



LOWER MINNESOTA RIVER WATERSHED DISTRICT

Executive Summary for Action

Lower Minnesota River Watershed District Board of Managers Meeting
Wednesday, May 20, 2020

Agenda Item

Item 6. G. - LMRWD Projects

Prepared By

Linda Loomis, Administrator

Summary

i. **Eden Prairie Study Area #3**

Staff has recently been investigating this area. On Thursday, May 7, LMRWD staff met on site with staff from the city of Eden Prairie to assess the severity of erosion at the top of the bluff. A summary of the field inspection is attached along with the January 2020 memo, a map of the properties affected and pictures taken the day of the filed inspection.

Staff would like the Board to discuss the recommendations in the January report and the next steps in the May 7th report. There is a fund of \$110,000 the District has collected to pay for expenses incurred in this area. The District collected \$75,000 in 2017 and \$35,000 in the 2020 budget. The only expenses that have been charged to this project so far have been the expenses incurred to monitor the inclinometers. These expenses total \$9,011 since 2013.

Additionally, we received readings from the inclinometers that were taken in February. The reading show no movement in the bluff and has been shared with the City of Eden Prairie.

ii. **Gully Inventory and Condition Assessment**

In 2007, the LMRWD engaged the Minnesota Conservation Corps to inventory gullies throughout the District. Since that time, some of the gullies have been stabilized and others have seen more erosion occur. The District has planned to update the inventory, by visiting all the gullies identified in 2007 and then documenting gullies that may have been missed and have been found to be experiencing significant amounts of erosion. Staff has prepared a work plan for this work, which is attached. Staff intends to use funds collected from the Gully Erosion Contingency Fund and the funds collected for the Minnesota River Sediment Reduction Strategy. There is currently \$150,000 in the Gully Erosion Contingency fund and \$50,000 in the Minnesota River Sediment Reduction Strategy fund.

One of the goals to this project will be to track sources of sediment that has been observed in different areas along Flying Cloud Drive.

iii. **2020 Trout Stream Gap Analysis and Long-Term Strategic Management Plan**

A work plan is attached that continues the work the District began in 2019 with the geomorphic assessment of the Trout streams. The work plan explains the project. Staff is looking for the Board to authorize this plan.

Item 6. G. LMRWD Projects

Executive Summary

May 20, 2020

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Attachments

Eden Prairie Study Area #3 memo and attachments

2020 Gully Inventory and Condition Assessment work plan

Trout Streams Gaps Analysis and Long-Term Strategic Management Plan work plan

Recommended Action

Provide direction to staff for Study Area #3

Approve Gully Inventory and Condition Assessment work plan and authorize implementation

Approve Trout Streams Gaps Analysis and Long-Term Strategic Management Plan work plan and authorize implementation

Technical Memorandum

To: Linda Loomis, Administrator
Lower Minnesota River Watershed District

From: Katy Thompson, PE, CFM
Della Schall Young, CPESC, PMP

Date: May 12, 2020

Re: Area 3 Site Visit Meeting Summary

The Lower Minnesota River Watershed District (LMRWD or District) has been working with the City of Eden Prairie (City) since 2008 to evaluate locations along the Minnesota River that have been experiencing bluff erosion, listed in the District's 2018–2027 Watershed Management Plan as “Minnesota River Study Area 3 – Bluff Stabilization Project.” The following summarizes the site visit recommended during the December 18, 2019, meeting (see attached 12/18/19 meeting summary).

May 7, 2020, Site Visit

Linda Loomis, District Administrator; Patrick Sejkora, City of Eden Prairie (City) Water Resources Engineer; and Della Young and Katy Thompson, Young Environmental Consulting Group (Young Environmental) met at 12641 Riverview Road in Eden Prairie for a site visit of the bluff and review of inclinometers.

The owner of 12613 Riverview Road was outside and allowed access to the bluff on her property. She has lived there since 2003 and said that the rate of erosion on the bluff near the property has accelerated in recent years. She said that she reached out to LMRWD, the City, and the US Army Corps of Engineers (USACE) several times to discuss the neighborhood concerns, especially the need to install retaining walls to protect their residences. The backyards of 12557, 12585, 12613, 12641, and 12669 Riverview Road all were observed to have relatively new retaining walls located near the residences (see attached landowners map and photos).

The homeowner confirmed that the soils around her property were extremely sandy, as evidenced by active bank erosion in nearby gullies. The gullies contained numerous

brush clippings and vegetation, placed in the gully at the advice of USACE staff several years ago.

The inclinometers could not be found during the visit, but no signs of active landslides or mass wasting processes were observed in the field. The active erosion seemed to be contained to the existing gullies and runoff from private property.

Next steps

1. Young Environmental will contact Braun Intertec for inclinometer coordinates because the inclinometers could not be located in the field.
2. The City of Eden Prairie will provide electronic storm sewer maps of the area. (Received 5/8/2020)
3. Young Environmental will overlay inclinometer locations, lidar topography, storm sewer outfalls, available photos, and historic aerials to identify possible concentrated flow locations that could exacerbate the erosion processes and reconvene in June/July 2020 to discuss the results at a later date.
4. District will evaluate options for a team to view the site in the fall (September or October) from the Minnesota River.
5. The District will also contact the Freshwater Society to find out if it has identified potential areas of erosion.
6. Young Environmental will review the Federal Emergency Management Agency hot spots report.

