Minnesota River Bank and Bluff Stabilization
Eden Prairie, Minnesota

A Report Prepared for

The Lower Minnesota River Watershed District

Prepared by

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INTRODUCTION

The purpose of this report is to present the results of an analysis of the Minnesota River bank erosion problem located southwest of the intersection of Riverview Road and Mooer Lane in Eden Prairie, Minnesota (see Figure 1). An explanation for the cause of the site erosion and alternative designs to address the problem are provided. The pros and cons for each alternative design are defined, including construction cost and maintenance considerations. A recommendation for an alternative to be selected for final design is also provided.

BACKGROUND

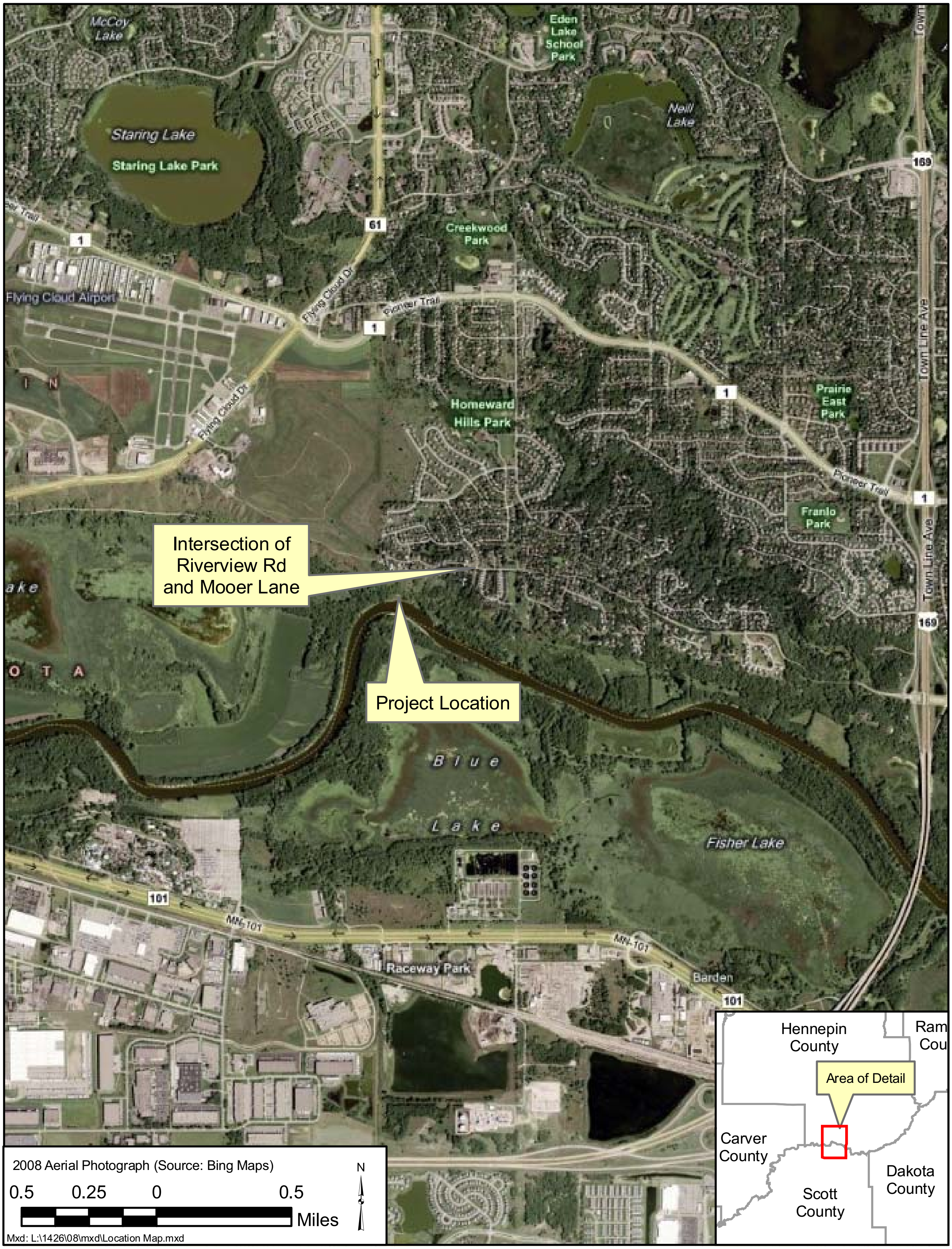
A study of the area was completed in October 2008 for the City of Eden Prairie in cooperation with the Lower Minnesota River Watershed District (SRF Consulting Group 2008). The 2008 study investigated a 250-foot portion of the erosion area. This report expands the 2008 study, incorporating the entire eroded bank area requiring the collection of additional data, river cross sections, hydraulic modeling and analysis.

PROBLEM ANALYSIS

The Minnesota River drains much of southern Minnesota, approximately 17,000 square miles, by the time it flows by the erosion site in Eden Prairie. The site is 19.6 river miles upstream of the confluence with the Mississippi River at Fort Snelling. The river has created a one-mile wide floodplain shown in Figure 1 as its meanders wander back and forth eroding the valley walls and bluffs in its long history. It is continuing this process at the site.

This report investigates the meander movement at this site and the various factors influencing the erosion of the bluff. Figure 2 defines the river banks and the bluff by the 2-foot contour lines from the LiDAR (Light Detection and Ranging) data provided by the City of Eden Prairie. Steep, eroded slopes are indicated where the lines are closely spaced. These data were found to match well with survey data collected at the site.

The eroded portions of the bluff extend approximately 55 feet vertically from typical low river levels. The historic north river bank may be approximated by the property line now in the middle of the river. Approximately 1200 feet of the bank is eroding. The center portion of this area includes 545 feet of failed bluff, portions of which are steeper than 1H:1V. Vegetation has begun to re-establish within areas that are not currently sloughing.



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Location Map

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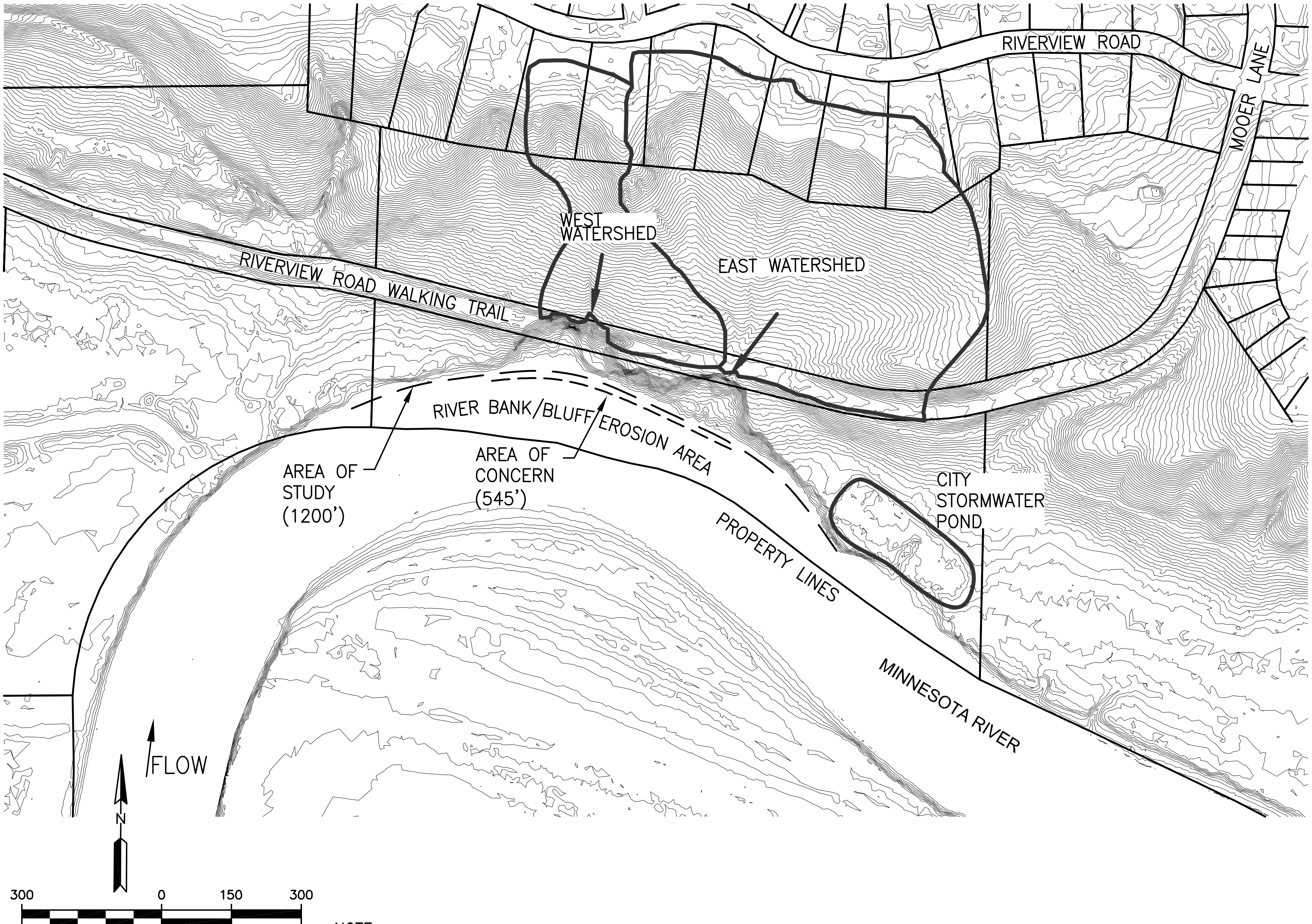
Figure 1



NOTE:
CONTOUR INTERVALS ARE AT 2'

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Exisitng Conditions

FIGURE 2

Rainfall runoff draining from the bluff into two areas is indicated as the east and west watershed in Figure 2. Runoff from the east watershed was originally conveyed under the Riverview Road walking trail by a corrugated metal culvert. Its inlet appears to be plugged and the flow now passes over the trail. The end of the culvert is now unsupported and cantilevers over the center of the eastern scarp area. The west watershed is somewhat smaller and drains directly into the west scarp area. Any solution to the erosion problem must convey this water from both these sources to the river without causing further erosion. The drainage from the bluff exacerbates the erosion problem, but is not the primary cause.

There is a significant seep at the toe of the slope along the majority of the eroded river bank. Groundwater seepage exits the bank approximately 10 to 15 feet above the normal river level. This flow makes the soils at the toe of the slope more unstable and susceptible to erosion. The geotechnical investigation portion of this report includes this effect in the analysis. Any bank stabilization method and construction procedure will need to address the effect of this seepage.

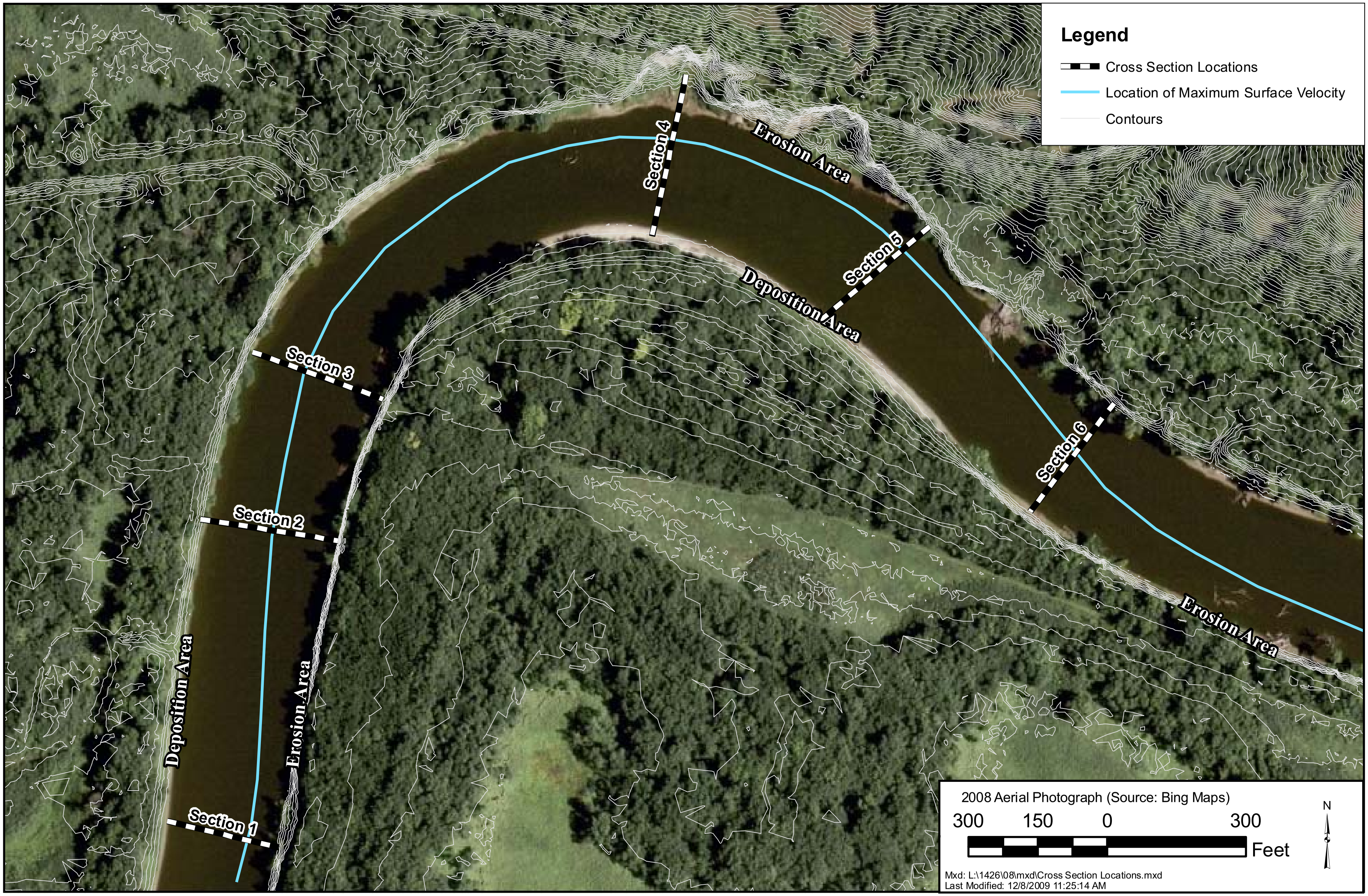
"Black ooze" has been noted by residents in the seepage area and thought to be related to the landfill located just northwest of the site. Samples of the material and seepage water were collected and analyzed as a side investigation of this study. The results provided in the appendix show constituents that are typical of a natural groundwater seep. There is no indication that it is impacted by the landfill.

The river meander at the site rounds a relatively sharp 750-foot radius bend compared to typical meanders in the river. The bank-full width of the river is approximately 300 feet. The banks and bed of the river are primarily sand with some gravel. The floodplain is alluvial material. The bluff is sand with some silty layers. The river is moving laterally within the floodplain as will be demonstrated later in this report, but its bed elevation appears to be stable. No significant aggradation (channel bottom build-up) or degradation (cutting) has been noted at near by bridge crossings.

Six river cross sections were surveyed on October 20, 2009, near the erosion site to better understand the river flow (see Figure 3). The water surface elevation was 688.5 at the site. The river discharge was estimated to be 3640 cubic feet per seconds using the U.S. Geological Service (USGS) gage records at Jordan, Minnesota. A comparison of each section is shown in Figure 4 and further described below.

Section 1 is located approximately 1900 feet upstream of the site. The river at this location is cutting into the right bank (looking downstream) as evidenced by the relatively steep bank. The deepest point or thalweg is approximately 50 feet from the right bank. This is also the location of maximum surface velocity, measured in the field at approximately 2 feet per second.

Section 2 is located approximately 1300 feet upstream of the site and is significantly wider than Section 1. The maximum surface velocity was noted to be near the center of



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Cross Section Location

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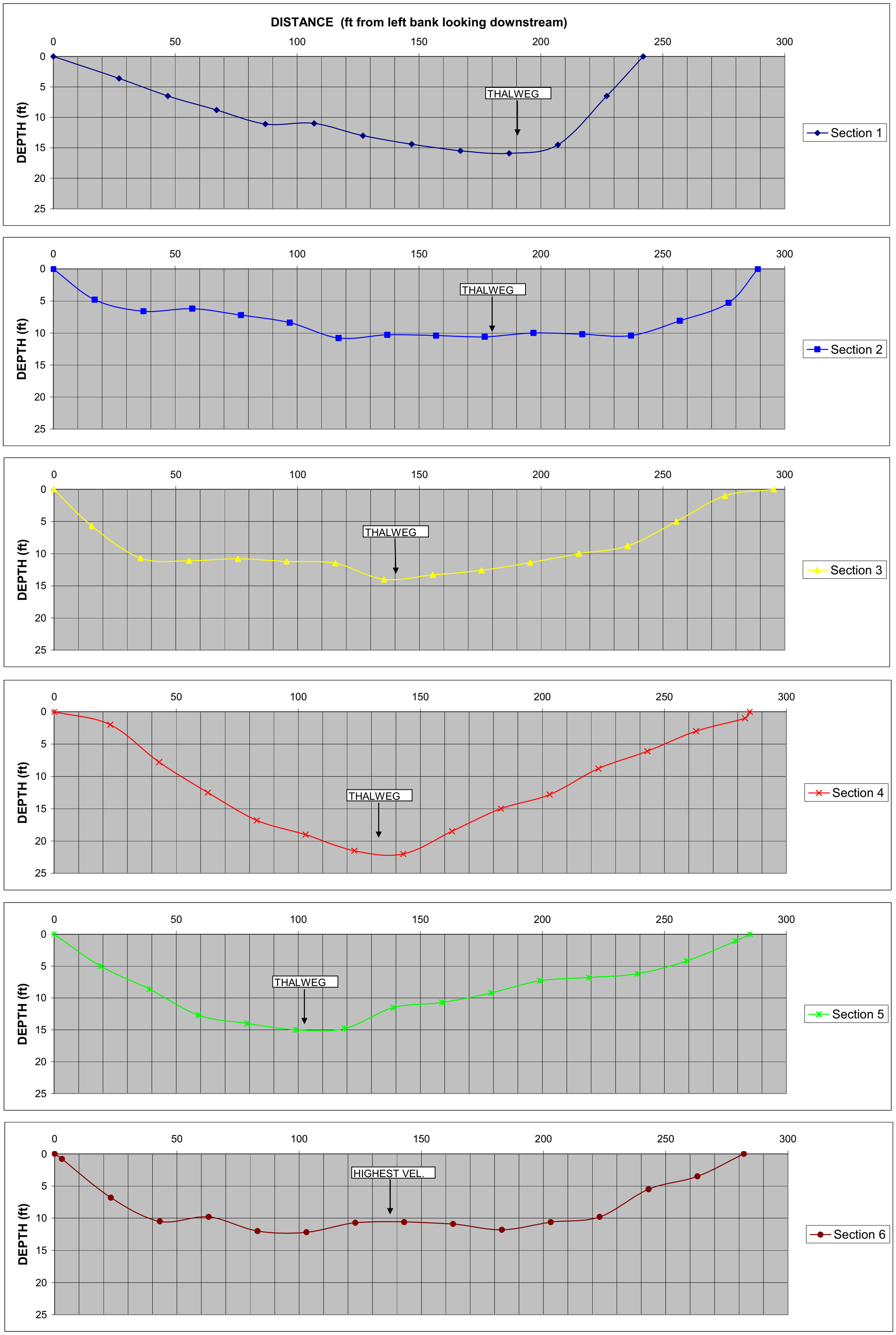
Figure 3



DEPTHS ARE RELATIVE TO A WATER SURFACE ELEVATION OF 688.5.

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Comparison of River Cross Sections

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FIGURE 4

the river. The thalweg is less defined, but moving toward the center. Both banks are relatively stable.

Section 3 is located 1000 feet upstream of the site. It is approximately the same width as Section 2. The thalweg and the maximum surface velocity were noted to be the left of center. Note that the left bank is steeper.

Section 4 is located at the erosion site at the apex of the meander bend. The thalweg depth was noted at 22 feet, the deepest measured in all the sections taken. The failed left bank is slumping into the river as is evident in the section. The highest surface velocity was noted near the left bank.

Section 5 is located approximately 550 feet downstream of the site. The thalweg is clearly noted near the left side. Erosion was noted on the left as well.

Section 6 is located 1150 feet downstream of the site. The thalweg of the river is moving toward the right bank. The highest surface velocity was noted near the center.

These sections combined with the detailed LiDAR data provide a clear indication where the current erosive forces are acting.

Figure 5 below illustrates the change in the cross section at the site (Section 4) between the time the Flood Insurance Study (FIS) was completed in the 1980s until now. The river has clearly moved significantly to the left bank (north). Further evidence of the shift north and east is demonstrated by the historical aerial photograph review described below.

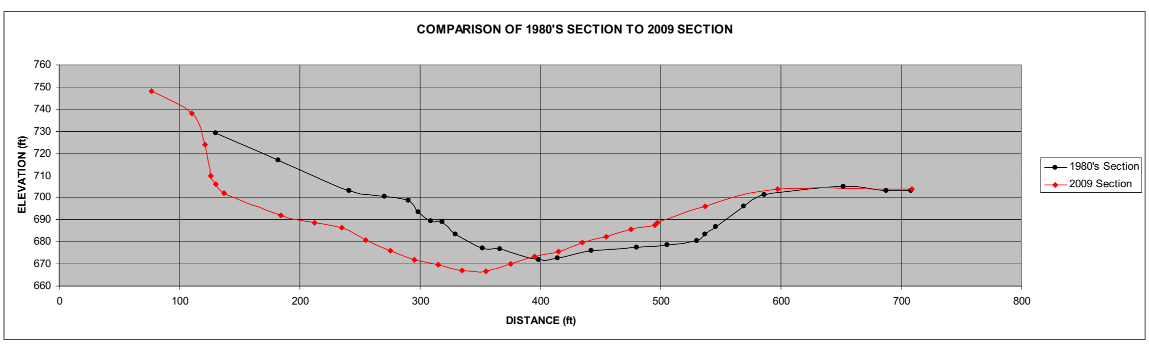


Figure 5. Comparison of Cross Section in 1980s and 2009.

Historical Aerial Photo Analysis

Eight available years with reasonable photographic resolution of the site were collected for review: 1937, 1953, 1964, 1969, 1979, 1991, 2000, and 2008. The images were geo-rectified (scale and photo position adjusted so all photos are comparable) using common landmarks between photos. The river banks were traced accounting for the different flow rates where possible. The results of all the photos are provided in the appendix. General movement in the meander is noted between all years. The meander bend approaches Riverview Road walking trail until the road fails around 1991. A summary of the results is provided in Figure 6 on the next page. The overall movement is similar to that expected of a typical meander. Compare to Figure 7 below, taken from the U. S. Department of Transportation FHWA (1989).

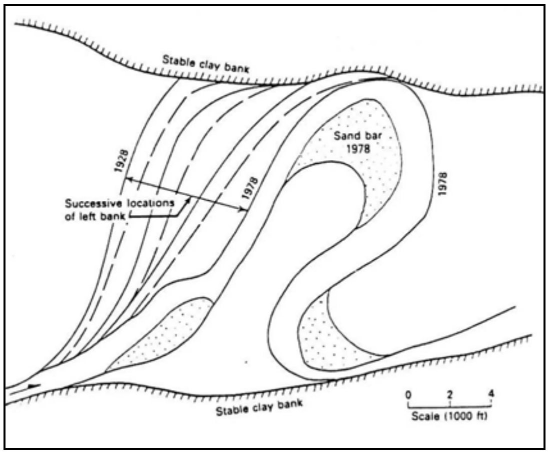
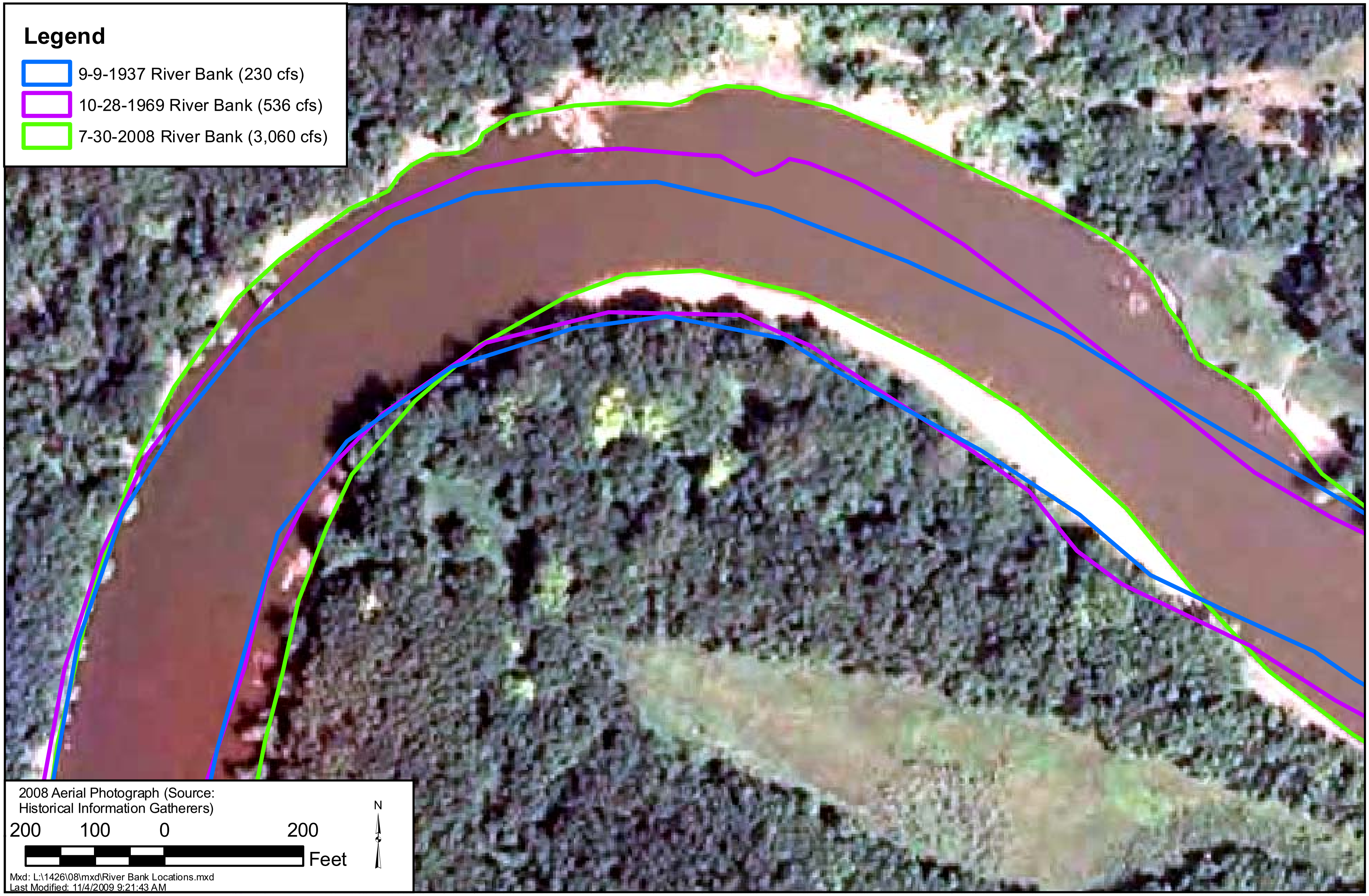


Figure 7. Meander Sketch from USDOT, FHWA (1989).

Eyewitnesses noted significant erosion as a result of the 1993 flood event. No aerial photographs were available for this year. As noted above, the Riverview Road walking trail failed around 1991. A small section of the trail can be seen affected by the river bank erosion. The 2000 aerial photograph shows significantly more erosion of the bank and trail. This may be a result of the 1993 flood and the subsequent 1997 flood. Further analysis of this is provided in the geotechnical portion of this report.

Between 1937 and 1969 the apex of the meander moved about 65 feet or 2 feet per year. Between 1969 and 2008 the apex moved approximately 115 feet or 3 feet per year. The measurements are not precise enough to determine if there is a change in the erosion rate over the years, but as will be demonstrated in the following section, the hydrology has changed. The change in hydrology supports an increase in erosion rate.

