MPDM Chapter 3
Engineering and Environmental Considerations

April 27, 2017

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Houston Engineering, Inc.

Chapter 3 Subcommittee Members

- Andrea Hendrickson, MnDOT
- Duane Hansel, Bolton & Menk
- Kris Sigford, MCEA
- Les Everett, University of MN
- Nathan Kestner, DNR
- Nick Gervino, MPCA
- Rebecca Kluckhohn, Wenck
- Rob Sip, MDA
- Ron Mortenson, Meeker County
- Scott Henderson, Sauk River Watershed District

Primary Purposes of Chapter 3

- Guidance to Engineers in completing their duties
  - M.S. 103E
  - Other applicable state and federal law
- Guidance to Drainage Authority on what to expect and request from their Engineer
- Guidance to regulators on what to expect in an Engineer's Report
- Inform stakeholders (D.A., regulators, viewers, landowners, etc.) of the Engineer's role and basis for their recommendation

What has changed since 1991?

What has changed since 1991?

2016 Minnesota Statutes

CHAPTER 103E. DRAINAGE

Section	Headnote
	GENERAL PROVISIONS
103E.005	DEFINITIONS.
103E.011	DRAINAGE AUTHORITY POWERS.
103E.015	CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE
103E.021	DITCHES MUST BE PLANTED WITH PERENNIAL VEGET
103E.025	PROCEDURE FOR DRAINAGE PROJECT THAT AFFECTS AREA USED FOR CONSERVATION.
103E.031	CONNECTION WITH DRAINS IN ADJOINING STATES.

STATUTES

AG PRACTICES

TECHNOLOGY

REGULATION

COMMUNICATION

PRIORITIES

Major Changes to MPDM Chapter 3

- Environmental Considerations
  - 103E.015 considerations
  - Regulatory requirements
  - Water Quality / TMDL
- Repair Reports / As Constructed and Subsequently Improved Condition (ACSIC)
- Resources
  - Links
  - Checklists
  - Sample Reports

Points of Emphasis in Update

- Reflect changes in law
- Consistent language and “voice”
  - “May” vs. “should” vs. “must” vs. “shall”
- Consistent with current engineering practice
- Not a policy document!

Chapter 3 Organization

1. **Introduction**
2. **Specific Environmental Considerations** 

3. Preliminary Survey and Engineer's Preliminary Report
4. Detailed Survey and Engineer's Final Report
5. Adequacy of Outlet
6. New Systems, Improvements, or Modifications of Drainage System

Chapter 3 Organization (cont.)

7. **Repair/Maintenance of Drainage System**
8. Redetermination of Benefits
9. Consolidation of Drainage Systems
10. Construction Plans and Specifications
11. Construction
12. Record Drawings

A. Appendices

CHAPTER 3 CONTENT

AUDITOR'S TABULAR ASSESSMENT STATEMENT IN THE MATTER OF THE PETITION OF HANS HANSON AND OTHERS FOR REPAIRS OF COUNTY DITCH NO. 31, OF ANOKA COUNTY, MINN.

Name of the Owners of Lands and Roads that are assessed for the Repairs of Ditch.	Description of Each Parcels Assessed for the Repairs.	Sec.	Twp.	Rng.	Amount of Original Assessment of Benefits by Construction.	Amount to be paid for Repairs Under Petit
Bessie W. Brown (E½) August Turnwald (W½)	N½ of NW¼	1	32	22	$65.00	$65.66
Hans Hanson	SW¼ of NW¼	1	32	22	45.00	45.45
Philip Rousch	SE¼ of NW¼	1	32	22	10.00	10.10
Alex & Emma C. Swanson	E½ of SW¼	1	32	22	23.00	23.24
Andrew Hanson	W½ of SW¼	1	32	22	135.00	136.36
Alex & Emma C. Swanson	SW¼ of SE¼	1	32	22	5.00	5.05
Hans Hanson	N½ of NE¼	2	32	22	18.00	18.18
Hans & Sophia Hanson	S½ of NE¼	2	32	22	8.00	8.08
Ivan Anderson	SW¼	2	32	22	30.00	30.32
Andrew Hanson	N½ of SE¼	2	32	22	20.00	20.20
Andrew Kunshire	S¼ of SE¼	2	32	22	30.00	30.32

