Lost River Design Report

Prepared For:

Red Lake Watershed District
Thief River Falls, Minnesota

June 2003

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Lost River Design Report
Red Lake Watershed District
Thief River Falls, MN 56701
June 23, 2003

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a Licensed Professional Engineer under the laws of the State of Minnesota.

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for
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I. INTRODUCTION

The Red Lake Watershed District commissioned Houston Engineering to evaluate alternative erosion control methods for a reach of the Lost River. The District is proposing this project as a demonstration on the use of emerging technology and innovative approaches toward erosion control, stream stabilization, and water quality improvements.

The project goals are to directly reduce erosion and improve water quality in the Lost River through implementation of erosion control measures in an eroding reach, as well as indirectly improve water quality in the region through education and information on the use of innovative and emerging erosion control methods/technologies.

II. LOCATION

The project site is located on the Lost River within Sections 5 and 6 of Gully Township, Polk County. Figure 1 is an aerial photo of the project location.

Figure 1. Lost River at CSAH 28, Sections 5 and 6 Gully Township[1]

The topography of the river basin in this area is typical of a glacial lake-washed plain. Figure 2 and Figure 3 are maps of the project location and the geomorphic regions of the Red Lake Watershed District.

[1] U.S. Geological Survey, Aerial Photo from May 1991, website: http://terraserver.homeadvisor.msn.com

Figure 2. Project Location

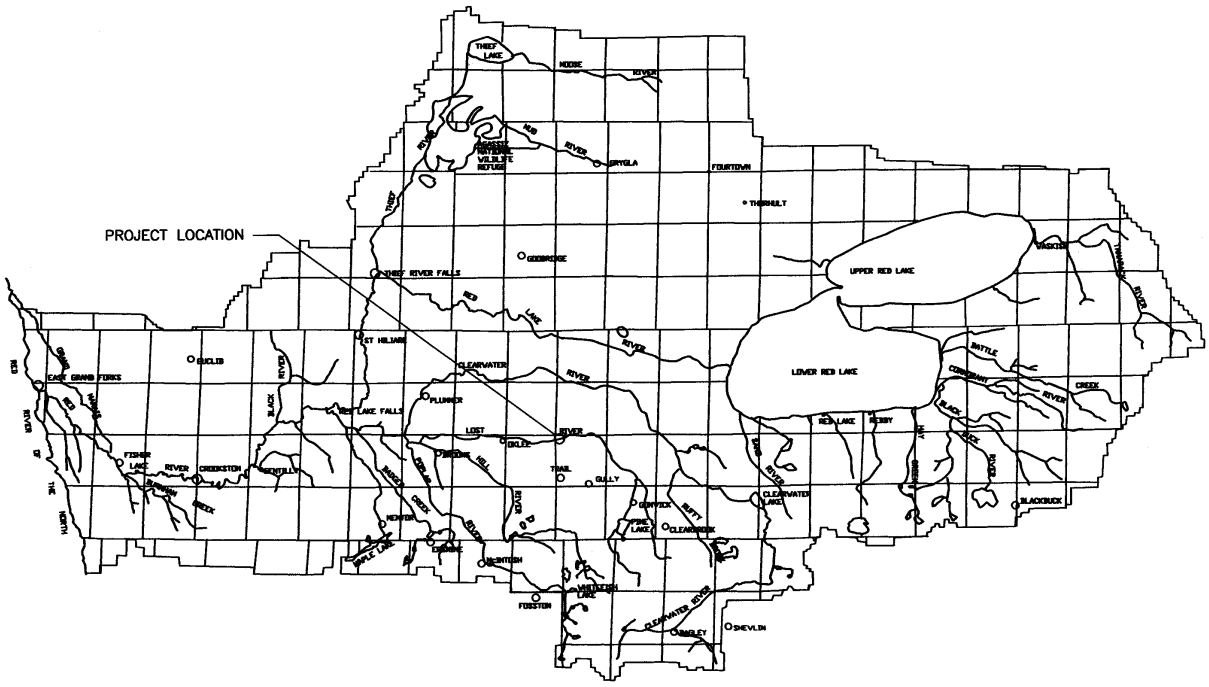
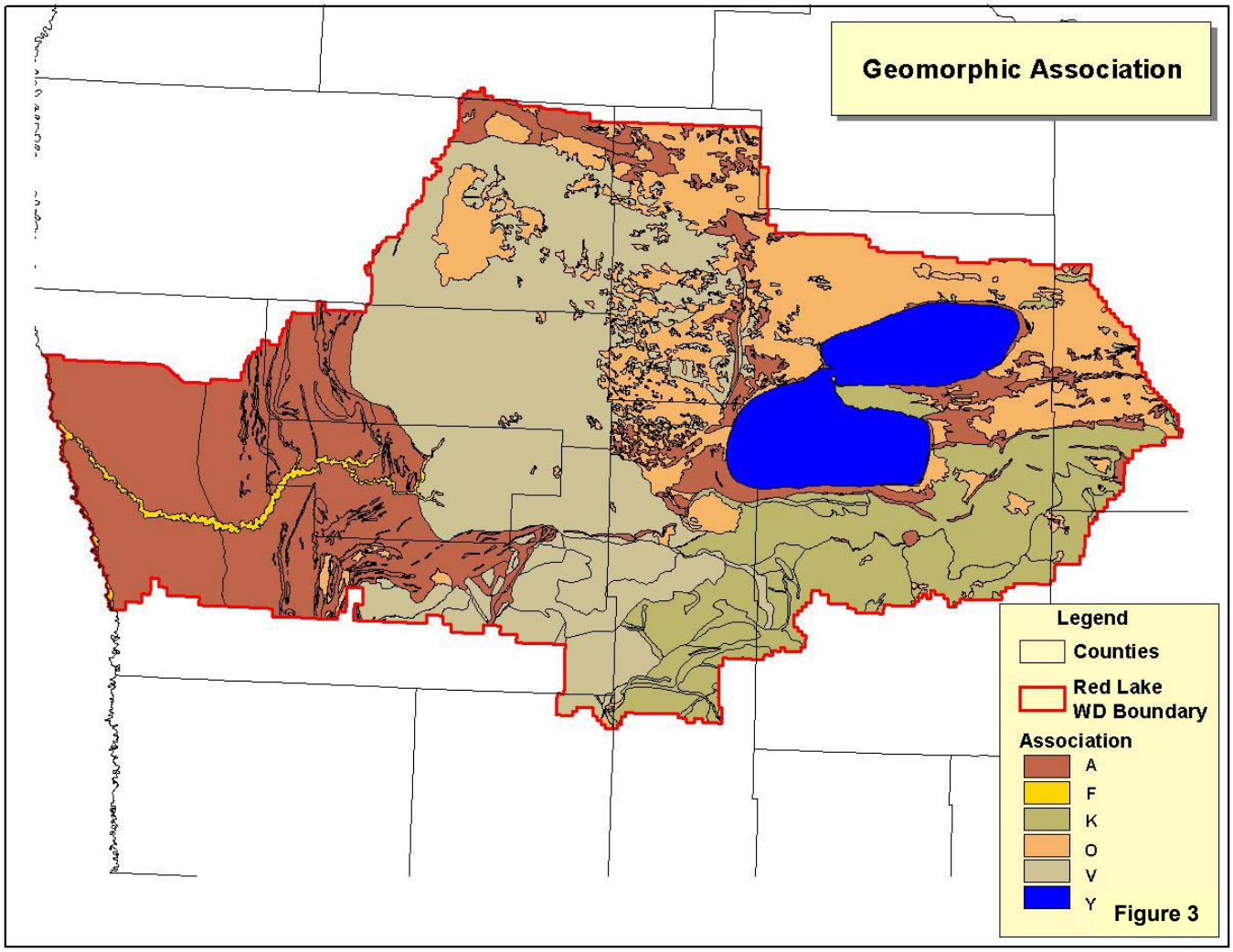


Figure 3. Geomorphic Associations of Red Lake Watershed District

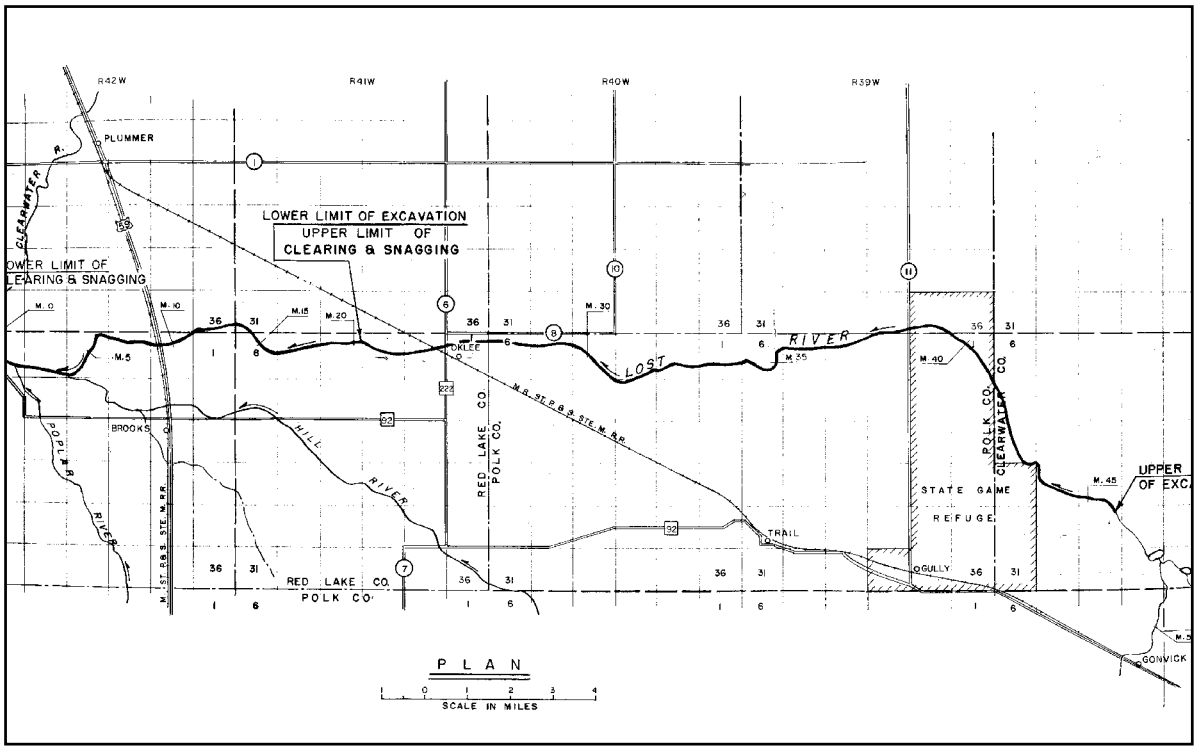


A. Corps Channel Project

In 1965 the U.S. Army Corps of Engineers completed a channel improvement project on the Lost River. The Red Lake Watershed District was the local sponsor. The channel project has the status of a Minnesota Public Drainage System. A benefited area was established as part of the project to allow for construction and maintenance costs to be assessed to benefiting lands. A portion of the original project costs were assessed to the benefited area, and ditch maintenance costs that are incurred are also levied over the benefited area.

The Corps project included clearing and snagging on the lower 20 miles of the Lost River as well as channel work in a reach of approximately 23 miles. The whole project extends from the confluence with the Clearwater River near Brooks to Section 28 of Winsor Township near Gonvick. The clearing and snagging project extended from the river mouth to the west edge of section 3, T150N, R41W Red Lake County. Channel excavation began at this point, river mile 20.25, about two miles west of Oklee. The channel excavation extended 23 miles upstream to river mile 43.3 in the Northeast ¼ of Section 28, T150N, R38W, Clearwater County. Figure 4 is a location map of the Corps project showing the clearing and excavation limits.

Figure 4. Location Map of Corps Flood Control Project on Lost River



The channel design section varied in size along the project reach. A trapezoidal channel was constructed having a bottom width varying from 10 feet to 45 feet,

3:1 sideslopes, and a 20 foot wide berm separating the channel slope from the spoil banks placed along both sides of the channel[2].

The project site is located near the midpoint of the reach of channel excavation at River Mile 32.5, within Sections 5 and 6 of Gully Township, T150N, R39W, Polk County. The site is about 4 ½ miles north of Trail. Table 1 lists the permanent right of way established for the Corps project.

Table 1

Corps Stationing	RLWD 2001 Stationing	Right of way centered on channel
639+90	2+00	
		250 feet
653+20	15+00	
		300 feet
698+00	30+00	

[2] Flood Control Channel Improvement; Local Flood Protection Project, Lost River, Minnesota; U.S. Army Engineer District, St. Paul; Corps of Engineers, July 1963.

III. SURVEY

The Lost River channel in the project area was surveyed in November 2001 by the Red Lake Watershed District survey crew. The channel alignment, bottom profile and cross-sections were measured within a reach of approximately 3000 feet. Figure 5 is an aerial photo of the site showing the approximate survey extents. Appendix A includes the plotted cross-sections and channel profile.

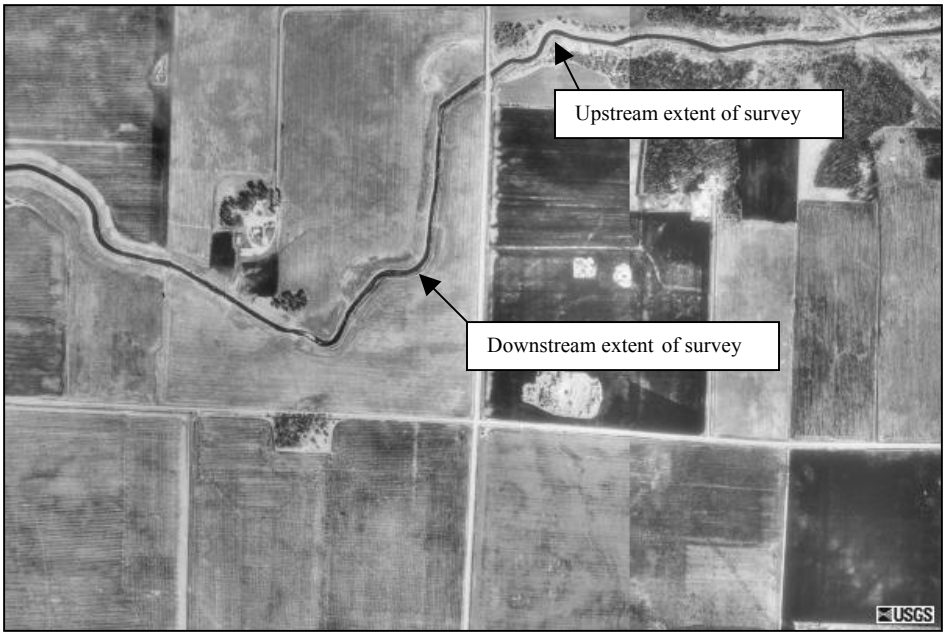
Survey Benchmark: The survey was based on a benchmark described as:

> *Chiseled "X" on top of concrete curb, S.E. corner of C.S.A.H. 28 bridge over Lost River, Elevation = 1156.05, Datum of 1929.*

We compared bridge and channel elevations to those shown on the Corps' Local Flood Protection Project plans dated July 1963, as well as the Polk County Highway Department plans for the bridge on CSAH 28. Both the Corps project and the Bridge plans are in mean sea level datum of 1912. The conversion to RLWD Datum is:

RLWD *in 1929 Datum* = Corps *in 1912 Datum* - 5 feet.

Figure 5. Lost River at CSAH 28, Sections 5 and 6 Gully Township



IV. HYDROLOGY

The drainage area of the Lost River is approximately 159 square miles at the project site. A drainage area transfer method was used to determine flow versus frequency relations at the project site, based upon the published flow data from the USGS gauging station on the Lost River at Oklee. Table 2 provides the flow-frequency data published for the Oklee gauging station and calculated for the project site.

Table 2

Recurrence Interval	Lost River at Oklee: Peak Flow[3]	Lost River at Section 6 Gully Township: Peak Flow (by drainage area transfer method)
1.05-yr	318	233
1.11-yr	437	320
1.25-yr	632	463
2-yr	1200	879
5-yr	2130	1552
10-yr	2800	2038
25-yr	3660	2665
50-yr	4310	3143
100-yr	4950	3614
Drainage Area (sq. mi.)	254	159.4

A. Hydraulics

The Army Corps of Engineers' River Analysis System (HEC-RAS) step-backwater computer program[4] was used to complete the channel and bridge hydraulic analyses. This program uses the channel geometry, channel roughness coefficients, and bridge information, to determine the water surface elevations corresponding to the flow rates of interest. The model was started with input tail water levels determined for normal depth with an energy slope of .00033.

[3] High-Streamflow Statistics of Selected Streams in the Red River of the North Basin, ND, MN, SD, and Manitoba; U.S. Geological Survey Open File Report 00-344

[4] U.S. Army Corps of Engineers HEC-RAS River Analysis System Hydrologic Engineering Center Davis CA Version 2, April 1997.

Channel and overbank Manning friction factors were assumed to be .03 and .05, respectively.

The model was checked by comparing the computed water surface profile to that observed during the survey of the channel in November of 2001. The flow at the project site was estimated in relation to the flow recorded at the USGS gauging station at Oklee (by drainage area transfer method). Figure 6 is a hydrograph showing flows recorded at the Oklee gauging station in late fall 2001, and showing flows estimated at the project site. The simulated water surface profile closely matched the water surface recorded by the RLWD survey crew. Figure 7 is a profile drawing showing the channel bottom within the study reach as well as the observed water surface elevations and the computed water surface profile. Figure 8 is a profile drawing showing the computed water surface profiles for a range of floods from the 1.25-year to the 100-year events.

Figure 6. Flows during RLWD Survey

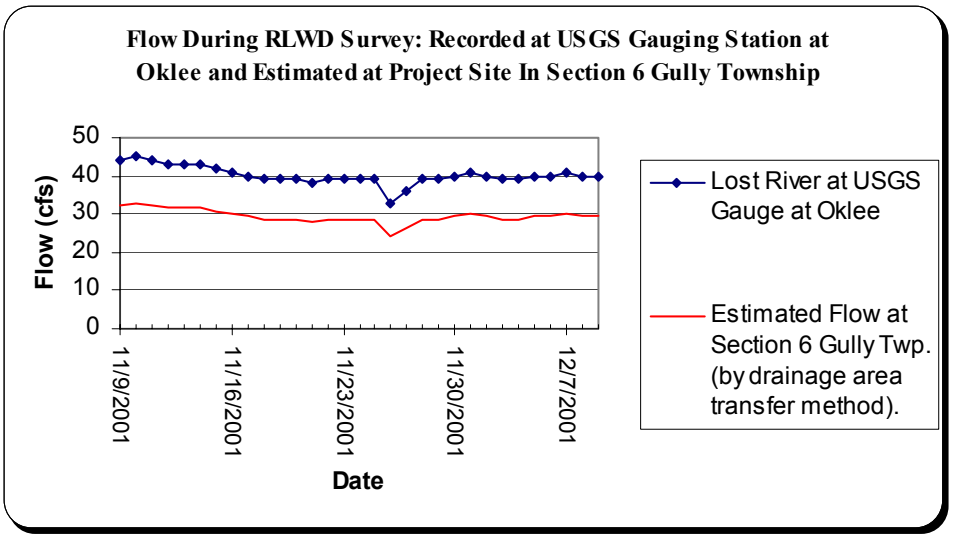


Figure 7. Hydraulic Model Verification

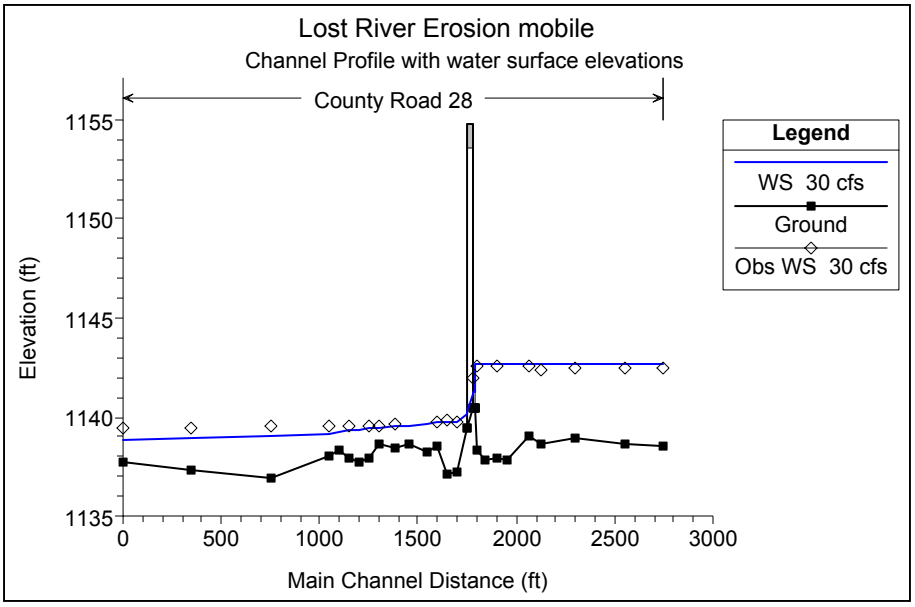
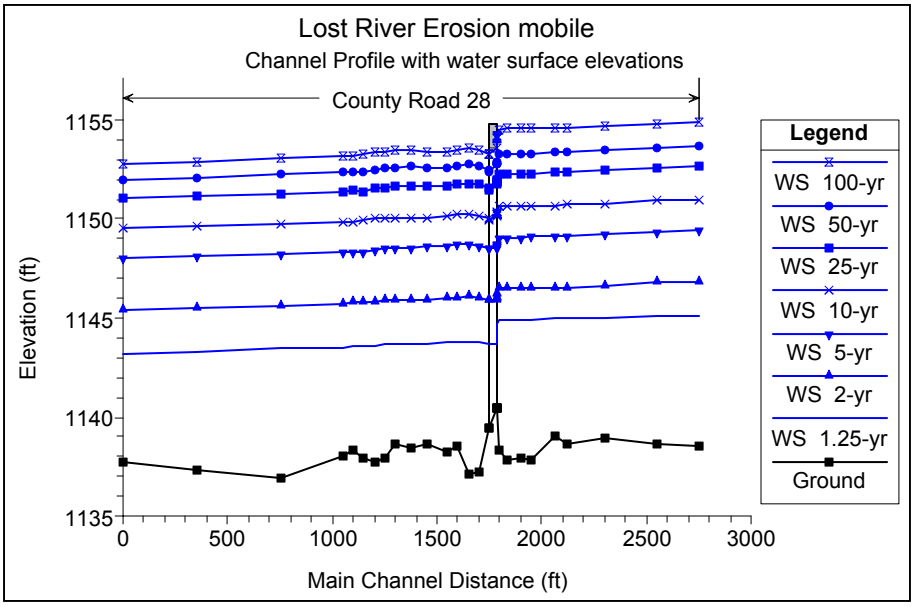


Figure 8. Water Surface Profile



B. Channel Capacity

The Corps project design capacity within Section 6 of Gully Township transitioned from 610 cfs upstream of CSAH 28 to 830 cfs downstream from CSAH 28.[5] The design water surface elevation of 1152.7 feet (1912 datum) at the highway bridge is equivalent to 1147.7 feet (1929 datum). The design flow of 830 cfs is approximately a two-year peak flow rate according to the recent hydrologic analysis. The two-year peak water surface elevation at the highway bridge is 1146.0 (1929 datum). The 5-year flow of 1552 cfs would result in a channel water surface elevation of approximately 1148.7. The Corps design water surface elevation of 1147.7 feet has a present day capacity of 1300 cfs and a recurrence interval of approximately 3.3 years.

