A Guide for

Drainage Superintendents

Working under the Drainage Act in Ontario

Publication 859

Ministry of Agriculture,
Food & Rural Affairs

Ontario

A Guide for

Drainage Superintendents

Working under the Drainage Act in Ontario

Publication 859

Ministry of Agriculture,
Food & Rural Affairs

Ontario

Editor

Arlene Robertson, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)

Co-Authors

Timothy Brook, P. Eng., OMAFRA

Sid Vander Veen, P. Eng., OMAFRA

Katharine Morris, OMAFRA

Jane Sadler Richards, Ph.D., P. Ag., Paralegal, Cordner Science

Wray Wilson, Drainage Superintendents Association of Ontario (DSAO)

Acknowledgements

The authors would like to thank the following people for their considerable contributions to the development of this guide:

Sarah Fleischhauer, Maitland Valley Conservation Authority

Art Groenveld, P.Eng., Ministry of Transportation

Davin Heinbuck, Ausable Bayfield Conservation Authority

Peter Jeffery, Ontario Federation of Agriculture

Geoff King, Maitland Valley Conservation Authority

Lu-Ann Marentette, Municipality of Leamington

Greg Nancekivell, Drainage Superintendents of Ontario

Dave Richards, Ministry of Natural Resources and Forestry

David Ryan, City of Ottawa

Jenn Thomas, Fisheries and Oceans Canada

Bill Trenouth, Credit Valley Conservation Authority

Ken Vegh, Town of Kingsville

Need technical or business information?

Contact the Agricultural Information Contact Centre at 1-877-424-1300 or ag.info.omafra@ontario.ca

To obtain copies of this or any other OMAFRA publication, please order:

- Online at Publications Ontario
- By phone through the Service Ontario Contact Centre
  - Monday to Friday, 8:30 AM to 5:00 PM
  - 416-326-5300
  - 416-325-3408 (TTY)
  - 1-800-668-9938 Toll-free across Canada
  - 1-800-268-7095 TTY Toll-free across Ontario

Disclaimer

This guide is intended for informational purposes only and is not meant to provide engineering, legal or other advice. Although the guide has been carefully written, the authors and the Government of Ontario do not accept any legal responsibility for the content or any consequences, including direct or indirect liability arising from its use. While some vendors/products may be identifiable, it does not represent an endorsement of any technology or product.

Published by the Ministry of Agriculture, Food and Rural Affairs

Toronto, Canada
ISBN 978-1-4868-5178-2 (PRINT)
ISBN 978-1-4868-5179-9 (PDF)

Outside Front cover – Dietrich Engineering Ltd

Inside Front cover – Tulloch Engineering

Table of Contents – Town of Bradford West Gwillimbury, Ontario

Tab Part A – Dave Richards, Ontario Ministry of Natural Resources and Forestry

Tab Part B – Dave Richards, Ontario Ministry of Natural Resources and Forestry

Back cover – Tulloch Engineering

Overview of the Guide

Providing drainage superintendent services in Ontario under the *Drainage Act, RSO 1990* *(Drainage Act, 1990)*, as amended, is a complex task of balancing property owner needs, environmental and societal interests, regulatory compliance and protection of the municipal infrastructure. This guide is designed to help drainage superintendents navigate through these challenges and opportunities and communicate with property owners, council members, environmental agencies and contractors. The guide is intended to assist but not prescribe how the drainage superintendent fulfills their responsibilities under the *Drainage Act, 1990*.

To work as a drainage superintendent, knowledge and understanding of the *Drainage Act, 1990* process, drainage system function and awareness of other legislation and how it impacts drainage works are essential.

The guide is presented in two parts:

- **Part A** addresses the requirements for drainage superintendents to fulfill their role under the *Drainage Act, 1990*.
- **Part B** addresses other applicable regulatory requirements, policy and agency interests and other aspects required to manage drainage in an environmentally sustainable manner.

DID YOU KNOW?

The Ontario Society of Professional Engineers (OSPE) Land Drainage Committee website (www.landdrainageengineers.com) contains many useful papers and presentations on various aspects of the *Drainage Act, 1990*.