Key Terminology in Chapter 3

- “Improvement”
- “Major Repair” vs. “Minor Repair” vs. “Petitioned Repair” vs. “Non-Petitioned Repair” vs. “Maintenance”
- “Drainage System Project”

Introduction

Roles and Responsibilities of the Engineer

- Technical expertise

- Technical application of drainage law;
- Surveying;
- Hydrology and hydraulics;
- Culvert, roadway, and structural design;
- Construction plan development;
- Construction management and observation;
- Erosion and sediment control design;
- Wetland delineation;
- Water quality analysis;
- Communication/liaison between drainage authority and other decision-makers and/or reviewers;
- Environmental review and permitting; and
- Soil and water conservation.

Introduction

Roles and Responsibilities of the Engineer

- Understanding of drainage law
- Understanding and evaluating regulatory requirements
- Evaluating environmental considerations (103E.015)
- Key technical advisor for the drainage authority

Specific Environmental Considerations

Specific Environmental Considerations General

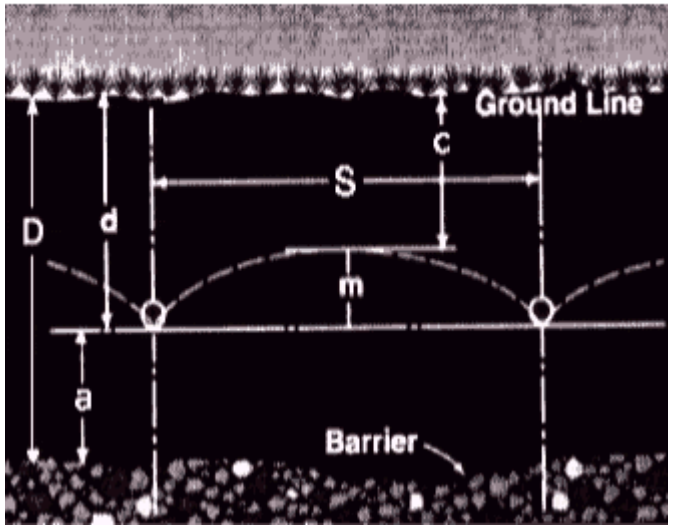
- Roles of Engineer and Regulatory Reviewer
- Pertinent regulations (table)
- Contact info (link)
- Early Coordination

Table 1: Pertinent Regulations

Agency	Local Regs.	State Regs.
Local Government		
Townships	Ordinances	Minn. Stat. 160.20
Counties	Ordinances	Minn. Stat. 103E, Minn. Stat. 160.20
Watershed Districts	WD Rules	Minn. Stat. 103E, Minn. Stat. 103D.335
State Agencies		
BWSR	Rules	WCA (Minn. R. 8420, Minn. Stat. 103G).

Specific Environmental Considerations
Wetlands

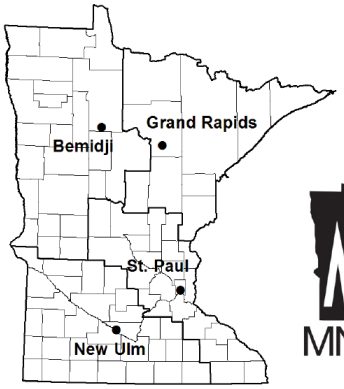
- Wetland Conservation Act (WCA)
- Clean Water Act (CWA)
- Swampbuster
- Determining Wetland Impacts
- Downgradient Wetland Effects