C. Channel Profile Changes Over Time

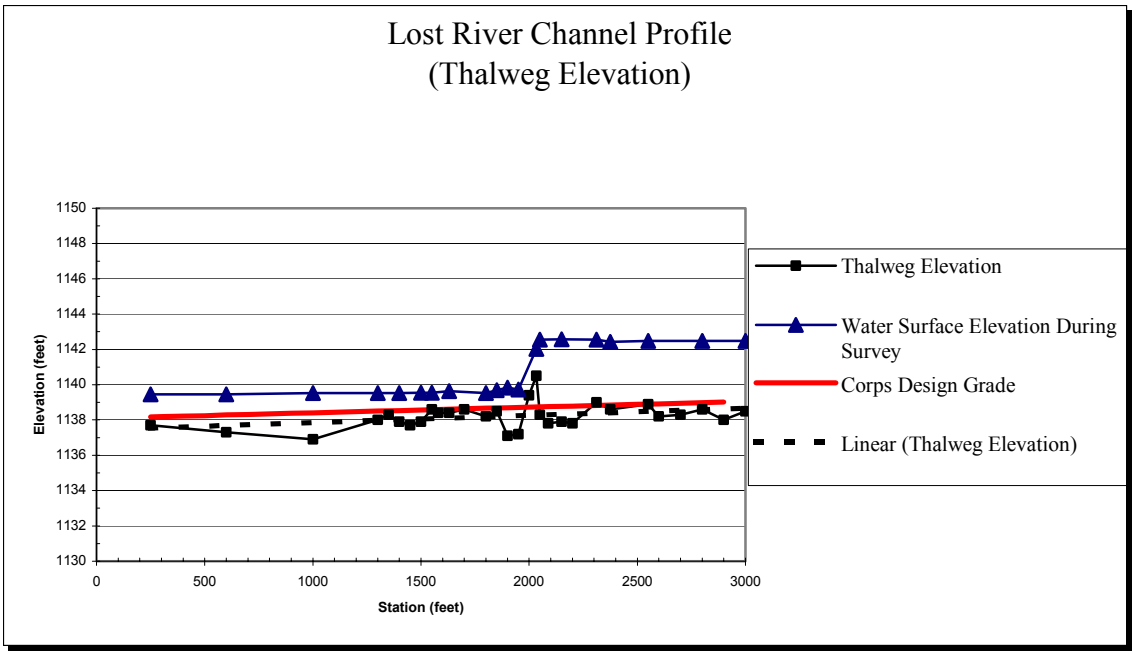
The Corps channel work lowered the bottom profile of the Lost River by approximately 4 feet in the project area. The difference in river bottom profile (pre- and post- construction) varied from about 3 feet to 5 feet. We determined the datum adjustment necessary to convert the Corps plans to current datum. The following equation is appropriate for converting between the various datums:

$$\text{RLWD}_{\textit{in 1929 Datum}} = \text{Corps}_{\textit{in 1912 Datum}} - 5 \text{ feet.}$$

The Corps used a design grade of .033% through the reach including Section 6 of Gully Township. The recent survey shows that the channel bottom profile fluctuates, but generally follows a slope of .039%. Figure 9 is a channel profile drawing showing the existing channel profile, the Corps design profile and the water surface profile observed during the 2001 survey. The existing channel bottom is very near to the design grade line set by the Corps.

[5] General Design Memorandum, Flood Control and Major Drainage; Lost River, Minnesota; U.S. Army Engineer District, St. Paul; Corps of Engineers, March 1960

Figure 9. Lost River Profile Drawing



D. Channel Cross-Section Changes Over Time

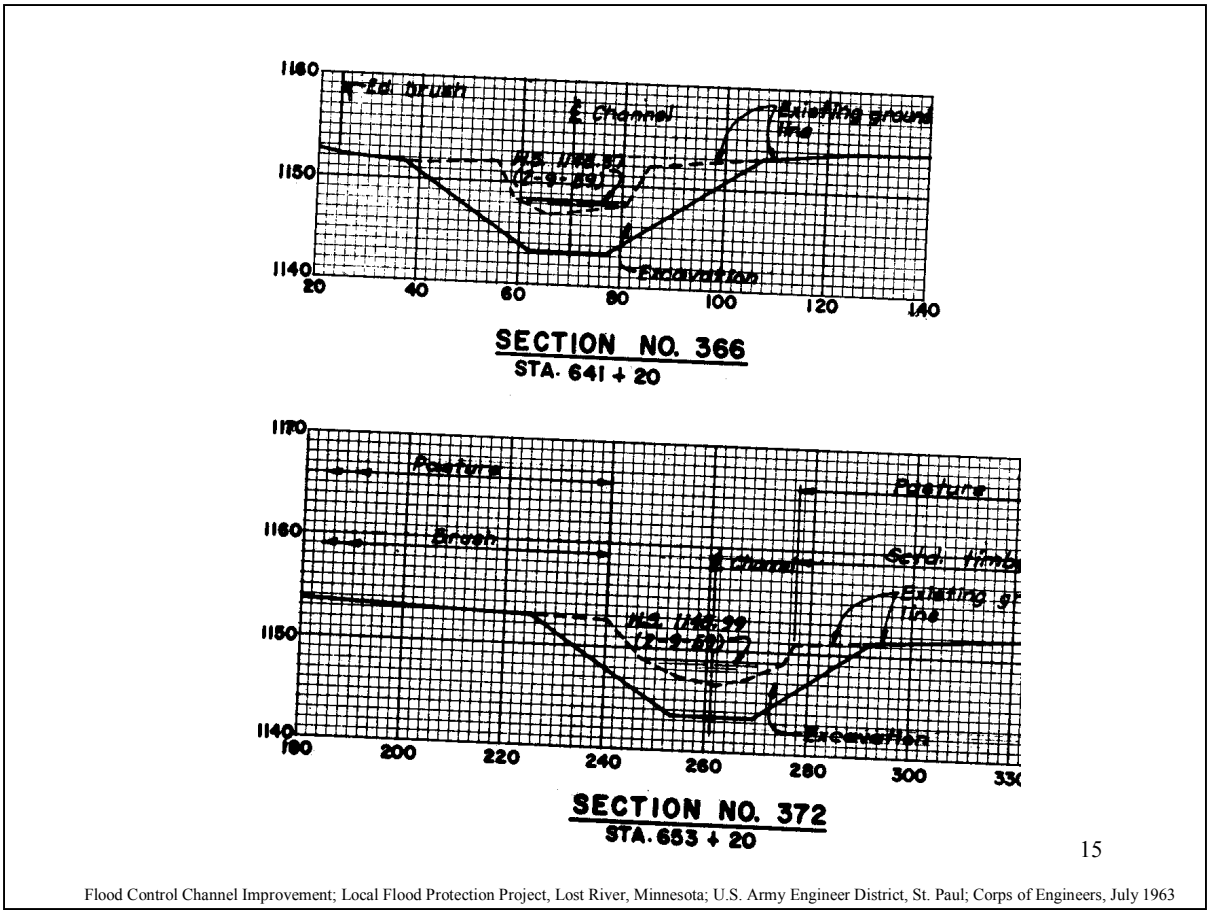
Figure 10 and 11 show the Corps design cross section overlaid upon the 1959 Lost River channel cross section. Figure 12 shows the Lost River channel section in 1959, the Corps Design Channel section and Lost River cross-sections in 2001.

It is interesting to note, however, that the channel has adjusted to form a shape similar to that in 1959--despite the construction work to create a trapezoidal channel with 15-foot bottom width and 3:1 side slopes. The channel bottom width has widened beyond the design 15-foot width, and the side slopes have become steeper than the constructed slopes of 3:1 (horizontal to vertical).

The old channel (pre-Corps) appeared to have a bank-full width of approximately 30 feet and a bank full depth of approximately 5 feet. The old channel also had an extensive flood plain. Once the flow depth exceeded the old bank-full depth, flow could spread out over the relatively flat floodplain along the channel.

Many of the current cross-sections have similar geometric dimensions to the pre-Corps channel, at least in the region below the floodplain bench. The floodplain bench that is forming currently is narrow and flood flows are essentially confined within the channel. While this may be good from a flood control perspective, it generally results in higher shear stresses and velocities than would develop if floods were spread over a wider floodplain rather than contained within an entrenched channel.

Figure 10. Corps Design Cross-Section Overlaid upon the 1959 Lost River Channel Cross-Section



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Flood Control Channel Improvement; Local Flood Protection Project, Lost River, Minnesota; U.S. Army Engineer District, St. Paul; Corps of Engineers, July 1963

Figure 11. Corps Design Cross-Section Overlaid upon the 1959 Lost River Channel Cross-Section.

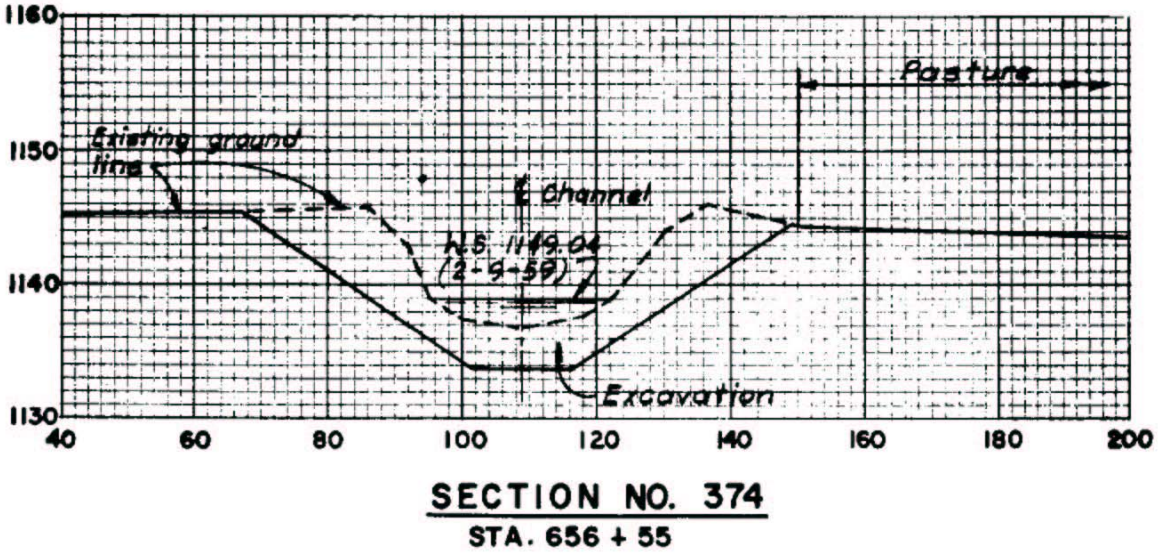
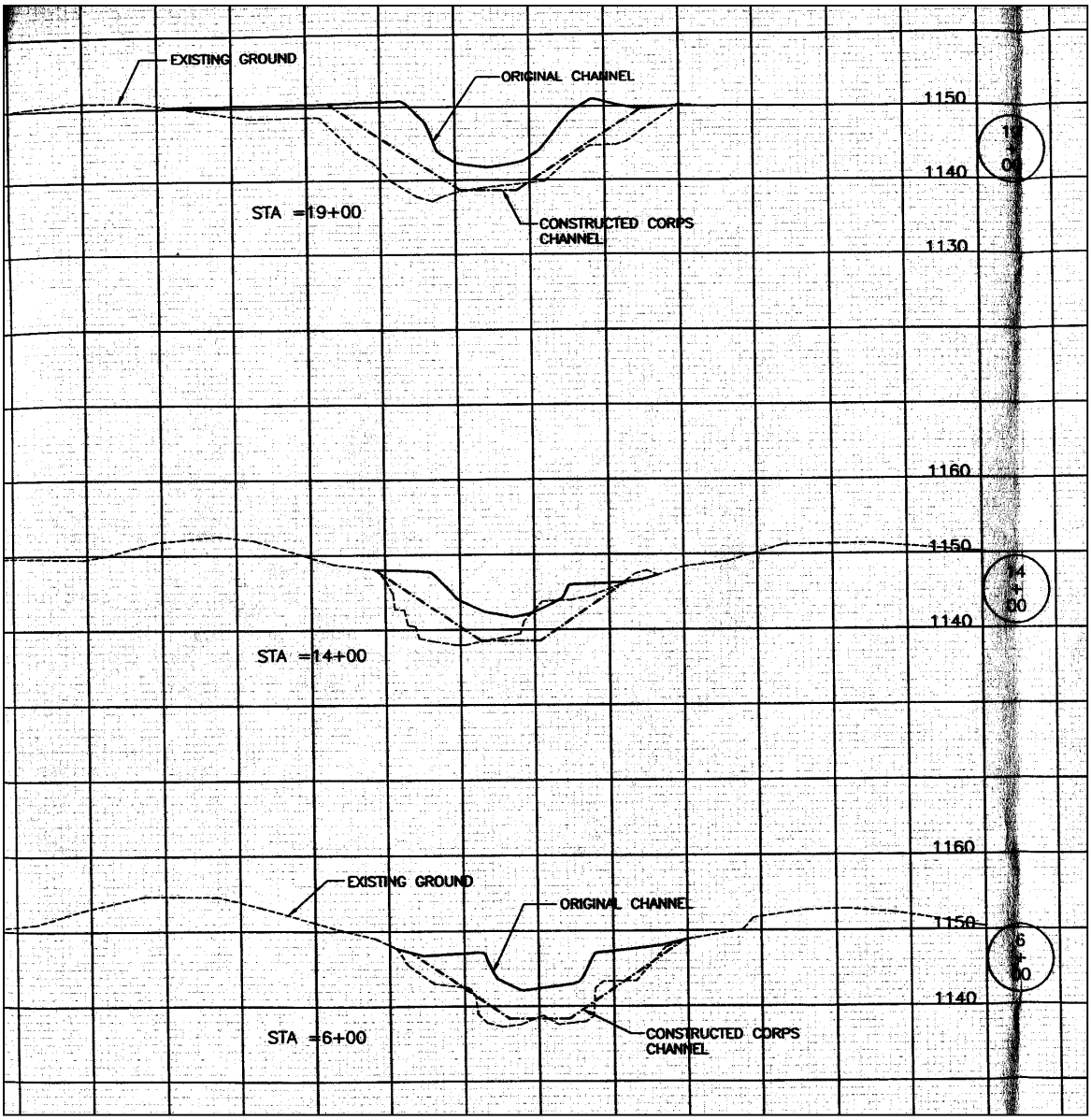


Figure 12. Lost River Channel Section in 1959, the Corps Design Channel Section and Lost River Cross-Sections in 2001



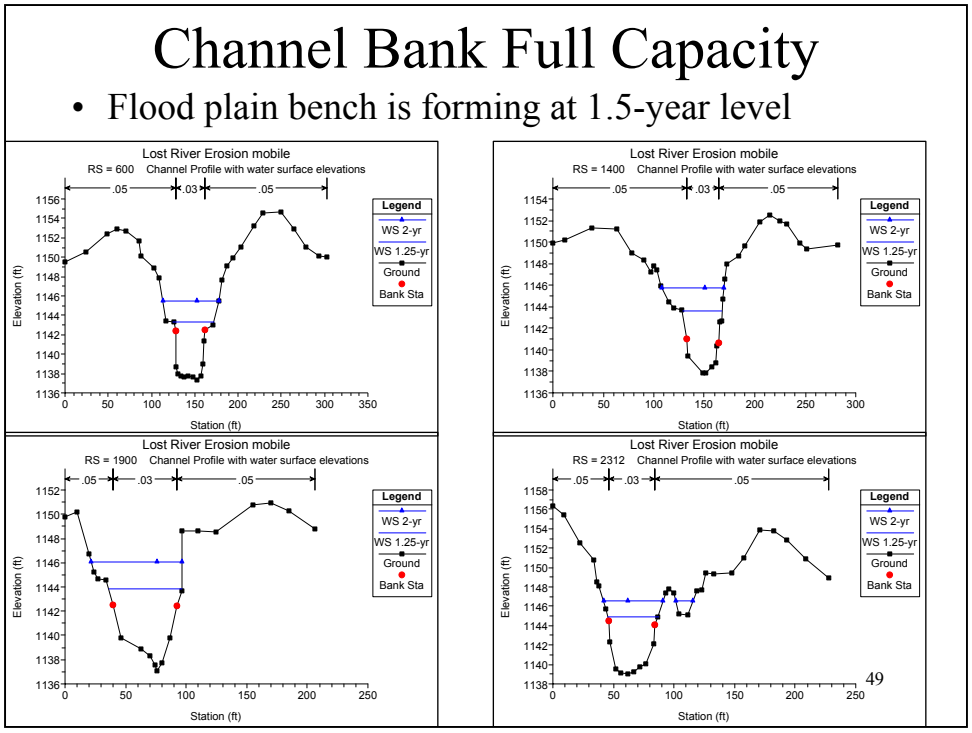
E. Channel Bank - Full Capacity

River and stream channels form with capacity to transport the flow and sediment from their watersheds. The bank-full capacity is defined as the channel forming or channel maintaining flow. For most rivers and streams the recurrence interval

of the bank-full flow is 1.5 years[6]. Figure 13 shows channel cross sections with water surface profiles for the 1.25-year and 2-year recurrence peak flows. Inspection of the cross sections indicates that channel erosion and sediment deposition is forming a floodplain bench at the approximate elevation of the 1.5-year peak flow.

The two-year recurrence interval peak flow is estimated to be 880 cfs. The 1.5 to 2 year recurrence interval flows are generally considered to be the channel forming flows. Natural stream channels evolve to carry flows of this general magnitude within their banks, while higher flows are carried by both the channel and adjacent floodplain.

Figure 13. Channel Cross-Sections



[6] Water, Rivers and Creeks, Luna B. Leopold, 1997 p. 84

V. STREAM CLASSIFICATION

Rivers and streams can be classified using measurements and descriptions of the stream cross-section, meander pattern, bottom profile, and bed materials. "The fundamental components of river morphology are its dimension, pattern, and profile. These components represent the integrated response of a river that enables it to be in balance with the prevailing energy gradients, sediment supply and sediment transport characteristics[7]."

Table 3 presents a summary of channel characteristics using the Rosgen stream classification method.

Table 3

	2001 Channel Station 23+75	2001 Channel Station 18+50
Bankfull Elevation	1147.2 by field observation *(1145 to 1146.6 by Hydraulics)*	1143 by field observation *(1143.8 to 1146.1 by Hydraulics)*
Bankfull Width	52	61
Bankfull Mean Depth	7.15	3.6
Floodplain Width	193	80
Entrenchment Ratio (Floodplain/Bankfull)	3.7	1.3
Width/Depth Ratio	7.3	17
Sinuosity (stream length/ valley length)		
Slope	.0004	.0004
Bed material	Inorganic clay (sandy)	Inorganic clay (sandy)
Rosgen Classification	E6	F6

[7] D. Rosgen, Applied River Morphology, 1996

VI. PROBLEM DESCRIPTION

The Lost River in the project reach is actively eroding.

- A scour hole has formed immediately downstream from the CSAH 28 Bridge. A rock pile and beaver dam in the bridge opening raise the water level upstream. A scour hole has formed where the flow exits the bridge opening.
- Additional problems immediately downstream of the bridge are severe bank erosion on the right descending bank and formation of a point bar on the left bank. The flow direction appears to shift at the bridge so that the river is directed into the right bank—causing a lot of bank erosion immediately downstream from the bridge.
- The channel banks are eroding around the outside of most of the meanders within the project reach. Point bars and floodplain deposits are noticeable along much of the reach on the side opposite to the eroding bends.
- The channel banks are slumping in some areas where erosion of the toe of the slope appears to have lead to slope stability problems.

Head cutting does not appear to be a problem, since the existing channel bottom profile appears to be similar to the Corps design channel.

A. Allowable Velocity and Tractive Force

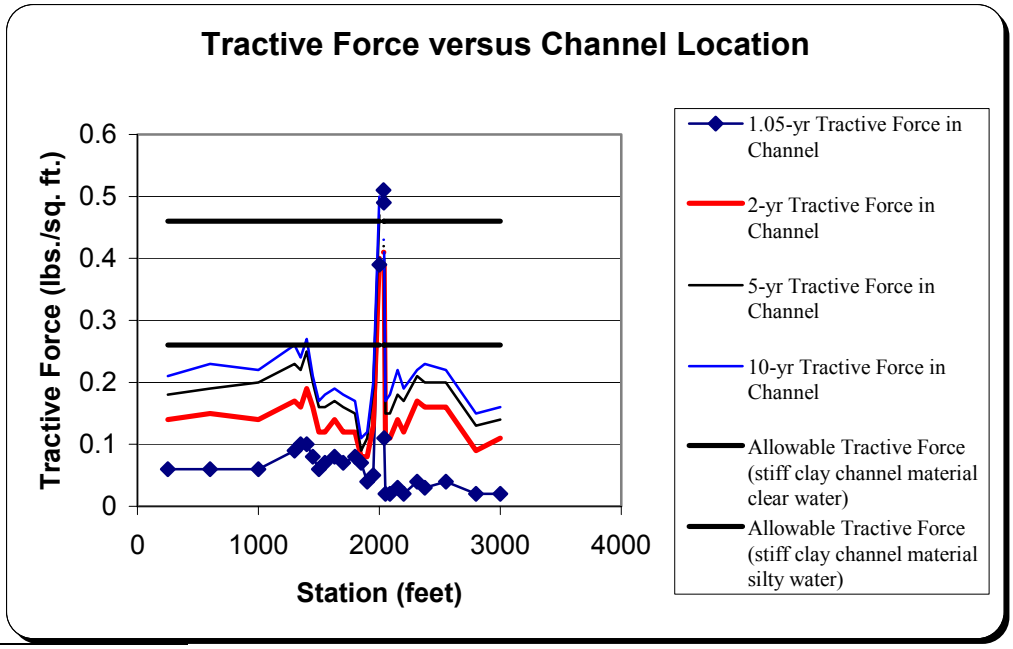
Table 4 lists allowable tractive forces and velocities for a number of channel materials. For a given soil material, flow in the channel that exceeds the allowable velocity or tractive forces will be erosive. Figures 14 and 15 are graphs showing the channel velocity and tractive force versus location for flood magnitudes ranging from 1.05-year to 10-year recurrence intervals. A range of allowable velocities and tractive forces have been shown in each figure for a channel in clay material. Most of the project reach will have flows within the allowable velocity and tractive force ranges—except within the bridge section.

Both velocity and tractive force will be in the erosive range within the bridge section. Since the channel is armored with riprap within the bridge, erosion will probably not occur at the bridge location, but will likely occur immediately downstream. The scour hole that has developed downstream from the bridge has likely resulted from erosive forces and velocities generated due to the rock pile/beaver dam and the channel constriction at the bridge.