Erosion rates published in the reference U. S. Department of Transportation FHWA (1989) are 3 feet per year for rivers of similar geometry to the Minnesota River. If left unchecked, the erosion of the bluff will continue and the meander bend will move downstream at a rate of 3 feet per year or more.



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Summary of Historical Aerial Photograph Analysis

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Figure 6

Hydrologic Analysis

The flood flow data in Table 1 is compiled from several references (USACE 2001, USACE and USGS 2004, USGS 1988). It is considered the "Best Available Data" until the Federal Emergency Management Agency (FEMA) produces new Flood Insurance Study (FIS) maps of the affected communities.

Table 1.
Bank Erosion Site River Mile 19.6 Flood Flow Data
Lower Minnesota River

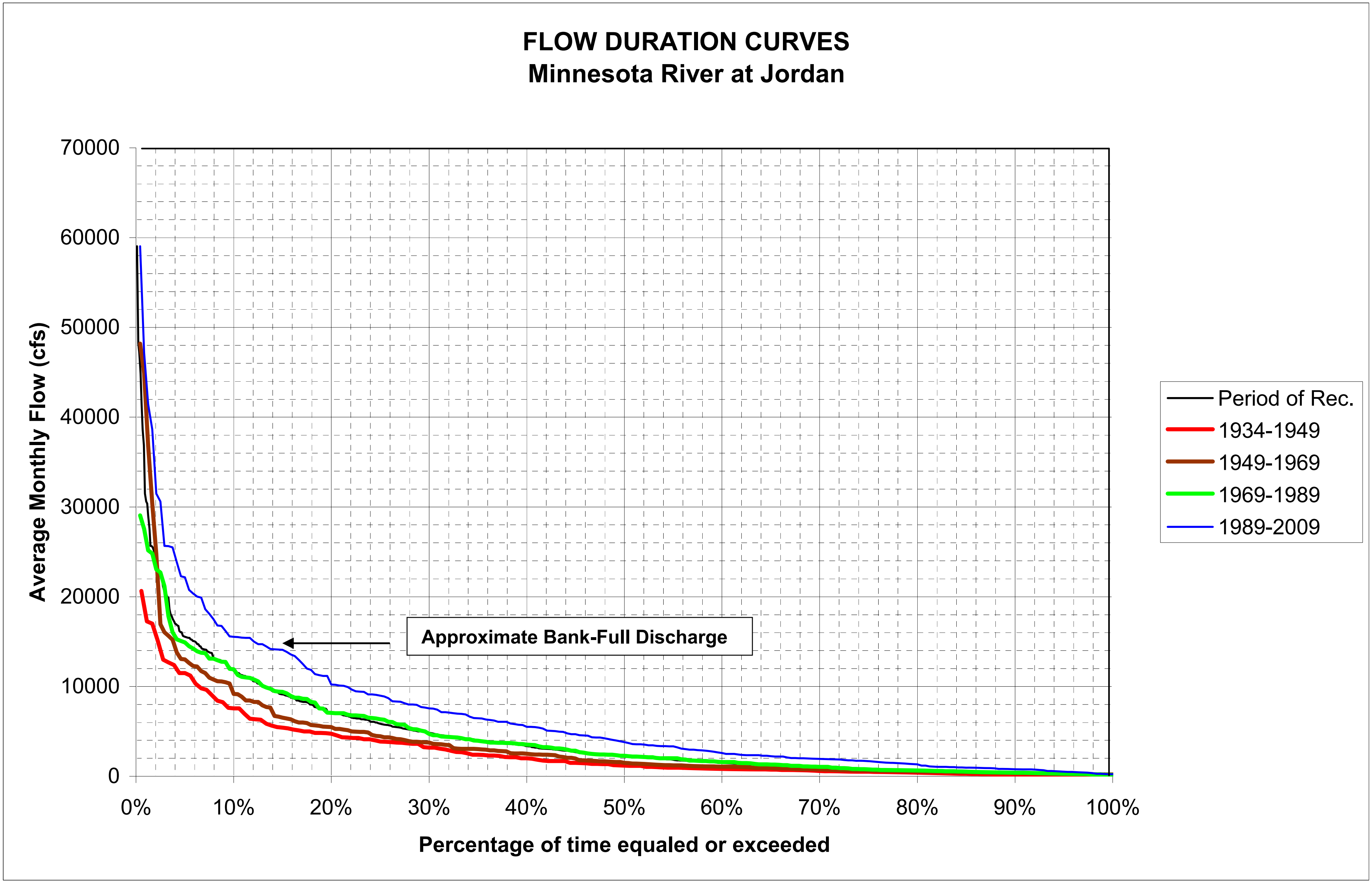
Historic Flood Event	**Discharge (cfs)**	**Water Surface Elevation (ft)**
1969	84,600	718.7
1993	92,200	716.9
1997	82,300	717.4
2001	87,100	717.5
Design Flood Event		
500-year	182,000	725.2
100-year	103,000	719.8
50-year	85,300	717.4
10-year	48,500	710.7
Bank full (~2 year)	17,000	~704

The above data provide flow rates and levels useful for design. Further investigation of the USGS flow records at Jordan, Minnesota, was completed to determine if hydrologic changes that affect streambank erosion have occurred. The Jordan gage is approximately 21 river miles upstream and incorporates more than 95 percent of the watershed at the site. Flows at Jordan will closely reflect those at the site.

The change in average annual river flow at Jordan for the period of record is provided in the appendix with a 30-year running average. Prior to the mid-80s, the average annual flow was less than 4000 cubic feet per second (cfs). Currently, it has increased to more than 6000 cfs.

The flow duration curve data is of more importance to streambank erosion. It defines how much time river flows remain at a given discharge. It has been shown that streambank erosion is affected significantly by the bank-full discharge. Velocities at this flow are larger than they are at lower flood events. Once flood flows exceed the river banks and spread over the floodplains, overall velocities decrease.

Figure 8 illustrates that the time the river remains at the bank-full discharge of approximately 17,000 cfs has significantly changed in the past 20 years. Presentations at the 2009 Annual Water Resources Conference in St. Paul support the change in river flow rates and attribute the deviation to climate change and drainage changes (added



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Flow Duration Curves

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Figure 8

drain tiles) in the watershed. Novotny and Stefan (2007) also provide research in concurrence with this premise.

Hydraulic Analysis

A HEC-RAS hydraulic flow model of the Lower Minnesota River was obtained from the U.S. Army Corps of Engineers (USACE). The new river cross section data were incorporated into the model to determine flow velocities useful for the bank stabilization design. Details of the modeling are provided in the appendix.

The model results show the average cross sectional velocity to be 1.5 feet per second (fps) at the bank-full discharge. Using hydraulic design manuals (USACE 1994 and other), the flow velocity at the outside of a bend may be two times or more the average velocity, resulting in 3 fps, an erosive velocity for the silty sand at the site (USACE 2001).

Geotechnical Analysis

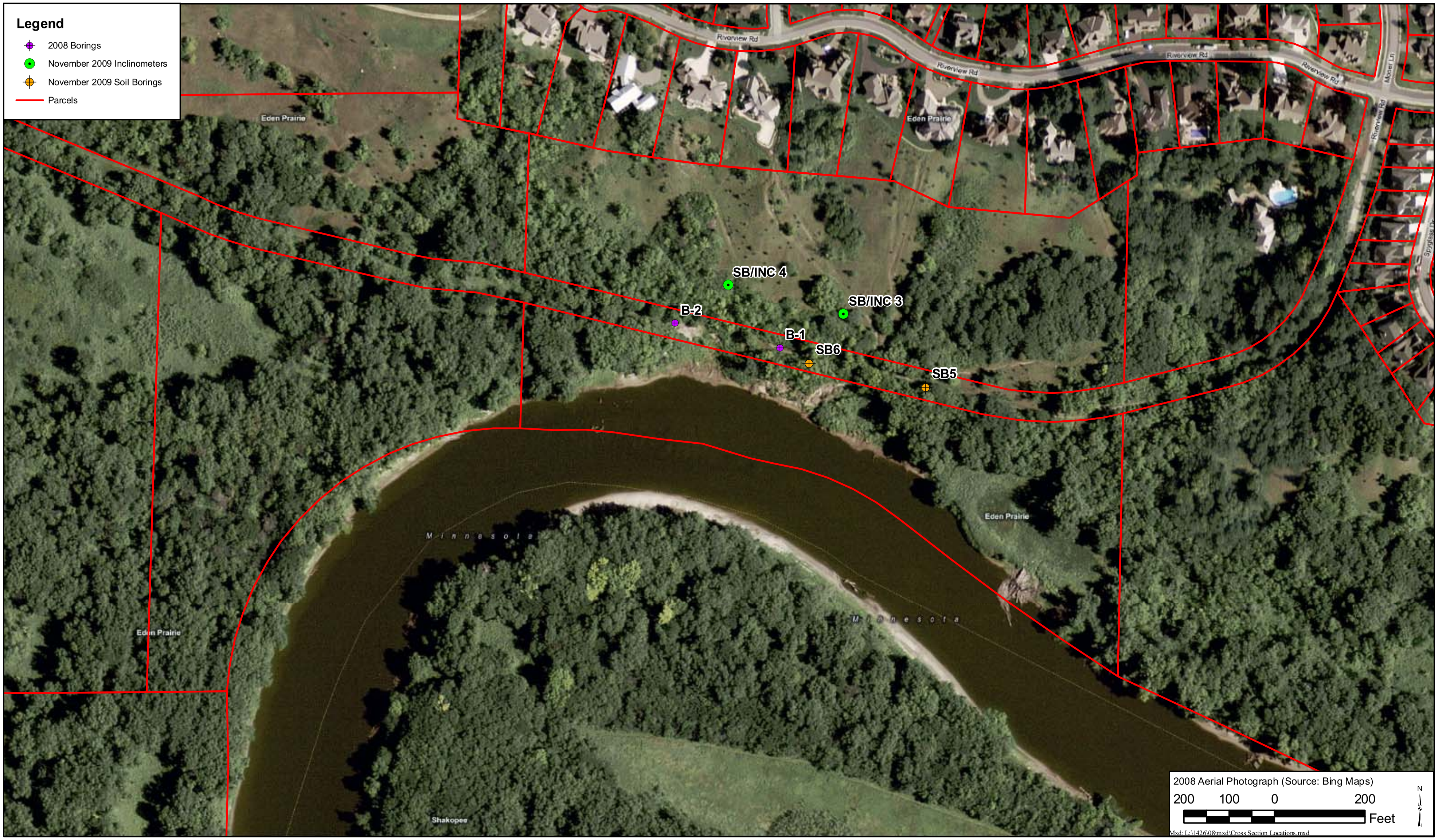
The objectives of the geotechnical analysis include:

- Developing a subsurface profile and soil parameters for use in a slope stability model using available soil borings;
- Determining the stability of the existing riverbank and bluff;
- Determining the grade required to achieve acceptable factors of safety for slope stability; and
- Developing geotechnical recommendations for construction of riverbank and bluff stabilization measures.

Subsurface Investigation:

Four soil borings were drilled and tested by Braun Intertec in early December 2009. Locations of these borings are shown in Figure 9. Borings SB-5 and SB-6 were drilled and sampled adjacent to and above the near vertical face of the bluff at elevations 740 and 748 respectively. A piezometer was installed near boring SB-6 to measure ground water levels within the bluff. On January 8th, the water level at SB-6 (ground elevation of ~740) was measured at approximately elevation 700. The other two borings (SB/INC-3 and SB/INC-4) were drilled further up the slope at approximately elevation 771 and 774 respectively and inclinometers were installed in each borehole. The inclinometers will be used to measure any shallow or deep seated movement of the bluff area that might occur over time. Once baseline readings are obtained, future inclinometer readings will allow the determination of both the magnitude and depth of any movement within the bluff.

2008 Gale-Tec borings ST-1 and ST-2 were used in conjunction with the new Braun boring field data to develop a subsurface profile for slope stability analysis. Both the new



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Soil Borings and Inclinometer Locations

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Figure 9

and existing borings encountered the water table at approximately elevation 700 to 710. This is consistent with the elevation where the water was observed exiting the vertical face of the eroded slope and with the recently installed piezometer. It is anticipated that the groundwater level within the bluff will vary depending on precipitation and river stage.

The subsurface profile developed for the stability analysis model of the bluff consists of very loose to loose poorly graded sand extending from the top of the slope down to elevation 730. The sand is underlain by medium dense to dense silt which extends to the limits of the borings. See Figure 10. The soil parameters utilized in the analysis were based upon general classifications determined from SPT blow counts. Refer to the slope stability plates in the appendix for soil parameters used.

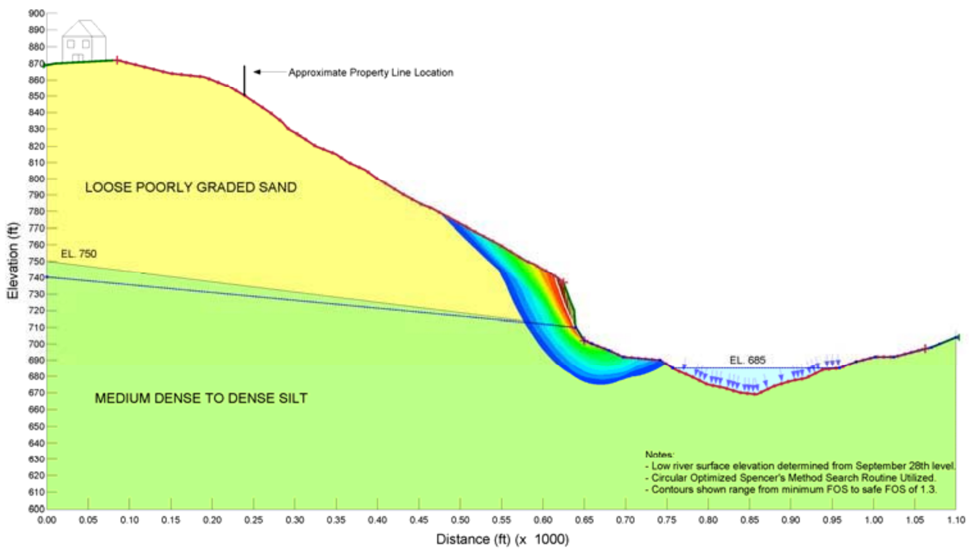

Figure 10. Site Stratigraphy and Stability

The riverbank in the vicinity of the failures was observed to be wet and soft during a site visit. Numerous seeps and springs were observed in the area of the erosion, and a phreatic surface was visible several feet above the toe on the face of the eroded bluff. Probing with a steel rod near the river's edge indicated a couple feet of very loose material overlying a stiffer layer. The stiffer layer appeared to be acting as an aquitard, and once penetrated, a "sand boil" would be created. The soft ground and artesian aquifer conditions observed will need to be accounted for during design and construction of riverbank stabilization measures.

Slope Stability Analysis:

Slope stability analyses were completed using the GEO-SLOPE SLOPE/W 2007 software. SLOPE/W uses a suite of analyses methods to evaluate global stability. Spencer's Method of analysis was the method selected for output results. The program's circular search routine was utilized to determine critical failure surfaces by specifying both entry and exit ranges. Within these entry and exit ranges, length and radius increments were also specified. SLOPE/W was then used to enable an optimized option for analysis of the same failure surface. Often the optimization leads to a slightly non-geometrically definable shape that has a slightly lower factor of safety than the geometrically definable shape produced by the non-optimized analysis.

An initial, "sunny day" analysis was completed for the entire slope spanning a horizontal distance of approximately 1100 feet and a vertical height of approximately 200 feet. A low-water river surface elevation of 685 was conservatively assumed based on September 2009 low water levels. The model and results for this analysis are shown as Plate 1 in the appendix. The objective of this analysis was to evaluate the risk of potential slope failures adversely affecting the safety of the homes and/or their property along the Minnesota River bluff, in the vicinity of the eroded bluff. This analysis returned a minimum factor of safety of 1.31 which exceeds the acceptable minimum value of 1.3. It should be noted that this was for a failure surface with an exit point located at the approximate riverward property line of the nearest property. Factors of safety will be higher than 1.4 for failure surfaces exiting the ground closer to the homes and their backyards. These higher factors of safety indicate that the risk of a failure impacting the homes or their backyards is very small.

Next, the eroded, steep face of the bluff was isolated in the stability model. Stability analysis of the steep eroded slope produced a factor of safety of 0.61 which indicates the steep face of the bluff is unstable in its current shape, and will likely experience failures and sloughing until a stable slope is achieved. Alternatively, the steep face of the bluff could be graded flat to achieve a stable condition. The model and results of this analysis are shown as Plate 2 in the appendix. It should be noted that these failures are in the immediate vicinity of the near vertical bluff face and do not pose a risk to the homes or their property. It can be seen from the slip surface safety map of this analysis that minimum required factors of safety are achieved well before any surfaces approach the homes or their property.

A third condition analyzed represents the bluff following a major flood event. Eye witnesses indicate that the past bluff failures have typically occurred following significant flood events. During prolonged flood conditions, high water levels will exist both with the river and the bluff soils. The water in the river exerts a stabilizing force on the bluff. When the river drops after the flood, the soils within the bluff will remain saturated for awhile until they can drain. The saturated soils add weight to the bluff, increasing the forces tending to destabilize the bluff. This loading condition is typically called the rapid drawdown case. In the drawdown model, the high water level was assumed at elevation 728 (500-yr flood elevation). The water in the river was then drawn down to elevation 685 and the stability of the bluff under drawdown conditions was evaluated. The model and results of this analysis are provided as Plates 3a and 3b in the appendix. The failure surface safety map provided on Plate 3a shows failure surfaces with factors of safety ranging from the minimum factor of safety to a factor of safety of 1.3. This plate shows that the failure surfaces extend higher up the bluff, further into the river and are slightly deeper than the non-flood analysis results. However, even with the larger and deeper failure surfaces, required minimum stability factors of safety are achieved well before any homes or properties are in danger. Plate 3b is also provided to show the same analysis with a failure surface safety map ranging from the minimum factor of safety to a factor of safety of 1.0.

The stability model was then used to determine a slope that would provide acceptable minimum stability factors of safety for all loading conditions and at all locations within the bluff. It was determined that the slope would require grading to a 3H:1V slope in order to achieve acceptable minimum factors of safety for both deep and shallow failure surfaces. It should be noted that a 3H:1V slope would require the abandonment or relocation of the existing trail. Major flood and drawdown conditions may result in some small, shallow failures at the base of the slope where the water table is still above the base of the sand stratum. These small failures may require maintenance and repair following flood events. If occasional maintenance is not desired, a 3 ft thick layer of riprap could be placed on the lower portion of the slope as shown in Plate 4 in the appendix. All new slopes should be covered with topsoil and seeded to provide erosion protection against surface water. Turf reinforcement products could be used to improve the short term survivability of the turf. In addition, surface water should be collected above the new slope and transported via pipe or riprap channel to the base of slope to reduce potential of erosion resulting from concentrated flow of surface water over the turf slope.

Design and Construction Consideration:

The high groundwater table, artesian groundwater conditions and soft ground conditions at the riverbank will need to be considered during the design and construction of riverbank stabilization measures. Construction on the soft ground will likely require the use of high strength geosynthetic to provide a stable base on which to construct rock berms or new embankments. In addition, filter and drainage layers should be included at the base of any new construction to control “piping” (internal erosion and loss of materials) that may result in undermining and/or settlement of new construction, and to safely collect and convey seepage and springs away from beneath new construction. Staged construction may also be required for new fill or berm construction to allow consolidation and strengthening of soft soils and reduce the risk of bearing failure during construction.

Summary

The meander movement at the erosion site is a natural process. The rate of movement may have been accelerated in the past several years due to changes in river hydrology as a result of additional drain tile installed in the watershed and/or climate change. The 1993 flood was noted by eyewitnesses to have caused significant damage to the bluff. The erosion at the site has been exacerbated by concentrated surface runoff from the bluff and seepage flows that weaken the support at the toe of the slope. If left unchecked the erosion of the bluff will continue as the apex of the meander moves downstream. The stability analysis of the slope shows that the bluff has an acceptable factor of safety.

A successful bank stabilization design depends on the following:

- Providing bank stabilization to protect against erosion forces of flood flow velocities and high flood levels.
- Adequate coverage upstream and downstream, anticipating the future movement of the meander bend.
- Providing slope stability.
- Properly conveying surface runoff from the bluff down to the river.
- Properly conveying seepage flows.
- Account for constructability concerns with the soft soils at the toe of the slope.
- Establishing vegetation on the higher bank areas once the toe of the slope has been stabilized.
- Monitoring and maintenance, as needed.

Information relating to the project was sent to the Corps of Engineers and Minnesota Department of Natural Resources regulatory staff for their initial review. Due to the scope of the project, the Corps will require a Letter of Permission, which includes a public notice process. The Corps' primary permitting issues will be navigation and mussels. The project will not likely impact navigation and this reach of the river is not known for mussel habitat. The Corps may waive a mussel survey. The MnDNR stated that the stability of the bluff is important. The geotechnical analysis and the inclinometers will be useful to address this issue.

Bank Stabilization Design

There are a number of different bank stabilization designs depending on the river size, flow velocities, and site conditions. The WES Stream Investigation and Streambank Stabilization Handbook (USACE 1997) provides a range of considerations. Considering the list of requirements given in the previous summary section, the following three alternatives are presented for consideration.

1. Riprap Blanket – a very commonly used approach.
2. Bendway Weirs – used to direct the flow back to the channel center.
3. Rock Vanes – similar to bendway weirs, but with a slightly different configuration.

Alternatives not pursued include "doing nothing," rerouting the river, and using geotextiles and an aggressive revegetation plan. If nothing is done, the meander will continue moving downstream and will erode through the area where the existing City storm water pond is located. The floodplain widens there to the north and bluff erosion is expected to be less severe. Its rate of movement will likely be more than 3 feet per year given the change in hydrology that has occurred. The slope stability may be monitored by the inclinometers recently installed. All things considered, this option is considered unacceptable due to perceived continued risk of properties on the bluff.

Rerouting the river in a channel formed in the upstream floodplain is not likely an option that the regulatory agencies would permit. It may also cause unpredictable problems with banks in the rerouted portion of the river.

Use of geotexiles and revegetation has yet to have an established record of success compared to the alternatives presented below.

Alternative 1 – Riprap Blanket

The riprap blanket alternative simply places a layer of rock on the eroded slope. There are a few design requirements for a successful job. It is important to start the riprap and key it in far enough upstream to prevent the river flow from getting behind the blanket and unraveling the work. The same applies on the downstream end where eddies may form. The toe of the riprap blanket should account for potential scour. The slope should be cleared of debris and back filled, as necessary. The amount of backfill will depend on how much area is planned to be reclaimed. A filter layer is needed under the riprap to prevent migration of fines through the rock and subsequent settling. The filter layer at this site will also serve to convey groundwater seepage. It is proposed that the riprap blanket extend up the slope to the bank-full discharge level (~El. 704). Above this level, vegetation is capable of holding the remaining slope during extreme flood events.

The riprap blanket can be screened by vegetation by blowing a layer of seed and compost into the voids of the rock or backfilling with topsoil and seeding. Live stakes can be inserted into to lower portions of the rock where the subgrade is moist. The cost of this vegetative practice will be added as an option for consideration.

A plan view and cross section of the riprap blanket are provided in Figure 11 and 12.

Alternative 2 – Bendway Weirs

Bendway weirs are fingers of rock built up to the bank-full flow level and extended out from the bank into the flow, pointed slightly upstream. The orientation of the weir causes the water passing over it to be directed away from the bank toward the centerline of the stream. A plan view and cross section of the concept is shown in Figures 13 and 14. Flow between the weirs is slowed and sediment accumulates over time. Bendway weirs are commonly used by the Corps of Engineers for bank stabilization and navigation channel maintenance.

The eroded slope should be graded and shaped as necessary prior to keying in and placing the weirs at this site. Filter material and a rock blanket are recommended over existing seeps. The bank area and slopes between the weirs should be planted to protect the higher portions of the slope during extreme flood events. Live stakes are recommended in low areas where soil moisture will promote growth.

Use of an economic fill material, such as shot rock or waste rock, in the core of the weirs may be considered to reduce the overall cost.

Alternative 3 – Rock Vanes

Rock vanes are similar to bendway weirs with fingers of rock extended out from the bank into the flow. Rock vanes angle more upstream then the bendway weirs and the top of the vane is sloped instead of the relatively flat top of the weirs. Compare the plan and cross section provided in Figures 15 and 16 with those for the bendway weirs. The function of the two methods is very similar.

The same grading and shaping of the eroded slope, and planting for the bendway weirs are recommended for the rock vanes.

Since the vanes are sloped, they are lower profile and require less rock. Core fill material will not likely be needed.

Cost Estimates

Construction cost estimates are provided for each alternative are provided in Table 2. Using a 30 percent contingency, the totals are:

- $1.9M for Alternative 1 - Riprap Blanket,
- $3.3M for Alternative 2 - Bendway Weirs, and
- $1.1M for Alternative 3 – Rock Vanes.

Recommendation

All three alternatives investigated provide a good solution to the problem. No one alternative has significant technical advantages over the others. The bendway weirs may be considered more robust than rock vanes by some designers. All require about the same maintenance and are equally constructible. Due to its lesser cost, it is recommended that Alternative 3 be chosen to move ahead with final plans and permitting.

