses of Lean Clay, brown, waterbearing, loose. (Alluvium)	7		P200 = %, full gradation attached
			12		
40.0					
41.0	GP	POORLY GRADED GRAVEL, consisting mainly of limestone with Sand, brownish-yellow, waterbearing, very dense. (Glacial Outwash or Weathered Bedrock)	*		* 50 blows for 1/8"
		END OF BORING.			
		Water observed at 15 feet while drilling.			
		Water observed at 20 feet immediately after withdrawal of auger.			
		Boring then grouted with 7 to 8 bags of bentonite and filled with 2 truck loads of sand backfill.			

(See Descriptive Terminology sheet for explanation of abbreviations)

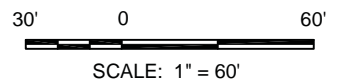
LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\01226A.GPJ BRAUN\_V8\_CURRENT.GDT 10/26/11 15:02

<b>Braun Project SP-11-01226A</b> <b>Geotechnical Evaluation</b> <b>Grey Cloud Island Drive S Flood Protection</b> <b>County Road 75</b> <b>Grey Cloud Island, Minnesota</b>			<b>BORING: ST-4</b> LOCATION: See attached sketch.		
DRILLER: J. Chermak	METHOD: 3 1/4" HSA, Autohammer	DATE: 3/25/11	SCALE: 1" = 4'		
Depth feet	Symbol	Description of Materials (Soil- ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
0.0					
0.5	PAV	5 3/4" of bituminous			
1.2	FILL	FILL: 8" of aggregate base			
	FILL	FILL: Poorly Graded Sand with Silt and Gravel, fine- to medium-grained, with pieces of bituminous, inclusions of Lean Clay, brown and black, moist.	17		Sieve/hydro
6.0			46*		*No recovery
	FILL	FILL: Silty Sand, fine- to medium-grained, dark brown, moist.	7		
9.0					
	SP	POORLY GRADED SAND, fine-grained, brown, moist, very loose. (Alluvium)	4		
11.0					
	SP	POORLY GRADED SAND, fine- to medium-grained, with a trace of Silt, brown, waterbearing, very loose. (Alluvium)	4	▽	Sieve/hydro
			2		
17.0					
	GP	POORLY GRADED GRAVEL, consisting mainly of limestone with Sand, yellowish-brown, waterbearing, medium dense to dense. (Glacial Outwash/ Weathered Bedrock)	14		
21.0			39		
		END OF BORING.			
		Water observed at 12 1/2 feet while drilling.			
		Water observed at 15 feet immediately after withdrawal of auger.			
		Water not observed to cave-in depth of 11 1/2 feet immediately after withdrawal of auger.			
		Boring then backfilled.			





⊗ DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING



Sheet of Fig:	Project No:	SP1107799A
	Drawing No:	SP1107799A
	Scale:	1" = 60'
	Drawn By:	BJB
	Date Drawn:	6/18/12
	Checked By:	JB
	Last Modified:	6/26/12

SOIL BORING LOCATION SKETCH  
 GEOTECHNICAL EVALUATION  
 GREY CLOUD ISLAND DRIVE BRIDGE  
 COUNTY ROAD 75  
 GREY CLOUD ISLAND, MINNESOTA

**BRAUN**  
**INTERTEC**

11001 Hampshire Avenue So.  
 Minneapolis, MN 55438  
 PH. (952) 995-2000  
 FAX (952) 995-2020

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\07799A.GPJ BRAUN\_V8\_CURRENT.GDT 8/27/12 13:50

(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-11-07799A GEOTECHNICAL EVALUATION Grey Cloud Island Drive Bridge County Road 75 Grey Cloud Island, Minnesota				BORING: <b>ST-5</b>				
DRILLER: S. McLean		METHOD: 3 1/4" HSA, Autohammer		DATE: 6/21/12		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
701.1	0.0							
700.7	0.4	PAV FILL	4 1/2 inches of bituminous. FILL: Silty Sand, fine- to medium-grained, with crushed Limestone, light brown, moist.					
697.1	4.0	FILL	FILL: Silty Sand, fine- to coarse-grained, with Gravel and Cobbles, dark brown, moist.	35		4		
689.1	12.0	FILL	FILL: Silty Sand, fine- to medium-grained, with Gravel and Cobbles, light brown, moist.	22				
687.1	14.0	FILL	FILL: Silt with Sand, fine- to medium-grained, trace roots and Gravel with lenses of dark brown Silty Sand throughout, increasing in amount with depth, dark gray, waterbearing.	7*				*No sample recovery.
				6				
				8				
				1	▽	27		An open triangle in the water level (WL) column indicates the depth at which groundwater was first observed while drilling. A solid triangle indicates the groundwater level in the boring on the date indicated. Groundwater levels fluctuate.
				6		22		
677.1	24.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace Gravel, gray, waterbearing.	12	▼			
			Wood pieces encountered at 30 feet.	10				

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\07799A.GPJ BRAUN\_V8\_CURRENT.GDT 8/27/12 13:50

(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-11-07799A GEOTECHNICAL EVALUATION Grey Cloud Island Drive Bridge County Road 75 Grey Cloud Island, Minnesota				BORING: <b>ST-5 (cont.)</b> LOCATION: N: 125832.47, E: 457200.27. See attached sketch.				
DRILLER: S. McLean		METHOD: 3 1/4" HSA, Autohammer		DATE: 6/21/12		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
669.1	32.0							
667.1	34.0		FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace Gravel, gray, waterbearing. (continued)					
		SP-SM	POORLY GRADED SAND with SILT, fine- to coarse-grained, with Gravel, brown, waterbearing, medium dense.  (Alluvium)  Lense of dark gray Silt with Sand at 35 feet.	23				
				15				
657.1	44.0	SP-SM	POORLY GRADED SAND with SILT, medium- to coarse-grained, trace Gravel with increasing amount of Gravel with depth, brown, waterbearing, medium dense.  (Alluvium)	30		16	6	
				20				
647.1	54.0	GM	SILTY GRAVEL, fine- to medium-grained, consisting mainly of decomposed dolomite, light brown, waterbearing, very dense.  (Alluvium)	50/3"				
641.6	59.5			50/2"				Auger met refusal at the 59 1/2-foot depth.  Switched from SBT to NQ rock coring method from 59 1/2 to 64 1/2 feet.
640.4	60.7	DOL	PRAIRIE DU CHIEN DOLOMITE, light brown, highly weathered, intensely fractured, inclusions of thin-bedded sandstone.					
		SS	PRAIRIE DU CHIEN SANDSTONE, light tannish brown, slightly weathered, moderately hard, highly fractured.					
638.1	63.0	DOL						

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\07799A.GPJ BRAUN\_V8\_CURRENT.GDT 8/27/12 13:50

<b>Braun Project SP-11-07799A</b> <b>GEOTECHNICAL EVALUATION</b> <b>Grey Cloud Island Drive Bridge</b> <b>County Road 75</b> <b>Grey Cloud Island, Minnesota</b>					<b>BORING: ST-5 (cont.)</b> LOCATION: N: 125832.47, E: 457200.27. See attached sketch.				
DRILLER: S. McLean		METHOD: 3 1/4" HSA, Autohammer		DATE: 6/21/12		SCALE: 1" = 4'			
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
637.1	64.0								
636.6	64.5		PRAIRIE DU CHIEN DOLOMITE, very light brown and white, slightly weathered, moderately hard, highly fractured. <i>(continued)</i> END OF BORING/CORE.  Groundwater observed at a depth of 15 feet while drilling.  Groundwater observed at a depth of 26 feet with hollow-stem auger.  Boring immediately backfilled with bentonite grout after rock coring.						