Table of Contents

Table of Contents

Part A
Application of the Drainage Act Requirements

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Part B

Managing Drainage Works for the Future

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

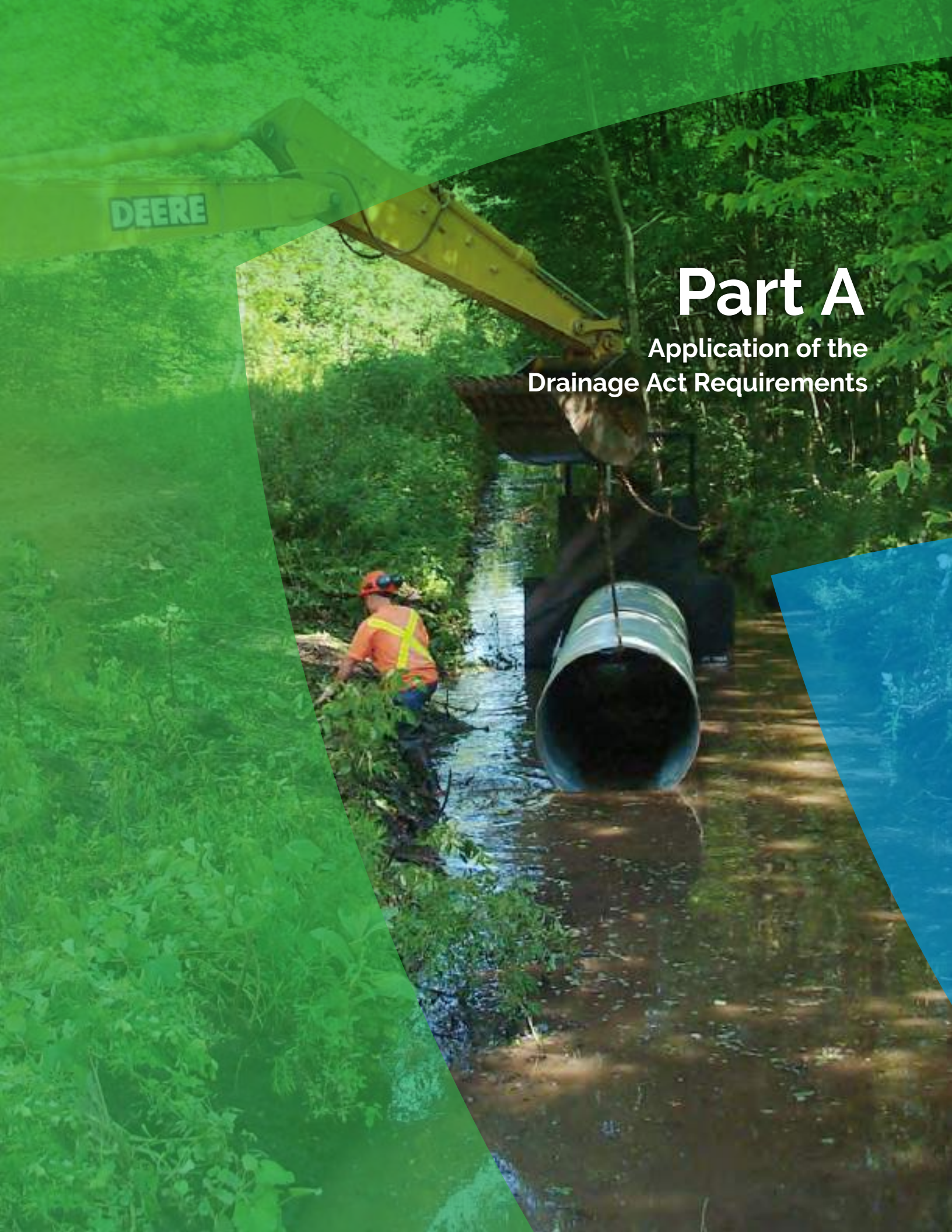
Figures

Part A

Part B

Part A

Part B



Part A

Application of the Drainage Act Requirements

Part A – Table of Contents

Application of the Drainage Act Requirements

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 1

Introduction

1.1 The Water Cycle

The water cycle (Figure A1-1) is the interaction between several hydrologic processes including precipitation, infiltration, evaporation and runoff. Surface water includes runoff that moves downhill across the surface or infiltrates into the soil. Surface water is divided into two categories: natural and constructed drainage.

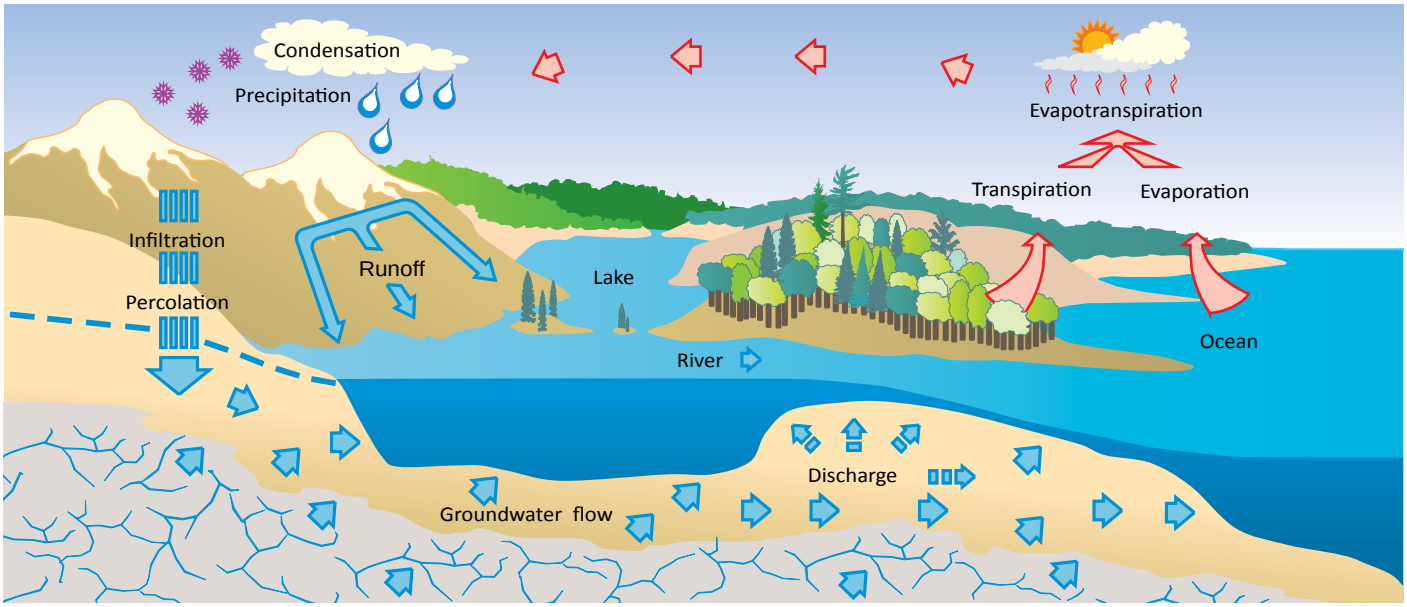


Figure A1-1. The water cycle.

1.1.1 Natural Drainage

Natural surface water runoff may move as sheet flow or flow through small rivulets or surface runs (Figure A1-2). Surface water does not flow in a defined channel of a natural watercourse.

Figure A1-2. Surface water flowing across a farm field.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

A natural watercourse is a natural channel where water flows between defined banks. The flow of water does not need to be constant, but the channel must be a permanent landmark. The watercourse may also spread over a level area without defined banks, before flowing again as a defined channel. The riparian zone is the area between the water and the adjacent land use and includes the banks of a natural watercourse (Figure A1-3).

Figure A1-3. A natural watercourse and riparian zone.
Source: Tulloch Engineering, Espanola, Ontario

There are three types of natural watercourses: ephemeral, intermittent and perennial streams.

- **Ephemeral streams** flow on an irregular basis and generally in response to a specific rainstorm. (Note: Ephemeral streams may or may not be considered natural watercourses under common law. See Chapter A1.2.2.)
- **Intermittent streams** do not flow throughout the year but may flow for several months in the year when there is a source of water (e.g., snowmelt).
- **Perennial streams** flow throughout the year.

1.1.2 Constructed Drainage

Constructed drainage includes drainage works built to improve surface or subsurface water flow for rural and urban purposes.

Surface drainage removes excess water using channels, land grading, pipes and surface inlets. Subsurface drainage removes excess soil water from the soil profile using perforated pipe. Cropland drainage (Figure A1-4) refers to surface and subsurface drainage components on agricultural land that is undertaken by the property owner.

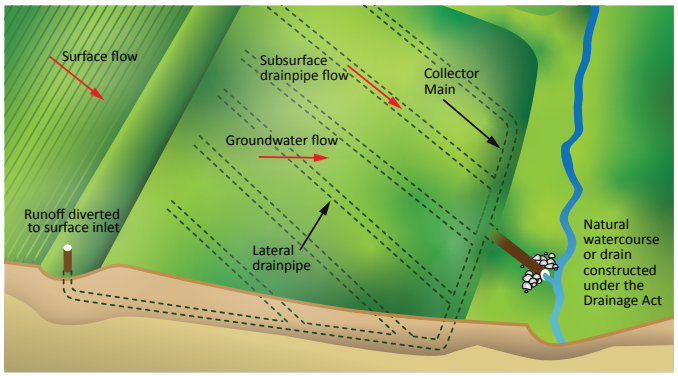


Figure A1-4. Cropland drainage includes surface and subsurface drainage that outlets to a drain or natural watercourse.

To function effectively, these drainage systems require a sufficient outlet where the water can be discharged without causing damage to others. This may be a channel or pipe that flows across downstream lands (Figure A1-5).

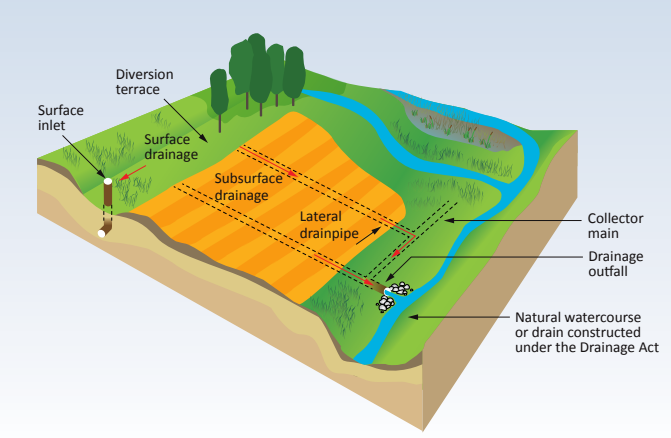


Figure A1-5. In-field drainage systems outlet to a natural watercourse or drain constructed under the *Drainage Act, 1990*.