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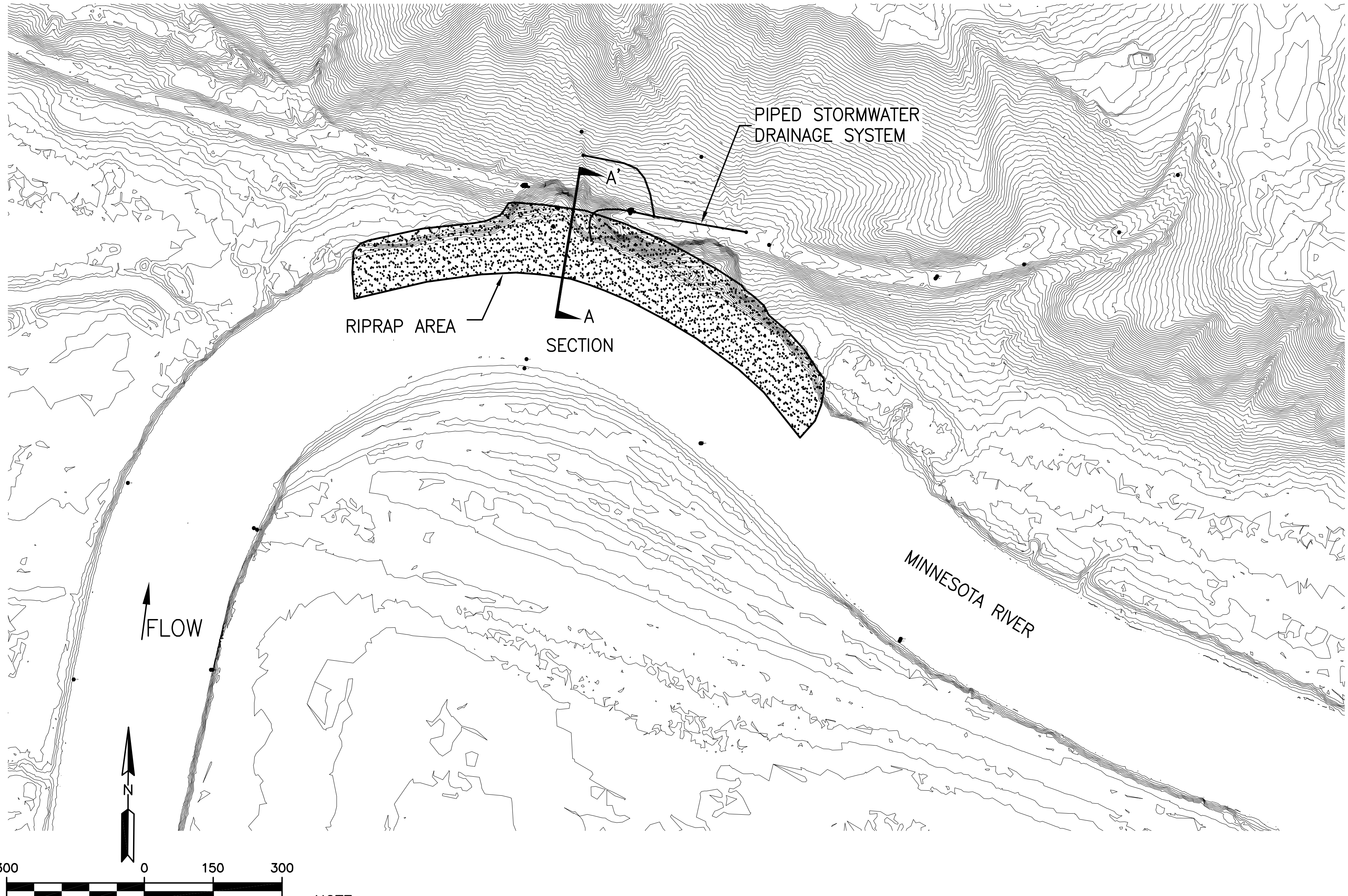
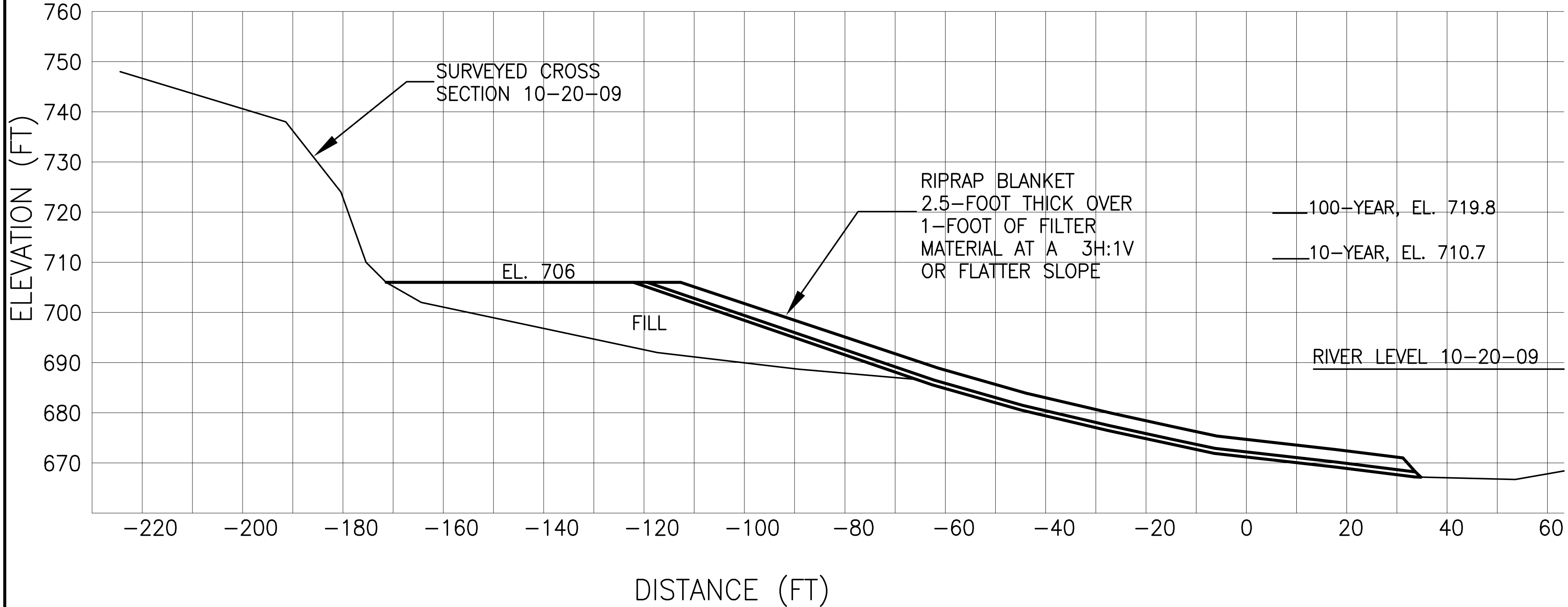


NOTE:
CONTOUR INTERVALS ARE AT 2'

LOWER MINNESOTA RIVER WATERSHED DISTRICT	Wenck Associates, Inc. Environmental Engineers, 1800 Pioneer Creek Center, Maple Plain, MN 55339	FIGURE 11
Riprap Blanket Plan	COPYRIGHT	

T:\1426 LMRWD\08 Bank Stabilization\Drawings\River Cross Section.dwg

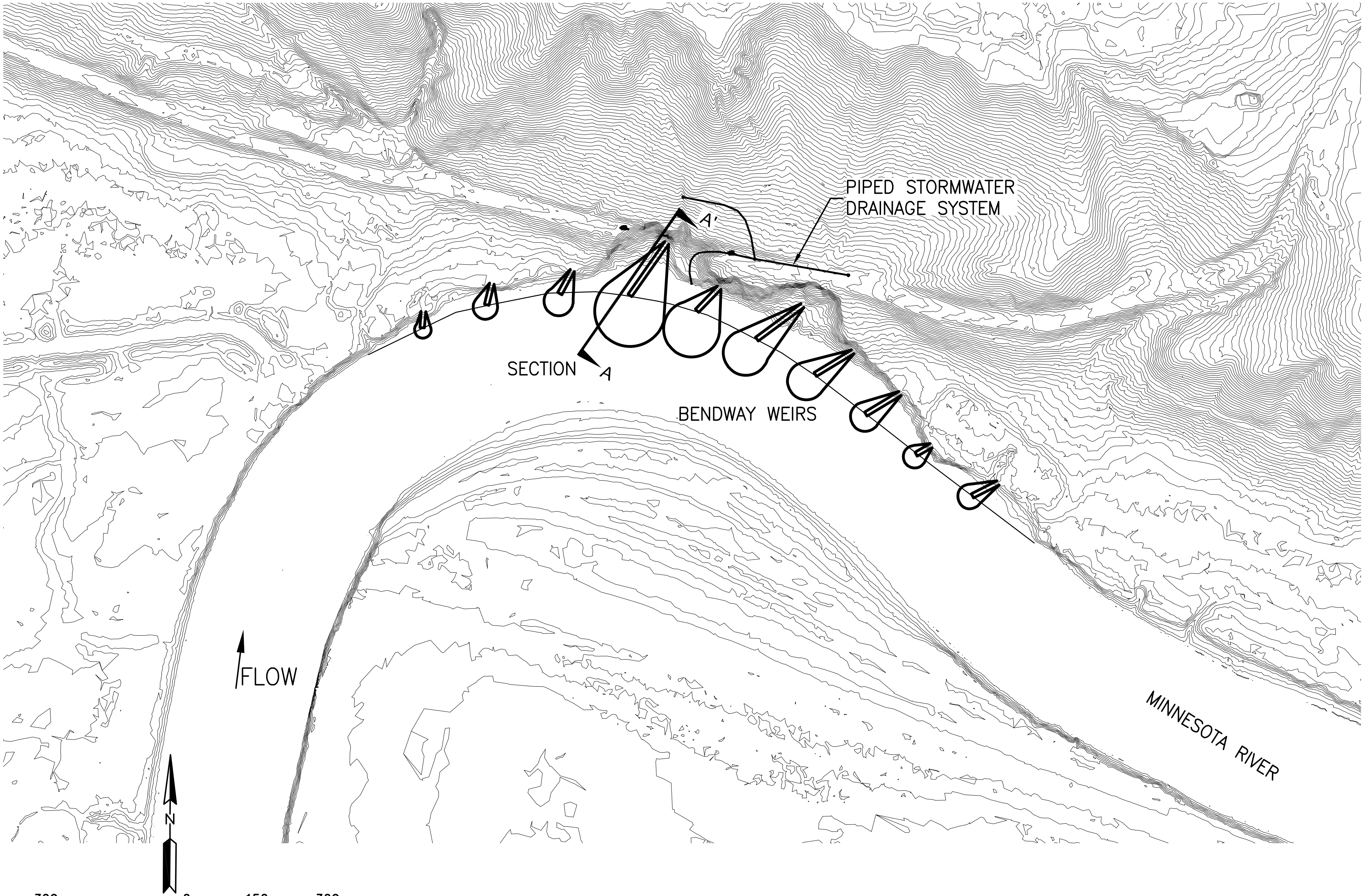
Plot Date & Time: 10 December 2009 3:34 PM



LOWER MINNESOTA RIVER WATERSHED DISTRICT	COPYRIGHT Wenck Associates, Inc. Environmental Engineers — Wenck 1800 Pioneer Creek Center Maple Plain, MN 55339	FIGURE 12
Riprap Blanket Section A–A’		

T:\1426 LMRWD\08 Bank Stabilization\Drawings\Plan Views.dwg

Plot Date & Time: 10 December 2008 3:58 PM



NOTE:
CONTOUR INTERVALS ARE AT 2'

LOWER MINNESOTA RIVER WATERSHED DISTRICT

Bendway Weir Plan

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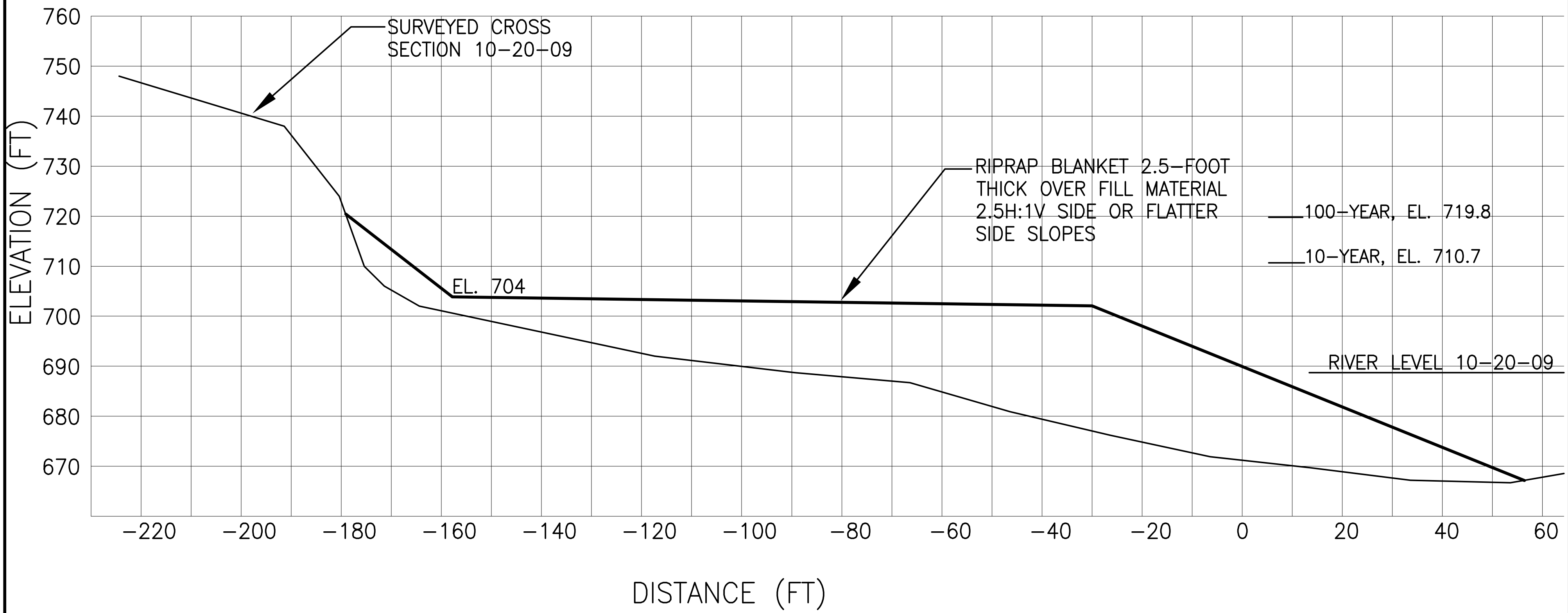
FIGURE 13

T:\1426 LMRWD\08 Bank Stabilization\Drawings\River Cross Section.dwg

Plot Date & Time: 10 December 2009 3:34 PM



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Bendway Weir Section A–A'

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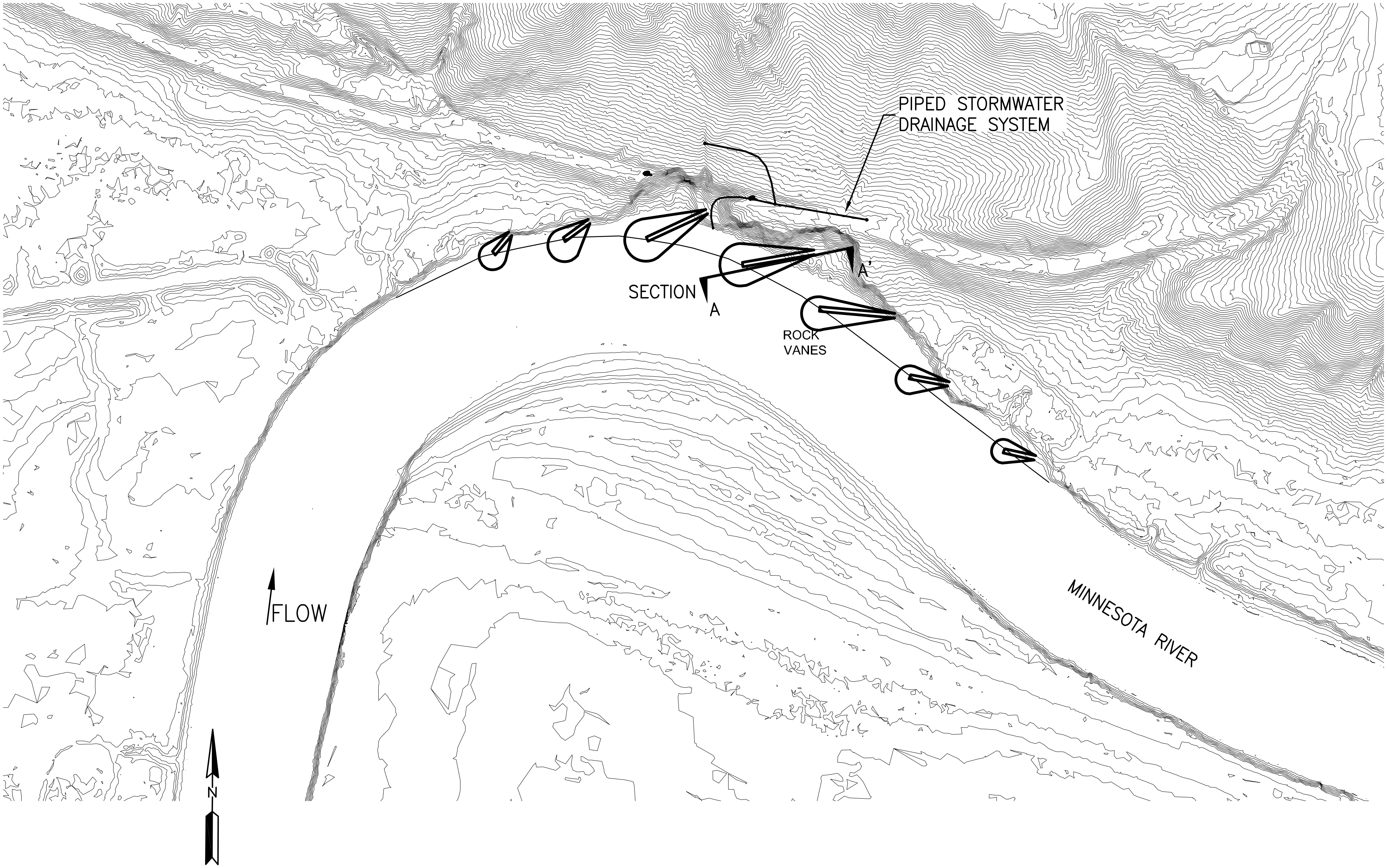
FIGURE 14

T:\1426 LMRWD\08 Bank Stabilization\Drawings\Plan Views.dwg Plot Date & Time: 10 December 2008 3:58 PM



NOTE:
CONTOUR INTERVALS ARE AT 2'

LOWER MINNESOTA RIVER WATERSHED DISTRICT

Rock Vane Plan

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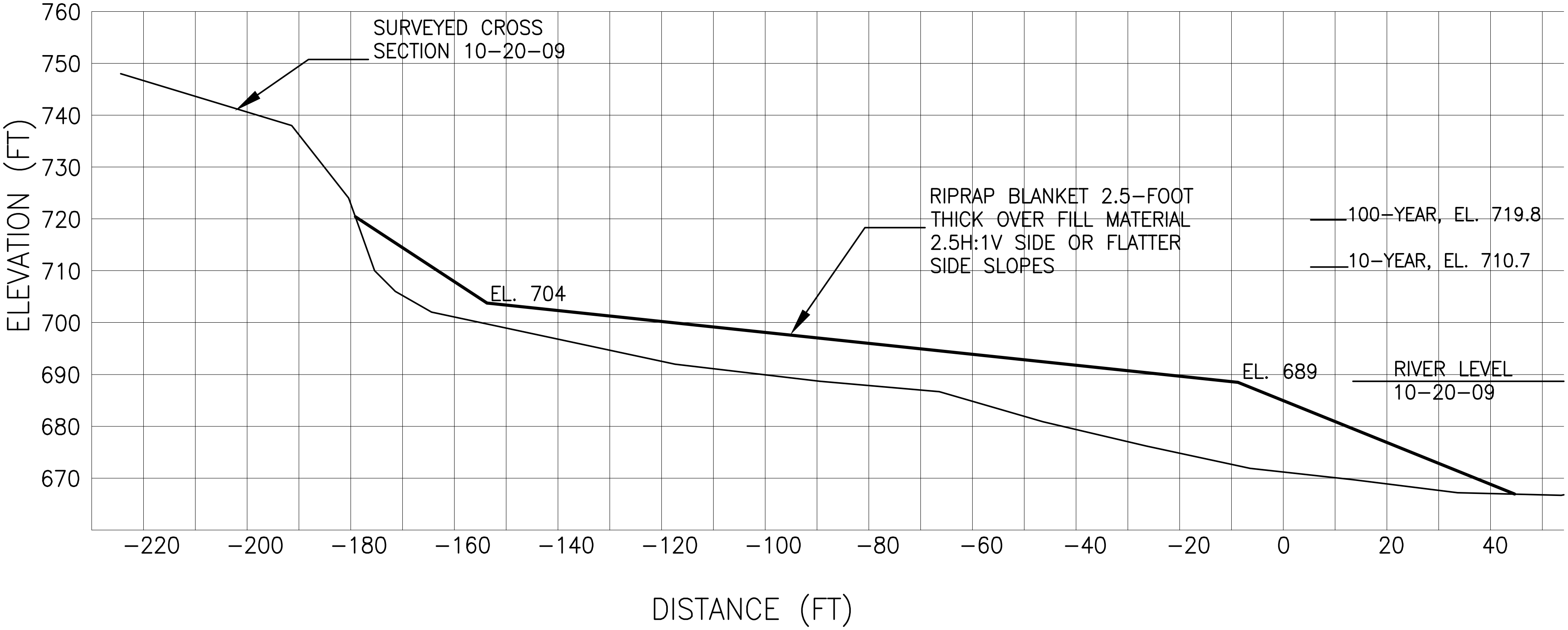
FIGURE 15

T:\1426 LMRWD\08 Bank Stabilization\Drawings\River Cross Section.dwg

Plot Date & Time: 10 December 2009 3:34 PM



LOWER MINNESOTA RIVER WATERSHED DISTRICT

Rock Vane Section A–A'

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FIGURE 16

Table 2.

Construction Cost Estimate

ALTERNATIVE 1 RIPRAP BLANKET				
Description	**Quantity**	**Unit**	**Unit Price**	**Extension**
Mobilization	1	LS	$120,000	$120,000
Clearing and Grubbing	0.5	Ac	$4,000	$2,000
Earth work	10000	CY	$6	$60,000
Fine Filter aggregate	6000	SY	$40	$240,000
Coarse filter	2000	CY	$45	$90,000
Class III riprap	14500	CY	$60	$870,000
24" HDPE Pipe	630	LF	$80	$50,400
CB manhole	3	Ea	$2,500	$7,500
Sediment and Erosion Control	1	LS	$5,000	$5,000
Floating Silt Curtain	1400	LF	$16	$22,400
Restoration and re-vegetation	1	Ac	$5,000	$5,000
				$1,472,300
	Contingency	30%		$441,690
			Total	**$1,913,990**

ALTERNATIVE 2 BENDWAY WEIRS				
Mobilization	1	LS	$70,000	$70,000
Clearing and Grubbing	0.5	Ac	$4,000	$2,000
Earth work	2000	CY	$6	$12,000
Fine filter aggregate	4000	SY	$3	$10,000
Coarse filter	2000	CY	$45	$90,000
Class III riprap	38000	CY	$60	$2,280,000
24" HDPE Pipe	630	LF	$80	$50,400
CB manhole	3	Ea	$2,500	$7,500
Sediment and Erosion Control	1	LS	$5,000	$5,000
Floating Silt Curtain	1400	LF	$16	$22,400
Restoration and re-vegetation	1	Ac	$5,000	$5,000
				$2,554,300
	Contingency	30%		$766,290
			Total	**$3,320,590**

ALTERNATIVE 3 ROCK VANES				
Mobilization	1	LS	$70,000	$70,000
Clearing and Grubbing	0.5	Ac	$4,000	$2,000
Earth work	2000	CY	$6	$12,000
Fine filter aggregate	2000	SY	$3	$5,000
Coarse filter	1000	CY	$45	$45,000
Class III riprap	10000	CY	$60	$600,000
24" HDPE Pipe	630	LF	$80	$50,400
CB manhole	3	Ea	$2,500	$7,500
Sediment and Erosion Control	1	LS	$5,000	$5,000
Floating Silt Curtain	1400	LF	$16	$22,400
Restoration and re-vegetation	1	Ac	$5,000	$5,000
				$824,300
	Contingency	30%		$247,290
			Total	**$1,071,590**

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Appendix

Figure A1 Birds Eye View of Site

Historical Aerial Photo Analysis

Figure A2. 1937 Historical Aerial Photo
Figure A2. 1953 Historical Aerial Photo
Figure A3. 1964 Historical Aerial Photo
Figure A4. 1969 Historical Aerial Photo
Figure A5. 1979 Historical Aerial Photo
Figure A6. 1991 Historical Aerial Photo
Figure A7. 2000 Historical Aerial Photo
Figure A8. 2008 Historical Aerial Photo

Hydraulic Modeling

Geotechnical Analysis Data

Plate 1. Low Water Analysis (Wide)
Plate 2. Low Water Bluff Analysis
Plate 3a. Drawdown Analysis (FS=1.31)
Plate 3b. Drawdown Analysis (FS=1)
Plate 4. Graded Slope Analysis (High Water)

December 2010 Soil Borings
Gradations
Soil Boring Coordinates and Elevations

Seepage Water Chemical Analysis Report

LOWER MINNESOTA RIVER WATERSHED DISTRICT

Bing Maps Birds Eye Aerial Photograph

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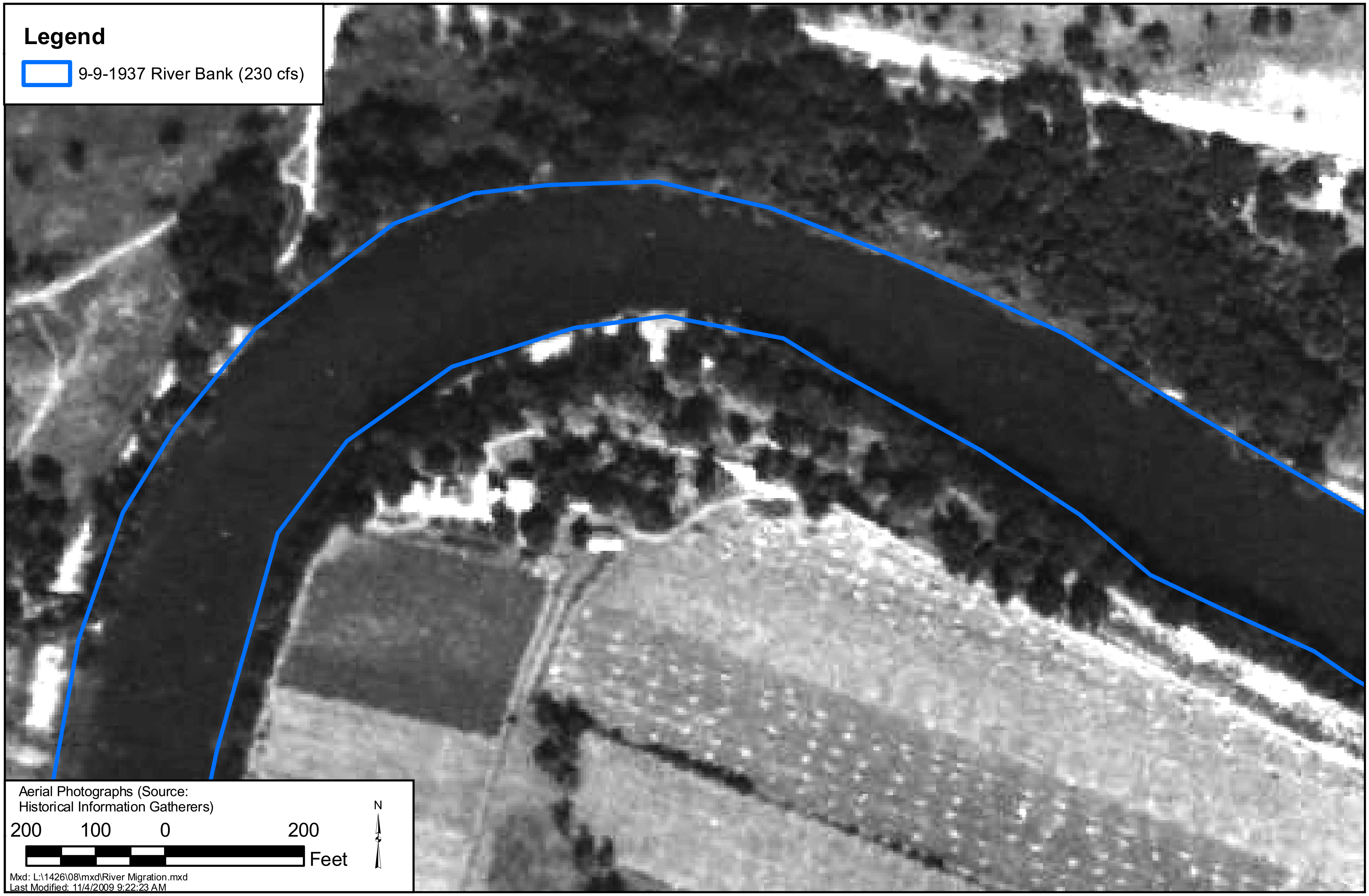
Figure A1

