FINAL REPORT

Drainage 101 County Roadways, City Streets and Drainage Ways: Best Practices and Resources Guide

April 2023
2023RIC08

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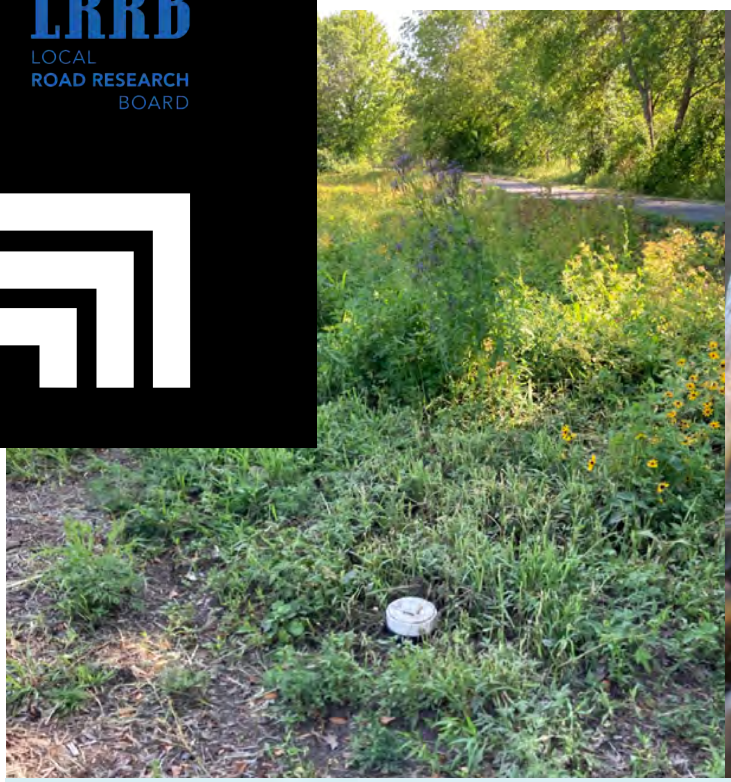

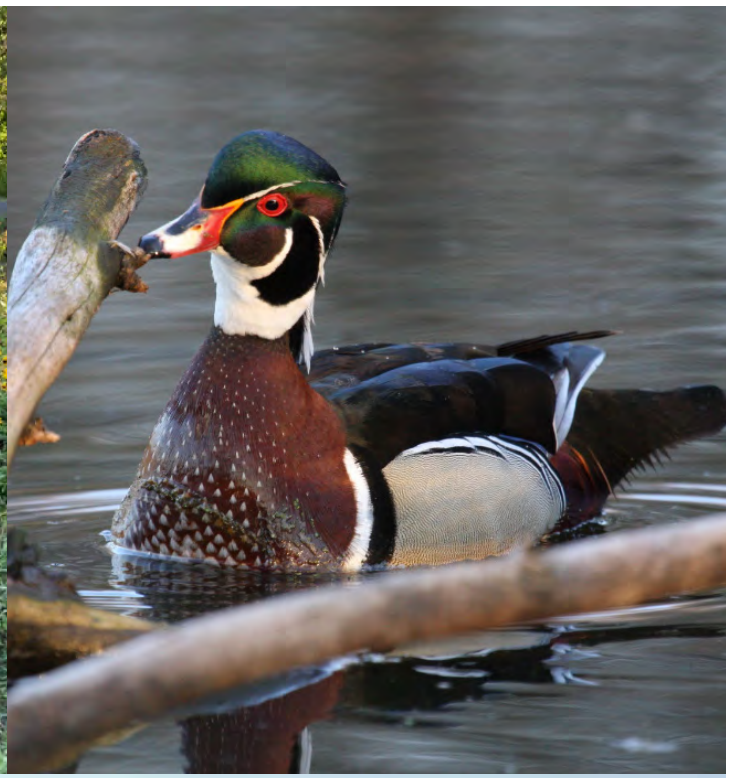

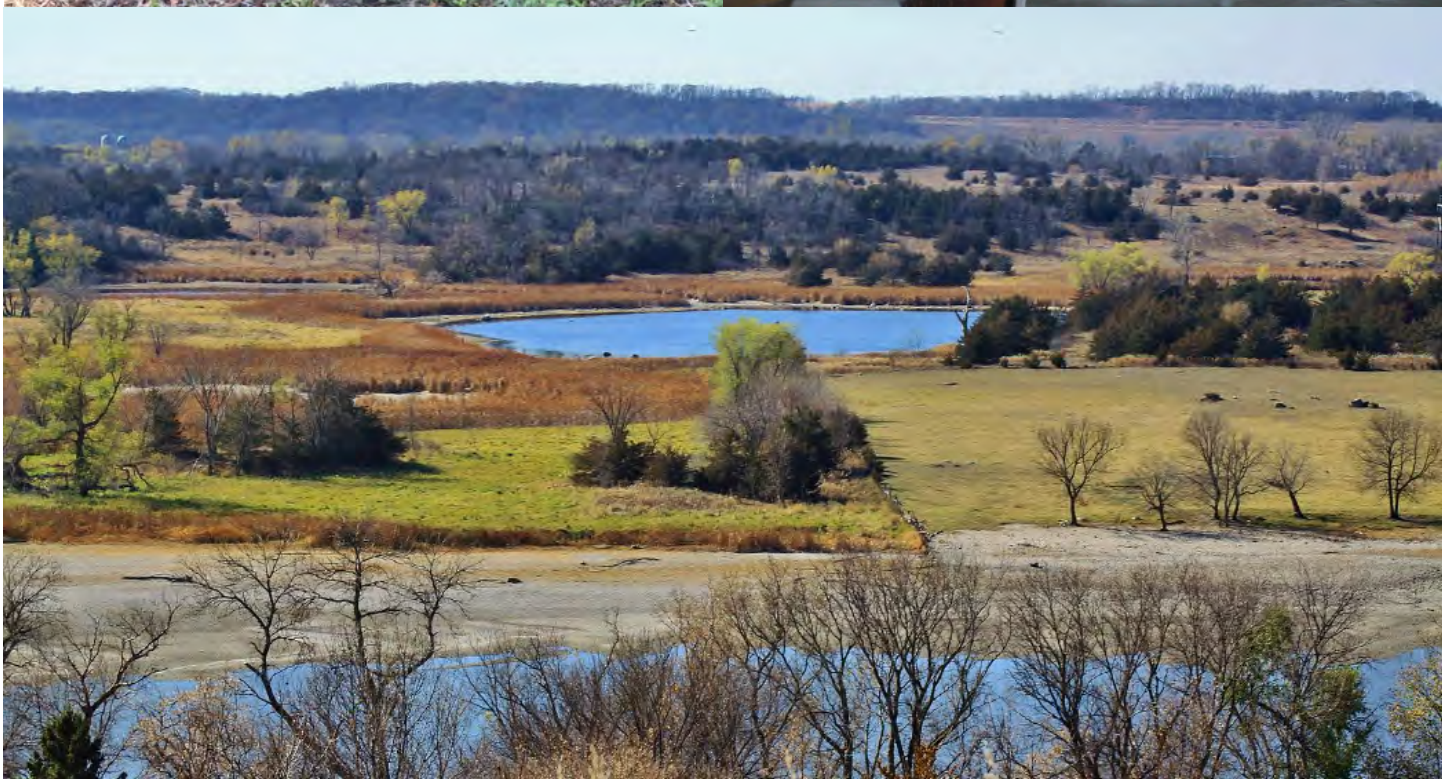

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The time individual engineers, administrators and their staff invest in researching drainage law and defining the best approach to solving drainage issues can be considerable. This document provides quick access to information needed to solve those problems and discover legal solutions to recurring drainage issues and the time saved could be invested in other pressing public responsibilities. This study also contains information which might be useful to local elected officials, private property owners and other interested parties as it offers concise educational materials that simplify and inform them on drainage issues and laws related to regional watershed protection, county road/highway ditches, city street/storm sewers and related drainage infrastructure.

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Quick Start Guide:

Drainage 101 County Roadways, City Streets, and Drainage Ways: Best Practices and Resources Guide

Addressing drainage requests from residents while effectively managing county road ditch drainage, city storm sewer and related drainage issues can be overly complicated. This is due in part to a lack of concise, easily understood guidance for both property owners and local agency engineers.

Therefore, the Minnesota Department of Transportation's Research Management Unit funded a project to create a guidance document to help these individuals. After the project was identified, a Technical Advisory Panel (TAP) was established. Under guidance from the TAP, Stonebrooke Engineering was assigned the project and created the Drainage 101 guidance document.

The structure of the document is based on the findings generated from answers to a survey that was sent out to area engineers and watershed managers. Once the survey answer data was analyzed, the content was structured around the common issues and questions from the area professionals. All subject matter related to this Guidebook was vetted, reviewed and approved by the TAP before it was placed into the document.

Topics of Interest and related links to the Drainage 101 document include:

- Do you have a question on which jurisdiction might control how drainage is **managed**? Chapter 1 has resource information regarding drainage design and construction requirements for various jurisdictional authorities.
- See and review the **survey** of area engineers and watershed managers in Chapter 2.
- State drainage law and statues can be very complicated. Drainage 101 takes a comprehensive look at case law in Appendix C and provides useful information compiled as a **fact sheet** in Appendix E and a general overview is provided in Chapter 3.
- If you don't already have your own, Drainage 101 has compiled some **useful information** in Chapter 4 and deployment ready templates in Appendix D that can be used to put together your own drainage permits and policies.
- With the presence of many drainage resources and guides, it is often difficult to find drainage content that is all in one place. Drainage 101 contains fact sheets in Appendix E that can be placed online for residents, elected officials and engineers. Discussion is provided in Chapter 5. These **fact sheets** are intended to provide information for anyone who has little to no drainage experience or background.
- Having trouble justifying an expensive project funded with taxpayer dollars? Chapter 6 contains a discussion on a **cost benefit ratio analysis**. This chapter is intended to get the reader thinking about all the variables that should be considered when making decisions on whether to do a project or use the resources you might already have in place.
- Are you considering using **desktop tools** to help manage your drainage infrastructure? Some GIS programs are built with your needs in mind. Chapter 7 has information available to help with your decision making.

Chapter 1: Relevant Resource Documents

The purpose of this chapter is to provide a compilation of reference materials used to develop this report. The reference materials listed below are also useful for determining what resource can provide information on a certain topic of interest. The reference materials are broken down by the agency that developed each reference document. Each reference document is not a stand-alone document but should be used in conjunction with other documents available to the user.

Minnesota State Legislature

The Minnesota State Legislature is responsible for the development, implementation, and amendment of Minnesota State laws. This agency is the lawmaking body for the State of Minnesota. The legislature has set numerous statutes relating to drainage and the waters of the state. The Minnesota statues are what all public and private agencies must follow and uphold. The statues also provide clear guidance on which entities shall enforce the drainage laws.

Image Credit: Minnesota Legislature Website

Minnesota Statutes

Chapter 103E – Drainage

Chapter 103E covers "public" drainage systems. Public drainage ditches covered under 103E benefit most agricultural and rural properties. This law allows landowners to work together to improve and repair drainage systems across public and private properties. Chapter 103E drainage ways are administered by the local drainage authority (typically County Board of Commissioners or Watershed District Board of Managers).

Chapter 103F – Protection of Water Resources

Chapter 103F describes the rules relating to floodplains, river basins, shorelands, and wetland restoration. 103F also includes laws and processes for the wetland establishment and restoration cost-share program that is available to use by local units of government.

Chapter 103G – Waters of the State

Chapter 103G governs the public waters and wetlands in the state. This chapter sets clear rules for how wetlands can be restored or replaced if a construction project or entity may impact a wetland. This chapter also provides clear guidance on property owners use of public waters and wetlands. There is also information on what type of work can be done in a public water without the need for a permit.

Minnesota Board of Water and Soil Resources (BWSR)

The Minnesota Board of Water and Soil Resources works with public and private organizations and citizens to protect Minnesota's water and soil resources. BWSR is responsible for regulating the Wetland Conservation Act (WCA) and aiding in comprehensive local water management.

BWSR's Minnesota Public Drainage Manual

Developed by BWSR, the Minnesota Public Drainage Manual is an interactive wiki format reference document. Most importantly, Chapter 5 has Best Management Practices for public drainage systems that can be used by ditch authorities governed under MN Statutes Chapter 103E – Drainage. These systems affect counties and cities infrastructure where they cross or discharge into county and city right of way, easements and drainageways.

Image Credit: Minnesota Board of Water and Natural Resources

BWSR's Native Vegetation Establishment and Enhancement Guidelines

A helpful resource for native seeding establishment is the Native Vegetation Establishment and Enhancement Guidelines published by BWSR. The guidelines discourage the use of invasive and noxious species and promote native vegetation that will successfully meet the goals of restoration and conservation projects. Native vegetation improves environmental quality, wildlife habitats, and biodiversity.

Image Credit: Minnesota Board of Water and Natural Resources

Minnesota Department of Natural Resources (MnDNR)

An agency committed to protecting stormwater within Minnesota is the Minnesota Department of Natural Resources. The MnDNR is responsible for protecting and managing land, water, fish, and wildlife. The MnDNR regulates work in all Public Waters identified by the Minnesota State Legislature which consist of lakes, wetlands, streams, and rivers.

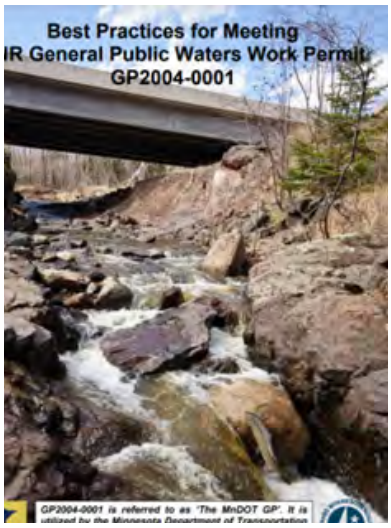


Image Credit: Minnesota Department of Natural Resources

MnDNR Best Practices Manual

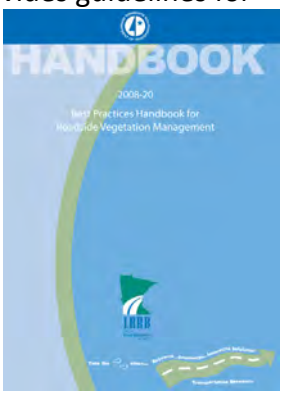
The Best Practices Manual is a helpful resource for ensuring construction projects meet the MnDNR General Public Waters Work Permit. The Best Practices Manual gives clear guidance for repairing or reconstructing drainage systems within DNR public waters. The manual can help with selecting appropriate seed mixes for turf establishment, determining ways to prevent the spread of aquatic invasive species, and selecting appropriate protection measures for areas of environmental sensitivity. There is also information on ways to improve culvert design, correct methods for in-water construction, and ways to encourage fish passage in drainage ways.

Minnesota Local Road Research Board (LRRB)

In the last 15 years, the Minnesota Local Road Research Board has sponsored over 200 research projects. The LRRB focuses on research for local transportation systems. There are a few drainage related manuals and guidebooks that the LRRB has published that are useful to both public and private agencies.

Best Practices Handbook on Roadside Vegetation Management

Published in 2000, the Best Practices Handbook on Roadside Vegetation Management provides guidelines for effective management of roadside vegetation for local agencies. The reference focuses on seven roadside vegetation best management practices (BMP's) that include developing a vegetation management plan, developing a public relations plan, establishing a mowing policy, establishing sustainable vegetation, controlling noxious weeds, managing living snow fences, and integrated construction and maintenance practices. Keep in mind, this reference was written in 2000, therefore other up to date resources should be used with the handbook.



Stormwater Maintenance Best Management Practice (BMP) Resource Guide

The Stormwater Maintenance BMP Resource Guide focused on maintenance relating to stormwater ponds, rain gardens, infiltration, and underground treatment and storage. The most helpful part of the guide is the inspection and maintenance checklists that are provided that can be used by public agencies in their BMP inspection processes. Each maintenance checklist helps the user to determine what deficiencies are occurring with an existing BMP and establish which maintenance activities outlined in the guide are needed to keep the BMP functioning as intended.

Decision Tree for Stormwater Best Management Practices (BMP's)

The BMP Decision Tree is intended to be used with the Stormwater Maintenance BMP Resource Guide. The Decision Tree is a resource tool to assist agencies in selecting BMP's for a project. The Decision Tree considers the amount of available space on a project and determines the best BMP that would work given the project constraints. The regulatory environment is considered to establish the strictest stormwater rules that affect a project and determine which BMP's can meet those criteria. Once BMP's are selected, the Decision Tree also further narrows the BMP options by considering capital costs, maintenance burden, and relative life expectancy of each potential BMP.

Minnesota Pollution Control Agency (MPCA)

Image Credit: Minnesota Pollution Control Agency

The Minnesota Pollution Control Agency was established in 1967 by the Minnesota State Legislature to regulate the environmental quality in the State of Minnesota. The agency is responsible for enforcing the rules and regulations set forth by the State to protect the air, waters, and land within Minnesota.

MPCA Construction Stormwater

The MPCA Construction Stormwater webpage focuses on the rules established by the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit. The permit outlines the rules for protecting water resources and the effects of stormwater runoff from construction sites. The permit purpose is to reduce pollutant runoff from construction sites and protect water quality in conjunction with the United States Clean Water Act, Minnesota State Statutes, and federal laws and regulations. The permit applies to any construction activity that results in land disturbance of equal to or greater than 1 acre. The permit gives clear requirements for Stormwater Pollution Prevention Plans (SWPPP's), erosion prevention and sediment control practices, BMP selection, erosion inspections and maintenance, and water quality treatment.

Image Credit: Minnesota Pollution Control Agency

The NPDES permit also lists additional requirements for special and impaired waters in the State. Projects that discharge to special and impaired waters have certain requirements for additional BMP's, stabilization time frames, temporary sediment basins, and buffers. The Construction Stormwater webpage also has navigation to the Special and Impaired Waters Search Tool. The Waters Search Tool helps public or private entities to quickly identify special or impaired waters in a project area that may require additional BMP's like redundant perimeter controls, temporary stabilization of disturbed soil areas, buffer zones, volume reduction ponds or swales, and additional site inspections.

MPCA MS4 (Municipal Separate Storm Sewer System)

The MPCA is also responsible for permitting for operating and discharging from small MS4 sites. The MPCA MS4 webpage provides information and resources on the requirements of the MPCA MS4 permit. The MS4 permit serves as rules for protecting water resources and reducing pollutant runoff in accordance with the U.S. Clean Water Act. In general, following the NPDES permit will also provide compliance with the MS4 permit. The MPCA MS4 webpage is helpful for entities looking for more information on the requirements of the Stormwater Pollution Prevention Program (SWPPP) that must be developed and implemented in conjunction with the MS4 permit.

MPCA's Minnesota Stormwater Manual

In 2012 and 2013, the MPCA developed the Minnesota Stormwater Manual. The manual is an online interactive wiki format reference document that provides stormwater management guidance. The document has information on stormwater concepts, issues, best management practices, and permitting. Notable topics in the MN Stormwater Manual include rain gardens, composting, solar farms and projects, rainwater harvest and reuse, and street sweeping. This reference is great for public entities looking for guidance on managing and maintaining sediment and wastes collected by pre-treatment practices like catch basins, grit chambers/ separators, hydrodynamic separators, pond forebays, and filter systems. The manual also discusses specific stormwater issues in Minnesota like the impact cold climate has on runoff management, mosquito control, MN plants, special waters, winter road salting and maintenance, and lake protection and restoration. The MPCA MN Stormwater Manual is constantly updated with new stormwater information and guidance.

MPCA's Plants for Stormwater Design Manual

Funded through a grant from the U.S. Environmental Protection Agency, Plants for Stormwater Design Manual is a guide to selecting plant species suitable in the Midwest for use in stormwater best management practices such as stormwater ponds and rain gardens. The most useful section of the guide is Stormwater Management Practices (pages 27-52). This section provides information on common forms of BMP's implemented and recommendations for types of vegetation to be used in each. BMP's discussed include wet and dry ponds, swales, and ditches; rain gardens; infiltration basins and trenches; wetlands; and filtration basins.

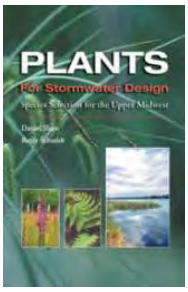
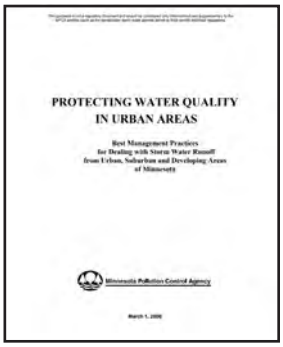


Image Credit: Minnesota Pollution Control Agency

MPCA's Stormwater Best Management Practices (BMP's) Manual

The Stormwater Best Management Practices Manual was published in 2000 by the MPCA. The document is focused on protecting water quality in urban areas. The manual can be useful for all entities including government officials, urban planners, developers, contactors, engineers, and citizens. Chapters 1-3 can be useful for educating the public because of discussion on water quantity and quality, BMP selection, and comprehensive stormwater policies & plans. Much of the information in the document appears to be outdated so it is recommended to find more up to date information in the Minnesota Stormwater Manual.



University of Minnesota (UMN)

The University of Minnesota works to provide water resources guidance for communities across Minnesota. With funding from research grants and partnerships, UMN engages their students, faculty, and staff in research and outreach relating to water resources. Within the large university, the UMN Extension and UMN St. Anthony Falls Laboratory programs are the center of the stormwater research and guidance provided by the UMN.

UMN St. Anthony Falls Laboratory (SAFL) - Stormwater Treatment: Assessment and Maintenance

The University of Minnesota St. Anthony Falls Laboratory serves as a resource for water resources research and knowledge. SAFL partners with many local public and private agencies to provide stormwater guidance and research to the State of Minnesota and research community.

The SAFL developed a Stormwater Treatment Guide as a supplement to the MPCA's Minnesota Stormwater Manual. The guide focuses on treatment processes and maintenance of urban stormwater treatment systems. The reference includes Visual Inspection Checklists for various BMP's such as ponds, rain gardens, and wetlands. These inspection checklists can be implemented into cities or counties BMP inspection processes. Also, numerous case studies are included in the guide to illustrate stormwater recommendations and apply treatment techniques to real-life applications.

Image Credit: SAFL

UMN Extension

The University of Minnesota Extension is a useful reference that provides education and learning resources for Minnesotans. The UMN Extension has two drainage related topics to learn that are beneficial for both public entities and citizens – Water and Yard and Garden. The Water webpage has information on agricultural drainage, crops and flooding, watering lawns and gardens, rain gardens, and many more topics that would be useful for both residents and city, county, or watershed staff. The Yard and Garden webpage gives advice for residents on subjects like native plants, invasive plant species, tree and shrub planting, water conservation, landscape design, and lawn care.

Image Credit: UMN Extension

Minnesota Department of Transportation (MnDOT)

Image Credit: MN Dept of Transportation

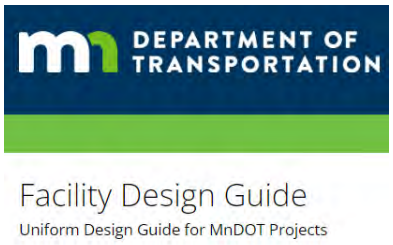
The agency responsible for implementation of roadway construction projects and providing road and travel information is the Minnesota Department of Transportation. MnDOT plans, designs, constructs, and maintains the highways in the state. MnDOT has released many guidance documents for use throughout the state that help engineers and designers.

MnDOT Drainage Manual

The MnDOT Drainage Manual outlines design criteria for hydrology and hydraulic design of highway drainage features. Developed in 2000, the MnDOT Drainage Manual has been a useful resource for engineers and designers. The rules and methods outlined in the guide provide a good basis for most drainage design situations. The manual is a great reference for information on standard flood design frequencies, Rational and Soil Conservation Service (SCS) methods of hydrology, design of stream channels and culverts, energy dissipation (i.e., riprap), pond and storage design, and storm sewer and pavement drainage design. *The manual has not been updated since 2000, therefore other up to date resources should be used in conjunction with the manual.*

MnDOT Facility Design Guide (FDG) – Chapter 13 Drainage and Erosion Control

The FDG provides uniform rules and procedures for the design of Minnesota State roads that can also be used and applied to other road systems in the state. The Drainage and Erosion Control Chapter (Chapter 13) outlines design criteria for both rural and urban roadway drainage design elements. This chapter is also a great resource for information on stormwater regulations and permitting.



MnDOT Seeding Manual

To find a basic guide to MnDOT seed mixtures and how to implement them, the MnDOT Seeding Manual is a great reference. The seed mixtures MnDOT uses focus on roadside plantings in Minnesota. The manual describes how to establish both native and non-native seed mixtures and what type of seeding methods and fertilizers to use. The Seed Mix Conversion Table on page 7 lists each MnDOT seed mix and provides easy navigation to details on each seed mixture.

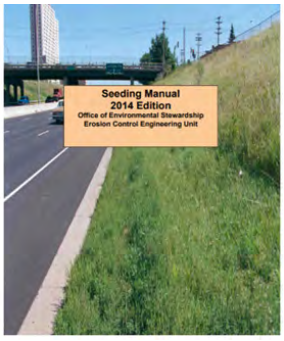


Image Credit: MN Dept of Transportation

MnDOT State Aid Manual – Chapter 5 – Drainage

State Aid for Local Transportation (SALT) administers the County State Aid Highway (CSAH) and Municipal State Aid Street (MSAS) portions of the Highway User Tax Distribution Fund (HUTDF) along with federal aid highway dollars and bond funds. The State Aid Manual is a set of rules that all state aid funded projects must follow to receive funds from SALT. The rules are set to provide safe and reliable highways and streets. Specifically, the manual describes project delivery rules as they relate to state aid drainage systems (Chapter 5.5 Drainage). Chapter 5.5 is especially helpful for County and City Engineers as the manual gives guidance on what specific documentation is required for construction of agricultural drainage tile across a highway.

MnDOT Technical Memoranda

Over the years, MnDOT has released Technical Memoranda that provide additional guidance on specific design situations. See below for a list of the technical memoranda that specifically apply to drainage.

- 20-04-TS-02 Design Guidelines for Locating Wet Ponds with Permanent Water Depths along Freeways and High-Speed Highways
- 20-05-B-01 Reinforced Concrete Pipe Load Tables
- 17-05-B-02 Use of Plastic Pipe for Storm Sewer and Culverts on Trunk Highways
- 16-05-B-02 Storm Drain Design Frequency and Catch Basin Spacing 15-10-B-02
- Use of Atlas 14 Volume 8 Precipitation Frequency Estimates

Minnesota Watershed Districts

Watershed districts were established by the MN State Legislature through the Watershed Act (MN Statues Chapter 103D – Watershed Districts). Watershed district's primary goals are to protect and conserve the natural resources in Minnesota. Since water does not flow based on political boundaries, watershed district boundaries were established to manage the water resources for each watershed. The boundaries of each district encompass the land area in which water flows to one outlet. There are 42 total watershed districts in the state (see the Minnesota Watershed District Map for a depiction of all 42 watershed boundaries).

Watershed Districts have many roles and responsibilities:

- Regulate the use of streams, lakes, ponds, floodplains, drainage ways
- Conserve and protect public water supply
- Protect, enhance, and monitor water quality
- Monitor, construct, and operate drainage systems
- Coordinate and monitor flood control projects
- Maintain and keep records of hydrological data
- Protect groundwater supply
- Regulate and monitor changes or additions to water crossings
- Plan the use of land
- Preserve and enhance wildlife habitat
- Educate the public and community
- Plan and obtain water resource project funding through grants

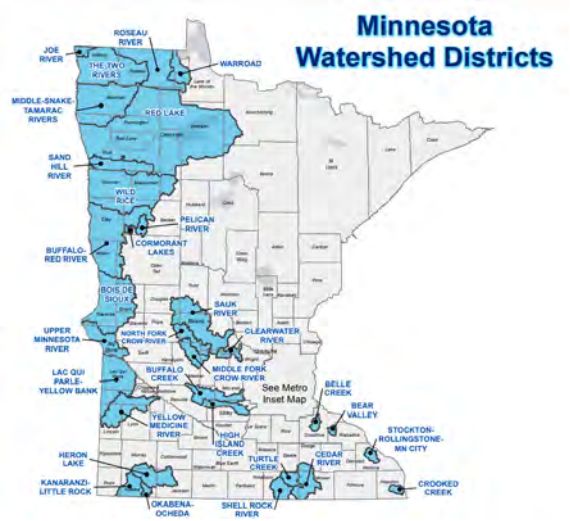


Image Credit: Minnesota Association of Watershed Districts

Each district must adopt a watershed management plan that outlines the purpose and goals for the watershed. The watershed districts must have a board of managers that are appointed by the county boards of commissioners within the watershed district boundaries. The managers develop regulations, policies, and programs to achieve the goals of the watershed.

One of watershed districts' goals is to educate the public and community. District staff are available to assist counties and cities within their district by providing knowledge and resources. Watershed districts have access to many tools and resources that can be of use to public agencies. Some examples include:

- GIS (Geographical Information System) of culvert and ditch inventories
- Water quality monitoring data
- Record drawings of drainage systems including flood control projects, drainage easements, buffer declarations, and Operations and Maintenance (O & M) declarations, county ditches
- Drainage maps and models

The best way to find these resources is to visit each watershed district's website or contact a staff or board member (see the Watershed District Directory on BWSR's website for a list of contact information for each watershed in the state).

A list of all reference materials previously mentioned is detailed in Appendix A.