In Ontario, the *Drainage Act, 1990* provides a procedure for property owners to obtain a sufficient outlet for their constructed drainage system. These are generally known as municipal drains and the drainage superintendent is responsible, on behalf of the municipality, for managing them (See Chapter A1.3).

1.2 Regulation of Drainage in Ontario

1.2.1 Overview of Statute Law

There are three levels of government in Ontario: federal, provincial and municipal. Each level has the authority to make laws, which set basic standards of behaviour and rules that are enacted and enforced by government or by others authorized to do so.

Statute law (also known as legislation, statutes or acts) is passed by the federal or provincial legislature. For example, the *Fisheries Act, 1985* is a statute enacted by federal legislature and the *Drainage Act, 1990* is a statute enacted by the Legislature of Ontario.

Municipal government is created by the provincial government and may consist of upper, lower and single tier municipalities. All are governed by a municipal council.

In Canada, different levels of government are responsible for different aspects of drainage, as further explained in this guide.

Regulations, passed under the authority of an act, are a set of rules on how the legislation is to be carried out. They add depth and details to the requirements in the act and provide citizens with the information they require to abide by the law. For example, there are two regulations associated with the *Drainage Act, 1990* including O Reg. 381/12 Forms and O Reg. 232/15 Rules of Practice and Procedure in Proceedings before the Referee.

Administrative rulings are decisions made by bodies created under the act to hear complaints or applications related to the act or its regulations. For example, to hear appeals under the *Drainage Act, 1990*, the act establishes three different appeal bodies:

- Court of Revision
- Agriculture, Food and Rural Affairs Appeal Tribunal (AFRAAT)
- drainage referee

1.2.2 Overview of Common Law

For the purposes of this guide, common law includes rules, principles and customs initially established in England (Canadian law evolved from English Common Law, except in Quebec where the law evolved from Roman Civil Law and the French Civil Code). In today's terms, common law has evolved along with our society to accommodate new customs and practices that are based on previously decided cases within our legal system (i.e., case law).

Today, we use a mixed system of law that includes two principal sources of written law:

- statutory law – includes regulations made under the authority of acts
- common law – includes the legal rules developed from previous cases

Common law always applies unless it is overwritten by statute laws.

1.2.3 Resolving Drainage Disputes

If statute law (e.g., *Conservation Authorities Act, 1990, Lakes and Rivers Improvement Act, 1990, Drainage Act, 1990)* can be applied to a drainage issue, then the parties to the issue should contact the government agency responsible for the administration or implementation of the act.

If no statute law applies to a drainage issue, then:

- common law principles apply to drainage issues
- there is no means by which any ministry or department of a federal, provincial or municipal government can enforce anything
- obtain legal counsel

Common law drainage issues are generally divided into two categories: natural watercourses and surface water.

1.2.3.1 Distinguishing Between Natural Watercourses and Surface Water

When a common law drainage dispute arises, determine whether it is a dispute on a natural watercourse or surface water. Only a judge can determine whether a specific flow of water is, or is not, a natural watercourse under the law. The following are some factors that may be considered by the courts:

- The channel must be a permanent, natural feature on the land. A constructed channel is not a natural watercourse. It is uncertain whether the courts would consider a natural watercourse, modified in the past, to be considered a natural watercourse.
- Water must flow through a channel that has banks and a bed. If the water spreads out from the banks at some point, it must eventually flow back into the defined channel.
- The water flow in a natural watercourse does not have to be continuous but must be significant. If water only flows after a heavy rain, it may not be a natural watercourse even if it has defined banks.

While an agency or person may have a statutory or other interest in a natural watercourse, no agency or person is responsible for the management of a natural watercourse (e.g., no agency or person is responsible for removing trees or other naturally occurring obstructions from a watercourse).

1.2.3.2 Natural Watercourses and Riparian Property Owners

Riparian property owners own the land immediately adjacent to a natural watercourse.

The following summarizes the rights and obligations of riparian property owners as established by the courts:

- **Right of drainage** – Riparian property owners have the right to drain their land into the natural watercourse, even if it may cause damage to downstream property owners. Non-riparian property owners do not have this right.
- **Right to use water for domestic purposes** – Riparian property owners have the right to use the water in a natural watercourse for domestic purposes, but this right has been capped by the Permit to Take Water (PTTW), under Section 34, *Ontario Water Resources Act, 1990*.
- **Obligation to not interfere with the channel to the detriment of others** – Riparian property owners can modify the channel of a natural watercourse provided it does not interfere with the general principle that "water flows naturally and should be permitted thus to flow." Any interference with a natural watercourse (including the removal of a beaver dam) may be grounds for legal action. Permits and/or approvals may also be required under various statute laws.

- **Obligation to not dam a natural watercourse** – Blocking a natural watercourse is in direct conflict with the general principle for natural watercourses that "water flows naturally and should be permitted thus to flow."
- **Obligation to accept the water** – A riparian property owner must accept the results if water overflows a natural watercourse and floods their land (Figure A1-6). However, if the flooding is caused by the actions of upstream non-riparian property owners, there may be grounds for legal action.

Figure A1-6. Riparian properties may be subject to flooding.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

1.2.3.3 Surface Water Flow

When a dispute arises, only a judge can make decisions on issues related to surface water flow under the law. The following summarizes the surface water principles that have been established by the courts.

Uncollected surface water

- The flow of uncollected surface water onto an adjoining property is not grounds for legal action.
- A lower property or downhill owner receiving the surface water can protect their property by building berms or dykes, provided these are built on the lower property owner's property.

Collected surface water

- Collected surface water (e.g., in a channel, pipe or eaves trough) must be discharged where it will not cause problems to downstream property owners, often referred to as taking the water to a sufficient outlet (Figure A1-7).
- If the discharge of collected surface water causes problems on or damages downstream properties, this could be grounds for legal action.

Figure A1-7. Collected surface water.
Source: Tulloch Engineering, Espanola, Ontario

Prescriptive rights

- If a property owner has collected and directed surface water onto lower land without being contested and without permission for 20 years, the property owner may have acquired a "prescriptive right" to drain the water onto the lower land.
- Although a person may claim this right of drainage, the right does not exist until legal action is taken and a judge rules that the prescriptive right of drainage exists.
- A prescriptive right is only valid for the original conditions that created it. If the conditions are altered resulting in increased volume or rate of flow, the prescriptive right of drainage may be lost.

1.2.4 Private "Common Law" Drainage Issues

1.2.4.1 Drainage Superintendent Response

What is the role of the drainage superintendent in common law problems? How involved should they become in these disputes? The following are a few points to consider:

- Unless the municipality is involved (e.g., road authority), a common law dispute is not the responsibility of the municipality to resolve. However, the drainage superintendent may share, within reason, their knowledge of the common law as it applies to drainage.
- The drainage superintendent should not take sides. Their municipality may not support involvement of municipal staff in common law drainage disputes.
- The drainage superintendent must be very careful about providing personal opinions.
- The drainage superintendent should inform the parties that ultimately, only a judge can decide who is right or wrong.
- Keeping the above in mind, the drainage superintendent should give the parties involved some options on how to resolve the problem. Where possible, provide information to support those options (e.g., factsheets on common law, copies of common law court decisions, factsheets on the *Drainage Act, 1990*).