Historical Aerial Photo Analysis



LOWER MINNESOTA RIVER WATERSHED DISTRICT

1937 Historical Aerial Photograph

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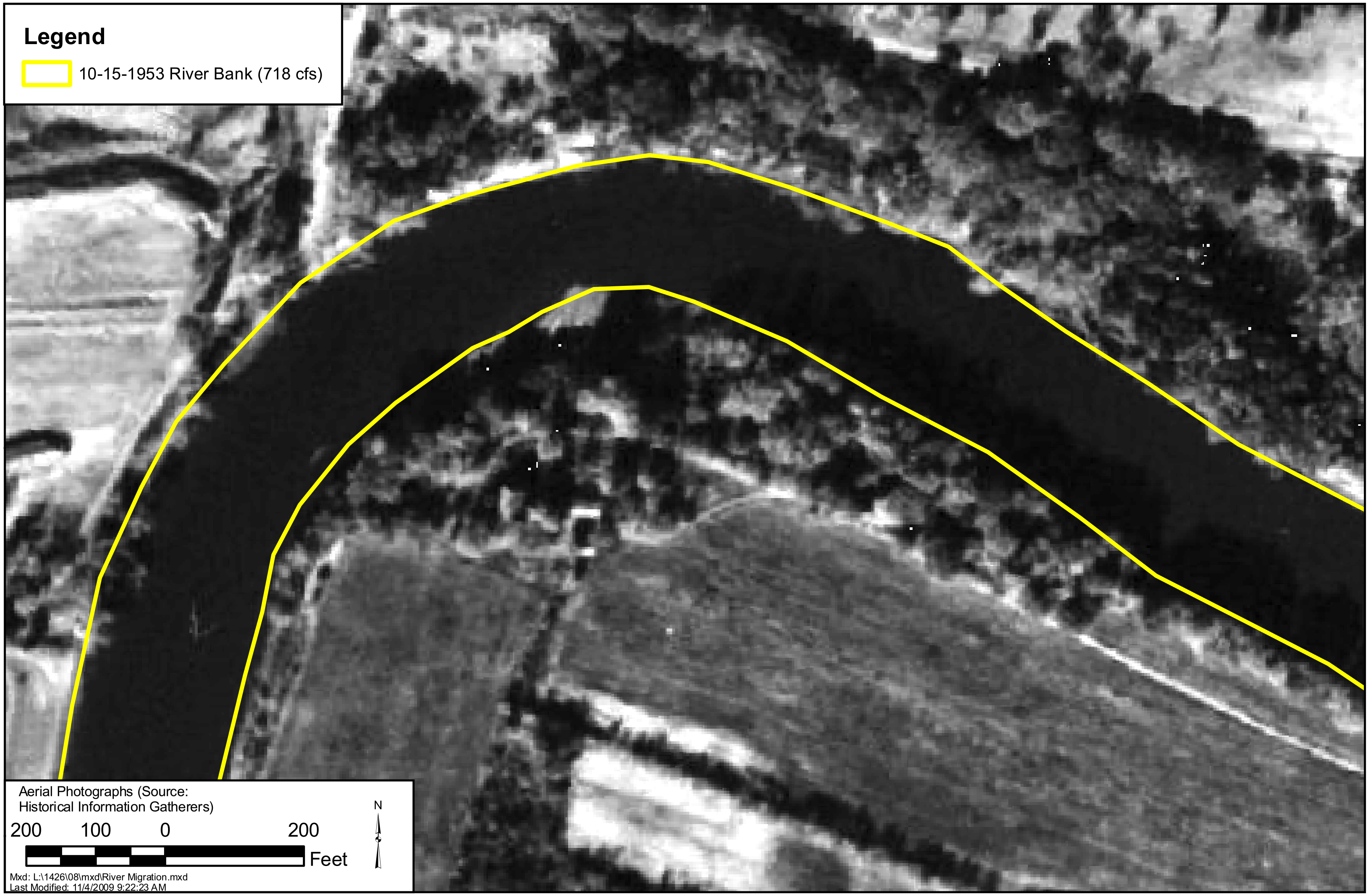
Figure A2



LOWER MINNESOTA RIVER WATERSHED DISTRICT

1953 Historical Aerial Photograph

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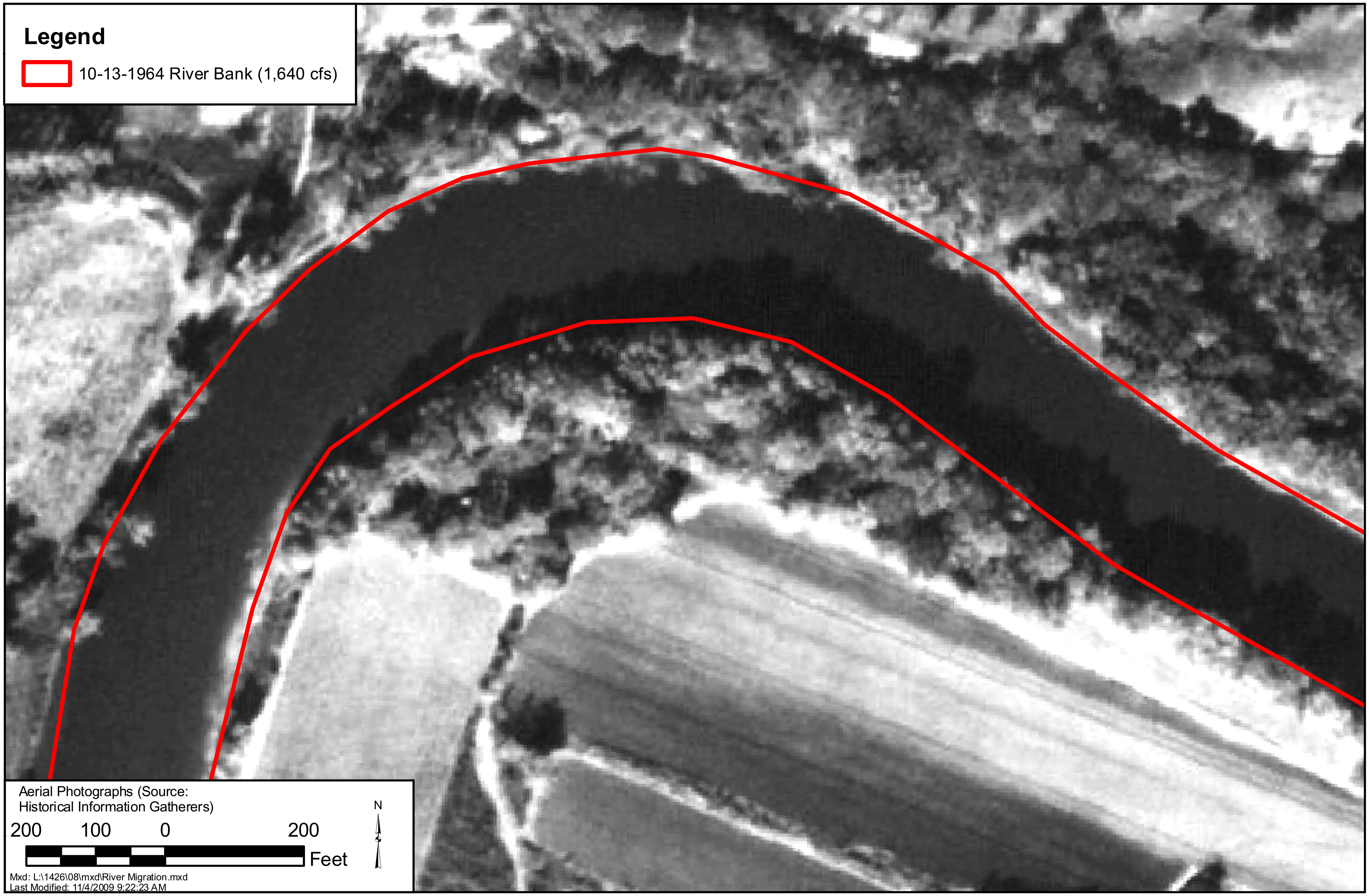
Figure A3



LOWER MINNESOTA RIVER WATERSHED DISTRICT

1964 Historical Aerial Photograph

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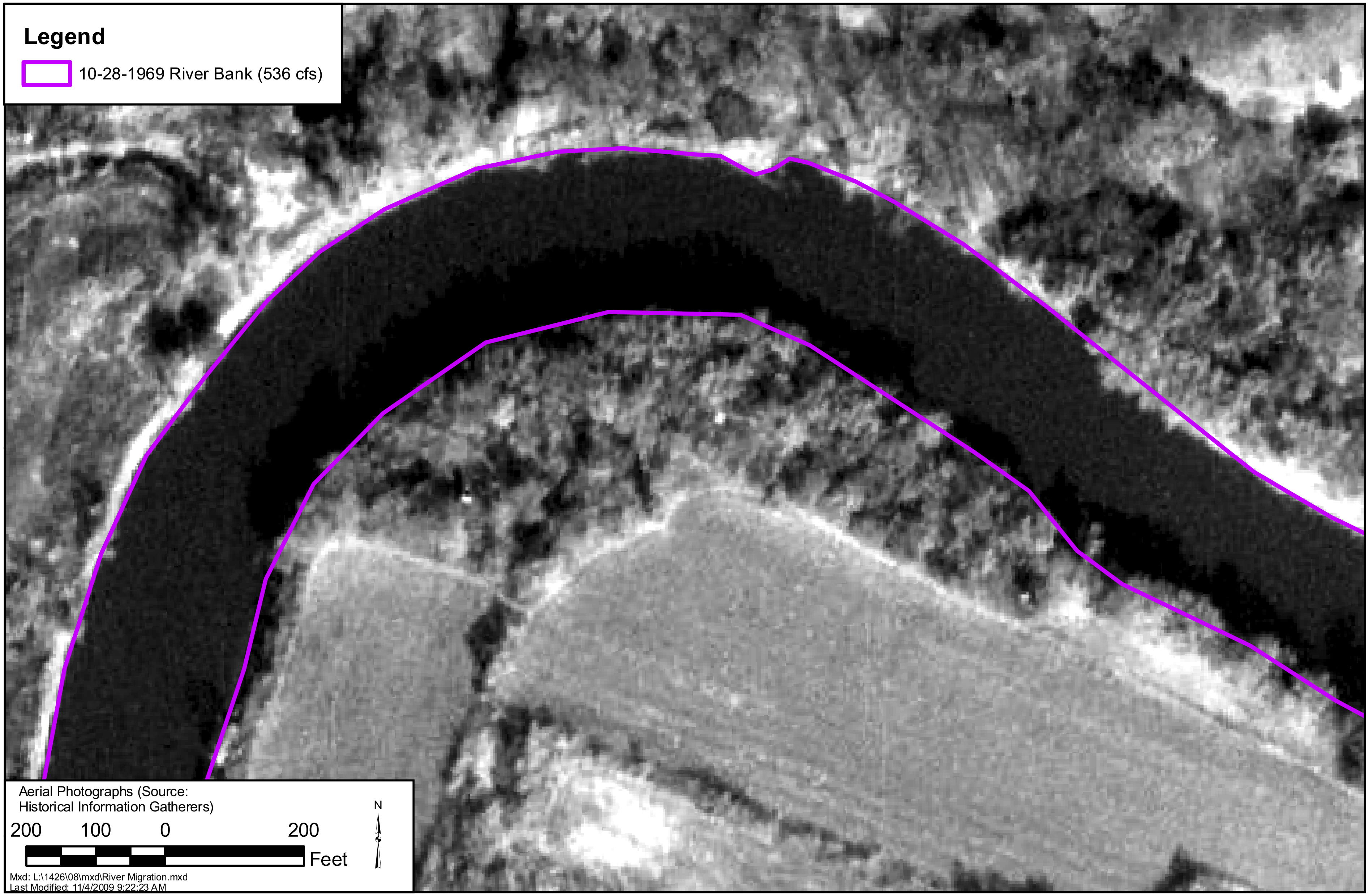
Figure A4



LOWER MINNESOTA RIVER WATERSHED DISTRICT

1969 Historical Aerial Photograph

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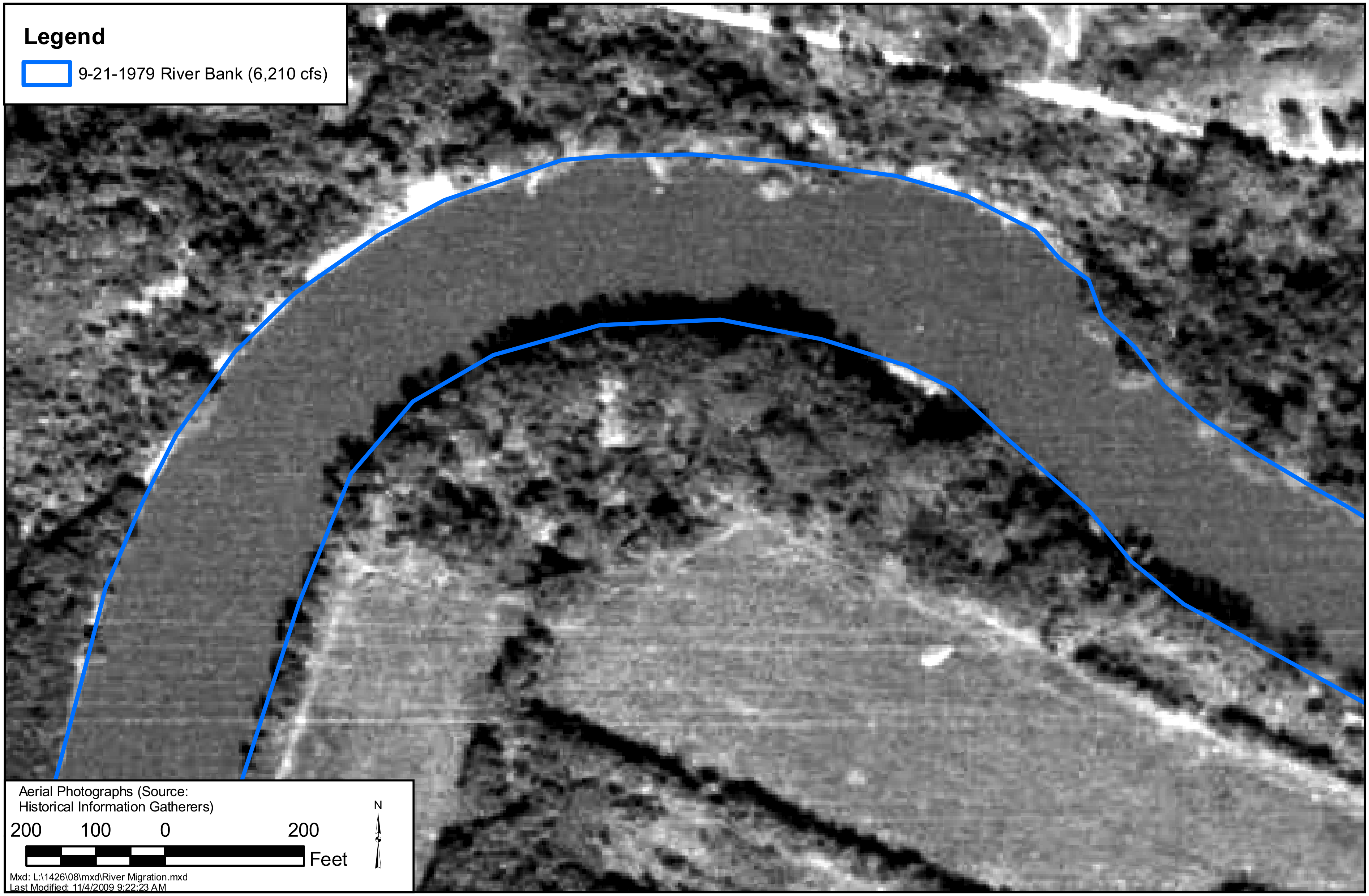
Figure A5



LOWER MINNESOTA RIVER WATERSHED DISTRICT

1979 Historical Aerial Photograph

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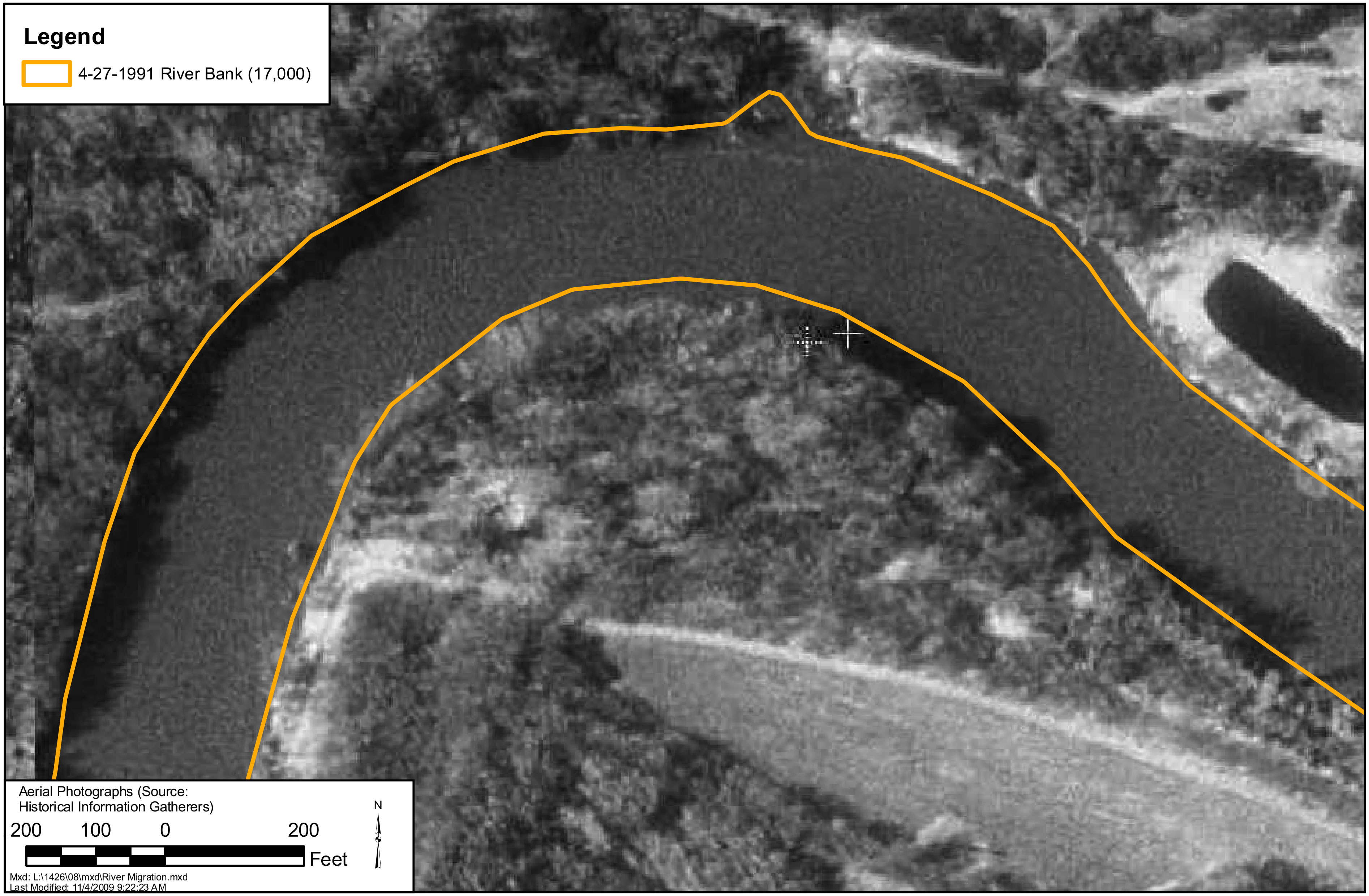
Figure A6



LOWER MINNESOTA RIVER WATERSHED DISTRICT

1991 Historical Aerial Photograph

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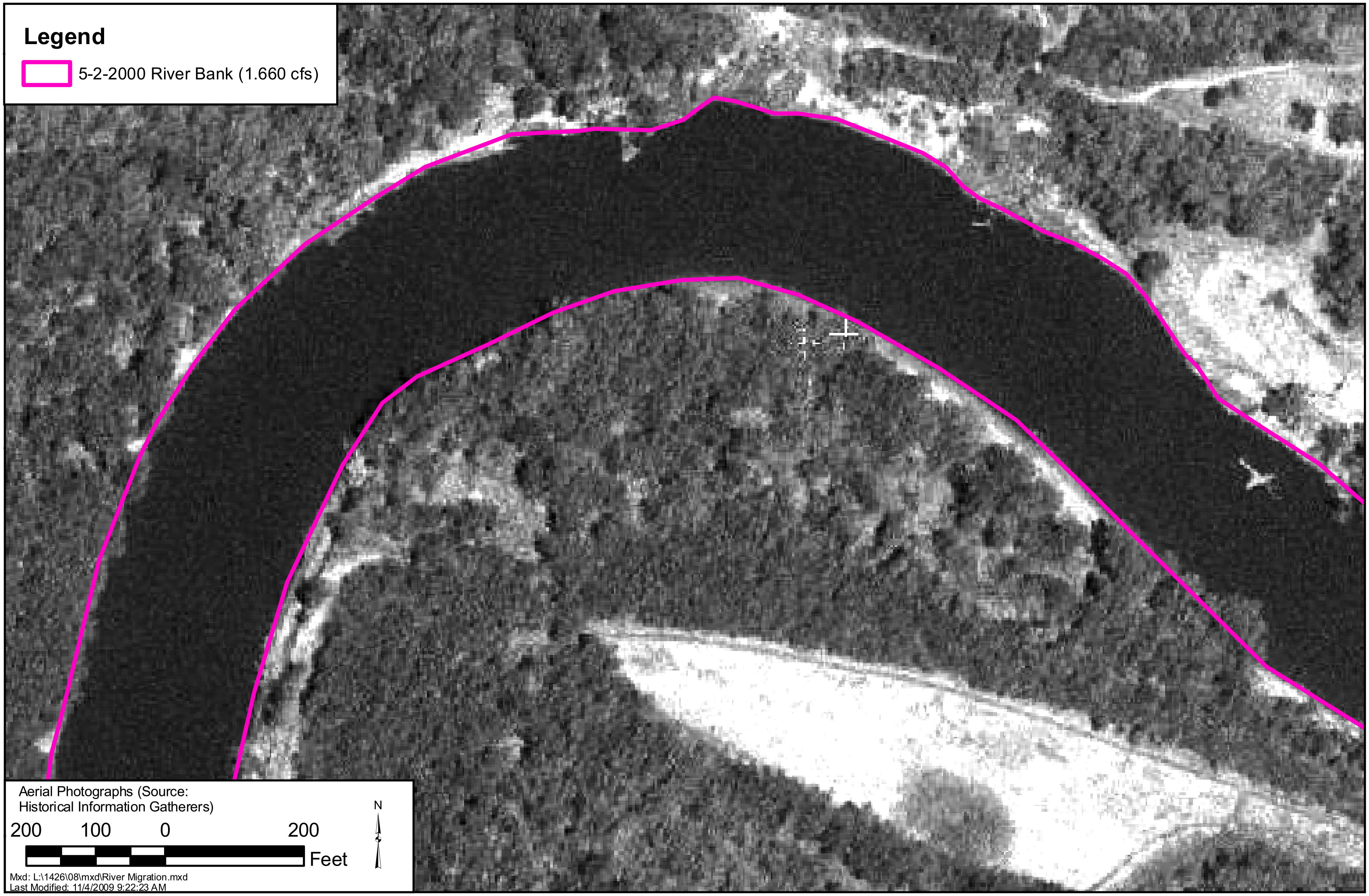
Figure A7



LOWER MINNESOTA RIVER WATERSHED DISTRICT

2000 Historical Aerial Photograph

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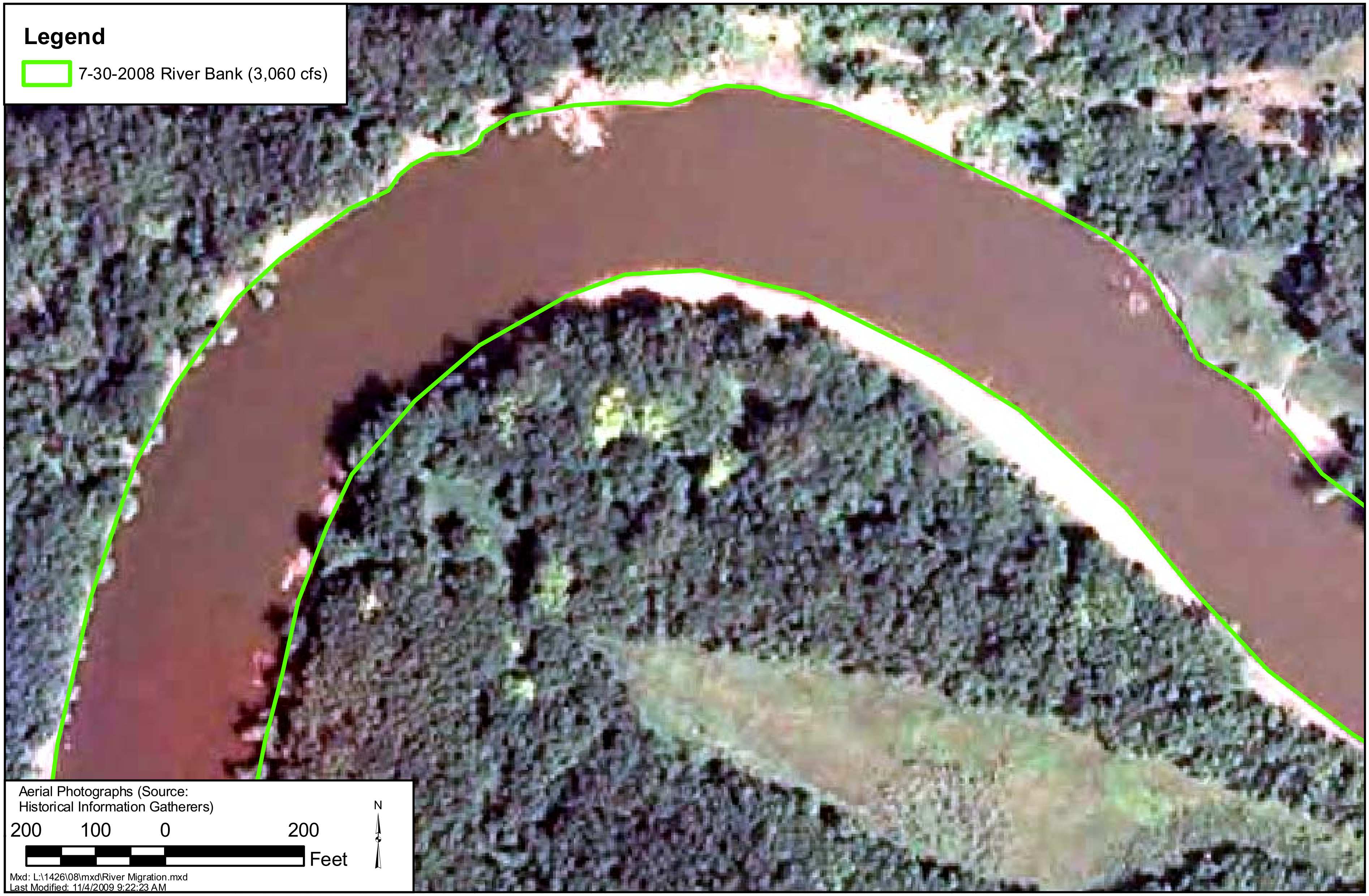
Figure A8



LOWER MINNESOTA RIVER WATERSHED DISTRICT

2008 Historical Aerial Photograph

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Figure A9

Hydraulic Modeling

HYDRAULIC MODELING

This section summarizes the analysis Wenck performed in order to evaluate water surface elevations and velocities for the Minnesota River Bank Stabilization project. The analysis used the standard step-backwater computer model HEC-RAS. We acquired the effective computer model from the U.S. Army Corps of Engineers (USACE) and created two additional models:

1. Duplicate model
2. Existing model

Effective and Duplicate Models

The effective model is the executed model from the USACE for the Minnesota River. The duplicate model is simply the effective model executed on a Wenck computer. Wenck staff subsequently edited the duplicate model to create the existing model.

Existing Model

Wenck surveyed six cross-sections in the project vicinity. Three cross-sections were located upstream and two downstream of the project area. The cross at the erosion site was used to modify the Section 52 in the existing model. Wenck surveyed the channel bank and river bottom using a Trimble R8 GNSS unit (GPS). Five new cross-sections were inserted into the duplicate model. Floodplain topography for the five new cross-sections was estimated based on adjacent up- and downstream cross-section data already in the model.

A summary of the changes Wenck made to the duplicate model are listed in Table 1 with a brief comment on why the change was necessary. Note that the effective model was "georeferenced." Wenck did not have access to the coordinate system used for georeferencing, so the five new cross-sections appear out of alignment in the HEC-RAS plan view. This does not affect model results, since HEC-RAS is a one-dimensional model.

Table 1. Summary of changes made to the duplicate model to create the existing model.