Specific Environmental Considerations
Public Waters

- Work in public waters
- Links to DNR site
- Checklist

MPARS
MNDNR PERMITTING AND REPORTING SYSTEM

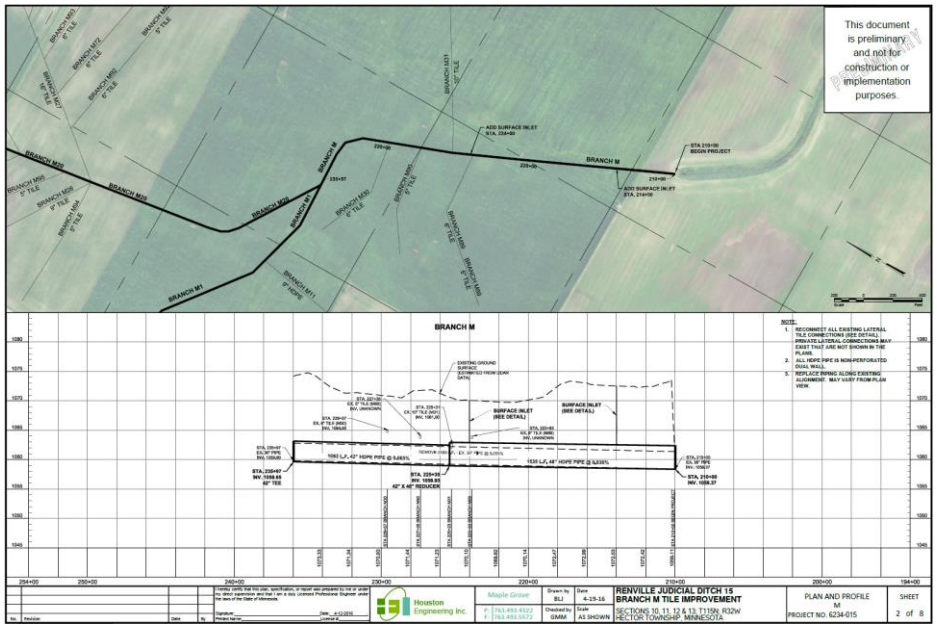


MNDNR

Specific Environmental Considerations Other

- Environmental Review
- Threatened and Endangered Species
- Water Quality
  - NPDES
  - State Standards and Goals

Preliminary Survey and Engineer's Preliminary Report



Preliminary Survey and Engineer's Preliminary Report
Preliminary Survey Procedures

- Guidance vs. mandatory information
- Alternatives to traditional survey
- Consideration of BMP siting (e.g., two-stage ditch)

Detailed Survey and Engineer's Final Report

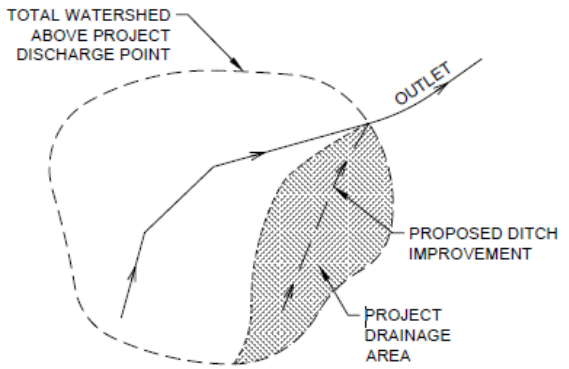
- Few Changes to this Section
- Required content in report
- Advisory Review
- Example Engineer's Reports (Appendix)

Adequacy of Outlet

Adequacy of Outlet
Basic Requirements

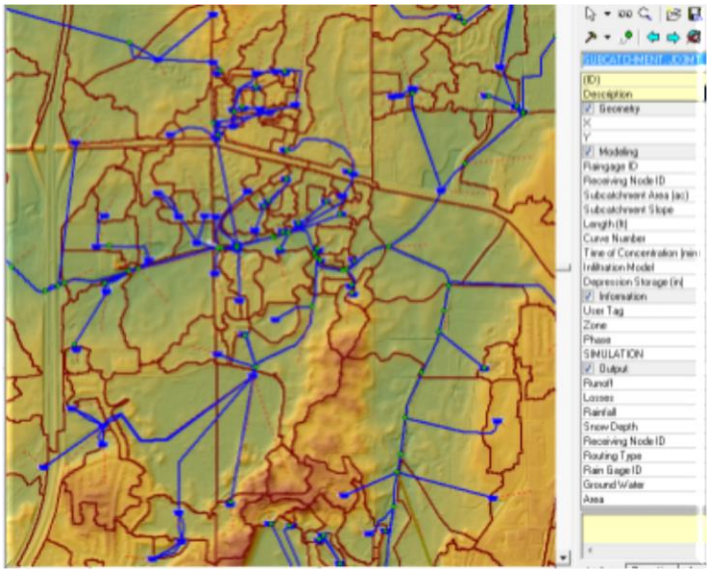
- No loss of function to downstream drainage outlets
- No excessive scour/deposition of sediment
- No flood damages, *unless compensation is made*