Table 4
Allowable Tractive Force And Velocity[8]

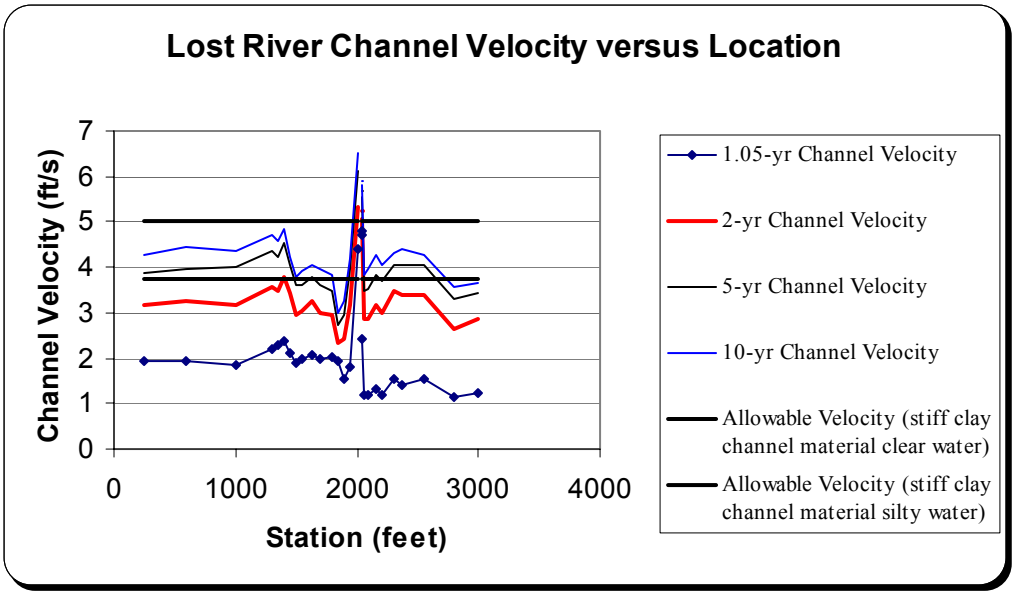
Channel Material	Allowable Tractive Force (lbs./sq.ft. clear water)	Allowable Tractive Force (lbs./sq.ft. silty water)	Allowable Velocity (ft./s. clear water)	Allowable Velocity (ft./s. silty water)
Sandy loam non-colloidal	0.037	0.075	1.75	2.50
Ordinary firm loam	0.075	0.150	2.50	3.50
Fine gravel	0.075	0.320	2.50	5.00
Stiff Clay	**0.260**	**0.460**	**3.75**	**5.00**
Shale and hardpan	0.670	0.670	6.00	6.00
Graded silts to cobbles colloidal	0.430	0.800	4.00	5.50

Figure 14. Channel Velocity and Tractive Force Versus Location for Flood Magnitudes



[8] Open Channel Hydraulics, Chow, Table 7-3, 1959

Figure 15. Channel Velocity and Tractive Force Versus Location for Flood Magnitudes



B. Alternatives

The District is proposing this project as a demonstration on the use of emerging technology and innovative approaches toward erosion control, stream stabilization, and water quality improvements. The project goals are to directly reduce erosion and improve water quality in the Lost River through implementation of erosion control measures in an eroding reach, as well as indirectly improve water quality in the region through education and information on the use of innovative and emerging erosion control methods/technologies.

Three broad options are available for consideration. These options include structural and non-structural solutions as well as the option to do nothing.

- Do Nothing. Let nature take its course.
  - •See what happens and fix problems later if/when they develop.
  - •Do Nothing Period!
- Non-structural
  - •Reduce runoff volume in basin
  - •Reduce runoff rate in basin

- Structural
  - •Remove rock and beaver dam from bridge
  - •Remove sand bars
  - •Ditch maintenance…remove sediment deposits, re-straighten channel
  - •Direct flow away from eroding banks
  - •Armour the channel banks
    - –Concrete liner
    - –Rock, gabions or cable-concrete etc
    - –Composite channel liners, rock and vegetation for example
    - –Vegetative lining.
  - •Construct and/or enlarge the floodplain bench to accelerate the natural process that is underway
  - •Build stable channel, predict ultimate equilibrium state and build it now. Increase channel length, reduce grade, and increase cross sectional area of floodplain bench.
  - •Adjust (raise) the channel bottom elevation

1. Do Nothing

The "No Build" alternative should always be considered. Doing nothing is a reasonable alternative in some cases. Doing nothing has no up front project costs, but doesn't reduce the risk of future problems. If the Lost River is not stabilized in the project area, the potential for continuing erosion remains.

The existing channel in the project reach is an "F6." This channel has a generally flat bottom, nearly vertical side slopes, and banks that are eroding and slumping. The probable future conditions, with the no build option, are continuing erosion in the project reach. The channel will likely continue eroding the outside bends—particularly where the flow is directed into the bank just downstream of the bridge. The width of the high flow channel may increase as the river continues to create a floodplain bench, and the width of low flow channel may decrease as sediment deposition builds point bars and floodplain benches and continues to narrow the low flow section. The elevation of the channel

bottom has not changed much since the Corps project and may remain at similar depth and profile.

The "do nothing" alternative does not improve water quality nor demonstrate erosion control technologies, so it does not satisfy the project goals.

2. Non-structural Techniques to Reduce the Rate or Volume of Runoff

Non-structural techniques to reduce the rate of runoff generally include land use changes that slow the flow of water from the watershed. These changes include actions such as changes in tillage practice, changes from row crops to hay or pasture, and restorations of channelized waterways. Techniques to reduce the volume of runoff include many similar tillage and land use changes—actions that promote infiltration and/or evapotranspiration and reduce the volume of storm runoff. Since large-scale land use changes are outside of the scope of this project, techniques to reduce runoff rate or volume are not feasible alternatives for solving the project goals.

3. Structural Alternatives

A number of structural alternatives can be considered for stabilizing the Lost River within the project reach. The following list provides a general description of the desired result and a list of alternatives that may be considered for use.

The goals of the structural alternatives are to stabilize the banks, reduce lateral erosion, and maintain the channel profile (avoiding downcutting or aggradation). Techniques to achieve these goals could be applied separately or in combination.

Reducing bank stress is desired to prevent further erosion of the channel banks—particularly on the outside banks of meanders. The channel is entrenched, so that flood flows are contained within a relatively small channel. Left unaddressed, the riverbanks will continue to erode in response to high bank stresses.

The reduction of lateral movement is desired to prevent excessive erosion of the channel banks—particularly on the right bank just downstream from the bridge. Bank erosion and lateral migration is a natural channel process. Our desire is to prevent excessive or accelerated erosion and migration, restoring a general balance to the river.

Grade control methods can be used to either maintain the existing channel profile, or restore the stream channel at a higher elevation and milder grade. Restoring the stream at a higher elevation may have additional stabilizing benefits by reducing the entrenchment of the channel and restoring the previously formed floodplain.

Reduce Bank Stresses:

- Restore flow to old floodplain by raising channel flowline
- Create new floodplain at a level consistent with the current channel flowline
- Widen stream…increasing flow area while reducing depth, velocity and tractive force
- Lengthen meanders to reduce the slope, velocity and tractive forces and evenly dissipate the river's energy throughout the reach..

Typical Methods To Improve Slope Stability:

- Re-excavate slopes to flatten them out. Excavation removes existing vegetation, so vegetation needs to be restored as well.
- Protect the toe of the slope from erosion, so slope failures and slumping are reduced
- Reduce soil pore water pressures by installing a seepage collection system (tile or gravel filter)

Typical Methods To Redirect Streamflow

- Direct flow away from eroding banks using excavation, deflectors, vanes and/or weirs.

Remove Beaver Dam and Rock Pile below Bridge:

- The flow depth is increased upstream of the bridge by the rock pile and beaver dam. Erosion is caused downstream of the bridge as the built-up energy is dissipated. Removing the rock and beaver dam will reduce the erosive energy of

the flow below the bridge. Removing the beaver dam may have negative effects upstream, since the impounded water may be beneficial in reducing erosion, upstream of the dam, by reducing flow velocity and adding support to the channel banks. The impounded water may also provide stream habitat.

Typical Methods To Reduce Lateral Erosion:

- Shape Banks
  - Cut steep banks to improve stability (may not reduce channel erosion)
  - Fill banks above toe protection measures such as root wads, trees and rocks
- Armor Banks
  - Rock riprap
  - Concrete, sheet piling
  - Trees, logs, root wads
  - Vegetation
  - Wattles, fascines, brush mats, etc

Typical Grade Control Methods:

- Hard points (e.g. constructed rock riffles)
- Drop Structures or dams
- Rock vanes or weir

4. Recommended Alternatives

The problems, project goals and potential solutions were discussed during a meeting with the Red Lake Watershed District Board and staff on September 26, 2002. The following actions were recommended by the engineer and affirmed by the Board.

- Remove point bars at 20+25 R, 19+00 L and 14+50 L
- Install rock riffle/cross vane weir at 19+00 to direct flow away from bank
- Install rock vanes at 14+50 to direct flow away from bank
- Retain rocks under bridge, and beaver dam
- Retain vegetation on outside meander banks rather than reshaping.

5. Recommended Alternatives Meet Project Goals

The recommended alternatives will reduce erosion in the project reach. Using vanes and weirs to redirect the flow of the river is an emerging technology. Vanes work with the river to reduce bank erosion with less

rock than would be required to armor the banks and also provide better habitat and a more natural appearance than a riprap armoring project.

6. Plans and Specifications

Houston Engineering has prepared plans and specifications for construction of the erosion control measures, and will assist the RLWD in construction observation efforts. The construction plans and specifications are attached to this report as Appendix A. The plans include drawings of the channel profile and cross sections as well as excavation areas and typical sections of the proposed vanes.

VII. OPINION OF PROBABLE COST

Table 5 is the Opinion of Probable Cost for the construction work shown on the plans and specifications.

Table 5

ENGINEER'S OPINION OF PROBABLE COST						
Lost River Erosion Control Project						
Base Quote						
Item No.	Spec. No.	Description	Unit	Qty	Unit Price	Total
1	2563.601	Traffic Control	l.s.	1	$1,000.00	$1,000.00
2	2021.501	Mobilization	l.s.	1	1,000.00	1,000.00
3	2123.509	Dozer	hour	4	90.00	360.00
4	2123.610	2.5 C.Y. Backhoe	hour	10	125.00	1,250.00
5	2511.501	Random Riprap, Class IV	cu.yd.	335	50.00	16,750.00
6	2573.502	Silt Fence, Type Preassembled	lin. ft.	100	3.00	300.00
7	2573.505	Floating Silt Curtain, Type Moving Water, 3'	lin. ft.	80	18.00	1,440.00
8	2575.501	Seeding	acre	0.5	200.00	100.00
9	2575.502	Seed, Mixture 1	lb.	24	3.00	75.00
10	2575.523	Erosion Control Blanket, Category 4	sq. yd.	163	3.00	489.00
					Total Quote Base Bid	**$22,764.00**
Bendway Weir Option						
11	2123.509	Dozer	hour	2	$90.00	$180.00
12	2123.610	2.5 C.Y. Backhoe	hour	5	125.00	625.00
13	2511.501	Random Riprap, Class IV	cu.yd.	162	50.00	8,100.00
14	2573.502	Silt Fence, Type Preassembled	lin. ft.	50	3.00	150.00
15	2575.523	Erosion Control Blanket, Category 4	sq. yd.	107	3.00	321.00
					Subtotal Quote Option	**$9,376.00**
					Total Quote Base Bid Plus Bendway Weir Option	**$32,140.00**

A. Funding Sources

Project funding sources include an EPA 319 Grant (50%) and local matching funds (50%). The local matching funds will be supplied by the Red Lake

Watershed District Clearwater Nonpoint Funds (Administrative Construction account). Ditch funds will not be used, and no special assessments are planned. No other local or state funds are slated for this project.

B. Permits and Approvals

The following agencies may have project review and permit authority.

- US Army Corps of Engineers, Section 404
- DNR Protected Waters
- Minnesota Wetlands Conservation Act
- MPCA NPDES Construction Permit and Erosion Control Plan
- Red Lake Watershed District and Army Corps: Lost River Flood Control Project
- Polk County Highway Department: C.S.A.H. 28 right of way

Appendix B includes copies of the joint notification permit form i.e. the Minnesota Local/State/Federal Application Form for Water/Wetland Projects. This form will be submitted by the RLWD to the Corps of Engineers, the Minnesota DNR and the East Polk County SWCD.

The area disturbed by this project will be less than 1 acre, so neither a Phase I nor Phase II Storm Water Permit for construction activity is required.

Richard Sanders, Polk County Engineer, stated that work within the river banks does not require a right-of-way permit from Polk County.

VIII. MONITORING PLAN

A monitoring program will be implemented to assess the success of the work at the Lost River erosion site. Monitoring will include a combination of assessments. Physical assessments will include measuring channel profiles and cross sections over time from established monuments and benchmarks. Photo records will also be collected, at each successive inspection, using established photo reference points. Biologic assessments will include measuring the type and abundance of vegetation along established transects. Short-term monitoring activities are planned to continue for five years to document the success (or failure) of the project measures. Reference points and benchmarks will remain into the indefinite future allowing continuing monitoring opportunities. A description of the monitoring plan procedures is included in Appendix C. Baseline data and photographs are also included in the Appendix.

APPENDIX A

PLANS AND SPECIFICATIONS

Specifications and Quote Package
Lost River Erosion Control
Project Number 82
Red Lake Watershed District
Thief River Falls, MN 56701
June 23, 2003

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a Licensed Professional Engineer under the laws of the State of Minnesota.

Brent H. Johnson

Brent H. Johnson
MN License No. 20378

Date: 6-23-2003

Houston Engineering, Inc.
2505 North University Drive
Box 5054
Fargo, ND 58105
H.E. Project No. 3655-040

REQUEST FOR QUOTES

NOTICE

The Red Lake Watershed District (District) is requesting quotes for an erosion control project in the Lost River within Sections 5 and 6 of Gully Township, T150N, R39W, Polk County, Minnesota. The work is outlined within the project plans and specifications. Major bid items are backhoe and dozer equipment rental, furnishing and installing Class IV Random Riprap, and seeding and erosion control items.

The Board of Managers of the Red Lake Watershed District will receive quotes at the Red Lake Watershed District Office, P.O. Box 803, 102 North Main, Thief River Falls, Minnesota, 56701, until 1:00 P.M. July 9, 2003. Quotes must be submitted on forms furnished by the Red Lake Watershed District.

GOVERNING SPECIFICATIONS

The Minnesota Department of Transportation Standard Specifications for Construction, 2000 ed. shall govern.

Where the word "COMMISSIONER" is stated in the Standard Specifications it shall mean the Board of Managers of the Red Lake Watershed District.

Where the word "DEPARTMENT" is stated in the Standard Specifications it shall mean the Red Lake Watershed District.

Where the work "ENGINEER" is stated in the Standard Specifications it shall mean the ENGINEER of the Red Lake Watershed District or their designee.

PROJECT LIMITS

Work limits shall be as shown on the plans or as directed by the Engineer. All construction activities shall occur within the limits established.

INCIDENTAL WORK

Construction required to complete a specific item which is shown or described on the Plan, Specifications or Special Provisions and is necessary for the satisfactory completion of that specific item, and for which no item has been set aside on the proposal form, is to be considered incidental work and no direct compensation shall be made thereof.

PROGRESS SCHEDULE

Work shall start on this project within ten (10) days of notice to proceed. All items on this project shall be completed by September 15, 2003.

ADJUSTMENT OF QUANTITIES

Any item can be increased, decreased or deleted with no adjustment in the unit prices.

SEED MIXTURE 1

This item shall be compensation in full for furnishing Seed Mixture 1 at the contract price per pound. Furnishing oats or winter rye (as required for planting dates) at a rate of 1 bushel per acre shall be incidental to the Seed Mixture 1 item. Allowable planting dates for Mixture 1 shall be April 15 to September 20. The Seed Mixture furnished shall be a uniform blend of the designated seeds, proportioned by weight as specified in the following tabulation:

Mixture 1	Plant Species	Rate/acre	Relative %'s
	Smooth Brome grass	24 lbs.	50
	Timothy	9 lbs.	19
	Birds Foot Trefoil	15 lbs.	31
	TOTAL	48 lbs.	100 %
	*Oats	1 bu.	

*Winter rye shall be substituted for oats during plantings after August 14 of any year.

QUOTE

Project: Lost River Erosion Control Project #82
Quotes Due: 1:00 P.M. July 9, 2003

Quote Submitted to:
Myron Jesme, Administrator
Red Lake Watershed District
102 North Main, P.O. Box 803
Thief River Falls, MN 56701
PH. 218-681-5800
FAX. 218-681-5839

Base Quote						
Item No.	Spec. No.	Description	Unit	Qty.	Unit Price	Total
1	2563.601	Traffic Control	l.s.	1		
2	2021.501	Mobilization	l.s.	1		
3	2123.509	Dozer	hour	4		
4	2123.610	2.5 C.Y. Backhoe	hour	10		
5	2511.501	Random Riprap, Class IV	cu.yd.	335		
6	2573.502	Silt Fence, Type Preassembled	lin. ft.	100		
7	2573.505	Floating Silt Curtain, Type Moving Water, 3'	lin. ft.	80		
8	2575.501	Seeding	acre	0.5		
9	2575.502	Seed, Mixture 1	lb.	24		
10	2575.523	Erosion Control Blanket, Category 4	Sq. Yd.	163		
		Total Base Quote				
Bendway Weir Option						
11	2123.509	Dozer	hour	2		
12	2123.610	2.5 C.Y. Backhoe	hour	5		
13	2511.501	Random Riprap, Class IV	cu.yd.	162		
14	2573.502	Silt Fence, Type Preassembled	lin. ft.	50		
15	2575.523	Erosion Control Blanket, Category 4	Sq. Yd.	107		
		Subtotal Quote Bendway Weir Option				
		Total Quote = Base Quote Plus Bendway Weir Option Quote				

THE ABOVE QUOTE IS HEREBY RESPECTFULLY SUBMITTED BY:

_____

CONTRACTOR

_____

BY TITLE

_____

BUSINESS ADDRESS

_____

CITY STATE ZIP CODE

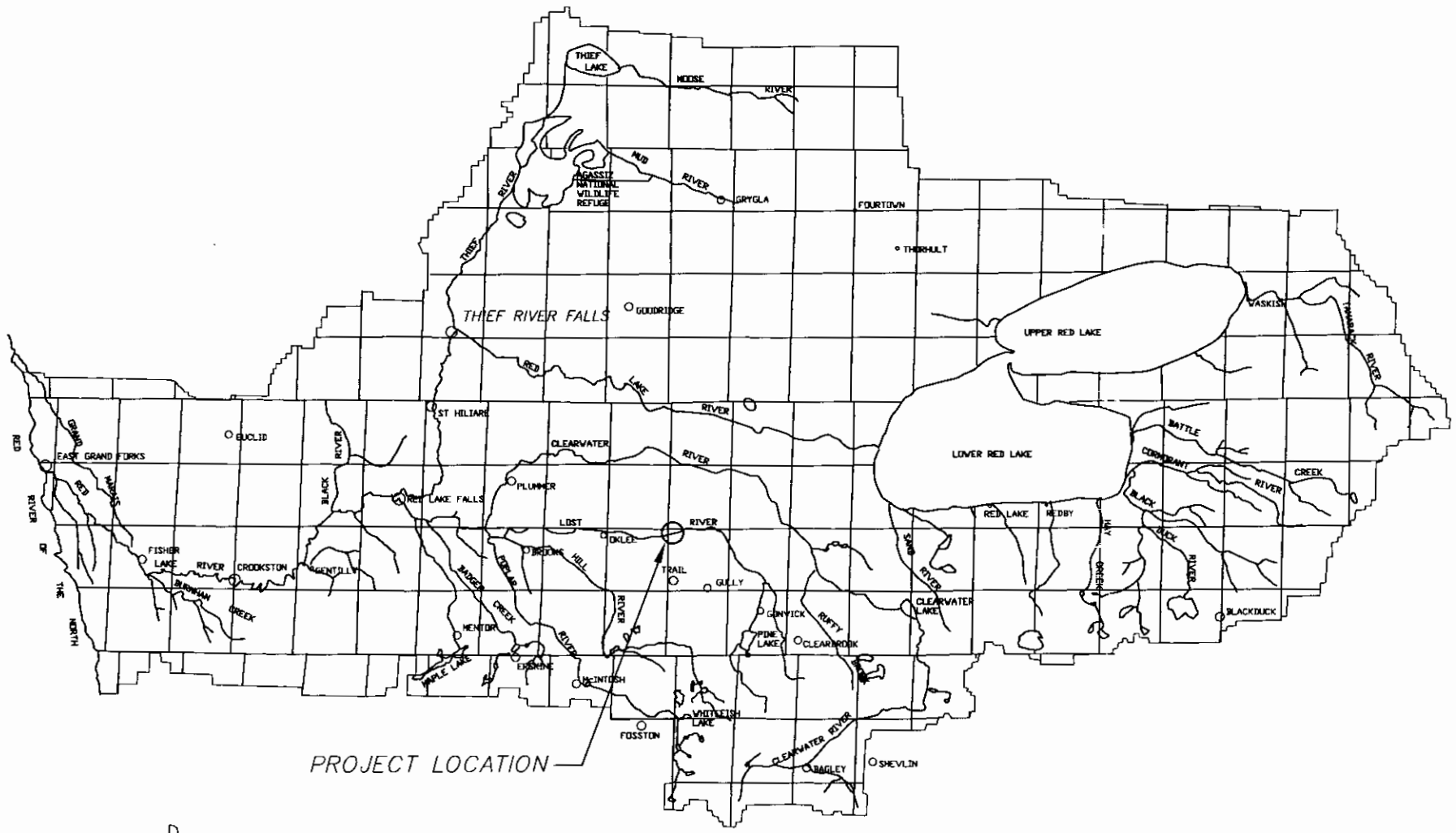
_____

DATE

CONSTRUCTION PLANS FOR

LOST RIVER EROSION CONTROL PROJECT

RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA
JUNE 23, 2003



SHEET INDEX

I hereby certify that this plan, specification, or report was prepared be me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: Brent H. Johnson Typed or Printed Name: Brent H. Johnson

Date: 6-23-2003 Lic. No. 20378

PREPARED BY: *HOUSTON ENGINEERING, INC.*

FARGO, NORTH DAKOTA *MAPLE GROVE, MINNESOTA* *BISMARCK, NORTH DAKOTA*

CAD. REF. S:/3655-040/CADD/FINAL PLANS/COVER.DWG

ESTIMATED QUANTITIES

NOTES	ITEM NO.	ITEM	UNIT	BASE BID QUANTITIES	BID OPTION QUANTITIES	TOTAL ESTIMATED QUANTITIES	FINAL QUANTITIES
	2563.601	TRAFFIC CONTROL	LUMP SUM	1		1	
	2021.501	MOBILIZATION	LUMP SUM	1		1	
(1)	2123.509	DOZER	HOUR	4	2	6	
(2)	2123.610	2.5 C.Y. BACKHOE	HOUR	10	5	15	
(3)	2511.501	RANDOM RIPRAP, CLASS IV	CU. YD.	335	162	497	
(4)	2573.502	SILT FENCE, TYPE PREASSEMBLED	LIN. FT.	100	50	150	
	2573.505	FLOATING SILT CURTAIN, TYPE MOVING WATER, 3'	LIN. FT.	80		80	
	2575.501	SEEDING	ACRE	0.50		0.50	
(5)	2575.502	SEED, MIXTURE 1	POUND	24		24	
(6)	2575.523	EROSION CONTROL BLANKET, CATEGORY 4	SQ. YD.	163	107	270	

NOTES:

(1) BID ITEM FOR BACKHOE IS FOR REMOVAL OF EXISTING SEDIMENT DEPOSITS IN THE RIVER BED AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. EXCAVATED MATERIAL SHALL BE PLACED ON EXISTING SPOIL BANKS OR USED AS BANK FILL AT THE CROSS-VANE WEIR AS DIRECTED.