Model Change Number	Cross-Section	Comment
1	53.0	Left, center and right channel lengths adjusted for new downstream cross-section.
2	52.5	New cross-section. Channel surveyed by Wenck; floodplain topography obtained from cross-sections (XS) 53.0 and 52.0.
3	52.4	New cross-section. Channel surveyed by Wenck; floodplain topography obtained from cross-sections (XS) 53.0 and

		52.0.
4	52.3	New cross-section. Channel surveyed by Wenck; floodplain topography obtained from cross-sections (XS) 53.0 and 52.0.
5	52.0	Replaced channel topography with Wenck channel survey data. No change to floodplain topography.
6	51.6	New cross-section. Channel surveyed by Wenck; floodplain topography obtained from cross-sections (XS) 52.0 and 51.0.
7	51.3	New cross-section. Channel surveyed by Wenck; floodplain topography obtained from cross-sections (XS) 52.0 and 51.0.

Results

Table 2 lists the results of the duplicate and existing model conditions.

Table 2. Model results by River Station for the Duplicate and Existing HEC-RAS computer models.

			Duplicate Model		Wenck Existing Model	
		Q Total	W.S. Elev	Vel Chnl	W.S. Elev	Vel Chnl
River Sta	Profile	(cfs)	(ft)	(ft/s)	(ft)	(ft/s)
54	100-yr	103,000	719.98	1.53	719.95	1.53
	50-yr	85,300	717.64	1.46	717.62	1.46
	10-yr	48,500	710.97	1.38	710.94	1.39
		18,000	705.00	1.03	704.97	1.04
	Bankfull	14,000	704.23	0.90	704.20	0.90
		10,000	703.51	0.72	703.50	0.72
53	100-yr	103,000	719.90	2.55	719.87	2.55
	50-yr	85,300	717.56	2.51	717.54	2.51
	10-yr	48,500	710.85	2.81	710.81	2.82
		18,000	704.84	2.65	704.81	2.66
	Bankfull	14,000	704.09	2.31	704.07	2.31
		10,000	703.43	1.77	703.42	1.77
52.5	100-yr	103,000	NA		719.81	2.55
	50-yr	85,300			717.47	2.46
	10-yr	48,500			710.71	2.49
		18,000			704.72	1.90
	Bankfull	14,000			704.01	1.62
		10,000			703.37	1.24
52.4	100-yr	103,000	NA		719.79	2.65
	50-yr	85,300			717.45	2.53
	10-yr	48,500			710.69	2.49
		18,000			704.71	1.83
	Bankfull	14,000			703.99	1.34
		10,000			703.37	1.20

			Duplicate Model		Wenck Existing Model	
		Q Total	W.S. Elev	Vel Chnl	W.S. Elev	Vel Chnl
River Sta	Profile	(cfs)	(ft)	(ft/s)	(ft)	(ft/s)
52.3	100-yr	103,000	NA		719.78	2.69
	50-yr	85,300			717.45	2.54
	10-yr	48,500			710.69	2.35
		18,000			704.71	1.58
	Bankfull	14,000			703.99	1.34
		10,000			703.36	1.03
52	100-yr	103,000	719.77	2.62	719.76	2.69
	50-yr	85,300	717.43	2.47	717.42	2.53
	10-yr	48,500	710.67	2.30	710.66	2.30
		18,000	704.70	1.60	704.69	1.52
	Bankfull	14,000	703.99	1.36	703.98	1.27
		10,000	703.36	1.05	703.36	0.97
51.6	100-yr	103,000	NA		719.76	1.91
	50-yr	85,300			717.42	1.80
	10-yr	48,500			710.66	1.62
		18,000			704.69	1.05
	Bankfull	14,000			703.98	0.88
		10,000			703.36	0.67
51.3	100-yr	103,000	NA		719.74	1.98
	50-yr	85,300			717.40	1.86
	10-yr	48,500			710.64	1.66
		18,000			704.68	1.06
	Bankfull	14,000			703.98	0.89
		10,000			703.36	0.68
51	100-yr	103,000	719.73	1.79	719.73	1.79
	50-yr	85,300	717.39	1.67	717.39	1.67
	10-yr	48,500	710.63	1.47	710.63	1.47
		18,000	704.68	0.94	704.68	0.94
	Bankfull	14,000	703.97	0.79	703.97	0.79
		10,000	703.35	0.60	703.35	0.60

Geotechnical Analysis

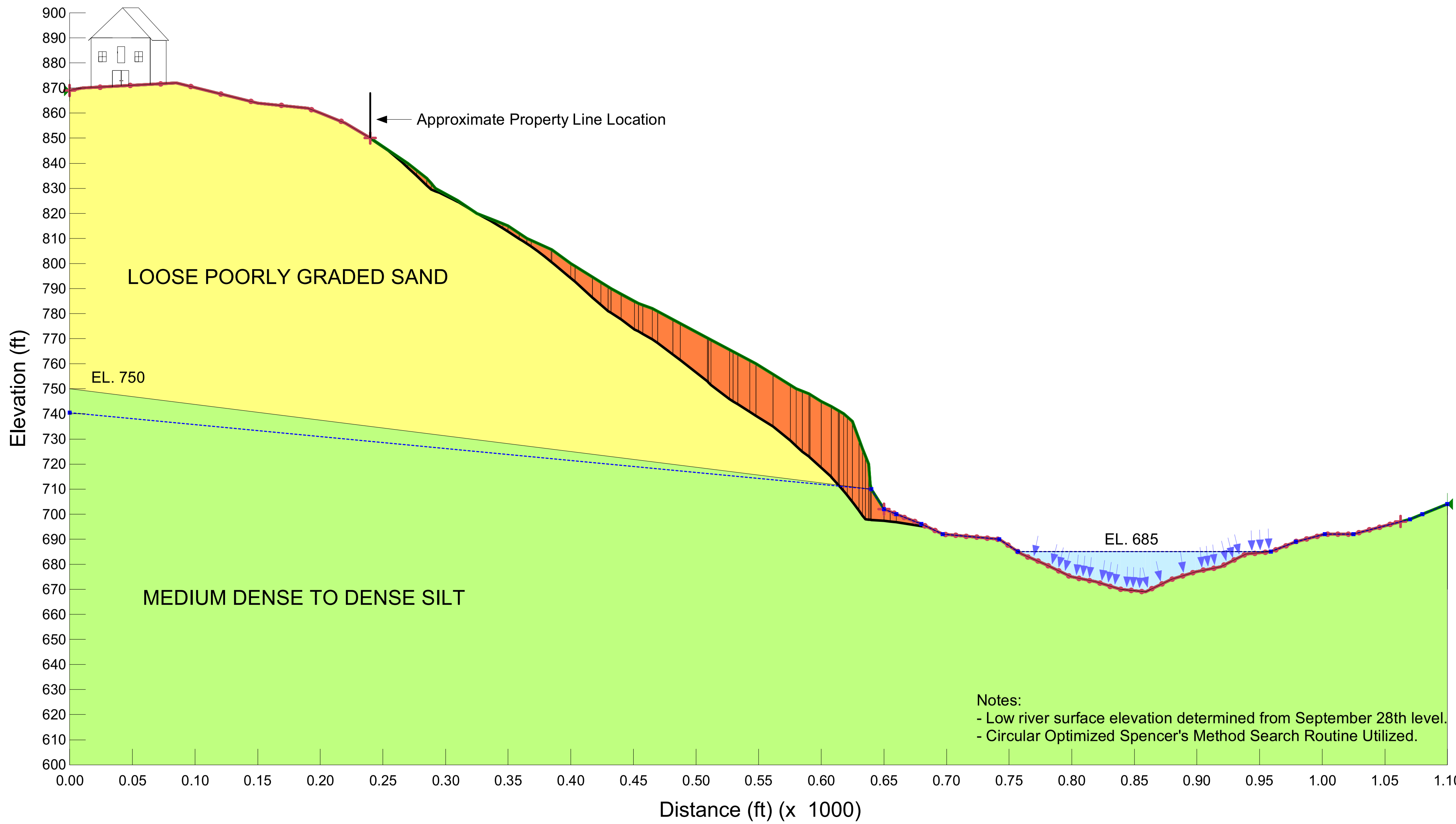
Plate 1. Low Water Analysis (Wide)
Plate 2. Low Water Bluff Analysis
Plate 3a. Drawdown Analysis (FS=1.31)
Plate 3b. Drawdown Analysis (FS=1)
Plate 4. Graded Slope Analysis (High Water)

December 2010 Soil Borings
Gradations
Soil Boring Coordinates and Elevations

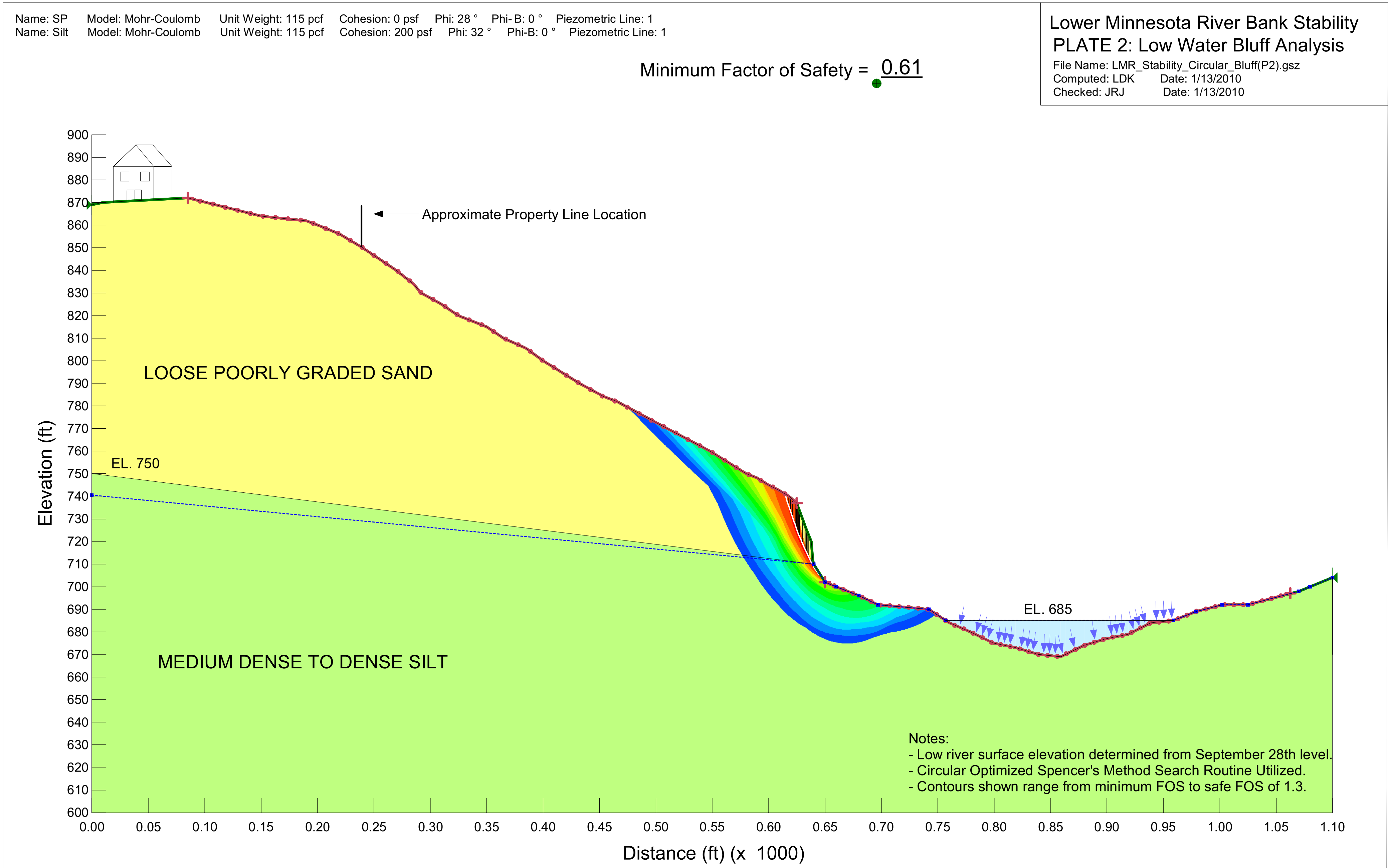
Lower Minnesota River Bank Stability
PLATE 1: Low Water Analysis (Wide)
File Name: LMR_Stability_Circular_House_Search(P1).gsz
Computed: LDK Date: 2/9/2010
Checked: JRJ Date: 2/9/2010

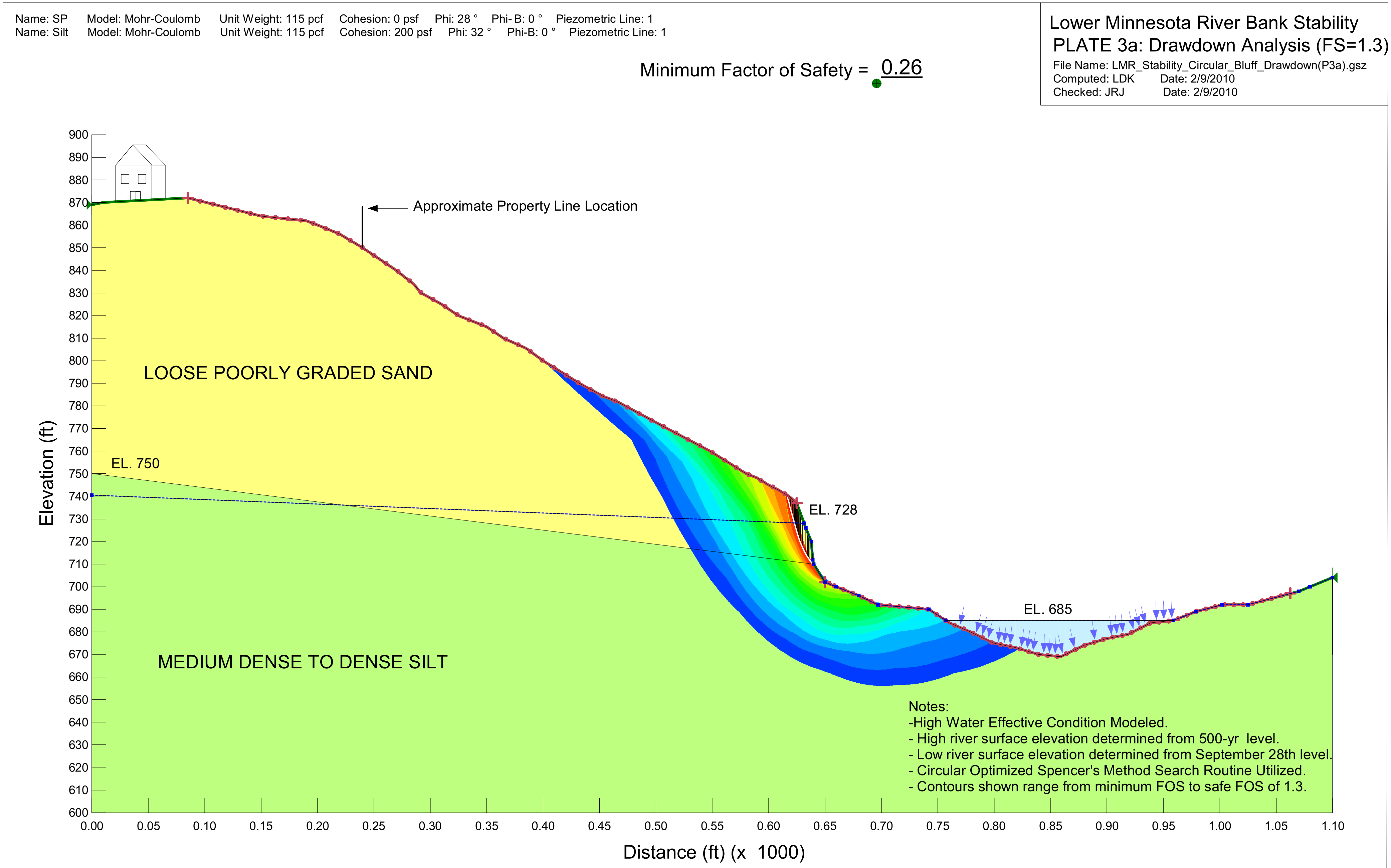
Name: SP	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion: 0 psf	Phi: 28 °	Phi-B: 0 °	Piezometric Line: 1
Name: Silt	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion: 0 psf	Phi: 32 °	Phi-B: 0 °	Piezometric Line: 1

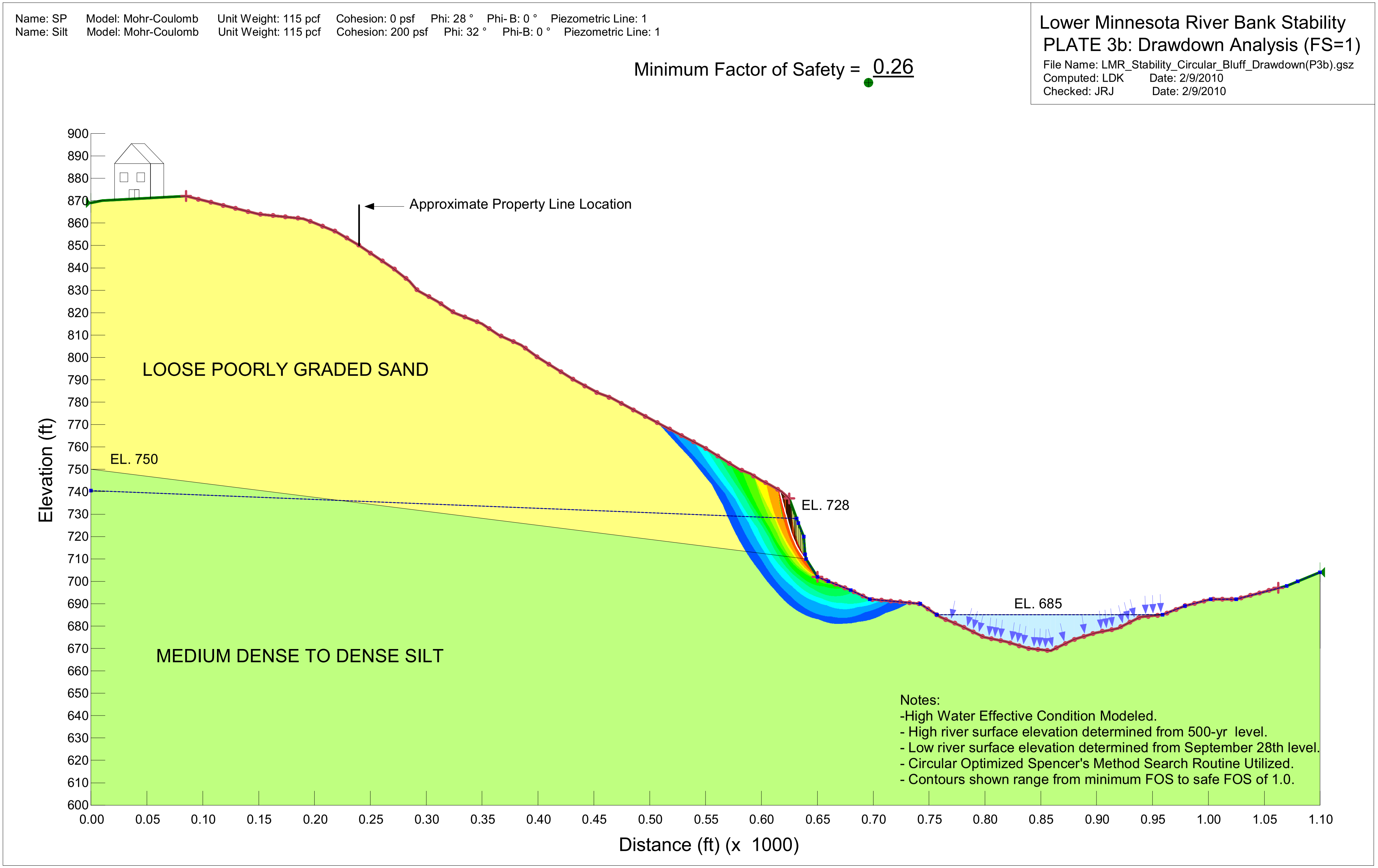
Minimum Factor of Safety = 1.31

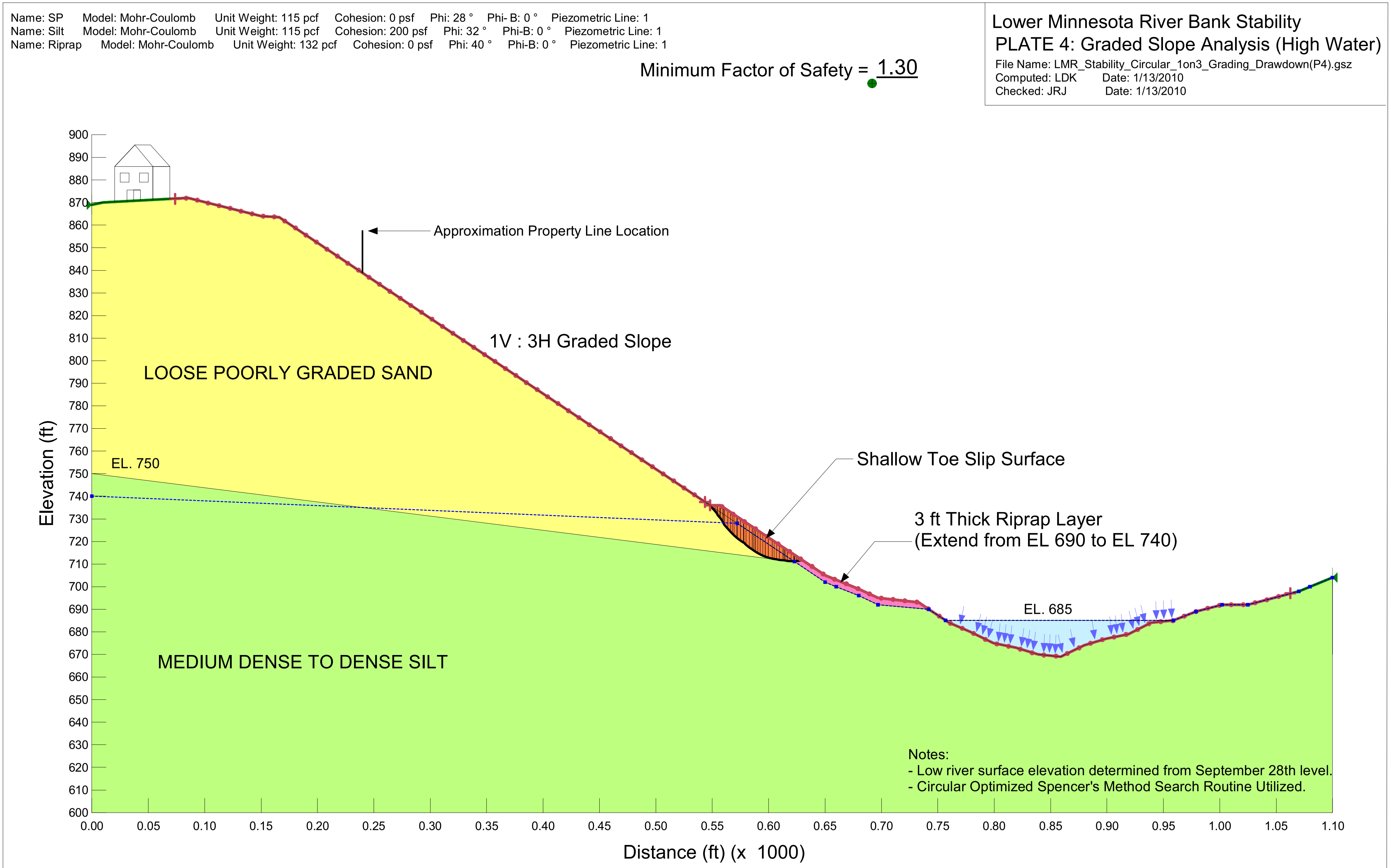


Notes:
- Low river surface elevation determined from September 28th level.
- Circular Optimized Spencer's Method Search Routine Utilized.


Name: SP Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 28 ° Phi- B: 0 ° Piezometric Line: 1
Name: Silt Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 200 psf Phi: 32 ° Phi-B: 0 ° Piezometric Line: 1
Lower Minnesota River Bank Stability
PLATE 2: Low Water Bluff Analysis
File Name: LMR_Stability_Circular_Bluff(P2).gsz
Computed: LDK Date: 1/13/2010
Checked: JRJ Date: 1/13/2010
Minimum Factor of Safety = 0.61
Approximate Property Line Location
LOOSE POORLY GRADED SAND
EL. 750
MEDIUM DENSE TO DENSE SILT
EL. 685
Notes:
- Low river surface elevation determined from September 28th level.
- Circular Optimized Spencer's Method Search Routine Utilized.
- Contours shown range from minimum FOS to safe FOS of 1.3.
Elevation (ft)
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
600
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
0.95
1.00
1.05
1.10
Distance (ft) (x 1000)


Name: SP Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 28 ° Phi-B: 0 ° Piezometric Line: 1
Name: Silt Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 200 psf Phi: 32 ° Phi-B: 0 ° Piezometric Line: 1
Lower Minnesota River Bank Stability
PLATE 3a: Drawdown Analysis (FS=1.3)
File Name: LMR_Stability_Circular_Bluff_Drawdown(P3a).gsz
Computed: LDK Date: 2/9/2010
Checked: JRJ Date: 2/9/2010
Minimum Factor of Safety = 0.26
Approximate Property Line Location
LOOSE POORLY GRADED SAND
EL. 750
EL. 728
EL. 685
MEDIUM DENSE TO DENSE SILT
Notes:
-High Water Effective Condition Modeled.
- High river surface elevation determined from 500-yr level.
- Low river surface elevation determined from September 28th level.
- Circular Optimized Spencer's Method Search Routine Utilized.
- Contours shown range from minimum FOS to safe FOS of 1.3.
Elevation (ft)
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
600
0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60 0.65 0.70 0.75 0.80 0.85 0.90 0.95 1.00 1.05 1.10
Distance (ft) (x 1000)


Name: SP Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 28 ° Phi- B: 0 ° Piezometric Line: 1
Name: Silt Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 200 psf Phi: 32 ° Phi-B: 0 ° Piezometric Line: 1
Lower Minnesota River Bank Stability
PLATE 3b: Drawdown Analysis (FS=1)
File Name: LMR_Stability_Circular_Bluff_Drawdown(P3b).gsz
Computed: LDK Date: 2/9/2010
Checked: JRJ Date: 2/9/2010
Minimum Factor of Safety = 0.26
Approximate Property Line Location
LOOSE POORLY GRADED SAND
EL. 750
EL. 728
EL. 685
MEDIUM DENSE TO DENSE SILT
Notes:
-High Water Effective Condition Modeled.
- High river surface elevation determined from 500-yr level.
- Low river surface elevation determined from September 28th level.
- Circular Optimized Spencer's Method Search Routine Utilized.
- Contours shown range from minimum FOS to safe FOS of 1.0.
Elevation (ft)
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
600
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
0.95
1.00
1.05
1.10
Distance (ft) (x 1000)


Name: SP Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 28 ° Phi- B: 0 ° Piezometric Line: 1
Name: Silt Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 200 psf Phi: 32 ° Phi-B: 0 ° Piezometric Line: 1
Name: Riprap Model: Mohr-Coulomb Unit Weight: 132 pcf Cohesion: 0 psf Phi: 40 ° Phi-B: 0 ° Piezometric Line: 1
Lower Minnesota River Bank Stability
PLATE 4: Graded Slope Analysis (High Water)
File Name: LMR_Stability_Circular_1on3_Grading_Drawdown(P4).gsz
Computed: LDK Date: 1/13/2010
Checked: JRJ Date: 1/13/2010
Minimum Factor of Safety = 1.30
Approximation Property Line Location
1V : 3H Graded Slope
LOOSE POORLY GRADED SAND
EL. 750
Shallow Toe Slip Surface
3 ft Thick Riprap Layer
(Extend from EL 690 to EL 740)
EL. 685
MEDIUM DENSE TO DENSE SILT
Notes:
- Low river surface elevation determined from September 28th level.
- Circular Optimized Spencer's Method Search Routine Utilized.
Elevation (ft)
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
600
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
0.95
1.00
1.05
1.10
Distance (ft) (x 1000)

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LOG OF BORING

Braun Project SP-09-04727 **Geotechnical Evaluation** **LMR/WD Stability Analysis** **Minnesota River Bluff** **Eden Prairie, Minnesota**	BORING: **SB-3/INC3** LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: **12/1/09**	SCALE: **1" = 4'**

Elev. feet 771.0	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
		FILL	FILL: Silt, black, moist.			108158.73 N, 486167.26 E
768.5	2.5	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, brown, moist.	3		
763.5	7.5	SP	POORLY GRADED SAND, fine- to medium-grained, with a trace of Gravel, brown, moist, loose. (Glacial Outwash)	5		
758.5	12.5	SP	POORLY GRADED SAND, fine-grained, light brown, moist, loose. (Alluvium)	9 6 7		
741.0	30.0	ML	SILT, light brown, moist, medium dense. (Alluvium)	15		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

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LOG OF BORING

Braun Project SP-09-04727 **Geotechnical Evaluation** **LMR/WD Stability Analysis** **Minnesota River Bluff** **Eden Prairie, Minnesota**	BORING: **SB-3/INC3 (cont.)** LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: **12/1/09**	SCALE: **1" = 4'**

Elev. feet 739.0	Depth feet 32.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SILT, light brown, moist, medium dense. (Alluvium) *(continued)*			
				23		
				21		
				22		
721.0	50.0	SM	SILTY SAND, fine-grained, light brown, moist, medium dense. (Alluvium)	25		* See attached Grain Size Accumulation Curve
				32		
				25		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

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LOG OF BORING

Braun Project SP-09-04727 **Geotechnical Evaluation** **LMR/WD Stability Analysis** **Minnesota River Bluff** **Eden Prairie, Minnesota**	BORING: **SB-3/INC3 (cont.)** LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: **12/1/09**	SCALE: **1" = 4'**

Elev. feet 707.0	Depth feet 64.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SILTY SAND, fine-grained, light brown, moist, medium dense. (Alluvium) *(continued)*	34	▽	
				25		
				19		
690.0	81.0			47		
			END OF BORING. Water observed at 65 feet with 79 1/2 feet of hollow-stem auger in the ground. Inclinometer set to a depth of 80 feet.			