Attachments:

December 18, 2019, Meeting Summary

Riverview Road Landowners Map

May 7, 2020, Site Photos

Technical Memorandum

To: Linda Loomis, Administrator
Lower Minnesota River Watershed District

From: Steve Woods, PE
Della Schall Young, CPESC, PMP

Date: January 17, 2020

Re: Eden Prairie Area 3 and the Minnesota River—Meeting summary and recommendations

Background

Area 3 occupies steep bluff lands adjacent to the Minnesota River southeast of Flying Cloud Airport or south of the intersection of Pioneer Trail and Flying Cloud Drive in Eden Prairie, Minnesota. The river has meandered adjacent to the north valley wall. Upland land use is split between a landfill and residential sites, though there is a strip of undeveloped land on the slope between the river and existing residential areas owned by Lakefront Properties, Inc. The Minnesota River Valley formed through the overtopping of Lake Agassiz, which created an outlet river (Glacier River Warren) that drained south and carved it.¹

In 2008, the City of Eden Prairie (City) and the Lower Minnesota River Watershed District commissioned a project by SRF Consulting Group, Inc. (SRF) to study sites along the Minnesota River Valley that were experiencing flooding to determine the cause of the erosion and to provide recommendations for addressing the erosion and preventing future problems. See the enclosed study Area 3 location map. SRF's site investigation and analysis yielded the following results, which were presented in the 2008 report²:

¹ Minnesota River Valley Formation, *Minnesota River Basin Data Center*, visited 18 November 2019.

² SRF Consulting Group, Erosion Stabilization Study: Study Area 3 Final Report Prepared for the City of Eden Prairie, October 2008.

The analysis of bluff instability and erosion found causes and problems such as the following:

1. Low internal soil strength properties
2. Removal of vegetation
3. Frequent river flooding
4. Soil saturation due to flooding and the presence of springs
5. High velocities along the outside bend of the river during flood stage
6. Presence of steep slopes

It was further stated that erosion may be caused by “a combination of localized erosive velocities as the river flows around the bend and the permanent soil saturation that occurs near the springs that has accelerated bluff erosion, which would otherwise occur more slowly from flooding saturation/desaturation, low in-situ soil shear strength, steep slopes, and the removal of vegetation” (SRF 2008).

Recommendation: Using the causal information generated, SRF recommended two alternative solutions: 1) Regrade to a more gentle slope to balance driving and resistive forces, with a probable cost estimate (PCE) of approximately \$434,000; and 2) Increase resistive forces of the soil through the use of constructed, stabilized slopes with a PCE of \$414,000. Alternative 2 was recommended for its “technical” and cost advantages.

In 2010, the team of Wenck Associates, Inc. and Stanley Consultants, Inc. were retained to expand on the information produced by SRF. The Wenck team focused on the slope interface with the river (see enclosed existing conditions map). Additional data were collected, and the team completed hydrology, hydraulics slope stability and geotechnical analyses. The Wenck team’s conclusions were similar to SRF’s. They highlight that the meander is a natural process that has been accelerated by changes in hydrology and climate variability and increased erosion due to stormwater runoff concentrated on the surface and seepage flows (Wenck, 2010). The Wenck team concluded that if left as is, without stabilization, erosion will continue as the meander moves downstream. That said, they did note that the slope stability analyses showed the bluff had an acceptable safety factor for the residences and properties.

Recommendation: Based on the analysis completed and data collected, three alternatives for bank stabilization were identified: 1) riprap blanket with a PCE of \$1.9 million, 2) bendway weirs with a PCE of \$3.3 million, and 3) rock vanes with a PCE of \$1.1 million. Alternative 3 was selected because of cost.

Because of the acceptable safety factor, the District commissioned the placement of inclinometers on the slope to monitor if movement occurs. Inclinometers have been monitored and reports submitted to the District since 2010 by Braun Intertec (Braun). In June 2019, Braun provided a report that showed slope movement. Alarmed, the District

and its technical consultants (Young Environmental Consulting Group, LLC and Barr Engineering Company) met to review the information and discuss a path forward. As the group reviewed the information, it was apparent there were problems with the information received. The problem spurred these questions:

- Is the information accurate?
- If it is accurate, what do we do with the information?
- If the information isn't accurate, what should we do to remedy the error?
- What does the District do with the data it collects?
- Should this data be collected by the LMRWD?
- Are there other activities, like work in the river to reduce the speed of encroachment, that LMRWD should invest in?

December 2019 Meeting

Young Environmental was instructed to contact Braun to have them review and validate the information provided and to convene a team of experienced professionals familiar with Area 3 to consider these questions and review past studies, collected data, and a range of options for future action.

The team was convened on Wednesday, December 18, 2019. Attendees were as follows:

Linda Loomis, LMRWD
Della Young and Steve Woods, Young Environmental
Joel Toso and Ed Matthiesen, Wenck
Bill Holman, Stanley Consultants
Bryan Ripp, Braun Intertec
Aaron Grosser, Barr

During the meeting the group converged on two overarching discussion topics: slope erosion and river meander movement. Below is a summary of those topics.