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\07799A.GPJ BRAUN\_V8\_CURRENT.GDT 8/27/12 13:50

Braun Project SP-11-07799A					BORING: <b>ST-6</b>				
GEOTECHNICAL EVALUATION					LOCATION: N: 125832.01, E: 457300.32 See attached sketch.				
Grey Cloud Island Drive Bridge									
County Road 75									
Grey Cloud Island, Minnesota									
DRILLER: S. McLean		METHOD: 3 1/4" HSA, Autohammer			DATE: 6/22/12		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
701.7	0.0								
701.3	0.4	PAV	5 inches of bituminous.						
		FILL	FILL: Silty Sand, fine- to medium-grained, with crushed Limestone, light brown, moist.	32		4			
697.7	4.0	FILL	FILL: Silty Sand, fine- to coarse-grained, with Gravel and bituminous, dark brown, moist.	45		5			
				5					
692.7	9.0	FILL	FILL: Silty Sand, fine- to coarse-grained, with increasing amount of Gravel with depth, brown, moist.	6					
				12					
			Cobbles suspected at 15 feet.	10*					*No sample recovery.
683.7	18.0	GM	SILTY GRAVEL with SAND, mainly dolomite with possible Cobbles, brown, waterbearing, loose to medium dense.  (Alluvium)	15	▽				
				8	▼	9	5		
671.7	30.0	SP-SM	POORLY GRADED SAND with SILT, with Gravel and Limestone, trace of roots, brown, waterbearing, dense.  (Alluvium)	45					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2011\07799A.GPJ BRAUN\_V8\_CURRENT.GDT 8/27/12 13:50

<b>Braun Project SP-11-07799A</b> <b>GEOTECHNICAL EVALUATION</b> <b>Grey Cloud Island Drive Bridge</b> <b>County Road 75</b> <b>Grey Cloud Island, Minnesota</b>				<b>BORING: ST-6 (cont.)</b> LOCATION: N: 125832.01, E: 457300.32 See attached sketch.				
DRILLER: S. McLean		METHOD: 3 1/4" HSA, Autohammer		DATE: 6/22/12		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
669.7	32.0							
667.7	34.0		POORLY GRADED SAND with SILT, with Gravel and Limestone, trace of roots, brown, waterbearing, dense. (Alluvium) <i>(continued)</i>					
666.7	35.0	SP-SM	POORLY GRADED SAND with SILT, medium- to coarse-grained, trace Gravel, brown, waterbearing, dense.	50/2**				*24 blows to set, followed by 50 blows for 2 inches.  Auger met refusal at the 37-foot depth.  Switched from SBT to NQ rock coring method from 37 to 42 feet.
		SS	(Alluvium)					
664.7	37.0		HIGHLY WEATHERED SANDSTONE, with dolomite, light brown, waterbearing.					
		DOL	(Bedrock)					
663.2	38.5		PRAIRIE DU CHIEN DOLOMITE, light brown, highly weathered, moderately hard, intensely fractured, porous, inclusions of thin-bedded sandstone.					
		DOL						
661.2	40.5		PRAIRIE DU CHIEN DOLOMITE, gray and whitish tan, highly weathered, hard, intensely fractured, porous, pits throughout.					
		SS						
659.7	42.0		PRAIRIE DU CHIEN SANDSTONE, brown, highly fractured, moderately hard, highly fractured, porous, staining throughout.					
			END OF BORING/CORE.					
			Groundwater observed at a depth of 19 feet while drilling.					
			Groundwater observed at a depth of 22 feet with hollow-stem auger.					
			Boring immediately backfilled with bentonite grout after rock coring.					

# Appendix J

## Well Log Records

**531424**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/11/1994  
 Update Date  
 Received Date 02/14/2014

<b>Well Name</b> REPKE, RUSS	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BACACC	<b>Well Depth</b> 175 ft.	<b>Depth Completed</b> 175 ft.	<b>Date Well Completed</b> 09/29/1993
<b>Elevation</b> 702 ft.	<b>Elev. Method</b> 7.5 minute topographic map (+/- 5 feet)				<b>Drill Method</b> Non-specified Rotary	<b>Drill Fluid</b> Foam	
<b>Address</b>					<b>Use</b> domestic	<b>Status</b> Active	
C/W 9263 GREYCLOUD ISLAND DR ST PAUL PARK MN 55071					<b>Well Hydrofractured?</b>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
					<b>Casing Type</b> Single casing	<b>Joint</b> Welded	
<b>Stratigraphy Information</b>					<b>Drive Shoe?</b>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
					<b>Above/Below</b>		
<b>Geological Material</b>	<b>From</b>	<b>To (ft.)</b>	<b>Color</b>	<b>Hardness</b>	<b>Casing Diameter</b>	<b>Weight</b>	<b>Hole Diameter</b>
SAND	0	2	BROWN	SOFT	4 in. To	168 ft. 10.7 lbs./ft.	8 in. To 168 ft.
LIMEROCK	2	140	YEL/WHT	HARD			4 in. To 175 ft.
SANDROCK	140	175	WHITE	MEDIUM			
					<b>Open Hole</b>	From 168 ft.	To 175 ft.
					<b>Screen?</b> <input type="checkbox"/>	<b>Type</b>	<b>Make</b>
					<b>Static Water Level</b>		
					20 ft.	Land surface	Measure 09/29/1993
					<b>Pumping Level (below land surface)</b>		
					73 ft.	1 hrs. Pumping at	25 g.p.m.
					<b>Wellhead Completion</b>		
					Pitless adapter manufacturer	MAASS	Model 4J1
					<input type="checkbox"/> Casing Protection	<input type="checkbox"/> 12 in. above grade	
					<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)		
					<b>Grouting Information</b>	Well Grouted?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Specified
					Material	Amount	From To
					Neat Cement	55 Sacks	0 ft. 168 ft.
					<b>Nearest Known Source of Contamination</b>		
					26 feet	Northeas Direction	Septic tank/drain field Type
					Well disinfected upon completion?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
					<b>Pump</b> <input type="checkbox"/> Not Installed	Date Installed	11/05/1993
					Manufacturer's name	GPM	
					Model Number	10G101313	HP 0.75 Volt 230
					Length of drop pipe	115 ft	Capacity 10 g.p. Typ Submersible
					<b>Abandoned</b>		
					Does property have any not in use and not sealed well(s)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
					<b>Variance</b>		
					Was a variance granted from the MDH for this well?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
					<b>Miscellaneous</b>		
					First Bedrock	Prairie Du Chien Group	Aquifer Jordan
					Last Strat	Jordan Sandstone	Depth to Bedrock 2 ft
					Located by Minnesota Geological Survey		
					Locate Method	Digitized - scale 1:24,000 or larger (Digitizing Table)	
					System	UTM - Mad83, Zone 15, Meters	X 500224 Y 4962534
					Unique Number Verification	Address verification	Inpute Date 02/01/1998
					<b>Angled Drill Hole</b>		
					<b>Well Contractor</b>		
					Mantyla Well Co.	82084	SANDERS, G.
					Licensee Business	Lic. or Reg. No.	Name of Driller
<b>Remarks</b>							
<b>Minnesota Well Index Report</b>					<b>531424</b>		
					Printed on 03/18/2016 HE-01205-15		