(See Descriptive Terminology sheet for explanation of abbreviations)

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LOG OF BORING

Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota	BORING: **SB-4/INC4** LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: **11/25/09**	SCALE: **1" = 4'**

Elev. feet 773.6	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
772.6	1.0	SM	SILTY SAND, fine-grained, black, moist. (Topsoil)			108378.80 N, 485906.21 E
		ML	SANDY SILT, light brown, moist, loose. (Alluvium)	6		
763.6	10.0					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose. (Alluvium)	7		
				9		
753.6	20.0					
		ML	SANDY SILT, light brown, moist, medium dense. (Alluvium)	11		
				16		
				11		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

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LOG OF BORING

Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota	BORING: SB-4/INC4 (cont.) LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: 11/25/09	SCALE: 1" = 4'

Elev. feet 741.6	Depth feet 32.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SANDY SILT, light brown, moist, medium dense. (Alluvium) *(continued)*			
738.6	35.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose to very loose. (Alluvium)	8		
				3		
728.6	45.0	ML	SANDY SILT, light brown, moist, medium dense. (Alluvium)	23		
723.6	50.0	ML	SILT, gray to light brown, moist, medium dense. (Alluvium)	23		* See attached Grain Size Accumulation Curve
				28		
				28		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

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LOG OF BORING

Braun Project SP-09-04727
Geotechnical Evaluation
LMR/WD Stability Analysis
Minnesota River Bluff
Eden Prairie, Minnesota

BORING: **SB-4/INC4 (cont.)**

LOCATION: See attached sketch.

DRILLER: C. Powers | METHOD: 3 1/4" HSA, Autohammer | DATE: 11/25/09 | SCALE: 1" = 4'

Elev. feet 709.6	Depth feet 64.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SILT, gray to light brown, moist, medium dense. (Alluvium) *(continued)*	45		
				16		
					▽	
				WH		
693.6	80.0	SP	POORLY GRADED SAND, reddish brown, with a trace of Gravel, brown, waterbearing, medium dense. (Glacial Outwash)	22		
692.6	81.0		END OF BORING.			

Water observed at 74 feet with 79 1/2 feet of hollow-stem auger in the ground.

Inclinometer set to a depth of 80 feet.

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

LOG OF BORING

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Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota	BORING: SB-5 LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: 11/24/09	SCALE: 1" = 4'

Elev. feet 747.5	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
		FILL	FILL: Silty Sand, fine- to medium-grained, brown, moist.			108131.76 N, 486315.11 E
				11		
				7		
732.5	15.0	CL	SANDY LEAN CLAY, with a trace of Gravel, brown to gray, moist, very stiff to rather stiff. (Glacial Till)	18		
				12		
722.5	25.0	SP	POORLY GRADED SAND, fine- to medium-grained, with a trace of Gravel, light brown, moist, medium dense. (Glacial Outwash)	11		
				16		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

BRAUN℠ INTERTEC

LOG OF BORING

Braun Project SP-09-04727
Geotechnical Evaluation
LMR/WD Stability Analysis
Minnesota River Bluff
Eden Prairie, Minnesota

BORING: **SB-5 (cont.)**

LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: 11/24/09	SCALE: 1" = 4'

Elev. feet 715.5	Depth feet 32.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			POORLY GRADED SAND, fine- to medium-grained, with a trace of Gravel, light brown, moist, medium dense. (Glacial Outwash) *(continued)*			
				18		
				23		
702.5	45.0	SC	CLAYEY SAND, fine- to medium-grained, with a trace of Gravel, brown, waterbearing, to wet, very stiff. (Glacial Till)	24	▽	* See attached Grain Size Accumulation Curve
				22		
				26		
687.5	60.0	ML	SILT, with seams of Sand, light brown, wet, medium dense. (Alluvium)	24		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

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LOG OF BORING

Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota	BORING: **SB-5 (cont.)** LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: 11/24/09	SCALE: 1" = 4'

Elev. feet 683.5	Depth feet 64.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SILT, with seams of Sand, light brown, wet, medium dense. (Alluvium) *(continued)*	30		
677.5	70.0	SM	SILTY SAND, fine- to medium-grained, light brown, wet, very dense. (Glacial Till)	*		* 50 blows for 6" (set)
672.5	75.0	CL	SANDY LEAN CLAY, gray, wet, hard. (Glacial Till)	*		* 50 blows for 3" (set)
				*		* 50 blows for 6" (set)
666.5	81.0		END OF BORING. Water observed at 45 feet with 79 1/2 feet of hollow-stem auger in the ground. Water not observed to cave-in depth of 42 feet immediately after withdrawal of auger. Boring then grouted.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

BRAUN INTERTEC

LOG OF BORING

Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota	BORING: SB-6 LOCATION: See attached sketch.

DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: 12/3/09	SCALE: 1" = 4'

Elev. feet 739.5	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
		FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, brown, moist.	4		108158.73 N, 486091.65 E
729.5	10.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown, moist, loose. (Alluvium)	5		
724.5	15.0	SM	SILTY SAND, fine-grained, light brown, moist, loose. (Alluvium)	9		
719.5	20.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown, moist, medium dense. (Alluvium)	11 8		
709.5	30.0	ML	SILT with SAND, light brown to gray, moist to wet to waterbearing, medium dense to loose. (Alluvium)	15		* See attached Grain Size Accumulation Curve

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

LOG OF BORING

BRAUN INTERTEC

Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota		BORING: **SB-6 (cont.)** LOCATION: See attached sketch.	
DRILLER: C. Powers	METHOD: 3 1/4" HSA, Autohammer	DATE: **12/3/09**	SCALE: **1" = 4'**

Elev. feet 707.5	Depth feet 32.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SILT with SAND, light brown to gray, moist to wet to waterbearing, medium dense to loose. (Alluvium) *(continued)*			
				8		
				10		
				7	▽	
				12		
				5		
				29		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

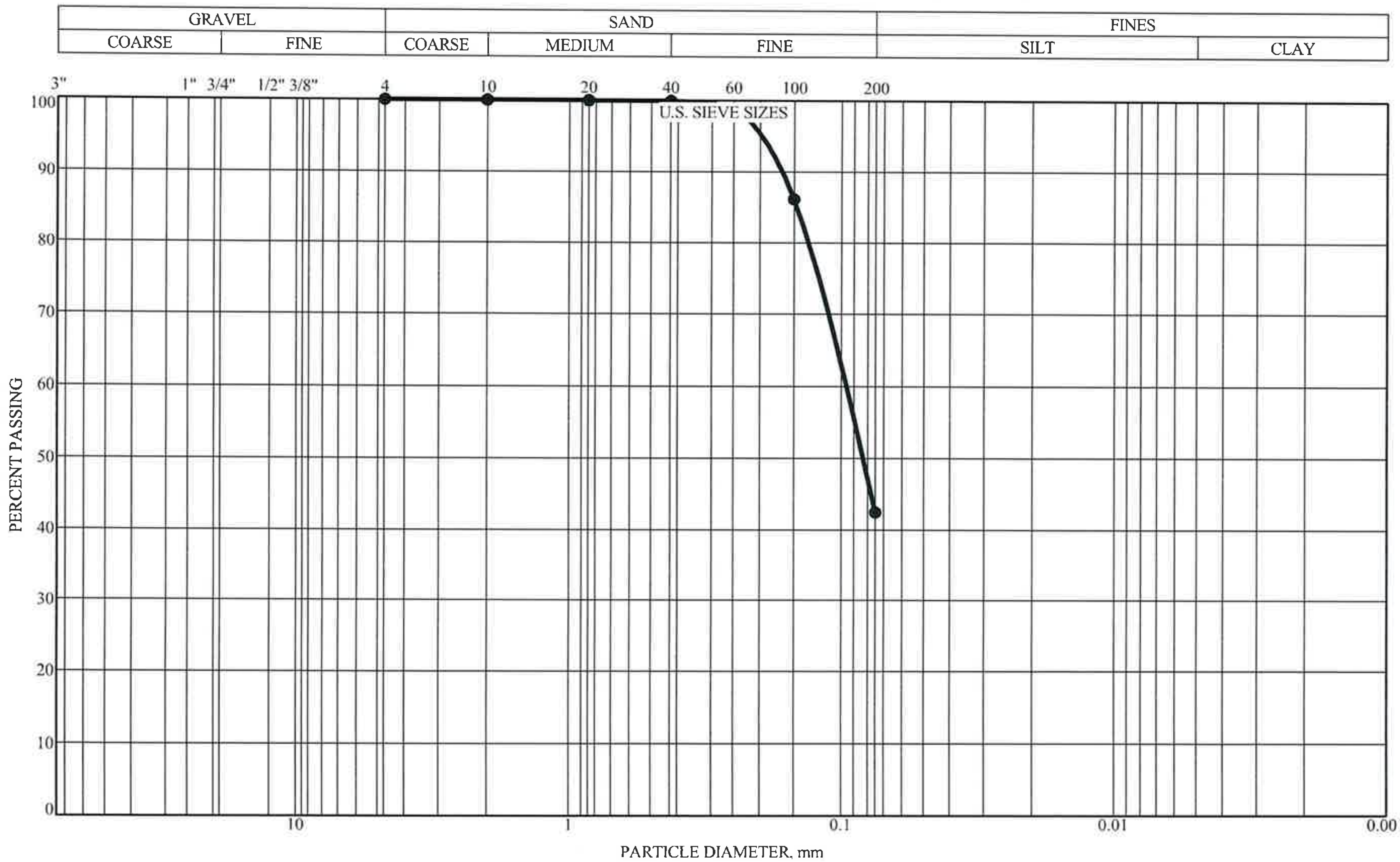
Braun Project SP-09-04727 Geotechnical Evaluation LMR/WD Stability Analysis Minnesota River Bluff Eden Prairie, Minnesota	BORING: SB-6 (cont.) LOCATION: See attached sketch.
DRILLER: C. Powers / METHOD: 3 1/4" HSA, Autohammer	DATE: 12/3/09 / SCALE: 1" = 4'

Elev. feet 675.5	Depth feet 64.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
			SILT with SAND, light brown to gray, moist to wet to waterbearing, medium dense to loose. (Alluvium) *(continued)*	9		
669.5	70.0	ML	SANDY SILT, gray, waterbearing, medium dense. (Alluvium)	11		* See attached Grain Size Accumulation Curve
				13		
659.5	80.0	ML	SILT, gray, waterbearing, medium dense. (Alluvium)	28		
658.5	81.0		END OF POWER AUGER BORING. Water observed at 46 feet with 79 1/2 feet of hollow-stem auger in the ground. Piezometer set to a depth of 80 feet.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04727.GPJ BRAUN_08.GDT 12/28/09 16:31

GRAIN SIZE ACCUMULATION CURVE (ASTM)



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Braun Project SP-09-04727
Drilling and Lab Testing
LMRWD Stability Analysis
Minnesota River Bluff
Eden Prairie, MN

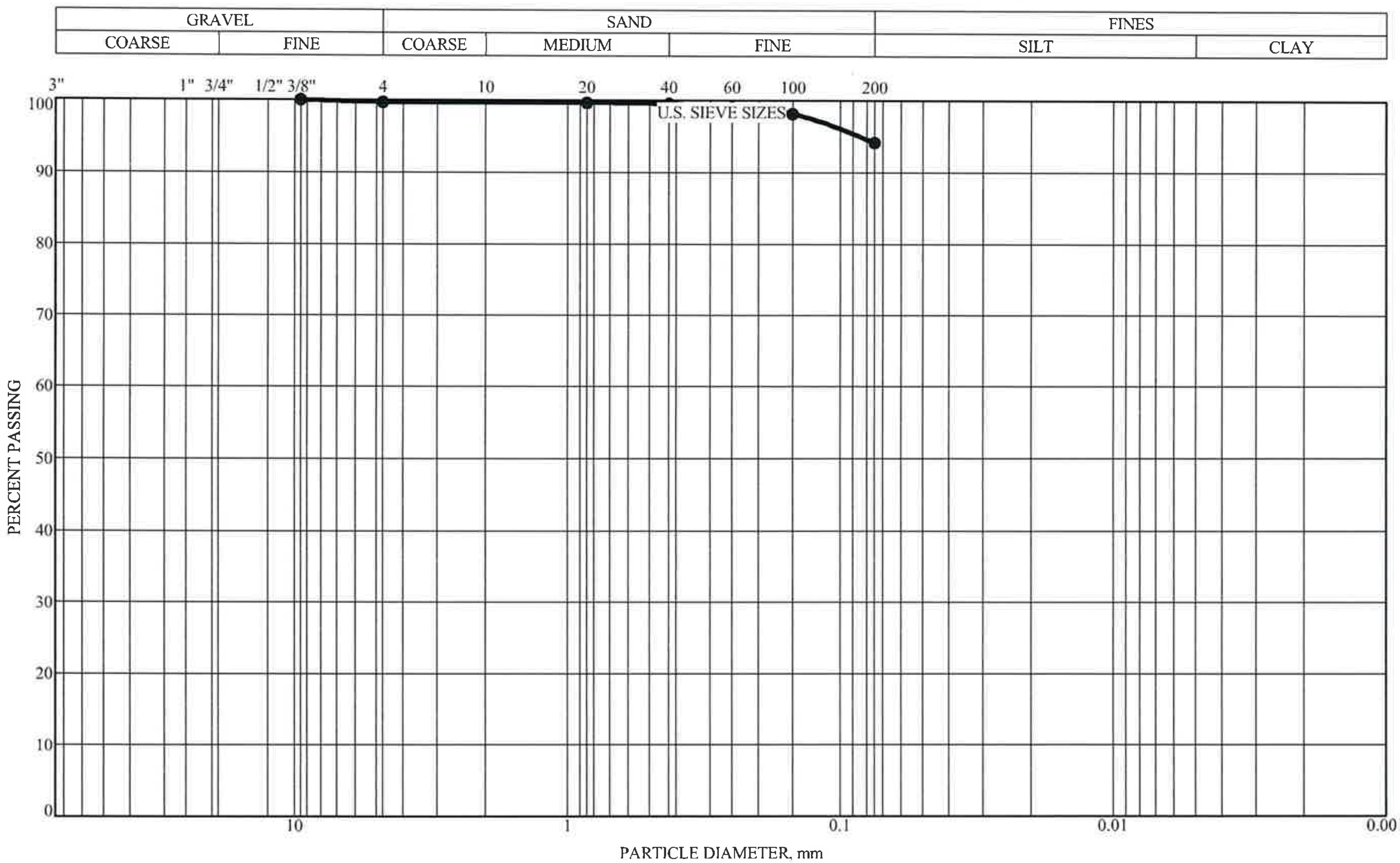
BORING: 3 DEPTH: 50.0'-80.0'

GRAVEL	0.0%
SAND	57.5%
FINES	42.5%
D60=0.099	Cu=
D30=	Cc=
D10=	

CLASSIFICATION:
SILTY SAND(SM)

ASTM D 6913

GRAIN SIZE ACCUMULATION CURVE (ASTM)



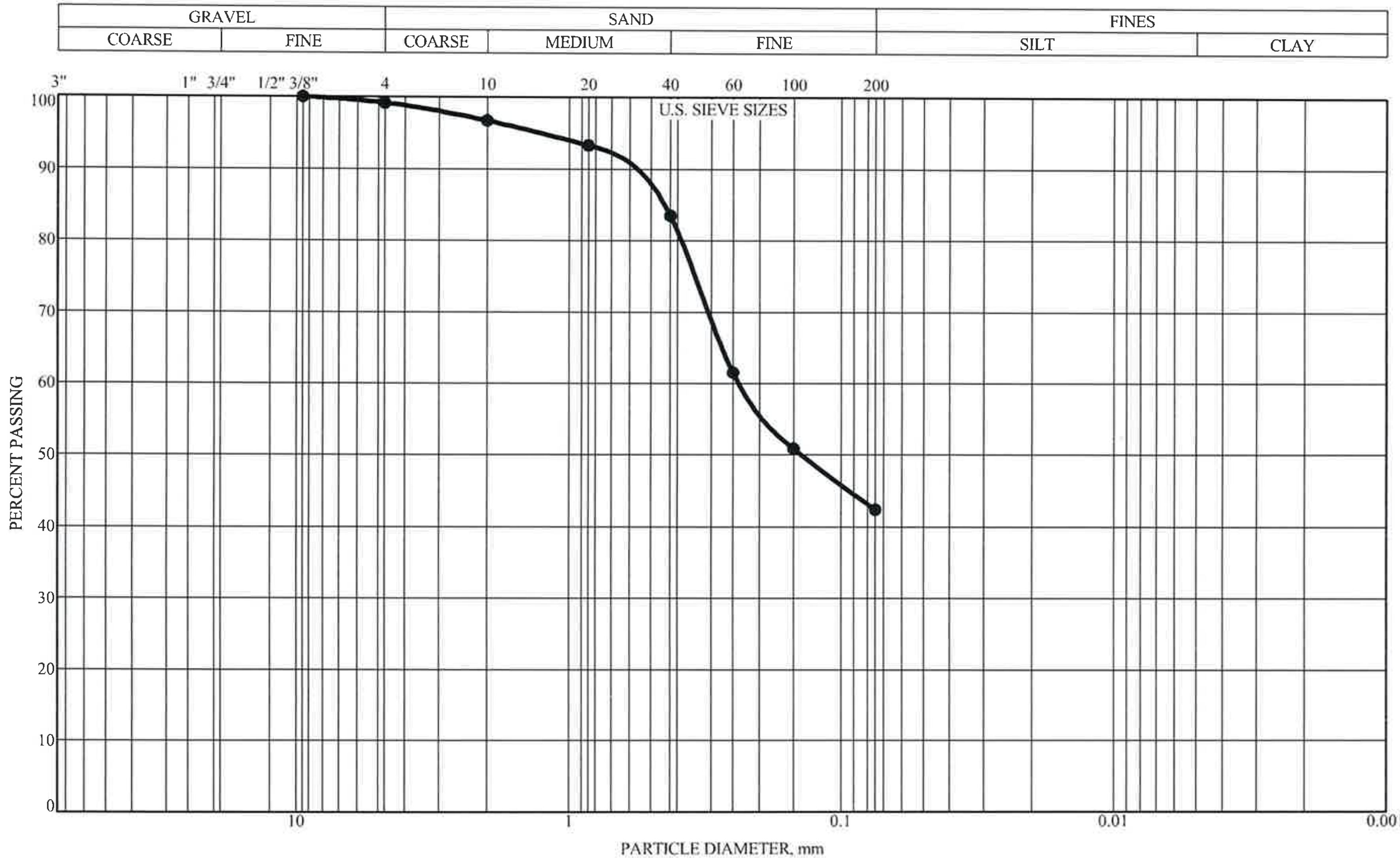
Braun Project SP-09-04727
Drilling and Lab Testing
LMRWD Stability Analysis
Minnesota River Bluff
Eden Prairie, MN
BORING: 4 DEPTH: 50.0'-65.0'

GRAVEL	0.3%		
SAND	5.5%		
FINES	94.2%		
D60=			
D30=	Cu=		
D10=	Cc=		

CLASSIFICATION:
SILT(ML)

ASTM D 6913

GRAIN SIZE ACCUMULATION CURVE (ASTM)



BRAUN INTERTEC

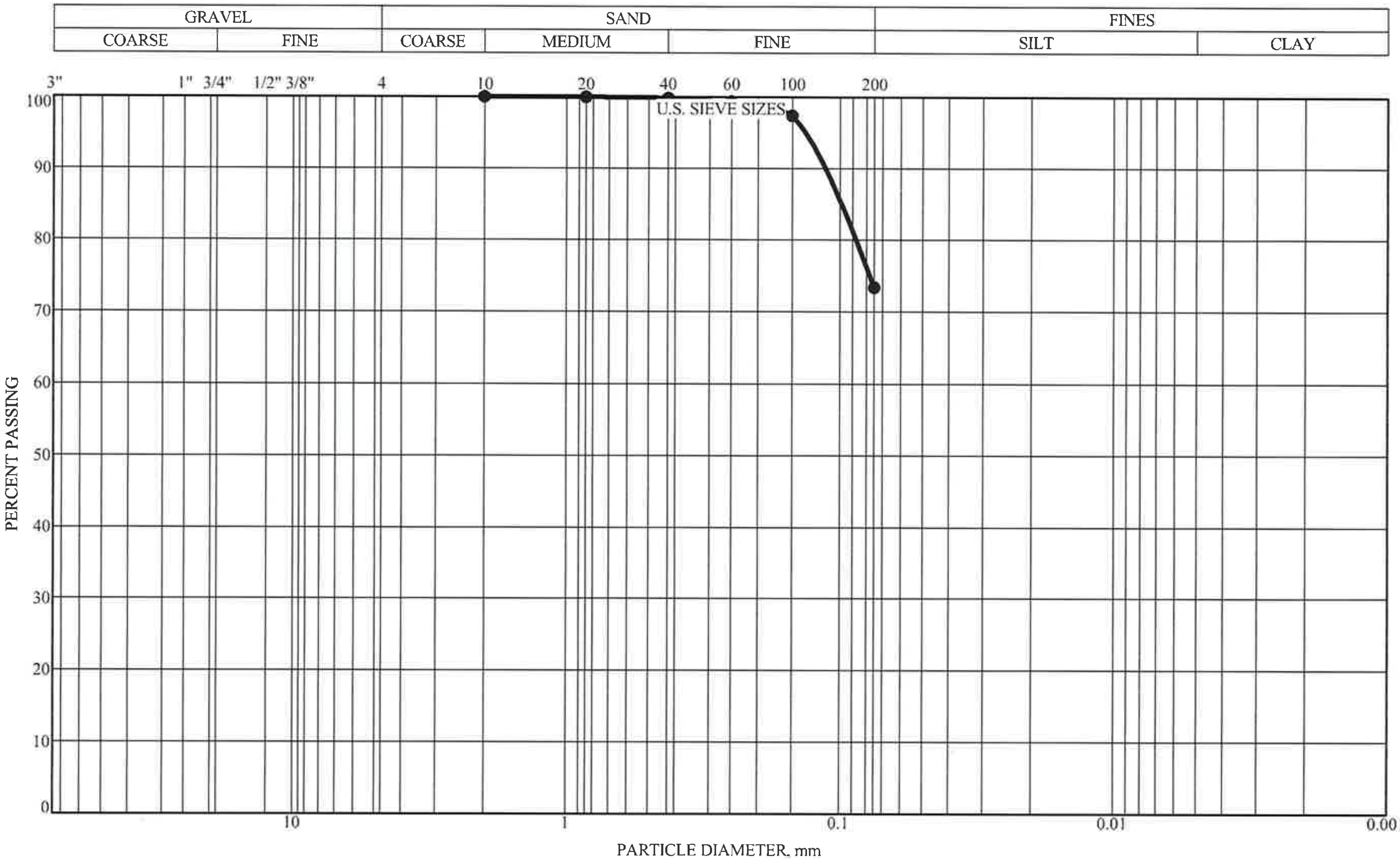
Braun Project SP-09-04727
Drilling and Lab Testing
LMRWD Stability Analysis
Minnesota River Bluff
Eden Prairie, MN
BORING: 5 DEPTH: 45.0'-60.0'

GRAVEL	0.8%
SAND	56.7%
FINES	42.4%
D60=0.232	
D30=	Cu=
D10=	Cc=

CLASSIFICATION:
CLAYEY SAND(SC)

ASTM D 6913

GRAIN SIZE ACCUMULATION CURVE (ASTM)



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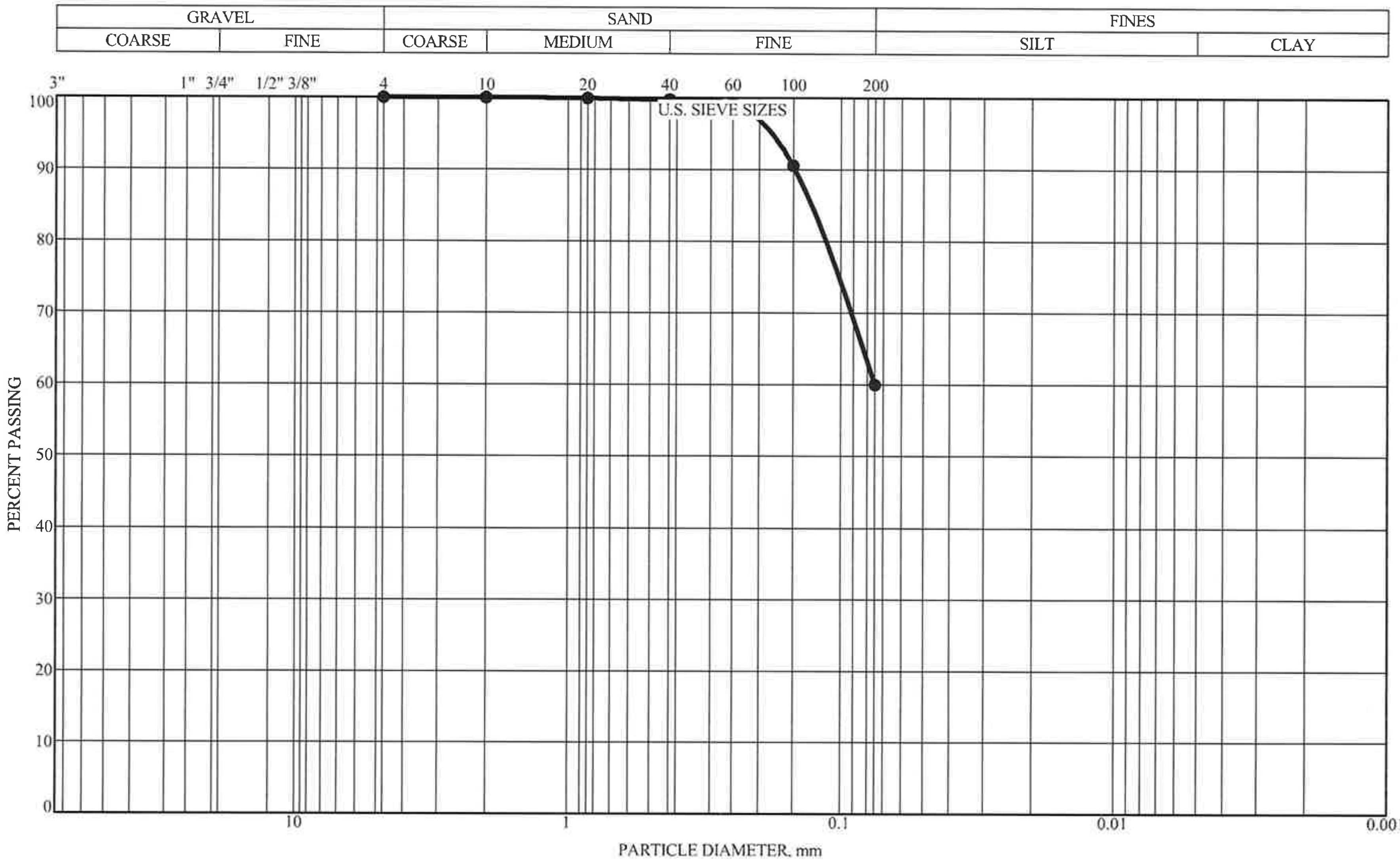
Braun Project SP-09-04727
Drilling and Lab Testing
LMRWD Stability Analysis
Minnesota River Bluff
Eden Prairie, MN
BORING: 6 DEPTH: 30.0'-50.0'

GRAVEL	0.0%
SAND	26.6%
FINES	73.4%
D60=	Cu=
D30=	Cc=
D10=	

CLASSIFICATION:
SILT with SAND(ML)

ASTM D 6913

GRAIN SIZE ACCUMULATION CURVE (ASTM)



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Braun Project SP-09-04727
Drilling and Lab Testing
LMRWD Stability Analysis
Minnesota River Bluff
Eden Prairie, MN

BORING: 6 DEPTH: 70.0'-80.0'

GRAVEL	0.0%
SAND	40.0%
FINES	60.0%

D60=
D30=
D10=

Cu=
Cc=

CLASSIFICATION:
SANDY SILT(ML)

ASTM D 6913

Data for Soil Borings
Lower Minnesota River Bank Stabilization Project

pt #	NORTHING	EASTING	ELEVATION	Description
1	108158.73	486091.65	739.50	SB 6
2	108131.76	486315.11	747.48	SB 5
3	108323.98	486167.26	770.97	SB/INC 3
4	108378.80	485906.21	773.55	SB/INC 4

Seepage Water Chemical Analysis

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Braun Intertec Corporation
11001 Hampshire Avenue S.
Minneapolis, MN 55438

Phone: 952.995.2000
Fax: 952.995.2020
Web: braunintertec.com

Mr. Wes Boll
Wenck Associates, Inc.
1800 Pioneer Creek Center P.O. Box 249
Maple Plain, MN 55359-0249

January 26, 2010

Work Order #: 1000144

RE: Lower Minn. Bank
1426-08

Dear Wes Boll:

Braun Intertec Corporation received samples for the project identified above on January 13, 2010. Analytical results are summarized in the following report.