1.2.4.2 Resolution Options

If the drainage dispute falls under the realm of common law, the drainage superintendent should determine if it is a "surface water" issue or a "natural watercourse" issue and ask questions of the property owner to develop an opinion on the type of common law dispute. Since common law disputes can only be decided by a judge, even after forming an opinion, the drainage superintendent should use phrases such as, "If this is not a natural watercourse…" or "If your neighbour has collected surface water…"

The following situations show a variety of options for resolving drainage issues. Unless the solution falls under the *Drainage Act, 1990*, the drainage superintendent should be clear that it is up to the property owner to ensure implemented options comply with legislation and bylaws. The first and best option is a negotiated solution.

Situation #1

Lower property owner receiving free flowing surface water (not collected) from higher property owner (Figure A1-8).

Options:

- negotiate a solution
- resolve using the *Drainage Act, 1990* (mutual agreement drain or petition drain)
- block the flow of water with dykes or berms (seek legal advice)

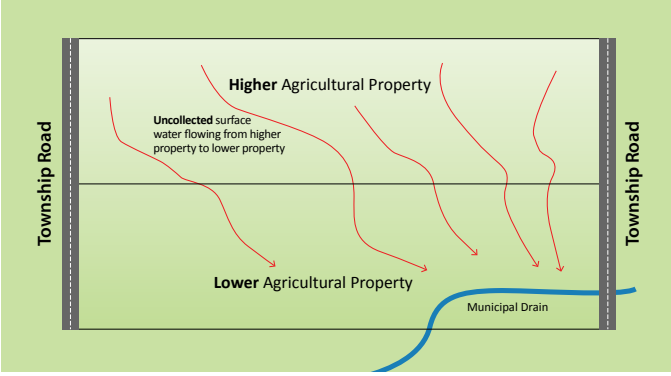


Figure A1-8. Lower property owner receiving uncollected surface water from higher property.

Situation #2

Lower property owner receiving collected surface water from higher property owner (Figure A1-9).

Options:

- negotiate a solution
- determine if there is a prescriptive right through the *Real Property Limitations Act, 1990*

- if prescriptive right is established, potential solution under the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain)
- if no prescriptive right established, block flow of water with dykes/berms or take legal action through civil courts after seeking legal advice

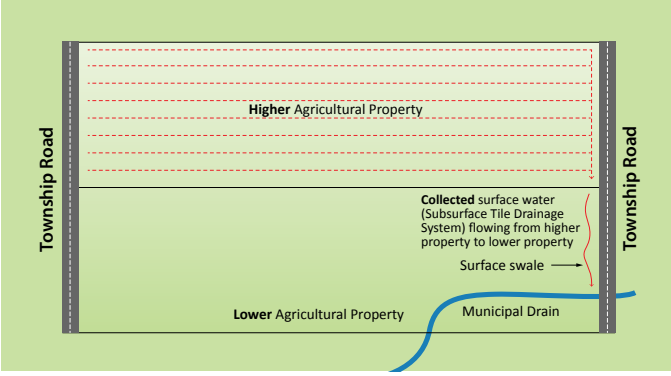


Figure A1-9. Lower property owner receiving collected surface water from higher property owner.

Situation #3

Higher property owner's collected surface water is blocked by lower property owner (Figure A1-10).

Options:

- negotiate a solution
- determine if there is a prescriptive right through the *Real Property Limitations Act, 1990*
  - if Prescriptive Right established, potential solution under the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain) or take legal action through civil courts after seeking legal advice.
  - if no Prescriptive Right established, potential solution under the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain)

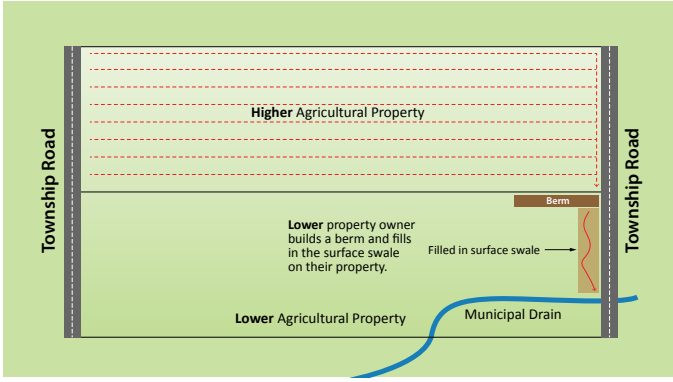


Figure A1-10. Higher property owner's collected surface water is blocked by lower property owner.

Situation #4

Higher property owner's surface water (not collected) is blocked by lower property owner (Figure A1-11).

Options:

- negotiate a solution
- resolve using the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain)

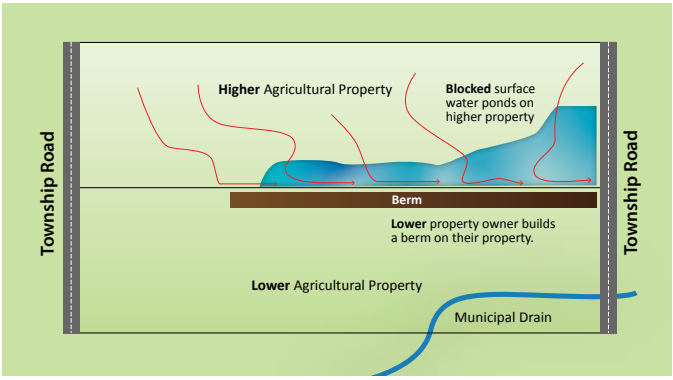


Figure A1-11. Higher property owner's surface water (not collected) is blocked by lower property owner.

Situation #5

Higher property owner flooded due to a natural watercourse blocked by lower property owner (Figure A1-12).

Options:

- negotiate a solution
- resolve using the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain)
- take action through *Lakes and Rivers Improvement Act, 1990* under MNRF
- take legal action through civil courts (seek legal advice)

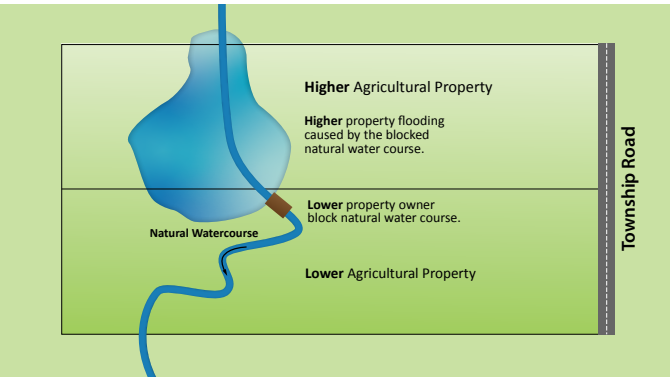


Figure A1-12. Higher property owner flooded due to a natural watercourse blocked by lower property owner.

Situation #6

Higher property owner flooded due to natural activities (e.g., beaver dam, debris, sedimentation) on a natural watercourse on a lower property owner's property (Figure A1-13).