(2) BID ITEM FOR DOZER IS FOR SPOIL LEVELING, FINAL SHAPING AND REPAIRING DISTURBED AREAS PRIOR TO SEEDING.

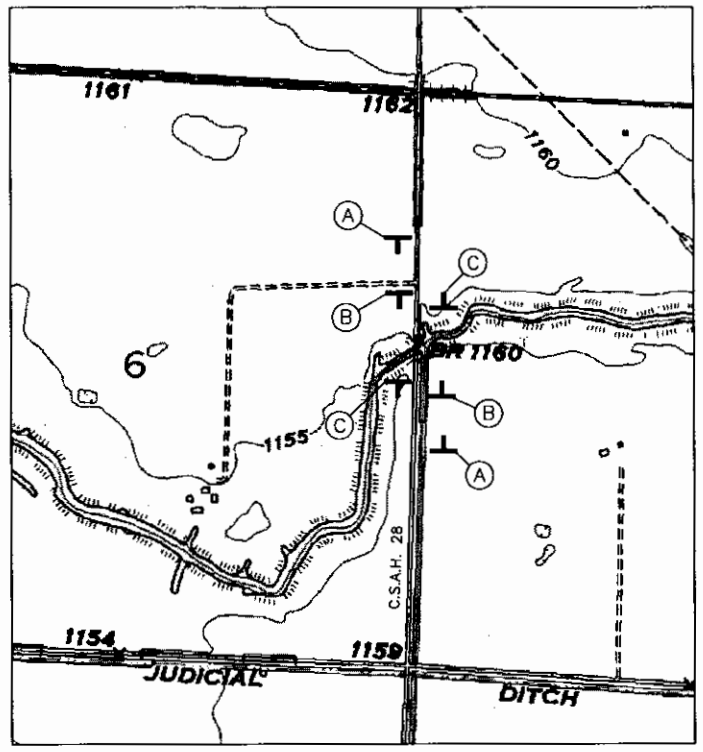
(3) SEE SHEET 6 FOR A SCHEDULE OF RIPRAP QUANTITIES AND LOCATIONS.

(4) SILT FENCE, TYPE PREASSEMBLED, SHALL BE INSTALLED AS DIRECTED WHERE EVER EXCAVATED RIVER SEDIMENT CANNOT BE SPOILED SUCH THAT THEY DRAIN AWAY FROM THE RIVER (SEE DETAIL - SHEET 10).

(5) BID ITEM FOR SEED, MIXTURE 1, INCLUDES A NURSE CROP OF OATS OR WINTER RYE AT 1 BU./ACRE.

(6) EROSION CONTROL BLANKET, CATEGORY 4, SHALL BE PLACED ON ALL RIVER BANKS DISTURBED BY THE CONTRACTOR AS DIRECTED BY THE ENGINEER. BID QUANTITY IS ESTIMATE ONLY BASED ON AN AREA 20' ON EACH SIDE OF THE PROPOSED WEIRS AND THE LENGTH OF THE BANK SLOPE. FINAL QUANTITIES MAY VARY DEPENDING ON THE CONTRACTORS OPERATIONS.

TRAFFIC CONTROL PLAN

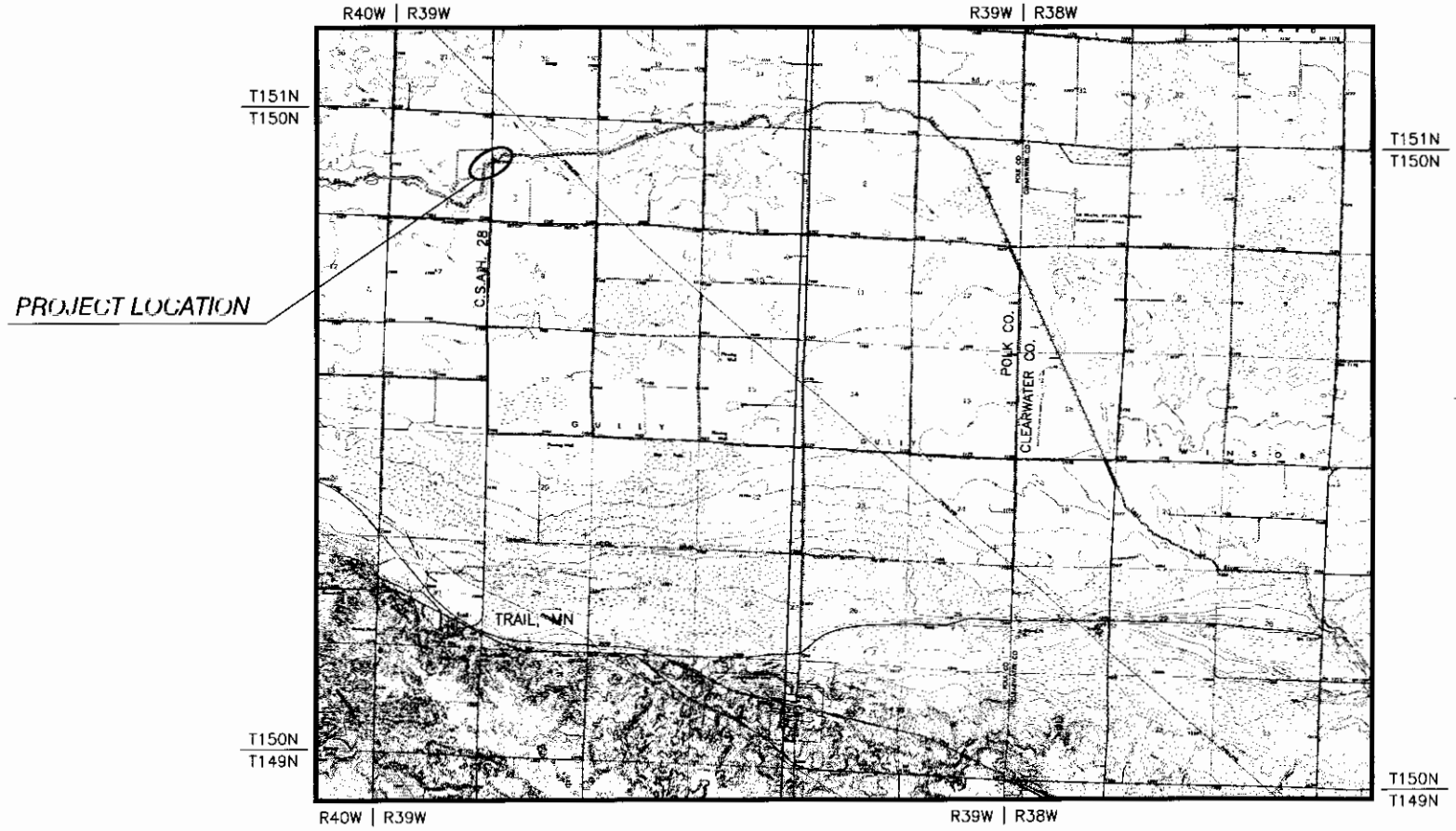


Ⓐ	Ⓑ	Ⓒ
2	2	2
W20-1		G20-2A
48" x 48"	36" x 36"	48" x 24"
ROAD WORK AHEAD	TRUCKS HAULING	END ROAD WORK
PLACE 750 FT. FROM BRIDGE	PLACE 500 FT. FROM BRIDGE	PLACE 200 FT. FROM BRIDGE

NOTES:

1. ALL TRAFFIC CONTROL DEVICES SHALL CONFORM TO CURRENT MMUTCD. (INCLUDING FIELD MANUAL, DATED JANUARY 2001)

2. THE ABOVE REFERENCED SIGNS SHALL BE IN PLACE WHENEVER THE CONTRACTOR IS HAULING PROJECT MATERIALS TO THE SITE OR WHEN THE CONTRACTORS OPERATIONS HAVE EQUIPMENT ON OR NEAR THE ROADWAY. SIGNS MAY BE PLACED ON APPROVED TEMPORARY MOUNTS.



PROJECT LOCATION
SECTIONS 5 & 6
GULLY TOWNSHIP
POLK COUNTY, MINNESOTA

BASIS OF ESTIMATED QUANTITIES

SEED, MIXTURE 1	48 LB/ACRE
MULCH MATERIAL, TYPE 1	2 TON/ACRE
COMM. FERT. ANAL. 40-20-10	150 LB/ACRE

STANDARD PLATES

THE FOLLOWING STANDARD PLATES, APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION SHALL APPLY ON THIS PROJECT.

PLATE NO.	DESCRIPTION

I hereby certify that this plan, specification, or report was prepared be me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: Brent H. Johnson Typed or Printed Name: Brent H. Johnson

Date: 6-13-2003 Lic. No. 20378

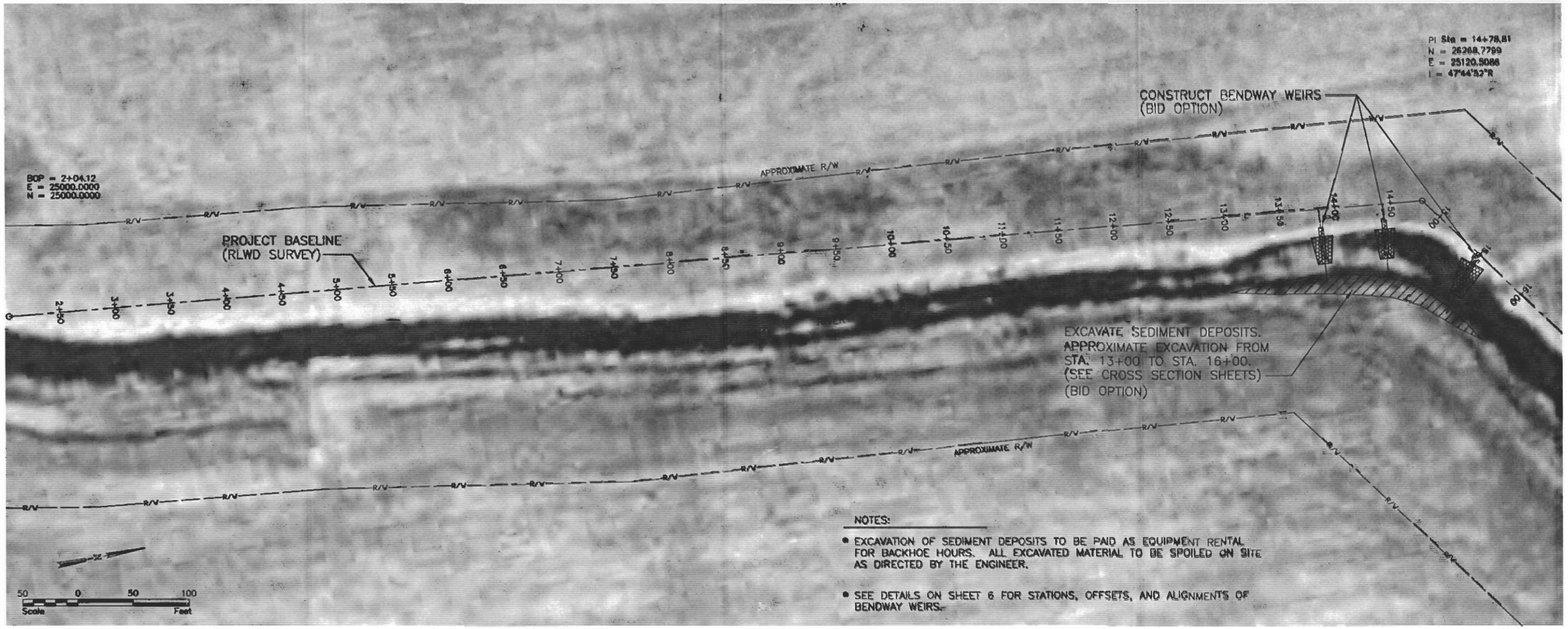
No.	Revision	Date	By

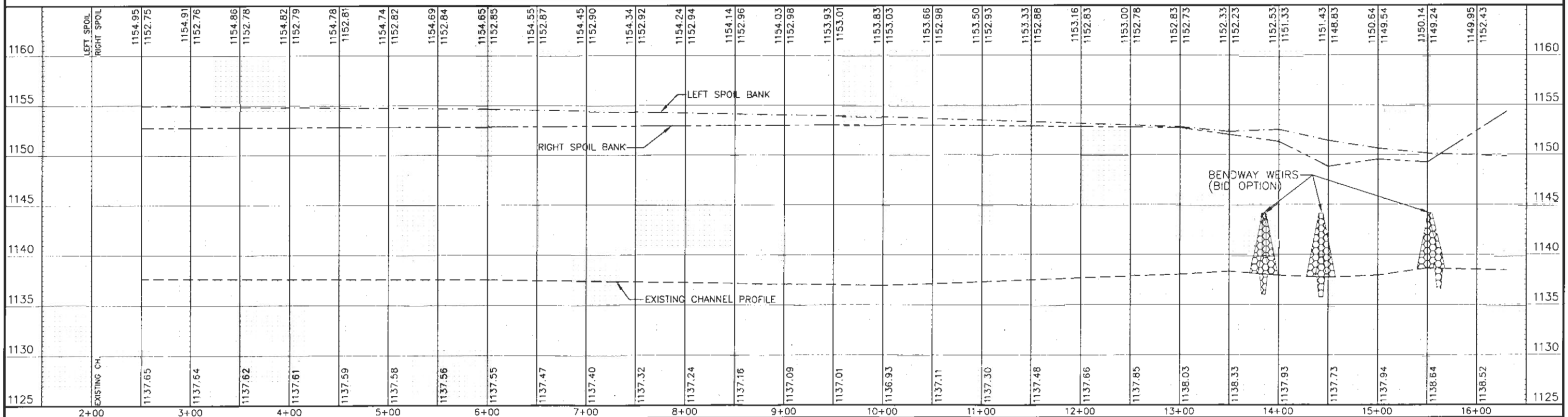
Scale	Drawn by	Checked by
AS SHOWN	BGJ	BHJ
Project No. 3655-040	Date 5-16-03	

ESTIMATED QUANTITIES AND SITE MAP
LOST RIVER EROSION CONTROL PROJECT
RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA

PREPARED BY
HOUSTON ENGINEERING, INC.
10900 73rd Ave. North, Suite 106 Maple Grove, MN 55369
PHONE: (763) 493-4522 FAX: (763) 493-5572

CAD. REF. S:/1851-053/CADD/FINAL PLANS/EST_SHEET.DWG





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Signature: Brent H. Johnson Typed or Printed Name: Brent H. Johnson

Date: 6-23-2003 Lic. No. 20378

No.	Revision	Date	By

Scale	Drawn by	Checked by
AS SHOWN	BGJ	BHJ
Project No.	Date	
3655-040	5-16-03	

PLAN & PROFILE

LOST RIVER EROSION CONTROL PROJECT
RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA

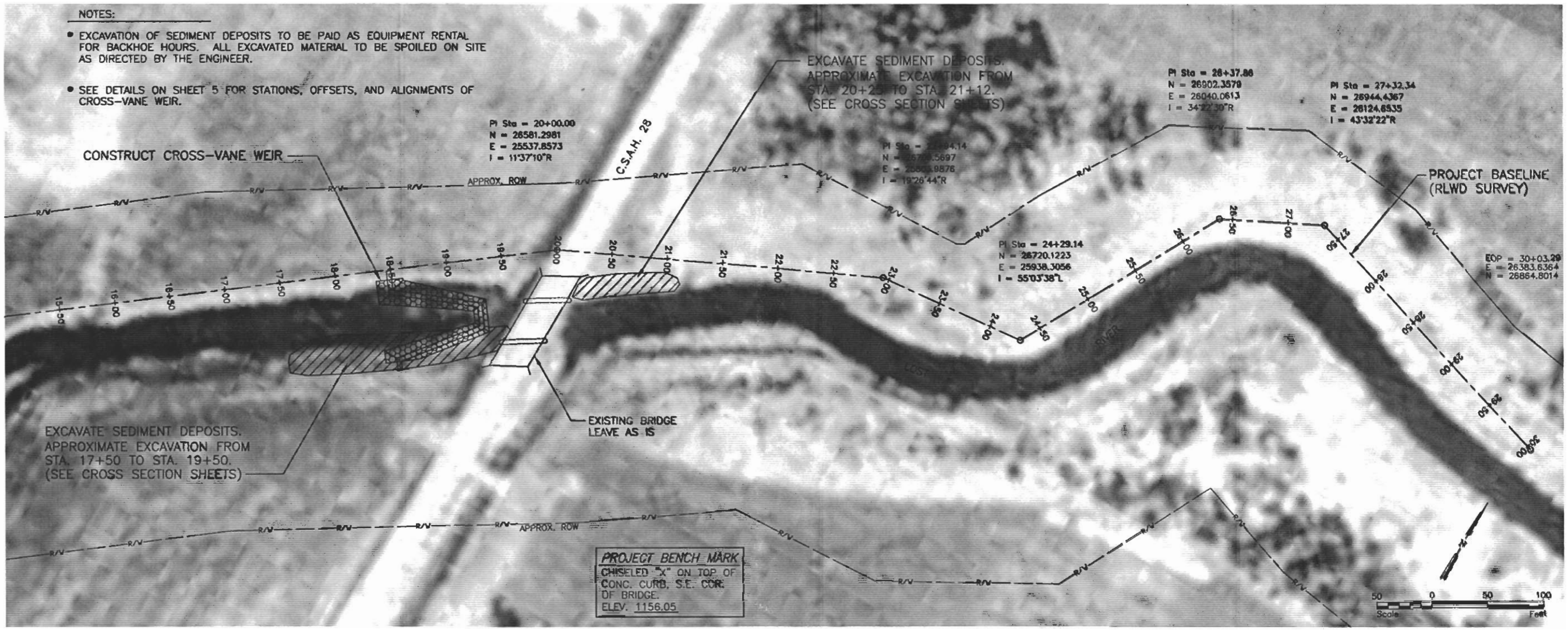
PREPARED BY
HOUSTON ENGINEERING, INC.
10900 73rd Ave. North, Suite 106 Maple Grove, MN 55369
PHONE: (763) 493-4522 FAX: (763) 493-5572

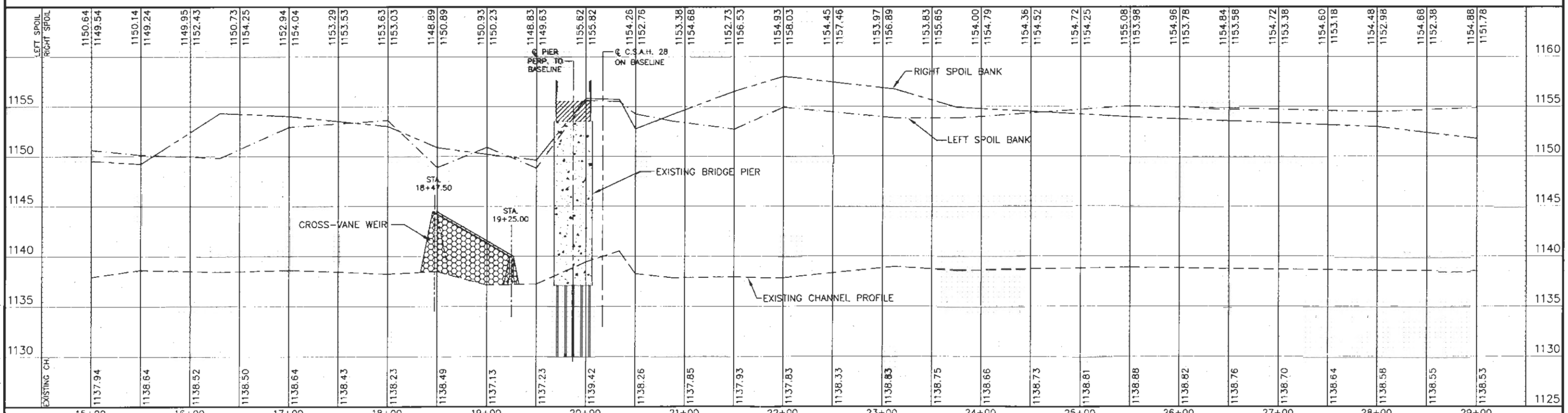
SHEET 3 OF 10 SHEETS

CAD. REF. PP-SINGL

NOTES:

- EXCAVATION OF SEDIMENT DEPOSITS TO BE PAID AS EQUIPMENT RENTAL FOR BACKHOE HOURS. ALL EXCAVATED MATERIAL TO BE SPOILED ON SITE AS DIRECTED BY THE ENGINEER.
- SEE DETAILS ON SHEET 5 FOR STATIONS, OFFSETS, AND ALIGNMENTS OF CROSS-VANE WEIR.