Image Credit: Minnesota PCA

Chapter 2: Drainage Surveys of City and County Engineers and Watershed Administrators

Minnesota City and County Engineers and Watershed Administrators were surveyed to tap into the individual drainage management knowledge and experience of each respondent. The survey results were then used to identify necessary content to include in this report and obtain additional resources to assist in compilation of the report. The objectives of the surveys were to:

- Identify issues respondents encounter when managing drainage within county roadway ditches, city streets and drainage ways.
- Identify approaches respondents take to resolving drainage issues within county roadway ditches, city streets and drainage ways.
- Identify solutions and best practices used by respondents in resolving drainage issues within county roadway ditches, city streets and drainage ways.

Survey Results: City and County

Based on the questions and responses, the following is a listing of some of the important data that was discovered in the survey to focus the content of this document:

Survey Question:

What is the one thing you wish you had known about county road/highway ditch drainage when you were a new County Engineer or Water Resources Engineer/Staff? Top answers are represented below.

Count	Answer
22	What are the laws, rules, and regulations?
10	Who's responsibility is it?
8	How do I respond to landowners?
5	How do I deal with previous construction issues?
4	What at the best practices?
3	How do I work through maintanence logistics?
3	What are my resources?
2	What are the different types of ditches?
2	What are my watershed implications?
2	How do I priorizite projects?
1	What is considered the right of way?
1	How do I size my culverts?
1	How do I determing what needs to change?
1	Where does funding come from?
1	How do I be fiscally responsible?
1	What is the permitting process like?

Survey Question:

What are the top three issues that the City and County engineering group encountered as they are related to drainage?

Below are the top responses:

- Cleaning and maintaining roadway ditches and culverts
- Cleaning, maintaining and replacement of driveway approach culverts
- Drain tile discharge into roadway ditches and culverts
- Controlling private landowners who wish to modify drainage within the Right of Way
- Culvert and roadway ditch sizing
- Permitting of work within the Right of Way
- Determination of jurisdictional wetland areas

The survey prompted the respondents to upload documents that are currently used to address drainage issues like agreements, policies, permits, ordinances, memorandums of understanding, or guidance to responding to engineering questions. Many documents were provided, some were used to develop the drainage document templates discussed in Chapter 4.

Survey Question:

What are the top four factors you consider when deciding whether to invest in maintenance practices to preserve the life of a road/highway where drainage encroachments/deficiencies exist vs reconstructing the roadway and/or regrading/establishing positive drainage in ditches? Top answers are represented below.

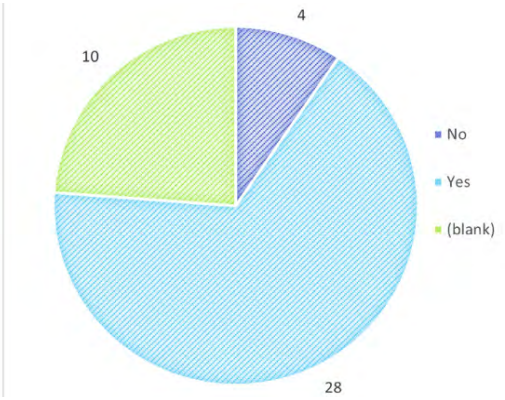
Count	Answer
31	What is the cost and benefit trade off?
25	What is the life remaining on the existing pavement and utility line?
16	What funding is available?
15	What are potential right of way impacts and property impacts?
15	What other projects are planned in the area?
9	Is there a public safety impact?
7	What techniques can we use to drain the area?
6	What is the risk of flooding in the area?
6	What are the traffic volumes along the roadway?
4	Is there political pressure?
3	How did previous projects in the area do?
2	How feasible are the improvements?
2	What future development is going on in the area?
1	What sort of technological support is needed?
1	Are there any unintended outcomes needed?
1	What staffing availability do we have?
1	Are there any freight impacts?
1	Are there any impacts to agricultural land?

The survey identified some of the investment strategies to use to determine whether to invest in routine drainage maintenance or reconstruct, re-build. These strategies are discussed in Chapter 6.

Question:

Do you involve other agencies such as the local Soil Water Conservation Districts (SWCD), Watershed District, or others in addressing private property owner drainage issues?

County Engineers



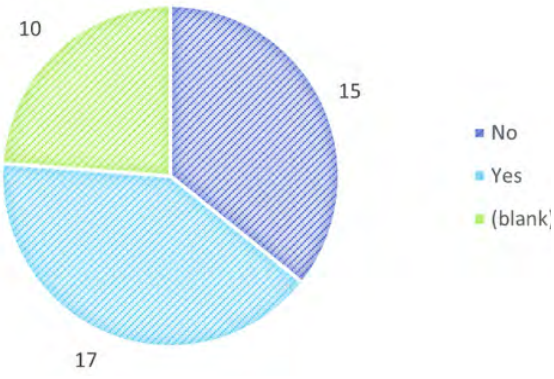
City Engineers

The survey results showed that a majority of County and City Engineers utilize other agencies such as Local Watershed Districts, Soil and Water Conservation Districts, or others to help address private landowner drainage issues.

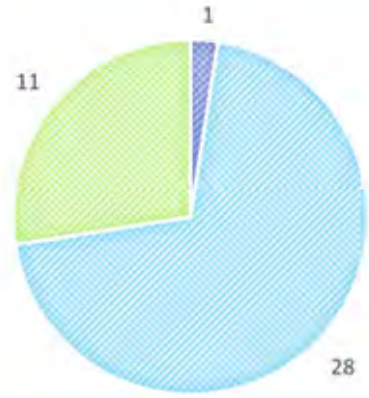
Question:

Do you use Geographic Information Systems (GIS) tools to manage drainage?

County Engineers



City Engineers



Other Tools Mentioned:

- Lidar
- Geomoose
- In-house inventory
- Mapping

How is GIS used to help manage drainage facilities and aid with decision making processes? Some ideas and concepts are presented in Chapter 7.

The original survey, survey questions and a summary of the results is included in Appendix B.

Survey Results: Watershed Administrator

Based on the questions and responses, the following is a listing of some of the important data that was discovered in the survey to focus the content of this document:

Survey Question:

What is the one thing you wish you had known about city and county drainage when you were a new Watershed Administrator or Watershed Operations staff member? Top answers are represented below.

Count	Answer
4	What do the statues say?
3	What is the size and location of the current infrastructure?
1	What amount of water is due to ground water vs. precipitation?
1	Do the proposed changes match the need of the project?
1	What is happening upstream?

Survey Question:

What are the top three ways you assist cities and counties in addressing drainage issues? Top answers are represented below.

Count	Answer
5	Providing modeling
3	Helping apply for grants
3	Helping in emergency flooding situations
3	Helping communicate with the public
3	Monitoring water levels and infrastructure
2	Helping apply for permits
2	Helping coordinate with cities and counties
1	Helping determine boundary lines
1	Helping to look at the larger picture
1	Providing survey data
1	Determining laws and regulations
1	Education of best practices

Chapter 3: Overview of Water and Drainage Law

Minnesota State Statutes

Water and Drainage Law is governed by the Minnesota State Statutes. The important chapters of the State Statues that apply to water and drainage are chapters 103E, 103F, and 103G.

At times, the State statues are not easily understood. In order to apply the intent of drainage law into this report, a legal expert was added to the team to help answer those questions which were posed during the survey. Below is a high-level summary of the legal findings:

Water and Property Rights

All landowners whose property is adjacent to a body of water have the right to make reasonable use of it. With these rights, the landowners are also responsible to manage it's disposition onto other property. If property is acquired or condemned for public use, this could impair the water-related rights of the remaining land and give rise to severance claims, so it is important to understand this as part of the appraisal process when purchasing property.

Impacts of Roadway Construction

Other than compensating property owners fairly for land acquisition to complete projects, engineers should consider all applicable rights of adjacent landowners for any work located within the ROW or easement. This is called a "Bundle of Rights". Under the Bundle of Rights a reasonable use concept has been developed. This principal covers all items related to drainage and its effect on private property by balancing the competing rights of the property owners. Overall, the principal is as follows:

- There is a reasonable necessity for such activity (like cleaning a roadside ditch or making road/ drainage improvements.
- Reasonable care must be taken to avoid unnecessary injury to the land receiving the improvement or change (burden).
- The activity reasonably outweighs the gravity of the harm resulting to the land receiving the burden.
- The activity reasonably improves the normal and natural system of drainage according to its reasonable carrying capacity, or if, in the absence of a practicable natural drain, a reasonable and feasible artificial drainage system is adopted.
- Regardless of whether the water at issue surface water or part of a natural watercourse is, a landowner may not use his land in a way that unreasonably injures their neighbor.

Table 4.1 provides a resolution to common issues using the reasonable use concept.

Reasonable Use Concept Matrix for Drainage Law for Private Drainage

Issue	Resolution
Private Drains to road Right of Way	Property owner must ensure tha the roadway drainage system is left in good condition in every way as it was before the connection was made.
	Authority may adopt rules and regulations for the connections by implementing a permitting system.
Drain Tile Discharge into Right of Way	Authority may set specifications, adopt reasonable rules, and may require a bond before issuing a permit to install drain tile.
	Property owner must ensure that the length of the tile installed is restricted to the minimum necessary to achieve the desired agricultural benefits.
	Once installed, the road authority is not responsible for damage to the drain tile.
Road Construction	If roadway improvements block access to a suitable outlet, improvements must be funded and completed with the project to ensure adequate conveyance of upstream runoff.

Reasonable Use Concept Matrix for Drainage Law for Public Drainage

Issue	Resolution
Roadway or Drainage Conveyance Improvements	Private property cannot be taken, destroyed or damaged for public use without just compensation.
Driveway Culverts	Authority shall provide culverts under approaches required by the construction of a new road or relocation of an existing road.
Roadway Ditches	Authority is authorized to repair, clean, deepen, widen and improve ditches for the purpose of draining public roads.
Easements for Drainage Conveyance	Authority is authorized to acquire, voluntarily or through condemnation, easements needed for conveyance of surface waters.
Road Right of Way Vacation	Authority may retain the right of access for the purpose of maintaining drainage facilities.

During the survey, engineers were also asked to provide input on dealing with drainage issues that come up during their day-to-day conversations with land owners and citizens. In that context, the following bullet points provide insight that is quite useful:

- If it's a private drainage issue with no public drainage tributary to the point of interest, then it is often appropriate to advise of possible solutions but not get directly involved in the work other than to inspect the connections to the public storm system. An example of this might be a private drain tile connection into a City storm manhole (if it is allowed).
- If the local authority commits to a drainage improvement project, no work should take place until temporary easements and/or permanent easements are in place. Temporary construction easements will suffice for construction projects that will not be maintained by the local authority after the project is completed.
- The work can be completed by the public works or roadway department provided they are adequately staffed and have the resources to complete the project.
- Driveway culverts within the public right-of-way can be challenging to maintain and not all requirements for maintenance are the same. In general, maintenance and replacement of culverts is the responsibility of the authority.
- If a public drainage system is blocked or otherwise inoperable and is located on private property, then an effort should be made to fix the problem provided it is not caused by property owners. Cleaning out sediment from outfalls is a good example of this.

A drainage law outline and a memorandum detailing Drainage Law and Road Authorities can be found in Appendix C. In addition, a quick reference Fact Sheet for Water and Drainage Law can be found in Appendix E.

Chapter 4: Drainage Document Templates

One of the goals of this report was to provide drainage document templates synthesized from the example documents provided by the survey respondents. While many useful documents were provided, the consensus was to create templates for drainage permits and drainage policies since they are more frequently used.

Drainage Permit Template

Permits to perform work on existing or new drainage infrastructure is required for many reasons. Obtaining this permit requires an understanding by the applicant regarding what must be done (plan), hiring a qualified person (licensed contractor) who can do the work legally, keeping track of who is doing the work in the right-of-way and other related items. The permit also requires the local authority to perform their due diligence to ensure that the proposed work is designed and constructed to engineering and other code standards.

In general terms, the drainage permit should contain:

- Who is requesting a permit to do the work (applicant)? Is the applicant the same as the person doing the work?
- When is the work being done?
- Where is the work being done and what type of work is it?
- Applicant must acknowledge terms and conditions to release other parties from legal liability during the work.
- Detailed conditions or “reminders” on the permit which describe what is allowed and what is prohibited. These conditions serve as reminders to both the contractor and inspector.

A copy of a permit template is provided in the Appendix D.

Drainage Policy Template

Drainage agreements are important to set forth for any drainage or road authority to ensure applicants follow the guidelines of the authority.

Drainage agreements should contain:

- The role of the Drainage or Road Authority.
- Permitting process.
- Time required for road authority engineer to inspect drainage work.
- Cost share policy.

When developing a drainage agreement, it is recommended to seek legal counsel to ensure the agreement remains within the legal responsibilities and rights of both parties.

A copy of a drainage policy template is provided in Appendix D.

Chapter 5: Fact Sheets

With the presence of many drainage resources and guides, it is often difficult to find drainage content that is all in one place. This report contains fact sheets that can be referenced by residents, elected officials, and engineers. These one-page fact sheets are intended to be documents that can be handed out to residents or can be useful to newer engineers or any individual who has little to no drainage experience or background.

With so many drainage topics to learn and inform the public of, five separate fact sheets were developed that each focused on a topic and audience:

- **Landowner Responsibilities:** This fact sheet discusses managing stormwater to, from and within private property.
- **Road Authority Responsibilities, Duties, and Authorizations According to Drainage Law**: Information on this fact sheet details roles and responsibilities of the road or drainage authority as it relates to improvements, maintenance or other items related to drainage conveyance and public safety.
- **Agency Involvement:** The Agency Involvement fact sheet is intended to guide landowners (public or private) to ascertain which regulatory agencies may become involved in a drainage related issue or project.
- **Drainage Design:** Provides guidance on drainage design concepts and how they relate to public or private drainage improvements.
- **Water and Drainage Law:** Has information on the basics of drainage law established through case law and the Minnesota State Statues.

These fact sheets can be useful to better inform the public on many drainage topics. Fact sheets are provided in Appendix E of this document.

Chapter 6: Qualitative Cost Benefit Analysis of Drainage Investment

Another outcome of the survey to area engineers and watershed planners was how to best utilize a cost/ benefit analysis (CBA) to assist with project decision making.

Justifying spending money on repairing or replacing drainage assets that might get used to their full potential a handful of times a year can be difficult. Officials must consider if the system can function as intended with less costly but on-going maintenance or if the repair as is necessary given the risks of doing nothing.

The following must be considered when budgeting for drainage improvement or repair projects:

- Explore and use preventive measures performed by available staff rather than more costly remediations by an outside contractor/vendor.
- Decisions on priorities should be data driven to support funding decisions. It is important to keep records on the locations and severity of stormwater issues. Photo documentation can also be key to obtaining funding support.
- Determine a high-level cost and ensure funding availability. Property or easement acquisition to complete the project can be timely and expensive.
- Schedule and fund the project with other capital projects or maintenance operations. Request or take opportunities to understand other infrastructure projects such as roadway or utility improvements so that requests for drainage upgrades can be documented and considered.
- Be reasonable about the allocation of taxpayer funded resources to complete a drainage project. Determine if municipal crews can complete the work effectively or should it be contracted.
- Complete a risk assessment of properties that could be affected by doing nothing.
- Determine life expectancy and condition of the assets in place through a field examination. Televise storm piping systems if given a budget to do so to establish priorities.
- Permits to complete work in a regulated floodplain or jurisdictional wetland (US Corps of Engineers or Federal Emergency Management Agency (FEMA) will take time to obtain.
- Document the need for the project if driven by drainage changes, increased run-off or homeowner encroachment. Check to see if stormwater management devices were required to be installed and if the work was done in accordance with the plans and specifications.
- Research data compiled on resident complaints. Determine if potential resident benefits are localized or more far reaching.

Once the initial review is completed, begin compiling information on actual costs and risks based on the best information available. This review can be considered a qualitative cost-benefit analysis (CBA). Many agencies have set criteria for this analysis, but the general format of the CBA should detail the following:

- Yearly costs for preventative maintenance if no improvements are made.
- Costs to design, obtain easements and construct the facility. Estimate how much funding might be required to maintain the new infrastructure on a yearly basis.
- Consider a phased approach to the project. Smaller projects installed over time could be more cost effective.
- Will the project mitigate risk to individuals and private property?
- If the project will protect existing infrastructure such as roads, bridges and utilities, determine a cost for replacement due to a flooding event if nothing is done.
- Detail environmental consequences if no improvements are made. Consider the effects to the surrounding environment due to possible damage to power, gas or other public utility infrastructure.
- The improvements should enhance compliance with MS-4 requirements.

A CBA involves input from many stakeholders, but public opinion should not drive the need for the project. Decisions should be made based on facts and findings.

Federal agencies offer incentives to local governments to design and construct drainage projects and a CBA is typically provided in the application for funding and is used in the selection process. For example, FEMA offers incentives to local agencies in the form of BRIC (Building Resilient Infrastructure Communities) and FMA (Flood Management Assistance) Grants. The application process requires a BCA as part of the selection process to secure grant funding.
Other resources include:

- MnDOT Benefit-Cost Analysis for Transportation Projects
- The Effectiveness of Maintenance and its Impact on Capital Expenditures
- Estimating Benefits and Cost of Stormwater Management
- Conservation Based Approach for Assessing Public Drainage Benefits

In a case study relevant to a CBA, an analysis performed on the merits of installing subsurface drains with roadway construction was determined to be beneficial over time by reducing long term maintenance costs:

Some areas of Minnesota have poorly draining soils (typically clay) because they lock in moisture for extended periods of time. This extended period of moisture detention is especially problematic during the spring because road subgrades, road gravel bases and asphalt are subjected to freeze/thaw conditions while being in a continual wettened state. This situation leads to the rapid breakdown of the road surfacing (asphalt of gravel), gravel support base and compacted soils. One method that is commonly used to help alleviate this problem is installing subdrain systems beneath the shoulder areas outside of the pavement areas or in locations under dirt/gravel roads that are continually saturated.

In most cases, the systems are constructed with larger roadway improvement projects that the governing authority awards and are not usually stand alone. Unless there is a reason not to install subdrains, then they are part of the larger project as they are relatively simple and inexpensive to construct:

A 4-inch perforated drain tile with a coarse filter aggregate bedding on each side of the road will usually suffice if the roadway is paved. If sub drainage systems are installed in problem areas on gravel roads, the geometry of the pipe system should be configured to maximize infiltration. Ensure that rigid pipe is installed in gravel road sections to make sure the pipe is not crushed by heavy loading. A tile sock around the drainpipe should not be used since the clay tends to clog the fabric. Ensure that the system can drain by gravity and

work best if they are drained to the atmosphere and are not submerged. A minimum pipe slope of 0.50% should be maintained. Do not connect sump pump, roof down-spout lines or other drainage conveyances to the underdrains.

The construction of the sub drain takes place with the overall project prior to pavement construction. The best time to install the systems is in the fall or early winter when subsurface conditions are driest and the ground has not been subjected to freezing. The systems are relatively maintenance free although the outlets should be checked annually and cleared of debris or blockage. In most cases, no provisions are made to make the systems locatable. The location of the system is noted with the as-built plans.

Engineers who use the systems estimate that underdrains may add 10-15% to a 60-year asphalt life cycle if installed properly.

Chapter 7: GIS Usage for County and City Drainage Management

Effectively monitoring and managing drainage assets is an important part of any stormwater program and was another topic of interest by many in the engineer's survey.

A web based and mobile friendly asset management program that syncs with an ArcGIS program is highly recommended. Accurate input and organization will assist in the compilation of data which can be used in the Cost Benefit Analysis mentioned in Chapter 6. The following can be organized and updated in real time using GIS:

- Know what drainage assets are in place, where they're located and what condition they're in.
- Perform the right maintenance work at the right time.
- Track resources such as labor, equipment, materials used for every task.
- Use data instead of best guesses to guide decision making.
- Update assets online during inspections and attaching photo documentation provides real time information and will save time, money, and resources with respect to future maintenance.
- Ensures accurate data is provided for field locating.
- Compiles complete sets of data necessary to document Municipal Separate Storm Sewer System (MS4) compliance.
- Keep record of who owns each drainage asset.
- Assist with developing city, county, or watershed comprehensive plans.
- Assess and rate the condition of drainage assets.
- Develop maintenance and repair plans.
- Make informed decisions on drainage improvements that are cost-effective.
- Aid in communication of funding needs with agency members, the public, and elected officials.
- Provide a pro-active approach that could reduce resident complaints.

Available aerial photography enabled municipalities to locate drainage features from a desktop. Once these systems were found, mapping tools were used to create efficient and coherent mapping exhibits which were then deployed to the field to further assess size, location, and conditions of drainage features. In some cases, additional drainage facilities were found which created a more complete data base.

It is important to locate drainage facilities (pipes, inlets, outlets, ponds, channels, etc.) in the field with Global Positioning System (GPS) such that features can be populated as data is collected. To do this, additional staff such as summer interns could be trained to gather the data.

Consider using ArcGIS Online and a cloud-hosted application. Tablets can be purchased for individuals working outside since they can document items in the field and update the data base in a timely and efficient manner. If the decision is made to purchase software to manage assets, start with the basics and work up with additional modules if they are needed. The program should be tailored to suit the needs of the department. Ensure that the new system will work with any existing programs that will remain so that data can be shared and compiled.

Asset management systems can be costly and will require buy-in from all individuals who use the systems. Over time, most individuals realize the value and potential of these programs. However, these systems only work effectively if information is compiled accurately. Meticulous and careful data entry pertaining to all segments and portions of the drainage facilities is paramount. A detailed technical paper on "GIS Tools and Apps-Integration with Asset Management", report No. MN/RC 2020RIC 15, can be found on the LRRB website.

Chapter 8: Summary of Outcomes

What was our goal?

The objective of this study was to provide a compilation and quick access to stormwater drainage information, resources and other materials commonly used by stormwater professionals, the layperson or new stormwater engineers. The study also provides an overview of drainage law and water rights.

What did we do?

To provide the most useful information to the reader, it was important to understand what drainage topics the reader might be most interested in. To discover and understand the relevant topics, researchers developed questions that were sent to local drainage professionals for their input and thoughts. Once the survey data was complied, the content of the study was synthesized based on the responses from the survey and the input provided by the Technical Advisory Panel.

The content of the document includes reference materials and guidance information from jurisdictional authorities, results from survey questions posted to area engineers and water shed administrators with responses, an overview of drainage law, drainage document templates for use by local agencies, fact sheets that can be disbursed to residents and are also useful to newer engineers or any individual who has little to no drainage experience or background, a discussion related to cost-benefit analysis and a summary of GIS usage for managing drainage assets.

What's next?

Possible future RIC projects could explore any of these topics in greater detail. A future project could provide more in-depth research that focuses on the complexities of Drainage Law, possible scenarios that a drainage professional may encounter and tips on how to handle public drainage law issues. More research could be done on the drainage cost benefit analysis and could look at a quantitative cost benefit process which could be useful to engineers and local officials. Another possible future project could be the development of training materials and a class based on the outcomes of this project for engineers and technicians, either new to or with some experience in drainage.

Appendices

Appendix A: Relevant Resource Document Quick Links

APPENDIX A: RELEVANT RESOURCE DOCUMENT QUICK LINKS

Minnesota State Legislature

- MN Statutes (all)
  https://www.revisor.mn.gov/statutes/
- MN Statutes Chapter 103E – Drainage
  https://www.revisor.mn.gov/statutes/cite/103E
- MN Statues Chapter 103F – Protection of Water Resources
  https://www.revisor.mn.gov/statutes/cite/103F
- MN Statutes Chapter 103G – Waters of the State
  https://www.revisor.mn.gov/statutes/cite/103G

BWSR

- BWSR's Minnesota Public Drainage Manual
  https://bwsr.state.mn.us/minnesota-public-drainage-manual
- BWSR's Native Vegetation Establishment and Enhancement Guidelines
  https://bwsr.state.mn.us/sites/default/files/2019-07/Updated%20guidelines%20Final%2007-01-19.pdf

MnDNR

- MnDNR Best Practices Manual
  https://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/gp_2004_0001_manual.html
- DNR General Public Waters Work Permit
  https://files.dnr.state.mn.us/waters/watermgmt_section/pwpermits/General_Permit_2004-0001.pdf

MN LRRB

- Best Practices Handbook on Roadside Vegetation Management
  https://lrrb.org/media/reports/200019.pdf
- Stormwater Maintenance BMP Resource Guide
  https://www.lrrb.org/pdf/2009RIC12.pdf
- Decision Tree for Stormwater BMP's
  https://www.lrrb.org/pdf/2011RIC01.pdf

MPCA

- MPCA Construction Stormwater
  https://www.pca.state.mn.us/water/construction-stormwater
- MPCA's NPDES Construction Stormwater General Permit
  https://www.pca.state.mn.us/sites/default/files/wq-strm2-80a.pdf
- MPCA's Special and Impaired Waters Search Tool
  https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=e03ef170fa3e41f6be92f9fafec100cc
- MPCA MS4
  https://www.pca.state.mn.us/water/municipal-stormwater-ms4

- MPCA's NPDES MS4 Permit
  https://www.pca.state.mn.us/sites/default/files/wq-strm4-94.pdf
- Stormwater Pollution Prevention Program (Complying with the MS4 general permit)
  https://www.pca.state.mn.us/water/complying-ms4-general-permit
- Minnesota Stormwater Manual
  https://stormwater.pca.state.mn.us/index.php/Main_Page
- MPCA's Plants for Stormwater Design
  https://www.pca.state.mn.us/water/plants-stormwater-design
- Stormwater Best Management Practices Manual
  https://www.pca.state.mn.us/water/stormwater-best-management-practices-manual

UMN

- St. Anthony Falls Laboratory's Stormwater Treatment: Assessment and Maintenance
  http://stormwaterbook.safl.umn.edu/
- University of Minnesota – SAFL homepage
  https://cse.umn.edu/safl
- Visual Inspection Checklists
  http://stormwaterbook.safl.umn.edu/other-resources/visual-inspection-checklists
- UMN Extension
  https://extension.umn.edu/
- UMN Extension – Water
  https://extension.umn.edu/water
- UMN Extension – Yard and Garden
  https://extension.umn.edu/yard-and-garden

MnDOT

- MnDOT State Aid Manual
  https://www.dot.state.mn.us/stateaid/manual.html
- MnDOT Drainage Manual
  https://www.dot.state.mn.us/bridge/hydraulics/drainagemanual.html
- MnDOT Facility Design Guide
  https://roaddesign.dot.state.mn.us/facilitydesign.aspx
- Seeding Manual
  https://www.dot.state.mn.us/environment/erosion/pdf/seedingmanual.pdf
- Technical Memorandums
  https://techmemos.dot.state.mn.us/

MN Watershed Districts

- MN Statutes Chapter 103D – Watershed Districts
  https://www.revisor.mn.gov/statutes/cite/103D
- MN Watershed District Map
  https://www.mnwatershed.org/watershed-district-map
- MN Watershed District Contacts
  https://bwsr.state.mn.us/watershed-districts

Appendix B: County, City and Watershed Surveys - Response Summaries

COUNTY, CITY AND WATERSHED SURVEYS – RESPONSE SUMMARIES

Drainage 101 County Roadways, City Streets and Drainage Ways: Best Practices Resources Guide

COUNTY ENGINEERS SURVEY SUMMARY OF 41 RESPONSES

The purpose of this survey is to tap into the individual drainage management knowledge and experiences of county or water resources engineers for county road/highway ditches and storm sewer.

- Identify issues encountered managing drainage within county roadway ditches.
- Identify approaches to resolving drainage issues within county roadway ditches.
- Identify solutions and best practices used by county or water resources engineers in resolving drainage issues within county roadway ditches.

Information gathered will be used in developing a quick reference Best Practices and Resource Guide with the oversight of the LRRB – RIC Technical Advisory Panel to minimize the time necessary for county engineers to effectively address county road drainage issues.

1. **Name:**_____
2. **Title/Role:**_____
3. **What is the one thing you wish you had known about county road/highway ditch drainage when you were a new County Engineer or Water Resources Engineer/Staff?**

- Resources for calculating drainage areas, flow rates and for proper sizing of structures.
- Difference between legal ditch systems and road ditch systems.
- Complexity of 103.E.
- Statutes, rules, regulations.
- Drainage Law (Can landowners legally terminate drain tile at or into a highway ditch (ROW)?) Change to Drainage RW.
- What components of MS 103 apply to any given section of highway ditch.
- Better understanding on hydraulic design for sizing culverts (up to box culvert sizes).
- I was also the ditch inspector at the time, so felt informed about county ditches.
- I am a new county engineer!
- As-built plans showing what was and what was changed.
- Water flows downhill.
- Difference between public drainage ditch systems and standard roadway ditches and the maintenance funding.
- Drainage laws and liabilities.
- Permitting related to wetland impacts.
- Understand the watershed's role in regulating ditch cleaning / improvement work.
- Best practices, guidance and fiscally responsible solutions to drainage issues that arise in design and maintenance.
- Ditch and drainage laws, Right of Way information and laws.
- Water laws and rights.

- Have drainage and ditch maintenance a higher priority.
- How much landowners ask.
- Quick guide to key resources for design and BMP's, and potential permitting agencies that may need to be contacted.
- Judicial Ditch law.
- When is a wetland existing or created and which one needs to be mitigated and which ones are exempt.
- How to handle private claims regarding: a new roadway or bridge improvement damaged the existing private tile system or impacted runoff, causing increased standing water.
- Drainage Law and short run-down of important information regarding it. Knowing what can be done via repair vs improvement.
- Steele County has a significant amount of agricultural tile crossing the highways and located in county right of way, presumably installed by neighboring property owners. Whose responsibility is it to maintain?
- Laws pertaining to drainage systems and county highways.
- Where to find standards that need to be applied in an easy-to-understand format.
- Drainage Law. County or State Policy. Condensed state and federal water resources permitting requirements and guidelines.
- Understand Statute language and the responsibility/authority of the highway department when it comes to ditches.
- Drainage law. Knowing who to contact when making changes to drainage when designing or when requested by citizens. Basic language on how to handle requests from citizens and how to decide who should pay for what.
- Post construction BMP requirements for rural highway reconstruction.
- Condition and life expectancy of corrugated metal pipe.