All routine quality assurance procedures were followed, unless otherwise noted.

Analytical results are reported on an "as received" basis unless otherwise noted. Where possible, the samples will be retained by the laboratory for 14 days following issuance of the initial final report. The samples will be disposed of or returned at that time. Arrangements can be made for extended storage by contacting me at this time.

We appreciate your decision to use Braun Intertec Corporation for this project. We are committed to being your vendor of choice to meet your analytical chemistry needs.

If you have any questions please contact me at the above phone number.

Sincerely,

Richard A. Maw For Steven J. Albrecht
Associate Principal

Providing engineering and environmental solutions since 1957

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11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Wenck Associates, Inc.	Client Ref: Lower Minn. Bank	Work Order #: 1000144
1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

How to Use this Report

In order to get the most out of the information presented in this report please refer to the following explanations as to how the data in this report is tied together and how some of the terms are defined.

Qualifiers and Abbreviations are defined in the following section. You will find these codes used throughout the report in headers and in note sections to designate a unique fact about the data to which they are associated.

The Case Narrative gives a "story" about the analysis and results. Here you will find greater elaboration on relevant qualifiers as well as an explanation of anything of particular note in the data. This is a discussion of the data in terms of quality control and chemistry. It is a summary of any deviations that could affect the usefulness of the data. This is not an interpretation as to how this information relates to regulatory compliance, toxicity, or hazardous characterization. These items are beyond the scope of this report.

The Sample Summary provides detail on sample receipt. The association between Client sample ID and the Laboratory sample ID are defined here; this information is valuable to have when discussing results with your project manager. Sample collection and receipt dates and times are provided here as well. General notes regarding the work order are also documented here. This is a mini "case narrative" that describes any anomalies regarding the condition of the samples upon arrival to the laboratory or special circumstances regarding the work order.

The Conditions Upon Receipt summarizes the results of specific checks that have been performed at sample receipt. This includes items like custody documentation, sample condition, and temperature at receipt. Each "cooler" is identified and the conditions associated with that cooler are documented. A "cooler" is defined as the larger container used to transport the individual samples. In most cases this is a standard recreational cooler but it can be a box, plastic bag, or other container.

The laboratory results are summarized in the following sections. Data is broken down into major categories for convenience. An example of such a category would be "Total Petroleum Hydrocarbons." Here you would find data that references the testing of such parameters as diesel range organics and gasoline range organics. Other categories are similarly mapped. The batch number is associated with each sample. This is important to evaluate Quality Control (QC) data. Surrogate results samples are provided with each sample. Laboratory control limits are provided for comparison (see below). The reference method is also identified. If a method is denoted with an "M" (e.g. EPA 1234(M)) this means that it has been modified. An explanation of the modification will be found in the Case Narrative. A result is given with appropriate units. If a soil sample is dry-weight corrected then the word "dry" will appear next to the units. If the word "dry" does not appear then the result is "as received."

The Method Reporting Limit (MRL) is provided. It is important to understand this term. The MRL is a level that has been empirically verified to provide reliable quantification of results. Results that are equal to or greater than this value will show up as bolded. They are considered "hits." If a result is less than the MRL, the result is given as less than the MRL (e.g. if the MRL = 10 then a less than would be given as "< 10").

The Quality Control (QC) samples are documented in the following section. Here you will find the preparation batches associated with each sample from the results section. The sample preparation method is also defined here. Accuracy is represented in terms of a percent recovery as compared to a known value. Precision is represented as a relative percent difference between two duplicate sample aliquots. The laboratory control limits are provided as a means to evaluate the quality control data. If the result falls outside the laboratory control limits this simply means that it is outside what is typical for the laboratory and is noted accordingly. This does not mean that the data is invalid. Laboratory control limits are generally tighter than most program limits. This is a very important distinction. How the data is ultimately used determines its validity. Program requirements are defined in the Quality Assurance Project Plan (QAPP) governing the project. If your project manager is aware of your specific program requirements then a note will be made in the case narrative if the data fails to meet any of these requirements.

The last section contains copies of important documents and/or instrument printouts relevant to the report. This includes the chain of custody. It also may include items like chromatograms or spectra.

Please note that this report is paginated and must be reproduced in its entirety.

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
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Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Qualifiers and Abbreviations

gk	The sample was analyzed 1 day past the method specified holding time.
COC	Chain of Custody
dry	Sample results reported on a dry weight basis
MRL	Method Reporting Limit
NA	Not Applicable
ND	Analyte NOT DETECTED
NR	Not Reported
%Rec	Percent Recovery
RPD	Relative Percent Difference
VOC	Volatile Organic Compound

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SAMPLE SUMMARY

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Water Sample	1000144-01	Water	01/13/10 03:28	01/13/10 15:55
Soil Sample	1000144-02	Soil	01/13/10 03:28	01/13/10 15:55
Trip Blank	1000144-03	Water	01/13/10 00:00	01/13/10 15:55

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Conditions Upon Receipt

Cooler: Cooler #1

Temperature:	14.2 °C	**Received on Ice:**	No	**Preservation Confirmed:**	Yes
COC Included:	Yes	**Hand Delivered by Sampler:**	Yes	**Temperature Blank:**	Yes
Custody Seals Used:	No	**Sufficient Sample Provided:**	Yes	**COC Complete:**	Yes
Custody Seals Intact:	No	**Headspace Present (VOC):**	No	**COC & Labels Agree:**	Yes

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Water Sample
1000144-01 (Water)
1/13/10 3:28

Classical Chemistry Parameters

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloride	**5.8**	1.0	mg/L	1	B0A0225	1/20/10	1/20/10	SM4500 CL-E	
Sulfide	< 0.050	0.050	mg/L	1	B0A0216	1/19/10	1/19/10	SM4500 S2-	

Metals

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	< 10	10	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Barium	**240**	10	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Cadmium	< 2.0	2.0	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Chromium	< 5.0	5.0	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Lead	< 5.0	5.0	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Selenium	< 10	10	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Silver	< 5.0	5.0	ug/L	1	B0A0218	1/19/10	1/20/10	EPA 6010B	
Mercury	< 0.20	0.20	ug/L	1	B0A0227	1/20/10	1/20/10	EPA 7470A	

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,1-Trichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,2,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,2-Trichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,2-Trichlorotrifluoroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1-Dichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1-Dichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1-Dichloropropene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,3-Trichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,3-Trichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,4-Trichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,4-Trimethylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dibromo-3-chloropropane	< 10	10	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dibromoethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,3,5-Trimethylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,3-Dichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,3-Dichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	

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Water Sample

1000144-01 (Water)

1/13/10 3:28

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,4-Dichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
2,2-Dichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
2-Butanone (MEK)	< 10	10	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
2-Chlorotoluene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
4-Chlorotoluene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
4-Isopropyltoluene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Acetone	< 15	15	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Allyl Chloride	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Benzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromochloromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromodichloromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromoform	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromomethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Carbon Tetrachloride	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chlorodibromomethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chloroform	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chloromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
cis-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
cis-1,3-Dichloropropene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Dibromomethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Dichlorodifluoromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Dichlorofluoromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Ethyl Ether	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Ethylbenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Hexachlorobutadiene	< 2.0	2.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Isopropylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
m,p-Xylenes	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Methyl Isobutyl Ketone	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Methylene chloride	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Methyl-t-butyl ether	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Naphthalene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
n-Butylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
n-Propylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	

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Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Water Sample

1000144-01 (Water)

1/13/10 3:28

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
o-Xylene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
sec-Butylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Styrene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
tert-Butylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Tetrachloroethene	< 2.0	2.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Tetrahydrofuran	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Toluene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
trans-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
trans-1,3-Dichloropropene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Trichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Trichlorofluoromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Vinyl chloride	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Surrogate: 1,2-Dichloroethane-d4	*106 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	
Surrogate: 4-Bromofluorobenzene	*89.8 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	
Surrogate: Dibromofluoromethane	*99.5 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	
Surrogate: Toluene-d8	*96.8 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	

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1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Soil Sample

1000144-02 (Soil)

1/13/10 3:28

Classical Chemistry Parameters

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Organic Matter	**10**	0.050	% Wt	1	B0A0249	1/21/10	1/21/10	ASTM D2974	gk

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Trip Blank

1000144-03 (Water)

1/13/10 0:00

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,1-Trichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,2,2-Tetrachloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,2-Trichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1,2-Trichlorotrifluoroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1-Dichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1-Dichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,1-Dichloropropene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,3-Trichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,3-Trichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,4-Trichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2,4-Trimethylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dibromo-3-chloropropane	< 10	10	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dibromoethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dichloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,2-Dichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,3,5-Trimethylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,3-Dichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,3-Dichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
1,4-Dichlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
2,2-Dichloropropane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
2-Butanone (MEK)	< 10	10	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
2-Chlorotoluene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
4-Chlorotoluene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
4-Isopropyltoluene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Acetone	< 15	15	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Allyl Chloride	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Benzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromochloromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromodichloromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromoform	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Bromomethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Carbon Tetrachloride	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chlorobenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	

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Trip Blank

1000144-03 (Water)

1/13/10 0:00

Volatile Organic Compounds

Analyte	Result	MRL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chlorodibromomethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chloroethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chloroform	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Chloromethane	**1.5**	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
cis-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
cis-1,3-Dichloropropene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Dibromomethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Dichlorodifluoromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Dichlorofluoromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Ethyl Ether	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Ethylbenzene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Hexachlorobutadiene	< 2.0	2.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Isopropylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
m,p-Xylenes	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Methyl Isobutyl Ketone	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Methylene chloride	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Methyl-t-butyl ether	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Naphthalene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
n-Butylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
n-Propylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
o-Xylene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
sec-Butylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Styrene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
tert-Butylbenzene	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Tetrachloroethene	< 2.0	2.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Tetrahydrofuran	< 5.0	5.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Toluene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
trans-1,2-Dichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
trans-1,3-Dichloropropene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Trichloroethene	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Trichlorofluoromethane	< 1.0	1.0	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Vinyl chloride	< 2.5	2.5	ug/L	1	B0A0169	1/15/10	1/15/10	EPA 8260B	
Surrogate: 1,2-Dichloroethane-d4	*106 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	
Surrogate: 4-Bromofluorobenzene	*92.2 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	
Surrogate: Dibromofluoromethane	*99.2 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	
Surrogate: Toluene-d8	*98.0 %*	*Limits: 80-120%*			*B0A0169*	*1/15/10*	*1/15/10*	*EPA 8260B*	

EPA Lab ID: MN00063

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Wenck Associates, Inc.	Client Ref: Lower Minn. Bank	Work Order #: 1000144
1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Classical Chemistry Parameters - Quality Control

Batch B0A0216 - Default Prep GenChem

Method Blank (B0A0216-BLK1) Prepared & Analyzed: 01/19/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfide	< 0.050	0.050	mg/L	NA	NA	NA	NA	NA	NA	

Laboratory Control Sample (B0A0216-BS1) Prepared & Analyzed: 01/19/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfide	0.417	0.050	mg/L	0.400	NA	104	80-120	NA	NA	

Laboratory Control Sample Duplicate (B0A0216-BSD1) Prepared & Analyzed: 01/19/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfide	0.409	0.050	mg/L	0.400	NA	102	80-120	1.99	20	

Matrix Spike (B0A0216-MS1) **Source: 1000144-01** Prepared & Analyzed: 01/19/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfide	0.399	0.050	mg/L	0.400	ND	99.8	75-125	NA	NA	

Matrix Spike Duplicate (B0A0216-MSD1) **Source: 1000144-01** Prepared & Analyzed: 01/19/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfide	0.391	0.050	mg/L	0.400	ND	97.8	75-125	2.07	20	

Batch B0A0225 - NO PREP

Method Blank (B0A0225-BLK1) Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	< 1.0	1.0	mg/L	NA	NA	NA	NA	NA	NA	

Laboratory Control Sample (B0A0225-BS1) Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	40.3	1.0	mg/L	40.0	NA	101	80-120	NA	NA	

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Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Classical Chemistry Parameters - Quality Control

Batch B0A0225 - NO PREP

Laboratory Control Sample Duplicate (B0A0225-BSD1)

Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	40.6	1.0	mg/L	40.0	NA	101	80-120	0.656	20	

Matrix Spike (B0A0225-MS1)

Source: 1000191-01RE1 Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	149	10	mg/L	40.0	114	88.7	75-125	NA	NA	

Matrix Spike Duplicate (B0A0225-MSD1)

Source: 1000191-01RE1 Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	151	10	mg/L	40.0	114	92.9	75-125	1.12	20	

Batch B0A0249 - Default Prep GenChem

Method Blank (B0A0249-BLK1)

Prepared & Analyzed: 01/21/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Organic Matter	< 0.050	0.050	% Wt	NA	NA	NA	NA	NA	NA	

Duplicate (B0A0249-DUP1)

Source: 1000144-02 Prepared & Analyzed: 01/21/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Organic Matter	10.0	0.050	% Wt	NA	10.0	NA	NA	0.293	20	

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Metals - Quality Control

Batch B0A0218 - EPA 3005A

Method Blank (B0A0218-BLK1)

Prepared: 01/19/10 Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	< 10	10	ug/L	NA	NA	NA	NA	NA	NA	
Barium	< 10	10	ug/L	NA	NA	NA	NA	NA	NA	
Cadmium	< 2.0	2.0	ug/L	NA	NA	NA	NA	NA	NA	
Chromium	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	
Lead	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	
Selenium	< 10	10	ug/L	NA	NA	NA	NA	NA	NA	
Silver	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	

Laboratory Control Sample (B0A0218-BS1)

Prepared: 01/19/10 Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	1100	10	ug/L	1000	NA	110	85-115	NA	NA	
Barium	1050	10	ug/L	1000	NA	105	85-115	NA	NA	
Cadmium	1010	2.0	ug/L	1000	NA	101	85-115	NA	NA	
Chromium	984	5.0	ug/L	1000	NA	98.4	85-115	NA	NA	
Lead	1050	5.0	ug/L	1000	NA	105	85-115	NA	NA	
Selenium	992	10	ug/L	1000	NA	99.2	85-115	NA	NA	
Silver	195	5.0	ug/L	200	NA	97.7	85-115	NA	NA	

Laboratory Control Sample Duplicate (B0A0218-BSD1)

Prepared: 01/19/10 Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	1140	10	ug/L	1000	NA	114	85-115	3.44	20	
Barium	1080	10	ug/L	1000	NA	108	85-115	3.06	20	
Cadmium	1040	2.0	ug/L	1000	NA	104	85-115	3.14	20	
Chromium	1020	5.0	ug/L	1000	NA	102	85-115	3.17	20	
Lead	1070	5.0	ug/L	1000	NA	107	85-115	1.62	20	
Selenium	1030	10	ug/L	1000	NA	103	85-115	3.32	20	
Silver	199	5.0	ug/L	200	NA	99.4	85-115	1.74	20	

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Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Metals - Quality Control

Batch B0A0218 - EPA 3005A

Matrix Spike (B0A0218-MS1) **Source: 1000144-01** Prepared: 01/19/10 Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	1140	10	ug/L	1000	1.43	114	75-125	NA	NA	
Barium	1300	10	ug/L	1000	237	106	75-125	NA	NA	
Cadmium	1030	2.0	ug/L	1000	ND	103	75-125	NA	NA	
Chromium	1000	5.0	ug/L	1000	0.388	100	75-125	NA	NA	
Lead	1040	5.0	ug/L	1000	ND	104	75-125	NA	NA	
Selenium	1030	10	ug/L	1000	ND	103	75-125	NA	NA	
Silver	199	5.0	ug/L	200	ND	99.7	75-125	NA	NA	

Matrix Spike Duplicate (B0A0218-MSD1) **Source: 1000144-01** Prepared: 01/19/10 Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	1140	10	ug/L	1000	1.43	114	75-125	0.416	20	
Barium	1290	10	ug/L	1000	237	105	75-125	0.639	20	
Cadmium	1020	2.0	ug/L	1000	ND	102	75-125	1.11	20	
Chromium	993	5.0	ug/L	1000	0.388	99.3	75-125	1.04	20	
Lead	1030	5.0	ug/L	1000	ND	103	75-125	1.22	20	
Selenium	1020	10	ug/L	1000	ND	102	75-125	0.912	20	
Silver	198	5.0	ug/L	200	ND	99.2	75-125	0.489	20	

Batch B0A0227 - EPA 7470A

Method Blank (B0A0227-BLK1) Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Mercury	< 0.20	0.20	ug/L	NA	NA	NA	NA	NA	NA	

Laboratory Control Sample (B0A0227-BS1) Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Mercury	2.48	0.20	ug/L	2.50	NA	99.2	85-115	NA	NA	

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Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Metals - Quality Control

Batch B0A0227 - EPA 7470A

Laboratory Control Sample Duplicate (B0A0227-BSD1) Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Mercury	2.50	0.20	ug/L	2.50	NA	99.9	85-115	0.683	20	

Matrix Spike (B0A0227-MS1) **Source: 1000144-01** Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Mercury	2.47	0.20	ug/L	2.50	ND	98.8	75-125	NA	NA	

Matrix Spike Duplicate (B0A0227-MSD1) **Source: 1000144-01** Prepared & Analyzed: 01/20/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Mercury	2.45	0.20	ug/L	2.50	ND	98.0	75-125	0.813	20	

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Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Method Blank (B0A0169-BLK1)

Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1,1,2-Tetrachloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1,1-Trichloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1,2,2-Tetrachloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1,2-Trichloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1,2-Trichlorotrifluoroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1-Dichloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1-Dichloroethene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,1-Dichloropropene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2,3-Trichlorobenzene	1.09	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2,3-Trichloropropane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2,4-Trichlorobenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2,4-Trimethylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
1,2-Dibromo-3-chloropropane	< 10	10	ug/L	NA	NA	NA	NA	NA	NA	
1,2-Dibromoethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2-Dichlorobenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2-Dichloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,2-Dichloropropane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,3,5-Trimethylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
1,3-Dichlorobenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,3-Dichloropropane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
1,4-Dichlorobenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
2,2-Dichloropropane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
2-Butanone (MEK)	< 10	10	ug/L	NA	NA	NA	NA	NA	NA	
2-Chlorotoluene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
4-Chlorotoluene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
4-Isopropyltoluene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Acetone	< 15	15	ug/L	NA	NA	NA	NA	NA	NA	
Allyl Chloride	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Benzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Bromobenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Bromochloromethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Bromodichloromethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Bromoform	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	
Bromomethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Carbon Tetrachloride	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Chlorobenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Chlorodibromomethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Chloroethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Chloroform	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	

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Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Method Blank (B0A0169-BLK1)

Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloromethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
cis-1,3-Dichloropropene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Dibromomethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Dichlorodifluoromethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Dichlorofluoromethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Ethyl Ether	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Ethylbenzene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Hexachlorobutadiene	< 2.0	2.0	ug/L	NA	NA	NA	NA	NA	NA	
Isopropylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
m,p-Xylenes	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Methyl Isobutyl Ketone	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	
Methylene chloride	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	
Methyl-t-butyl ether	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Naphthalene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
n-Butylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
n-Propylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
o-Xylene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
Styrene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
tert-Butylbenzene	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
Tetrachloroethene	< 2.0	2.0	ug/L	NA	NA	NA	NA	NA	NA	
Tetrahydrofuran	< 5.0	5.0	ug/L	NA	NA	NA	NA	NA	NA	
Toluene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
trans-1,2-Dichloroethene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
trans-1,3-Dichloropropene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Trichloroethene	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Trichlorofluoromethane	< 1.0	1.0	ug/L	NA	NA	NA	NA	NA	NA	
Vinyl chloride	< 2.5	2.5	ug/L	NA	NA	NA	NA	NA	NA	
Surrogate: 1,2-Dichloroethane-d4	*25.8*		ug/L	*25.0*	*NA*	*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*23.9*		ug/L	*25.0*	*NA*	*95.4*	*80-120*			
Surrogate: Dibromofluoromethane	*25.1*		ug/L	*25.0*	*NA*	*100*	*80-120*			
Surrogate: Toluene-d8	*24.4*		ug/L	*25.0*	*NA*	*97.6*	*80-120*			

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Wenck Associates, Inc.	Client Ref: Lower Minn. Bank	Work Order #: 1000144
1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Laboratory Control Sample (B0A0169-BS1) Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1,1,2-Tetrachloroethane	26.9	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
1,1,1-Trichloroethane	26.6	1.0	ug/L	25.0	NA	106	75-125	NA	NA	
1,1,2,2-Tetrachloroethane	27.0	1.0	ug/L	25.0	NA	108	75-125	NA	NA	
1,1,2-Trichloroethane	26.2	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
1,1,2-Trichlorotrifluoroethane	25.6	1.0	ug/L	25.0	NA	102	75-125	NA	NA	
1,1-Dichloroethane	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
1,1-Dichloroethene	25.5	1.0	ug/L	25.0	NA	102	75-125	NA	NA	
1,1-Dichloropropene	27.2	1.0	ug/L	25.0	NA	109	75-125	NA	NA	
1,2,3-Trichlorobenzene	30.0	1.0	ug/L	25.0	NA	120	75-125	NA	NA	
1,2,3-Trichloropropane	26.7	1.0	ug/L	25.0	NA	106	75-125	NA	NA	
1,2,4-Trichlorobenzene	28.1	1.0	ug/L	25.0	NA	112	75-125	NA	NA	
1,2,4-Trimethylbenzene	26.6	2.5	ug/L	25.0	NA	106	75-125	NA	NA	
1,2-Dibromo-3-chloropropane	25.3	10	ug/L	25.0	NA	101	75-125	NA	NA	
1,2-Dibromoethane	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
1,2-Dichlorobenzene	26.7	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
1,2-Dichloroethane	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
1,2-Dichloropropane	25.8	1.0	ug/L	25.0	NA	103	75-125	NA	NA	
1,3,5-Trimethylbenzene	26.4	2.5	ug/L	25.0	NA	106	75-125	NA	NA	
1,3-Dichlorobenzene	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
1,3-Dichloropropane	25.6	1.0	ug/L	25.0	NA	102	75-125	NA	NA	
1,4-Dichlorobenzene	26.3	1.0	ug/L	25.0	NA	105	75-125	NA	NA	
2,2-Dichloropropane	26.8	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
2-Butanone (MEK)	24.5	10	ug/L	25.0	NA	98.0	80-140	NA	NA	
2-Chlorotoluene	26.0	2.5	ug/L	25.0	NA	104	75-125	NA	NA	
4-Chlorotoluene	27.4	2.5	ug/L	25.0	NA	109	75-125	NA	NA	
4-Isopropyltoluene	26.8	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
Acetone	28.7	15	ug/L	25.0	NA	115	80-150	NA	NA	
Allyl Chloride	26.2	1.0	ug/L	25.0	NA	105	75-125	NA	NA	
Benzene	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
Bromobenzene	26.3	1.0	ug/L	25.0	NA	105	75-125	NA	NA	
Bromochloromethane	24.6	1.0	ug/L	25.0	NA	98.3	75-125	NA	NA	
Bromodichloromethane	27.1	1.0	ug/L	25.0	NA	108	75-125	NA	NA	
Bromoform	26.9	5.0	ug/L	25.0	NA	108	75-125	NA	NA	
Bromomethane	26.7	1.0	ug/L	25.0	NA	107	70-130	NA	NA	
Carbon Tetrachloride	26.8	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
Chlorobenzene	25.6	1.0	ug/L	25.0	NA	102	75-125	NA	NA	
Chlorodibromomethane	26.9	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
Chloroethane	25.7	1.0	ug/L	25.0	NA	103	75-125	NA	NA	
Chloroform	25.8	1.0	ug/L	25.0	NA	103	75-125	NA	NA	

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Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Laboratory Control Sample (B0A0169-BS1)

Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloromethane	25.8	1.0	ug/L	25.0	NA	103	75-125	NA	NA	
cis-1,2-Dichloroethene	25.8	1.0	ug/L	25.0	NA	103	75-125	NA	NA	
cis-1,3-Dichloropropene	26.9	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
Dibromomethane	25.4	1.0	ug/L	25.0	NA	101	75-125	NA	NA	
Dichlorodifluoromethane	23.3	1.0	ug/L	25.0	NA	93.0	50-120	NA	NA	
Dichlorofluoromethane	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
Ethyl Ether	25.2	1.0	ug/L	25.0	NA	100	75-125	NA	NA	
Ethylbenzene	26.9	1.0	ug/L	25.0	NA	107	75-125	NA	NA	
Hexachlorobutadiene	27.9	2.0	ug/L	25.0	NA	111	75-125	NA	NA	
Isopropylbenzene	27.8	2.5	ug/L	25.0	NA	111	75-125	NA	NA	
m,p-Xylenes	52.9	1.0	ug/L	50.0	NA	106	75-125	NA	NA	
Methyl Isobutyl Ketone	26.3	5.0	ug/L	25.0	NA	105	75-125	NA	NA	
Methylene chloride	24.5	5.0	ug/L	25.0	NA	97.7	75-125	NA	NA	
Methyl-t-butyl ether	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
Naphthalene	29.6	2.5	ug/L	25.0	NA	118	75-125	NA	NA	
n-Butylbenzene	27.5	2.5	ug/L	25.0	NA	110	75-125	NA	NA	
n-Propylbenzene	26.8	2.5	ug/L	25.0	NA	107	75-125	NA	NA	
o-Xylene	26.5	1.0	ug/L	25.0	NA	106	75-125	NA	NA	
sec-Butylbenzene	26.8	2.5	ug/L	25.0	NA	107	75-125	NA	NA	
Styrene	26.2	2.5	ug/L	25.0	NA	104	75-125	NA	NA	
tert-Butylbenzene	27.2	2.5	ug/L	25.0	NA	108	75-125	NA	NA	
Tetrachloroethene	25.3	2.0	ug/L	25.0	NA	101	75-125	NA	NA	
Tetrahydrofuran	26.4	5.0	ug/L	25.0	NA	105	75-125	NA	NA	
Toluene	25.5	1.0	ug/L	25.0	NA	102	75-125	NA	NA	
trans-1,2-Dichloroethene	25.5	1.0	ug/L	25.0	NA	102	75-125	NA	NA	
trans-1,3-Dichloropropene	27.9	1.0	ug/L	25.0	NA	112	75-125	NA	NA	
Trichloroethene	25.8	1.0	ug/L	25.0	NA	103	75-125	NA	NA	
Trichlorofluoromethane	26.0	1.0	ug/L	25.0	NA	104	75-125	NA	NA	
Vinyl chloride	24.8	2.5	ug/L	25.0	NA	99.2	70-130	NA	NA	
Surrogate: 1,2-Dichloroethane-d4	*25.5*		ug/L	*25.0*	*NA*	*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.8*		ug/L	*25.0*	*NA*	*99.0*	*80-120*			
Surrogate: Dibromofluoromethane	*25.4*		ug/L	*25.0*	*NA*	*101*	*80-120*			
Surrogate: Toluene-d8	*24.5*		ug/L	*25.0*	*NA*	*97.9*	*80-120*			