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Signature: Brent H. Johnson Typed or Printed Name: Brent H. Johnson

Date: 6-23-2003 Lic. No. 20378

No.	Revision	Date	By

Scale	Drawn by	Checked by
AS SHOWN	BGJ	BHJ
Project No.	Date	
3655-040	5-16-03	

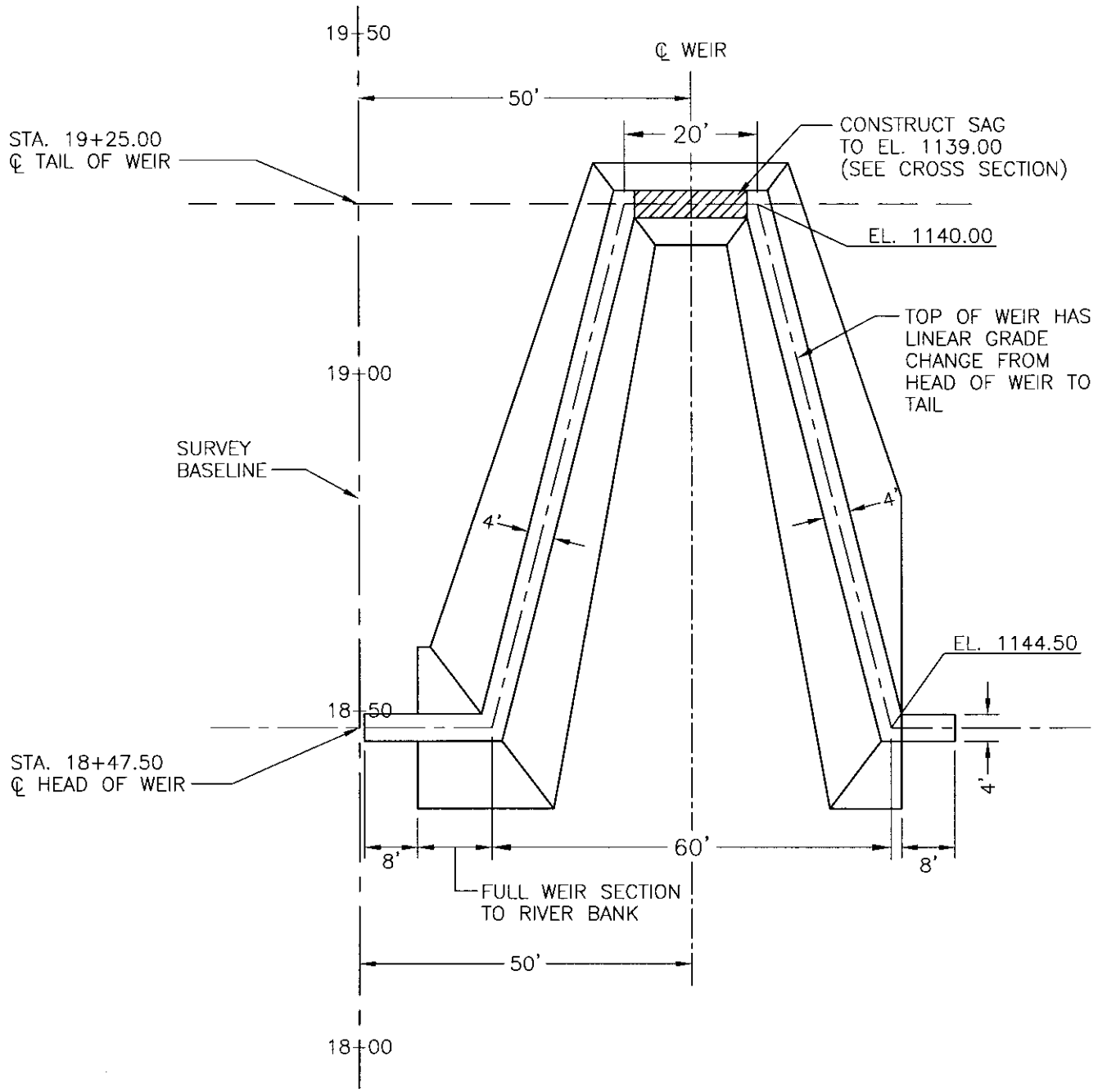
PLAN & PROFILE

LOST RIVER EROSION CONTROL PROJECT
RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA

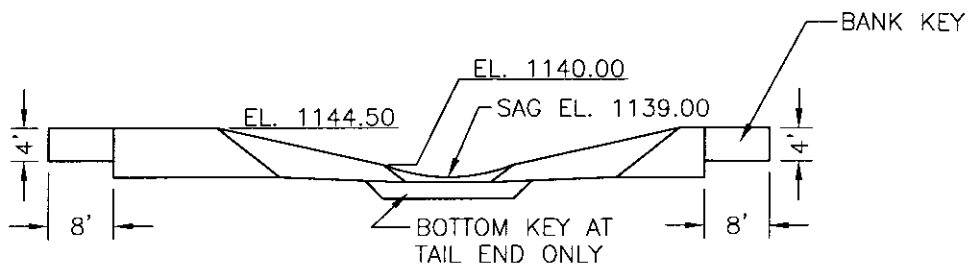
PREPARED BY
HOUSTON ENGINEERING, INC.
10900 73rd Ave. North, Suite 106 Maple Grove, MN 55369
PHONE: (763) 493-4522 FAX: (763) 493-5572

SHEET 4 OF 10 SHEETS

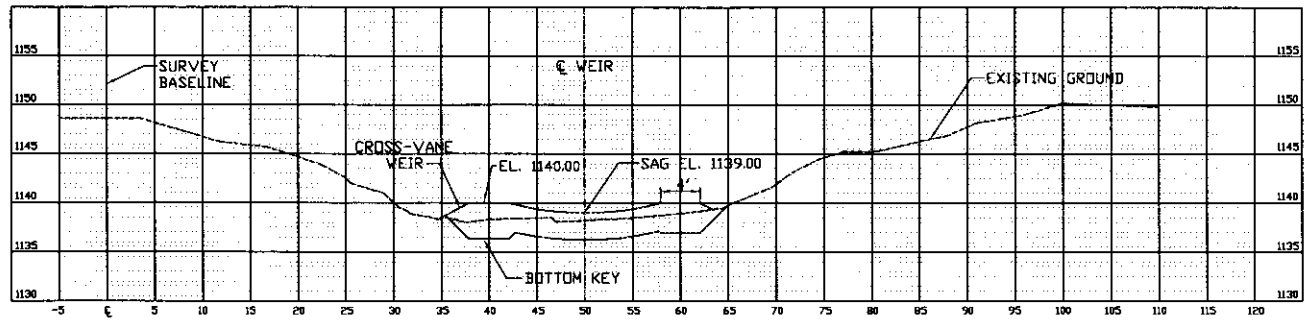
CAD. REF. S:/3655-040/CADD/FINAL PLANS/PP2.DWG



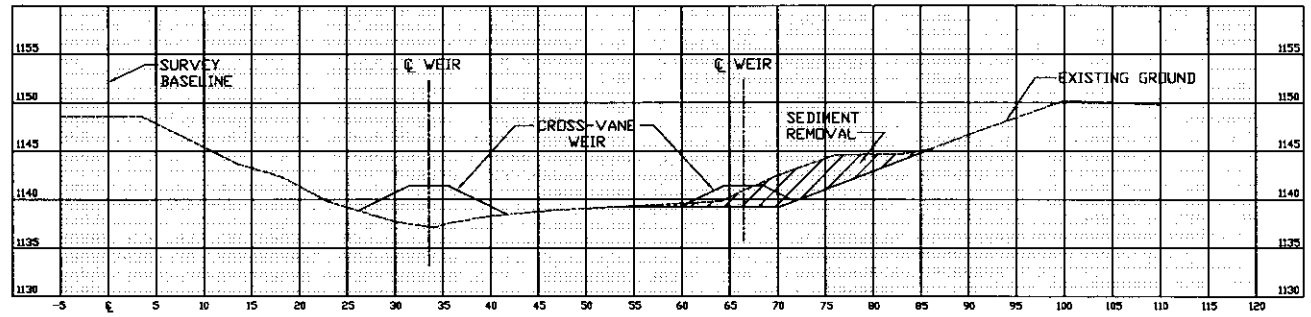
PLAN
NOT TO SCALE



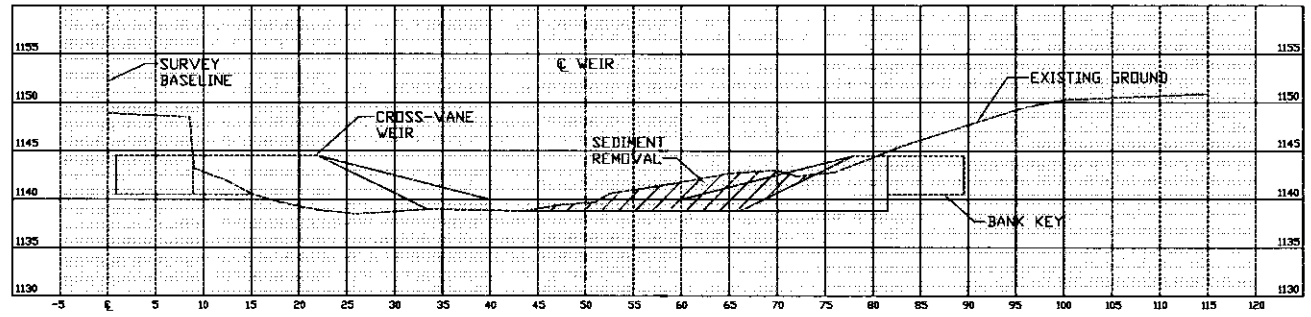
ELEVATION
NOT TO SCALE



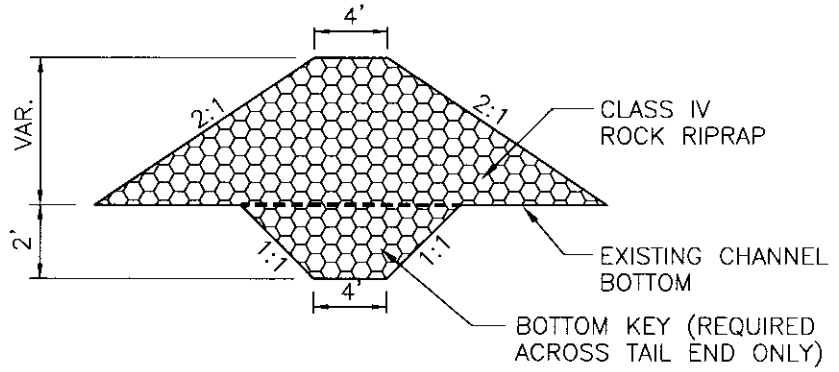
STA. 19+25



STA. 19+00



STA. 18+47.50



TYPICAL WEIR SECTION

NOTES:

- LOCATIONS, LENGTHS, AND ESTIMATED QUANTITIES FOR THE CROSS-VANE WEIR IS ESTIMATED BASED ON AVAILABLE CROSS SECTION DATA. FINAL LOCATIONS AND QUANTITIES MAY VARY BASED ON EXISTING CONDITIONS AT TIME OF CONSTRUCTION.
- ESTIMATED RIPRAP QUANTITIES FOR CROSS-VANE WEIR:
  TOTAL CLASS IV RIPRAP = 335 CU. YD.
- ALL EXCAVATION REQUIRED TO CONSTRUCT THE CROSS-VANE WEIR AS DETAILED IN THE PLANS AND SPECIFICATIONS SHALL BE CONSIDERED INCIDENTAL AND NO DIRECT COMPENSATION SHALL BE MADE.

No.	Revision	Date	By

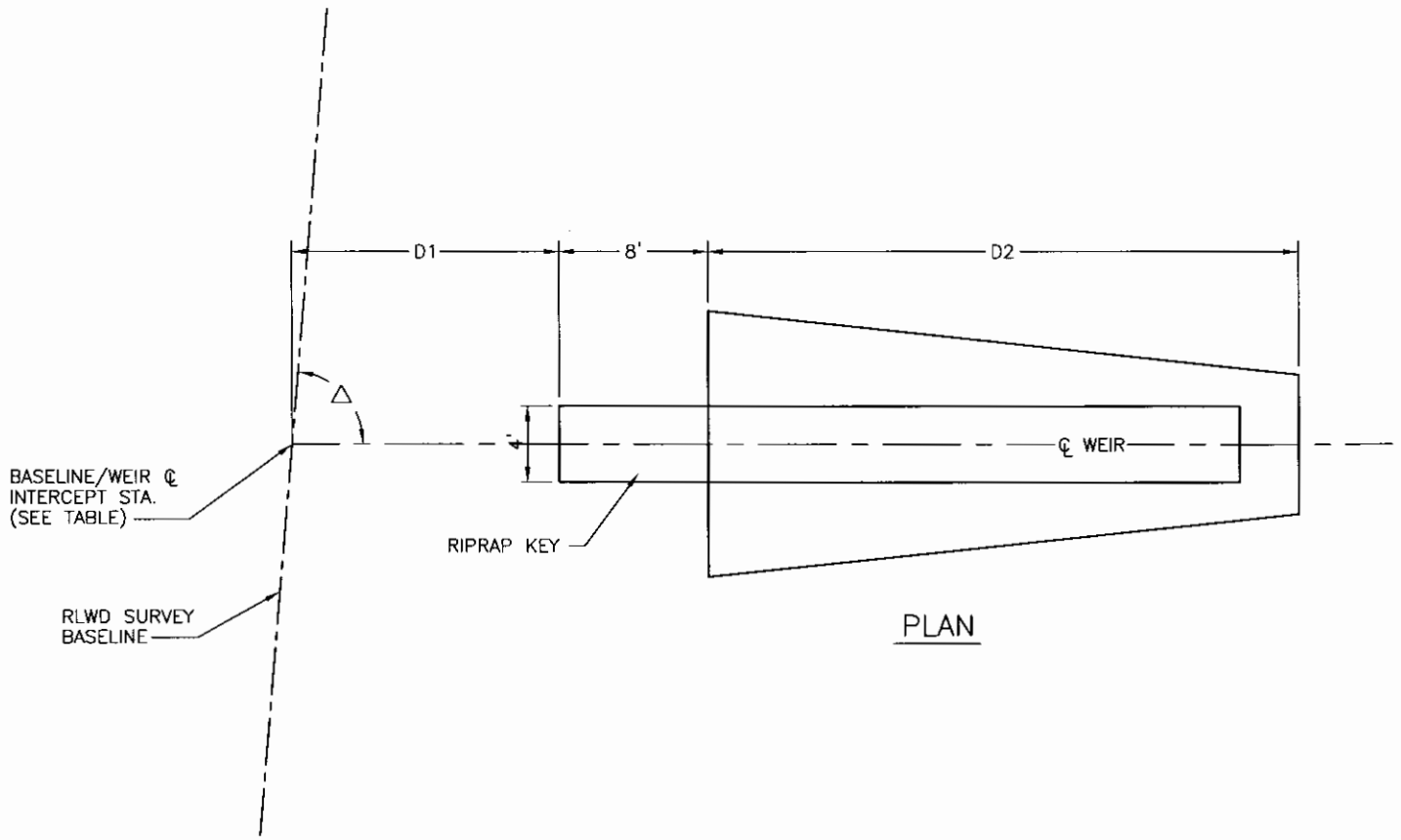
CONSTRUCTION DETAIL - CROSS-VANE WEIR

LOST RIVER EROSION CONTROL PROJECT
RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA

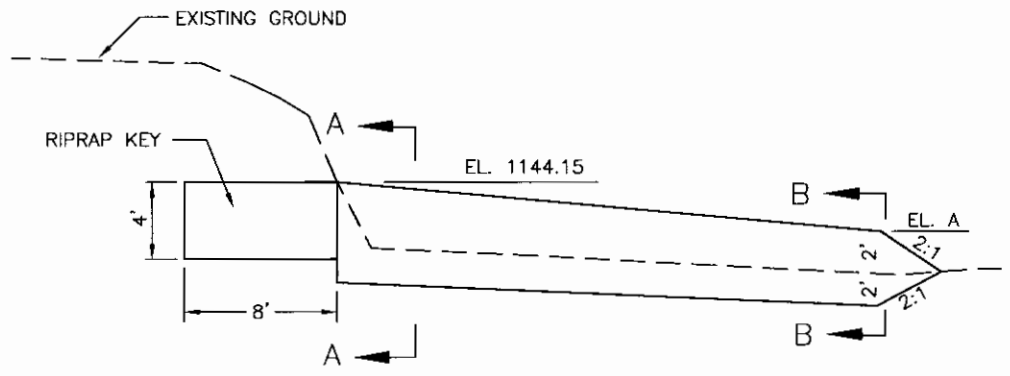
Scale	Drawn by	Checked by	Project No.	Date	Sheet
AS SHOWN	BGJ	BHJ	3655-040	5-20-03	5 of 10

PREPARED BY
HOUSTON ENGINEERING, INC.
10900 73rd Ave. North, Suite 106 Maple Grove, MN 55369
PHONE: (763) 493-4522 FAX: (763) 493-5572

CAD. REF. S:/3655-040/CADD/FINAL PLANS/DETAILS_1.DWG



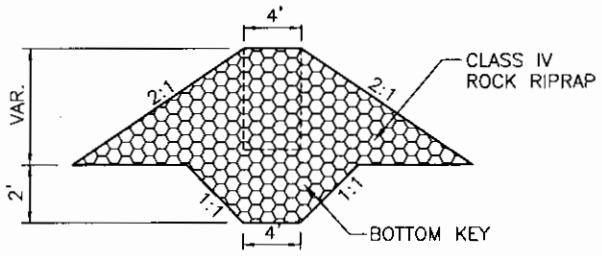
PLAN



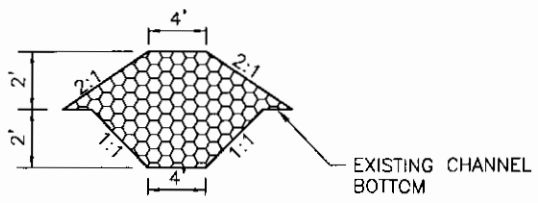
ELEVATION

TYPICAL BENDWAY WEIR

NOT TO SCALE



SECTION A–A



SECTION B–B

BENDWAY WEIR LAYOUT DATA				
INTERCEPT STATION	Δ	D1	D2	EL. A
13+85.26	87°44'07"	16'	24'	1140.60
14+42.82	89°57'53"	14'	26'	1140.60
15+46.80	75°16'19"	2'	32'	1140.80

NOTES:

- LOCATIONS, LENGTHS, AND ESTIMATED QUANTITIES FOR BENDWAY WEIRS IS ESTIMATED BASED ON AVAILABLE CROSS SECTION DATA. FINAL LOCATIONS AND QUANTITIES MAY VARY BASED ON EXISTING CONDITIONS AT TIME OF CONSTRUCTION.
- ESTIMATED RIPRAP QUANTITIES FOR BENDWAY WEIRS:
  STA. 13+85.26 = 45 CU. YD.
  STA. 14+42.82 = 53 CU. YD.
  STA. 15+46.80 = 64 CU. YD.
- ALL EXCAVATION REQUIRED TO CONSTRUCT THE BENDWAY WEIRS AS DETAILED IN THE PLANS AND SPECIFICATIONS SHALL BE CONSIDERED INCIDENTAL AND NO DIRECT COMPENSATION SHALL BE MADE.

CONSTRUCTION DETAIL – BENDWAY WEIRS

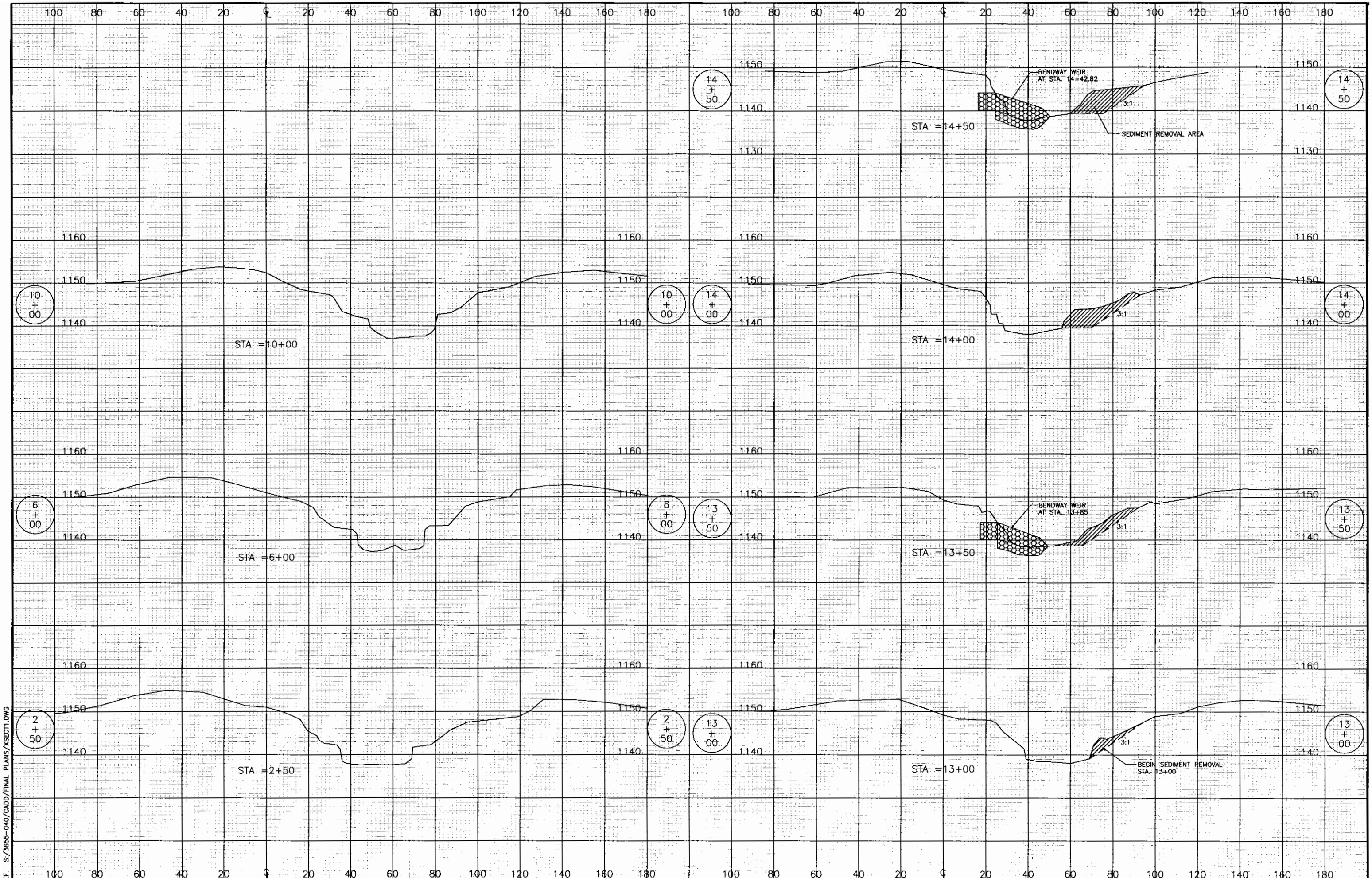
LOST RIVER EROSION CONTROL PROJECT
RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA

Scale	Drawn by	Checked by	Project No.	Date	Sheet
AS SHOWN	BGJ	BHJ	3655-040	5-20-03	6 of 10

No.	Revision	Date	By

PREPARED BY
HOUSTON ENGINEERING, INC.
10900 73rd Ave. North, Suite 106 Maple Grove, MN 55369
PHONE: (763) 493-4522 FAX: (763) 493-5572

CAD. REF. S:/3655-040/CADD/FINAL PLANS/DETAILS_2.DWG



STA =17+00

STA =16+30

END SEDIMENT REMOVAL
STA. 16+00

BENDWAY WEIR AT
STA. 15+46.80

STA =15+50

SEDIMENT REMOVAL AREA

STA =15+00

END SEDIMENT REMOVAL
STA. 19+50

STA =19+50

STA =19+00

NOTE:
CROSS-VANE WEIR NOT SHOWN.
SEE SHEET 5 FOR CROSS SECTIONS
OF CROSS-VANE WEIR.