<u>Note: These are more or less unchanged from 1991</u>



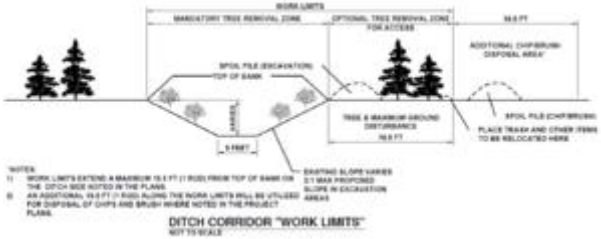
Adequacy of Outlet
Methods of Analysis

- Consider regulatory requirements in survey scope
- Modern hydrology/hydraulics techniques
- Matching rigor of analysis to nature and scope of project



New Drainage Systems, Improvements, Laterals, and Other Modifications of Drainage System

- General Information (little change)
- Engineering Requirements
  - Hydrologic and Hydraulic Analysis
  - Ditch/Tile Hydraulic Design
  - Bridge/Culvert Hydraulic Analysis and Design
  - Erosion Control for Drainage Water Entry to a Public Ditch
  - Miscellaneous Structures
  - Channel Geometry
  - Vegetated Ditch Buffer Strips



Repair/Maintenance of Drainage System

"Minor Repair" → *Non-Petitioned Repair*

"Major Repair" → *Petitioned Repair*

Contracting and Levying for Maintenance and Repair

Repair/Maintenance of Drainage Systems
Determination of the As-Built Condition

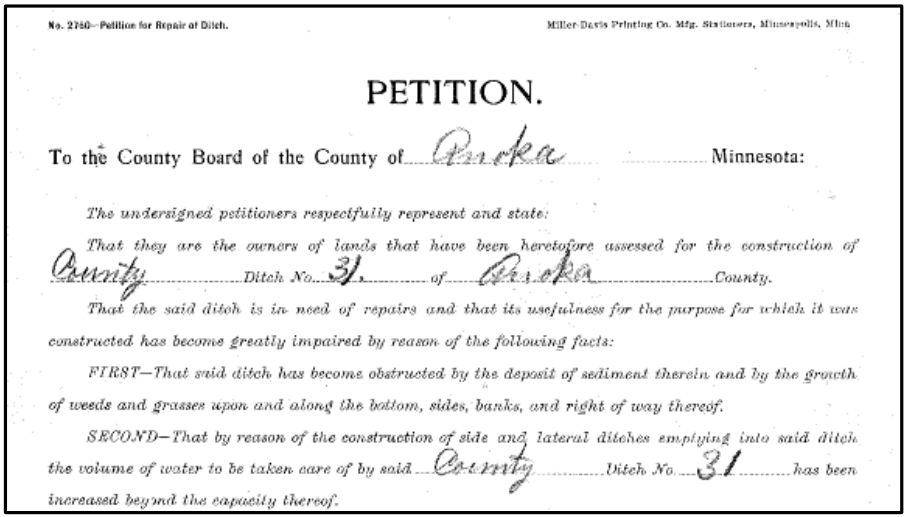
- Fore Repairs and/or Reestablishment of Drainage System Records
- Test pits
- Soil Borings
- Culvert Comparison
- Cut Sheets
- Drainage Records Modernization

Repair/Maintenance of Drainage Systems
Petitioned Repair

- Recommended examination
- Bridge/culvert capacity
- Repair report outline
- Example repair reports (Appendix)

Other Chapter 3 Sections

- Redetermination of Benefits
- Consolidation of Drainage Systems
- Construction Plans and Specifications
- Construction
- Public Drainage System Records



No. 2760—Petition for Repair of Ditch. Miller-Davis Printing Co. Mfg. Stationers, Minneapolis, Minn

PETITION.

To the County Board of the County of Anoka Minnesota:

The undersigned petitioners respectfully represent and state:

That they are the owners of lands that have been heretofore assessed for the construction of County *Ditch No.* 31 *of* Anoka *County.*