**257692**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/22/2014  
 Update Date  
 Received Date 10/22/2015

<table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;"><b>Well Name</b></td> <td style="width:15%;"><b>Township</b></td> <td style="width:15%;"><b>Range</b></td> <td style="width:15%;"><b>Dir Section</b></td> <td style="width:15%;"><b>Subsection</b></td> </tr> <tr> <td>NOTEBOOM,</td> <td>27</td> <td>22</td> <td>W 24</td> <td>BABDCA</td> </tr> <tr> <td><b>Elevation</b></td> <td>710 ft.</td> <td><b>Elev. Method</b></td> <td colspan="2">Calc from NED (Natl.Elev.Dataset-30m)</td> </tr> <tr> <td colspan="5"><b>Address</b></td> </tr> <tr> <td colspan="5">C/W 9100 GREY CLOUD ISLAND ST PAUL PARK MN 55071</td> </tr> <tr> <td colspan="5"><b>Stratigraphy Information</b></td> </tr> </table>	<b>Well Name</b>	<b>Township</b>	<b>Range</b>	<b>Dir Section</b>	<b>Subsection</b>	NOTEBOOM,	27	22	W 24	BABDCA	<b>Elevation</b>	710 ft.	<b>Elev. Method</b>	Calc from NED (Natl.Elev.Dataset-30m)		<b>Address</b>					C/W 9100 GREY CLOUD ISLAND ST PAUL PARK MN 55071					<b>Stratigraphy Information</b>					<table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;"><b>Well Depth</b></td> <td style="width:30%;"><b>Depth Completed</b></td> <td style="width:40%;"><b>Date Well Completed</b></td> </tr> <tr> <td>null</td> <td>null</td> <td></td> </tr> <tr> <td><b>Drill Method</b></td> <td colspan="2"><b>Drill Fluid</b></td> </tr> <tr> <td colspan="3"><b>Use</b></td> </tr> <tr> <td colspan="3"><b>Status</b></td> </tr> <tr> <td><b>Well Hydrofractured?</b></td> <td>Yes <input type="checkbox"/></td> <td>No <input type="checkbox"/></td> </tr> <tr> <td><b>Casing Type</b></td> <td colspan="2"><b>Joint</b></td> </tr> <tr> <td><b>Drive Shoe?</b></td> <td>Yes <input type="checkbox"/></td> <td>No <input type="checkbox"/></td> </tr> <tr> <td colspan="3"><b>Above/Below</b></td> </tr> <tr> <td colspan="3"><b>Open Hole</b></td> </tr> <tr> <td></td> <td>From</td> <td>To</td> </tr> <tr> <td></td> <td>ft.</td> <td>ft.</td> </tr> <tr> <td><b>Screen?</b></td> <td><input type="checkbox"/></td> <td><b>Type</b></td> </tr> <tr> <td></td> <td></td> <td><b>Make</b></td> </tr> <tr> <td colspan="3"><b>Static Water Level</b></td> </tr> <tr> <td colspan="3"><b>Pumping Level (below land surface)</b></td> </tr> <tr> <td colspan="3"><b>Wellhead Completion</b></td> </tr> <tr> <td colspan="2">Pitless adapter manufacturer</td> <td>Model</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Casing Protection</td> <td><input type="checkbox"/> 12 in. above grade</td> </tr> <tr> <td><input type="checkbox"/></td> <td colspan="2">At-grade (Environmental Wells and Borings ONLY)</td> </tr> <tr> <td><b>Grouting Information</b></td> <td>Well Grouted?</td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Specified</td> </tr> <tr> <td colspan="3"><b>Nearest Known Source of Contamination</b></td> </tr> <tr> <td></td> <td>feet</td> <td>Direction</td> </tr> <tr> <td></td> <td></td> <td>Type</td> </tr> <tr> <td colspan="3">Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td><b>Pump</b></td> <td><input type="checkbox"/> Not Installed</td> <td>Date Installed</td> </tr> <tr> <td colspan="3">Manufacturer's name</td> </tr> <tr> <td colspan="2">Model Number</td> <td>HP</td> </tr> <tr> <td colspan="2">Length of drop pipe</td> <td>Volt</td> </tr> <tr> <td></td> <td>ft</td> <td>Capacity</td> </tr> <tr> <td></td> <td></td> <td>g.p.</td> </tr> <tr> <td></td> <td></td> <td>Typ</td> </tr> <tr> <td colspan="3"><b>Abandoned</b></td> </tr> <tr> <td colspan="3">Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td colspan="3"><b>Variance</b></td> </tr> <tr> <td colspan="3">Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td colspan="3"><b>Miscellaneous</b></td> </tr> <tr> <td colspan="2">First Bedrock</td> <td>Aquifer</td> </tr> <tr> <td colspan="2">Last Strat</td> <td>Depth to Bedrock</td> </tr> <tr> <td colspan="2"></td> <td>ft</td> </tr> <tr> <td colspan="3">Located by Minnesota Department of Health</td> </tr> <tr> <td colspan="3">Locate Method GPS SA Off (averaged)</td> </tr> <tr> <td>System</td> <td>UTM - Mad83, Zone 15, Meters</td> <td>X 500219 Y 4962688</td> </tr> <tr> <td>Unique Number Verification</td> <td>Info/GPS from data</td> <td>Input Date 01/21/2014</td> </tr> <tr> <td colspan="3"><b>Angled Drill Hole</b></td> </tr> <tr> <td colspan="3"><b>Well Contractor</b></td> </tr> <tr> <td colspan="2">Licensee Business</td> <td>Lic. or Reg. 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<b>Well Contractor</b>																																																																																																																																																																															
Licensee Business		Lic. or Reg. No.																																																																																																																																																																													
		Name of Driller																																																																																																																																																																													

**257691**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/22/2014  
 Update Date  
 Received Date 10/22/2015

<b>Well Name</b> LEDO, JEROME J 27	<b>Township</b> 22	<b>Range</b> W 24	<b>Dir Section</b> BABDBD	<b>Subsection</b>	<b>Well Depth</b> null	<b>Depth Completed</b> null	<b>Date Well Completed</b>
<b>Elevation</b> 714 ft.	<b>Elev. Method</b>	Calc from NED (Natl.Elev.Dataset-30m)					
<b>Address</b>				<b>Use</b>			
C/W 9070 GREY CLOUD ISLAND ST PAUL PARK MN 55071				<b>Status</b>			
<b>Stratigraphy Information</b>				<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>From</b> <b>To</b>			
				<b>Casing Type</b> <b>Joint</b>			
				<b>Drive Shoe?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>Above/Below</b>			
				<b>Open Hole</b> From ft. To ft.			
				<b>Screen?</b> <input type="checkbox"/> <b>Type</b> <b>Make</b>			
				<b>Static Water Level</b>			
				<b>Pumping Level (below land surface)</b>			
				<b>Wellhead Completion</b>			
				Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)			
				<b>Grouting Information</b> Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Specified			
<b>Nearest Known Source of Contamination</b>							
feet _____ Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Pump</b> <input type="checkbox"/> Not Installed <input type="checkbox"/> Date Installed _____							
Manufacturer's name _____ Model Number _____ HP _____ Volt _____ Length of drop pipe _____ ft Capacity _____ g.p. Typ _____							
<b>Abandoned</b>							
Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Variance</b>							
Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Miscellaneous</b>							
First Bedrock _____ Aquifer _____ Last Strat _____ Depth to Bedrock _____ ft							
Located by Minnesota Department of Health Locate Method GPS SA Off (averaged) System UTM - Mad83, Zone 15, Meters X 500232 Y 4962715 Unique Number Verification Info/GPS from data Inpute Date 01/21/2014							
<b>Angled Drill Hole</b>							
<b>Well Contractor</b>							
Licensee Business _____ Lic. or Reg. No. _____ Name of Driller _____							

**761663**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 12/17/2009  
 Update Date 06/14/2010  
 Received Date 09/29/2014

<b>Well Name</b> WICKE, TONY	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BABDBD	<b>Well Depth</b> 200 ft.	<b>Depth Completed</b> 200 ft.	<b>Date Well Completed</b> 04/22/2010
<b>Elevation</b> 713 ft.	<b>Elev. Method</b> 7.5 minute topographic map (+/- 5 feet)				<b>Drill Method</b> Non-specified Rotary	<b>Drill Fluid</b> Foam	
<b>Address</b>					<b>Use</b> domestic		<b>Status</b> Active
Contact 9010 GREY CLOUD ISLAND DR ST PAUL PARK MN 55071					<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>From</b> <b>To</b>		
Well 9070 GREY CLOUD ISLAND DR ST PAUL PARK MN 55071					<b>Casing Type</b> Step down <b>Joint</b>		
<b>Stratigraphy Information</b>					<b>Drive Shoe?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>Above/Below</b>		
<b>Geological Material</b>		<b>From</b>	<b>To (ft.)</b>	<b>Color</b>	<b>Hardness</b>	<b>Casing Diameter</b> <b>Weight</b> <b>Hole Diameter</b>	
CLAY		0	3	BROWN	SOFT	4 in. To 168 ft. 10.7 lbs./ft. 12 in. To 8 ft.	
LIME		3	142	YELLOW	HARD	8 in. To 8 ft. 28.5 lbs./ft. 8 in. To 168 ft.	
SANDROCK		142	165	BROWN	SOFT		
SANDROCK		165	200	BROWN	MEDIUM		
<b>Open Hole</b>					From 168 ft. To 200 ft.		
<b>Screen?</b> <input type="checkbox"/>					<b>Type</b> <b>Make</b>		
<b>Static Water Level</b>					35 ft. Land surface Measure 04/22/2010		
<b>Pumping Level (below land surface)</b>					80 ft. 2 hrs. Pumping at 20 g.p.m.		
<b>Wellhead Completion</b>					Pitless adapter manufacturer WHITEWATER Model SUYX5.5		
<input type="checkbox"/> Casing Protection					<input type="checkbox"/> 12 in. above grade		
<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)							
<b>Grouting Information</b>					Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Specified		
<b>Material</b>		<b>Amount</b>	<b>From</b>	<b>To</b>			
		3 Cubic yards	0 ft.	168 ft.			
<b>Nearest Known Source of Contamination</b>					59 feet West Direction Septic tank/drain field Type		
Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Pump</b> <input type="checkbox"/> Not Installed					Date Installed 04/22/2010		
Manufacturer's name GRUNDFOS							
Model Number 15SQE0718		HP 0.75	Volt 230				
Length of drop pipe 84 ft		Capacity 15 g.p.	Typ				
<b>Abandoned</b>					Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<b>Variance</b>					Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<b>Miscellaneous</b>					First Bedrock Prairie Du Chien Group Aquifer Jordan		
Last Strat Jordan Sandstone		Depth to Bedrock 3		ft			
Located by Minnesota Department of Health							
Locate Method Digitization (Screen) - Map (1:24,000)							
System UTM - Mad83, Zone 15, Meters		X 500226	Y 4962716				
Unique Number Verification		Info/GPS from data	Inpute Date 10/22/2009				
<b>Angled Drill Hole</b>							
<b>Well Contractor</b>					Kimmes Bauer Well Drilling, 1540 FRITZ, R.		
Licensee Business		Lic. or Reg. No.	Name of Driller				