Options:

- negotiate a solution
- resolve using the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain)

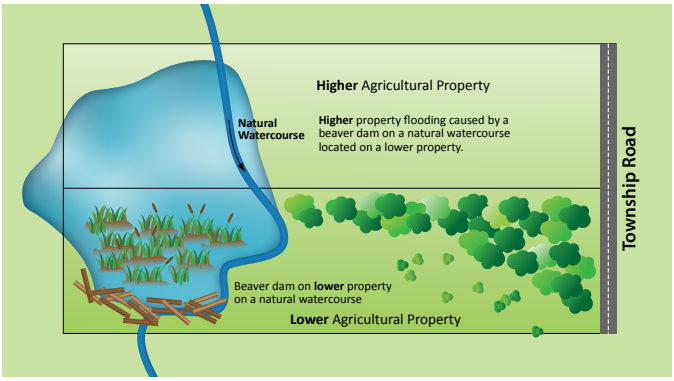


Figure A1-13. Higher property owner flooded due to natural activities on a natural watercourse on a lower property owner's property.

Situation #7

Property owner activities in the upper part of a watershed of a natural watercourse have resulted in flooding on a lower riparian property owner's property (Figure A1-14).

Options:

- negotiate a solution
- resolve using the *Drainage Act, 1990* (e.g., mutual agreement drain or petition drain)
- take legal action through civil courts (seek legal advice)

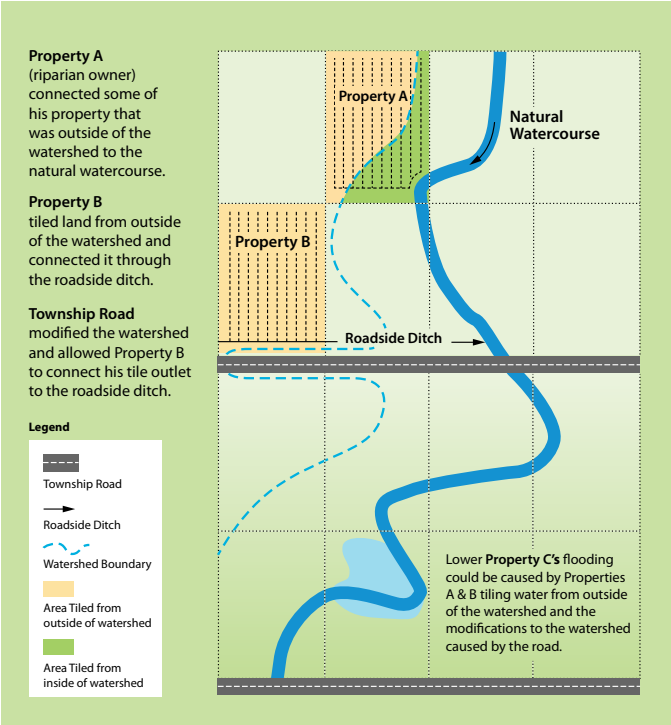


Figure A1-14. Property owner activities in the upper part of a watershed of a natural watercourse have resulted in flooding on a lower riparian property owner's property.

DID YOU KNOW?

Importing soil to build berms or dykes may require plans and permits. Refer to OMAFRA factsheet, *Importation of Soil onto Agricultural Land* for regulatory requirements, best management practices and guidance. Search online at ontario.ca.

1.2.5 Constructed Drainage

There are many ways of constructing drains including private drains (with no statutory involvement), award drains, mutual agreement drains, requisition drains and petition (municipal) drains. Municipalities, through their drainage superintendent, are only directly responsible for managing municipal drains. Municipal drains may look very similar to any of these constructed drainage systems or natural watercourses.

Drainage superintendents must verify the legal status of the drainage system before completing any repair or maintenance activities. Consider developing a municipal map that shows all the different types of constructed drainage systems and natural watercourses.

1.2.5.1 Private Drainage Works

Private drains (e.g., channels, pipes, tile drains) are built and owned privately. Roadside ditches are private ditches owned by the road authority to drain the road. Property owners are responsible for the privately-owned drains located on their properties. Adjoining property owners (including those who own roads) have no right to:

- drain into a private drainage system – permission to outlet must be obtained from the owner of the drainage system
- perform work on a private drainage system – permission to work must be obtained from the owner of the drainage system
- demand that the owner of a drainage system maintain or repair the system for the benefit of the adjoining property owner(s)

Disputes related to private ditches may be addressed through an alternative dispute resolution process (e.g., mediation or through legal action).

1.2.5.2 Drainage Works Created under Statute Law

There are four types of drainage works created under statute law including:

1. award drains
2. mutual agreement drains
3. requisition drains
4. petition drains

While the drainage superintendent is responsible for managing requisition and petition drains on behalf of the municipality, they must also be aware of the existence of award and mutual agreement drains.

1.2.5.2.1 Award drains

An award drain is a drainage works constructed under the *Ditches and Watercourses Act, 1960* and its predecessors. The act was repealed in 1963, but some award drains constructed before 1963 still exist. The drainage superintendent should be aware of the following key elements of an award drain:

- Under the *Ditches and Watercourses Act, 1960* and its predecessors, the engineer's report "awarded" sections of the drain to adjoining property owners including a road authority. The owners of these properties are still responsible for keeping their section of the drain maintained and repaired.
- An award drain may be brought under the provisions of the *Drainage Act, 1990* by petition under Section 4 of the act. See Chapter A2.3.1.
- Section 3(18) of the *Drainage Act, 1990* states that award drains must continue to be maintained in accordance with the engineer's report until converted to a municipal drain by petition.
- If a municipality maintains sections of an award drain they are not responsible for, they could incur liability and have no legal authority to recover costs.
- If a property owner refuses to abide by the terms of the award drain, another property owner may make application to the court of the drainage referee for an order directing that the work be done.
- Additional information is available online at ontario.ca/drainage and search for the Drainage eReference Tool.

1.2.5.2.2 Mutual agreement drains

A mutual agreement drain may be constructed under Section 2 of the *Drainage Act, 1990*, and are private drains constructed and cost-shared through an agreement between two or more property owners. To ensure the mutual agreement drain is binding on the property, regardless of ownership, the agreement (or an executed copy) is registered on each of the property title(s) through the land registry office. Provisions of the agreement are enforced through legal action. Detailed information is available in OMAFRA factsheet, Mutual Agreement Drains and online at ontario.ca/drainage and search for the Drainage eReference Tool.

When assisting property owners in resolving their drainage issues, the drainage superintendent may propose a mutual agreement drain as an alternative solution to a petition drain under the *Drainage Act, 1990.*

1.2.5.2.3 Requisition drains

A requisition drain is a drainage works constructed under Section 3 of the *Drainage Act, 1990* prior to 2010. Sections 3(1)-(17) were repealed in 2010 so new requisition drains can no longer be constructed, but some requisition drains still exist. Requisition drains were developed through the following process:

- A property owner requiring drainage requisitioned their municipality for the appointment of an engineer.
- The engineer's assessment was limited to "lands lying within 750 metres from the sides of the drainage works and land lying within 750 metres from the upstream point of commencement of the drainage works."