Slope Monitoring. Inclinometers were installed in 2010 to monitor slope erosion and/or movement. Braun has been collecting and analyzing data collected from the inclinometers on behalf of the District since installation. Until June 2019, the inclinometers had not shown any indication of movement. When this data appeared, LMRWD requested further analysis as there was some doubt as to its accuracy. Subsequent review by Braun identified a hardware calibration issue, and the data set was updated. Braun's revised data showed no movement.

This hardware issue initiated the gathering of professionals to consider whether further data collection was warranted by the District. Following a historic review of the area and consequent discussion, it was concluded that these data need to be collected with a few enhancements by the District and then shared with the City because they serve as an management information tool.

River Flow. As highlighted in the reports by SRF and the Wenck team, landslides in the area are a normal process that has been worsened by the increasing magnitude and frequency of flood flows in the Minnesota River. In addition, the meander bend apex continues to move toward the Area 3 embankment, resulting in downstream migration of the riverbank toward the City's stormwater pond, which currently is overtopped by high river flows. As the river continues to progress downstream, the backyards of properties along the bluff could be affected.

Because of the conditions exhibited by the Minnesota River over the past few years, it was concluded that the rock vane bank stabilization alternative recommended by the Wenck team should be reviewed and designed, while sources of funding are investigated and acquired to address the river's effects on the toe of the slope.

Recommendations

Based on the discussion, the LMRWD Board of Managers is asked to consider and approve the following recommendations:

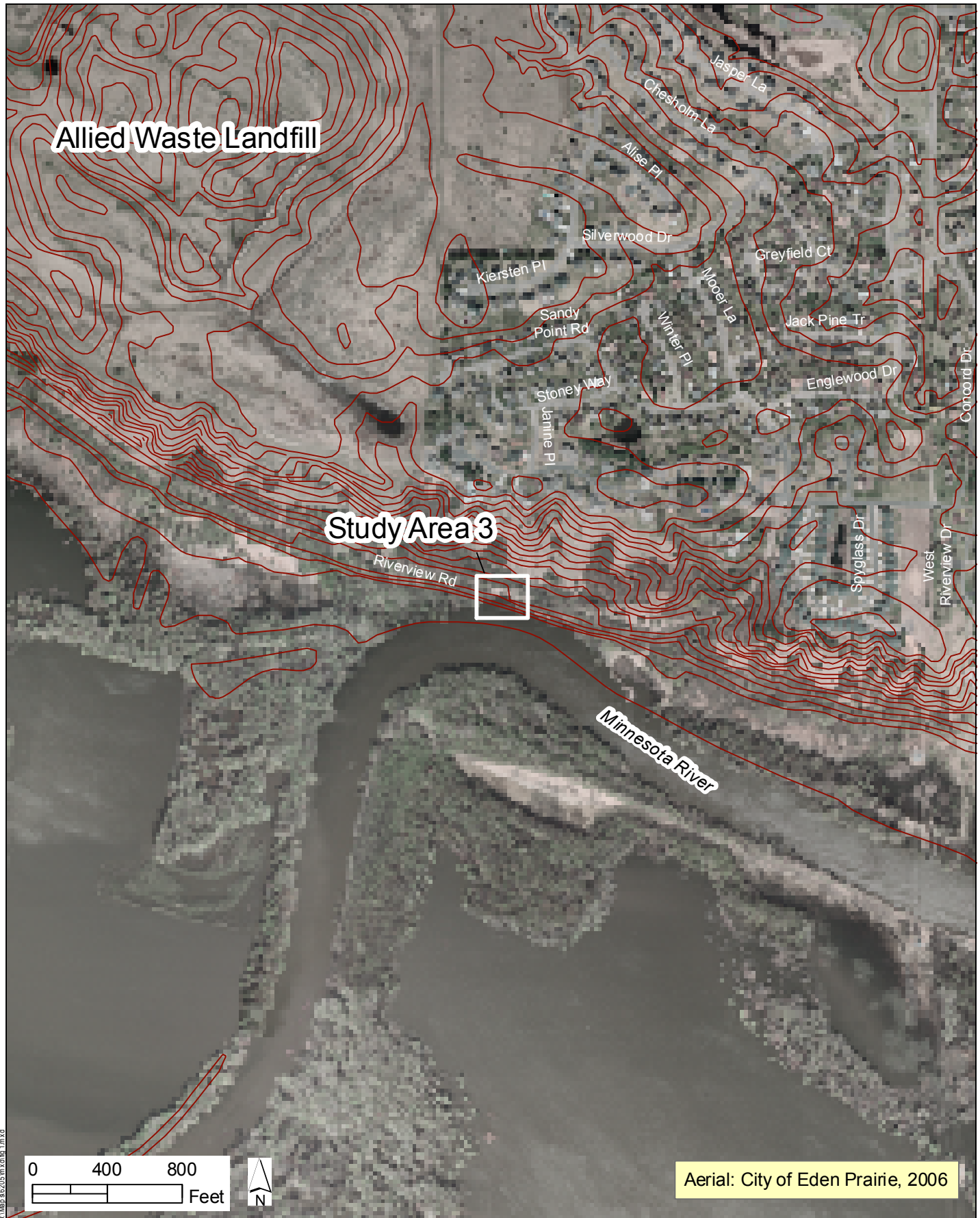
1. Install a vibrating wire piezometer in the casing of an existing piezometer to record water levels in the embankment. If the existing piezometer cannot be located, a new vibrating wire piezometer will be installed in a soil boring within the slope to monitor groundwater conditions.
2. Increase the frequency of data collection from the inclinometers to a minimum of twice per year—after snow melt in the spring and sustained high water in late summer or early fall. Provide the data analysis of the inclinometers and piezometers in monitoring memos to the LMRWD after each monitoring event summarizing the condition of the slope.
3. Update river cross-sections (i.e., soundings) taken for the 2010 report. This effort would update the location of the thalweg (a line that connects the lowest points in a valley or river channel, and thus the line of fastest flow or deepest water along a river's course) and allow for estimates of both scour and movement.
4. Conduct a field reconnaissance exercise with the City to verify where flows are still overtopping the bluff. In the Wenck team's 2010 report and review of aerial