STA =18+50

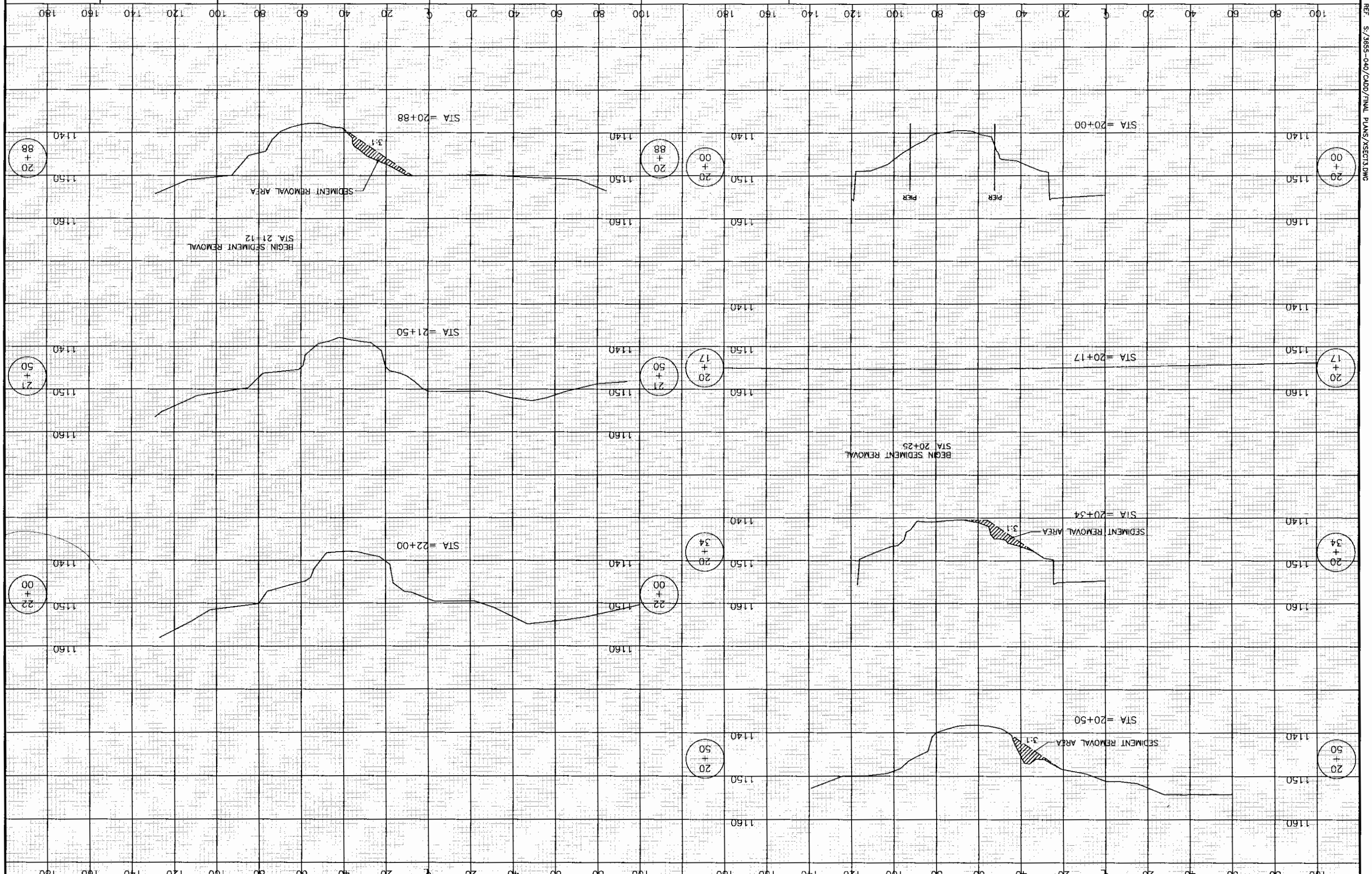
SEDIMENT REMOVAL AREA

STA =18+00

BEGIN SEDIMENT REMOVAL
STA. 17+50

CAD. REF. S:/3655-040/CADD/FINAL PLANS/XSECT2.DWG

PROJECT NO. 3655-040	LOST RIVER EROSION CONTROL PROJECT	RED LAKE WATERSHED DISTRICT	CROSS SECTIONS	Sheet 8 of 10



STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

1. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING A COPY OF AND BEING FAMILIAR WITH THE MINNESOTA POLLUTION CONTROL AGENCY GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH A CONSTRUCTION SITE.

2. THE CONTRACTOR SHALL PRESERVE THE EXISTING VEGETATION WHERE ATTAINABLE. DISTURBED AREAS WILL BE STABILIZED AS SOON AS PRACTICABLE. STABILIZATION PRACTICES MAY INCLUDE: TEMPORARY SEEDING, PERMANENT SEEDING, MULCHING, GEOTEXTILES, SODDING, VEGETATIVE BUFFER STRIPS AND OTHER MEASURES.

3. ~~THE CONTRACTOR SHALL MAINTAIN A RECORD OF THE DATES WHEN MAJOR GRADING ACTIVITIES OCCUR, WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE AND WHEN STABILIZATION MEASURES ARE INITIATED.~~

4. ~~DISTURBED AREAS WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED WILL BE STABILIZED AS SOON AS PRACTICAL BUT IN NO CASE LATER THAN 14 DAYS AFTER CONSTRUCTION ACTIVITY HAS CEASED, UNLESS STABILIZATION IS PRECLUDED BY SNOW COVER.~~

5. ~~AREAS WHERE CONSTRUCTION ACTIVITY WILL RESUME WITHIN 21 DAYS OF THE TIME CONSTRUCTION ACTIVITY TEMPORARILY CEASES NEED NOT BE STABILIZED.~~

6. ~~IN ARID AREAS (AVERAGE ANNUAL RAINFALL OF 8 TO 10 INCHES) AND SEMI-ARID AREAS (AVERAGE ANNUAL RAINFALL 10 TO 20 INCHES), STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICAL.~~

7. THE CONTRACTOR SHALL MINIMIZE OFF-SITE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST. ~~GRAVEL CONSTRUCTION ENTRANCE SHALL BE FIELD LOCATED AS NEEDED.~~

8. THE CONTRACTOR SHALL MAINTAIN, REPAIR OR RESTORE ALL GRADE SURFACES, WALLS, DAMS AND STRUCTURES, VEGETATION, EROSION AND SEDIMENT CONTROL MEASURES AND OTHER PROTECTIVE DEVICES IDENTIFIED IN THE SITE PLAN.

9. THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL PRACTICES ON THE SITE AT LEAST EVERY SEVEN DAYS AND WITHIN 24 HOURS AFTER A STORM EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR SHALL TAKE ACTION TO ELIMINATE ANY DEFICIENCIES FOUND DURING THESE INSPECTIONS. DOCUMENTATION OF THE INSPECTIONS, THE FINDINGS AND ANY CORRECTIVE ACTIONS SHALL BE MAINTAINED AT THE SITE. ~~THE DOCUMENTATION SHALL INCLUDE A REPORT SUMMARIZING THE SCOPE OF THE INSPECTION(S), NAME(S) AND QUALIFICATIONS OF PERSON MAKING THE INSPECTIONS, THE DATE(S), THE INSPECTIONS, MAJOR OBSERVATIONS RELATED TO THE SWPPP AND ACTIONS TAKEN.~~

10. WASTE DISPOSAL

    THE CONTRACTOR SHALL REMOVE ALL WASTE COMPOSED OF BUILDING MATERIALS FROM THE SITE FOR DISPOSAL IN LICENSED DISPOSAL FACILITIES.

    A. NO BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED OR DISCHARGED TO WATERS OF THE STATE AT THE SITE.

    B. ~~EACH SITE SHALL HAVE GRAVELED ACCESS ENTRANCE AND EXIT DRIVES AND PARKING AREAS TO REDUCE THE TRACKING OF SEDIMENT ONTO PUBLIC OR PRIVATE ROADS.~~

    C. ~~ALL UNPAVED ROADS ON THE SITE CARRYING MORE THAN 25 VEHICLES PER DAY SHALL BE GRAVELED.~~

    D. THE CONTRACTOR SHALL ENSURE AND DEMONSTRATE COMPLIANCE WITH THE APPLICABLE STATE DEPARTMENT OF ENVIRONMENTAL QUALITY OR LOCAL SANITARY SEWER OR Sseptic SYSTEM REGULATIONS.

11. FUEL AND CHEMICAL STORAGE AREAS

    THE CONTRACTOR SHALL PROVIDE CONTAINMENT AROUND FUELING AND CHEMICAL STORAGE AREAS TO ENSURE THAT SPILLS IN THESE AREAS DO NOT REACH WATERS OF THE STATE. CONTINGENCIES SHALL BE PROVIDED FOR THE TREATMENT AND/OR DISPOSAL OF CONTAMINATED SOILS.

12. EXISTING STATE OR LOCAL REQUIREMENTS FOR SEDIMENT AND EROSION CONTROL ARE HEREBY INCORPORATED BY REFERENCE AND ARE ENFORCEABLE.

13. ~~THE CONTRACTOR MUST CLEARLY IDENTIFY FOR EACH MEASURE IDENTIFIED IN THE PLAN, THE CONTRACTOR(S) AND/OR SUBCONTRACTOR(S) THAT WILL IMPLEMENT THE MEASURE. ALL CONTRACTORS AND SUBCONTRACTORS IDENTIFIED BY THE CONTRACTOR MUST SIGN A COPY OF THE CERTIFICATION STATEMENT. ALL CERTIFICATIONS MUST BE INCLUDED IN THE STORM WATER POLLUTION PREVENTION PLAN.~~

14. CERTIFICATION STATEMENT

    ~~ALL CONTRACTORS AND SUBCONTRACTORS SHALL SIGN A COPY OF THE STATE SIGNATORY CERTIFICATION STATEMENT BEFORE CONDUCTING ANY PROFESSIONAL SERVICE AT THE SITE IDENTIFIED IN THE STORM WATER POLLUTION PREVENTION PLAN.~~

15. ~~THE CERTIFICATION MUST INCLUDE THE NAME AND TITLE OF THE PERSON PROVIDING THE SIGNATURE IN ACCORDANCE WITH THE STATE NPDES PERMIT, THE NAME, ADDRESS AND TELEPHONE NUMBER OF THE CONTRACTING FIRM, THE ADDRESS (OR OTHER IDENTIFYING DESCRIPTION) OF THE SITE, AND THE DATE THE CERTIFICATION IS MADE.~~

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) GENERAL SPECIFICATIONS

THE PURPOSE OF THE SWPPP, OF WHICH THE EROSION CONTROL PLAN IS A PART, IS TO MINIMIZE POLLUTION TO STORM WATERS, IN COMPLIANCE WITH THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) ENACTED BY THE EPA IN SEPTEMBER, 1992.

~~THE CONTRACTOR AND THE OWNER ARE JOINTLY REQUIRED TO SUBMIT TO THE MPCA AND THE STATE A NOTICE OF INTENT (NOI) AT LEAST 48 HOURS PRIOR TO COMMENCEMENT OF CONSTRUCTION AT THE SITE. THE CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR THIS PROJECT WILL SPECIFICALLY ADDRESS THE RESPONSIBILITIES OF THE OWNER AND THE CONTRACTOR REGARDING THE NOI.~~

~~THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING THE SWPPP AS REQUIRED BY THE CONTRACT. THE PLAN PROVIDES STRUCTURAL CONTROLS AND/OR STABILIZATION PRACTICES DESIGNED TO MINIMIZE POLLUTANTS IN THE STORM WATER DISCHARGE (INCLUDING SOIL SEDIMENT), TO MINIMIZE EROSION ON THE SITE, AND TO ELIMINATE TRACKING OF SOIL OFF SITE BY VEHICLES.~~

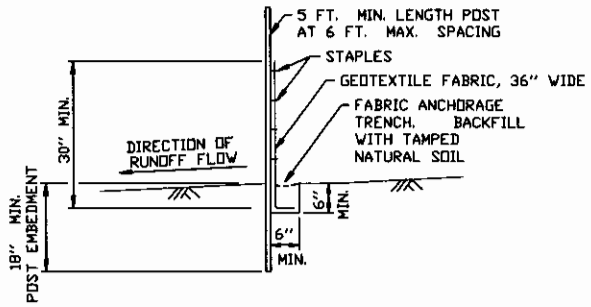
~~A REGULAR PROGRAM OF INSPECTION AND MAINTENANCE OF THE EROSION AND POLLUTION CONTROLS IS REQUIRED BY MCPA. THE CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR THIS PROJECT IDENTIFY THE PARTY RESPONSIBLE FOR SUCH INSPECTIONS. BASED ON THESE INSPECTIONS, THE EROSION AND POLLUTION CONTROLS WILL BE MAINTAINED, MAY BE MODIFIED AND MAY BE SUPPLEMENTED BY ADDITIONAL MEASURES IN ORDER TO ADEQUATELY MINIMIZE POLLUTANTS.~~

~~THE CONTRACTOR AND THE OWNER ARE JOINTLY REQUIRED TO SUBMIT TO THE MCPA AND THE STATE A NOTICE OF TERMINATION (NOT) AFTER THE SITE HAS BEEN STABILIZED, CONSTRUCTION HAS ENDED AND TEMPORARY EROSION CONTROL MEASURES HAVE BEEN REMOVED.~~

~~STORM WATER MANAGEMENT FEATURES IN ADDITION TO THOSE SHOWN ON THE PLANS SHALL BE PLACED, MONITORED, MAINTAINED, AND REMOVED AT THE DISCRETION AND DIRECTION OF THE ENGINEER AS NECESSARY.~~

~~STRAW BALE CHECKS SHOULD BE INSTALLED AS NEEDED AT SLOPES AND DITCHES. SILT FENCES WILL BE REQUIRED AT THE BOTTOM OF SLOPES AS OUTLINED ON THE PLANS.~~

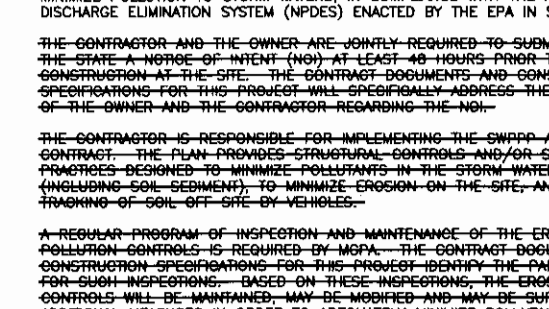
SEQUENCE OF CONSTRUCTION



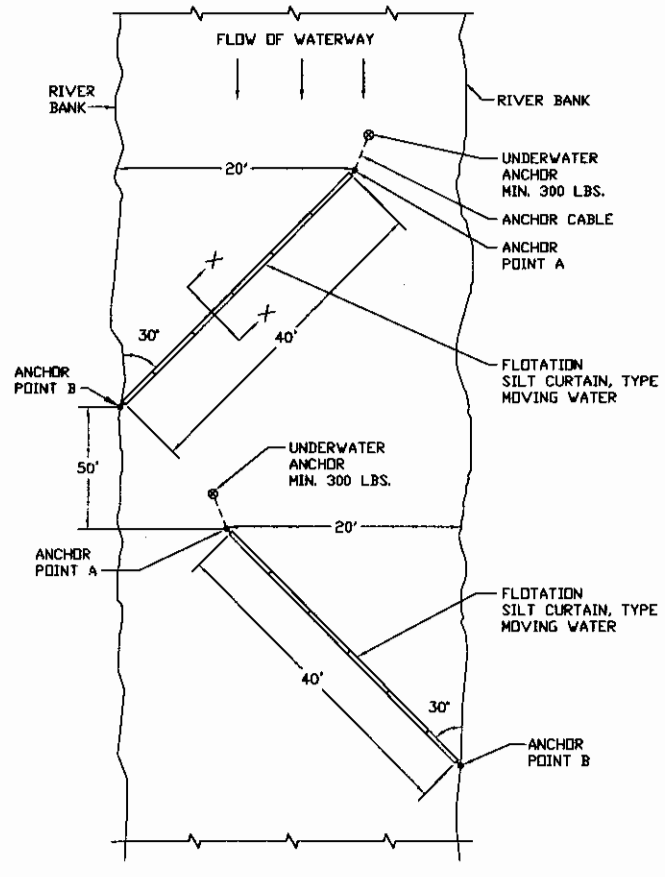
SILT FENCE - TYPE PREASSEMBLED

NOT TO SCALE

NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.



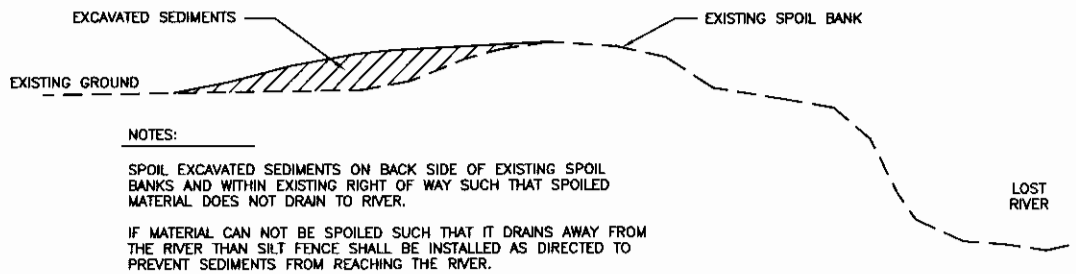
SECTION X-X
FLOTATION SILT CURTAINS



PLAN VIEW

FLOTATION SILT CURTAIN DETAIL

NOT TO SCALE



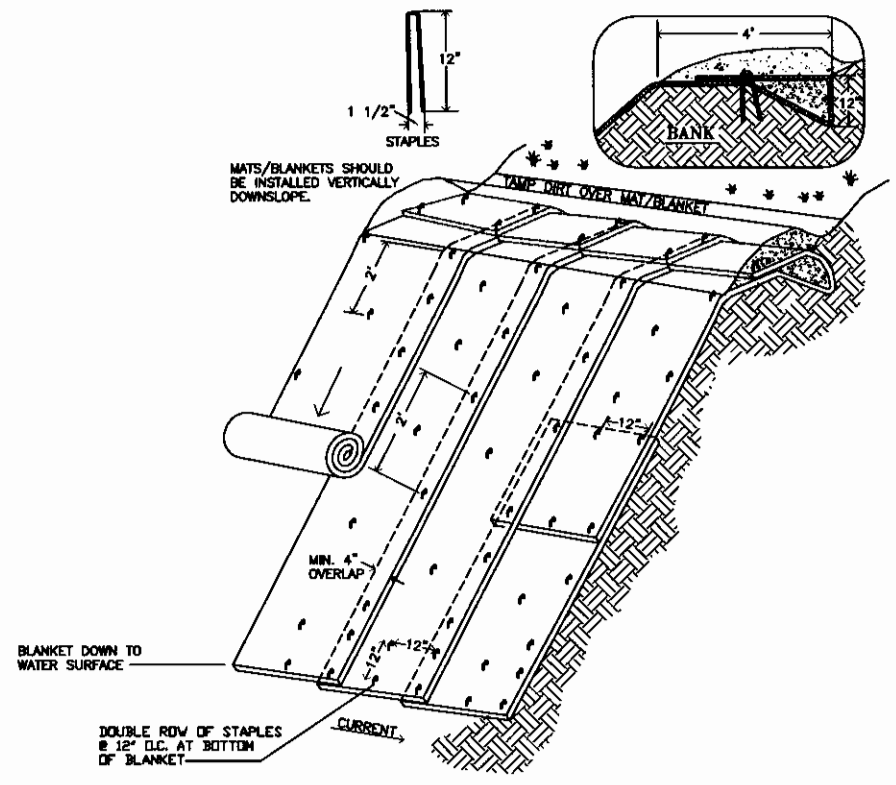
NOTES:

SPOIL EXCAVATED SEDIMENTS ON BACK SIDE OF EXISTING SPOIL BANKS AND WITHIN EXISTING RIGHT OF WAY SUCH THAT SPOILED MATERIAL DOES NOT DRAIN TO RIVER.

IF MATERIAL CAN NOT BE SPOILED SUCH THAT IT DRAINS AWAY FROM THE RIVER THAN SILT FENCE SHALL BE INSTALLED AS DIRECTED TO PREVENT SEDIMENTS FROM REACHING THE RIVER.

SPOIL PLACEMENT DETAIL

NOT TO SCALE



NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.
3. MATS/BLANKETS TO BE ANCHORED IN A TRENCH AT THE TOP AND THE UPSTREAM EDGE.

EROSION CONTROL BLANKET DETAIL

NOT TO SCALE

I hereby certify that this plan, specification, or report was prepared be me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: Brent H. Johnson Typed or Printed Name: Brent H. Johnson

Date: 6-13-2003 Lic. No. 20378

No.	Revision	Date	By

Scale	Drawn by	Checked by
AS SHOWN	BGJ	BHJ
Project No.	Date	
3655-040	5-28-03	

EROSION & SEDIMENT CONTROL DETAILS AND NOTES

LOST RIVER EROSION CONTROL PROJECT
RED LAKE WATERSHED DISTRICT
THIEF RIVER FALLS, MINNESOTA

PREPARED BY
HOUSTON ENGINEERING, INC.
10900 73rd Ave. North, Suite 106 Maple Grove, MN 55369
PHONE: (763) 493-4522 FAX: (763) 493-5572

SHEET 10 OF 10 SHEETS

CAD. REF. S:/3655-040/CADD/FINAL PLANS/EROSION.DWG

APPENDIX B

JOINT NOTIFICATION PERMIT FORM

Minnesota Local/State/Federal Application Forms for Water/Wetland Projects

USE THIS APPLICATION FOR ANY PROJECT AFFECTING A LAKE, RIVER, STREAM OR WETLAND, INCLUDING:

Local Government Unit Approval Pursuant to Minnesota Wetlands Conservation Act (WCA)
Minnesota Department of Natural Resources (DNR) Permit to Work in Public Waters
Department of the Army Permit (33 CFR 325)

Note: The U. S. Army Corps of Engineers (**COE**) will forward application forms to the Minnesota Pollution Control Agency (**MPCA**) for processing if state water quality certification is required from the MPCA. You **do not** need to send this application to the MPCA.

This application packet includes **Part I:** The **BASIC APPLICATION** and the **COE APPLICATION** to be filled out by all applicants (see Instructions).

You will also be informed if your proposal requires **Part II:** The **REPLACEMENT PLAN SUPPLEMENT.** Part II is *only for* projects that require a replacement plan for wetland mitigation.

Do not proceed with your project until you have received all required approvals from your LGU, the DNR and the COE. If you wish to confirm the status of your application at any time, contact the agencies directly (see Instructions, page 2). **Proceeding with work before all required authorizations are obtained may result in fines or other penalties, and may include a requirement to restore the project site to original condition.**

If you have questions or need assistance with filling out these forms, contact your local SWCD office, your LGU, your Area DNR Waters office, or your COE field office (see Instructions, page 2).

If you believe that your project may be subject to watershed district, local zoning, or any other local regulations besides those of your LGU, contact those office(s) directly. **If you are a Federal Farm Program participant** and your project affects a wetland or water body on agricultural land, your eligibility for USDA benefits may be affected. Contact a Natural Resources Conservation Service office for further information.

A QUICK LOOK AT THE PROJECT APPLICATION PROCESS

Electronic files: Forms can be downloaded and filled out using Microsoft Word. Your input will be restricted to fill-in fields where users can enter text or check boxes. These areas appear gray on the screen, but not on the printed document.

Send copies of these completed application forms to your LGU, your Area DNR Waters office, and your COE regulatory office.

Any of the agencies may make initial contact with you to: a) inform you that it has no jurisdiction over your project; b) request additional information needed; or c) inform you of applicable fees.

When your application is considered complete and appropriate fees have been received (if requested) it will be distributed for appropriate review.

Following agencies' reviews, you will be informed if it has been approved, approved with changes or conditions, withdrawn, or denied.
For information about state laws, rules and regulations that direct this process go to the web site www.revisor.leg.state.mn.us. For information on U.S. Army Corps of Engineers regulations go to the web site www.mvp.usace.army.mil .

Instructions for Part I

HELP 1: Every applicant must fill out Section 1. The applicant is the person, agency, company, corporation, or other organization that owns, leases, or holds other legal rights to the land where the project is located. Indicate names of multiple applicants on a separate sheet.