**257690**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/22/2014  
 Update Date  
 Received Date 10/22/2015

<b>Well Name</b> TAYLOR,	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BAACBA	<b>Well Depth</b> null	<b>Depth Completed</b> null	<b>Date Well Completed</b>			
<b>Elevation</b> 737 ft.	<b>Elev. Method</b>	Calc from NED (Natl.Elev.Dataset-30m)			<b>Drill Method</b>	<b>Drill Fluid</b>				
<b>Address</b>					<b>Use</b>					
C/W 9055 GREY CLOUD ISLAND ST PAUL PARK MN 55071					<b>Status</b>					
<b>Stratigraphy Information</b>					<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>From</b> <b>To</b>					
					<b>Casing Type</b>			<b>Joint</b>		
					<b>Drive Shoe?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>			<b>Above/Below</b>		
					<b>Open Hole</b>			From ft. To ft.		
					<b>Screen?</b> <input type="checkbox"/>			<b>Type</b> <b>Make</b>		
					<b>Static Water Level</b>					
					<b>Pumping Level (below land surface)</b>					
					<b>Wellhead Completion</b>			Pitless adapter manufacturer Model		
					<input type="checkbox"/> Casing Protection			<input type="checkbox"/> 12 in. above grade		
					<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)					
<b>Grouting Information</b>			Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Specified							
<b>Nearest Known Source of Contamination</b>			feet Direction Type							
Well disinfected upon completion?			<input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Pump</b> <input type="checkbox"/> Not Installed			Date Installed							
Manufacturer's name										
Model Number			HP Volt							
Length of drop pipe			ft Capacity g.p. Typ							
<b>Abandoned</b>			Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Variance</b>			Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Miscellaneous</b>			First Bedrock Aquifer							
Last Strat			Depth to Bedrock ft							
Located by			Minnesota Department of Health							
Locate Method			GPS SA Off (averaged)							
System			UTM - Mad83, Zone 15, Meters X 500336 Y 4962715							
Unique Number Verification			Info/GPS from data Inpute Date 01/21/2014							
<b>Angled Drill Hole</b>										
<b>Well Contractor</b>			Licensee Business Lic. or Reg. No. Name of Driller							

**257689**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/22/2014  
 Update Date  
 Received Date 10/22/2015

<b>Well Name</b> GEORGE E	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BABACA	<b>Well Depth</b> null	<b>Depth Completed</b> null	<b>Date Well Completed</b>			
<b>Elevation</b> 721 ft.	<b>Elev. Method</b>	Calc from NED (Natl.Elev.Dataset-30m)			<b>Drill Method</b>	<b>Drill Fluid</b>				
<b>Address</b>					<b>Use</b>					
C/W 9040 GREY CLOUD ISLAND ST PAUL PARK MN					<b>Status</b>					
<b>Stratigraphy Information</b>					<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>From</b> <b>To</b>					
					<b>Casing Type</b>			<b>Joint</b>		
					<b>Drive Shoe?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>			<b>Above/Below</b>		
					<b>Open Hole</b>			From ft. To ft.		
					<b>Screen?</b> <input type="checkbox"/>			<b>Type</b> <b>Make</b>		
					<b>Static Water Level</b>					
					<b>Pumping Level (below land surface)</b>					
					<b>Wellhead Completion</b>			Pitless adapter manufacturer Model		
					<input type="checkbox"/> Casing Protection			<input type="checkbox"/> 12 in. above grade		
					<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)					
<b>Grouting Information</b>			Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Specified							
<b>Nearest Known Source of Contamination</b>			feet Direction Type							
Well disinfected upon completion?			<input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Pump</b> <input type="checkbox"/> Not Installed			Date Installed							
Manufacturer's name										
Model Number			HP Volt							
Length of drop pipe			ft Capacity g.p. Typ							
<b>Abandoned</b>			Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Variance</b>			Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Miscellaneous</b>			First Bedrock Aquifer							
Last Strat			Depth to Bedrock ft							
Located by			Minnesota Department of Health							
Locate Method			GPS SA Off (averaged)							
System			UTM - Mad83, Zone 15, Meters X 500221 Y 4962774							
Unique Number Verification			Info/GPS from data Inpute Date 01/21/2014							
<b>Angled Drill Hole</b>										
<b>Well Contractor</b>			Licensee Business Lic. or Reg. No. Name of Driller							

**123507**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 03/01/1989  
 Update Date  
 Received Date 03/17/2014

<b>Well Name</b> COX, KENNETH	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BAABAC	<b>Well Depth</b> 156 ft.	<b>Depth Completed</b> 156 ft.	<b>Date Well Completed</b> 10/13/1976
<b>Elevation</b> 745 ft. <b>Elev. Method</b> 7.5 minute topographic map (+/- 5 feet)					<b>Drill Method</b> Non-specified Rotary		<b>Drill Fluid</b>
<b>Address</b>					<b>Use</b> domestic		<b>Status</b> Active
<b>Stratigraphy Information</b> Geological Material From To (ft.) Color Hardness CLAY & SAND 0 15 BLACK SOFT LIMEROCK 15 135 YEL/WHT HARD SANDROCK 135 156 YEL/BRN MEDIUM					<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>		<b>From</b> <b>To</b>
					<b>Casing Type</b> Single casing		<b>Joint</b> Welded
					<b>Drive Shoe?</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		<b>Above/Below</b> 1 ft.
					<b>Casing Diameter</b> 4 in.		<b>Weight</b> 138 ft. 11 lbs./ft.
					<b>Open Hole</b> From 138 ft. To 156 ft.		
					<b>Screen?</b> <input type="checkbox"/>		<b>Type</b> <b>Make</b>
					<b>Static Water Level</b> 60 ft. Land surface		<b>Measure</b> 10/13/1976
					<b>Pumping Level (below land surface)</b> 62 ft. 1.5 hrs. Pumping at		15 g.p.m.
					<b>Wellhead Completion</b> Pitless adapter manufacturer		<b>Model</b>
					<input type="checkbox"/> Casing Protection <input checked="" type="checkbox"/> 12 in. above grade		
<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)							
<b>Grouting Information</b> Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Specified							
Material Neat Cement		Amount 2.5 Cubic yards	From 10 ft. To 138 ft.				
<b>Nearest Known Source of Contamination</b> 80 feet East Direction		<b>Septic tank/drain field</b> Type					
Well disinfected upon completion? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Pump</b> <input type="checkbox"/> Not Installed Date Installed 10/19/1976							
Manufacturer's name REDA PUMP CO							
Model Number 9D9D051 HP 0.5		Volt 230					
Length of drop pipe 90 ft Capacity 12 g.p.		Typ Submersible					
<b>Abandoned</b> Does property have any not in use and not sealed well(s)?		<input type="checkbox"/> Yes <input type="checkbox"/> No					
<b>Variance</b> Was a variance granted from the MDH for this well?		<input type="checkbox"/> Yes <input type="checkbox"/> No					
<b>Miscellaneous</b> First Bedrock Prairie Du Chien Group		<b>Aquifer</b> Jordan					
Last Strat Jordan Sandstone		<b>Depth to Bedrock</b> 15 ft					
Located by Minnesota Geological Survey							
Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)							
System UTM - Mad83, Zone 15, Meters		X 500357 Y 4962784					
Unique Number Verification Address verification		Inpute Date 01/01/1990					
<b>Angled Drill Hole</b>							
<b>Well Contractor</b> Mantyla Well Co.		82084 SANDERS, G.					
Licensee Business		Lic. or Reg. No. Name of Driller					