photos, it appeared the bluff was taking overland flow. This has direct erosion potential, adds weight, and lowers soil cohesion.

5. Design and construct the Minnesota River rock vane bank stabilization alternative recommended in 2010 by the Wenck team (See enclosed Rock Vane Plan and Section). As presented, the alternative had a PCE of \$1.1 million. To convert this estimate to 2020 dollars, we applied the Engineering News-Record cost index for Minneapolis, which advances the PCE to \$1.4 million³. Engineering design and regulatory costs were not included in the Wenck team's PCE. However, those costs are estimated to be 10–15 percent of the PCE. This project represents a potential partnership with the City, area legislators, the US Army Corps of Engineers, and the river transport-based industry concerned with navigability of the Minnesota River. (Note: The LMRWD has no property or infrastructure in the project area.)

CC: Rod Rue and Leslie Stovring, City of Eden Prairie
Joel Toso, Wenck Associates
Ed Matthiesen, Wenck Associates
Bill Holman, Stanley Consultants
Bryan Ripp, Braun Intertec
Aaron Grosser, Barr Engineering

³ Ed Matthiesen, Wenck Associates, personal communication, January 7, 2020



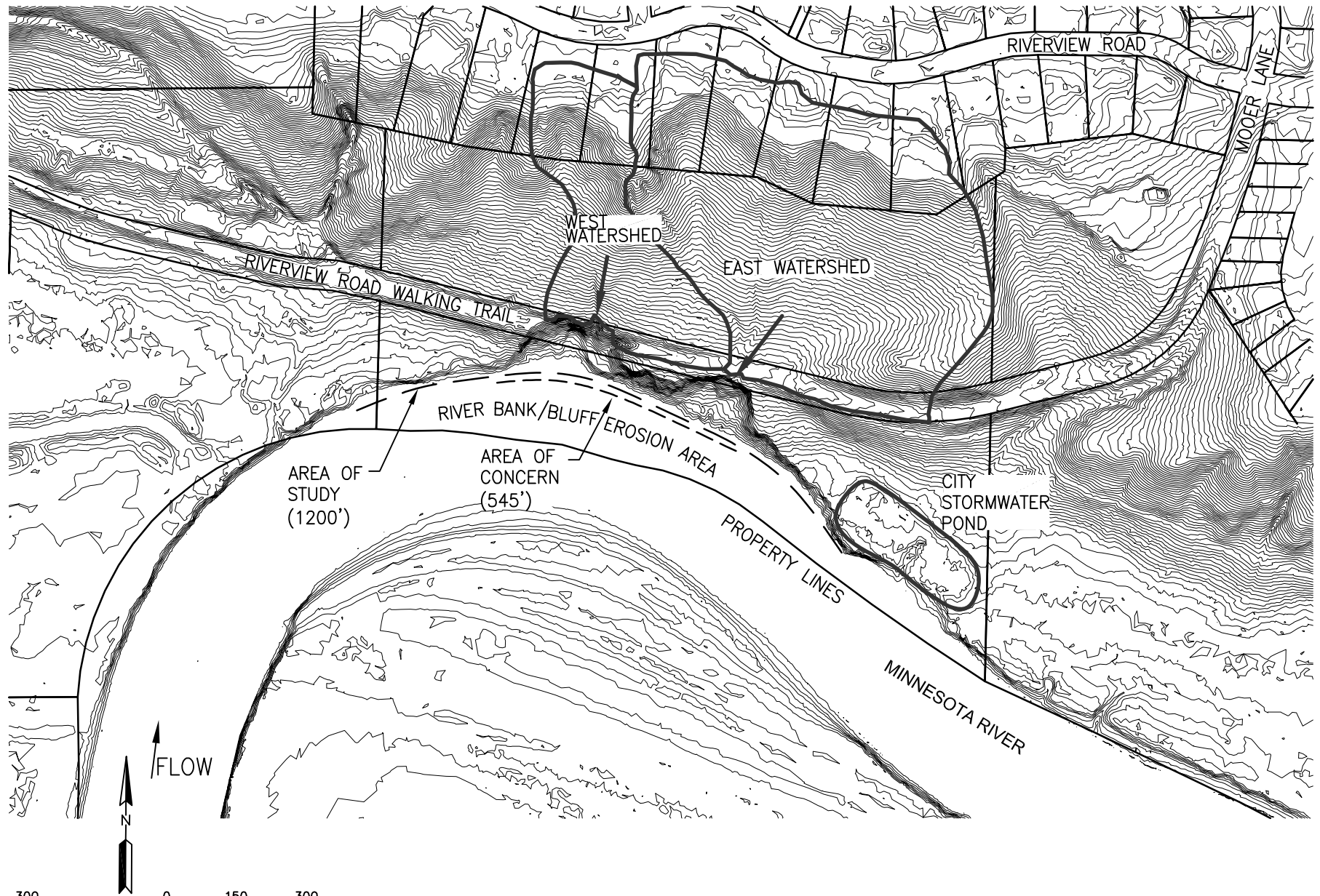
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Aerial: City of Eden Prairie, 2006