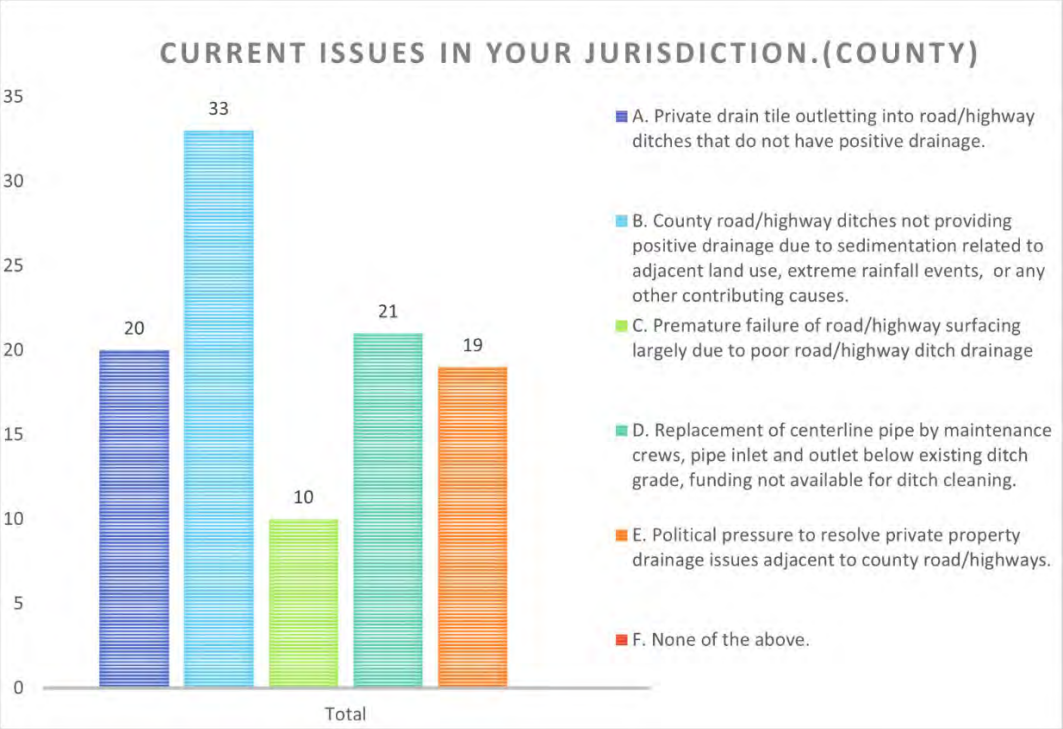
4. What are the top three issues you are asked to address related to drainage in county road/highway ditches?

Issue 1	**Issue 2**	**Issue 3**
Flooding	Culvert sizing	Permitting
Who cleans and at whose cost?	Culvert sizing	Ditch improvement process
Clean ditch	Culvert settling	Directing private drainage to public R/W
Can I outlet my tile in your road ditch?		
Homeowners modifying ditches	Permitting req. of maintenance in ditches	Ditch stormwater treatment capabilities/cred
Drain tile terminating at highway ROW such that it flows into highway ditch	Repair/replace private tile under county highway	
Who is responsible or allowed to mow or maintain it?	When is it a wetland vs. a wet ditch?	
Landowners asking permission to grade a road ditch	Landowners requesting to lower or increase sizes of culverts	Where is the drainage supposed to go?
Remove beaver dams/trap beavers	Replace/change elevation of culverts	Remove sediment
Permitting	Tiling	Stormwater regulations

Standing water in the ditch	Culvert size	Outlet tiles in the ditch
Plugged culverts	Failed culverts	High water
Ensure that site work done via access or utility permits is compliant with PCA requirements for erosion control.	Ensure that slopes, flows, etc. proposed by developers or other permit holders meets county requirements.	Protect other infrastructure such as shared use paths from negative impacts of drainage such as shoulder aggregate, algae, etc.
Poor drainage - need for maintenance	Need to explain to people/ beneficiaries why they have a ditch assessment.	Need to explain to the Board/Drainage Authority what their role or responsibility is.
Clean culvert	Clean out/grade ditches to improve drainage	Deal with washouts/erosion beyond our Highway R/W
Request by landowner to survey, improve, or change highway ditch drainage	Concerns about farming into the roadway ditches	Concerns about a landowner cleaning ditch without road authority approval and how to correct poor work
Road culverts simply pass water under the road, it's not all water from the roadway.	Drainage tile that daylights uphill from our road ditch	Prevent erosion in the road ditch
Erosion issues	Determine if structures are properly sized	Ditches/structures not draining properly
Farmers request ditch cleaning	County ditch/tile crossings	Dealing with encroachments
People wanting to outlet tiles into ditch creating wet areas	You're not draining my field or you're draining into my field	Water backed up into house
Washouts	Ditches that are overgrown and not draining	Infrastructure connected to ditches not working
Improve drainage to facilitate yard maintenance	Improve drainage to facilitate curb appeal	Improve drainage to facilitate site development
Rate of flow	Water quality requirements	Maintenance of flows and flow patterns
Routing natural drainage ways to along the road to ease drainage in a field	Clean out farmers ditches that are plugging the ditches	211
Clean culvert	Replace culvert	Clean ditch
Clean out the ditch and the water should go that way not the way it is now	We just need to lower the pipe, and it will drain.	Farmers spraying roundup keep moving into the ditch and then want to know why the culverts are all plugged with dirt.
Who pays to clean?	Who pays to replace culverts in approaches?	Why is there water standing in the ditch?
Perpetuating flow	Private tile lines in County ditches	Pipe is under/oversized
Public drainage tile issues	Road ditch cleaning	Farmer's tile crossings under our roads and or running parallel

Clean ditch	Resolve potentially blocked private tile under the highway or in highway right of way	Address culverts that are seemingly undersized, at least as perceived by the public. The public doesn't understand we only size driveways to say a 10-year event, or cross culverts to a 50-year event, thus accepting a regular overtopping or backup.
Flow restrictions	Tile or culvert washouts	Field entrances
Flooding	Homeowner concerns/complaints	Erosion issues
Ag. drain tiles in the ROW, upsizing, crossings, outlets etc.	Surface runoff impacts to upstream and downstream landowners	Illicit or unauthorized discharges
Fixing and increasing grades to get better drainage	Adding additional or larger pipes to create better flow and drain the ditch	Cleaning ditches that are causing farm field to flood or back up with water
Clean roadside ditches	Install drain tile across roadway	Change drainage across or adjacent to road
Water is higher than before so fix it	Cleaning saturated ditches	Plugged culverts
Plugged culverts	Pipe elevation adjustment	Whether to tie or not - untied concrete apron and end sections.

5. **In addition to the previous question, select all of the following options that are currently issues in your jurisdiction.**



6. **If you have any documents that you use to address drainage issues such as agreements, policies, permits, ordinances, memorandums of understanding, or guidance for responding to questions (FAQs) that you would be willing to share, please upload them.**

- File Names of Documents Shared
  - Application for Drainage Permit
  - Ditch Cleaning Permit Application - fillable form
  - Drain Tile in ROW New
  - Drain Tile into Ditch County Attorney Letter
  - Drain Tile Crossing County Road Agreement - fillable form & standard conditions
  - Drain Tile Parallel to County Road Agreement - fillable form & standard conditions
  - P21 Drainage Work on Private Property
  - Resolution on Tile Crossing dated Nov. 2007
  - Tile Drainage Ordinance
  - WashCo ROW Ordinance 188 with MS4

7. **If you have materials that have been particularly effective which you or other engineering staff use to educate new county commissioners, township officials and/or residents regarding county road/highway ditch drainage that you would be willing to share, please upload them.**
    - Name of Documents Shared
        - Tile Drainage Ordinance (same document shared in response to Q6)

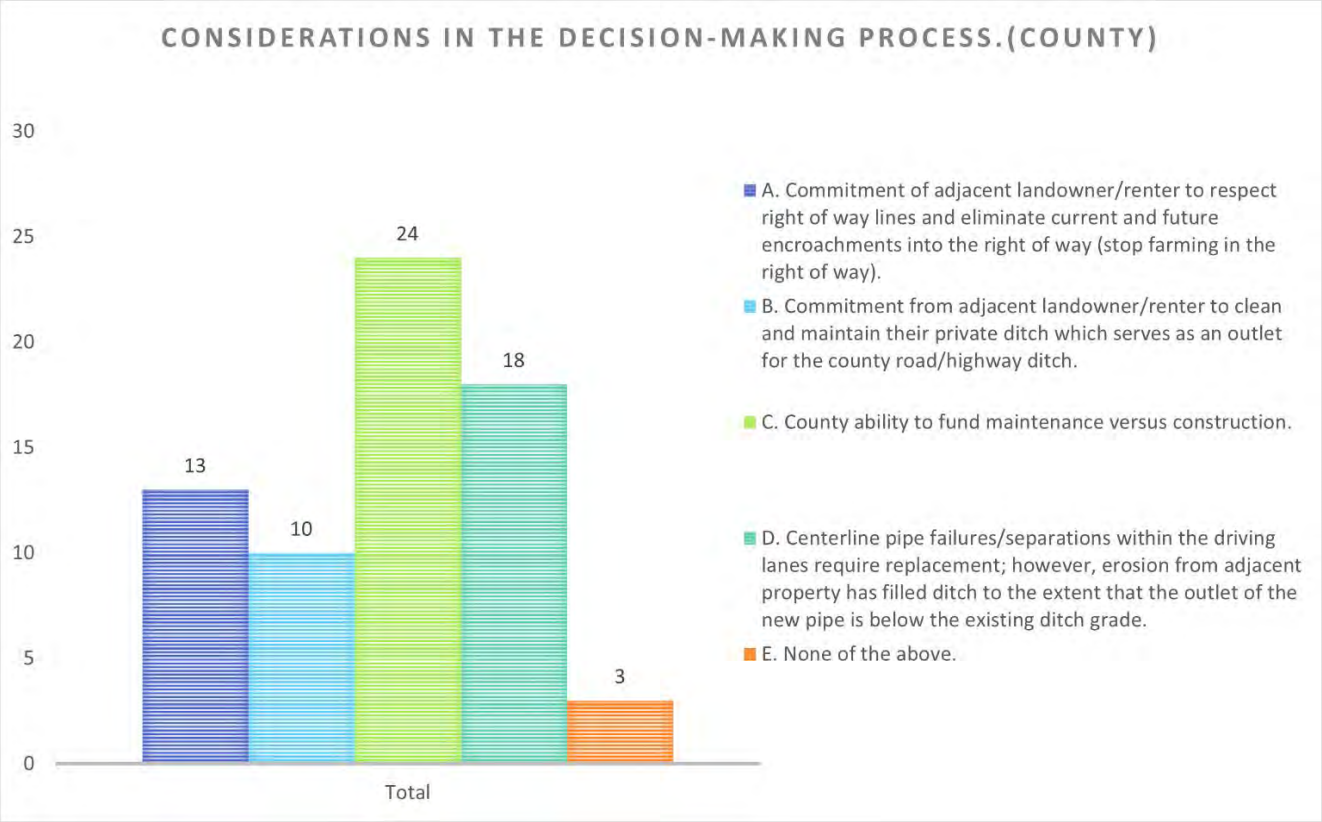
8. **What are the top four factors you consider when deciding whether to invest in maintenance practices to preserve the life of a road/highway where drainage encroachments/deficiencies exist vs reconstructing the roadway and/or regrading/establishing positive drainage in ditches?**

FACTOR 1	**FACTOR 2**	**FACTOR 3**	**FACTOR 4**
Traffic count	Surface type	Right of way width	Utility locations
What is requested?	What ditch system is the work being completed?	What type of work is being requested?	What is needed based on survey?
Timing	Funding	Severity	
Cost	Life expectancy		
Planning cycles	Resident complaints	Traffic numbers	Cost
Cost	Politics		
Cost	Effective	Life expectancy of the practice	We would correct the drainage issue
Existing road geometry	Funding availability	Other road priorities	Traffic volumes
Costs	Long term costs	Permitting	Landowner
How old is the roadway?	Is it a major route.	Cost and benefit study	Is it a safety issue.
Funding available	Timeline of when a reconstruction project could be done		
Funding	Condition of driving surface	Cost	Workload
Safety of the traveling public	Level of effort/cost of maintenance activities	Age of pavement/facility	Public feedback/complaints
Budget	Priority	Try to partner with private landowners and do ditch work when they are doing adjacent private work.	Coincide with other county projects
Always fix drainage and don't regrade.	If road is going to be milled and paved, we go thru the entire corridor	Ditching is considered money well spent when	If work can be done with in-house employees

	replacing culverts, repairing catch basins, and ditching where it's needed. We also repair washouts and any erosion issues.	considering the lifetime of the entire road.	
Budget	County systemwide priorities	ADT	Public safety
Ease of the repair	Cost	Available right of way	Permitting requirements
Cost			
Public Hazard	Cost and scope of upcoming pavement project	Remaining life of roadway pavement	County funds to finance pipe replacement
Cost when we have other priorities	Other priorities for reconstruction funds	Ability of addressing road surface condition with reclamation	Expand a reconditioning project to include not just the road surface, but also culvert replacement, ditch cleaning, spot reconstruction to address horizontal or vertical curve issues, signing, guardrail upgrades, etc. Make it an all-inclusive recondition project, not just road surface recondition.
Road surface condition	Width of right of way	Outlets for the needed drainage	ADT
Cost	Willing landowners	Time	Political support
Road & Surface age & condition	Road Traffic Volumes	Road Load Rating & heavy traffic volume generators	Benefit of drainage improvements to surrounding ag. land
Funding	Using existing ditch grades from the 1950s.	Erosion	Road usage/AADT volume
How extensive the fix will be	Where funding will come from	If permits or permission/ROW is needed	How badly the road is affected and if its gravel or paved
Safety of the travelling public	Amount of public infrastructure at risk	Cost	Anticipated duration of the event

Cost	Cost of proposed maintenance activity	Skill level and available equipment of maintenance staff	Other project impacts of reconstruction

9. In addition to the previous question, select all of the following items that are considerations in the decision-making process.



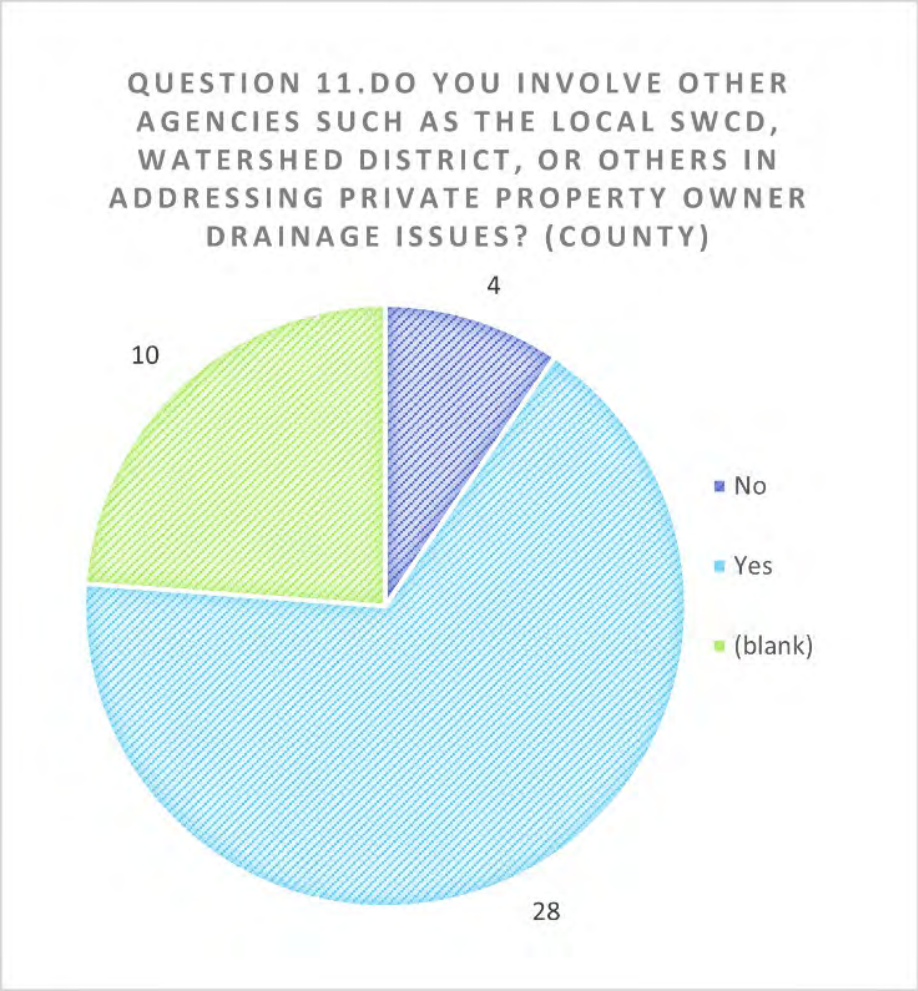
10. How do you approach and manage expectations when private property owners raise surface and/or subsurface drainage concerns?

- Practical approach to determine if a solution is the responsibility of the County or adjacent landowner.
- Review the request, discuss what is needed with landowner. What money is available.
- Listen, investigate concern, explain findings, help if reasonable, explain priorities where did or does the water run.
- Clarify only maintain drainage within ROW without easement or agreement.
- Carefully.
- Educate the property owner on limits of right of way and drainage law.
- Road ditches are not for drainage purposes. The landowners are the ones benefitting from the drainage requests, so they should fund the work. We allow improvements within the R/W as long as they follow MN drainage law. We also consult with the local watershed district.

- Utilize legal ditch process, outside legal ditch system and not a priority for highway department, we have landowner take care of the issue through permit.
- Look at situation individually, past precedence to help guide the solution and answer.
- Study.
- Not generally an issue.
- My involvement is only through our permit process for work in the right-of-way.
- Explain responsibilities, level of available funding, and priorities.
- Treat each request the same way. Follow your policy or past practice if possible. If you give something to one resident everyone will be asking for the same treatment.
- Be upfront on budget and priority constraints.
- Put it in perspective. If there isn't a benefit/concern regarding the county roadway, then their concern is low priority and may be best addressed by the private property owner by obtaining a permit to work in the ROW.
- We talk to them in an effort to do what is necessary to keep the ditches dry.
- Able to handle the issue right away, we do. Coordinating with local watersheds - DNR and homeowners - taking time to get it right is important.
- If the ditch has sediment that has impacted the original design, then we approach this as a restoration/ clean out operation. Any changes to the existing drainage patterns and flows would need to follow more stringent permitting requirements and may require private property owners to pay for some or all of the cost of the improvements if there is no benefit to the county highway.
- Facts.
- No private tile in county roadway ditches unless no other options for landowner exist. Or lack of funds in county hwy. department budget in many cases to repair/replace unless it is a roadside hazard. Or if the County clearly has ownership of the problem, we will repair.
- Try to understand what their issue is. If it is a maintenance issue, add it to the extensive backlog of drainage maintenance items, and explain we'll get to it as crews are able. If issues are due to private land, educate them on what their responsibilities are and where ours begin, refer them to the water and soil conservation office perhaps. Provide permits to have them maintain their tiles running across or along the highway right of way. Sometimes the issue can be resolved with an upcoming construction project. Other issues may need a cooperative work between the property owner and the county.
- Discuss options with the property owner. Sometimes we can improve the situation and sometimes the property owner has to do something to improve drainage.
- Work with landowners to help them understand the role of the county in managing drainage vs. private landowner responsibilities.
- We discuss the issue with the landowner and investigate whether the issue is within the County ROW or a private tile issue. 8/10 times the issue is private, and we are able to prove it to the landowner for private resolution. Surface drainage issues are evaluated in a similar manner.
- Make sure all the applicable Minnesota Statutes are being followed. Address the issue with the drainage authority (Commissioner).
- Look at ditch funds. Survey existing ditch to profile versus original ditch grade. Perform maintenance when needed.

- Meet with them and then talk to maintenance superintendent to see if their issues coincide with road issues.
- We will do what we can, but we aren't going to be changing drainage patterns that have been in place for 70+ years.
- Look at whether the drainage deficiency is impacting the roadway or only would benefit adjacent landowner. Then inform landowner of Highway decision or allow them to improve the ROW drainage at their expense.

11. Do you involve other agencies such as the local SWCD, Watershed District, or others in addressing private property owner drainage issues?

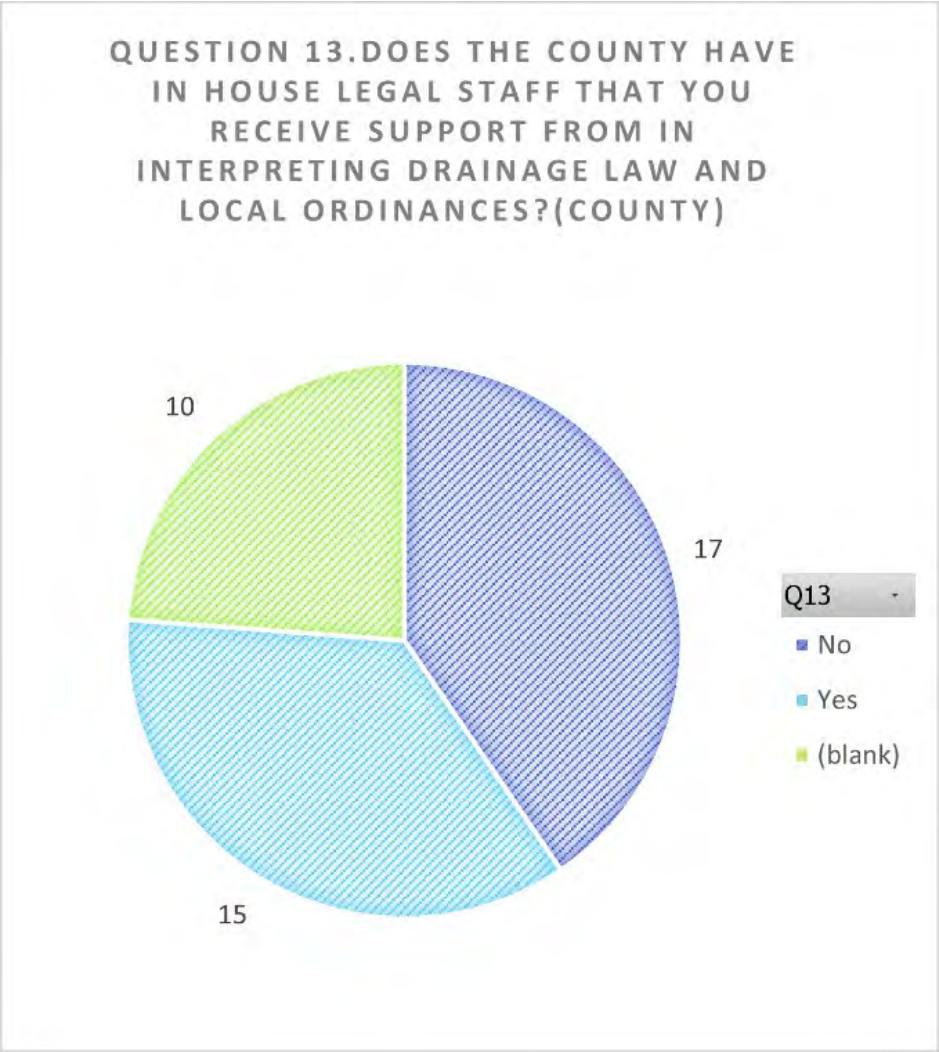


12. If yes, please provide an example where you have involved other agencies in addressing private property owner drainage issues.

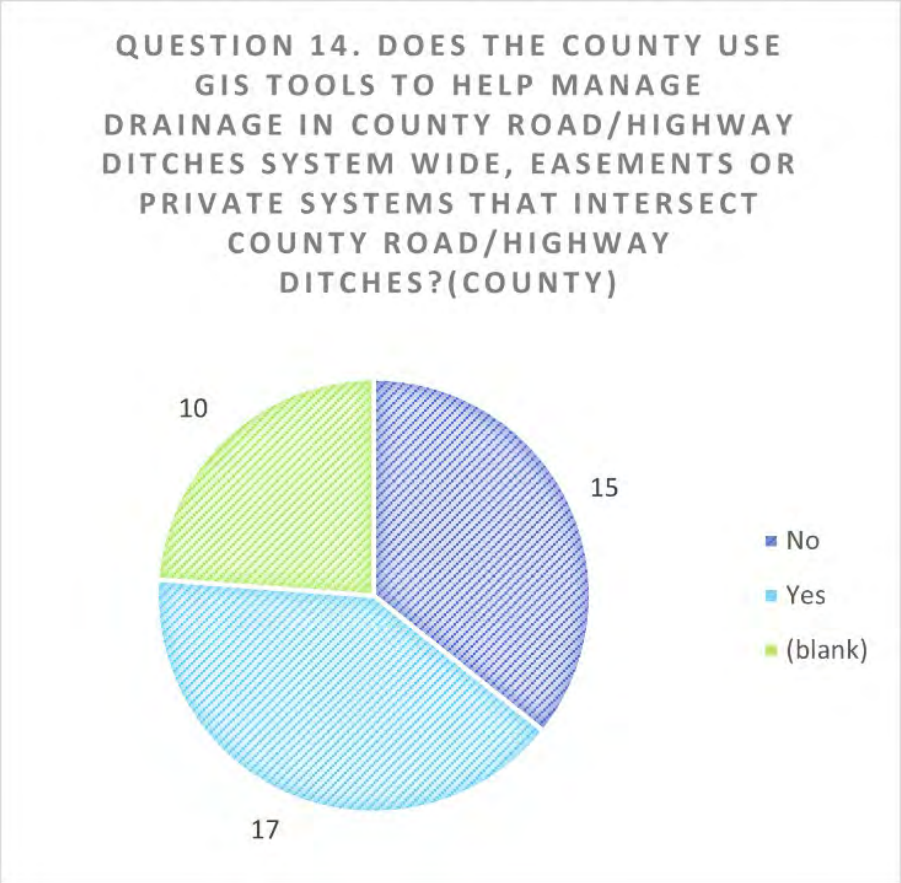
- Don't address private property drainage issues but direct them to SWCD.
- Those involved is based on what type of work is needed.

- Consulted with the local DNR hydrologist, our County land services department which administers WCA requirements.
- Had SWCD come review a culvert location.
- Where drainage area contribution is not entirely the county's and city/other agency involvement is required. The watershed district can act as facilitator of the project.
- None to date - but would get SWCD involved if necessary.
- On county highway permits we require agency review. Otherwise, based on if project will impact wetlands or public waters.
- Affects roadway damage.
- I almost always involve the watershed in drainage issues. Good to get them involved early in the discussions as any improvements will likely require a watershed permit.
- We had SWCD work w/ County staff in property owner disputes regarding drainage issues in the past
- When landowner want to create/clean waterway that will affect our ditch.
- Leaned on DNR and local watersheds to help farmers understand how it affects lakes, rivers, and streams practices.
- Cost share programs with SWCD/ NCRS if available for upland erosion control improvements that may include/require ditch improvements.
- We will include drainage improvements into reconstruction projects that the benefiting property owner may pay for some or all of the enhancements beyond what we need. This is typically handled with right of way negotiations if we need additional right of way. We do work with our WMO and other private organizations that have drainage concerns to direct them towards grant opportunities or support from other governmental agencies.
- We involve Lake of the Woods Soil and Water District to help fund repairs with clean water funding.
- SWCD and landowners requested to fill part of roadway ditch in order to replace lake levy. Worked with SWCD and BWSR to create a solution that worked for every party.
- SWCD, Ditch Inspector, DNR.
- Involve SWCD if they may be able to help the landowner with design and/or funding of an improvement project.
- Landowners are referred to the SWCD if they may be of assistance in addressing drainage issues. Otherwise, the landowner is informed that it is unfortunately a private civil manner that the County is not a party in.
- When requesting to add a pipe or upsize a pipe, the Watershed gets involved.
- When their request has potential to effect wetlands and/or divert natural water flow direction.
- Mostly when they expect the Highway Department to fix the problem when it doesn't encroach on public infrastructure.
- We have changed centerline pipe elevations in advance of resurfacing projects at the watersheds requests.

13. Does the county have in house legal staff that you receive support from in interpreting drainage law and local ordinances?



14. Does the county use GIS tools to help manage drainage in county road/highway ditches system wide, easements or private systems that intersect county road/highway ditches?