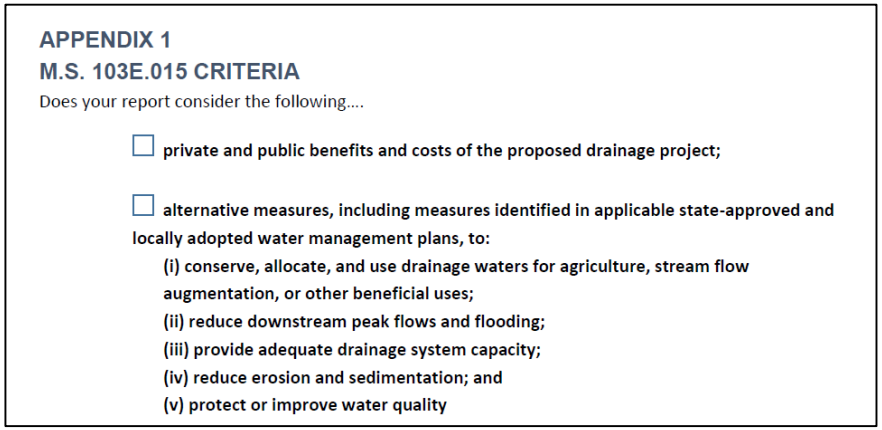
That the said ditch is in need of repairs and that its usefulness for the purpose for which it was constructed has become greatly impaired by reason of the following facts:

FIRST—That said ditch has become obstructed by the deposit of sediment therein and by the growth of weeds and grasses upon and along the bottom, sides, banks, and right of way thereof.

SECOND—That by reason of the construction of side and lateral ditches emptying into said ditch the volume of water to be taken care of by said County *Ditch No.* 31 *has been increased beyond the capacity thereof.*

Chapter 3 Appendices
Checklists

- M.S. 103E.015 Criteria
- Items in a Concept Plan
- Preliminary Report Guidelines
- Key Questions for Considering Water Quality Impact
- Does Your Project Require an Environmental Review?



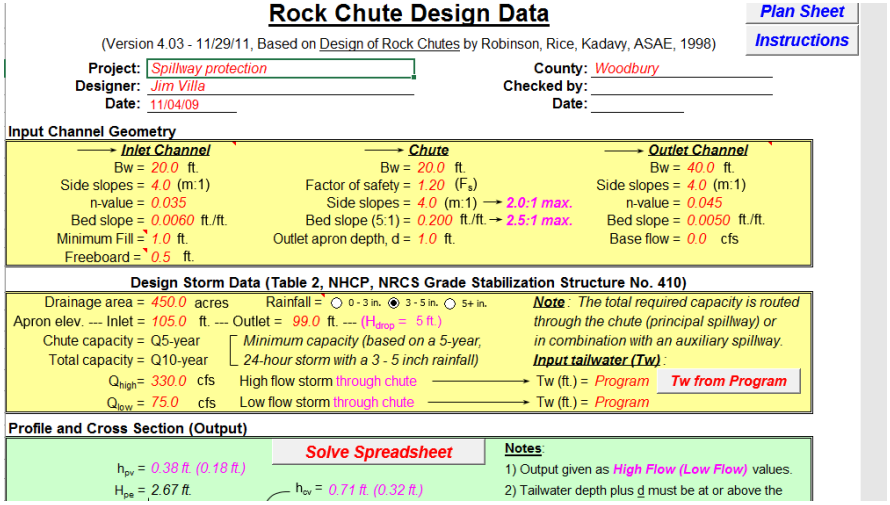
APPENDIX 1
M.S. 103E.015 CRITERIA
Does your report consider the following....

☐ private and public benefits and costs of the proposed drainage project;

☐ alternative measures, including measures identified in applicable state-approved and locally adopted water management plans, to:
(i) conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses;
(ii) reduce downstream peak flows and flooding;
(iii) provide adequate drainage system capacity;
(iv) reduce erosion and sedimentation; and
(v) protect or improve water quality

Chapter 3 Appendices
Resources

- External sources of funding
- MN water quality standards
- Sample hydraulic structures table
- Rock chute design spreadsheet



Rock Chute Design Data

Plan Sheet | Instructions

(Version 4.03 - 11/29/11, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Spillway protection — County: Woodbury
Designer: Jim Villa — Checked by:
Date: 11/04/09 — Date:

Input Channel Geometry

Inlet Channel	Chute	Outlet Channel
Bw = 20.0 ft.	Bw = 20.0 ft.	Bw = 40.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.20 (F_s)	Side slopes = 4.0 (m:1)
n-value = 0.035	Side slopes = 4.0 (m:1) → 2.0:1 max.	n-value = 0.045
Bed slope = 0.0060 ft./ft.	Bed slope (5:1) = 0.200 ft./ft. → 2.5:1 max.	Bed slope = 0.0050 ft./ft.
Minimum Fill = 1.0 ft.	Outlet apron depth, d = 1.0 ft.	Base flow = 0.0 cfs
Freeboard = 0.5 ft.		