Study Area 3 Location Map
 Eden Prairie Erosion Stabilization Study
 Eden Prairie, MN

Figure 1



NOTE:
CONTOUR INTERVALS ARE AT 2'

LOWER MINNESOTA RIVER WATERSHED DISTRICT

Existing Conditions

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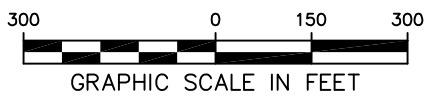
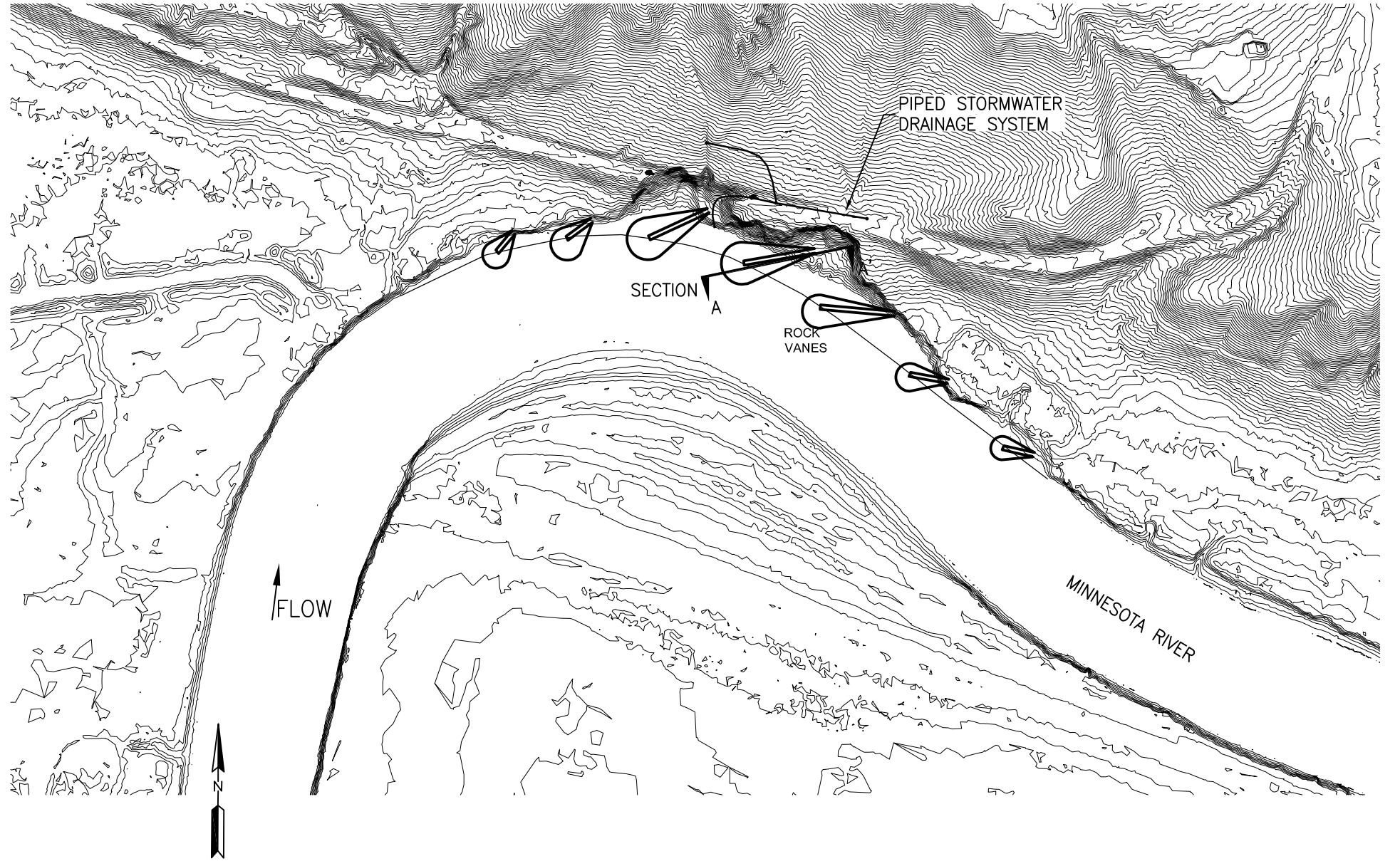


Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55339

FIGURE 2



NOTE:
CONTOUR INTERVALS ARE AT 2'

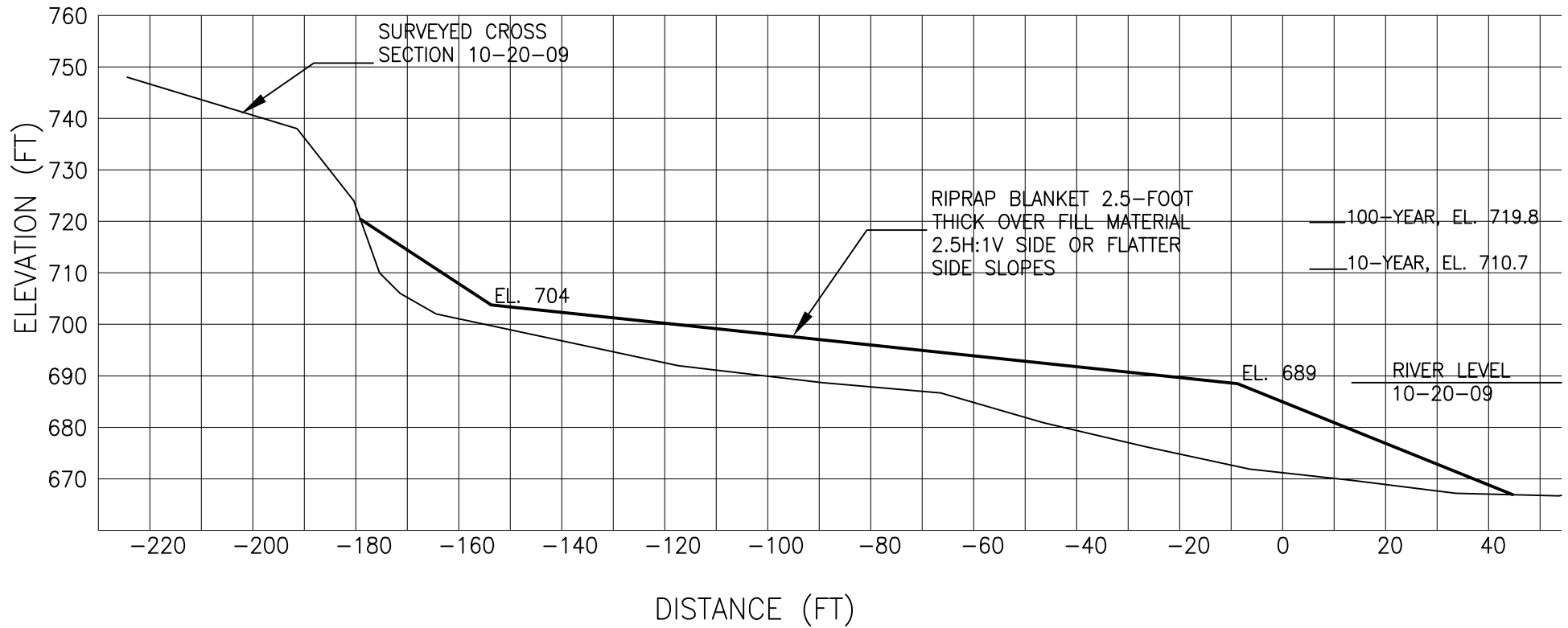
LOWER MINNESOTA RIVER WATERSHED DISTRICT

Rock Vane Plan

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Wenck
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55339

FIGURE 15



LOWER MINNESOTA RIVER WATERSHED DISTRICT

Rock Vane Section A-A'



Wenck
 1800 Pioneer Creek Center
 Maple Plain, MN 55339

FIGURE 16

Figure 1. Riverview Road Properties (map courtesy of Hennepin County).



MAY 7, 2020 SITE VISIT

12585 Riverview Rd

12557 Riverview Rd



MAY 7, 2020 SITE VISIT


12613 Riverview Rd



A photograph showing a gully with a tree and a river in the background. The gully is filled with dry, tangled brush and some green grass. A tree with yellow-green leaves stands in the middle ground. In the background, a river flows through a lush green landscape under a clear sky.

MAY 7, 2020 SITE VISIT

**Active gully erosion
at 12613 Riverview
Rd and homeowner
preventative
measures**



MAY 7, 2020 SITE VISIT

**Same gully at 12613
Riverview Rd and
homeowner
preventative
measures**

MAY 7, 2020 SITE VISIT

12641 Riverview Rd

12669 Riverview Rd



LOWER MINNESOTA RIVER WATERSHED DISTRICT
Trout Streams Gaps Analysis and Long-Term Strategic Management Plan
WORK PLAN—May 15, 2020

Summary

<i>Outcome:</i>	Trout Streams Gaps Analysis and Long-Term Strategic Management Plan:
<i>Project Partners:</i>	Minnesota Department of Natural Resources (MNDNR), US Fish and Wildlife Service (USFWS), Trout Unlimited, City of Burnsville, City of Eagan, City of Bloomington, City of Savage, City of Shakopee, City of Chaska, City of Chanhassen, Dakota County, Carver County, Scott County, Hennepin County, and the public.
<i>Timeline for Completion of Project:</i>	June–October 2020
<i>Total Project Budget:</i>	\$42,000–\$49,500

Objective 1. Project Management

Task 1-1: Project plan development and project management. Finalize the workplan; assign project tasks; determine whether additional resources are needed; set dates for deliverables; generate and maintain project schedule/Gantt chart.