- The engineer filed a preliminary report including a benefit cost statement and a statement of anticipated effects of the drainage works on the local environment.
- Only drainage works costing less than $7,500 (excluding the cost of crossing lands occupied by the works of a public utility or road authority) were constructed under Section 3 of the *Drainage Act, 1990.*

A municipality is still responsible for maintenance and repair of existing requisition drains. Assess costs in accordance with the assessment schedule in the engineer's report for the requisition drain.

1.2.5.2.4 Petition drains (municipal)

A petition drain is a drainage works constructed under Section 4 of the *Drainage Act, 1990* with the end result commonly known as a municipal drain. Municipal drains are developed through the following process:

- Public consultation – Petition drains are initiated by a property owner or a community of property owners through a petition submitted to their local municipality. The petition drain process includes one or more public meetings to address property owners' concerns and desires.
- If the need for drainage work is confirmed, the municipality requests an engineer's report to identify the proposed solution to the drainage problem and how the costs will be shared.
- Legal existence – After any appeals have been dealt with, the municipality passes a bylaw adopting the engineer's report, giving the municipality the legal authority and responsibility to construct the drain.
- Municipal infrastructure – Once the drain is constructed, it becomes part of the municipality's infrastructure. The municipality, through the drainage superintendent, is responsible for the management of the drain.

1.3 Overview of the *Drainage Act, 1990*

1.3.1 Introduction

The *Drainage Act, 1990* defines a process for overriding the common law, as it relates to drainage, and provides property owners with a process for resolving drainage issues through their local municipality. The act is administered by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

1.3.2 Definitions

Section 1 of the act provides a list of definitions. Here are some of the key terms that are important for the drainage superintendent to understand.

- **drainage works** includes a drain constructed by any means, including the improving of a natural watercourse, and includes works necessary to regulate the water table or water level within or on any lands or to regulate the level of the waters of a drain, reservoir, lake or pond, and includes a dam, embankment, wall, protective works or any combination thereof

  Drainage works is more commonly known as a municipal drain. The act makes it clear that "drainage works" is a drain constructed by any means, and has traditionally been used to construct trapezoidal channels, pipes and pumping stations. However, the act is flexible enough to construct drainage works with natural channel designs and to control water levels to create or recreate wetlands.

- **repair** means the restoration of a drainage works to its original condition

  Every drainage system constructed under the act exists because of a municipal bylaw that adopts an engineer's report containing the plans, profiles and specifications of the drain. Repair work on the drain is always governed by the standards specified in the engineer's report. Examples of repair work include:

  - removing sediment to re-establish the grade as defined in the engineer's report
  - culvert replacement
  - bank slope repair

- **maintenance** means the preservation of a drainage works

  Maintenance is the preventative actions taken to avoid the need for repairs. Maintenance on the drain is not necessarily governed by the standards specified in the engineer's report. Examples of maintenance work include:

  - re-establishing vegetation on a disturbed or bare channel bank
  - spraying vegetation e.g., phragmites, before it blocks water flow in the drain
  - removing beavers from a drain before dams are constructed

1.3.3 Drainage Solutions

The *Drainage Act, 1990* provides tools for resolving drainage issues:

- mutual agreement drains (Section 2) – see Chapter A1.2.5.2
- petition Drains (Section 4) – see Chapter A2.3.1

Once a drain exists, there are a number of municipal responsibilities for managing these drains. Some are direct responsibilities of the drainage superintendent, others are indirect responsibilities:

- drain improvement (Sections 77 and 78) – see Chapter A2.5
- maintenance and repair (Sections 74, 75, 79 and 81) – see Chapter A2.4
- assessment schedule updates:
  - severances (Sections 65(1) and 65(2)) – see Chapter A2.7.2
  - land use changes and subsequent connections (Section 65 (3)) – see Chapter A2.7.2
  - complete new assessment schedules (Section 76) – see Chapter A2.4.3
- abandonment (Sections 84 and 19) – see Chapter A2.7.5
- enforcement (Sections 80 and 82) – see Chapter A4.5

Chapter 2

General Guidance on Key Sections, *Drainage Act, 1990*

2.1 Introduction

Since the *Drainage Act, 1990* is applied primarily on private land and the project is paid for by private property owners, it receives significant attention from those involved. Drainage superintendents must be familiar with the *Drainage Act, 1990* and understand the authority and the responsibilities of the municipality and the drainage superintendent.

The following summaries of key sections in the act provide general guidance to drainage superintendents and should be read together with the actual sections of the act.

These summaries do not provide a thorough legal analysis of the legislation. Seek out legal counsel when needed.

2.2 Authority

2.2.1 Municipal Council

Municipal council has the principal responsibility for the procedures under the *Drainage Act, 1990*. They assign the drainage superintendent and other municipal staff with various roles for implementation.

2.2.2 Drainage Superintendent

Section 93 gives council the authority to appoint a drainage superintendent by bylaw to carry out various duties for council. Specific duties of the drainage superintendent are indicated in various other sections of the act. For example, Section 80(1) provides council or their appointed drainage superintendent with the authority to remove an obstruction in a drainage works if the duly notified property owner does not.

2.2.3 Clerk

The municipal clerk has the responsibility for administrative duties under the *Drainage Act, 1990* such as:

- sending notices and reports
- receiving and processing of petitions and requests
- drafting bylaws
- serving as clerk of the tribunal

2.2.4 Treasurer

The municipal treasurer has the responsibility for financial duties under the *Drainage Act, 1990* such as paying bills, levying assessments and applying for grants.

2.2.5 Commissioners

Section 95 gives council the authority to appoint commissioners by bylaw to manage specific drainage works (e.g., pump station and water control structure). Additional information on commissioners is provided in Chapters A2.6 and A5.3.

2.2.6 Appeal Bodies

The *Drainage Act, 1990* establishes three different appeal bodies:

- Court of Revision
- Agriculture, Food and Rural Affairs Appeal Tribunal (AFRAAT)
- drainage referee

2.2.6.1 Court of Revision

A court of revision hears appeals on assessment matters only (Section 52). A party to a hearing of the court of revision may appeal a decision to the tribunal. They may also appeal the court's omission, neglect or refusal to hear or decide an appeal.

2.2.6.2 Agriculture, Food and Rural Affairs Appeal Tribunal

The Agriculture, Food and Rural Affairs Appeal Tribunal is authorized under the *Drainage Act, 1990* to hear appeals on technical matters and on assessments.

2.2.6.3 Drainage Referee

The drainage referee has the authority to hear all matters of law. The referee's authority is defined in Section 106 of the *Drainage Act, 1990*.

Referee decisions set precedents for future cases and may be appealed to Divisional Court. O. Reg. 232/15 of the *Drainage Act, 1990* sets out the rules of practice and procedures in proceedings before the referee.

2.2.7 Drainage Engineers

Drainage engineers have a variety of roles in the *Drainage Act, 1990* process. Refer to OMAFRA Publication 852, *A Guide for Engineers working under the Drainage Act in Ontario* for additional information.

DID YOU KNOW?

The Ontario Society of Professional Engineers Land Drainage Committee provides direction to Ontario engineers on current practices and activities. The website contains information on the:

- annual drainage engineers conference
- land drainage committee meeting and drainage practitioners meeting minutes
- technical papers and reports

www.landdrainageengineers.com

DID YOU KNOW?