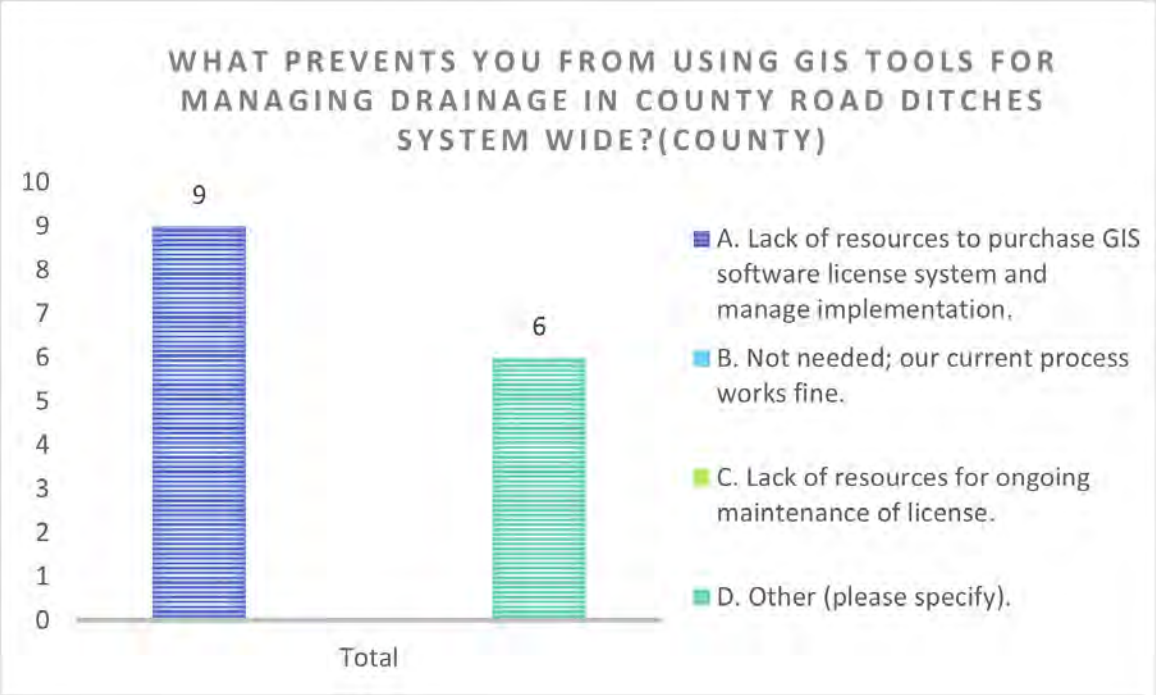


15. If yes, what GIS tools are most useful and what do you use them for? Please specify if tools are privately developed or online.

- Lidar - determine natural drainage patterns.
- Ditch mapping and repair documentation.
- Geomoose to display GIS data and various hydro layers are helpful along with contours
- Historic ditch files, storm sewer infrastructure, land use categories, and land contours. Some are privately housed, and some are widely available online.
- Maps.
- In-house development of culvert inventory. Right of way and roadway attribute additions are in progress.
- Systems mapped along with benefiting lands and landowners as part of county-wide parcel mapping developing our in-house centerline culvert inventory.
- Property ownership, permitting jurisdiction, contours, aerial mapping (current and past years). Most are through data collection that the state performs, with some supplemental information data such as property information.
- Arc map.

- We currently only have GIS data on public tiles and public ditches. I've served in other counties with a culvert inventory that includes size, type, invert elevations, location, condition, etc. that is very useful, especially when combined with a contour map, to understand where water is coming and going. I dream of a detailed system of culvert invert information and detailed contour information to use in hydraulic studies. A previous county I served also had routine inspections by the maintenance staff assigned to the route of culverts and drainage systems with a simple, but effective rating system (good, fair, poor) and some maintenance notes, that were recorded in the GIS system. Maintenance supervisors were able to regularly able to schedule culvert and ditch cleaning. Engineering staff could review the culverts rated "poor" and plan appropriately for their replacement.
- GIS mapping of stormwater management system with contours and aerial photos. Privately developed within the County.
- Simple Culvert Software Maintenance has started to locate and inspect centerline pipes and use the software to locate and ID them.

16. If no, what prevents you from using GIS tools for managing drainage in county road ditches system wide, easements or private systems that intersect county road/highway ditches?



17. May we contact you to follow up on your survey response? If yes, please provide your phone number and/or email.

CITY ENGINEERS SURVEY OF 40 RESPONSES

The purpose of this survey is to tap into the individual drainage management experience of city and/or water resources engineers for city streets and drainageways (drainage and utility easements).

- Identify issues encountered managing drainage within city streets and drainageways.
- Identify approaches to resolving drainage issues within city streets and drainageways.
- Identify solutions and best practices used by city and/or water resource engineers resolving drainage issues within city streets and drainageways.

Information gathered will be used in developing a quick reference Best Practices and Resource Guide with the oversight of the LRRB- RIC Technical Advisory Panel to minimize the time necessary for city and water resources engineers to effectively address city street and drainageway.

1. **Name**:_____
2. **Title/Role**: _____
3. **What is the one thing you wish you had known about city street drainage, storm sewer or drainageways (drainage and utility easements) when you were a new City Engineer or Water Resources Engineer/Staff?**
    - Variable Groundwater. Tools and tips to help homeowners to deal with soggy yards or nuisance flows.
    - How to help people figure out how to fix their concerns but also to communicate that it's likely a local issue for them that the City isn't going to fix for them.
    - If an existing drainage way is covered with a new drainage & utility easement due to a platting process, does that new D&U easement obligate the regulating authority (i.e.: city, county, township) to be responsible for the maintenance and function of the drainage way or is there some responsibility on the underlying property owner to ensure it functions?
    - State Aid hydraulics rules.
    - Every pipe/system encountered from past construction is undersized when performing a reconstruction project.
    - The legal facts behind MN drainage laws.
    - Rules / laws / norms for drainage on public and private property.
    - City model.
    - How easements affect private property owners and how can I ensure that those owners clearly understand the city's ability to enter and maintain the drainage ways.
    - Good drainageway cleaning methods.
    - What is considered a private drainage issue.
    - The extent of the issues associated with the system as a whole.
    - Drainage law, Infiltration design/ maintenance.
    - Understanding the benefits of D&U's and the land use authority cities have with the easements. Impacts of groundwater and ability effectively to manage groundwater to preserve street segments.

- What are the reasonable and defendable limits of what Cities can do to resolve drainage issues on private properties and within D&U easements. How can Cities work effectively with property owners to resolve these issues and not take on additional maintenance burden.
- The responsible entity for each feature (jurisdiction and inspection/maintenance protocols & frequency) - who owns them & does what/when?
- Maintenance logistics.
- Each project is a generational project, you are not going to do another project at that location in your career. Also, drainage greatly impacts the quality of life and safety of the community.
- Typical catch basin spacing, intersection drainage layouts, minimum grades for turf drainage and street drainage.
- How drainage responsibilities and improvement/maintenance costs are apportioned between jurisdictions at differing levels of government (i.e., MnDOT and City).
- Prescriptive easement laws/regulations.
- The impact it plays during the design process. With limited area and having to treat a required amount of water can be very challenging.
- Why/how a majority of the responsibility (for maintenance) typically falls on the city no matter whose storm sewer/water it is.
- No matter how big you design the storm sewer a lot of leaves can clog your intakes with the first 1/2 inch of rain.
- Everything is undersized.
- Drainage rights and how to resolve private/private drainage disputes effectively.
- Drainage law and how it applies to suburban environments.
- Older Developments in the City do not have always have the easement areas clearly defined.
- Provide more excess capacity for new storm sewer and drainage since climate change is increasing rain amounts and intensity.
- Understanding of private landscaping and things homeowners can do to protect themselves against their homes (basements)/properties flooding - best practices for single family home properties. Effects of politics.
- More about easements.
- Effective catch basin spacing.

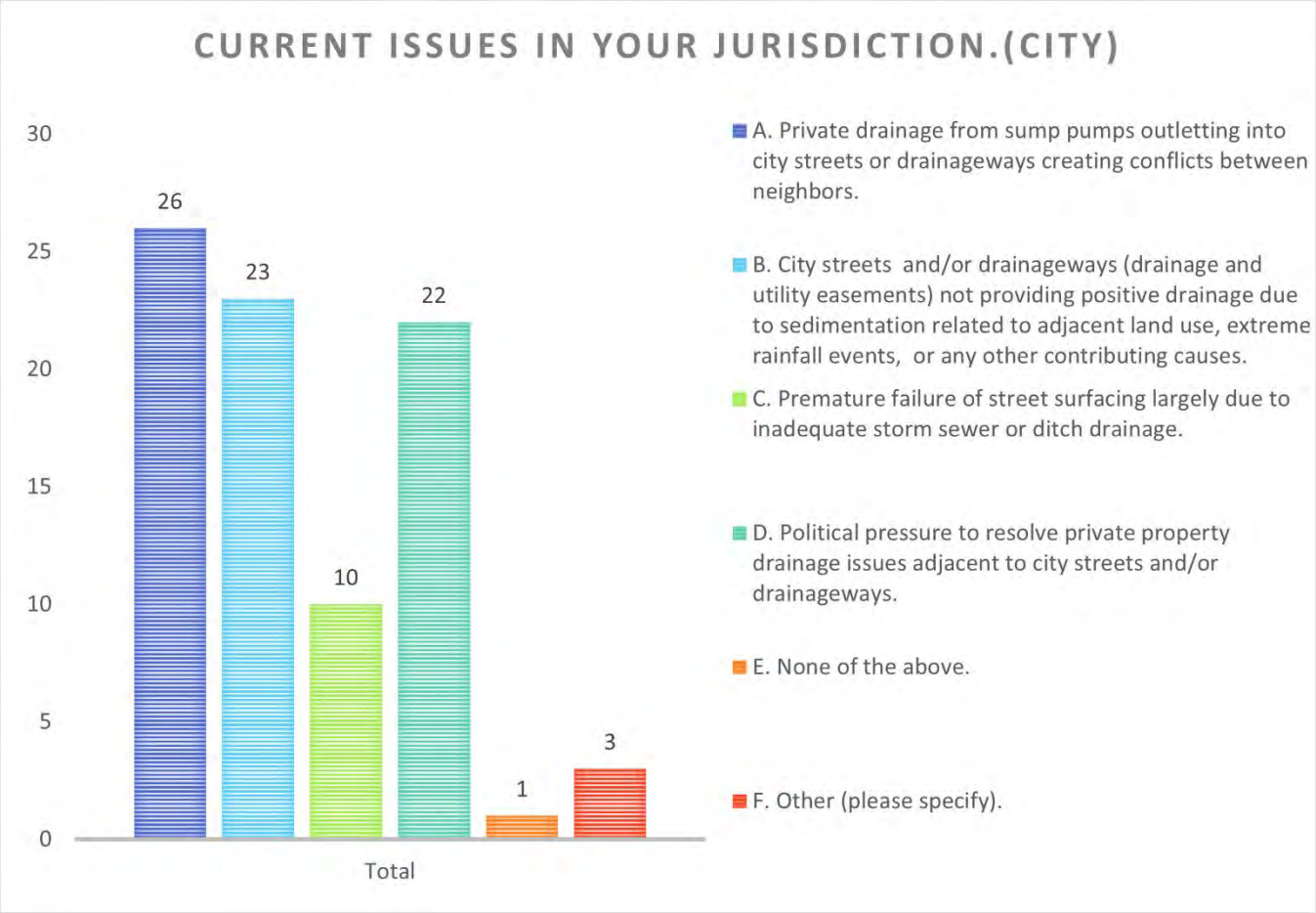
4. What are the top three issues you are asked to address related to drainage in city streets, storm sewer and/or drainageways (drainage and utility easements)?

ISSUE 1	**ISSUE 2**	**ISSUE 3**
Nuisance drainage issues	Flooding	Regrading, landscaping and construction
"Soggy sod" complaints/concerns	Flat poorly graded yards	Unapproved obstructions in the drainage easement
In areas that have more rural cross sections, why are residents	Who is responsible for maintenance or repairs when its	Any time we have a project that removes trees residents will

"responsible" to convey the runoff from the roadway through their property?	Old infrastructure and no formal agreements are in place?	Comment that they significantly help reduce the amount of run off and improve drainage issues. Is there validity to their claims?
Street flooding	Private flooding	Erosion problems
Improperly graded lots that adversely impact neighboring lots because they don't match approved grading plan	Erosion issues in drainage swales, sometimes private and sometimes public	Localized flooding areas but no nearby storm sewer available to address the issue
Why does my street flood when we get a big rain?	Why does my sump pump run constantly (there must be a spring right?)	Why does the City have all these rules about storm water (MPCA CSW and MS4 permit requirements)?
Runoff onto private property	Obstructions/issues on private property drainage ways impacting City drainage	Oppressive watershed rules when doing simple culvert change outs. Too much modeling and expense for simple improvements.
Flooding	Replace open channels with pipes	Allow structures on easements
Easement encroachments	Ponding needs for private development	Maintenance to existing structures and BMPs
Catch basin reconstruction	Street flooding	Drainageway cleaning
Drainage from road enters private property	Poor overland drainage conveyance	Function of storm water management features
Providing treatment where there isn't any	Flooding	Age and future development
Blocking of drainage through public easements on private property	Inadequate grading/drainage on private property	Sump discharge to streets
Grass clippings and leaves in the street or being placed in catch basins or water bodies	Pond water levels and aquatic weeds	Wet back yards and/or wet basements
On-street flooding due to lack of catch basins/storm sewer pipes	Localized flooding from several private properties converging to one or several points and within D&U easements	Encroachments into drainage and utility easements/wetland land buffers
Sump pump discharge	Encroachments	Winter maintenance (icy spots)
Poor street drainage that affects private property owners via runoff onto their property	Private drainage connections options to the City storm sewer	Poor roadway drainage that impacts road and shoulder integrity

	system for wet yards, seeps and sump pump discharge	
Backyard drainage issues, wet backyards	Trying to create storage or treatment areas in street ROW	Bird baths in street or curb
Historic flooding, especially with higher intensity storms	Maintenance of ponding in rear easements; need to dredge to make these function as open water ponds	Maintenance of private drainage systems (e.g., this WQ basin is full of weeds)
Wet yards/properties (not homes)	Sump pumps causing icing issues in winter	People landscaping in easements
Flooding	Water quality	Erosion control
Isolated drainage issues in alley areas with no storm sewer	Upstream development affecting downstream pond elevations (many times it is perception, sometimes uncoordinated design)	Vegetation maintenance issues in ponds.
Clogged drainage	Undersized storm sewer	Maintenance
Seasonal sump pump drainage impacts	Frozen ground drainage affects that have short term impacts	Restoring function to systems that have failed or need maintenance
Erosion caused by upstream contributors	City or private owner(s) responsibility to reconcile drainage issue	Flooding or blocked drainage concerns
Backyard Drainage Issues	Flooding	Sump pump discharge
Flooding	Street flooding from surcharging storm sewer	Seepage
Flooding	Sump pump discharge - where should it go?	Clean out pipes or ponds
The role of concrete curb and gutter	What private property owners can place within easements	Storm water treatment
Backups/standing water during large events	Relating to developers the impacts of creating impervious surfaces	How to fund storm sewer improvements

5. **In addition to the previous question, select any of the following options that are issues in your jurisdiction.**



6. **If you have any documents that you use to address drainage issues such as agreements, policies, permits, ordinances, memorandums of understanding, or guidance for responding to questions (FAQs) that you would be willing to share, please upload them.**

- File Names of Documents Shared
  - 2013-01-08 Drainage Nuisance Policy
  - 3950 114th Lane Agreement djb
  - 9911 Palm Street Agreement3
  - 12220 Ilex Street NW Agreement
  - Engineering Standards
  - Lot Drainage Tips

- Minnetonka_CouncilPolicyBook_11.3 Private Uses of Public Easement Areas
- Minnetonka_CouncilPolicyBook_12.11 Lake and Pond Management
- Minnetonka -ordinance 500.045 Drainage Requirements
- Shorewood-Stormwater_Maintenance_Agreement-Final 05-19-2020
- Sump Pump Discharge Policy

7. **If you have particularly effective materials that you or other engineering staff use to educate new city council, planning commission members, or other city officials and/or residents regarding city street drainage, storm sewer and/or drainageways (drainage and utility easements) that you would be willing to share, please upload them in the following hyperlink.**
   - No documents shared

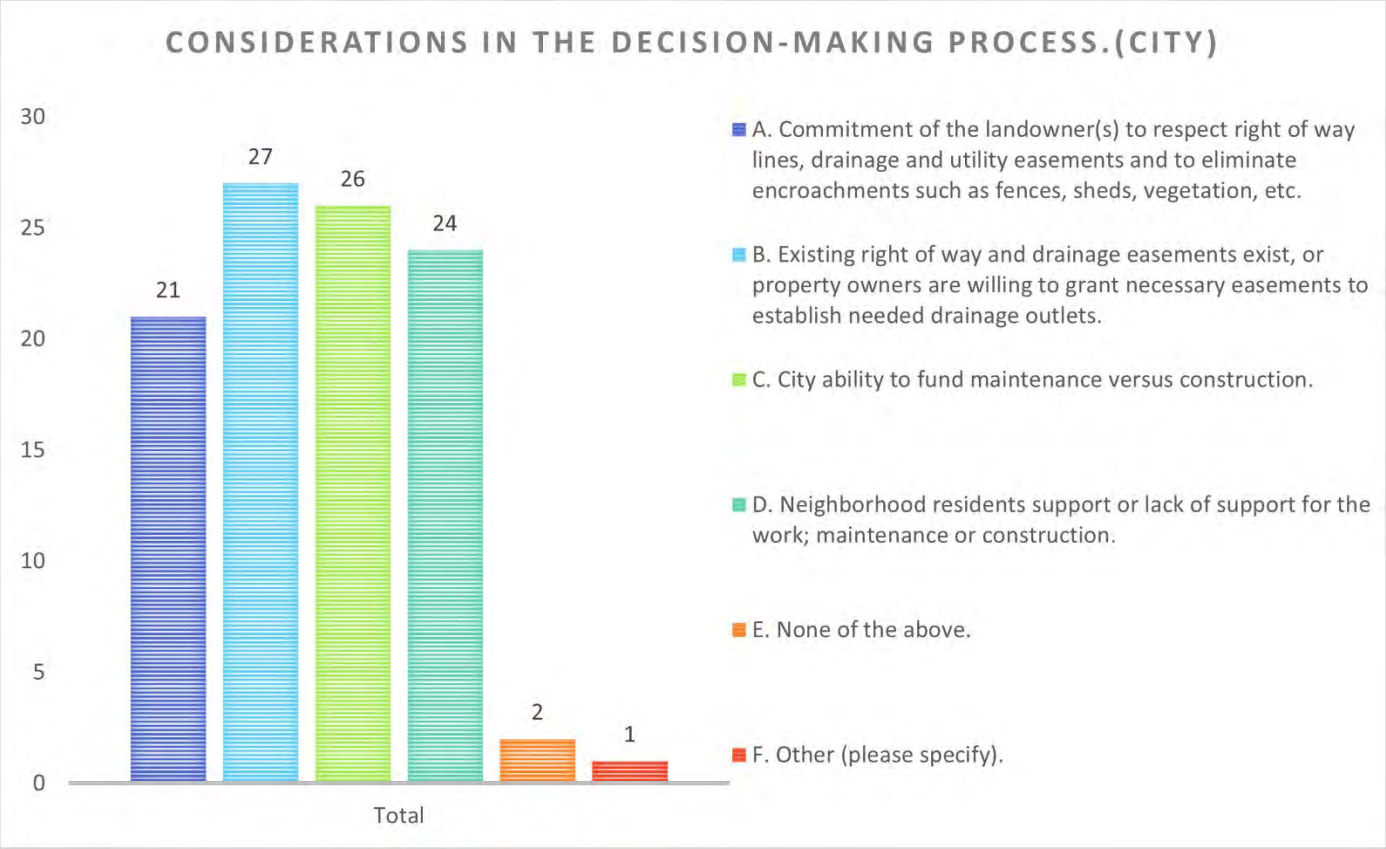
8. **What are the top four factors you consider when deciding whether to invest in maintenance practices to preserve the life of a street where drainage encroachments or deficiencies exist vs reconstructing a street and replacing drainage infrastructure to provide positive drainage?**

FACTOR 1	**FACTOR 2**	**FACTOR 3**	**FACTOR 4**
CWRMP flood risk priority, number of homes at risk of flooding	We provide tech support, not public solutions to private drainage issues.		
Feasibility	Cost/benefit	Remaining life/age of street	Local or regional issue
About half of the City of Shorewood is not on municipal water, so we try to plan major drainage improvements with the addition of watermain and full street reconstruction projects as part of the CIP process.	If the city has adequate land rights such as right of way or D&UE to complete the maintenance work. If not, that maintenance/ improvements are delayed for a larger CIP project.	Can we solve the drainage issues of some residents without making it worse for others in an economical fashion**?**	Is the needed maintenance likely to cause larger issues if not addressed timely?
Overall current condition	Severity of the problem	ROW issues	Can it be improved?
Risk of failing to cure issue	Cost	Age of street surface	Political pressure

Pavement Condition	Remaining life of pavement	Remaining life/ effectiveness of the existing stormwater situation	Funding
The magnitude of the drainage problem	Re-occurrence rate	Time and expense of maintenance	Population affected by the problem
Cost	Adjacent property impacts	Addressing new MS4 requirements	Possibility to rehab in place
Cost/type of maintenance	Remaining time of street before reconstruction	Any other needed water or sanitary main upgrades	
Available budget (maintenance is cheaper than reconstructing)	Number of residents that benefit from each option	If the maintenance activity will only provide a very marginal improvement (i.e., all you're doing is showing that you made an effort to address the issue.	How long until a large-scale project will be done in the area?
Current condition	Future development	Funding	Safety
Drain tile	Rain gardens	Ponding	
Condition of other underground utilities	Funding	Stormwater quantity and quality benefits	Impact on residents/public support/priority ranking
Feasibility	Cost	How effective the improvement will be	Ancillary impacts and unintended outcomes
Age of infrastructure	Cost of maintenance vs. replacement	Location - potential concerns/impacts (large or small bank for buck)	Individual issue or for the greater good
Risk/impacts of flooding	Safety	Compounding benefits (Water Quality improvement)	Relationship /proximity to future plans/projects
MONEY	Is there a project that can be combined with drainage?	Is there a serious road safety issue due to drainage / storm infrastructure failure?	Political pressure
Cost	Pavement condition	Drainage issues	Neighborhood interest

Whether the existing condition is a hazard to safety or property	Pavement Condition	Availability of feasible drainage system options	Possibility of reduction in street width
What type of pavement improvement is needed?	The scale of drainage improvement needed	Easement availability	Downstream ponding availability
Street Condition	Curb & Gutter Condition		
Cost	Funding		
Cost	Amount of actual damage from deficiencies	Frequency of issues	Location
How is City infrastructure being affected?	Impact to private properties in the vicinity	Feasibility and ease of implementing a solution	Funding
Effectiveness of past maintenance practices	Will a sump pump collection system improve the drainage issues?	Will drain tile installed at and near low points improve and dry out the subgrade to improve effectiveness of street maintenance strategies?	Pavement age and PCI ratings
Capital available	Previous date of street repair/construction	Condition of street relative to other streets	Past flood history and identified solution
Structure flooding	Cost	Natural overflow configuration	Location (Is the fix feasible on City property or ROW?)
Timing with when other utilities need to be replaced; sewer and water drive the timing of our larger reconstruction projects.	Cost	Do we have ROW or easements?	Can the work be done by our public works staff or do we need to hire a contractor?
Age of street	Pavement condition	Other utility issues	Cost
Expansion of the system upstream of the problem area	Condition of adjacent utilities	Condition of street	Cost

9. In addition to the previous question, select all of the following items that are considerations in the decision-making process.



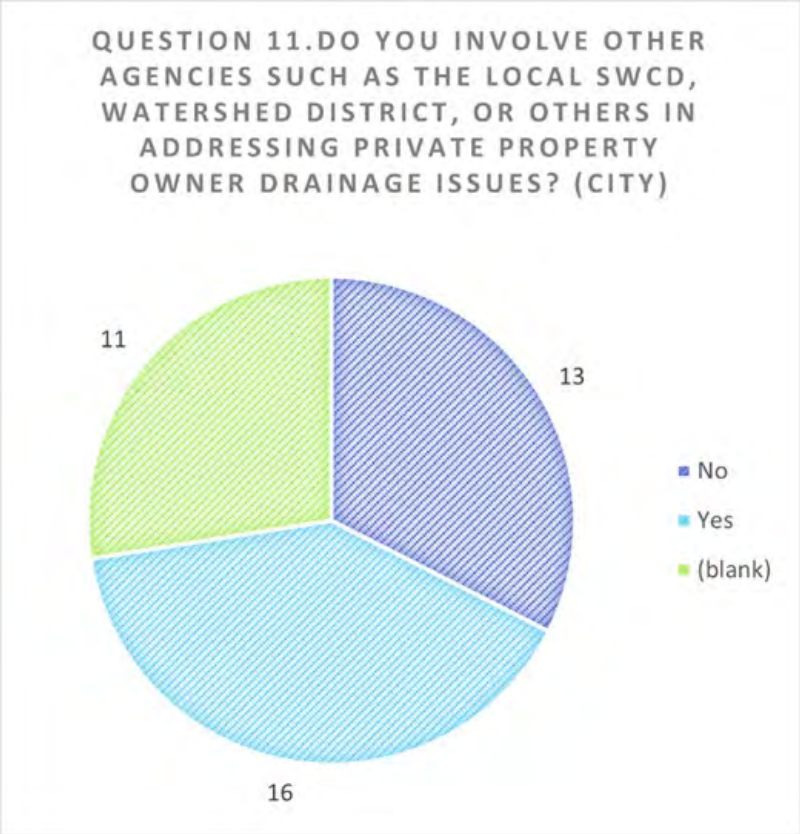
10. How do you approach and manage expectations when private property owners raise surface and/or subsurface drainage concerns?

- We provide technical support for these issues, not public projects.
- Evaluate/describe the issue and try to find lots of potential solution options they could do themselves to fix.
- Highlight the point that there are many variables involved in drainage issues. The city roadway is one variable, but so is the size, imperviousness, and grading of private lots. We are all part of the issue and all part of the solution. The city is generally willing to take the lead on correcting drainage issues but need cooperation from residents.
- Listen to the issue and determine the best course of action.
- Explain the roles/responsibilities of each party (private and public), discuss options and costs. Never promise to design/build a system that will cure all problems for ever as we all know mother nature always wins.
- 1. Communication 2. Investigation 3. Communication.

- Independent analysis of the problem. Use a consultant if trust or conflict of interest is an issue. Dialogue with the homeowner begins with drainage regulations, the capacity of system downstream impacts and the history of the problem. Avoid using the term "fix". Instead, focus on reducing the frequency of problems as effective drainage can be influenced by rainfall intensity.
- Generally, a discussion about the overall stormwater management plan for the city and the fact that ponds may not be of the water quality that they desire because that is not the function.
- Work with individual property. Expand property owners if/as needed.
- Private issue, explain why that is and why taxpayer money won't be spent on it. Public issue, explain the severity of the issue with respect to other known issues in the city, available funding, and what other areas maintenance and reconstruction dollars are being spent on.
- We typically regulate these activities and provide plan review comments, along with discussion, as needed.
- Determine the source of the concern and whether or not it is a public drainage issue or a private drainage issue. If private drainage issue offer consultation and technical advice but explain why city is generally not able to operate or perform work on private property.
- If public drainage issue, determine city's responsibility and if needed estimate where this work fits into schedule. Provide timely and appropriate communication with public so they are heard and understand what to expect.
- Begin by meeting in person with property to review issue. Come up with list of options. Review cost and feasibility. Understand property owner willingness to assist either with maintenance, access considerations, and cost.
- Act as a resource to hear the concern, evaluate the overall need/impact, share info, and educate on what can/can't assist with. Provide other resources as necessary.
- Educate, primarily public vs. private ownership but also WQ impacts.
- Depending on the level of risk to life, property and traffic, they will get prioritized for high-risk issues. Otherwise combined with future infrastructure projects in same location or put on list as resources are available. Very little funds available to address low risk issues.
- We investigate the issue and determine if it is a public or private issue. If private, we provide technical assistance. If public, we may look into funding a study to determine the underlying issues and what some solutions may be.
- We spend a lot of time educating property owners on what maintenance is performed, and what expectations they should have, performing onsite meetings, presentations, etc. We involve watershed organizations and conservation district staff when advantageous. We allow owners to provide funding for aesthetic improvements through special assessment projects.
- First, we listen. When possible, we work with them to be part of the solution. Often, we make sure they know up front that work we may do will not solve all water issues but can improve them (ex. heavy rains may not be able to be conveyed in a storm pipe designed for a 10-year event).
- Provide feedback for how the property owner can address the drainage concerns on the property but also acknowledge the concern even if the city is unable to assist in remediating the drainage concern.
- Proactively - evaluate and assist when possible.

- Acknowledge the issue, explain the circumstances that created the issue, and work to identify/prioritize the level of the concern. Educate on the budgeting process and how budget limits the amount of work that can be completed.
- Be clear that private drainage impacts affecting only one property may not include City involvement to correct. Educate the owner about the source of the water and help them understand the difference between treating the problem rather that correcting just the symptoms of poor drainage. It is also very important to note what authority a City has to correct drainage issues originating on a neighboring property. Declaring a public nuisance is not always easy to establish or enforce.
- We meet with them to discuss the problems and possible solutions. Use our policies to address and correct drainage issues by either working toward fixing the problem, if needed, or facilitating a solution with private property owners.
- Determine cause (private vs. public), identify any plans for improvement, or how homeowner can help themselves.
- We review them and many times it is a private issue, but we are open to a collaborative solution (e.g., City provides connection point for French drains, but owner installs French drain system, City provides sump basket and owner runs lines and connects to it, etc.).
- Leading people to believe that you can do more to help them than you really can is not REALLY helping them. I try to be as gracefully straight forward as possible about what the city is able to help them with vs what is their responsibility as a private property owner.
- Typically, if there is an issue, we try to include a solution in a larger scale project such as a reconstruction or pavement improvement project.
- Be truthful with them in how we got to the condition we are in now, and make sure they have realistic expectations of what the system can do.

11. Do you involve other agencies such as the watershed district, or others in addressing private property owner drainage issues?