HELP 1A: Fill out Section 1A only if you have designated an authorized agent. An authorized agent may be an attorney, builder, consultant, contractor, engineer, or any other person or organization designated by the applicant to represent him/her in this process. An agent is not required.

HELP 5: Purpose, description and dimensions of project: State briefly (in a sentence or two) what you propose to do and why it is needed. Also, describe whether your project will involve any of the following:

- Construction of structures, filling, draining, dewatering, removing, excavating or repair.
- Construction of an access path, bridge, culvert, dam, ditch, dock, driveway, riprap, road, sand blanket, shore protection, or tile line.
- Construction of any structures on fill, piles or a float-supported platform. If so, describe.
- Dredging or discharging (placing fill material) into a wetland or other water body (including the temporary placement of material). If so, explain the specific purpose of the placement of the material (such as erosion control) and indicate how it will be done (such as with a backhoe or dragline). If dredged material is to be discharged on an upland site, identify the location of the site.

Include an overhead view drawing showing the work to be undertaken and its relative location on the property. Show items such as property boundaries or lot dimensions; location and extent of shoreline, wetlands and water; location and dimensions and footprint of the proposed project, structure or activity (include length, width, elevation and other measurements as appropriate); points of reference such as existing homes, structures, docks or landscape features; indication of north; and location of spoil and disposal sites (if applicable). Hand drawn, computer generated or professionally prepared drawings are acceptable, as long as they contain all necessary information clearly, accurately, and in adequate detail. Please include specific dimensions whenever possible. You may also include photos, if you wish.

HELP 7: For information regarding adjacent landowners, contact the tax assessor where the project is to be developed.

HELP 8: If any part of the work has already been completed, describe the area already developed. Include a description of structures completed; any dredged or fill material already discharged (including type of material and volume in cubic yards); acres or square feet filled (if a wetland or other waterbody); and whether the work was done under an existing permit (if so identify the authorization, if possible).

HELP 9: Other permits, reviews or approval related to the project may include the following: conditional use permit; plat approval; zoning variance; National Pollutant Discharge Elimination System permit; state disposal system permit (includes dredged material disposal); watershed district/watershed management organization permit (stormwater, erosion, floodplain); environmental assessment worksheet/environmental impact statement; hazardous waste site; feedlot permit; groundwater appropriation permit; or county/township driveway/road permit. Are you aware of any archeological or cultural resource determinations or surveys completed concerning the project or replacement site by the State Historic Preservation Office (SHPO) or others? If yes, please explain on a separate sheet or attach a copy of any determinations or surveys.

Final Checklists (Part I)

- ☐ **Have you completed all of Part I** (Page 1), plus the Federal application (Page 2)?
- ☐ **Did you (and your agent, if applicable) sign Section 10** on page 1?
- ☐ **Have you signed the Application for the Department of the Army Permit** (Page 2) to seek Federal authorization of your project?
- ☐ **Have you included the necessary attachments for Part I?**

Attachments *must* include:

- ☐ Site Locator Map (Section 3)
- ☐ Type of Project (Section 4) (if additional space was needed)
- ☐ Overhead View of Project (Section 5 and HELP 5)
- ☐ Project Purpose, Description and Dimensions (Section 5) (if additional space was needed)

Attachments *may* also include:

- ☐ Applicant Contact Information (HELP 1) (if additional space was needed)
- ☐ Project Location (Section 3) (if additional space was needed)
- ☐ Project Alternatives (Section 6) (if additional space was needed)
- ☐ Photographs
- ☐ Adjoining Property Owners (Section 7) (if additional space was needed)
- ☐ Work Already Completed Section (Section 8) (if you answered YES)
- ☐ State Historic Preservation Office determination or survey

Submitting Your Application

Make three copies of the entire application and all attachments. Keep the original, and mail **a complete copy of your application to each of the local, state, and Federal entities listed below.** Be sure to include Part I and all attachments with each application.

LOCAL: Send to the appropriate Local Government Unit (LGU). If necessary, contact your county Soil and Water Conservation District (SWCD) office or visit the Board of Water and Soil Resources (BWSR) web site (www.bwsr.state.mn.us) to determine the appropriate LGU.

STATE: Send to your Area DNR Waters office, attention Area Hydrologist. If necessary, contact your county Soil and Water Conservation District (SWCD) office or visit the DNR web site (www.dnr.state.mn.us) to locate the Area Hydrologist for your location, or contact a Regional DNR office:

NW Region:
2115 Birchmont Beach Road N.E.
Bemidji, MN 56601
Phone: 218-755-3873

NE Region:
1201 East Highway 2
Grand Rapids, MN 55744
Phone: 218-327-4416

Central Region:
1200 Warner Road
St. Paul, MN 55106
Phone: 651-772-7910

Southern Region:
261 Highway 15 South
New Ulm, MN 56073
Phone: 507 359-6053

FEDERAL: Send to the appropriate U.S. Army Corps of Engineers regulatory field office:

Brainerd:
U.S. COE, Regulatory Branch
10867 E. Gull Lake Drive N.W.
Brainerd, MN 56401-9051
Phone: 218-829-8402

St. Paul:
U.S. COE, Regulatory Branch
Army Corps of Engineers Centre
190 5th Street East
St. Paul, MN 55101-9051
Phone: 651-290-5375

La Crescent:
U.S. COE, Regulatory Branch
1114 South Oak Street
La Crescent, MN 55947-1338
Phone: 507-895-8059

Two Harbors:
U.S. COE, Regulatory Branch
1554 Highway 2, Suite 2
Two Harbors, MN 55161
Phone: 218-834-6630

WEBSITES: BWSR: www.bwsr.state.mn.us U.S. COE: www.mvp.usace.army.mil DNR: www.dnr.state.mn.us MPCA: www.pca.state.mn.us

NA-026620-03A (V.2.01 for MS WORD) 02/14/03

Minnesota Local/State/Federal Application Form for Water/Wetland Projects

For Internal Use Only			
Application No.	Field Office Code	Date Initial Application Received	Date initial Application Deemed Complete

PART I: BASIC APPLICATION

"See HELP" **directs you to important additional information and assistance in Instructions, Page 1.**

1. LANDOWNER/APPLICANT CONTACT INFORMATION ***(See Help 1)***

Name: Red Lake Watershed District, Myron Jesme , Administrator Phone: 218 681-5800

Complete mailing address: 102 North Main Avenue, PO Box 803, Thief River Falls, MN 56701

1A. AUTHORIZED AGENT ***(See Help 1A)*** *(Only if applicable;* ***an agent is not required)***

Name: Phone:

Complete mailing address:

2. NAME, TYPE AND SIZE OF PUBLIC WATERS or WETLANDS IMPACTED (Attach *Additional Project Area* sheets if needed)

Name or I.D. # of Waters Impacted (if applicable; if known): Lost River

(Check all that apply): ☐Lake ☒River ☐Wetland type ☐ 1 ☐ 1L ☐ 2 ☐ 3 ☐4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

Indicate size of entire lake or wetland (check one): ☐ Less than 10 acres (indicate size:) ☐10 to 40 acres ☐ Greater than 40 acres

3. PROJECT LOCATION *(Information can be found on property tax statement, property title or title insurance):*

Project street address: Fire #: City (if applicable):

¼ Section: Section: 5 & 6 Township #: 150-N Range #: 39W County: Polk

Lot #: Block: Subdivision: Watershed (name or #) Red Lake

Attach a simple site locator map. If needed, include on the map written directions to the site from a known location or landmark, and provide distances from known locations. Label the sheet *SITE LOCATOR MAP.*

See attached plans. Sheets 1 and 2 of 10 include location maps.

4. TYPE OF PROJECT: Describe the type of proposed work. Attach *TYPE OF PROJECT* sheet if needed.

This is an erosion control project. It includes the removal of sediment and the installation of rock weirs.

5. PROJECT PURPOSE, DESCRIPTION AND DIMENSIONS: Describe what you plan to do and why it is needed, how you plan to construct the project with dimensions (length, width, depth), area of impact, and when you propose to construct the project. **This is the most important part of your application. See HELP 5 before completing this section; see What To Include on Plans** (Instructions, page 1). Attach *PROJECT DESCRIPTION* sheet.

See attached project report.

Footprint of project: acres or (See Attached) square feet drained, filled or excavated.

6. PROJECT ALTERNATIVES: What alternatives to this proposed project have you considered that would avoid or minimize impacts to wetlands or waters? List at least **TWO** additional alternatives to your project in Section 5 that avoid wetlands (one of which may be "no build" or "do nothing"), and explain why you chose to pursue the option described in this application over these alternatives. Attach *PROJECT ALTERNATIVES* sheet if needed.

1. Large scale land use changes, and 2. Do Nothing, (see attached project report for descriptions)

7. ADJOINING PROPERTY OWNERS: For projects that impact more than 10,000 square feet of water or wetlands, list the complete mailing addresses of adjacent property owners on an attached separate sheet. (See **HELP 7**)

8. PORTION OF WORK COMPLETED: Is any portion of the work in wetland or water areas already completed? ☐ Yes ☒No. If yes, describe the completed work on a separate sheet of paper labeled **WORK ALREADY COMPLETED.** (See **HELP 8**)

9. STATUS OF OTHER APPROVALS: List any other permits, reviews or approvals related to this proposed project that are either **pending** or **have already been approved or denied on a separate attached sheet. See HELP 9.**

10. I am applying for state and local authorization to conduct the work described in this application. I am familiar with the information contained in this application. To the best of my knowledge and belief, all information in Part I is true, complete, and accurate. I possess the authority to undertake the work described, or I am acting as the duly authorized agent of the applicant.

Signature of applicant (Landowner) *Date* *Signature of agent (if applicable)* *Date*

This block must be signed by the person who desires to undertake the proposed activity and has the necessary property rights to do so. If only the Agent has signed, please attach a separate sheet signed by the landowner, giving necessary authorization to the Agent.

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325) OMB APPROVAL NO. 0710-003 Expires Dec 31, 2004

The public burden for this collection of information is estimated to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of these addresses. Completed applications must be submitted to the District engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT: Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research and Sanctuaries Act, 33 USC 1413, Section 103. Principal purpose: Information provided on this form will be used in evaluating the application for a permit. Routine uses: This information may be shared with the Department of Justice and other Federal, state, and local government agencies. Submission of requested information is voluntary; however, if information is not provided, the permit application cannot be evaluated nor can a permit be issued.

ITEMS 1 THROUGH 4 TO BE FILLED IN BY THE CORPS

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

YOU *DO NOT* NEED TO COMPLETE ITEMS 6-10 and 12-25 in the SHADED AREAS.

All applicants must complete **non-shaded** items 5 and 26. If an agent is used, **also** complete items 8 and 11. This optional Federal form is valid for use ***only*** when included as part of this entire state application packet.

5. APPLICANT'S NAME Red Lake Watershed District, Myron Jesme, Admin.	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NO.	10. AGENT'S PHONE NO.

11. STATEMENT OF AUTHORIZATION *(if applicable; complete* **only** *if authorizing an agent)*

I hereby authorize _____ to act on my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT"S SIGNATURE: _____ DATE: _____

12. PROJECT NAME OR TITLE (see instructions)	
13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
15. LOCATION OF PROJECT	
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)	
17. DIRECTIONS TO THE SITE	18. NATURE OF ACTIVITY
19. PROJECT PURPOSE	20. REASON(S) FOR DISCHARGE
21. TYPES OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS	
22. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED	
23. IS ANY PORTION OF THE WORK ALREADY COMPLETE? YES _____ NO ___ IF YES, DESCRIBE COMPLETED WORK.	
24. ADDRESSES OF ADJOINING PROPERTY OWNERS,	
25. LIST OF OTHER CERTIFICATIONS OR APPROVALS/DENIALS RECEIVED FROM OTHER FEDERAL, STATE OR LOCAL AGENCIES FOR WORK DESCRIBED IN THIS APPLICATION.	

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

_____ _____ _____ _____

Signature of applicant Date Signature of agent (if any) Date

The application must be signed by the person who desires to undertake the proposed activity (applicant), or it may be signed by a duly authorized agent if the statement in Block 11 has been filled out and signed. **18 U.S.C. Section 1001** provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up with any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

ENG FORM 4345, Jul 97 EDITION OF FEB 94 IS OBSOLETE. (Proponent: CECW-OR)

5. PROJECT PURPOSE, DESCRIPTION AND DIMENSIONS:

Footprint of project: ___ acres or 9800 square feet of sediment removal (with disposal on existing upland spoil banks), and 4100 square feet of rock fill for vane construction.

APPENDIX C

MONITORING PLAN PROCEDURES, BASELINE DATA, AND PHOTOGRAPHS

MONITORING PLAN PROCEDURES

Monitoring will be conducted on the Lost River Erosion Control Project to measure and document the condition of the river channel and the implemented erosion control features. Monitoring should be done on an annual basis for a period of about five years. The monitoring will be conducted in order to determine the effectiveness of the proposed erosion control measures. This will be determined by monitoring bank erosion, lateral and vertical movement of the stream, and vegetation in and immediately adjacent to the project locations. Monitoring will consist of the following:

- Photos taken from designated locations
- Surveyed cross sections and profiles to document the channel shape, thalweg elevations and changes.
- Vegetation type and density assessment

The following workbook sections should be completed following each site inspection so that changes in the observed data can be compared year to year as well as cumulatively over the monitoring period. A written summary report should be prepared. The report should identify the results of the monitoring and include the collected data for each monitoring location. The report should also include comments from the inspector on the effectiveness of the erosion control measures, and particularly include descriptions of any surprising issues—problems, solutions, or ancillary benefits that were not planned or expected.

Channel Cross Sections

The following channel station locations should be monitored to measure changes in the river channel: 6+00, 14+00, 18+00, 18+50, 19+00 and 20+50. Additional cross sections should be added to document areas of significant erosion or sediment deposition. The frequency of channel measurements can be reduced to less than once per year if changes from year to year are small.

Monuments should be set at each cross section to mark the location of each endpoint, and a TBM elevation should be established and recorded for one monument at each cross-section. Cross section measurements should be taken between the monuments (perpendicular to the channel), using a uniform cross section stationing so the sections can be compared year to year for changes. A table and graph for each measured cross section should be updated after each monitoring survey.

Table C-1
Station 6+00

Cross Section Station (feet)	Lost River 1959		Corps Design		Lost River 2001		RLWD 2003 As-built		Monitoring Year 1,2 etc.	
	Offset	Elevation	Offset	Elevation	Offset	Elevation	Offset	Elevation	Offset	Elevation
6+00	16.0	1149.05	16.0	1149.05	16.0	1149.05				
	22.0	1147.65	22.0	1147.65	22.0	1147.65				
	29.2	1146.77	25.8	1147.19	25.0	1145.45				
	44.2	1147.14	51.9	1138.37	32.0	1142.95				
	45.2	1147.09	68.0	1138.32	41.0	1142.45				
	48.6	1143.67	98.4	1148.57	43.0	1141.35				
	54.8	1142.15	100.0	1148.85	43.5	1138.95				
	55.8	1142.0	115.0	1150.05	46.0	1137.75				
	61.4	1142.44			50.0	1137.25				
	65.3	1143.00			55.0	1137.55				
	70.7	1143.27			61.0	1138.75				
	73.1	1145.27			65.0	1137.55				
	75.0	1147.06			69.0	1137.75				
	88.5	1147.81			72.5	1137.95				
	94.0	1147.85			74.5	1138.65				
	100.0	1148.85			75.0	1142.35				
	115.0	1150.05			77.0	1143.25				
					86.0	1143.35				
					94.0	1147.85				
					100.0	1148.85				
					115.0	1150.05				

Figure C-1. Cross Sections at Station 6+00

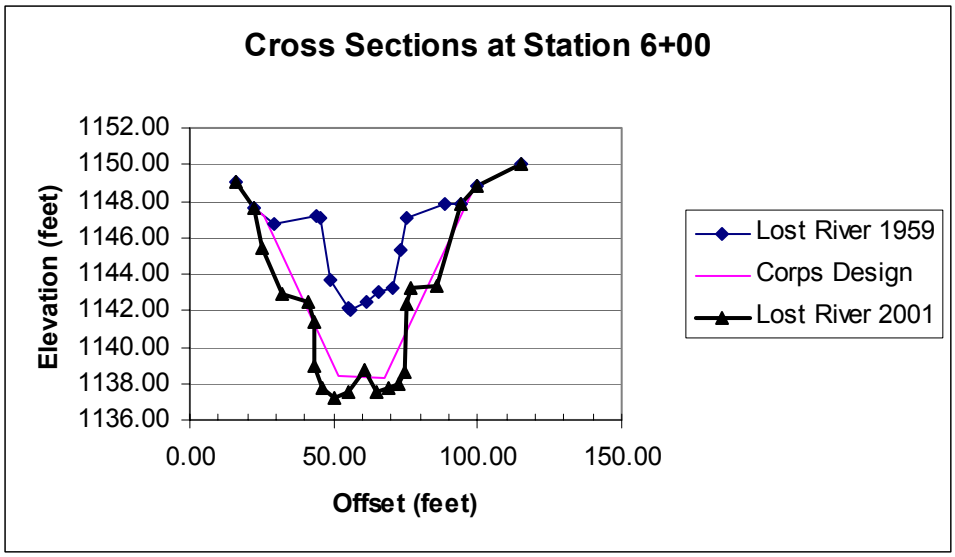


Table C-2
Station 14+00

Cross Section Station (feet)	Lost River 1959		Corps Design		Lost River 2001		RLWD 2003 As-built		Monitoring Year 1,2 etc.	
	Offset	Elevation	Offset	Elevation	Offset	Elevation	Offset	Elevation	Offset	Elevation
14+00	6.0	1148.73	6.0	1148.73	6.0	1148.73				
	17.5	1148.03	17.5	1148.03	17.5	1148.03				
	28.9	1147.85	45.5	1138.53	20.0	1146.63				
	32.4	1147.61	61.5	1138.53	22.0	1144.73				
	38.8	1144.22	84.2	1146.31	22.5	1142.73				
	47.7	1142.23	87.0	1147.43	25.0	1142.63				
	54.2	1141.67	90.0	1147.83	26.0	1140.63				
	60.0	1142.38	93.0	1147.23	28.0	1140.43				
	64.48	1143.40	100.0	1148.33	29.0	1138.83				
	67.5	1144.26			33.0	1138.43				
	69.6	1145.98			39.0	1137.93				
	84.2	1146.31			41.0	1137.93				
	87.0	1147.43			56.0	1139.43				
	90.0	1147.83			57.0	1141.03				
	93.0	1147.23			62.0	1143.73				
	100.0	1148.33			70.0	1143.93				
					75.0	1144.43				
					83.0	1145.93				
					87.0	1147.43				
					90.0	1147.83				
					93.0	1147.23				
					100.0	1148.33				

Figure C-2. Cross Sections at Station 14+00

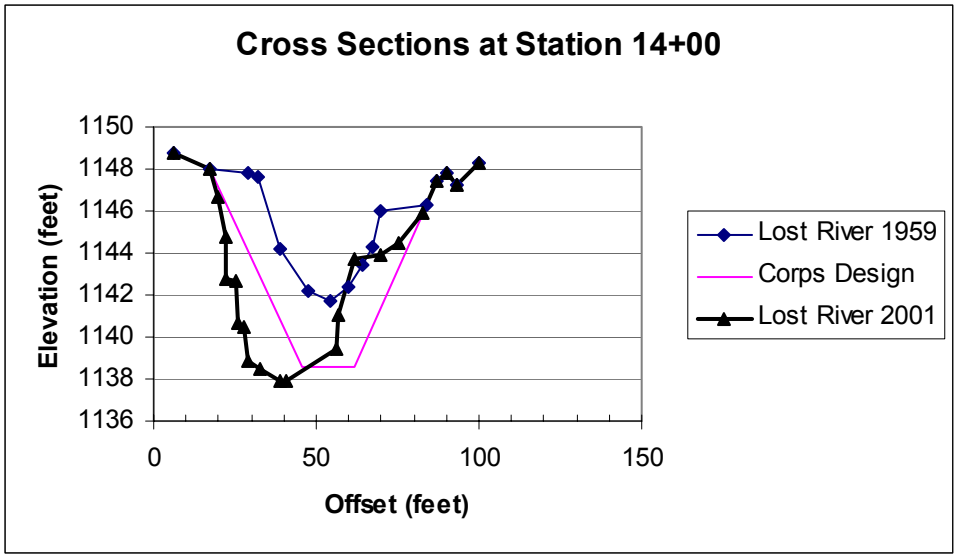


Table C-3
Station 18+00

Cross Section Station (feet)	Lost River 2001		RLWD 2003 As-built		Monitoring Year 1,2 etc	
	Offset	Elevation	Offset	Elevation	Offset	Elevation
18+00	7.0	1149.33				
	9.0	1147.43				
	10.0	1147.43				
	11.5	1146.23				
	14.0	1145.83				
	19.0	1144.33				
	21.0	1142.43				
	23.0	1138.73				
	28.0	1138.23				
	31.0	1138.53				
	40.0	1139.13				
	52.0	1139.13				
	54.0	1139.53				
	66.0	1142.73				
	71.0	1142.73				
	85.0	1147.33				
	97.0	1150.93				
	100.0	1150.73				
	115.0	1150.63				

Figure C-3. Cross Sections at Station 18+00

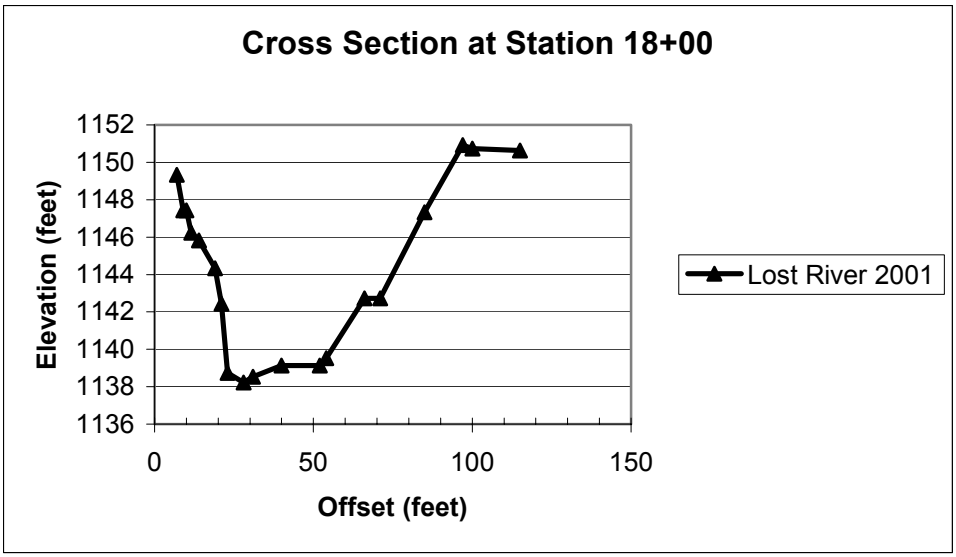


Table C-4
Station 18+50

Cross Section Station (feet)	Lost River 2001		RLWD 2003 As-built		Monitoring Year 1,2 etc	
	Offset	Elevation	Offset	Elevation	Offset	Elevation
18+50	8.5	1148.49				
	9.0	1143.19				
	12.5	1141.89				
	15.0	1140.59				
	18.0	1139.69				
	22.0	1138.89				
	26.0	1138.49				
	34.0	1138.99				
	43.5	1138.79				
	47.0	1139.39				
	51.0	1139.69				
	52.5	1140.59				
	59.0	1141.59				
	65.0	1142.69				
	70.0	1142.99				
	72.0	1142.39				
	76.0	1142.79				
	83.0	1145.49				
	95.5	1149.39				
	100.0	1150.29				
	115.0	1150.89				