The names and locations of engineers in Ontario, who practice under the *Drainage Act, 1990*, are found at www.omafra.gov.on.ca/english/landuse/drain-pub.htm – select drainage contacts.

2.2.8 Other Stakeholders

There are other stakeholders with various roles and authorities under the *Drainage Act, 1990* including property owners, road authorities, utilities, conservation authorities and the director appointed by the Minister of Agriculture, Food and Rural Affairs responsible for administering the *Drainage Act, 1990*.

2.3 Construction of New Drainage Works by Petition

2.3.1 Section 4 – The Petition

The *Drainage Act, 1990* defines a process that property owners (and others) can use to manage water on their lands so that legal responsibility is shared and the potential for damage is limited. This process is initiated when a petition for drainage works is signed and filed with the clerk of the municipality.

DID YOU KNOW?

For more information on the petition drain procedure under the *Drainage Act, 1990* refer to Part A of Publication 852, *A Guide for Engineers working under the Drainage Act in Ontario.*

The authority for the petition is identified in Section 4(1) of the *Drainage Act, 1990*. This section identifies four criteria that can result in a valid petition for drainage:

- the majority (e.g., 50% or more) in number of property owners (including roads) in the area requiring drainage
- the property owner(s) representing at least 60% of the area of land requiring drainage
- the road authority, where a road requires drainage
- the director (appointed by the minister under Section 91), where drainage is required for agricultural lands

DID YOU KNOW?

Use a keyword (e.g., petition form drainage act Ontario or drainage act) when searching to find the appropriate petition form at www.forms.ssb.gov.on.ca

The petition is a legal document and the signature(s) on the petition must legally represent the properties listed on the petition. The submission of the petition initiates a process that must be followed by the municipality. This process is summarized in Figure A2-1 Petition Drain Procedures Section 4 of the *Drainage Act, 1990.*

Petition Drain Procedures

Section 4

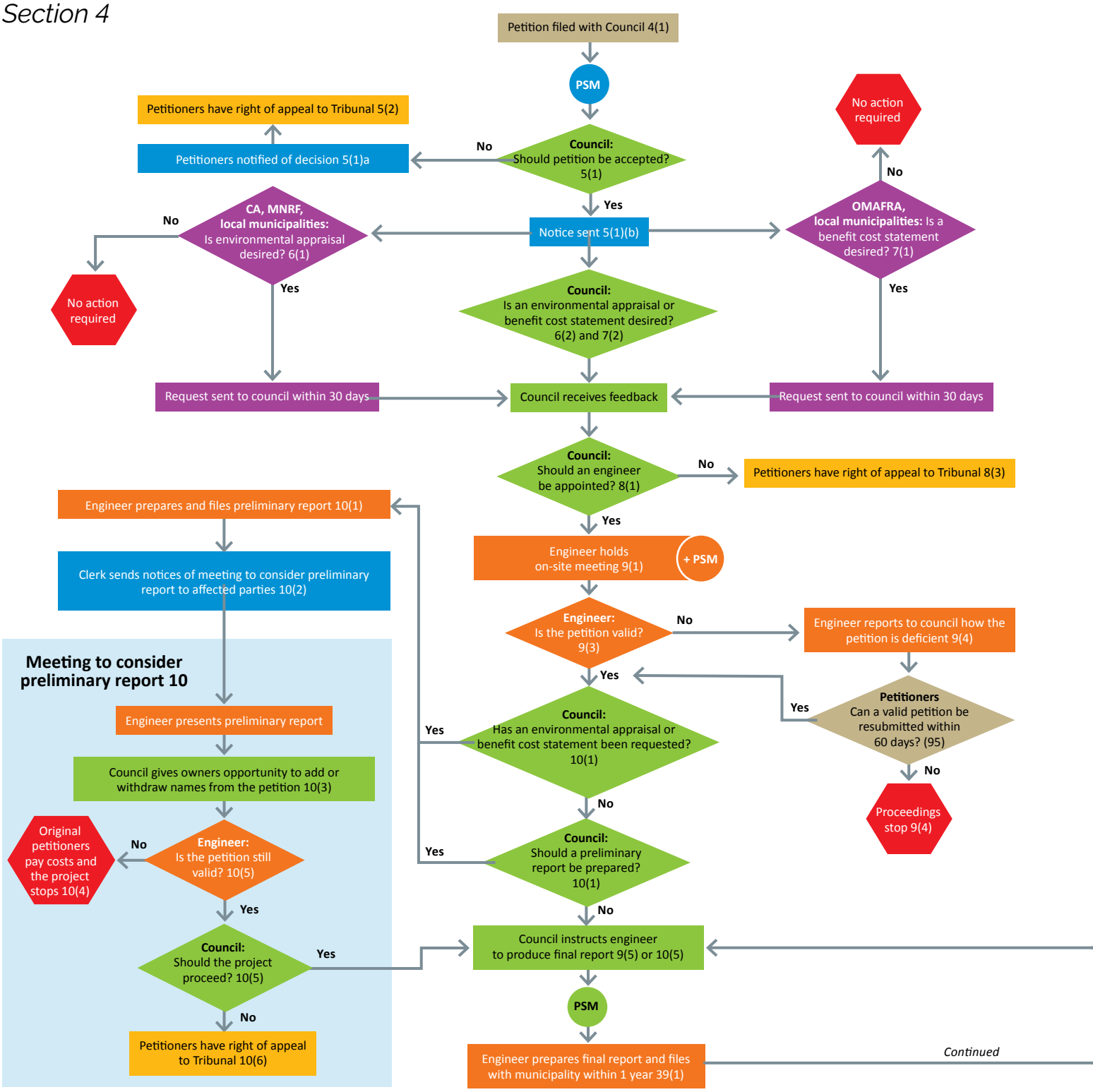
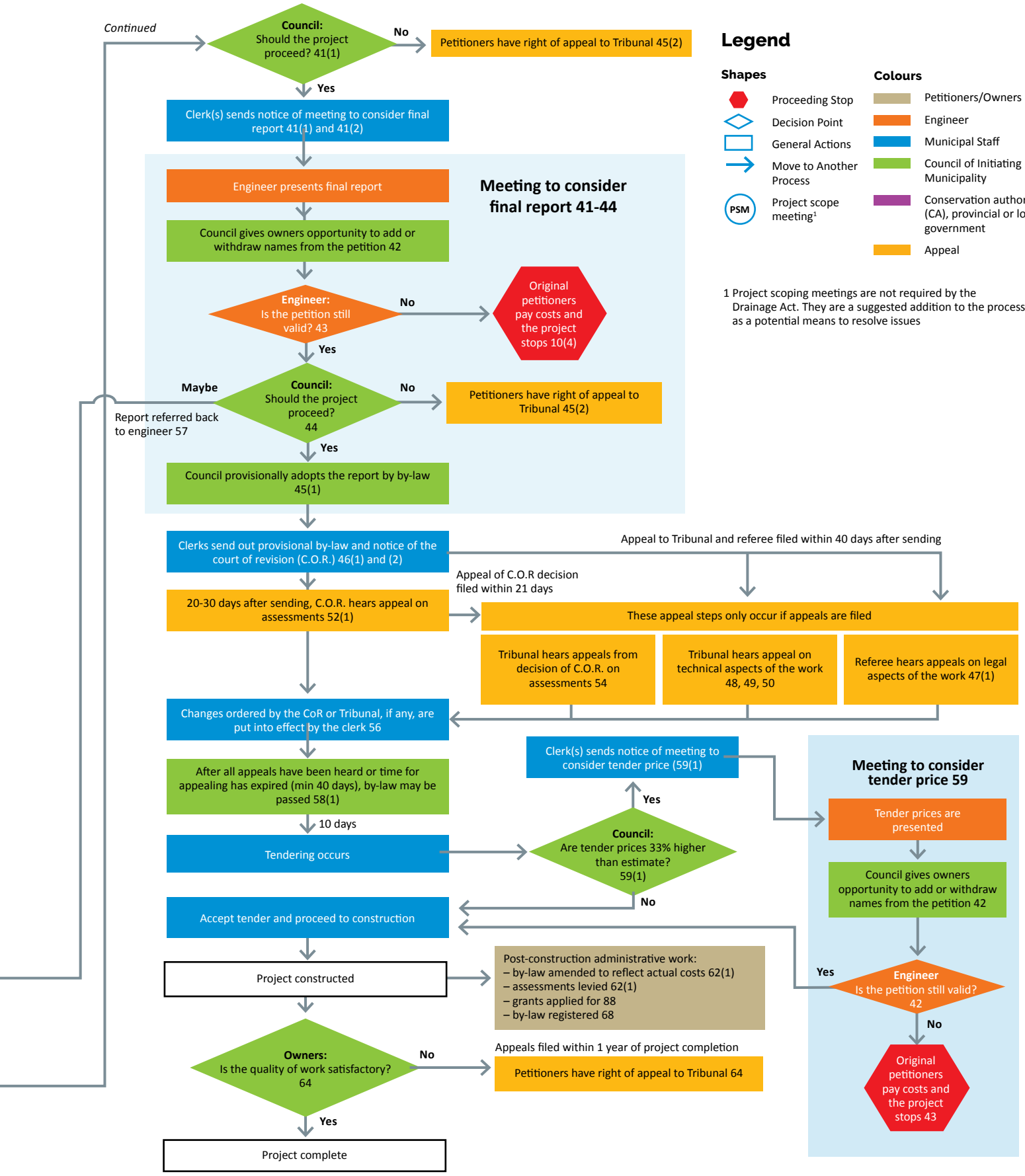