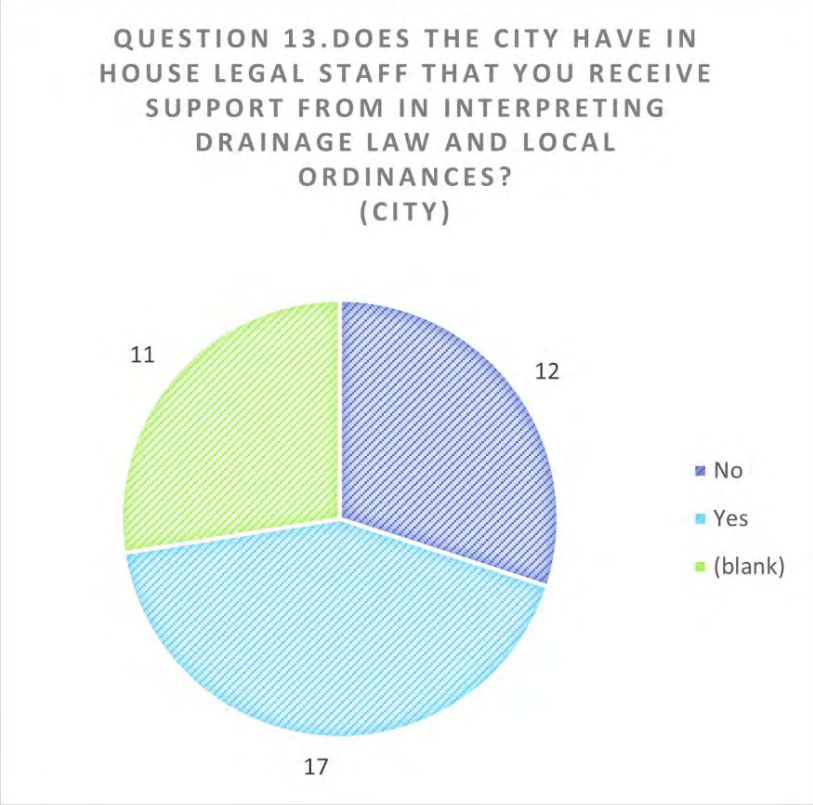


12. If yes, please provide an example where you have involved other agencies in addressing private property owner drainage issues.

- Local WDs.
- Often times when we know that it is not a city issue, we will direct them to the watershed district where they may have grants available to private residents to help address drainage issues.
- Will incorporate SWCD if wetlands are involved. Will coordinate with County and DNR depending on waterway jurisdiction.
- We routinely work with MCWD on private drainage concerns.
- Watershed.
- Cattail maintenance control on a drainageway. Watershed was helpful with property owners herbicide proposal.
- Unpermitted wetland related impacts.

- Work with operations and maintenance staff at Watershed District for technical assistance and input, as well as to assist with 3rd party communication to property owner.
- Educate, primarily public vs. private ownership but also WQ impacts.
- Involved one of our Watershed Districts and Conservation District to lead an evaluation of bank failure caused by a combination of natural river migration and private property stormwater discharge/land alteration practices. By them leading as a neutral party, the analysis was more accepted as credible versus initial claims by private owners of the City creating the issue through modification/maintenance practices.
- Some watersheds provide rain garden grants which can keep water consolidated in a part of their yard. Some drainage problems around watershed water bodies require coordination.
- Sometimes - if the watershed district offers grants (such as for rain gardens) then I would direct the resident to the watershed district. Or if the drainage issue involves a major water body, the watershed district may be involved. Generally, though, if a drainage issue is truly private, I would not involve another agency.
- Removal of dams/debris in creeks.
- If the drainage system combines with other jurisdictions (MnDOT/County/ag tile), I include representatives from those entities in my conversations with the property owners.

13. Does the city have in house legal staff that you receive support from in interpreting drainage law and local ordinances?



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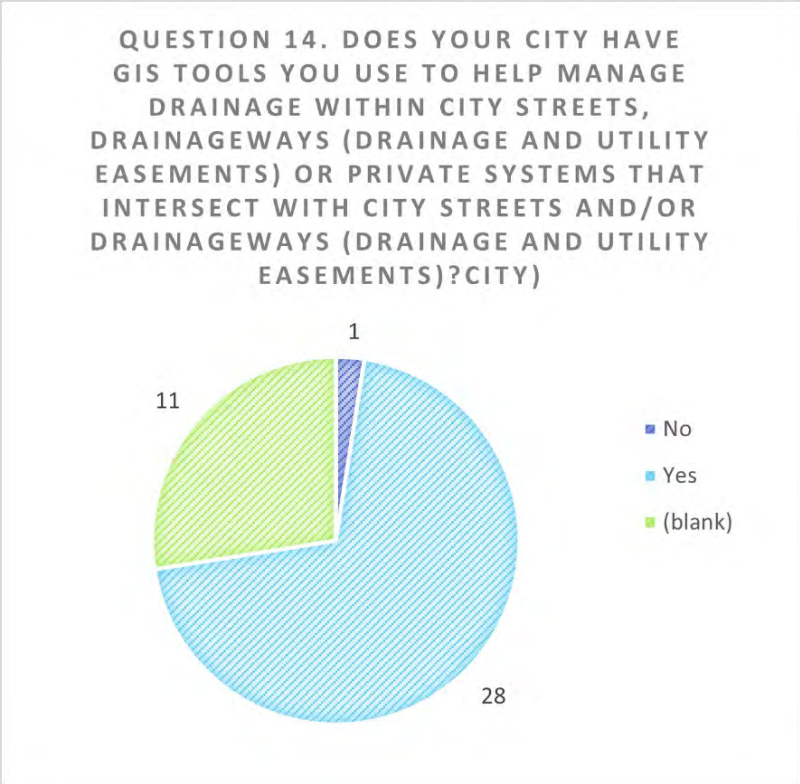

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- Storm sewer map (ArcMap developed in house) and currently building a storm sewer model in XPSWMMM (developed by consultant) for all pipes 15" or larger.
- We use Cartegraph to manage our Stormwater assets and workflows.
- Mapping, contours and watershed delineations.

- GIS with existing storm infrastructure, LIDAR contours, subdivision and easement information.
- 2' LIDAR contours, storm sewer network (privately developed).
- Sewer Mapping, *LIDAR*, Survey 123 and cartograph for inspections, NWI mapping, floodplain mapping and field verification, current and historical aerial photos.
- LiDAR and contour data, aerial photos, mapped easement areas, ability to access site plans, mapped underground utilities and attribute information (i.e., elevations). Use of ArcMap tools such as Survey123 and Collector for field data collection.
- ESRI products.
- Privately developed in-house to map the storm sewer system. expanded with watershed modeling for flood predictions. inspection maps and documents for asset management/work orders, etc.
- In-house GIS.....we distinguish public vs. private ownership via different colors. We attempt to include links to documents for easy access.
- GIS database with parcel, easement, ROW, all public infrastructure, aerial imagery, topo, watersheds, streams, zoning, project issue attribute points/polygons.
- ArcGIS for mapping, Cartegraph OMS for tracking tasks associated with the issue.
- We have established a full inventory of drainage elements and record drawings that are enhanced and verified over time by City staff with contracted GIS services, which are used as a preliminary tool to diagnose issues, maintenance concerns, potential for improvements, preservation of easements, etc. These are available to all City staff, and some items are available to the public (e.g., floodplain maps, critical area maps).
- ArcGIS and try to include all public and private storm pipes so we know sizes and what is public and private.
- GIS Maps showing location of private drainage ways and where they intersect with city storm sewer as well as where best management practices are located and their effect on drainage.
- Asset inventory, as built-record drawing system.
- We use GIS for inventory mostly. No specific tools in regard to drainage.
- Detailed contour data overlaid with drainage utility information is the best tool used to help determine the extent of run-on to a site. This is the first step used for nearly every drainage concern/problem we encounter. The contour and shaded relief maps help people visualize the overall drainage. characteristics of an area rather than just a single point of concern. This is a very effective tool to help people understand the extent of a drainage area relative to an area of concern. The GIS tools used are developed by City staff with assistance from LOGIS.
- ArcGIS infrastructure and LiDAR data.
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- VueWorks Asset Management System.
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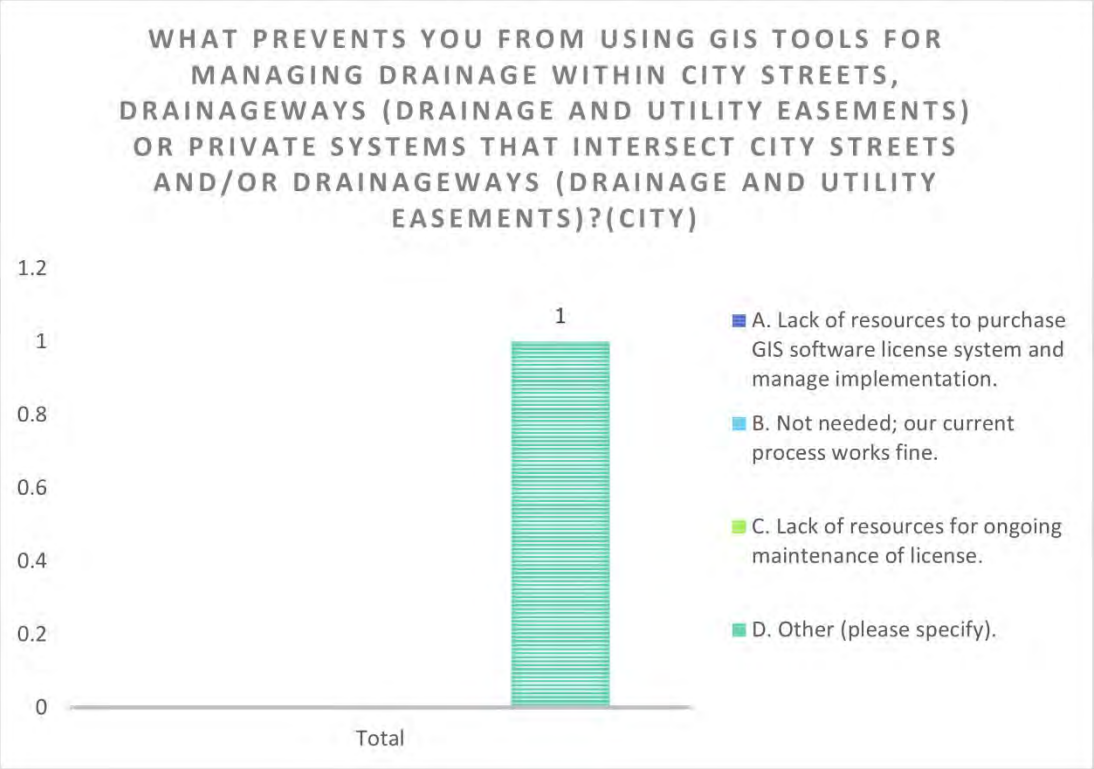

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WATERSHED ADMINISTRATOR SURVEY WITH 11 RESPONSES

The purpose of this survey is to tap into the individual drainage management experience of watershed administrators and/or their operations staff who work with City and County Engineers and their water resources staff to:

- Identify issues encountered managing drainage within cities and counties.
- Identify approaches to resolving drainage issues within cities and counties.
- Identify solutions and best practices used by city and county engineers and/or water resource engineers resolving drainage issues within city streets and drainageways, as well as county highway/roadway ditches and storm sewer.

Information gathered will be used in developing a quick reference Best Practices and Resource Guide with the oversight of the Research Implementation Committee (RIC) Technical Advisory Panel to minimize the time necessary for city and county engineers and their water resources staff to effectively address drainage issues.

1. **Name:** _____
2. **Title/Role:**_____
3. **Jurisdiction:**_____
4. **What is the one thing you wish you had known about city and county drainage when you were a new Watershed Administrator or Watershed Operations staff member?**
   - Ditch authority for systems in 3 out of the 6 counties we cover. Need to learn about 103E statutes.
   - Issue was knowing pipe sizes and locations.
   - Lack of historical information has caused the SRWD multiple headaches in performing our statutory responsibility. No accurate records of culvert replacements with sizing and elevations has been a big issue in working with WCA and PW agencies.
   - Influence of surficial groundwater on drainage infrastructure. Put another way, what portion of the annual flow of drainage segments are driven by groundwater versus precipitation on an annual basis.
   - Cities almost always want to add curb and gutter regardless of the need.
   - Some Counties or even Cities not understanding what Watershed District full statutory functions are.
   - Better understanding of what role, the city and county would like the watershed district to fill in regard to non-jurisdictional drainage.
   - Map of their owned drainage ditch and culvert inventory and size.
   - Details of MN Statute 103E would have been helpful as a new employee.
   - Already familiar with the challenges.
   - Interconnected systems...what happens up stream travels downstream.

5. What are the top three ways you assist cities and counties in addressing drainage issues?

WAY 1	WAY 2	WAY 3
Cities - we incorporated their needs into our overall plan in case grant opportunities arise .	We have several boundary-line issues for drainage systems outside our jurisdiction - trying to compel counties to redetermine them.	Flood emergencies - we work together to mitigate damages and compile FEMA claims.
We have a watershed-wide hydrologic and hydraulic (XP SWMM) model that we share with them for their use in assessing drainage issues/projects.	If a drainage issue is a large enough flooding problem, the watershed may add a project to their CIP to address the problem.	Understanding impacts of proposed projects on the watershed's trunk system
Survey work performed by SRWD	Open communication	
District wide SWMM model for 100-year flood elevations and culvert sizing	Modeling for climate change scenarios to facilitate planning	Water elevation monitoring
Provide modeling/risk assessment	Partner on capital projects	Meet/communicate with residents including assist with LOMR/A
Assist in water quality studies or projects	Assisting with flooding issues	Assist in developing city and county infrastructure using our permitting authority. Identifying problems with drainage or water quality before the city or county gets too far into a project.
Providing existing drainage information from our H&H model	Modeling proposed drainage scenarios for projects	Meeting with private residents with drainage concerns
103E drainage law	Issuing watershed district permits	Flood control, flow regulation, sizing of culverts
Funding	Studies, education, technical assistance	Coordination
District wide model - sharing model, updating it	Inspecting, maintaining the public drainage system...providing a predictable outlet	Offering partnerships in addressing issues

6. **What types of historical documents such as Operations and Maintenance Procedures, Memorandums of Understanding, Rights of Entry, etc. do you have available to assist cities and counties in addressing drainage issues? Please list examples of types of documents and the format (hard copy or electronic)they are available in.**

- Petitions to Outlet Property/Add to Benefitted Area and Petitions to Remove Property.
- Record drawings of the Flood Control Project system (electronic and hard copy).
    - O&M Manual for the Flood Control Project (electronic).
    - Agreements between the member cities regarding.
      construction of the Flood Control Project (electronic).
    - Watershed-wide XP SWMM model (electronic).
    - Watershed-wide XP SWMM model documentation/report (electronic).
- Drainage Policy, which is all inclusive - hard and electronic.
- Drainage easements, buffer declarations, and O and M declarations - digital files and recorded with County Deeds and Titles.
    - Big Marine Lake Outlet Channel and Outlet Pipe.
    - Construction Documents hard copies and digital.
- None.
- We have considerable O & M for procedures for various projects.
    - We have developed MOU as recent as last year with a city in developing and restoring an old Oxbow within the city limits.
    - We have completed two petitioned flood diversion projects in the City of Thief River Falls which addressed two county ditches entering the city from the south and west.
    - We have copies of petitions, MOU, Joint Powers Agreements.
    - Permits- hard copy, more recent are electronic.
- None.
- 103E drainage records - scanned.
    - 103D watershed project records - paper and electronic.
    - Rules of the TRWD - electronic.
    - Culvert inventory - GIS.
    - Ditch inventory - GIS.
- Not sure how to answer as the WMO staff is also the County water resources staff, so we oversee all of it.

- As Constructed and Subsequently Improved Condition Order, electronic.
    - Drainage Portal of historic ditch records, electronic.

7. If you have particularly effective educational materials that you or watershed operations staff use to assist in educating new elected officials, city or county staff, and/or residents regarding local agency drainage that you would be willing to share, please upload them.

- File Names of Documents Shared.
    - BdSWD Annual Report 2020.
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    - TSAC Papers Factsheet - May 15, 2018.
- Annual reports when addressing counties during our yearly meeting with them. (no documents shared).

8. What electronic computer tools such as GIS (private or online), modeling software, etc. are used by the watershed staff to manage drainage issues?

- Google Earth, Arc GIS, Esri online, higher models by professional engineering staff.
- ArcGIS, XP SWMM, HEC-RAS, sometimes Hydro-CAD , StoryBoard, InDesign.
- Esri GIS; Survey 1, 2, 3; and Drainage Db by Houston Engineering Inc.
- Online map available to the public through our website. GIS shapefiles available for Cities and County. SWMM Model.
- GIS, HEC modeling, risk assessment mapping.
- HEC-RAS, GIS, AutoCAD, LiDAR, PTMapp and various other engineering software.
- XP SWMM model of our entire watershed of hydraulics and hydrology. Updated regularly with surveyed information and to reflect reconstructed roads/culverts and developments.
- ArcMap, stream stats, etc.
- GIS, complaint tracker, No Wait Inside, custom Esri inspection , survey apps.
- District wide model, GIS mapping/inputs.

9. **What electronic computer tools are most useful and what do you use them for?**

- App that allows instantly upload of files and drainage system data (with geo tags and dates) directly into ESRI online mapping tool.
- Modeling tools - XP SWMM for analyzing complex/large watershed drainage systems; HEC-RAS for stream systems/flows; HydroCAD for project reviews, if applicant uses it. ArcGIS - for mapping/showing drainage patterns, flooding, etc. and for providing information for the models. InDesign and StoryBoard for communicating issues to stakeholders.
- Drainage Db for inspections and linking survey information to the actual drainage system. It's very helpful and creates reports to share with stakeholders and drainage authority members.
- Online maps for understanding drainage patterns, viewing approximate easement boundaries and parcel data.
- Clearly using our LIDAR, GIS and drainage area tools to determine culvert sizing for permits as well as benefited area maps that we use in determining what direction the landowners can efficiently drain or manage their water.
- Able to model proposed changes to drainage and effect on upstream and downstream landowners/infrastructure and water resources impacts.
- ArcMap - various data layers like public and private ditches, drainage areas, ditch benefit areas, culvert inventory data, etc.

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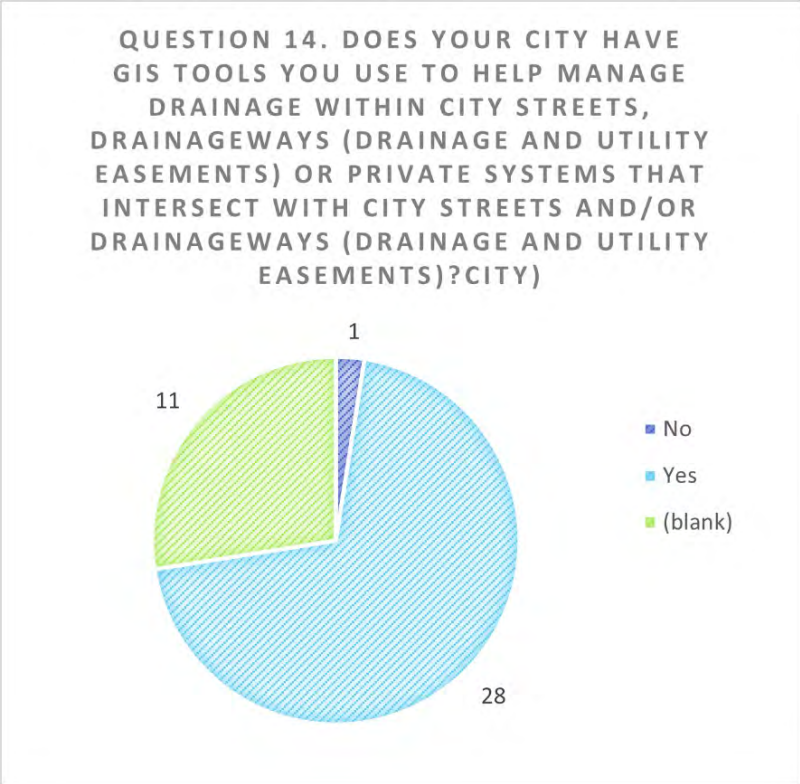

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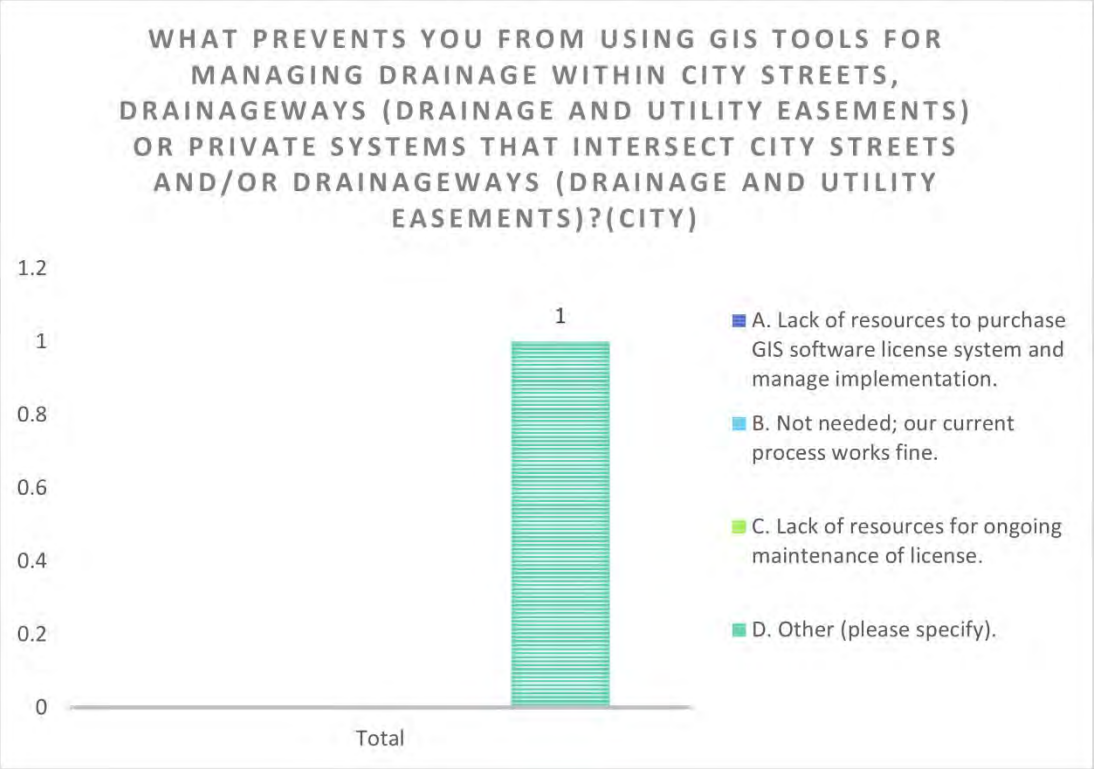

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9. **What electronic computer tools are most useful and what do you use them for?**

- App that allows instantly upload of files and drainage system data (with geo tags and dates) directly into ESRI online mapping tool.
- Modeling tools - XP SWMM for analyzing complex/large watershed drainage systems; HEC-RAS for stream systems/flows; HydroCAD for project reviews, if applicant uses it. ArcGIS - for mapping/showing drainage patterns, flooding, etc. and for providing information for the models. InDesign and StoryBoard for communicating issues to stakeholders.
- Drainage Db for inspections and linking survey information to the actual drainage system. It's very helpful and creates reports to share with stakeholders and drainage authority members.
- Online maps for understanding drainage patterns, viewing approximate easement boundaries and parcel data.
- Clearly using our LIDAR, GIS and drainage area tools to determine culvert sizing for permits as well as benefited area maps that we use in determining what direction the landowners can efficiently drain or manage their water.
- Able to model proposed changes to drainage and effect on upstream and downstream landowners/infrastructure and water resources impacts.
- ArcMap - various data layers like public and private ditches, drainage areas, ditch benefit areas, culvert inventory data, etc.

10. **May we contact you to follow up on your survey response? If yes, please provide your phone number and/ or email.**

Appendix C: Drainage Law and Road Authorities

Drainage 101 for Transportation Engineers and Road Authorities[1]

Table of Contents

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[1] Authored by John C. Kolb of Rinke Noonan, St. Cloud, MN, in conjunction with Stonebrooke Engineering for the Minnesota Department of Transportation and the Minnesota Local Road Research Board.

INTRODUCTION

Governmental and consulting transportation engineers, in designing and analyzing projects, often find themselves addressing risk and conflict at the intersection of transportation infrastructure and surface (drainage) waters. Navigating the common law cases, statutes, and regulations that balance the interests of private property owners with the interest of the public respecting drainage and surface water management can be daunting.

Road authorities, and their engineers, are responsible for ensuring surface water is managed when roads are constructed, maintained, improved or abandoned. Proper water management is necessary to accommodate frequent flooding; prevent erosion and sedimentation issues; address the concentration of flow on adjacent properties; prevent damages to roads, bridges, and other infrastructure; and to address non-point source pollution washed off from impervious surfaces.

This summary is intended to provide an overview of property rights associated with drainage, the statutory obligations of road authorities when accommodating water, and environmental regulations impacting road authorities' management and treatment of stormwater runoff.

COMMON LAW: PROPERTY RIGHTS IN THE REASONABLE USE OF LAND

Common law is the basis of our legal system; it applies equally to all owners of property unless it is specifically modified by statute. Common law is created when disputes that are unable to be resolved mutually are brought to the courts through initiation of a lawsuit resolved by the court's ruling.

The first case on record in Minnesota addressing a dispute over drainage was decided by the State Supreme Court in 1872.[2] The dispute arose over the City of Saint Paul's discharge of a large quantity of stormwater across plaintiff's property, in amounts the plaintiff alleged exceeded the capacity of the existing natural watercourse and caused a nuisance by eroding the banks of a channel.[3] The Supreme Court found in favor of the plaintiff, but the standard it used to conclude that the city's stormwater management actions constituted a nuisance is not immediately clear.

Over time, more disputes over water were brought to Minnesota's courts for resolution. These court decisions established precedents in drainage disputes and from these precedents, a set of rules or principles were developed that apply to water and property rights. The cases separate rights that applied to "natural watercourses" from rights that applied to the management of "surface water"; thus, we must first explain how courts characterize the two.

Natural Watercourses:

"Natural watercourses" and drain-ways for "surface water" differ in their physical characteristics.[4] In order to constitute a "natural watercourse," "the flow ordinarily must have some substantial permanency and continuity and must be a part of a well-defined stream or body of water."[5] To decipher the difference, the courts look at the physical characteristics of the flow in terms of volume,[6] topography,[7] or continuity.[8]

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[2] *See O'Brien v. City of St. Paul*, 18 Minn. 176 (1872).
[3] *Id.* at 181–82.
[4] *See Collins v. Wickland*, 88 N.W.2d 83, 86 (Minn. 1958).
[5] *See id.* at 86 (citing *Enderson v. Kelehan*, 32 N.W.2d 286, 289; 56 Am. Jur., Waters, §§ 9 & 6; 93 C.J.S., Waters, § 4; *Greenwood v. Evergreen Mines Co.*, 19 N.W.2d 726 (Minn. 1945)).
[6] *See McClure v. City of Red Wing*, 9 N.W. 767 (Minn. 1881).
[7] *See Sheehan v. Flynn*, 61 N.W. 462 (Minn. 1894).
[8] *See Collins*, 88 at FN7 (citing Restatement (First) of Torts, Watercourse Defined, § 841).

Surface Waters:

"Surface waters," on the other hand, consist of waters from "rains, springs, or melting snow which lie or flow on the surface of the earth, but do not form a part of a well-defined body of water or natural watercourse."[9] These waters have a tendency to follow the natural depressions and contour of the land. While they might flow in a worn, small natural channel, they do not flow in the well-defined channels that rise to the description of natural watercourses above.

The distinction is relevant because the common law rule for resolving disputes over obstructing, enhancing, or diverting natural watercourses differs slightly from the rule for surface waters. When it comes to resolving disputes over natural watercourses, some courts cite the Latin phrase *aqua currit et currere debet*, which means, "water flows naturally and should be permitted thus to flow." Obstructing a natural watercourse, for example, violates the property rights of riparian landowners—owners of property adjacent to the natural watercourse.[10] Surface water, on the other hand, does not impose riparian rights on to an abutting property owner; therefore, the rule addressing the manipulation of surface water requires a much more in-depth analysis into the facts of that particular situation.

Initially, many state courts, including Minnesota, treated surface waters as a "common enemy" which each owner may get rid of as best as he or she can.[11] Over time, that standard evolved to what is commonly referred to as "the rule of reasonable use."

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[9] *Id.* at 87 (Minn. 1958) (citing *Enderson*, 32 N.W.2d 286).
[10] *See Johnson v. Seifert*, 100 N.W.2d 689 (Minn. 1960); *Petraborg v. Zontelli*, 15 N.W.2d 174 (Minn. 1944).
[11] *See O'Brien v. City of St. Paul*, 25 Minn. 331, 335 (1878) (stating "It [surface water] has been called a common enemy, which each owner may get rid of as best he may; and some cases, and not a few indeed, maintain the owner's right to adopt any means he may choose to prevent it coming on his land, or to turn it off from his land, without regard to the consequences which may ensue to others.").

The Rule of Reasonable Use:

Applying the "reasonable use rule" requires balancing competing property rights. In simple terms, it means that a landowner may exercise rights on her land as she pleases, provided she does not interfere with the rights of others. The courts describe the rule as follows:

> [I]n effecting a reasonable use of his land for a legitimate purpose a landowner, acting in good faith, may drain his land of surface waters and cast them as a burden upon the land of another, although such drainage carries with it some waters which would otherwise have never gone that way but would have remained on the land until they were absorbed by the soil or evaporated in the air, if:
> (a) There is a reasonable necessity for such drainage;
> (b) Reasonable care has been taken to avoid unnecessary injury to the land receiving the burden;
> (c) The utility or benefit accruing to the land drained reasonably outweighs the gravity of the harm to the land receiving the burden; and
> (d) Where practicable, it is accomplished by reasonably improving and aiding the normal and natural system of drainage according to its reasonable carrying capacity, or if, in the absence of a practicable natural drain, a reasonable and feasible artificial drainage system is adopted.[12]

If damage is caused to others from the obstruction, enhancement, or diversion of surface waters, the person making the improvements will only be liable for such damages if the court finds that in planning and executing the diversion, the acting party made "unreasonable" use of its property. Drainage that is found by the courts under these factors to be "reasonable," will not carry with it liability for the damages downstream.