**Remarks**  
 GREY CLOUD ISLAND TOWNSHIP

**257635**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/22/2014  
 Update Date  
 Received Date 10/22/2015

<b>Well Name</b> MEYERS, JANET 27	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BAABDA	<b>Well Depth</b> null	<b>Depth Completed</b> null	<b>Date Well Completed</b>										
<b>Elevation</b> 742 ft.	<b>Elev. Method</b> Calc from NED (Natl.Elev.Dataset-30m)	<b>Drill Method</b>		<b>Drill Fluid</b>													
<b>Address</b> Well 9020 GREY CLOUD TR ST PAUL PARK MN 55071					<b>Use</b>			<b>Status</b>									
<b>Stratigraphy Information</b>					<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>			<b>From</b>			<b>To</b>						
					<b>Casing Type</b>					<b>Joint</b>							
					<b>Drive Shoe?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>					<b>Above/Below</b>							
					<b>Open Hole</b>					From		ft.		To		ft.	
					<b>Screen?</b> <input type="checkbox"/>					<b>Type</b>			<b>Make</b>				
					<b>Static Water Level</b>												
					<b>Pumping Level (below land surface)</b>												
					<b>Wellhead Completion</b>					Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)							
					<b>Grouting Information</b>					Well Grouted?		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input checked="" type="checkbox"/> Not Specified			
					<b>Nearest Known Source of Contamination</b>					feet		Direction		Type			
Well disinfected upon completion?					<input type="checkbox"/> Yes <input type="checkbox"/> No												
<b>Pump</b> <input type="checkbox"/> Not Installed					Date Installed												
Manufacturer's name					Model Number		HP		Volt								
Length of drop pipe					ft		Capacity		g.p. Typ								
<b>Abandoned</b>					Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No												
<b>Variance</b>					Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No												
<b>Miscellaneous</b>					First Bedrock		Aquifer										
Last Strat					Depth to Bedrock		ft										
Located by					Minnesota Department of Health												
Locate Method					GPS SA Off (averaged)												
System					UTM - Mad83, Zone 15, Meters		X 500368		Y 4962781								
Unique Number Verification					Info/GPS from data		Input Date		01/21/2014								
<b>Angled Drill Hole</b>																	
<b>Well Contractor</b>																	
Licensee Business					Lic. or Reg. No.		Name of Driller										



Minnesota  
Department of  
Health

v1.0.8

## Minnesota Well Index

### General Information

Unique Well ID:	<b>257688</b>	Well Name:		County:	<b>Washington</b>	Aquifer:	
Well Elevation (msl in feet):	<b>744</b>	Drilled Depth (ft):		Well Completed (ft):		Date Drilled:	
Township:	<b>27</b>	Range:	<b>22</b>	Dir:	<b>W</b>	Section:	<b>13</b>
Subsection:	<b>CDDCCC</b>	Use:		Well Status:		Depth To Bedrock:	
Driller:		Entry Date:	<b>01/22/2014</b>	Update Date:			

### Related Resources:

[Go to MN Well Index Map](#)    [Well Log Report](#)

[More Details](#)
[Stratigraphy](#)
[Address](#)
[Chemical Data](#)
[Construction](#)
[Pump Test](#)
[Static Water](#)
[Comments](#)
[Overview Map](#)

First Bedrock:	Strat Date:	Last Strat:
Strat Update Date:	Strat Source:	MGS Quadrangle: <b>102C</b>
Open Hole To Unit:	Strat Method:	



**257637**

County Washington  
 Quad St Paul Park  
 Quad ID 102C

MINNESOTA DEPARTMENT OF HEALTH  
**WELL AND BORING REPORT**  
 Minnesota Statutes Chapter 1031

Entry Date 01/22/2014  
 Update Date  
 Received Date 10/22/2015

<b>Well Name</b> WICKE,	<b>Township</b> 27	<b>Range</b> 22	<b>Dir Section</b> W 24	<b>Subsection</b> BAADCB	<b>Well Depth</b> null	<b>Depth Completed</b> null	<b>Date Well Completed</b>			
<b>Elevation</b> 738 ft.	<b>Elev. Method</b>	Calc from NED (Natl.Elev.Dataset-30m)			<b>Drill Method</b>	<b>Drill Fluid</b>				
<b>Address</b>					<b>Use</b>					
Well 9044 GREY CLOUD TR ST PAUL PARK MN 55071					<b>Status</b>					
<b>Stratigraphy Information</b>					<b>Well Hydrofractured?</b> Yes <input type="checkbox"/> No <input type="checkbox"/> <b>From</b> <b>To</b>					
					<b>Casing Type</b>			<b>Joint</b>		
					<b>Drive Shoe?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>			<b>Above/Below</b>		
					<b>Open Hole</b>			From ft. To ft.		
					<b>Screen?</b> <input type="checkbox"/>			<b>Type</b> <b>Make</b>		
					<b>Static Water Level</b>					
					<b>Pumping Level (below land surface)</b>					
					<b>Wellhead Completion</b>			Pitless adapter manufacturer Model		
					<input type="checkbox"/> Casing Protection			<input type="checkbox"/> 12 in. above grade		
					<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)					
<b>Grouting Information</b>			Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Specified							
<b>Nearest Known Source of Contamination</b>			feet Direction Type							
Well disinfected upon completion?			<input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Pump</b> <input type="checkbox"/> Not Installed			Date Installed							
Manufacturer's name										
Model Number			HP Volt							
Length of drop pipe			ft Capacity g.p. Typ							
<b>Abandoned</b>			Does property have any not in use and not sealed well(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Variance</b>			Was a variance granted from the MDH for this well? <input type="checkbox"/> Yes <input type="checkbox"/> No							
<b>Miscellaneous</b>			First Bedrock Aquifer							
Last Strat			Depth to Bedrock ft							
Located by			Minnesota Department of Health							
Locate Method			GPS SA Off (averaged)							
System			UTM - Mad83, Zone 15, Meters X 500409 Y 4962676							
Unique Number Verification			Info/GPS from data Inpute Date 01/21/2014							
<b>Angled Drill Hole</b>										
<b>Well Contractor</b>			Licensee Business Lic. or Reg. No. Name of Driller							

# Appendix K

## Northern Long-eared Bat Fact Sheet and Maps



## Northern Long-Eared Bat

### *Myotis septentrionalis*

The northern long-eared bat is federally listed as a threatened species under the Endangered Species Act. **Endangered** species are animals and plants that are in danger of becoming extinct. **Threatened** species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's Endangered Species Program.

#### What is the northern long-eared bat?

**Appearance:** The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

**Winter Habitat:** Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible.

**Summer Habitat:** During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. They rarely roost in human structures like barns and sheds.

**Reproduction:** Breeding begins in late summer or early fall when males begin to swarm near hibernacula. After



*This northern long-eared bat, observed during an Illinois mine survey, shows visible symptoms of white-nose syndrome.*

copulation, females store sperm during hibernation until spring. In spring, females emerge from their hibernacula, ovulate and the stored sperm fertilizes an egg. This strategy is called delayed fertilization.

After fertilization, pregnant bats migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies of females and young generally have 30 to 60 bats at the beginning of the summer, although larger maternity colonies have also been observed. Numbers of bats in roosts typically decrease from the time of pregnancy to post-lactation. Most bats within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Maximum lifespan for the northern long-eared bat is estimated to be up to 18.5 years.

**Feeding Habits:** Like most bats, northern long-eared bats emerge at dusk to feed. They primarily fly through the

understory of forested areas feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation.

**Range:** The northern long-eared bat's range includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species' range includes 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

#### Why is the northern long-eared bat in trouble?

**White-nose Syndrome:** No other threat is as severe and immediate as

this. If this disease had not emerged, it is unlikely that northern long-eared bat populations would be experiencing such dramatic declines. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast; an area that includes the core of the northern long-eared bat's range, where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99 percent in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, it is expected to continue to spread throughout the United States in the foreseeable future.

#### **Other Sources of Mortality:**

Although no significant population declines have been observed due to the sources of mortality listed below, they may now be important factors affecting this bat's viability until we find ways to address WNS.

**Impacts to Hibernacula:** Gates or other structures intended to exclude people from caves and mines not only restrict bat flight and movement, but also change airflow and microclimates. A change of even a few degrees can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Arousal during hibernation causes bats to use up their energy stores, which may lead to bats not surviving through winter.

#### **Loss or Degradation of Summer**

**Habitat:** Highway construction, commercial development, surface mining, and wind facility construction permanently remove habitat and are activities prevalent in many areas of this bat's range. Many forest management activities benefit bats by keeping areas forested rather than converted to other uses. But, depending on type and timing, some forest management activities can cause mortality and temporarily remove or degrade roosting and foraging habitat.

**Wind Farm Operation:** Wind turbines kill bats, and, depending on the species, in very large numbers. Mortality from windmills has been documented for northern long-eared bats, although a

small number have been found to date. However, there are many wind projects within a large portion of the bat's range and many more are planned.

#### **What Is Being Done to Help the Northern Long-Eared Bat?**

**Disease Management:** Actions have been taken to try to reduce or slow the spread of white-nose syndrome through human transmission of the fungus into caves (e.g. cave and mine closures and advisories; national decontamination protocols). A national plan was prepared by the Service and other state and federal agencies that details actions needed to investigate and manage white-nose syndrome. Many state and federal agencies, universities and non-governmental organizations are researching this disease to try to control its spread and address its affect. See [www.whitenosesyndrome.org/](http://www.whitenosesyndrome.org/) for more.