Deliverables: Invoices and project updates

Estimated Budget: \$2,500–\$3,000

Objective 2. Data Collection and Review

Task 2-1: Gather available information. Collect available information on all of the viable trout streams within the Lower Minnesota River Watershed District (LMRWD or District) from public resources, including LiDAR data and cold water resources management plans from the MNDNR, historical aerial photos, and information generated and produced from the 2019 *Geomorphic and Habitat Assessments of Trout Streams in the Lower Minnesota River Watershed District*. Develop standardized email for LMRWD to send to project partners notifying them about the project and advising that they may be contacted by Young Environmental staff.

Task 2-2: Desktop analysis. From the information collected in Task 2-1, develop a comprehensive list of items needed to effectively manage trout streams as well as areas of needed research. Generate a sustainable trout habitat criteria list based on the comprehensive list, detailing the ideal habitat characteristics necessary for a healthy and sustainable trout stream. This task will also develop a trout stream strategic plan framework based on the MNDNR's 2004–2015 Strategic Plan for Coldwater Resources Management in Southeast Minnesota for long-range planning, management, and operation of these cold-water resources.

Timeline for Completion: June–July 2020

Deliverables: Standardized email to project partners, sustainable trout habitat criteria list, and cold-water resource strategic plan framework

Estimated Budget: \$7,000–\$9,000

Objective 3. Gaps Analysis

Task 3-1: Complete gaps analysis for each viable trout stream. Using the sustainable trout habitat criteria list generated in Task 2-2, evaluate each viable trout stream data and knowledge for gaps. This task assumes some work with project partners, as needed.

Timeline for Completion: July–August 2020

Deliverable: Gaps analysis

Estimated Budget: \$4,000–\$5,000

Objective 4. Long-term Strategic Management Plan

Task 4-1: Complete the long-term strategic management plan. Using the cold-water resources strategic plan framework developed in Objective 2 and outcomes of Objective 3, develop a ten-year strategic plan for each viable trout stream within the District. These adaptive plans will define the individual and specific management actions required to achieve the goals in the cold-water resources strategic plan and draft annual operational plans.

Timeline for Completion: August–September 2020

Deliverables: High-level themes, goals, strategies, and operational plans

Estimated Budget: \$6,500–\$7,500

Objective 5. Partner Engagement

Task 5-1: Solicit input from project partners. Host two workshops with project partners to solicit input. The first workshop will be held following the completion of the gaps analysis in Objective 3, and we will ask the participants to review and comment on the cold water resources strategic plan framework generated in Objective 2 and the outcome of Objective 3. The second workshop will be held following the completion of the long-term strategic planning in Objective 4.

Timeline for Completion: July and September 2020

Deliverables: Workshop agendas and summaries for two workshops

Estimated Budget: \$4,500–\$5,500

Objective 6. Documentation

Task 6-1: Generate Draft Outline: Generate a draft annotated outline that documents the assumptions, methodology, and results of Objectives 2–5.

Task 6-2: Develop the Draft Report: Build on the annotated outline, develop the draft report documenting methods, assumptions, procedures, results, and recommendations.

Task 6-3: Present Approach and Preliminary Plan: Present approach and preliminary findings to the project partners and the district’s managers.

Task 6-4: Finalize the Report: Finalize draft report, incorporating project partners, district administrator, and managers written feedback.

Timeline for Completion: June–October 2020

Deliverables: Annotated outline, draft report, preliminary plan presentation, and final report

Estimated Budget: \$17,500–\$19,500

LOWER MINNESOTA RIVER WATERSHED DISTRICT
2020 UPDATED GULLY INVENTORY AND CONDITION ASSESSMENT

WORKPLAN – March 23, 2020

Using the Minnesota River as a focal point, this project will examine issues facing the river's complex natural system, which is a shared resource and a place where varied interests and other systems converge. The report will examine pressures on the river from inside the watershed and expand to consider areas upland of the watershed. Fieldwork will be conducted to inventory gullies in the watershed and to prioritize the gullies by their potential for loading sediment into the Minnesota River. The outcome will determine the primary areas of flow and sediment contribution into the Minnesota River between the City of Carver and the confluence with the Mississippi River, as well as formulating potential management strategies moving forward.

Summary

Outcome: 2020 Updated Gully Inventory and Condition Assessment

Timeline for Completion of Project: 2020 – 2021

Project Partners: Minnesota Department of Natural Resources (MnDNR), U.S. Fish and Wildlife Service (USFWS), Trout Unlimited, City of Burnsville, City of Eagan, City of Bloomington, City of Savage, City of Shakopee, City of Chaska, City of Chanhassen, Dakota County, Carver County, Scott County, and Hennepin County.

Audience (For whom is this plan intended?): Cities and counties within the Lower Minnesota River Watershed District (LMRWD), and resource and landuse professionals.