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Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Laboratory Control Sample Duplicate (B0A0169-BSD1) Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1,1,2-Tetrachloroethane	26.3	1.0	ug/L	25.0	NA	105	75-125	2.26	20	
1,1,1-Trichloroethane	26.4	1.0	ug/L	25.0	NA	105	75-125	0.718	20	
1,1,2,2-Tetrachloroethane	26.3	1.0	ug/L	25.0	NA	105	75-125	2.51	20	
1,1,2-Trichloroethane	25.1	1.0	ug/L	25.0	NA	100	75-125	4.02	20	
1,1,2-Trichlorotrifluoroethane	25.8	1.0	ug/L	25.0	NA	103	75-125	0.583	20	
1,1-Dichloroethane	25.9	1.0	ug/L	25.0	NA	103	75-125	0.116	20	
1,1-Dichloroethene	25.5	1.0	ug/L	25.0	NA	102	75-125	0.274	20	
1,1-Dichloropropene	27.2	1.0	ug/L	25.0	NA	108	75-125	0.110	20	
1,2,3-Trichlorobenzene	24.6	1.0	ug/L	25.0	NA	98.3	75-125	19.8	20	
1,2,3-Trichloropropane	26.1	1.0	ug/L	25.0	NA	104	75-125	2.05	20	
1,2,4-Trichlorobenzene	26.0	1.0	ug/L	25.0	NA	104	75-125	7.77	20	
1,2,4-Trimethylbenzene	26.6	2.5	ug/L	25.0	NA	106	75-125	0.188	20	
1,2-Dibromo-3-chloropropane	23.8	10	ug/L	25.0	NA	95.2	75-125	6.10	20	
1,2-Dibromoethane	25.2	1.0	ug/L	25.0	NA	101	75-125	3.00	20	
1,2-Dichlorobenzene	26.5	1.0	ug/L	25.0	NA	106	75-125	0.677	20	
1,2-Dichloroethane	25.8	1.0	ug/L	25.0	NA	103	75-125	0.696	20	
1,2-Dichloropropane	26.4	1.0	ug/L	25.0	NA	105	75-125	2.18	20	
1,3,5-Trimethylbenzene	26.5	2.5	ug/L	25.0	NA	106	75-125	0.151	20	
1,3-Dichlorobenzene	25.8	1.0	ug/L	25.0	NA	103	75-125	0.656	20	
1,3-Dichloropropane	25.2	1.0	ug/L	25.0	NA	101	75-125	1.53	20	
1,4-Dichlorobenzene	25.9	1.0	ug/L	25.0	NA	103	75-125	1.50	20	
2,2-Dichloropropane	26.8	1.0	ug/L	25.0	NA	107	75-125	0.0373	20	
2-Butanone (MEK)	24.7	10	ug/L	25.0	NA	98.5	80-140	0.528	25	
2-Chlorotoluene	25.9	2.5	ug/L	25.0	NA	103	75-125	0.463	20	
4-Chlorotoluene	26.8	2.5	ug/L	25.0	NA	107	75-125	2.21	20	
4-Isopropyltoluene	27.2	1.0	ug/L	25.0	NA	109	75-125	1.59	20	
Acetone	30.7	15	ug/L	25.0	NA	123	80-150	6.87	30	
Allyl Chloride	26.0	1.0	ug/L	25.0	NA	104	75-125	0.920	20	
Benzene	26.4	1.0	ug/L	25.0	NA	105	75-125	1.49	20	
Bromobenzene	26.0	1.0	ug/L	25.0	NA	104	75-125	0.803	20	
Bromochloromethane	24.2	1.0	ug/L	25.0	NA	96.8	75-125	1.51	20	
Bromodichloromethane	27.8	1.0	ug/L	25.0	NA	111	75-125	2.48	20	
Bromoform	26.6	5.0	ug/L	25.0	NA	106	75-125	1.38	20	
Bromomethane	26.3	1.0	ug/L	25.0	NA	105	70-130	1.55	20	
Carbon Tetrachloride	27.6	1.0	ug/L	25.0	NA	110	75-125	3.23	20	
Chlorobenzene	25.2	1.0	ug/L	25.0	NA	101	75-125	1.26	20	
Chlorodibromomethane	26.6	1.0	ug/L	25.0	NA	106	75-125	1.01	20	
Chloroethane	25.7	1.0	ug/L	25.0	NA	102	75-125	0.195	20	
Chloroform	25.6	1.0	ug/L	25.0	NA	102	75-125	0.817	20	

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Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Laboratory Control Sample Duplicate (B0A0169-BSD1)

Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloromethane	24.8	1.0	ug/L	25.0	NA	99.1	75-125	3.99	20	
cis-1,2-Dichloroethene	25.5	1.0	ug/L	25.0	NA	102	75-125	0.897	20	
cis-1,3-Dichloropropene	27.4	1.0	ug/L	25.0	NA	109	75-125	1.88	20	
Dibromomethane	26.0	1.0	ug/L	25.0	NA	104	75-125	2.26	20	
Dichlorodifluoromethane	23.6	1.0	ug/L	25.0	NA	94.1	50-120	1.20	20	
Dichlorofluoromethane	25.9	1.0	ug/L	25.0	NA	104	75-125	0.116	20	
Ethyl Ether	24.6	1.0	ug/L	25.0	NA	98.3	75-125	2.13	20	
Ethylbenzene	26.6	1.0	ug/L	25.0	NA	106	75-125	0.972	20	
Hexachlorobutadiene	26.5	2.0	ug/L	25.0	NA	106	75-125	5.11	20	
Isopropylbenzene	27.5	2.5	ug/L	25.0	NA	110	75-125	1.19	20	
m,p-Xylenes	52.1	1.0	ug/L	50.0	NA	104	75-125	1.68	20	
Methyl Isobutyl Ketone	27.1	5.0	ug/L	25.0	NA	108	75-125	3.15	20	
Methylene chloride	24.2	5.0	ug/L	25.0	NA	96.8	75-125	0.903	20	
Methyl-t-butyl ether	25.3	1.0	ug/L	25.0	NA	101	75-125	2.54	20	
Naphthalene	25.5	2.5	ug/L	25.0	NA	102	75-125	14.9	20	
n-Butylbenzene	27.7	2.5	ug/L	25.0	NA	110	75-125	0.762	20	
n-Propylbenzene	26.8	2.5	ug/L	25.0	NA	107	75-125	0.298	20	
o-Xylene	26.2	1.0	ug/L	25.0	NA	105	75-125	1.10	20	
sec-Butylbenzene	26.9	2.5	ug/L	25.0	NA	108	75-125	0.670	20	
Styrene	25.9	2.5	ug/L	25.0	NA	104	75-125	0.883	20	
tert-Butylbenzene	27.0	2.5	ug/L	25.0	NA	108	75-125	0.369	20	
Tetrachloroethene	24.8	2.0	ug/L	25.0	NA	99.2	75-125	1.76	20	
Tetrahydrofuran	24.6	5.0	ug/L	25.0	NA	98.3	75-125	7.05	20	
Toluene	24.9	1.0	ug/L	25.0	NA	99.5	75-125	2.42	20	
trans-1,2-Dichloroethene	25.4	1.0	ug/L	25.0	NA	101	75-125	0.432	20	
trans-1,3-Dichloropropene	28.7	1.0	ug/L	25.0	NA	115	75-125	2.72	20	
Trichloroethene	26.3	1.0	ug/L	25.0	NA	105	75-125	1.92	20	
Trichlorofluoromethane	26.6	1.0	ug/L	25.0	NA	106	75-125	2.05	20	
Vinyl chloride	24.8	2.5	ug/L	25.0	NA	99.2	70-130	0.00	20	
Surrogate: 1,2-Dichloroethane-d4	*24.9*		ug/L	*25.0*	*NA*	*99.6*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.4*		ug/L	*25.0*	*NA*	*97.8*	*80-120*			
Surrogate: Dibromofluoromethane	*25.4*		ug/L	*25.0*	*NA*	*102*	*80-120*			
Surrogate: Toluene-d8	*24.1*		ug/L	*25.0*	*NA*	*96.2*	*80-120*			

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Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Matrix Spike (B0A0169-MS1) **Source: 1000144-01** Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1,1,2-Tetrachloroethane	26.7	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
1,1,1-Trichloroethane	27.5	1.0	ug/L	25.0	ND	110	75-125	NA	NA	
1,1,2,2-Tetrachloroethane	26.8	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
1,1,2-Trichloroethane	26.4	1.0	ug/L	25.0	ND	105	75-125	NA	NA	
1,1,2-Trichlorotrifluoroethane	26.7	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
1,1-Dichloroethane	26.8	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
1,1-Dichloroethene	26.8	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
1,1-Dichloropropene	28.4	1.0	ug/L	25.0	ND	114	75-125	NA	NA	
1,2,3-Trichlorobenzene	30.3	1.0	ug/L	25.0	ND	121	80-130	NA	NA	
1,2,3-Trichloropropane	26.6	1.0	ug/L	25.0	ND	106	75-125	NA	NA	
1,2,4-Trichlorobenzene	28.2	1.0	ug/L	25.0	ND	112	75-125	NA	NA	
1,2,4-Trimethylbenzene	27.0	2.5	ug/L	25.0	ND	108	75-125	NA	NA	
1,2-Dibromo-3-chloropropane	27.0	10	ug/L	25.0	ND	108	75-125	NA	NA	
1,2-Dibromoethane	26.0	1.0	ug/L	25.0	ND	104	75-125	NA	NA	
1,2-Dichlorobenzene	27.4	1.0	ug/L	25.0	ND	109	75-125	NA	NA	
1,2-Dichloroethane	26.2	1.0	ug/L	25.0	ND	105	75-125	NA	NA	
1,2-Dichloropropane	26.7	1.0	ug/L	25.0	ND	106	75-125	NA	NA	
1,3,5-Trimethylbenzene	27.5	2.5	ug/L	25.0	ND	110	75-125	NA	NA	
1,3-Dichlorobenzene	26.8	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
1,3-Dichloropropane	26.3	1.0	ug/L	25.0	ND	105	75-125	NA	NA	
1,4-Dichlorobenzene	26.8	1.0	ug/L	25.0	ND	107	75-125	NA	NA	
2,2-Dichloropropane	27.9	1.0	ug/L	25.0	ND	111	75-125	NA	NA	
2-Butanone (MEK)	26.9	10	ug/L	25.0	ND	107	65-140	NA	NA	
2-Chlorotoluene	26.9	2.5	ug/L	25.0	ND	107	75-125	NA	NA	
4-Chlorotoluene	28.2	2.5	ug/L	25.0	ND	112	75-125	NA	NA	
4-Isopropyltoluene	28.0	1.0	ug/L	25.0	ND	112	75-125	NA	NA	
Acetone	30.6	15	ug/L	25.0	ND	122	60-150	NA	NA	
Allyl Chloride	27.3	1.0	ug/L	25.0	ND	109	75-125	NA	NA	
Benzene	27.0	1.0	ug/L	25.0	ND	108	75-125	NA	NA	
Bromobenzene	27.0	1.0	ug/L	25.0	ND	108	75-125	NA	NA	
Bromochloromethane	25.1	1.0	ug/L	25.0	ND	100	75-125	NA	NA	
Bromodichloromethane	27.7	1.0	ug/L	25.0	ND	111	75-125	NA	NA	
Bromoform	27.2	5.0	ug/L	25.0	ND	108	75-125	NA	NA	
Bromomethane	27.6	1.0	ug/L	25.0	ND	110	70-130	NA	NA	
Carbon Tetrachloride	28.0	1.0	ug/L	25.0	ND	112	75-125	NA	NA	
Chlorobenzene	25.8	1.0	ug/L	25.0	ND	103	75-125	NA	NA	
Chlorodibromomethane	27.1	1.0	ug/L	25.0	ND	108	75-125	NA	NA	
Chloroethane	26.9	1.0	ug/L	25.0	ND	108	75-125	NA	NA	
Chloroform	26.4	1.0	ug/L	25.0	ND	105	75-125	NA	NA	

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Wenck Associates, Inc. 1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249	Client Ref: Lower Minn. Bank Client Contact: Mr. Wes Boll PO Number: 1426-08	Work Order #: 1000144 Project Mgr: Steven J. Albrecht Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Matrix Spike (B0A0169-MS1) **Source: 1000144-01** Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloromethane	27.1	1.0	ug/L	25.0	0.600	106	75-125	NA	NA	
cis-1,2-Dichloroethene	26.3	1.0	ug/L	25.0	ND	105	75-125	NA	NA	
cis-1,3-Dichloropropene	27.6	1.0	ug/L	25.0	ND	110	75-125	NA	NA	
Dibromomethane	26.3	1.0	ug/L	25.0	ND	105	75-125	NA	NA	
Dichlorodifluoromethane	24.0	1.0	ug/L	25.0	ND	95.9	50-120	NA	NA	
Dichlorofluoromethane	27.1	1.0	ug/L	25.0	ND	108	75-125	NA	NA	
Ethyl Ether	25.7	1.0	ug/L	25.0	ND	103	75-125	NA	NA	
Ethylbenzene	27.4	1.0	ug/L	25.0	ND	110	75-125	NA	NA	
Hexachlorobutadiene	29.4	2.0	ug/L	25.0	ND	117	75-125	NA	NA	
Isopropylbenzene	28.4	2.5	ug/L	25.0	ND	113	75-125	NA	NA	
m,p-Xylenes	53.8	1.0	ug/L	50.0	ND	108	75-125	NA	NA	
Methyl Isobutyl Ketone	26.9	5.0	ug/L	25.0	ND	107	75-125	NA	NA	
Methylene chloride	24.8	5.0	ug/L	25.0	ND	99.0	75-125	NA	NA	
Methyl-t-butyl ether	26.4	1.0	ug/L	25.0	ND	106	75-125	NA	NA	
Naphthalene	29.5	2.5	ug/L	25.0	ND	118	75-125	NA	NA	
n-Butylbenzene	28.3	2.5	ug/L	25.0	ND	113	75-125	NA	NA	
n-Propylbenzene	27.8	2.5	ug/L	25.0	ND	111	75-125	NA	NA	
o-Xylene	26.7	1.0	ug/L	25.0	ND	106	75-125	NA	NA	
sec-Butylbenzene	28.2	2.5	ug/L	25.0	ND	112	75-125	NA	NA	
Styrene	26.5	2.5	ug/L	25.0	ND	106	75-125	NA	NA	
tert-Butylbenzene	28.4	2.5	ug/L	25.0	ND	113	75-125	NA	NA	
Tetrachloroethene	26.3	2.0	ug/L	25.0	ND	105	75-125	NA	NA	
Tetrahydrofuran	26.2	5.0	ug/L	25.0	ND	105	75-125	NA	NA	
Toluene	25.8	1.0	ug/L	25.0	ND	103	75-125	NA	NA	
trans-1,2-Dichloroethene	26.6	1.0	ug/L	25.0	ND	106	75-125	NA	NA	
trans-1,3-Dichloropropene	28.8	1.0	ug/L	25.0	ND	115	75-125	NA	NA	
Trichloroethene	26.6	1.0	ug/L	25.0	ND	106	75-125	NA	NA	
Trichlorofluoromethane	27.9	1.0	ug/L	25.0	ND	111	75-125	NA	NA	
Vinyl chloride	26.0	2.5	ug/L	25.0	ND	104	70-130	NA	NA	
Surrogate: 1,2-Dichloroethane-d4	*25.3*		ug/L	*25.0*	*NA*	*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.3*		ug/L	*25.0*	*NA*	*97.2*	*80-120*			
Surrogate: Dibromofluoromethane	*25.4*		ug/L	*25.0*	*NA*	*102*	*80-120*			
Surrogate: Toluene-d8	*24.3*		ug/L	*25.0*	*NA*	*97.1*	*80-120*			

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Wenck Associates, Inc.	Client Ref: Lower Minn. Bank	Work Order #: 1000144
1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Matrix Spike Duplicate (B0A0169-MSD1) **Source: 1000144-01** Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1,1,2-Tetrachloroethane	26.6	1.0	ug/L	25.0	ND	106	75-125	0.525	20	
1,1,1-Trichloroethane	27.1	1.0	ug/L	25.0	ND	108	75-125	1.65	20	
1,1,2,2-Tetrachloroethane	26.8	1.0	ug/L	25.0	ND	107	75-125	0.112	20	
1,1,2-Trichloroethane	26.2	1.0	ug/L	25.0	ND	104	75-125	0.800	20	
1,1,2-Trichlorotrifluoroethane	26.4	1.0	ug/L	25.0	ND	106	75-125	0.978	20	
1,1-Dichloroethane	26.2	1.0	ug/L	25.0	ND	104	75-125	2.30	20	
1,1-Dichloroethene	25.8	1.0	ug/L	25.0	ND	103	75-125	3.80	20	
1,1-Dichloropropene	28.1	1.0	ug/L	25.0	ND	112	75-125	1.06	20	
1,2,3-Trichlorobenzene	28.5	1.0	ug/L	25.0	ND	114	80-130	6.08	20	
1,2,3-Trichloropropane	26.8	1.0	ug/L	25.0	ND	107	75-125	0.750	20	
1,2,4-Trichlorobenzene	27.1	1.0	ug/L	25.0	ND	108	75-125	3.73	20	
1,2,4-Trimethylbenzene	26.0	2.5	ug/L	25.0	ND	104	75-125	3.84	20	
1,2-Dibromo-3-chloropropane	25.8	10	ug/L	25.0	ND	103	75-125	4.62	20	
1,2-Dibromoethane	26.1	1.0	ug/L	25.0	ND	104	75-125	0.538	20	
1,2-Dichlorobenzene	27.0	1.0	ug/L	25.0	ND	108	75-125	1.43	20	
1,2-Dichloroethane	26.0	1.0	ug/L	25.0	ND	104	75-125	0.727	20	
1,2-Dichloropropane	26.7	1.0	ug/L	25.0	ND	107	75-125	0.187	20	
1,3,5-Trimethylbenzene	26.4	2.5	ug/L	25.0	ND	105	75-125	4.13	20	
1,3-Dichlorobenzene	26.1	1.0	ug/L	25.0	ND	104	75-125	2.84	20	
1,3-Dichloropropane	26.2	1.0	ug/L	25.0	ND	105	75-125	0.343	20	
1,4-Dichlorobenzene	26.2	1.0	ug/L	25.0	ND	105	75-125	2.38	20	
2,2-Dichloropropane	27.4	1.0	ug/L	25.0	ND	109	75-125	1.74	20	
2-Butanone (MEK)	26.0	10	ug/L	25.0	ND	104	65-140	3.21	25	
2-Chlorotoluene	26.1	2.5	ug/L	25.0	ND	104	75-125	2.95	20	
4-Chlorotoluene	27.2	2.5	ug/L	25.0	ND	108	75-125	3.69	20	
4-Isopropyltoluene	27.1	1.0	ug/L	25.0	ND	108	75-125	3.30	20	
Acetone	29.4	15	ug/L	25.0	ND	117	60-150	4.13	30	
Allyl Chloride	26.6	1.0	ug/L	25.0	ND	106	75-125	2.78	20	
Benzene	26.5	1.0	ug/L	25.0	ND	106	75-125	2.06	20	
Bromobenzene	26.3	1.0	ug/L	25.0	ND	105	75-125	2.89	20	
Bromochloromethane	25.1	1.0	ug/L	25.0	ND	100	75-125	0.279	20	
Bromodichloromethane	27.4	1.0	ug/L	25.0	ND	109	75-125	1.16	20	
Bromoform	27.1	5.0	ug/L	25.0	ND	108	75-125	0.406	20	
Bromomethane	26.1	1.0	ug/L	25.0	ND	104	70-130	5.48	20	
Carbon Tetrachloride	27.6	1.0	ug/L	25.0	ND	110	75-125	1.62	20	
Chlorobenzene	25.6	1.0	ug/L	25.0	ND	102	75-125	0.661	20	
Chlorodibromomethane	27.1	1.0	ug/L	25.0	ND	108	75-125	0.111	20	
Chloroethane	26.4	1.0	ug/L	25.0	ND	105	75-125	1.95	20	
Chloroform	26.1	1.0	ug/L	25.0	ND	104	75-125	1.26	20	

BRAUN INTERTEC

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Minneapolis, MN 55438
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Wenck Associates, Inc.	Client Ref: Lower Minn. Bank	Work Order #: 1000144
1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

Volatile Organic Compounds - Quality Control

Batch B0A0169 - EPA 5030B

Matrix Spike Duplicate (B0A0169-MSD1) **Source: 1000144-01** Prepared & Analyzed: 01/15/10

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloromethane	26.7	1.0	ug/L	25.0	0.600	104	75-125	1.37	20	
cis-1,2-Dichloroethene	26.1	1.0	ug/L	25.0	ND	104	75-125	0.915	20	
cis-1,3-Dichloropropene	27.2	1.0	ug/L	25.0	ND	108	75-125	1.72	20	
Dibromomethane	26.1	1.0	ug/L	25.0	ND	104	75-125	0.572	20	
Dichlorodifluoromethane	23.6	1.0	ug/L	25.0	ND	94.3	50-120	1.72	20	
Dichlorofluoromethane	26.7	1.0	ug/L	25.0	ND	107	75-125	1.30	20	
Ethyl Ether	25.8	1.0	ug/L	25.0	ND	103	75-125	0.310	20	
Ethylbenzene	27.1	1.0	ug/L	25.0	ND	108	75-125	1.25	20	
Hexachlorobutadiene	29.4	2.0	ug/L	25.0	ND	117	75-125	0.0340	20	
Isopropylbenzene	28.0	2.5	ug/L	25.0	ND	112	75-125	1.31	20	
m,p-Xylenes	53.2	1.0	ug/L	50.0	ND	106	75-125	1.18	20	
Methyl Isobutyl Ketone	26.5	5.0	ug/L	25.0	ND	106	75-125	1.57	20	
Methylene chloride	24.4	5.0	ug/L	25.0	ND	97.3	75-125	1.75	20	
Methyl-t-butyl ether	26.2	1.0	ug/L	25.0	ND	105	75-125	0.797	20	
Naphthalene	28.0	2.5	ug/L	25.0	ND	112	75-125	5.01	20	
n-Butylbenzene	27.4	2.5	ug/L	25.0	ND	109	75-125	3.20	20	
n-Propylbenzene	27.3	2.5	ug/L	25.0	ND	109	75-125	1.81	20	
o-Xylene	26.5	1.0	ug/L	25.0	ND	106	75-125	0.677	20	
sec-Butylbenzene	27.6	2.5	ug/L	25.0	ND	110	75-125	2.08	20	
Styrene	26.4	2.5	ug/L	25.0	ND	105	75-125	0.189	20	
tert-Butylbenzene	27.6	2.5	ug/L	25.0	ND	110	75-125	2.61	20	
Tetrachloroethene	26.0	2.0	ug/L	25.0	ND	104	75-125	1.11	20	
Tetrahydrofuran	26.2	5.0	ug/L	25.0	ND	105	75-125	0.00	20	
Toluene	25.6	1.0	ug/L	25.0	ND	102	75-125	1.05	20	
trans-1,2-Dichloroethene	26.0	1.0	ug/L	25.0	ND	104	75-125	2.47	20	
trans-1,3-Dichloropropene	28.7	1.0	ug/L	25.0	ND	115	75-125	0.487	20	
Trichloroethene	26.2	1.0	ug/L	25.0	ND	105	75-125	1.25	20	
Trichlorofluoromethane	27.5	1.0	ug/L	25.0	ND	110	75-125	1.62	20	
Vinyl chloride	25.7	2.5	ug/L	25.0	ND	103	70-130	1.01	20	
Surrogate: 1,2-Dichloroethane-d4	*25.4*		ug/L	*25.0*	*NA*	*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.5*		ug/L	*25.0*	*NA*	*98.0*	*80-120*			
Surrogate: Dibromofluoromethane	*25.5*		ug/L	*25.0*	*NA*	*102*	*80-120*			
Surrogate: Toluene-d8	*24.3*		ug/L	*25.0*	*NA*	*97.4*	*80-120*			

BRAUN INTERTEC

11001 Hampshire Ave. S.
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Wenck Associates, Inc.	Client Ref: Lower Minn. Bank	Work Order #: 1000144
1800 Pioneer Creek Center P.O. Box 249	Client Contact: Mr. Wes Boll	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359-0249	PO Number: 1426-08	Account ID: W02540

For Braun Intertec Use Only
Laboratory Work Order No: 1000144

BRAUN INTERTEC
Braun Intertec Corporation
11001 Hampshire Ave. S
Minneapolis, MN 55438

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Bottle orders and sampling inquires:
labservices@braunintertec.com
Phone: 952-995-2600 Fax: 952-995-2601

IMPORTANT
Date Results Requested: 1/20/10
Time: noon if possible
Rush Charges Authorized? ___ Yes ___ No
Rush / Quote #

Page 1 of 1

001537

REPORT RESULTS TO
Contact Name: Joel Toso
Project ID/Name: Lower Minn. Bank
P.O. #/Project #: 1426-08
Company: Wenck
Mailing Address: 1800 Pioneer Creek Center
City, State, Zip: Maple Plain MN 55359
Telephone #: 763-479-4231
Fax #: 763-479-4242
E-mail: jtoso@wenck.com

SEND INVOICE TO
Contact Name | Company
Address
City, State, Zip
Telephone # | Fax #

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, petrofund, reporting units)

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)
Site Location (State): MN

LAB ID#	CLIENT SAMPLE IDENTIFICATION (IDs must be unique)	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	VOLUME/AREA (specify units)	Number of Containers	Metals Field Filtered Y/N	VOCs	Heavy Metals	Chloride	SVOCs	Organics HTM					FOR LAB USE ONLY
	1A	1/13/10	3:20	water				✓									
	1B	"	3:22	"				✓									
	1C	"	3:23	"				✓									
	2	"	3:25	"					✓	X							
	3	"	3:27	"							X						
	4	"	3:28	"					X								
	5	"	3:28	soil								✓					

CHAIN OF CUSTODY
Collected by: (Print) Joel Toso
Collector's Signature: [signature]
Relinquished by: | Date/Time
Received by: | Date/Time
Relinquished by: | Date/Time
Received Contents Not Verified: | Date/Time
Custody Seal Intact ☐ Yes ☐ No ☐ N/A ☒ Hand Delivered by Client
On Ice ☐ Yes ☒ No
Received Contents Verified: [signature] | Date/Time 1/13/10 1555
Temp Blank ☒ Yes ☐ No
Comments:
Temp: 14.2 °C

Form # CS02.03 F:\Groups\QA_QC\Forms\clientservices\COC_CS02 Effective Date: 10/10/07