#### **Addressing Wind Turbine**

**Mortality:** The Service and others are working to minimize bat mortality from wind turbines on several fronts. We fund and conduct research to determine why bats are susceptible to turbines, how to operate turbines to minimize mortality and where important bird and bat migration routes are located. The Service, state natural resource agencies, and the wind energy industry are developing a Midwest Wind Energy Habitat Conservation Plan, which will provide wind farms a mechanism to continue operating legally while minimizing and mitigating listed bat mortality.

**Listing:** The northern long-eared bat is listed as a threatened species under the federal Endangered Species Act. Listing a species affords it the protections of the Act and also increases the priority of the species for funds, grants, and recovery opportunities.

**Hibernacula Protection:** Many federal and state natural resource agencies and conservation organizations have protected caves and mines that are important hibernacula for cave-dwelling bats.

#### **What Can I Do?**

##### ***Do Not Disturb Hibernating Bats:***

To protect bats and their habitats, comply with all cave and mine closures, advisories, and regulations. In areas without a cave and mine closure policy, follow approved decontamination protocols (see <http://whitenosesyndrome.org/topics/decontamination>). Under no circumstances should clothing, footwear, or equipment that was used in a white-nose syndrome affected state or region be used in unaffected states or regions.

##### ***Leave Dead and Dying Trees***

**Standing:** Like most eastern bats, the northern long-eared bat roosts in trees during summer. Where possible and not a safety hazard, leave dead or dying trees on your property. Northern long-eared bats and many other animals use these trees.

**Install a Bat Box:** Dead and dying trees are usually not left standing, so trees suitable for roosting may be in short supply and bat boxes may provide additional roost sites. Bat boxes are especially needed from April to August when females look for safe and quiet places to give birth and raise their pups.

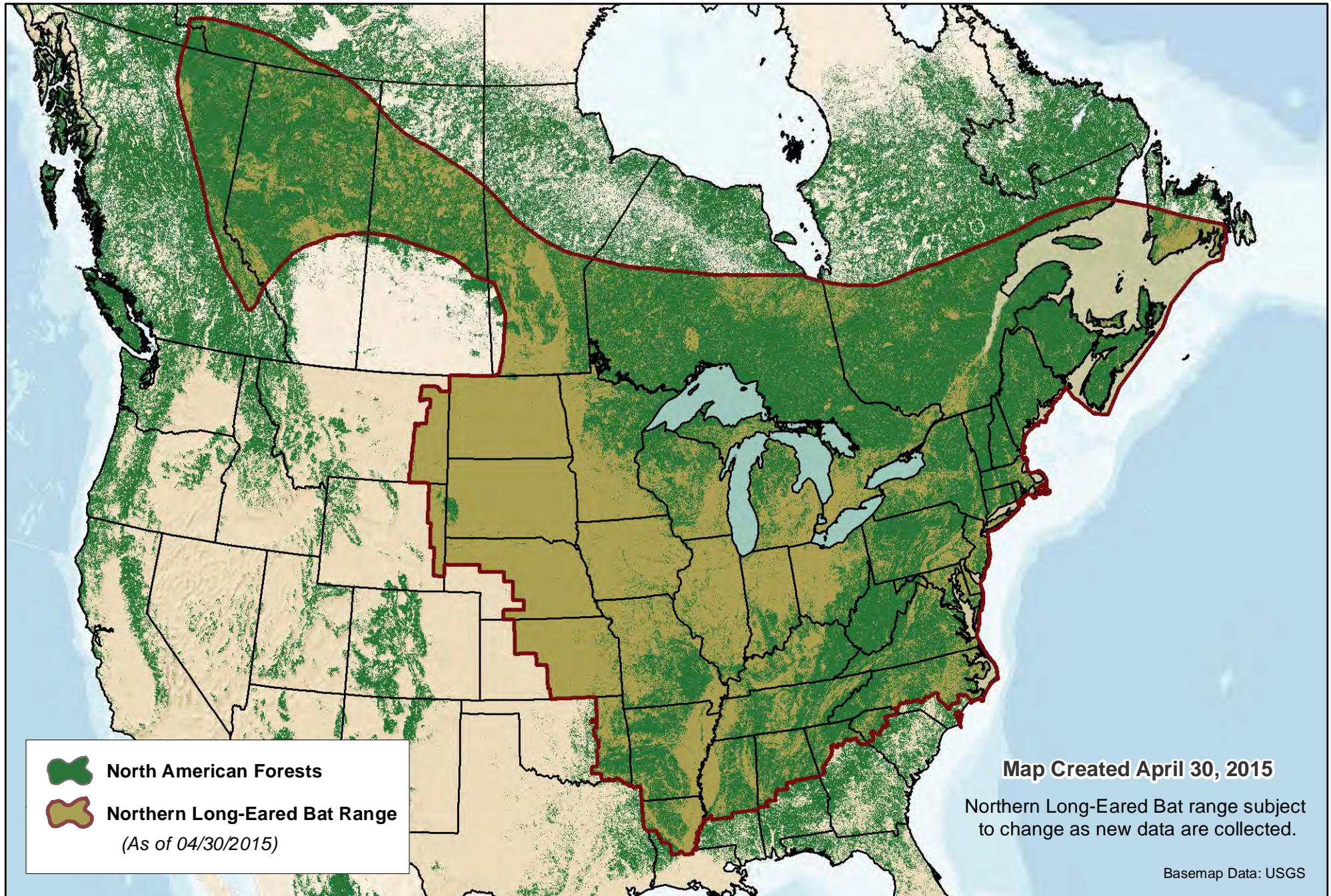
**Support Sustainability:** Support efforts in your community, county and state to ensure that sustainability is a development goal. Only through sustainable living will we provide rare and declining species, like the northern long-eared bat, the habitat and resources they need to survive alongside us.

**Spread the Word:** Understanding the important ecological role that bats play is a key to conserving the northern long-eared and other bats. Helping people learn more about the northern long-eared bat and other endangered species can lead to more effective recovery efforts. For more information, visit [www.fws.gov/midwest/nleb](http://www.fws.gov/midwest/nleb) and [www.whitenosesyndrome.org](http://www.whitenosesyndrome.org)

**Join and Volunteer:** Join a conservation group; many have local chapters. Volunteer at a local nature center, zoo, or national wildlife refuge. Many state natural resource agencies benefit greatly from citizen involvement in monitoring wildlife. Check your state agency websites and get involved in citizen science efforts in your area.