Surface water runoff is a naturally occurring and generally unavoidable event: water flows downhill. Owners of higher elevated property, whether it be private or public, should

[12] *Enderson*, 32 at 289.

consider how grading, routing and discharge of surface waters may potentially impact the lower property. Lower property landowners, including road authorities managing a public roadway, must recognize the natural rules of reasonable drainage while considering the impact of restricting runoff from a higher property.

ROADS & DRAINAGE

When a new road is constructed, reconstructed, improved, or relocated, the impact of construction on surface waters must be an important part of the road authority's design considerations.[13] The road authority is responsible for roadside ditching to protect roads from flooding and erosion, to facilitate safe passage of the traveling public and to also accommodate reasonable improvements to the flow of surface waters toward the roadway. Courts will analyze the management of surface water between private property owners and road authorities under the same reasonable use rule factors described above. Because "reasonableness" is measured on a case-by-case basis, professional assistance from an engineer with training in hydrology should be sought before undertaking a project that will impact the accommodation or modification of drainage. Improper handling of changes in the right-of-way that impact drainage could create legal or financial obligations to affected property owners.

As explained above, one of the many rights that attach to property is the right to remove excess water from property, within reason, and the right to prevent an unreasonable amount of water from draining or flowing onto property. But these rights are not without limitation and

[13] *See Felepe v. Town of America*, 219 N.W. 158, 159 (Minn. 1928) ("In the construction and improvement of public highways surface water has to be taken care of.").

whether an action is reasonable may be subject to both civil and criminal interpretation.[14] In some instances, the roadway will be located downstream of a natural watercourse or artificial improvements to drainage. In such instances, the road authority must ensure it accommodates a level of drainage which is natural, plus some quantity of reasonable improvement upstream. In some instances, the road authority may find its roadway is enhancing or diverting drainage upstream. In such instances, the road authority must ensure that any enhancement or diversion of the waters downstream is reasonable.

If the road authority obstructs, diverts, or enhances drainage in an unreasonable way, compensation to the private landowner may be required. It is important to understand the extent of invasions of property rights by drainage which constitutes a taking, versus an invasion of property rights by drainage which does not constitute a taking. Under the Minnesota Constitution, private property shall not be taken, destroyed or damaged for public use without just compensation therefor, first paid or secured.[15]

Whether an action by a public authority takes or damages private property is a question of fact and degree. Physical appropriation of private property for public purpose is a taking requiring the government to commence eminent domain proceedings to compensate landowner for such taking.[16] However, where no additional or greater amount of water flowed past or upon owners' lands by reason of construction and operation of water control projects, and where such

[14] For existing and established drainage of public roadways, it is unlawful to obstruct any ditch draining any highway or drain any noisome materials into any such ditch. Minn. Stat §160.2715 (a)(7).
[15] Minn. Const., Art. 1, § 13
[16] *Spaeth v. City of Plymouth*, 344 N.W.2d 815 (Minn. 1984) (planned permanently flooding such property for use as municipal stormwater holding pond).

lands would have been damaged in substantially the same manner in a state of nature, there was no "taking" of the lands by the state and owners were not entitled to compensation.[17]

Intermittent flooding may, under some circumstances, constitute a taking.[18] Flooding is permanent if it imposes a servitude of indefinite duration, even if intermittent, thus, intermittent flooding may, under some circumstances, constitute a taking. Whether occasional flooding is of such frequency, regularity, and permanency as to constitute a taking and not merely a temporary invasion for which the landowner should be left only to a possible recovery of damages is a question of degree, and each case must stand on its own peculiar facts.[19] Finally, property may be taken not only by actual flooding but also when adjacent flooding, by percolation, raises the water table so as to soak property to a degree and for sufficient duration to destroy its value.[20]

Bridges & Culverts:

Historically, road authorities carried the responsibility to pay for culverts in approaches. The law was amended in 1998 to place the primary responsibility for paying for culverts on the abutting property owners.[21] When the road authority gives an owner permission to construct an approach, the owner is responsible for paying for the culvert if one is needed in the approach. If the road authority chooses, it can adopt a policy by resolution to make it responsible for part or all of the cost of culverts needed for approaches. As is required under Minn. Stat. § 160.18, subd.

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[17] *State v. Bentley*, 71 N.W.2d 780 (Minn. 1955); *State ex rel. Peterson v. Bentley*, 12 N.W.2d 347 (Minn. 1943) (Flooding of land which resulted in serious interruption of its common and necessary use was a "taking" of property within provision of Minnesota's Constitution prohibiting taking of private property for public use without just compensation); *State v. Stanley*, 247 N.W. 509 (Minn. 1933) (Owner of land permanently flooded by diversion of water in construction of highway was entitled to have such land included in highway condemnation proceedings for assessment of damages).

[18] *Blaine v. City of Sartell*, 865 N.W.2d 723 (Minn. Ct. App. 2015).

[19] *Nolan and Nolan v. City of Eagan*, 673 N.W.2d 487 (Minn. Ct. App. 2003); *Vern Reynolds Const., Inc. v. City of Champlin*, 539 N.W.2d 614 (Minn. Ct. App. 1995); *Spaeth v. City of Plymouth*, 344 N.W.2d 815 (Minn. 1984).

[20] *Nelson v. Wilson*, 58 N.W.2d 330 (Minn. 1953).

[21] Minn. Stat. § 160.18, subd. 1.

2, the road authority should provide approaches required by the construction of a new road or relocation of an existing road.

"Takings Claims" for Unreasonable Use:

Road authorities must place openings in roadways to permit surface water to escape in its natural course from the higher to the lower lands. The road authority must make proper and adequate provisions for passage of waters that can reasonably be anticipated to approach the roadway based on past history and all facts and circumstances reasonably available to the road authority.[22] An injunction may be granted to restrain the road authority from improving a roadway, or from eliminating, altering or installing new culverts that divert water from its course of natural drainage and causes it to flow upon land in an unreasonable manner. If a road does not reasonably accommodate the area's natural flows, the road authority could be responsible to pay a monetary judgment for property that is damaged, typically in a case that is rooted in a claim for "inverse condemnation."

The road authority is not liable for unexpected flooding if the road's outlet is reasonably sufficient for the water from such storm events as ought to have been anticipated. In an early case before the Minnesota Supreme Court, the Court held that as long as the road authority provided a suitable outlet for flood waters that it ought to have anticipated, the road authority could not be held liable for damages caused by water retained on properties adjacent to the roadway.[23] However, if the road crossing was not sufficient to accommodate storm events that ought to be anticipated in that area, then the road authority could be held liable for overflow

[22] *Poynter v. Cnty. of Otter Tail*, 25 N.W.2d 708 (Minn. 1947).
[23] *Van Wilgen v. Albert Lea Farms Co.*, 223 N.W. 301, 344–45 (Minn. 1929).

damages that the road contributed to, even if unprecedented rains for that area occurred.[24] By failing to provide a suitable outlet for anticipated rainfall, the Court ruled, the road authority's negligence contributed to the overflow and resulting damage.

Statutory Road Ditch Authority:

Road authorities are authorized to repair, clean out, deepen, widen, and improve road ditches for the purpose of draining public roads and preventing water from accumulating in the road ditch.[25] Whether such work is necessary is determined by the road authority; however, the board must ensure there is an adequate outlet before improving or enhancing road ditches.[26]

Obstructions to Road Ditches:

It is unlawful to obstruct any ditch draining any highway or drain any noisome materials into any ditch[27] and to damage or tamper with any drains on or along any highway.[28] This is often a common situation that will lead a resident to request assistance from the road authority. For example, when a neighbor obstructs the road ditch in a manner that impedes another neighbor's drainage, it is reasonable for the harmed neighbor to ask the road authority to intervene.

Drainage in Railroad Rights-of-Way:

When a drainage ditch constructed by the road authority to drain a road crosses the right-of-way of any railroad, the road authority may demand the railroad company allow the ditch under and across the railroad's right-of-way and divide the cost proportionately between the road authority and the railroad company on the basis of benefits that accrue to each.[29]

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[24] *Id.*; *see also Poynter*, 25 N.W.2d.
[25] Minn. Stat. §§ 160.201, subd. 1 & 164.36(8).
[26] Minn. Stat. §§ 160.201, subd. 1.
[27] Minn. Stat. § 160.2715(a)(7).
[28] Minn. Stat. § 160.2715(a)(11).
[29] Minn. Stat. § 160.19.

Railroads have the same obligation as road authorities when it comes to accommodating natural flow and reasonable drainage improvements across the railroad bed. Under the Federal Railroad Safety Act, the Secretary of Transportation was ordered to prescribe regulations for railroad safety.[30] Those regulations require "each drainage or other water carrying facility under or immediately adjacent to the roadbed shall be maintained and kept free from obstruction, to accommodate expected water flow for the area concerned."[31]

ROAD AUTHORITIES & PUBLIC DRAINAGE SYSTEMS

The first state drainage act was passed in 1858, the same year that Minnesota became a state. The primary purposes of the act and subsequent state drainage law were to enable joint, private drainage projects across private ownership and governmental boundaries to make land more productive for agriculture, to enable and protect roadways, to protect public health from stagnant waters, and to promote commerce. Over the years, Minnesota drainage law has retained these purposes, while adding provisions with regard to protection of public waters and, more recently, wetlands, as well as consideration criteria for environmental and natural resource protection. Minnesota drainage law (sometimes referred to as the "Drainage code") is currently contained in Minnesota Statutes, chapter 103E.

Road authorities may be assessed benefits for drainage benefits provided to the roadway.[32] If assessed for benefits to a road in a drainage project proceeding and the road is later

[30] 49 U.S.C. § 20103(a).
[31] 49 C.F.R. § 213.33.
[32] Minn. Stat. §§ 103E.315, subd. 3 & 103E.615, subd. 1.

vacated, the road authority may petition the drainage authority to have the benefit removed from the assessment roll.[33]

Bridges & Culverts across Public Drainage Systems:

A public bridge or culvert may not be constructed or maintained across or in a public drainage system with less hydraulic capacity than specified in the detailed survey report.[34] If the detailed survey report does not specify the hydraulic capacity, a public bridge or culvert in or across a public drainage system may not be constructed without the approval of the hydraulic capacity required from the Director of the Division of Ecological and Water Resources of the Department of Natural Resources.[35]

Bridges and culverts on public roads required by the construction or improvement of a drainage project or system must be constructed and maintained by the road authority responsible for keeping the road in repair.[36] If the road authority does not complete construction within the required time, the drainage authority may order the construction to be completed and will deduct the cost of construction from any damages awarded to the road authority arising from the project, or assess the cost as a benefit.[37] When a drainage improvement or project proceeding is taking place, the viewers award damages for the cost of construction and maintenance of the bridges provided for in the engineer's report, less the value of the wreckage from the bridges to be replaced.[38]

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[33] Minn. Stat. § 103E.805.
[34] Minn. Stat. § 103E.525, subd. 1.
[35] *Id.*
[36] Minn. Stat. § 103E.525, subd. 2.
[37] Minn. Stat. § 103E.525, subd. 3.
[38] *In re Judicial Ditch No. 24*, 200 N.W. 816, 817 (Minn. 1924).

Road authorities are obligated to take care of surface waters when constructing and improving public highways; however, when utilizing a public drainage system as an outlet, the disposal must be adapted to the existing public drainage system so as to permit the drainage system to function substantially as established.[39] Once a public drainage system is established, the owners of the land who have been assessed for benefits or have recovered damages for its construction have a vested property right to have the ditch maintained in the same condition as it was when originally established.[40] The expectation interest of the landowners includes the anticipated function of culverts and conveyances related to the public road network.[41] Road authorities, in improving and maintaining public highways, do not have the authority to substantially change or interfere with the operation of duly established drainage systems.[42]

PRIVATE DRAINAGE IN ROAD RIGHTS-OF-WAY

Road authorities may not prohibit natural drainage or reasonable drainage improvements from entering the road right-of-way. Enforcement of such a rule would run counter to the reasonable use principles that prohibit unreasonable obstructions to the natural flow of surface waters and even those surface water drainage improvements upstream that are reasonable. Thus, road authorities must exercise caution in handling requests from landowners to improve or modify the drainage of surface waters into road ditches, through centerline culverts or across the roadway.

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[39] *See Garrett v. Skorstad*, 173 N.W. 406, 408 (Minn. 1919); *Lupkes v. Town of Clifton*, 196 N.W. 666, 669 (Minn. 1924).

[40] See *Fischer v. Town of Albin*, 104 N.W.2d 32, 34 (Minn. 1960); *Oelke v. Faribault Cnty.*, 70 N.W.2d 853, 860 (Minn. 1955); *In re Petition of Jacobson*, 48 N.W.2d 441, 444 (Minn. 1951); *Lupkes v. Town of Clifton*, 196 N.W. 666, 668-69 (Minn.1924).

[41] *Id.*

[42] *See Garrett v. Skorstad*, 173 N.W. 406, 408 (Minn. 1919); *Lupkes v. Town of Clifton*, 196 N.W. 666, 669 (Minn. 1924).

Connecting Private Drains to Road Ditches:

When the course of natural drainage of any land runs to a road, the adjacent owner has a right to enter the right-of-way in order to connect a drain or ditch to the road ditch as long as the highway is left in as good condition in every way as it was before the connection was made.[43] The road authority may prescribe and enforce reasonable rules and regulations with reference to the connections by implementing a permitting system for such drainage connections, obligating the adjacent owner to obtain a permit before connecting a drain or ditch to the road ditch.[44] The permit may set forth specifications for the work and the road authority may establish reasonable rules and regulations governing connections.

An owner may seek a permit from the road authority to install a drain tile along or across the road right-of-way.[45] The road authority may set specifications, adopt reasonable rules, and may require a bond before issuing a permit. Certain restrictions are placed on what may be permitted.[46] For example, the permits must ensure that the length of the tile installation is restricted to the minimum necessary to achieve the desired agricultural benefits.[47] A permit must not allow open trenches to be left on the right-of-way after installation of the drainage tile is complete.[48] Once installed, the road authority is not responsible for damage to the drain tile.

In some instances, a road may block a landowner's access to a suitable outlet for drainage improvements. If a person desires, during construction or reconstruction of a highway, to install a tile drain for agricultural benefits in a natural drainage line in lands adjacent to any highway,

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[43] Minn. Stat. § 160.20, subd. 1.
[44] *Id.*
[45] Minn. Stat. § 160.20, subd. 4.
[46] *See* Minn. Stat. § 160.20, subd. 3 & 4.
[47] Minn. Stat. § 160.20, subd. 4(a).
[48] *Id.*

and if a satisfactory outlet cannot be secured on the upper side of the right-of-way and the tile line must be projected across the right-of-way to a suitable outlet, the expense of both material and labor used in installing the tile drain across the roadbed shall be paid from funds available for the roads affected provided the road authority is notified of the necessity of the tile drain in advance of the construction of the roadbed so that the drain may be placed and the roadbed constructed in the same operation.[49]

It is a misdemeanor offense for a person to install drain tile along or across a road without a permit,[50] to obstruct a road, or to drain any noisome material into any ditch.[51]

Drainage Easement Agreements:

The uncertainty regarding drainage liability can be overcome through execution of a drainage easement agreement between parties with an interest in property. A drainage easement is permanent permission given by one property owner burdened by water to the owner of property imposing the drainage burden. The easement is both a contract and a creation of a property right. The contract defines rights and obligations of the parties, limitations or restrictions on use, and enforcement remedies. Property interests are created by the terms of the contract which may grant reciprocal easements and rights of entry to ensure the parties maintain the ability to use and repair the drainage improvements over time. Typically, these rights attach to the property and are binding on future owners and parties.

All road authorities are statutorily authorized to acquire, voluntarily or through condemnation, easements needed for drainage in order to meet the obligation to take care of

[49] Minn. Stat. § 160.20, subd. 2.
[50] Minn. Stat. § 160.20, subd. 4(b).
[51] Minn. Stat. § 160.2715, a(7).

surface waters in a manner that is necessary for the construction, maintenance, safety, or convenience of public travel.[52]

Considerations when Vacating Roads:

When considering vacation of a roadway, the road authority must determine whether the road ditches or laterals thereto are essential for surface drainage of the adjacent lands, or for drainage of other public highways, in the area.[53] If the road authority finds that preservation of such drainage facilities is for the general health and welfare of the public, then the road authority may cause the road to be vacated with a provision that the road authority shall retain the right of access for the purpose of maintaining such drainage facilities.[54] An owner of land adjacent to the vacated portion of the road shall not interfere with the functioning of such drainage facilities.[55]

ENVIRONMENTAL CONSIDERATIONS: ROADWAY RUNOFF

Under the Clean Water Act, some road ditches are categorized as Municipal Separate Stormwater Systems (MS4)[56] and the road authority is considered a MS4 entity subject to permitting requirements based on its ownership or operation of the system collecting and conveying stormwater. The purpose of the MS4 program under the Clean Water Act is to maintain and benefit water quality in creeks, streams, and waterways by reducing pollution in the stormwater runoff.

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[52] *See* Minn. Stat. § 160.04.
[53] Minn. Stat. §§ 160.09, 163.111 and 164.07, subd. 3a.
[54] *Id.*
[55] *Id.*
[56] Minn. R. Part 7090.0080, subp. 8

A road authority is subject to stormwater regulation under the Clean Water Act and Minnesota Rule 7090 if:

(1) Its stormwater system is located fully or partially within an urbanized area as determined by the last Decennial Census and owned or operated by a publicly owned entity that has the potential resident capacity, bed count occupancy, or average daily user population of 1,000 or more.
(2) The road authority itself is located fully or partially within an urbanized area as determined by the latest Decennial Census and owns or operates an MS4.
(3) The road authority has a population of 10,000 or more.
(4) The MS4 is owned or operated by a municipality with a population of at least 5,000 and discharges or has the potential to discharge stormwater to one of the following:
    a. A water identified as an outstanding resource value water as identified in Minn. R. 7050.0180, subps. 3 & 6.
    b. A water identified as a trout lake or trout stream as identified in Minn. R. 6264.0050, subps. 2 & 4.
    c. A water listed as impaired under section 303(d) of the Clean Water Act, 33 U.S.C. § 1313.[57]

MS4 entities are required to develop and implement a stormwater pollution prevention plan (SWPPP) to reduce the discharge of pollutants from their MS4 to the maximum extent practicable. The SWPPP must cover six minimum control measures. The MS4 entity must identify best management practices (BMPs) and measurable goals associated with each minimum control measure. An annual report on the implementation of the SWPPP must be submitted each year.

IMMUNITY PROTECTIONS

Road authorities, including the State, counties, towns and municipalities are immune from (entitled to dismissal of) various types of claims. Minnesota statute sections 3.736 and 466.03 list claims from which governmental entities are immune. In addition, case law recognizes several immunity defenses, not otherwise provided for in statute. In those cases where a

[57] Minn. R. Part 7090.1010, subp. 1

governmental entity is not immune from a claim, it may still be protected by a cap or limit on liability.

The rationale for protecting governmental entities is generally based upon the following concepts: (1) governmental entities are charged with making decisions for the public good that involve the weighing of multiple factors that often have both negative and positive outcomes; (2) the judicial branch through the medium of lawsuits should not second guess those political balancing decisions of governmental entities; (3) an award obtained against a governmental entity is paid out of public funds which are funded by the taxpayer; (4) public funds are better protected, and it is a better use of public funds, if a few individuals suffer as opposed to the public in general; and (5) governmental agents will perform their duties more effectively if not hampered by fear of tort liability.[58]

Related to the management of drainage facilities, immunity doctrines protect the exercise of discretion, application of professional judgment and weighing of policy considerations. Officials are entitled to official immunity against state law claims in Minnesota if they are engaged in discretionary acts taken in the course of their official duties.[59]

The immunity protections will extend to engineering consultants under certain circumstances. For example, a private engineering firm, performing the functions of city engineer pursuant to contract with the city, performs discretionary functions in close coordination with the city, and thus qualified as "public official" eligible for common law official immunity for its

[58] *Nusbaum v. Blue Earth County*, 422 N.W.2d 713, 718 (Minn. 1988); *Holmquist v. State*, 425 N.W.2d 230, 231 (Minn. 1988); *Wilson v. Ramacher*, 352 N.W.2d 389, 393 (Minn. 1984); see generally, Restatement (Second) Torts §895B.

[59] *Drake ex rel. Cotton v. Koss*, 445 F.3d 1038 (8th Cir. 2006).

design of storm-water drainage system as city engineer.[60] An engineer's design of a municipal drainage system is a governmental function requiring the exercise of judgment and discretion. Engineering determinations on public-works projects are precisely the types of discretionary governmental acts that Minnesota courts have long deemed worthy of official immunity.[61]

However, a road authority will not be entitled to immunity protections when it ignores either a statutory obligation or abuses its discretion. For example, a county was not entitled to statutory immunity from a property owner's claims of trespass and nuisance based on a county's failure to maintain a closed-ditch drainage system where the county was required by state law to inspect the ditch on a regular basis but, instead, was ignoring its statutory duties to regularly inspect and maintain the ditch and used a reactive, complaint-based system to drive inspection and maintenance decisions.[62]

CONCLUSION

Drainage and water management involves a complex system of law and regulation. Road authorities must navigate multiple requirements and landowner concerns. In all cases, road authorities should consider and balance its obligations to provide for the health, safety and welfare of its community and the protection and maintenance of its infrastructure.

[60] *Kariniemi v. City of Rockford*, 882 N.W.2d 593 (Minn. 2016).
[61] *Id.*
[62] *Blaine v. City of Sartell*, 865 N.W.2d 723 (Minn. Ct. App. 2015).

DRAINAGE LAW OUTLINE – RINKE NOONAN

DRAINAGE 101 COUNTY ROADWAYS, CITY STREETS AND DRAINAGE WAYS: BEST PRACTICES AND RESOURCES GUIDE

I. Hypothetical Questions

A. **Highway Altering Natural Drainage.** A road authority plans to construct a highway in an area where the natural flow of water is perpendicular to the road system. On either side of the road, the engineer runs road ditches with culverts placed periodically along the road to allow passage of water in its natural direction. However, during major rain events, the road acts as a dike, preventing the natural flow of water, which causes water on the upstream of the highway to back up and flood the cropland adjoining the highway.

1. Does the fact that the highway may block the flow of water create severance damages as to the adjoining farmland?

2. After a significant rain, if a farmer loses some crops as the result of backed up water, can the farmer sue the road authority for damages?

3. Can the farmer run tile into the road ditch? Is there any limit to the amount of tiling that the farmer can do? If the road authority refuses the right to tile into the road ditch, is the farmer entitled to damages? If so, what is the legal standard that determines this?

B. **Design Requirements:** When a road is constructed, the impact on surface waters is an important part of the design. Assume that the drainage design work does not inflict additional damages on the surrounding lands. However, as the design work is done, the engineer has a choice to control the resulting water flow at a 10 year or 100 year flood event. By spending a bit more money, the engineer can provide substantial additional protection to surrounding lands.

1. Is there liability for failing to provide that additional protection based on a showing that the additional expenditure is justified by the damage protection conferred?

2. What if an engineer testifies that designing around the 100 year flood event is standard engineering practice.

II. About Water and Property Rights

A. The water-related rights that belong to a particular property are important to the appraisers in a variety of ways.

1. **Part of the Bundle of Rights.** A property is more or less valuable depending upon the scope of its water-related rights. If the appraiser ignores those rights, the appraiser is ignoring an important part of the bundle of rights that makes the property valuable.
2. **Severance Damages.** Understanding water-related rights is important to determining severance damages. Taking part of a property can impair the water-related rights of the remaining land and give rise to severance claims.
3. **Project Interference with Property Rights.** It can be very important to understand the water-related impacts of a project. Many private or public projects disturb the natural flow of water. Consequently, it is important to understand whether this disturbance interferes with property rights.
4. **Easement Design.** At times, a project seeks to acquire easements related to water-related rights. When so doing, it is important to understand what rights belong to the property.
5. **Easement Scope.** Sometimes, when a project needs to acquire flowage or other easements, the landowner will argue against the scope of the proposed easement, contending that the project seeks to take more rights than reasonably necessary.
6. **Nature of Damage.** It can be quite important to understand the distinction between an invasion of property rights which constitutes a taking, versus an invasion of property rights which do not constitute a taking.

B. We live under the **riparian system** of allocating water among the property owners. The riparian system has its origins in English common law. It is used in the United Kingdom and the eastern United States.

1. Under the riparian principle, all landowners whose property is adjacent to a body of water have the right to make reasonable use of it.

2. In the western United States, water rights are generally allocated under the principle of **prior appropriation**, which treats water as a resource unrelated to land. Under this system, there is an incentive to take as much water as you can, as soon as you can, to pre-empt the appropriation by others.

3. The riparian principle recognizes that the title to property abutting **"navigable waters"** includes special rights.[1] These rights arise by implication and do not need to be mentioned in a deed. Interpreted broadly, they include

   a. Access to the water.
   b. The right to wharf out.
   c. The right to acquire accretions.
   d. The right to fill.
   e. The right to continued flow.
   f. The right to preservation of the view of the water.

4. **Government rights.** The application of the riparian system of allocating water rights in navigable waters among competing owners, and understanding the complex relationship between public regulatory rights, state and federal, is extremely complex. It involves an understanding of the rights of the sovereign in navigable waters, the special rights afforded the United States through the Constitution in navigable waters, as well as state constitutional and legal principles. There are a series of Minnesota cases that deal with the allocation of riparian rights among private property owners and holders of roadway, railroad and other easements adjoining public waters.

5. A DNR publication points out that riparian owners also have **"riparian duties,"** to refrain from unreasonably interfering with the riparian rights of others.[2]

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[1] McLafferty v. St. Aubin, 500 N.W.2d 165 (Minn. 1993) states "Riparian rights are generally described as the rights to use and enjoy the profits and advantages of the water. See 78 Am.Jur.2d Waters § 263 (1975). The riparian owner has a right to make such use of the lake over its entire surface, in common with all other abutting owners, provided such use is reasonable and does not unduly interfere with the exercise of similar rights on the part of other abutting owners. Johnson v. Seifert, 257 Minn. 159, 169, 100 N.W.2d 689, 697 (1960). Riparian rights include the right to build and maintain, for private or public use, wharves, piers, and landings on the riparian land and extending into the water. State v. Korrer, 148 N.W. 617, 622 (1914). They also include such rights as hunting, fishing, boating, sailing, irrigating, and growing and harvesting wild rice. In re Application of Central Baptist Theological Seminary, 370 N.W.2d 642, 646 (Minn.App.1985), pet. for rev. denied (Minn. Sept. 19, 1985)." See also Sanborn v. People's Ice Co. 84 NW 641 (1900); Lamprey v. State, 53 NW 1139 (1883).

[2] It is the duty of the riparian owners to exercise their rights reasonably, so as not to unreasonably interfere with the riparian rights of others (see Petraborg v. Zontelli, 217 Minn 536, 15 NW 2d 174 [1944]). They cannot dike off and drain, or fence off, their part of the

C. In considering the impact of a road project, appraisers or right of way professionals will consider property rights affected as part of a **bundles of rights**. The rights that come with acquiring land, consist of all sorts of constituent rights–access, air, support, groundwater, mineral, and other rights that together form the bundle of rights that make up the total (fee) interest in land. Riparian rights are part of the bundle of rights that come along with the total fee interest in land. Thus, if they are taken, compensation is required, unless those rights are subject to existing superior rights of the state or federal government.

D. Another piece of the bundle of rights includes **rights and duties related to surface waters, the reasonable use principle.**

1. Surface waters consist of waters from rain, springs, or melting snow that lie or flow on the surface of the earth, but which do not form part of a well-defined body of water or natural watercourse.
2. Minnesota courts initially applied the common-enemy rule to address legal issues associated with disputes regarding surface waters. The common-enemy rule provided that surface water is a common enemy that each landowner "may get rid of as best he may."
3. Today Minnesota courts apply the reasonable use rule in cases that involve the channeling, obstruction, and diversion of surface waters. Common law defines private property rights to appropriate surface waters. Because it is judge-made, case-focused law, the common law naturally evolves to accommodate the role of water and water-related resources in current society.
4. Reasonable use involves a **balancing of competing property rights**. Each possessor (of land) is legally privileged to make a reasonable use of his land, even though the flow of surface waters is altered thereby and causes some harm to others. He incurs liability only when his harmful interference with the flow of surface water is unreasonable.

    a. There is a reasonable necessity for such activity
    b. If reasonable care be taken to avoid unnecessary injury to the land receiving the burden;
    c. If the utility or benefit accruing to the land from the activity reasonably outweighs the gravity of the harm resulting to the land receiving the burden; and

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waterbody (See Johnson v. Seifert). It is a public nuisance and a misdemeanor to "interfere with, obstruct, or render dangerous for passage waters used by the public" (see: Public Nuisance Law, Minnesota Statute 609.74).

d. If, where practicable, it is accomplished by reasonably improving and aiding the normal and natural system of drainage according to its reasonable carrying capacity, *or* if, in the absence of a practicable natural drain, a reasonable and feasible artificial drainage system is adopted.