Design Storm Data (Table 2, NHCP, NRCS Grade Stabilization Structure No. 410)

Drainage area = 450.0 acres — Rainfall = ○ 0 - 3 in. ◉ 3 - 5 in. ○ 5+ in.
Apron elev. --- Inlet = 105.0 ft. --- Outlet = 99.0 ft. --- (H_{drop} = 5 ft.)
Chute capacity = Q5-year
Total capacity = Q10-year
[Minimum capacity (based on a 5-year, 24-hour storm with a 3 - 5 inch rainfall)
Q_{high} = 330.0 cfs — High flow storm through chute → Tw (ft.) = Program
Q_{low} = 75.0 cfs — Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
Input tailwater (Tw):
Tw from Program

Profile and Cross Section (Output)

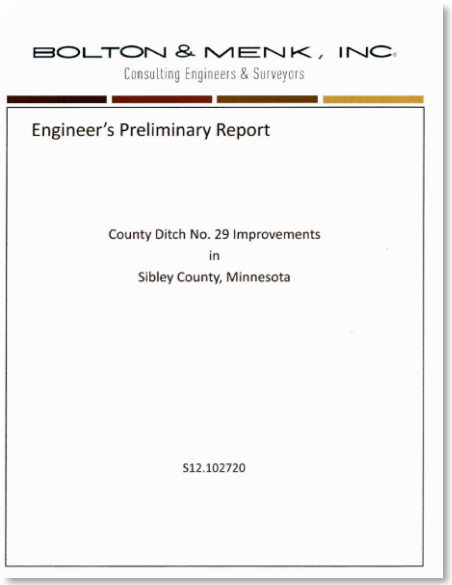
Solve Spreadsheet

h_{pv} = 0.38 ft. (0.18 ft.)
H_{pe} = 2.67 ft.
h_{cv} = 0.71 ft. (0.32 ft.)

Notes:
1) Output given as High Flow (Low Flow) values.
2) Tailwater depth plus d must be at or above the

Chapter 3 Appendices
Example Reports

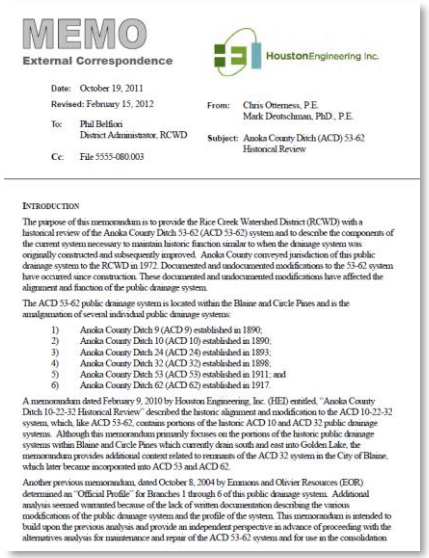
- Preliminary survey
- Engineer's final report
- Repair report
- Impoundment proceedings
- Correction of public drainage system record


BOLTON & MENK, INC.
Consulting Engineers & Surveyors

Engineer's Preliminary Report

County Ditch No. 29 Improvements
in
Sibley County, Minnesota

S12.102720


MEMO
External Correspondence

HoustonEngineering Inc.

Date: October 19, 2011
Revised: February 15, 2012

To: Phil Belfiori
District Administrator, RCWD

Cc: File 5555-080.003

From: Chris Otterness, P.E.
Mark Deutschman, PhD., P.E.

Subject: Anoka County Ditch (ACD) 53-62
Historical Review

INTRODUCTION

The purpose of this memorandum is to provide the Rice Creek Watershed District (RCWD) with a historical review of the Anoka County Ditch 53-62 (ACD 53-62) system and to describe the components of the current system necessary to maintain historic function similar to when the drainage system was originally constructed and subsequently improved. Anoka County conveyed jurisdiction of this public drainage system to the RCWD in 1972. Documented and undocumented modifications to the 53-62 system have occurred since construction. These documented and undocumented modifications have affected the alignment and function of the public drainage system.