Total Project Budget: \$109,000 – \$118,500, see table 1

Objective 1. Project Management

Task 1-1: Project plan development and project management. Finalize the workplan; assign project tasks; determine if additional resources are needed; set dates for deliverables; generate and maintain project schedule/Gantt chart.

Timeline for Objective 1 Completion: 5 – 7 months

Estimated Objective 1 Budget: \$4,500 – \$6,000

Objective 2. Collect and Review Data

Task 2-1: Gather background information. Gather background resource information from public resources, including LiDAR data from the MnDNR, and water resources management plans from partners' websites listed above. Develop standardized email for LMRWD to send to project partners notifying them about the project and advising that they may be contacted by Young Environmental staff.

Task 2-2: Desktop analysis. From the information collected in task 2-1, develop a list and map of existing gullies, as well as proposed and completed projects since 2006 that may have addressed gully erosion. Reach out to partners identified above for additional information as needed. Develop a Gully Erosion Susceptibility analysis and map using geospatial data, including MnDNR LiDAR data, soil types, land use and land cover, and surficial geology, to determine remotely which areas within the LMRWD watershed may be most susceptible to gully erosion.

Task 2-3: Complete a gaps analysis for 2020 fieldwork. Validate 2006 Gully Inventory and compare to LMRWD and partner studies and projects since 2006, as well as LMRWD and partner planned studies and projects and the

Gully Erosion Susceptibility analysis from task 2-2. Develop a list of sites which have not been assessed to date that will provide the basis for the objective 3 fieldwork. Work with project partners as needed.

Task 2-4: Condition assessment means and methods. Develop means and methods to address data gaps in the existing gully inventory and ensure the necessary data for determining a conditional assessment is collected during the 2020 fieldwork. Develop field data collection sheets to ensure data needed to objectively assess and rank an individual gully is captured during summer field visits.

Timeline for Objective 2 Completion: 6 – 10 weeks

Estimated Objective 2 Budget: \$15,000 – \$17,000

Objective 3. Fieldwork

Task 3-1: Gully Inventory. Deploy a team of interns to update the 2006 LMRWD Gully Inventory. Interns will collect photographs and waypoint locations of each of the gullies in the District identified in objective 2. Using the field data collection sheets developed in task 2-4, the current gully condition will be objectively assessed in the field. This will be supported by field data collection sheets, photographs, waypoint locations, and any field notes detailing the condition of the gully.

Task 3-2: Gully Ranking. Based on the gully condition assessment, rate the identified and assessed gullies in the LMRWD by the potential for sediment loading into the Minnesota River, HVRA, or 303-listed impaired waterbody, and potential project partnering opportunities.

Timeline for Objective 3 Completion: 12 weeks

Training Needed for Objective 3: Field safety training; gully condition assessment field sheets training.

Equipment Needed for Objective 3: Bug spray, sun block, car rental, LMRWD decals for cars, broomsticks/walking sticks, personal protective equipment (safety vests, safety glasses, hats), first aid kits, field notebooks, pencils, water bottles, and survey rods/measuring tape

Estimated Objective 4 Budget: \$74,000 – \$78,000

Objective 4. Documentation

Task 4-1: Generate draft outline. Generate draft annotated outline for the 2020 Updated Gully Inventory that will document the assumptions, methodology, results of the desktop analyses and 2020 fieldwork, and any recommendations or conclusions.

Task 4-2: Develop Updated Gully Inventory report. Building on the annotated outline, develop the draft report documenting methods, assumptions, procedures, results, and recommendations.

Task 4-3: Presentation of Approach and Preliminary Findings. Interns will present the gully inventory, condition assessment, and preliminary results to the LMRWD Board

Task 4-4: Submit Report for Review and Finalize Document. Submit draft Updated Gully Inventory to the District and project partners for consideration and written feedback with a two-week review window for return comments. Review feedback on draft Updated Gully Inventory. Incorporate edits as needed and submit final report to Board and project partners.

Timeline for Objective 4 Completion: 4 weeks

Estimated Objective 4 Budget: \$15,500 – \$17,500

Table 1: LMRWD 2020 Gully Inventory Update – Schedule and Cost Estimate

Objective	Task	Schedule (Mar. – Oct. 2020)	Budget
Objective 1. Project Management	Task 1-1: Project plan development and project management	5 – 7 months	\$4,500 – \$6,000
Objective 2. Collect and Review Data	Task 2-1: Gather background information	6 – 10 weeks	\$15,000 – \$17,000
	Task 2-2: Desktop analysis		
	Task 2-3: Complete gaps analysis for 2020 fieldwork		
	Task 2-4: Condition assessment means and methods		
Objective 3. Gully Inventory	Task 3-1: Gully inventory	10 – 12 weeks	\$74,000 – \$78,000
	Task 3-2: Gully ranking		
Objective 4. Documentation	Task 4-1: Annotated outline	4 weeks	\$15,500 – \$17,500
	Task 4-2: Updated Gully Inventory report		
	Task 4-3: Presentation of approach and findings		
	Task 4-4: Submit report for review and finalize Updated Gully Inventory		
Total		5 – 7 months	\$109,000 – \$118,500