5. Regardless of whether the water at issue is surface water or part of a natural watercourse, a landowner may not use his land in a way that unreasonably injures their neighbor.[3]

III. Examples of actual water related disputes involving roadways and other government construction projects

A. The obligation to use reasonable care to avoid damages from diversion of water

1. Van Wilgen v. Albert Lea Farms Co, 223 N.W. 301 (Minn. 1929). **No liability for unexpected flooding, if reasonable provisions for escape of water has been made:** Farming company that constructed a road authorized by County Board was not liable for damage from an unprecedented rainfall if it had made reasonable provision for the escape of water from such floods as were known to occur in that vicinity. The board of county commissioners laid out several county roads over the marsh, including one on the west line of section 4, and authorized defendant, Albert Lea Farms, to construct them. To drain the roadways, defendant dug a ditch along them with a buckeye ditching machine, depositing in the roadbed the material so excavated. The road embankment prevented surface water from the east from flowing west except as it was carried across the road by the 14-inch tile, as no culverts had been constructed across the road. In September, 1926, there was a rainfall of about 7 inches in 24 hours of which more than 6 inches fell in the space of 11 hours. This was a greater rainfall than had ever previously been recorded in that vicinity. The 14-inch tile was unable to carry off the water which came down from the high lands at the east,

[3] Hunt v. Estate of Hanson, 356 N.W.2d 323 (Minn. App. 1985). See, e.g., McClure v. The City of Red Wing, 28 Minn. 186, 9 N.W. 767 (1881); Poynter v. County of Otter Tail, 223 Minn. 121, 25 N.W.2d 708 (1947); Pell v. Nelson, 294 Minn. 363, 201 N.W.2d 136 (1972); and Fink v. O'Neill Country Club, 218 Neb. 30, 352 N.W.2d 166 (1984).

and the road embankment held it back upon plaintiff's land causing the damage for which he seeks to recover.

2. Poynter v. County of Otter Tail, 25 N.W.2d 708 (Minn. 1947). The liability of one constructing or maintaining a structure in or across a natural watercourse is based on the rule that he must make **proper and adequate provision for the passage therein of such waters as can be reasonably anticipated** as shown by past history and all facts and circumstances bearing upon that question.

3. Roche v. City of Minneapolis, 223 Minn. 359, 27 N.W.2d 295 (1947) A city is not liable for water damage to private property, despite the inadequacy of its drainage system, when the private property was the natural depository of the water discharged. When the city had not unnecessarily discharged water upon private property, it cannot be held liable for failing to prevent a natural result. **A city is not required to be an insurer for all water damage from the natural flow of surface water.** "The only complaint plaintiffs can make is that the municipality did not do more and wholly relieve the premises of surface and infiltrated water." Id. at 365, 27 N.W.2d at 298. The court in Roche found no liability for water damage when the city had not gathered surface waters into a large body and cast them in large quantities in an area where they did not previously flow.

B. Remedy for Reasonable Use Violations

1. **Negligence:** Bush v. City of Rochester, 191 Minn. 591, 255 N.W. 256 (1934). The traditional negligence case is based upon

   a. Breach of ordinary care by the defendant
   b. Proximate causation of damages.
   c. Contributory negligence defense.
   d. However, beginning with Bush v. City of Rochester, the courts began to apply the reasonable use test even to negligence cases.

2. **Nuisance: Highview North Apartments.** Then in the Highview North Apartments case, the Court seemed to move us to a nuisance based theory, suggesting that in most cases, no matter what the theory, the issue is reasonable use.

3. **Failure to Design** a city's deliberate decision not to expand its system to accommodate all storm water is not, by itself, negligence. The City of West St. Paul, V. Orr-Schelen-Mayeron & Associates, Inc.,1990 WL 152689 (Minn.App), Damages for degligence cannot be predicated upon flooding were the rainfall was unusual, extraordinary, and one that could not reasonably be anticipated. See, generally, Power v. Village of Hibbing, 182 Minn. 66, 233 N. W. 597, and cases cited; Taubert v. City of St. Paul, 68 Minn. 519, 71 N. W. 664; 4. See also Chabot v. City of Sauk Rapids, 422 N.W.2d 708 Minn.,1988.

C. Takings

1. United States v. Chicago, M., St. P. & P. R. Co., 312 U.S. 592, 596 -597 (1941) The **dominant power of the federal Government**, as has been repeatedly held, extends to the **entire bed of a stream, which includes the lands below ordinary high water mark.** The exercise of the power within these limits is not an invasion of any private property right in such lands for which the United States must make compensation. The damage sustained results not from a taking of the riparian owner's property in the stream bed, but from the lawful exercise of a power to which that property has always been subject.

2. Caponi v. Carlson, 392 N.W.2d 591 (Minn. App. 1986) (review denied); city's adoption of plans recognizing existence of storm water holding pond on property and installation of two storm sewer pipes bringing water into pond, vastly increasing water volume, was taking without compensation in violation of takings provisions of the State and Federal Constitutions....Caponi's property has been permanently flooded and is now used to hold storm water. This was done according to the city's plan and with its approval. The evidence substantiates Caponi's claim that it was the city's actions which **permanently flooded**

his land. Caponi's land, which was intermittently wet and dry, is now permanently flooded; it was sometimes tillable and suitable for grazing cattle. He fenced the land. This fence is now under water. * * * He has no use of the property.

3. Love v. Burlington Northern, Inc., 407 N.W.2d 452 (Minn. 1987)...Watershed district granted potato farmers permit to install culvert decreasing water flow in private drainage ditch used by sugar beet farmers. Appellants argue that as a result of the culvert, their land will be flooded each spring for a substantially longer period than in the past, preventing them from planting their crops on time, and there will be increased crop damage during the occasional summer flood. The record shows that there is **intermittent flooding of appellants' lands**, and the installation of the culvert will likely exacerbate the flooding. It does not establish, however, that the intermittent flooding will be of sufficient "frequency, regularity, and permanency" to constitute a taking.

4. Nelson v. Wilson, 239 Minn. 164, 58 N.W.2d 330 (1953)...In Nelson, the State built two dams which caused flooding in surrounding lands due in part to the overflowing of a drainage pool behind one dam. The supreme court held there had been a taking of lands below the dams which had been periodically flooded when the pool was drained, and had remained wet and flooded for several years. It stated: **Whether occasional flooding is of such frequency, regularity, and permanency as to constitute a taking and not merely a temporary invasion for which the landowner should be left only to a possible recovery of damages is a question of degree, and each case must stand on its own peculiar facts**. * * * Here, since the land remained flooded and wet for several years, since a bridge and trees were swept away, and since the state had full knowledge of the flooding and had taken no timely steps to correct the situation, * * * there is ample evidence to support the finding of a taking * * * 239 Minn. at 172, 58 N.W.2d at 335 (emphasis in original).

5. **United States v. Rand** 389 U.S. 121 (1967), "The power to regulate commerce comprehends the control for that

purpose, and to the extent necessary, of all the **navigable waters** of the United States . . . . For this purpose they are **the public property of the nation, and subject to all the requisite legislation by Congress**. This power to regulate navigation confers upon the United States a "dominant servitude," FPC v. Niagara Mohawk Power Corp., 347 U.S. 239, 249 (1954), which extends to the entire stream and the stream bed below ordinary high-water mark. The proper exercise of this power is not an invasion of any private property rights in the stream or the lands underlying it, for the damage sustained does not result from taking property from riparian owners within the meaning of the Fifth Amendment but from the lawful exercise of a power to which the interests of riparian owners have always been subject. Thus, without being constitutionally obligated to pay compensation, **the United States may change the course of a navigable stream or otherwise impair or destroy a riparian owner's access to navigable waters, even though the market value of the riparian owner's land is substantially diminished.**

6. United States v. Twin Cities Power, 350 U.S. 222 (1956). Court rejected a power company's contention that uplands taken should be compensated at a value which reflected its special value because of its power generation capability: It is argued, however, that the special water-rights value should be awarded the owners of this land since it lies not in the bed of the river nor below high water but above and beyond the ordinary high-water mark. An effort is made by this argument to establish that this private land is not burdened with the Government's servitude. The flaw in that reasoning is that the landowner here seeks a value in the flow of the stream, a value that inheres in the Government's servitude and one that under our decisions the Government can grant or withhold as it chooses. It is no answer to say that payment is sought only for the location value of the fast lands. That special location value is due to the flow of the stream; and if the United States were required to pay the judgments below, it would be compensating the landowner for the increment of value added to the fast lands if the flow of the stream were taken into account.

7. On the other hand, the government (including the United States) does not retain these unrestricted rights when it land above the ordinary high water mark of a stream or lake, the so-called fast lands. The issue is, what kind of damage, and under what circumstances, does a taking result. The destruction of all uses of the property by flooding has been held to constitute a taking. in Pumpelly v. Green Bay Co., 13 Wall. 166, 20 L.Ed. 557; Pumpelly v. Green Bay & M. Canal Co. involved the right to compensation for land overflowed with backwater from a dam erected and maintained in the Fox river, under authority of the state of Wisconsin, for the improvement of navigation. The State of Wisconsin argued that it could raise the river above its natural stage, by means of an artificial structure to improve navigation. The Supreme Court found a compensible taking. This court overruled the contention, and held there was a taking without compensation, contrary to the applicable provision of the Constitution of Wisconsin. In United States v. Lynah, 188 U.S. 445 , 47 L. ed. 539, 23 Sup. Ct. Rep. 349, the same principle was applied in the case of an operation by the government of the United States. For the improvement of the navigation of the Savannah river certain dams and other obstructions were placed and maintained in its bed, with the result of raising the water above its natural height and backing it up against plaintiff's embankment upon the river and interfering with the drainage of their plantation. This was held to be a taking of private property, requiring compensation under the 5th Amendment, notwithstanding the work was done by the government in improving the navigation of a navigable river.

8. In U. S. v. Dickinson, 331 U.S. 745 (1947), the Court considered a compensation claim resulting from construction of the Winfield Dam to improve navigability of the Kanawha River. The water above the dam was to be impounded to create a deeper channel and to raise the river pool level in that area. Notice of the proposed pool elevation was given to abutting landowners on July 1, 1936, and the dam was completed and officially accepted by the United States on August 20, 1937. The river was to be raised by successive stages from 554.65 feet to 566 feet

above sea level. That level was not reached until September 22, 1938. As a result of the raising of the river the land belonging to Dickinson was permanently flooded. In addition, erosion attributable to the improvement damaged the land which formed the new bank of the pool. The Court noted, "Property is taken in the constitutional sense when inroads are made upon an owner's use of it to an extent that, as between private parties, a servitude has been acquired either by agreement or in course of time.... When [the Government] takes property by flooding, it takes the land which it permanently floods as well as that which inevitably washes away as a result of that flooding. The mere fact that all the United States needs and physically appropriates is the land up to the new level of the river, does not determine what in nature it has taken. If the Government cannot take the acreage it wants without also washing away more, that more becomes part of the taking. This falls under a principle that in other aspects has frequently been recognized by this Court. ...If the resulting erosion which, as a practical matter, constituted part of the taking was in fact preventable by prudent measures, the cost of that prevention is a proper basis for determining the damage."

IV. **Selected statutes**. Below are references to some selected statutes that bear on the relationship between roads and drainage. These are included for reference only.

A. Right to acquire: Minnesota Statutes Section 160.04. Width of roads. Except as otherwise provided, all roads hereafter established, except cartways, shall be at least four rods wide. Additional right-of-way and easements, including easements needed for drainage, may be acquired by purchase, gift, or eminent domain proceedings when necessary for construction, maintenance, safety, or convenient public travel. The necessity for such additional right-of-way and easements shall be determined by the road authority having jurisdiction over the particular road involved.

B. Use of roadway right of way: 161.45 Subdivision 1. Rules. Electric transmission, telephone, or telegraph lines; pole lines; community antenna television lines; railways; ditches; sewers; water, heat, or

gas mains; gas and other pipelines; flumes; or other structures which, under the laws of this state or the ordinance of any city, may be constructed, placed, or maintained across or along any trunk highway, or the roadway thereof, by any person, persons, corporation, or any subdivision of the state, may be so maintained or hereafter constructed only in accordance with such rules as may be prescribed by the commissioner who shall have power to prescribe and enforce reasonable rules with reference to the placing and maintaining along, across, or in any such trunk highway of any of the utilities hereinbefore set forth. Nothing herein shall restrict the actions of public authorities in extraordinary emergencies nor restrict the power and authority of the commissioner of commerce as provided for in other provisions of law. Provided, however, that in the event any local subdivision of government has enacted ordinances relating to the method of installation or requiring underground installation of such community antenna television lines, the permit granted by the commissioner of transportation shall require compliance with such local ordinance.

C. Section 160.18 Access to roads; approaches. Deals with cost of culverts when approaches are supplied.

D. Section 160.19 Drainage ditch crossing railroad right of way. Railroad must carry a road drainage ditch under and across its right-of-way.

E. Section 160.20 Drainage:

1. Subdivision 1. Connecting drains to highway drains. When course of natural drainage of any land runs to a highway, owner of the land shall have the right to enter upon the highway for purpose of connecting a drain or ditch with any drain or ditch constructed along or across the highway. Permit required. Reasonable regulations allowed.
2. Subdivision 2. Governs private tile drain that must be projected across the right-of-way to a suitable outlet. If proper notice, road funds pay for installation.

3. Subdivision 3. Installing drain tile along or across highway. If properly permitted, when the course of natural drainage of any land runs to a highway, owner of the land may

install drain tile along or across the highway right of way along the general course of the natural drainageway, provided further that there will be no diversion of drainage waters away from the natural receiving drainageway...

F. 160.201. Repair and improving drainage:

1. For the purpose of draining public roads and preventing accumulations of water in road ditches, the overflow of which may damage adjacent lands, the various authorities having supervision over public roads, in addition to all other powers granted to said authorities, are authorized and empowered to expend moneys from funds available therefor in repairing, cleaning out, deepening, widening and improving public road ditches within the jurisdiction and supervision of such authorities. The necessity for such work shall be determined by the authorities which now have the supervision of said public roads; provided, that before said work may be done said road supervising authority shall determine that said road ditch as so improved will be provided with an adequate outlet.

G. 161.28. Altering public drainage ditch by trunk highway

1. Subdivision 1. Petition. Upon the filing of a petition by the commissioner with the appropriate county auditor setting forth that it would be advantageous or desirable in the construction or maintenance of a trunk highway to make a minor alteration or change in a public drainage system directly affecting a trunk highway and that the alteration or change will not affect the functioning or efficiency of the public drainage system, the auditor shall fix a time and place for hearing and give notice of the hearing by publication, as defined in section 103E.325. Upon the filing of the petition, the commissioner shall also file a plan showing in detail the alteration or change petitioned for. If upon the hearing it appears to the county board or joint county ditch authority that the alteration or change in the public drainage system will not affect or impair the efficiency of the drainage system, the board or authority shall make its order allowing the commissioner to make the alteration or change petitioned for. Upon the making

of the order by the county board or the joint county ditch authority, the commissioner may proceed at the sole cost and expense of the state to make the alterations or changes as may be in the order allowed, damages, if any, for any additional lands necessary for the change or alteration being first duly paid or secured. Upon completion of the alteration or change, the commissioner shall file with the appropriate auditor a map drawn to scale showing the change or alteration made and shall also file a profile of all lines of the alteration or change in the ditch showing graphically the elevation of the ground and gradient, whether open or tiled, the size of tile, and the bottom width and side slope of open ditch sections, and such other information as may appear necessary for understanding. Upon the completion of the alteration or change herein provided for, the ditch shall thereafter include such alteration or change as a part of it with the same force and effect as though it had been originally so constructed and established.

2. Subd. 2. Recovery of damages. Within six years after completion of any alteration or change as provided in this section, any owner or owners of lands in the drainage system claiming damages by reason of the alteration or change may bring an action in the district court of the county in which the lands are located to compel the commissioner to pay damages, if any, caused by the alteration or change. See also 163.17 to similar effect.

H. Obstruction 160.2715. Right-of-way use; misdemeanors.. (a) Except for the actions of the road authorities, their agents, employees, contractors, and utilities in carrying out their duties imposed by law or contract, and except as herein provided, it shall be unlawful to:....(7) obstruct any ditch draining any highway or drain any noisome materials into any ditch;...(11) deface, mar, damage, or tamper with any structure, work, material, equipment, tools, signs, markers, signals, paving, guardrails, drains, or any other highway appurtenance on or along any highway.

I. 103E.701(a) :

1. Subd. 3. Repair of town ditches. The town board has the power of a drainage authority to repair a town drainage system located within the town.

2. Subd. 4. Bridges and culverts.

   a. (a) Highway bridges and culverts constructed on a drainage system established on or after March 25, 1947, must be maintained by the road authority charged with the duty of maintenance under section 103E.525.

   b. (b) Private bridges or culverts constructed as a part of a drainage system established by proceedings that began on or after March 25, 1947, must be maintained by the drainage authority as part of the drainage system. Private bridges or culverts constructed as a part of a drainage system established by proceedings that began before March 25, 1947, may be maintained, repaired, or rebuilt and any portion paid for as part of the drainage system by the drainage authority.

   c. (c) For a repair of a drainage system that has had redetermination of benefits under section 103E.351, the drainage authority may repair or rebuild existing bridges or culverts on town and home rule charter and statutory city roads constructed as part of the drainage system and any portion of the cost may be paid by the drainage system.

3. Subd. 5. Construction of road instead of bridge or culvert. In a repair proceeding under sections 103E.701 to 103E.745, if the drainage authority finds that constructing a private road is more cost-effective or practical than constructing a bridge or culvert, a drainage authority may order a private road to be constructed under section 103E.526, instead of a bridge or culvert.

J. **103E.525. Construction and maintenance of bridges and culverts**

Subdivision 1. Hydraulic capacity. A public or private bridge or culvert may not be constructed or maintained across or in a drainage system with less hydraulic capacity than specified in the detailed survey report, except with the written approval of the director of the division of waters. If the detailed survey report does not specify the hydraulic capacity, a public or private bridge or culvert in or across a drainage system ditch may not be constructed without the director's approval of the hydraulic capacity.

Subd. 2. Road authority responsible for construction. Bridges and culverts on public roads required by the construction or improvement of a drainage project or system must be constructed and maintained by the road authority responsible for keeping the road in repair, except as provided in this section.

Subd. 3. Notice; charging cost. The auditor shall notify the state and each railroad company, corporation, or political subdivision that they are to construct a required bridge or culvert on a road or right-of-way under their jurisdiction, within a reasonable time as stated in the notice. If the work is not done within the prescribed time, the drainage authority may order the bridge or culvert constructed as part of the drainage project construction. The cost must be deducted from the damages awarded to the corporation or collected from it as an assessment for benefits. If the detailed survey report or viewers' report shows that the construction of the bridge or culvert is necessary, the drainage authority may, by order, retain an amount to secure the construction of the bridge or culvert from amounts to be paid to a railroad, corporation, or political subdivision.

Subd. 4. Construction on line between two cities paid equally. The costs of constructing a bridge or culvert that is required by construction of a drainage project on a public road that is not a state trunk highway on the line between two statutory or home rule charter cities, whether in the same county or not, must be paid jointly, in equal shares, by the cities. The cities shall pay jointly, in equal shares, for the cost of maintaining the bridge or culvert.

Subd. 5. Construction on town and county lines. The cost of constructing and maintaining bridges and culverts on a town or county road across a drainage system ditch constructed along the

boundary line between towns or counties, with excavated material deposited on the boundary line or within 33 feet of the line, must be paid equally by the town or county where the bridge or culvert is located and the other town or county adjoining the boundary.

K. **103E.526. Construction of road instead of bridge or culvert.** If the drainage authority finds that constructing a private road would be more cost-effective or practical than constructing a bridge or culvert, the drainage authority may order that a private road be constructed. The private road must be constructed and maintained in the same manner as a bridge or culvert. The private road must be constructed in a manner suitable for farm vehicles but may not have a right-of-way wider than 33 feet. The drainage authority has jurisdiction over the land required for the private road and the road is part of the drainage system.

L. Public highway crossing inventoried public water course (DNR Rule part 6115.0230 - .0231)

1. It is the goal of the department to allow crossings of public waters, only when less detrimental alternatives are unavailable or unreasonable, and where such facilities adequately protect public health, safety, and welfare.
2. The construction or reconstruction of any bridge, culvert, intake, outfall, or other crossing of public waters is subject to this part. Abandonment or removal of all crossings and structures governed by this part requires a permit.
3. No permit is required to construct or reconstruct a bridge or culvert on a public watercourse with a total drainage area, at its mouth, of five square miles or less, except on officially designated trout streams.
4. The construction, reconstruction, or relocation of all bridges, culverts, or other crossings over public waters shall be approved if the hydraulic capacity of the structure is established by a competent technical study. The sizing shall not be based solely on the size of existing upstream and downstream structures. If a state or federal floodplain information study exists for the area, or a United States Geological Survey gaging station is located nearby on the stream, the hydraulics of the proposed bridge/culvert

design must be consistent with these data. The department may waive this requirement if: the department has performed a hydraulic study based upon available information and reasonable assumptions; the department has made a field investigation of the project site; and the project will not cause flood-related damages or problems for upstream or downstream interests.

5. For new crossings, no approach fill for a crossing shall encroach upon a community designated floodway. When a floodway has not been designated or when a floodplain management ordinance has not been adopted, increases in flood stage in the regional flood of up to one-half of one foot shall be approved if they will not materially increase flood damage potential. Additional increases may be permitted if: a field investigation and other available data indicate that no significant increase in flood damage potential would occur upstream or downstream, and any increases in flood stage are reflected in the floodplain boundaries and flood protection elevation adopted in the local floodplain management ordinance.
6. For replacement of existing crossings, if the existing crossing has a swellhead of one-half of one foot or less for the regional flood, the replacement crossing shall comply with the provisions for new crossings. If the existing crossing has a swellhead of more than one-half of one foot for the regional flood, stage increases up to the existing swellhead shall be allowed if field investigation and other available data indicate that no significant flood damage potential exists upstream from the crossing based on analysis of data submitted by the applicant. The swellhead for the replacement crossing may exceed the existing swellhead if it complies with the provisions for new crossings.

Appendix D: Drainage Document Templates

PUBLIC ROAD RIGHT OF WAY DRAINAGE POLICY TEMPLATE

[DESIGNATION OF GOVERNING BODY]

RESOLUTION _____

WHEREAS, the *[DESIGNATION OF GOVERNING BODY]*, in its role as road authority, from time to time receives requests for installation of drainage tile along or through a road right-of-way, for a ditch or drain connection to a road right-of-way ditch, and for road ditch cleaning; and

WHEREAS, pursuant to Minn. Stat §160.20, subject to reasonable regulation by the road authority, an owner of land whose natural drainage runs to a roadway may install drain tile along or across the road right-of-way along the general course of the natural drainage; and

WHEREAS, prior to installing a drain or ditch connection or tiling, the statute requires, to the extent that the road authority has adopted a permitting program, an owner to first acquire a written permit from the road authority. The permitting program must comply with the requirements of Minn. Stat. § 160.20, subd. 4; and

WHEREAS, the permitting program may establish conditions and standards for the proposed work in order to protect the public road system and avoid landowner conflicts; and

WHEREAS, failure to obtain a written permit as required by Minn. Stat. § 160.20 is a misdemeanor crime; and

WHEREAS, in addition to a permitting program for the purposes described above, the Road Authority desires to establish a policy addressing maintenance of county road ditches, including: authorizations, conditions and standards for private parties to clean and remove perceived obstructions from the road ditches; establishment of a maintenance fund for such work to be performed by the Road Authority; and the development of standards by which the Road Authority will evaluate the need for such work; and

WHEREAS, the requirements and conditions prescribed for permits required under Minn. Stat. § 160.20 can also apply to individuals requesting permission and a permit to clean a public right-of-way ditch, and as a result the Road Authority chooses to include cleaning permits into its policy for private drainage utilization of public right-of-way ditches; and

WHEREAS, decisions to clean public right-of-way ditches is discretionary and the Road Authority is not required to approve an application for a private party to clean a public right-of-way ditch, the Road Authority may approve such application if the requirements of its policy and other applicable laws and regulations are complied with; and

WHEREAS, the Road Authority is not mandated to approve an application to clean a public right-of-way ditch even if the requirements of its policy are met; and

WHEREAS, in addition to Minn. Stat. §160.20, if a ditch is deemed to be a portion of the public drainage system, the requirements of Minn. Stat Ch. 103E and any other applicable law and regulations will also need to be complied with; and

WHEREAS, it is desirable to define the policy and procedure of the Road Authority for connection of private drains to roadway drains, installation of drain tile along or across a Road Authority right-of-way, and cleaning of public right-of-way ditches; and

THEREFORE, BE IT RESOLVED, that the following policy and regulations be adopted in *[DESIGNATION OF GOVERNING BODY]*:

1. The recitals set forth in the whereas clauses above are incorporated by reference as if fully set forth herein.

2. The Road Authority may approve an application for a permit connecting a drain or ditch with any drain or ditch constructed along or across the highway, installing drain tile along or across the highway right-of-way roadway ditch, or the cleaning of a roadway ditch provided that the parties requesting the permit shall comply with federal and state laws and regulations and these adopted policies and regulations.

3. The applicant shall submit a completed Drainage and Cleaning Permit application to the Public Works director and shall comply with any provisions described therein.

4. Before any permit is approved and/or any work is started, the individual/contractor responsible for the project (applicant) shall provide a certified check or performance bond in the amount deemed appropriate by the Road Authority engineer for the scope of work included under the permit. The maximum amount of the required check or performance bond is set forth in the adopted current Road Authority Fee Schedule. A fee will be charged for the required permit. The fee for the permit is also set forth in the Road Authority Fee Schedule.

   Upon completion of the work the applicant shall notify the Road Authority Engineer's office to obtain final inspection. If the work is determined acceptable, and after 60 calendar days have elapsed (to determine if any settlement occurs), the certified check or performance bond will be returned.

   If the work is deemed unacceptable by the Road Authority Engineer, notification will be given to the applicant, who shall complete all necessary corrective action within 30 days. If corrective action is not completed by the applicant within the allotted time frame, the performance bond or certified check funds will be used by the County to correct any deficiencies in the project. The remainder (if any) of the performance bond or certified check funds will be returned to the applicant upon completion of the corrective action.

5. For all Drainage and Cleaning Permits the parties requesting the permit shall comply with the following regulations:

   a. First complete all ditching needed below the outlet end of the connection to ensure proper drainage.

b. Any work done on highway right-of-way ditches or on slopes shall be done in a manner to meet current geometric standards.

c. All backfill material and the method of compaction shall comply with 2451.3D of the Minnesota Department of Transportation Standard Specifications (latest version).

d. Wherever topsoil and sod are disturbed, they shall be replaced and maintained satisfactorily until the turf is established, and otherwise restore the county highway right-of-way to its original condition.

e. Upon completion of an installation, the applicant shall then notify the Road Authority or its engineer of the completion of the work so that inspection can be made to determine its acceptability.

f. When working within the right-of-way limits of the highway, the contractor shall erect and maintain all barricades, signs and lights needed to protect the traffic, including all warning signs specified under Minnesota Statute 160.16, and in compliance with the current Minnesota Manual of Uniform Traffic Control Devices (MN MUTCD).

g. The highway shall not be closed to traffic on Sundays or on legal holidays, and shall not be closed for more than 5 hours on any project.

h. The installation shall not interfere with any existing utility facilities on the highway right-of-way. Interruption, interference or damages to any utility shall be restored and/or paid for by the applicant. It is the applicant's responsibility to complete a Gopher State One-Call ticket 48 hours prior to any excavation and to not proceed with any excavation until the site is marked or verification received of the absence of known, buried utilities.

i. The installation shall be made in conformity with all applicable laws, regulations, and codes covering said installations. All installations shall be made in conformity with regulations of governmental agencies for the protection of the public.

6. Any additional right-of-way or property interests required for the above work shall be obtained at the expense of the owner or applicant requesting the work.

7. The Road Authority may establish a maintenance fund pursuant to statutes section 160.201 for the purpose of paying all or a portion of the cost of cleaning and maintenance of right-of-way ditches.

8. If a maintenance fund is established, the Road Authority may participate in funding the requested work. Cost share funding of private cleaning or maintenance work in a right-of-way ditch shall not exceed 50% of prior documented costs of the work if in the judgment of the Road Authority or its engineer, a Road Authority highway, or the traveling public receives a direct benefit for such maintenance or cleaning. The amount and percentage of funding shall be at the discretion of the Road Authority or its Engineer. It shall otherwise be the responsibility of the Road Authority to maintain roadways in a manner to provide what would otherwise be a natural drainage condition upon consideration of policy factors including but not limited to (1) is the maintenance

required to eliminate or prevent harm to the road and (2) is the maintenance required to eliminate or prevent an objective harm to public or private interests adjacent to the roadway.

9. Each permit application and/or project will be reviewed on its own merits and specific circumstances by the Road Authority or its Engineer. Road Authority financial considerations will govern participation in all project costs. No guarantee of issuance of a permit or Road Authority participation in the project is implied by Road Authority participation in any other project or issuance of any other permit.

10. Written notification shall be made to the Road Authority or its Engineer if drainage ditching or other utility work will affect drainage to/from Road Authority facilities and/or right-of-way even if the work is to be accomplished outside of the existing of the existing right-of-way. Modifications to the existing Road Authority facilities, including to ditch/drainage systems made necessary by drainage, ditching, or other utility work, will require financial contribution from the responsible party. If the responsible party refuses to provide financial contribution, the cost of the required modification and/or alteration may be assessed to the responsible parties' property tax.

11. Other Permits and Agency Notification The applicant shall notify all appropriate agencies of the scope and nature of the work to be performed. Appropriate agencies may include but may not be limited to local land use authority, Soil and Water Conservation District, Minnesota Department of Natural Resources, U.S. Army Corps of Engineers, and other notifications as are appropriate to the specific project. Any permits required from outside agencies shall be obtained prior to commencing work. Required notifications and initial responses shall be included with the permit application.

12. Any permit shall be conditions so that the road authority my enter onto any properties requiring corrective action associated with the work included in the permit.