# Northern Long-Eared Bat Range

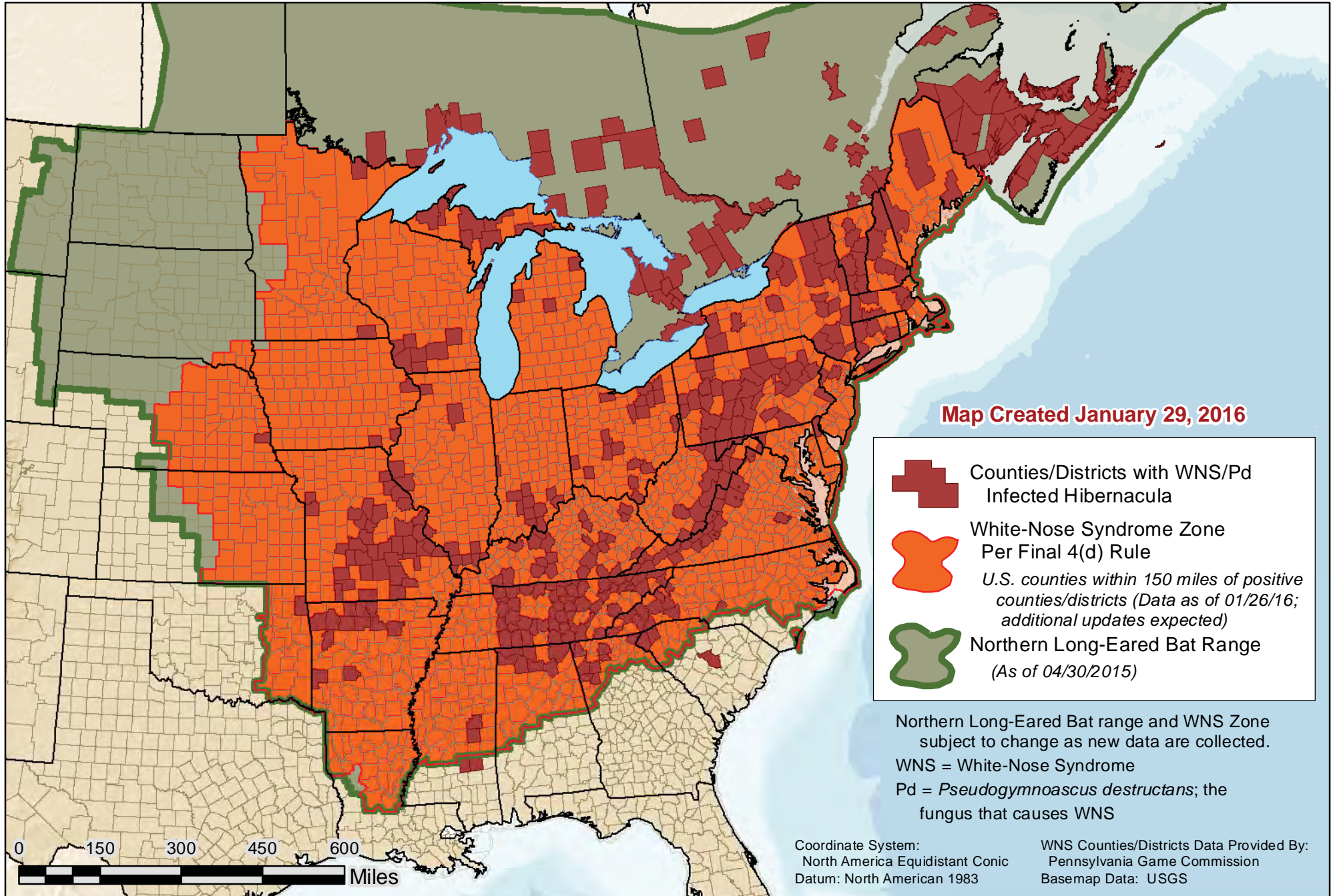




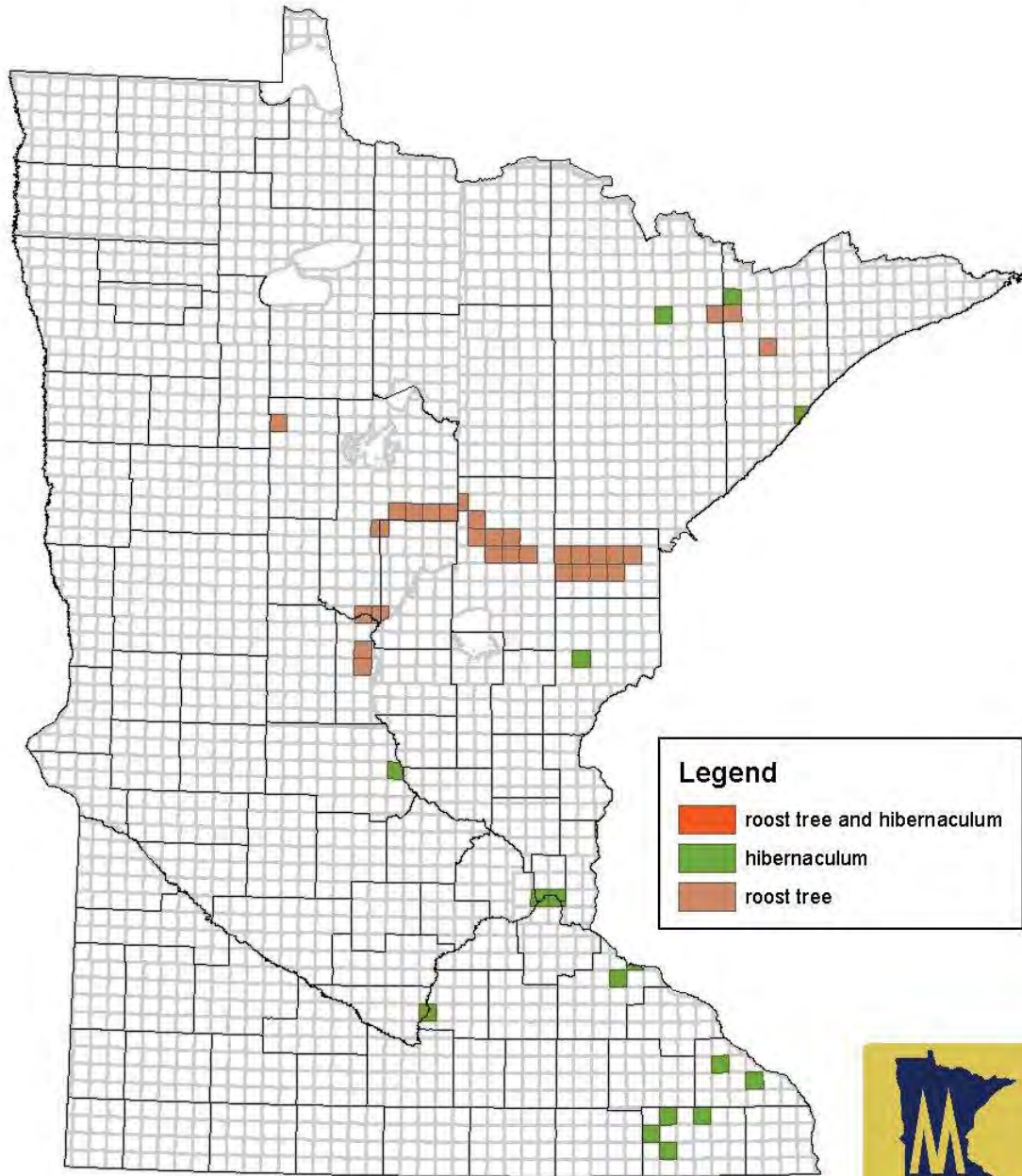
U.S. Fish & Wildlife Service

# Northern Long-Eared Bat Final 4(d) Rule

## White-Nose Syndrome Zone Around WNS/Pd Positive Counties/Districts



## Townships Containing Northern Long-eared Bat Roost Trees and/or Hibernacula



**Legend**

- roost tree and hibernaculum
- hibernaculum
- roost tree



For more information, contact:

Lisa Mandell, Deputy Field Supervisor  
U.S. Fish and Wildlife Service  
Twin Cities Ecological Services Field Office  
4101 American Blvd E., Bloomington, MN 55425  
[lisa\\_mandell@fws.gov](mailto:lisa_mandell@fws.gov)  
612-725-3548

Rich Baker, Endangered Species Coordinator  
Minnesota Department of Natural Resources  
Division of Ecological and Water Resources  
500 Lafayette Rd., St. Paul, MN 55155  
[richard.baker@state.mn.us](mailto:richard.baker@state.mn.us)  
651-259-5073

# TOWNSHIPS CONTAINING NORTHERN LONG-EARED BAT ROOST TREES AND/OR HIBERNACULA

Minnesota DNR/U.S. Fish and Wildlife Service June 6, 2015

- U.S. Fish and Wildlife Service rules restrict activity around northern long-eared bat roost trees and hibernacula. See <http://www.fws.gov/midwest/endangered/mammals/nlba/index.html> for more information on the northern long-eared bat and its protection.
- The townships listed below contain one or more northern long-eared bat roost trees and/or hibernacula
- A roost tree may be identified to a specific tree or to a general location (e.g. within ½ mile)
- **If a project involving tree removal is not within a listed township**, no further action is required
- **If a project involving tree removal is planned within an identified township**, you may:
  - Submit a data request to the DNR for a printed copy of precise locational information (see <http://www.dnr.state.mn.us/nhnrp/nhis.html#datarequest>)
  - Apply to the DNR for a data license to obtain a digital copy of precise locational information (see <http://www.dnr.state.mn.us/nhnrp/nhis.html#datarequest>)
  - Contact the USFWS to obtain detailed information and advice on how to proceed with your project (see contact information at the bottom)
  - Also contact USFWS if your project involves federal funding, a federal permit, or federal lands
- These data are current as of June 6, 2015. Updates of this information will be released twice annually on April 1 and October 1
- As of this date, there are 25 known hibernacula and 163 known roost trees in Minnesota

County	Township	Contains one or more Hibernaculum	Contains one or more Roost Tree
Aitkin	T139N R25W		X
Aitkin	T48N R23W		X
Aitkin	T48N R24W		X
Aitkin	T48N R25W		X
Aitkin	T49N R24W		X
Aitkin	T49N R25W		X
Aitkin	T49N R26W		X
Aitkin	T50N R26W		X
Aitkin	T51N R27W		X
Carlton	T47N R18W		X
Carlton	T47N R19W		X
Carlton	T47N R20W		X
Carlton	T47N R21W		X
Carlton	T48N R17W		X
Carlton	T48N R18W		X
Carlton	T48N R19W		X
Carlton	T48N R20W		X