Figure C-4. Cross Sections at Station 18+50

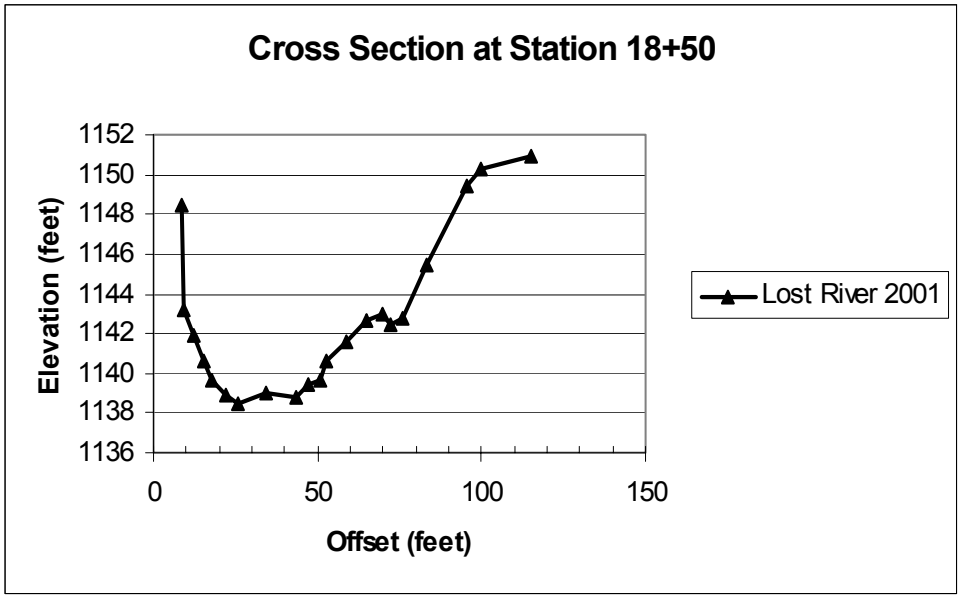


Table C-5
Station 19+00

Cross Section Station (feet)	Lost River 1959		Corps Design		Lost River 2001		RLWD 2003 As-built		Monitoring Year 1,2 etc.	
	Offset	Elevation	Offset	Elevation	Offset	Elevation	Offset	Elevation	Offset	Elevation
19+00	-45.0	1150.83	-45	1150.83	-45.0	1150.83				
	-37.2	1150.24	-37.2	1150.24	-15.0	1148.53				
	0	1150.43	0	1150.43	0	1148.63				
	5.8	1150.46	5.8	1150.46	3.5	1148.63				
	25.6	1150.80	41.4	1138.60	13.5	1143.73				
	31.8	1148.02	56.4	1138.60	18.0	1142.43				
	35.2	1143.91	89.8	1149.73	23.0	1139.83				
	40.2	1142.35	100.0	1150.23	30.0	1137.73				
	49.4	1141.76	110.0	1149.83	34.0	1137.13				
	57.9	1142.56			36.0	1137.63				
	62.8	1144.21			40.0	1138.33				
	70.5	1149.11			47.0	1138.93				
	76.9	1151.04			64.0	1139.83				
	87.79	1149.78			70.0	1142.53				
	89.8	1149.73			76.0	1144.63				
	100.0	1150.23			83.0	1144.73				
	110.0	1149.83			86.0	1145.23				
					90.0	1146.73				
					100.0	1150.23				
					110.0	1149.83				

Figure C-5. Cross Sections at Station 19+00

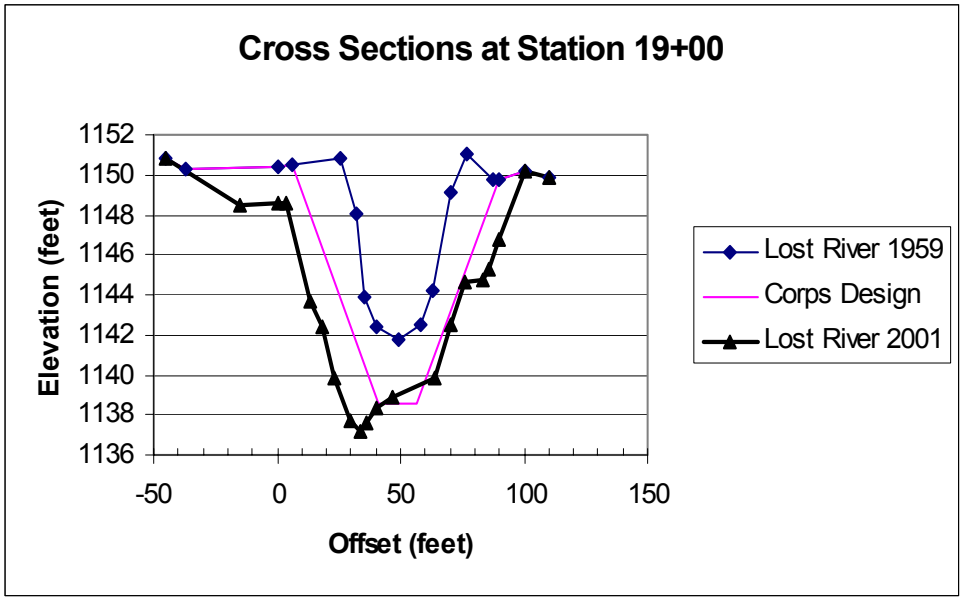
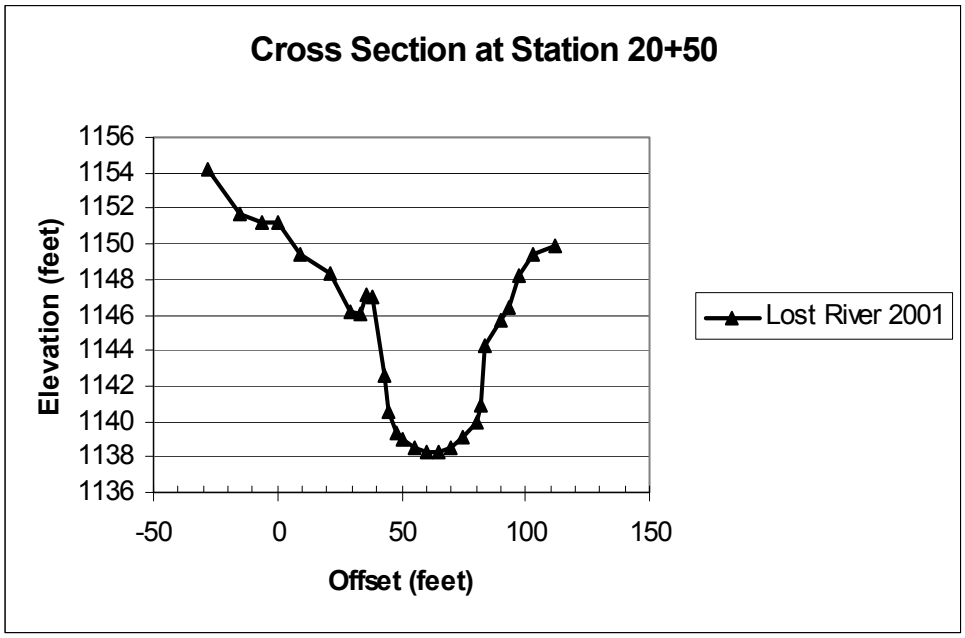


Table C-6
Station 20+50

Cross Section Station (feet)	Lost River 2001		RLWD 2003 As-built		Monitoring Year 1,2 etc.	
	Offset	Elevation	Offset	Elevation	Offset	Elevation
20+50	-28.0	1154.26				
	-15.0	1151.66				
	-6.0	1151.16				
	0	1151.16				
	9.0	1149.46				
	21.0	1148.36				
	29.0	1146.16				
	33.0	1146.06				
	36.0	1147.16				
	38.5	1146.96				
	43.0	1142.56				
	44.5	1140.56				
	48.0	1139.36				
	50.0	1138.96				
	55.0	1138.46				
	60.0	1138.26				
	65.0	1138.26				
	70.0	1138.46				
	75.0	1139.16				
	80.0	1139.96				
	82.0	1140.96				
	84.0	1144.26				

	90.0	1145.66				
	93.0	1146.46				
	97.0	1148.26				
	103.0	1149.36				
	112.0	1149.86				

Figure C-6. Cross Sections at Station 20+50



Thalweg Profile

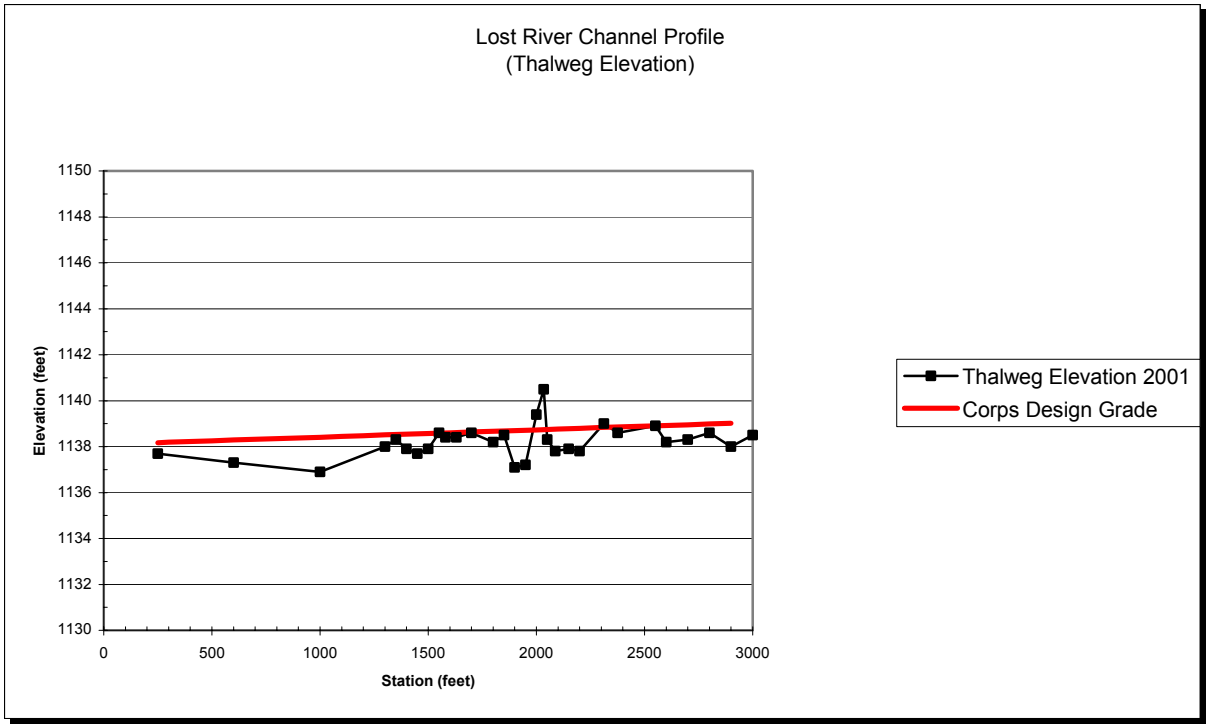
A profile measurement of the channel thalweg should be made during each inspection (i.e. the profile defining the lowest points along a reach of a river bed) from station 6+00 to station 21+00.

A table and graph for each measured thalweg profile should be updated after each monitoring survey.

Table C-7
Thalweg Profile

Corps Design		Lost River 2001		Monitoring Year 1,2 etc.	
Station	Elevation	Station	Elevation	Station	Elevation
250	1138.17	250	1137.7		
300	1138.19	600	1137.3		
400	1138.22	1000	1136.9		
500	1138.25	1300	1138		
600	1138.29	1350	1138.3		
700	1138.32	1400	1137.9		
800	1138.35	1450	1137.7		
900	1138.38	1500	1137.9		
1000	1138.41	1550	1138.6		
1100	1138.44	1580	1138.4		
1200	1138.48	1630	1138.4		
1300	1138.51	1700	1138.6		
1400	1138.54	1800	1138.2		
1500	1138.57	1850	1138.5		
1600	1138.6	1900	1137.1		
1700	1138.64	1950	1137.2		
1800	1138.67	2000	1139.4		
1900	1138.7	2034	1140.5		
2000	1138.73	2050	1138.3		
2100	1138.76	2088	1137.8		
2200	1138.79	2150	1137.9		
2300	1138.83	2200	1137.8		
2400	1138.86	2312	1139.0		
2500	1138.89	2375	1138.6		
2600	1138.92	2550	1138.9		
2700	1138.95	2600	1138.2		
2800	1138.99	2700	1138.3		
2900	1139.02	2800	1138.6		
		2900	1138		
		3000	1138.5		

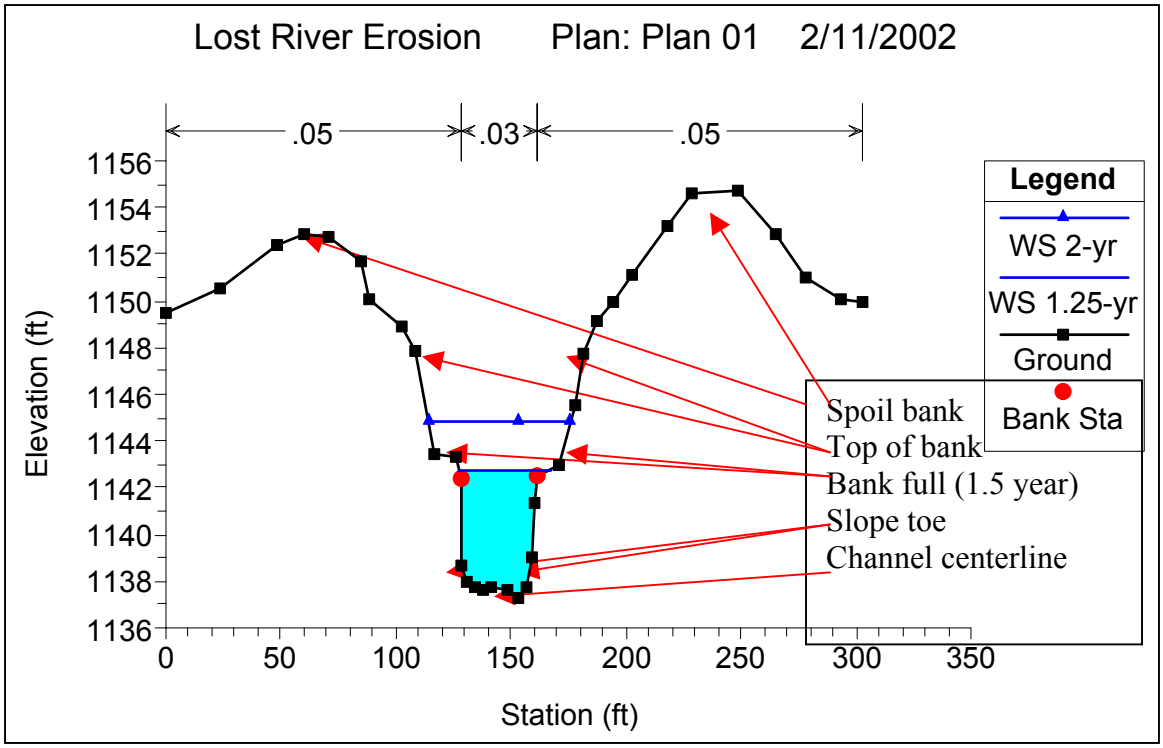
Figure C-7. Lost River Channel Profile (Thalweg Elevation)



Vegetation

Measure and record the dominant species and percentage cover during each inspection. Vegetation measurements should be taken from the same points each year so comparisons can be made. Use the monuments at each cross-section as reference points to mark channel transects for measurement. The frequency of vegetation measurements can be reduced to less than once per year if changes from year to year are small. Vegetation measurements should be taken at cross sections 6+00, 14+00, 18+50, and 20+50. Add additional vegetation measurements in areas that are significantly different from the measured transects. Identify the vegetation types in a 1-meter square area at up to 9 points along each channel transect. Select points such as spoil bank centerline (right and left), top of bank (right and left), bankfull or 1.5 year flood level (right and left), channel toe (right and left) and channel centerline. Figure C-8 shows a typical channel cross-section and the approximate vegetation measurement locations.

Figure C-8. Typical Channel Cross-Section



Record the vegetation type and percent cover at each transect point. The following table provides an example:

Table C-8

Cross Section: 6+00	Transect point: Top of left ascending bank	Vegetation Type	Percent Cover
		Reed Canary	85%
		Willow	5%
		Other	1%
		Exposed Soil	9%

Photos

Photos of the channel should be taken during each inspection. Photos should be taken from the same points each year so year-to-year comparisons can be made. Use the monuments at each cross section as reference points as well as the C.S.A.H. Bridge

centerline. Take photos from each reference point looking across the channel and up and downstream. Take photos from the bridge looking upstream and downstream. The frequency of channel photos can be reduced to less than once per year if changes from year to year are small. Photos should be taken at cross sections 6+00, 14+00, 18+00, 18+50, 19+00 and 20+50 and from the bridge. The following photos are from the 2001 site inspection and survey.

Lost River Erosion Control Project

- Location
  - Lost River within Sections 5 and 6 of Gully Township, Polk County.

Lost River May 13, 1991 Aerial Photo: Section 5 and 6 of Gully Township, CSAH 28 near center

Lost River Erosion Control Project

- Survey
  - RLWD staff surveyed the channel in November 2001
    - Alignment
    - Cross sections
    - Channel profile
    - Bridge opening
    - 3000 foot reach

Lost River at CSAH 28 (Trail Road) May 13, 1991

Looking downstream (west) from near Station 2+00,
November 2001

Looking upstream (north) from near Station 2+00,
November 2001

Looking downstream (south) from near Station 14+50,
November 2001

Looking downstream from near station 14+50, November 2001

Looking at left (descending) bank near station 14+50, November 2001

Looking upstream from near station 15+00, November 2001

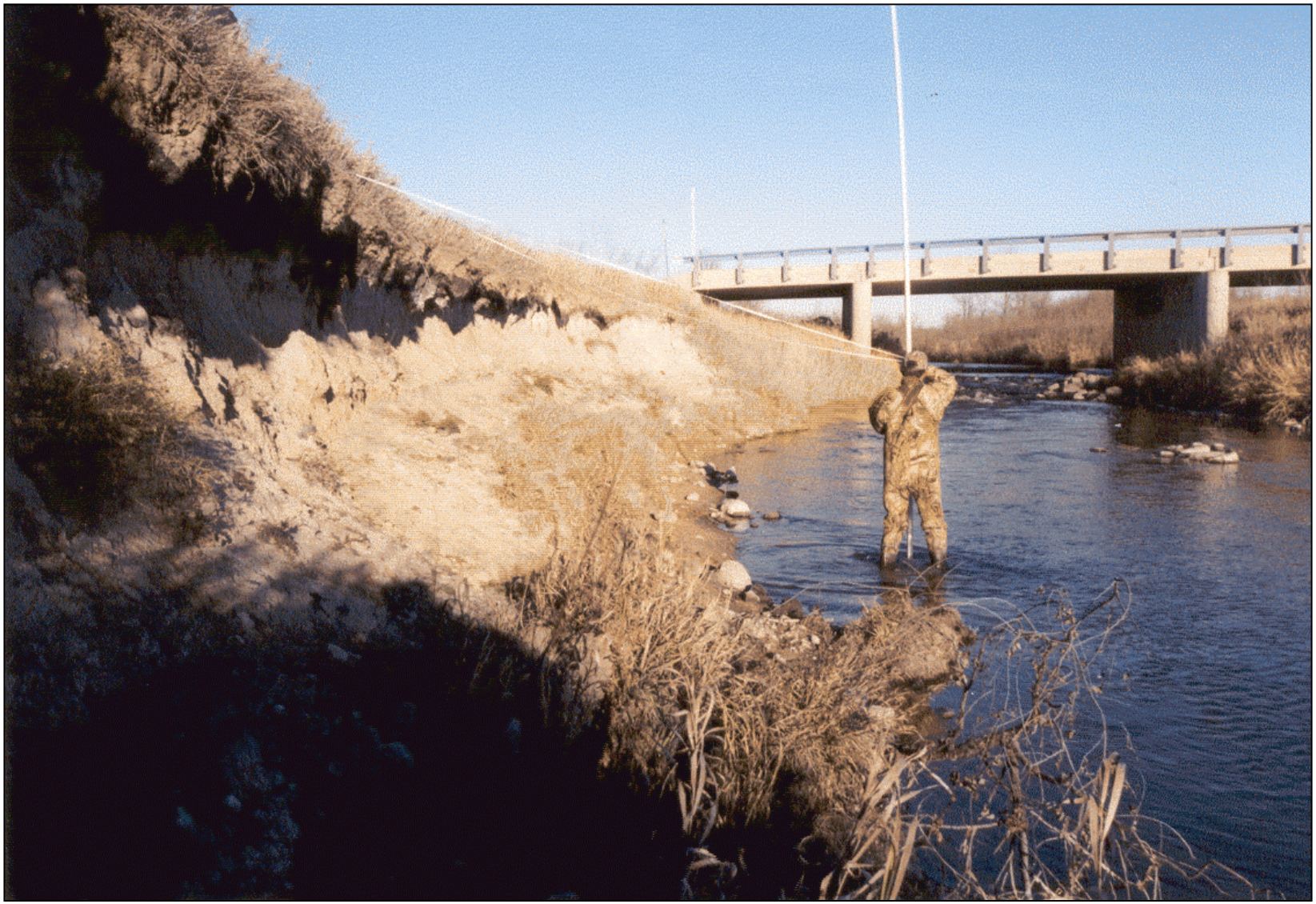
Looking northwest at right descending bank near Station 14+50
November 2001

Bank slump near station 14+50 on right (descending bank), November 2001

Looking upstream at right descending bank from near Station 14+50
November 2001

Looking upstream (east) at bridge opening and point bar, November 2001

Looking upstream from near station 18+50, November 2001



Looking NW from SW Abutment (near station 19+50)at erosion on right bank just west of bridge, Nov. 2001

Looking downstream from CSAH 28 bridge, November 2001

Looking upstream (east) at bridge opening and rock/beaver dam
(November 2001)

Looking upstream (east) from Bridge near Station 20+00,
November 2001

Looking southeast from NE Bridge Abutment, near station 20+50
November 2001

Looking upstream from near NE abutment, November 2001

Looking upstream from near Station 22+00 (200 feet upstream from bridge) November 2001

Looking upstream at large sediment bar on right bank near station 24+00 (400 feet upstream of bridge) November 2001

Looking downstream from near Station 24+00, November 2001

Looking upstream from near Station 25+00 (500 feet upstream of bridge), November 2001

Looking at right (west) bank from near Station 25+00 (500 feet upstream of bridge), November 2001

Looking upstream from near Station 26+50, November 2001

Looking upstream from near Station 27+00 (700 feet upstream of bridge)
November 2001