13. Any permit shall be condition to require applicant to indemnify and hold harmless the road authority, its agents and employees from and against all claims, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense is caused in whole or in part by any negligent act or omission of the applicant, anyone directly or indirectly employed by the applicant, or anyone for whose acts the applicant may be liable.

(The remainder of this page left blank)

Approved and adopted this _____ day of _____, 20__.

_____
Printed Name and Title
[DESIGNATION OF GOVERNING BODY]

ATTEST:

_____
Printed Name and Title

[Road Authority Name]
APPLICATION FOR DRAINAGE PERMIT

CSAH or Co. Rd. _____
Township _____

Parcel ID # _____

Applicant _____ Address _____ Phone No. _____

Property Owner _____ Address _____ Phone No. _____

Party Performing Work _____ Address _____ Phone No. _____

Location of proposed drainage work:

_____ in *[County Name]* _____ miles N - S - E - W of _____
(road name) (circle one) (specific road, landmark or road int.)

Legal Description of Property:

Type of Drainage:
_____ Tile Outlet
_____ Open Ditch
_____ Parallel Installation
_____ Crossing Installation ($100.00)

Area to be Drained: _____ acres

Pipe Size and Type _____

Casing Size and Type _____

Proposed Work to Begin on _____ Proposed Work to be completed on _____

I/We, the undersigned, herewith accept the terms and conditions of the permit requirements of the County Engineer and agree to fully comply therewith to his satisfaction.

Furthermore, except for the negligent acts of the Road Authority, its agents and employees, the applicant or his agents or contractor shall assume all liability for, and save the Road Authority, its agents and employees, harmless from, any and all claims for damages, actions or causes of action arising out of the work to be done herein and the continuing usage, constructing, reconstructing, maintaining and using of said drainage facility under this application and Permit for construction.

Dated: _____ Applicant's Signature: _____

See reverse side for Permit Requirements. Attach a sketch of project to this application form.

AUTHORIZATION PERMIT

(Permit not valid unless bearing signature and date)

In consideration of his agreement to comply in all respects with the permit requirements of the County Engineer covering such operations, permission is hereby granted for the work to be done as described in this application,said work to be done in accordance with special provisions required as hereby stated:

Dated: _____ Authorized Signature: _____

The date when work is completed must be reported to Road Authority Engineer.

Permit fee paid in the amount of *$XX.XX* or *$XXX.XX* for "Crossing Installation" _____
No deposit required: _____ Deposit in Amount of $ _____ required and attached hereto.
Date work completed: _____
Check No. _____ Bond _____
This deposit made by: _____ Address: _____
(name)

CONTINUED ON REVERSE SIDE

SPECIFICATIONS AND PERMIT REQUIREMENTS

1. All construction details shall be entered on the permit application or supplemental sheets as required.
2. Installations shall be in accordance with Specification 2502 of the Minnesota Standard Specifications for Highway Construction.
3. Allowable materials for longitudinal installations shall be:
   Corrugated metal pipe (Std. Plate 3040F)
   Reinforced concrete pipe (Std. Plate 3000H)
   Non-reinforced concrete pipe, Class I (Std. Plate 3000H) Non-reinforced concrete pipe, Wall C, Class II or III (Std. Plate 3000H)Thermoplastic Pipe (Spec. 3245)
4. Connections of field tile to allowable longitudinal – installations shall be made a minimum of three (3) feet beyond the highway right-of-way line using an inspection tee. (Std. Plate 3143C).
5. All casings shall be jacked or bored when beneath a bituminous or concrete paved roadway.
6. All system installation shall be a minimum of three (3) feet below existing ground.
7. No installation will be permitted in the shoulder or inslope of the roadway.
8. The owner, his successor or assigns, shall maintain the installation in perpetuity.
9. If drainage work to be done lies within the limits of any city, village or watershed district, permission must be obtained from the local governing authority involved. If drainage work to be done involves county, judicial, or group drainage system, permission must also be obtained from the authority involved. If any drainage is diverted from the owner's property he shall have written approval from the landowners upon whom it is discharged.
10. The applicant shall comply with all rules and regulations of the Minnesota Environmental Quality Council and any other affected governmental agencies.
11. The applicant shall furnish, install and maintain an approved culvert marker post at outlet of drainage tile.
12. The drainage work shall not interfere with any existing utility facilities on the county highway right-of-way.
13. Removal of trees or shrubs within the right-of-way requires prior approval of the County Engineer of his authorized representative.
14. No equipment will be permitted to operate on or across the roadway which will damage the roadway or shoulder surface.
15. The County reserves the right to remove or repair, with its own forces but at the expense of the applicant, any tile outlet which is not maintained and caused damage to adjacent right-of-way. Applicant must obtain a permit to do maintenance work on the drainage systemcovered by this permit.
16. If the County Highway Department shall make any improvements or change on all or any part of its right-of-way upon, over, under or along the trunk highway, then and in every case the applicant herein named shall, after notice from the County Engineer or his authorizedagents, proceed to alter, change, vacate or remove from County Highway right-of-way said works necessary to conform with said changes without cost of the County.
17. After work on a project is completed (the applicant) must notify the County Engineer that such work has been complete and is ready for final inspection and acceptance.

MINNESOTA LAW REGULATING DRAINAGE WORK

160.20 DRAINAGE Subdivision 1. Connecting drains to highway drains. When the course of natural drainage of land runs to a highway, the owner of the land shall have the right to enter upon the highway for the purpose of connecting his drain or ditch with any drain or ditch constructed along or across the highway, but before making the connections he shall first obtain a written permit for the connections from the road authority having jurisdiction. The connections shall be made in accordance with specifications set forth in the permits. The road authority shall have power to prescribe and enforce reasonable rules and regulations with reference to the connections. The highway shall be left in as good condition in every way as it was before the connection was made.

Subd. 3 (Installation of drain tile along or across highway right-of-way) (a) When the course of natural drainage of any land runs to a highway, the owner of the land who has been granted a permit as provided in this subdivision may install drain tile along or across the highway right-of-way along the general course of the natural drainageway, provided further that there will be no diversion of drainage waters away from the natural receiving drainageway immediately downstream from the highway. Any installation shall be made in accordance with specifications set forth in the permit and any rules that apply to the installations. When any installation is made pursuant to this subdivision the highway shall be left in as good condition in every respect as it was before the installation was made.

(b) Any road authority may accept applications for permits for installation of drain tile along or across the right-of-way of a highway under its jurisdiction. The road authority may adopt reasonable rules for the installations and may require a bond before granting any permit. Permits for installation along a highway right-of-way shall insure that the length of the installation is restricted to the minimum necessary to achieve the desired agricultural benefits. No permit shall allow any open trenches to be left on the right-of-way after installation of drain tile is completed. Any road authority that grants a permit for drain tile installation shall not be responsible for any damage to that installation resulting from the action of the authority or any other permittee utilizing the right-of-way.

(c) Any person who installs drain tile along or across a highway right-of-way without obtaining a permit as provided in this subdivision is guilty of a misdemeanor.

(d) The commissioner shall take no action pursuant to this subdivision which will result in the loss of any federal aid for highway construction in this state.

(e) For the purpose of this subdivision "highway" means any highway as defined in Chapter 160 which is located outside the corporate limits of any home rule charter or statutory city.

*****This template is generalized to be used by any Road Authority seeking a tile/ditch crossing permit application. The Road Authority using this template should modify as necessary to best fit the needs, requirements, and responsibilities of the Road Authority. This is not an all-inclusive or exclusive document. Road Authority should seek legal counsel to ensure application remains within the legal responsibilities and rights of the Road Authority*****

Appendix E: Fact Sheets

Landowner Responsibilities:

Drainage 101 County Roadways, City Streets, and Drainage Ways: Best Practices and Resources Guide

The following is intended to be a guide for private landowners and the responsibilities they have in managing stormwater to, from, and on their property.

Landowner Responsibilities According to Drainage Law

- Obstructing or diverting a watercourse or drainage way is subject to the law of reasonable use and may result in claims for damages to adjacent property.
- Improvement of surface water drainage from property by ditching, tiling or adding impervious surface may be allowed under the law of reasonable use even though it cause some damage or increases rate, volume or duration of flow upon adjacent property.
- Subject to road authority policy to the contrary, owners of property abutting the public highway must pay for culverts in approaches and such culvert must be sized appropriately for the drainage area served.
- Subject to reasonable regulation of the road authority, an adjacent landowner may connect a drain or ditch to a road ditch if the highway is left in good condition.
- It is the responsibility of the landowner to contact the proper governing body to make any changes to drainage within drainage easements or rights of way.
- The road authority may enforce permitting to make any changes within drainage easements or rights of way.

Potential Solutions to Addressing Localized Drainage Problems

The following are BMP's that landowners can install to help improve and conserve stormwater on their property.

- **Rain barrels** – These help to conserve water. Can easily be placed at the end of a gutter downspout. Many cities offer rebates for installing these systems.
- **Rain gardens** – These help to prevent water pollution by allowing stormwater to soak into the ground before it runs off. Native plants are typically installed to help encourage infiltration into the soils beneath the garden. These can be installed to collect runoff from downspouts and driveways. They can be aesthetically pleasing while also improving stormwater and can be a good solution for flooding issues in a landowner's yard.
- **Native plants** – These help to encourage infiltration and maintain healthy soils. Native plants provide an additional ecosystem for wildlife. Plants native to Minnesota are already adapted to our soil and climate which means they require minimal care to grow and thrive.
- **French drains (Dry Wells)** – These help to temporarily store water and encourage stormwater to infiltrate into surrounding soils. French drains are installed underneath the ground and backfilled with coarse stone aggregate.

Road Authority Responsibilities, Duties, Authorizations According to Drainage Law

Drainage 101 County Roadways, City Streets, and Drainage Ways: Best Practices and Resources Guide

1. Road Authorities are responsible for:
    a. Roadside **ditching** to protect roads from flooding and erosion.
    b. Facilitating **safe passage** of the traveling public.
    c. Accommodating reasonable roadway **drainage improvements.**
2. Provide **approaches** (ie. culvert crossings) required by the construction of a new road or relocation of an existing road.
3. Authorized to: **Repair, clean out, deepen, widen, and improve** road ditch drainage.
4. Obligated to **manage surface waters** when constructing and improving public highways and to continue the flow and accumulation of surface waters along their ordinary course within reasonable design standards.
5. **Bridges and culverts** on public roads required by the construction or improvement of a drainage project or system must be constructed and maintained by the road authority responsible for keeping the road in repair, damages having first been paid therefore to the road authority.
6. May not prohibit **natural drainage** or reasonable drainage improvements from entering the road right-of-way or crossing the right-of-way along their ordinary course.
7. May adopt a policy or permitting program, set specifications, adopt reasonable rules, and require a bond before **issuing permits** to drain into, across or along or otherwise enter the road right-of-way.
8. The road authority is <u>not</u> liable for **damaged drainage infrastructure** within its right of way unless the damage is the direct result of actions of the road authority.
9. Road authorities are immune from various types of claims. Immunity is based on the following:
    a. Road authority decisions are done for the public good and involve weighing of multiple factors that have both negative and positive outcomes.
    b. Judicial branch through the medium of lawsuits should not second guess those political balancing decisions of road authorities.
    c. An award obtained against a governmental entity is paid out of public funds (funded by the taxpayer).
    d. Public funds are better protected, and it is a better use of public funds if a few individuals suffer as opposed to the public in general.
    e. Governmental agents will perform their duties more effectively if not hampered by fear of tort liability.
10. Road authorities may acquire **easements** needed for drainage to meet their obligations and responsibilities.
11. A road authority must **inspect and maintain** drainage infrastructure under its jurisdiction to avoid potential claims for damages resulting from unsafe or deteriorated conditions.

Agency Involvement

Drainage 101 County Roadways, City Streets, and Drainage Ways: Best Practices and Resources Guide

The following is intended to be a guide for landowners, both private and public, who are looking for guidance on when a certain agency may become involved in a drainage related issue or project.

Board of Water and Soil Resources (BWSR)

- **What is BWSR?** – The Minnesota Board of Water and Soil Resources works with public and private organizations and citizens to protect Minnesota's water and soil resources. BWSR is responsible for regulating the Wetland Conservation Act (WCA) and aiding in comprehensive local water management.
- **When could BWSR become involved in a drainage related issue or project?**
    - Any impacts to a wetland (filling, excavating or draining of a wetland).
    - Any work in or near wetlands may be subject to WCA regulation.
- **What permitting/regulatory requirements does BWSR have?**
    - Wetland regulation under the WCA is implemented at the local level (by the Local Governmental Unit (LGU). Cities, Counties, Soil and Water Conservation Districts and Watershed District can all constitute LGUs under the WCA.
    - BSWR administers the rules for the WCA (Part 8420), participates on technical evaluation panels, and assures proper implementation of the WCA by LGUs.
    - Best to contact the LGU in the area of the drainage related issue or project (typically a city, county, watershed district, watershed management organization or soil and water conservation district) - https://bwsr.state.mn.us/wetland-conservation-act-contacts.
    - Activities that typically do require LGU determination of exemption, no-loss or replacement
        - Filling, excavating or draining of a wetland.
        - Culvert replacement within or crossing a wetland.
- **What are the best ways to determine if a drainage issue or project is in a wetland?**
    - Use the online National Wetlands Inventory mapper https://www.fws.gov/wetlands/data/mapper.html.
    - Contact LGU.
    - Hire a certified wetland delineator to delineate the area of interest.

Minnesota Department of Natural Resources (MnDNR)

- **What is MnDNR?** – A State agency charged with the preservation, protect, restoration and enhancement of Minnesota resources. The MnDNR is responsible for protecting and managing land, water, minerals, fish, and wildlife. The MnDNR regulates work in all Public Waters as define by the Minnesota State Legislature and identified in the public waters inventory, consist of lakes, wetlands, streams, and rivers.
- **When could the MnDNR become involved in drainage related issue or project?**
    - Any drainage or other work in a public water that may change the course, current or cross section of the public water.
    - Any drainage or other work that occurs at or below the defined Ordinary High Water Level (OHWL) of a public water.

- **What permitting requirements does MnDNR have?**
  - Activities in a public water that typically do require a permit
    - Bridge or culvert repair or replacement.
    - Tile repair or replacement.
    - Re-sloping of ditches or in-slopes.
    - Filling or excavation.
    - Construction or replacement of a reservoir, dam or waterway obstruction.
  - Activities that typically do not require a permit
    - Repair of public drainage systems established under MN State Statutes 103D or 103E.
    - Culvert restoration or replacement of the same size and elevation, if the restoration or replacement does not impact a trout stream.
  - Work in water exclusion dates – see MnDNR Best Practices Manual https://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/gp_2004_0001_manual.html.
- **What are the best ways to determine if a drainage issue or project is in a public water?**
  - Use the Public Waters Inventory Maps https://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html.
  - Use the Public Waters Inventory Lists/Orders https://www.dnr.state.mn.us/waters/watermgmt_section/pwi/download_lists.html.
  - Contact local area DNR hydrologist https://files.dnr.state.mn.us/waters/area_hydros.pdf.

Minnesota Pollution Control Agency (MPCA)

- **Who is the MPCA?** – The Minnesota Pollution Control Agency was established in 1967 by the Minnesota State Legislature to regulate the environmental quality in the State of Minnesota. The agency is responsible for enforcing the rules and regulations set forth by the State to protect the air, waters, and land within Minnesota.
- **When could the MPCA become involved in a drainage related issue or project?**
  - Municipal stormwater
    - MS4 (Municipal separate storm sewer system) projects.
    - Subsurface sewage treatment systems (septic systems).
  - Construction stormwater
    - Any construction work that disturbs over 1 acre of soil.
- **What permitting requirements does the MPCA have?**
  - Municipal stormwater
    - MS4's must satisfy the requirements of the MS4 general permit if they are at least one of the following:
      - Located in an urbanized area and used by a population of 1,000 or more.
      - Owned by a municipality with a population of 10,000 or more.
      - Have a population of at least 5,000 and the system discharges to specially.
    - MS4 must develop and implement a stormwater pollution prevention program (SWPPP).
  - Construction stormwater
    - Permit is required for any construction activity disturbing one acre or more of soil.
    - A permanent stormwater treatment system is required for any construction project that creates one or more acres of impervious surface.
    - Stormwater Pollution Prevention Plan (SWPPP) requirements.
    - Additional requirements if a project is located within 1 mile of a special or impaired water.

- **What are the best ways to determine if a drainage issue or project is located within an MS4?**
    - Use the MS4 mapping tool https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=8d310e604baa43699b25395834d0c69a.
    - Contact local City/Township.
- **What is the best way to determine if a project is located within 1 mile of a special or impaired**
- **water?**
    - Use the special and impaired waters search tool https://pca-gis02.pca.state.mn.us/ISW/.

Minnesota Department of Transportation (MnDOT)

- **What is MnDOT?** – The agency responsible for implementation of roadway construction projects and providing road and travel information is the Minnesota Department of Transportation. MnDOT plans, designs, constructs, and maintains the highways in the state.
- **When could MnDOT become involved in a drainage related issue or project?**
    - Any work occurring on MnDOT right of way.
    - Any drainage discharging to or from MnDOT right of way.

Watershed Districts

- **What are watershed districts?**
    - Established by the MN State Legislature through the Watershed Act, Chapter 103D.
    - Primary goals are to protect and conserve the natural resources in Minnesota.
    - Since water does not flow based on political boundaries, watershed district boundaries were established to manage the water resources for each watershed.
    - The boundaries of each district encompass the land area in which water flows to one outlet.
    - There are 42 total watershed districts in the state (see the Minnesota Watershed District Map for a depiction of all 42 watershed boundaries).
- **When could a Watershed District become involved in a drainage related issue or project?**
    - Any drainage related issue or project located within the boundaries of the watershed district.
    - When the Watershed District has adopted rules or a permitting program related to the activity.
- **What permitting requirements do Watershed Districts have?**
    - Each watershed district has different permitting requirements – it is best to contact the watershed to determine what permitting requirements they have.
    - Typical requirements include:
        - Additional and/or more strict treatment requirements (stricter than MPCA's requirements) for construction work that disturbs over 1 acre of soil.
        - Erosion and Sediment control.
        - Floodplain alterations.
        - Wetlands.
            - A watershed district may be the LGU for the regulation of WCA.
            - Wetland buffer requirements.
        - Shoreline and Streambank Stabilization/Alterations.
        - Dredging.
        - Bridge and Culvert crossings.

- **What is the best way to determine if a drainage related issue or project is located within a Watershed District?**
    - Use the Minnesota Watershed District Map https://www.mnwatershed.org/watershed-district-map.

Counties and Cities (Local Road Authority)

- **When could the Local Road Authority become involved in a drainage related issue or project?**
    - Any work occurring on local road authority right of way or drainage/utility easement.
    - Any drainage discharging to or from local road authority right of way or drainage/utility easement.
- **What permitting requirements do Local Road Authorities have?**
    - Some counties and cities have a permitting program in place.
    - Permitting may include – drain tile crossing construction or replacement, ditch cleaning, sump pump discharge, permitting related to meeting City's MS4 requirements.
    - Some activities may be subject to County land use or zoning permitting.

Soil & Water Conservation Districts (SWCD's)

- **What is a Soil & Water Conservation District (SWCD)?**
    - Established by the MN State Legislature through the Enabling Act.
    - Purpose is to conserve soil, water, and related natural resources on private land.
    - Provide soil and water conservation services to private landowners.
    - Participate in and fund soil and water conservation improvement projects.
- **When can SWCD's become involved in a drainage related issue or project?**
    - Potentially any soil and water related issue or project located within the boundaries of the district.
    - In counties where SWCD is designated as the LGU for WCA compliance.
    - If SWCD is involved in funding for a project.
    - In counties where SWCD is designated as the county ditch inspector.
- **What permitting requirements do SWCD's have?**
    - Permitting may include – wetlands, erosion control, public drainage ditches, drain tile.
- **What is the best way to determine if a drainage related issue or project is located within a SWCD?**
    - Use the Minnesota Association of Soil and Water Conservation Districts Map by County https://www.maswcd.org/SWCDs_On_The_Web/swcds_on_the_web.htm.

Drainage Design

Drainage 101 County Roadways, City Streets, and Drainage Ways: Best Practices and Resources Guide

The following is intended to be a quick guide regarding Drainage Design. This guide provides fundamental concepts relating to drainage design and how they relate to public and private landowners.

- Hydrology
    - Design Frequency: the number of times a flood of a certain magnitude or greater can be expected to occur on average over a period of time.
        - For example, a 50-year recurrence interval means that every year there is a 2% chance that a 50-year flood will occur.
        - Or a 100-year recurrence interval means every year there is a 1% chance that a 100-year flood will occur.
    - Atlas 14 Data: historical rainfall data that is used to estimate precipitation frequencies based on geographical location.
    - Peak Discharge: maximum rate of flow of water passing a given point during or after a rainfall event or snowmelt.
    - Time of concentration: time it takes for a drop of water falling on the hydraulically most remote point in a watershed to travel through the watershed to the point under investigation.
    - Drainage Area: the area draining to a certain point.
    - Hydrologic Soil Group: A group of soils having the same runoff potential under similar storm and cover conditions. This is a factor in calculating peak discharge.
- Rural Hydraulic Design
    - Why do we model culverts and bridges? – to adequately size culverts and bridges to accommodate the drainage flowing to the and to prevent unexpected flooding and overtopping of roadways.
    - Design events.
        - Centerline culverts crossing major highways are typically designed to a minimum of a 50-year event.
        - Entrance culverts under driveways and field entrances are typically designed to a minimum of 10-year event – driveways and field entrances are allowed to overtop in higher events but should be designed such that the overflow will drain into a nearby ditch and not onto a landowner's property.
    - Overtopping event: the point where during a certain rain event, the discharge flowing. through a culvert starts to flow over the roadway or approach and exceeds the design event
    - Box culvert sizing.
        - Span: the width measurement of a box culvert opening.
        - Rise: the height measurement of a box culvert opening.
        - Standard box culvert sizes.
            - Span: 6 to 16 feet.
            - Rise: 4 to 14 feet.
        - These are typically designed to the overtopping event or greater.
        - MnDNR sometimes requires 2-year flow information for fish passage and may require the culvert to be "buried" 1 foot to ensure fish passage.
- Subsurface Drainage (Drain Tile)

- Why are Drain tiles/Subsurface Drainage installed? – Provide better drainage to farm field soils especially in flat ground and reduce risk of crop water stress from excessive rainfall.
- Drain tile design.
  - Typically designed to remove water within 24-48 hours.
  - Considers: drainage area, time of concentration, soil type.

- Urban Hydraulic Design
  - Why do we model storm sewer? – to adequately size storm pipes and determine catch basin locations to prevent roadway flooding and convey stormwater.
  - Design event typically used is 10-year.
  - Allowable spread.
    - MnDOT and Cities/Counties have different requirements for how much water is allowed to "spread" or accumulate onto the roadway in a storm design event.
    - Typically this is ½ the lane for single lane roadways.
    - Depends on the roadway speed – roadways with higher speeds typically have less allowable spread than roadways with lower speeds (less than 40 mph).
- Pond/BMP Design
  - Stormwater is a leading source of water pollution (MPCA).
  - BMP (Best Management Practice).
    - Practice, technique, measures that prevent or reduce water pollution.
    - Some examples are rain gardens, ponds, permeable pavement, tree trenches, underground storage/infiltration/filtration.
  - Pond/Basin Design.
    - Design event typically used is 100-year.
    - HWL (High Water Level): This is the elevation that a pond or basin is designed to reach in a rain event (typically the 100-year event).
    - Typically have some sort of outlet control whether that be an outlet control structure, culvert/apron outlet, or weir that controls how the water leaves the basin and how much water is treated.
    - Pond/Basin Types.
      - Retention (Wet) Ponds or Basins.
        - Designed to be wet up to a certain elevation that is referred to as the normal water level (NWL).
        - The outlet control is designed such that the NWL is always maintained.
        - Recommended parameters:
          - Average depth of permanent pool shall be at least 4 feet with a maximum depth of 10 feet.
          - Maximum of 3:1 slopes above and below the NWL.
          - 10 foot wide bench with a maximum slope of 10:1 below the NWL.
      - Detention (Infiltration) Ponds or Basins.
        - Designed to infiltrate water through the bottom of the basin during a storm event.
        - Uses the existing soils to infiltrate water.
        - During a storm event, these basins will have standing water typically up to 24-48 hours.
      - Filtration Basins.
        - Like an infiltration basin but is designed with a filter media and drain tile to filter and treat stormwater.
        - These are typically implemented if the existing soils in the area do not infiltrate water well (clay soils).
        - During a storm event, these basins will have standing water typically up to

24-48 hours.

- Recommended Pond design parameters:
  - Minimum freeboard above the HWL for the lowest building floor shall be 2 feet.
- Emergency Overflow or Spillway (EOF): A device that is used to release excess discharge from ponds or basins. Its purpose is to provide a safe outlet for discharge in the event a primary outlet device fails. The device is typically in the form of a berm, outlet structure, riser or culvert pipe.
  - For berm outlets, a recommended sizing is a minimum bottom width of five feet and 4:1 side slopes.
  - Maximum flow depth in EOF's is recommended to be less than equal to one foot as calculated for a 100-year back-to-back storm event.
  - Emergency spillway shall be installed a minimum of 1 foot below the lowest building opening adjacent to the pond.

For additional information regarding these topics:

- MnDOT Drainage Manual
  https://www.dot.state.mn.us/bridge/hydraulics/drainagemanual.html
- Minnesota Stormwater Manual
  https://stormwater.pca.state.mn.us/index.php/Main_Page
- MPCA's Resident's Guide to Stormwater
  https://www.pca.state.mn.us/air-water-land-climate/water-permitting-guide-for-residents

Water and Drainage Law:
Drainage 101 County Roadways, City Streets, and Drainage Ways: Best Practices and Resources Guide

Minnesota State Statutes

Water and Drainage Law is governed by the Minnesota State Statutes. The important chapters of the State Statues that apply to water and drainage are chapters 103E, 103F, and 103G.

Chapter 103E - Drainage

Link to Chapter 103E – Drainage

Chapter 103E covers "public" drainage systems. Public drainage ditches covered under 103E benefit most agricultural and rural properties. This law allows landowners to work together to improve and repair drainage systems across public and private properties. Chapter 103E drainage ways are administered by the local drainage authority (typically County Board of Commissioners or Watershed District Board of Managers).

Chapter 103F – Protection of Water Resources

Link to Chapter 103F – Protection of Water Resources

Chapter 103F describes the rules relating to floodplains, river basins, shorelands, and wetland restoration. 103F also includes laws and processes for the wetland establishment and restoration costshare program that is available to use by local units of government.

Chapter 103G – Waters of the State

Chapter 103G – Waters of the State

Waters of the State Chapter 103G governs the public waters and wetlands in the state. This chapter sets clear rules for how wetlands can be restored or replaced if a construction project or entity may impact a wetland. This chapter also provides clear guidance on property owners use of public waters and wetlands. There is also information on what type of work can be done in a public water without the need for a permit.

Facts of Water and Drainage Law

The following information provides the basic concepts of Drainage Law that have been established through case law and as defined by the Minnesota State Statues. These are basic concepts and apply to some situations. Legal counsel should be obtained to determine the applicable rights and laws for a specific drainage situation.

Case Law

- Common law is created when lawsuits are made that require court's ruling to resolve a dispute between two parties.
- See case law examples provided by Rinke Noonan in Drainage Law Outline.

Types of Water Features

- **Watercourse** – A water feature that has flow with substantial permanency and continuity and is contained within a defined bed and bank. Watercourses may be natural, altered, or artificial.
- **Surface water** – A water feature that consists of waters from rains, springs, or melting snow which lies or flows on the surface of the earth and does not form a part of a well-defined body of water or natural watercourse.

- **Water basin** – A water feature that consists of an enclosed natural depression with definable banks, capable of containing water, and is discernible on aerial photographs.
- **Public water** – A watercourse or basin meeting the definition of "public waters" pursuant to statutes section 103G.005, subd. 15 and is included in the public waters inventory.

Reasonable Use

- **Reasonable Use** – Concept that a landowner can drain their land to another property if it is considered reasonable.
- A landowner may drain surface waters from their property to another if:
  - There is a reasonable need.
  - Reasonable steps are taken to prevent damage to the land.
  - The benefit to the land drained outweighs the harm to the land receiving the drainage.
  - Reasonably improves drainage flow and capacity.
- "**Reasonableness**" is measured on a case-by-case basis, assistance from a hydraulic engineer should be obtained.
- If a road authority obstructs, diverts, or enhances drainage in a manner that causes damage to adjacent land, compensation to the adjacent landowner may be required.

Roadway Drainage

- A road authority must design a roadway crossing to accommodate the area's natural flows – if this is not met, the road authority could be subject to a claim for damages and be responsible to compensate the owner if any property that damaged.
- A culvert crossing must be constructed to the designed hydraulic capacity or better.
- It is **unlawful** to:
  - Obstruct ditches.
  - Drain waste material into ditches.
  - Damage storm drains.

Private Drainage and Road Right of Way

- Landowners have the right to enter a road right-of-way to maintain the natural drainage from their property.
- When drainage flows to a road, the adjacent landowner has a right to enter the right-of-way.
- Landowners adjacent to road right of way, have the right to connect a drain or ditch to the road ditch.
- If landowners enter the road right of way, the roadway must be left in the same condition as existing.
- A landowner must complete permit from a road authority to install a drain tile along or across the road right-of-way.
- During the construction or reconstruction of a highway:
  - Landowners have the right to request to install a tile drain for agricultural benefits.
  - Drain tile can be requested if an outlet cannot be obtained on the upstream side of the right-of-way and requires crossing the roadway.
  - Expenses for installing the tile drain shall be paid through roadway funds.
  - Landowner must notify road authority of the drain tile need prior to the start of construction.