Carlton	T48N R21W		X
Cass	T133N R29W		X
Cass	T139N R25W		X
Cass	T139N R26W		X
Cass	T139N R27W		X
Cass	T139N R28W		X
Cass	T51N R27W		X
Chisago	T32N R19W	X	
Crow Wing	T138N R29W		X
Fillmore	T102N R12W	X	
Fillmore	T103N R13W	X	
Fillmore	T104N R10W	X	
Fillmore	T104N R12W	X	
Goodhue	T112N R15W	X	
Goodhue	T113N R14W	X	
Hubbard	T144N R35W		X
Lake	T56N R7W	X	
Lake	T60N R9W		X
Lake	T62N R11W		X
Lake	T63N R11W	X	
Morrison	T130N R30W		X
Morrison	T131N R30W		X
Morrison	T133N R29W		X
Morrison	T133N R30W		X
Nicollet	T110N R26W	X	
Pine	T42N R20W	X	
Ramsey	T28N R22W	X	
Ramsey	T28N R23W	X	
Stearns	T124N R28W	X	
St. Louis	T62N R12W		X
St. Louis	T62N R15W	X	
Winona	T106N R7W	X	
Winona	T107N R9W	X	

# Appendix L

State Historic Preservation Office  
Correspondence



February 01, 2016

Thomas Cinadr  
State Historic Preservation Office  
Minnesota Historic Society  
345 Kellogg Blvd. W.  
St. Paul, MN 55102-1903

**RE: Request for a Review of Archeological/Historic database.**

Mr. Cinadr,

I am writing to request a review of the archeological and historic database for the following area within Washington County, Grey Cloud Township, Minnesota:

**N ½, NW ¼, Section 24 of Township 27 North, Range 22 West**

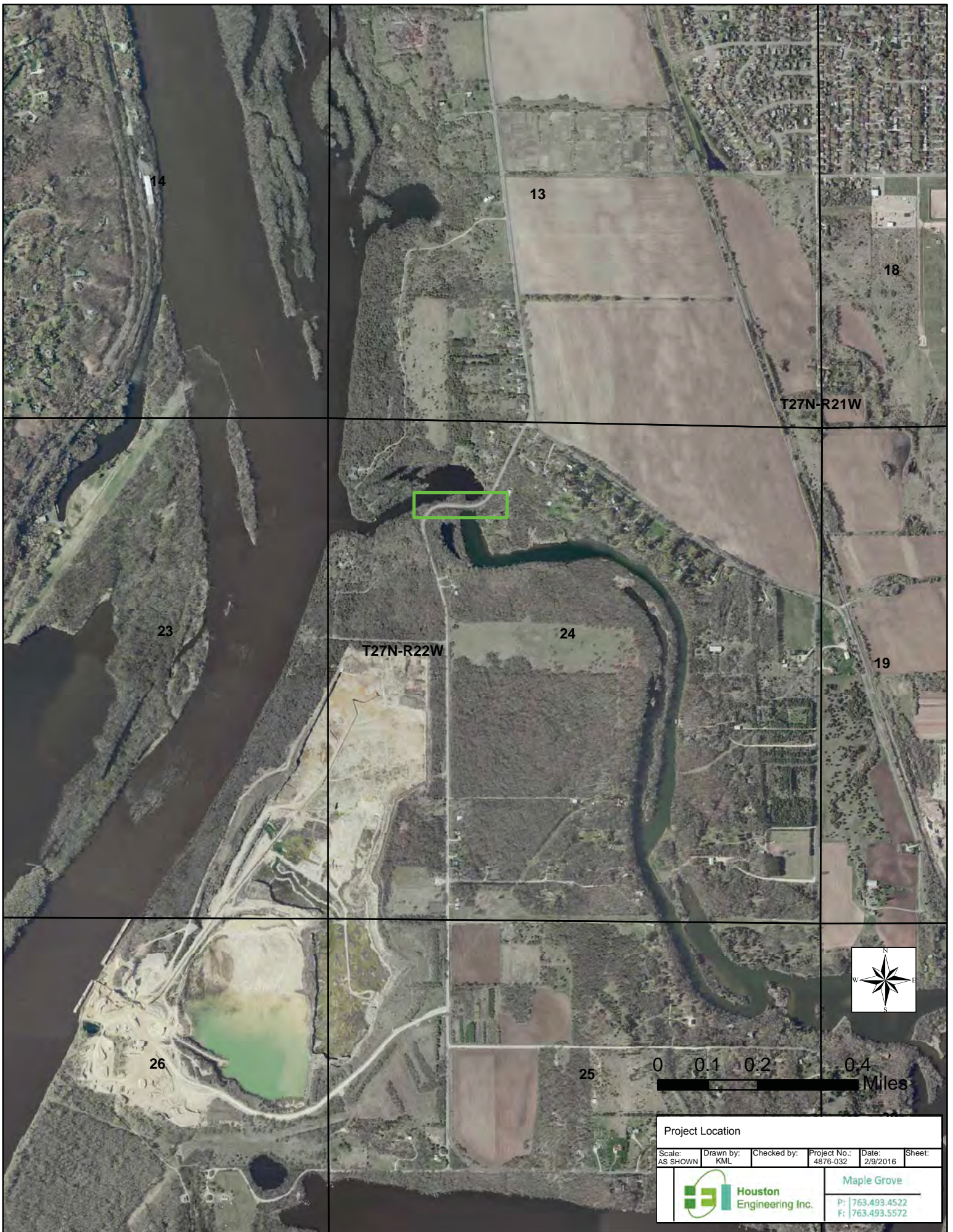
This information is being requested to be included in a state Environmental Assessment Worksheet (EAW) that is currently being prepared for the subject area. I have included a map of the subject area.

Sincerely,  
Houston Engineering, Inc.

A handwritten signature in black ink, appearing to read 'Katherine Lind'.

Katherine Lind  
Research Analyst

Encl: Project Location Map (1)  
Cc: HEI File 4876-032



14

13

18

T27N-R21W

23

T27N-R22W

24

19

26

25

0 0.1 0.2 0.4 Miles



Project Location					
Scale: AS SHOWN	Drawn by: KML	Checked by:	Project No.: 4876-032	Date: 2/9/2016	Sheet:
 <b>Houston Engineering Inc.</b>				<b>Maple Grove</b> P: 763.493.4522 F: 763.493.5572	

**Katherine Lind**

---

**From:** Thomas Cinadr <thomas.cinadr@mnhs.org>  
**Sent:** Tuesday, February 09, 2016 1:51 PM  
**To:** Katherine Lind  
**Subject:** Re: Request for a Review of the Archaeological/Historic database

**THIS EMAIL IS NOT A PROJECT CLEARANCE.**

**This message simply reports the results of the cultural resources database search you requested. The database search produced results for only previously known archaeological sites and historic properties. Please read the note below carefully.**

**No archaeological sites or historic structures were identified in a search of the Minnesota Archaeological Inventory and Historic Structures Inventory for the search area requested.**

The result of this database search provides a listing of recorded archaeological sites and historic architectural properties that are included in the current SHPO databases. Because the majority of archaeological sites in the state and many historic architectural properties have not been recorded, important sites or structures may exist within the search area and may be affected by development projects within that area. Additional research, including field survey, may be necessary to adequately assess the area's potential to contain historic properties.

If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson in Review and Compliance @ 651-259-3455 or by email at [kelly.graggjohnson@mnhs.org](mailto:kelly.graggjohnson@mnhs.org).

The Minnesota SHPO Survey Manuals and Database Metadata and Contractor Lists can be found at <http://www.mnhs.org/shpo/survey/inventories.htm>

***Tom Cinadr***  
Survey and Information Management Coordinator  
Minnesota Historic Preservation Office  
Minnesota Historical Society

345 Kellogg Blvd. West  
St. Paul, MN 55102

651-259-3453

On Tue, Feb 9, 2016 at 10:35 AM, Katherine Lind <[klind@houstoneng.com](mailto:klind@houstoneng.com)> wrote:

Good day Mr. Cinadr,

Please find the attached letter for the request of a review of the archaeological and historic database for a site in Washington County, Minnesota.

Please give me a call with any questions.

Regards,

Katie

**Katherine Lind**

Environmental Scientist

Houston Engineering, Inc.

📞 763.493.4522 | 📠 763.493.6692 | 📠 763.493.5572

6901 E Fish Lake Road, Suite 140



Maple Grove, MN • 55369

[www.houstoneng.com](http://www.houstoneng.com)



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# Appendix M

Grey Cloud Crossing – Preliminary  
Construction Roadway Detour



**Legend**

- Detour Route (5.2 Miles)
- 75 Properties Affected by Construction

**Crossing Project**  
ADT = 500 VPD

**ST. PAUL PARK**

**GREY CLOUD ISLAND TOWNSHIP**

**COTTAGE GROVE**

This map is the result of a compilation and reproduction of land records as they appear in various Washington County offices. This map should be used for reference purposes only. Washington County is not responsible for any inaccuracies.