The ACD 53-62 public drainage system is located within the Blaine and Circle Pines and is the amalgamation of several individual public drainage systems:

1) Anoka County Ditch 9 (ACD 9) established in 1890;
2) Anoka County Ditch 10 (ACD 10) established in 1890;
3) Anoka County Ditch 24 (ACD 24) established in 1893;
4) Anoka County Ditch 32 (ACD 32) established in 1898;
5) Anoka County Ditch 53 (ACD 53) established in 1911; and
6) Anoka County Ditch 62 (ACD 62) established in 1917.

A memorandum dated February 9, 2010 by Houston Engineering, Inc. (HEI) entitled, "Anoka County Ditch 10-22-32 Historical Review" described the historic alignment and modification to the ACD 10-22-32 system, which, like ACD 53-62, contains portions of the historic ACD 10 and ACD 32 public drainage systems. Although this memorandum primarily focuses on the portions of the historic public drainage systems within Blaine and Circle Pines which currently drain south and east into Golden Lake, the memorandum provides additional context related to remnants of the ACD 32 system in the City of Blaine, which later became incorporated into ACD 53 and ACD 62.

Another previous memorandum, dated October 8, 2004 by Emmons and Olivier Resources (EOR) determined an "Official Profile" for Branches 1 through 6 of this public drainage system. Additional analysis seemed warranted because of the lack of written documentation describing the various modifications of the public drainage system and the profile of the system. This memorandum is intended to build upon the previous analysis and provide an independent perspective in advance of proceeding with the alternatives analysis for maintenance and repair of the ACD 53-62 system and for use in the consolidation

Questions on Content?

SUBCOMMITTEE DISCUSSION TOPICS

Subcommittee Topics
Adequacy of Outlet

Issue: Does the Engineer need to consider nutrient and sediment loading with regard to the adequacy of the outlet?

Consensus: ***No subcommittee consensus.*** *However, consensus that no case law indicates use of water quality in considering outlet adequacy under 103E.*

Subcommittee Topics
Adequacy of Outlet

Issue: How far downstream does the Engineer need to consider downstream for adequacy? ¼ mile? 1 mile? 10 miles?

Consensus: No one-size-fits-all solution. Engineer needs to use judgement.

Subcommittee Topics
Downgradient Impacts

Issue: Are downgradient effects from drainage projects regulated under WCA or CWA?

Consensus: No. However, Engineer may consider these effects under M.S. 103.015 (Section II.B.5 of Chapter 3).

Subcommittee Topics
Future Regulatory Policy/Process

Issue: Should <u>potential</u> future regulatory changes (e.g., USACE 404 permit) be addressed in the MPDM?

Consensus: No – manual is not to presume what future decision will be. Instead, wiki format will enable "quick" changes to pages when policy/processes change

AND links provided to agency websites for first-hand information

Subcommittee Topics
Cumulative Impacts

Issue: Can/should the Engineer consider cumulative hydrology/hydraulic/water quality impacts?

Consensus: In role as advisor to Drainage Authority (and advocate for benefitting landowners) – No.

However, County or Watershed District may "wear other hats"

“HATS” A COUNTY OR WATERSHED DISTRICT BOARD WEARS

ZONING AUTHORITY

LOCAL WATER PLANNER

TAXING AUTHORITY

ROAD AUTHORITY

LOCAL GOV. UNIT (LGU)

RESPONSIBLE GOV. UNIT (RGU)

DRAINAGE AUTHORITY

How a Drainage Authority May Consider Cumulative Impacts (under a different hat)

- *Rules (e.g., maximum drainage coefficient)*
- *Cost share programs*
- *Regional projects*
- *Multi-purpose drainage management projects*

Subcommittee Topics
Early Coordination

Issue: How to minimize conflict between the Engineer and regulating agencies at the 11th hour of a project?

Consensus: Stress importance of early coordination in the MPDM

CHAPTER 3 FORUM

Ch. 3 Forum Topics

How can the Engineer make the most of the early coordination?

How can the regulating agency make the most of the early coordination?

Ch. 3 Forum Topics

What are common missing elements in an engineer's report?

….from a regulatory reviewer's perspective

….from a drainage attorney's perspective

Ch. 3 Forum Topics

How to advise the drainage authority on differentiating between “low cost” and “best value”?

How to advise the drainage authority on consideration of short term vs. long term cost?

Thank you!