Figure A2-1. Petition drain procedures (Section 4).


Continued
Council: Should the project proceed? 41(1)
No
Petitioners have right of appeal to Tribunal 45(2)
Yes
Clerk(s) sends notice of meeting to consider final report 41(1) and 41(2)
Meeting to consider final report 41-44
Engineer presents final report
Council gives owners opportunity to add or withdraw names from the petition 42
Engineer: Is the petition still valid? 43
No
Original petitioners pay costs and the project stops 10(4)
Yes
Maybe
Council: Should the project proceed? 44
No
Petitioners have right of appeal to Tribunal 45(2)
Report referred back to engineer 57
Yes
Council provisionally adopts the report by by-law 45(1)
Clerks send out provisional by-law and notice of the court of revision (C.O.R.) 46(1) and (2)
Appeal to Tribunal and referee filed within 40 days after sending
Appeal of C.O.R decision filed within 21 days
20-30 days after sending, C.O.R. hears appeal on assessments 52(1)
These appeal steps only occur if appeals are filed
Tribunal hears appeals from decision of C.O.R. on assessments 54
Tribunal hears appeal on technical aspects of the work 48, 49, 50
Referee hears appeals on legal aspects of the work 47(1)
Changes ordered by the CoR or Tribunal, if any, are put into effect by the clerk 56
Clerk(s) sends notice of meeting to consider tender price (59(1)
Meeting to consider tender price 59
After all appeals have been heard or time for appealing has expired (min 40 days), by-law may be passed 58(1)
Yes
10 days
Tendering occurs
Council: Are tender prices 33% higher than estimate? 59(1)
Tender prices are presented
No
Council gives owners opportunity to add or withdraw names from the petition 42
Accept tender and proceed to construction
Yes
Engineer Is the petition still valid? 42
Project constructed
Post-construction administrative work:
– by-law amended to reflect actual costs 62(1)
– assessments levied 62(1)
– grants applied for 88
– by-law registered 68
No
Original petitioners pay costs and the project stops 43
Owners: Is the quality of work satisfactory? 64
No
Appeals filed within 1 year of project completion
Petitioners have right of appeal to Tribunal 64
Yes
Project complete
Legend
Shapes
Proceeding Stop
Decision Point
General Actions
Move to Another Process
PSM
Project scope meeting[1]
Colours
Petitioners/Owners
Engineer
Municipal Staff
Council of Initiating Municipality
Conservation authority (CA), provincial or local government
Appeal
1 Project scoping meetings are not required by the Drainage Act. They are a suggested addition to the process as a potential means to resolve issues

2.3.2 Assessment of Cost for New Drains

The appointed engineer will prepare a report that includes plans, profiles and specifications for the proposed drainage system. The report will also include an assessment schedule that will distribute the cost among the involved property owners. If the engineer's report is adopted by bylaw, the construction of the project is authorized, including on private land and the assessed property owners must pay their share of the cost.

Under the *Drainage Act, 1990*, a drainage works serves a defined watershed. The lands within the watershed are evaluated by the engineer and assigned i.e., assessed, a value, in money, that relates to the costs of the drainage works. Several types of assessment are available under the act, which the engineer may use to determine the total assessment on a parcel of land.

2.3.2.1 Section 22 – Benefit

Assessment for benefit

Section 22 Lands, roads, buildings, utilities or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit.

Definitions

Section 1 … "benefit" means the advantages to any lands, roads, buildings or other structures from the construction, improvement, repair or maintenance of a drainage works such as will result in a higher market value or increased crop production or improved appearance or better control of surface or subsurface water, or any other advantages relating to the betterment of lands, roads, buildings or other structures.

Guidance

The "benefit" is applied to the land or infrastructure and not the property owner. The current owner may not appreciate the benefit, but a future owner may appreciate the benefit of the drainage system. Benefit to lands depends on many factors:

- elevation
- quantity of water to be drained from the land
- distance of affected land from the proposed drain
- presence or absence of existing drains

2.3.2.2 Section 23 – Outlet and Injuring Liability

Assessment for liability

Outlet liability

Section 23(1) Lands and roads that use a drainage works as an outlet, or for which, when the drainage works is constructed or improved, an improved outlet is provided either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek or watercourse, may be assessed for outlet liability.

Injuring liability

Section 23(2) If, from any land or road, water is artificially caused by any means to flow upon and injure any other land or road, the land or road from which the water is caused to flow may be assessed for injuring liability with respect to a drainage works to relieve the injury so caused to such other land or road.

Basis of assessment

Section 23(3) The assessment for outlet liability and injuring liability provided for in subsections (1) and (2) shall be based upon the volume and rate of flow of the water artificially caused to flow upon the injured land or road or into the drainage works from the lands and roads liable for such assessments.

Guidance

Injuring liability and outlet liability are usually combined in an engineer's assessment schedule as outlet liability. Generally, all properties in a watershed are assessed for outlet liability whether they make use of the drain or not, unless it can be proven they do not contribute water to the drain. The assessment is based on a cost per hectare. Properties in the upper parts of a watershed may have higher outlet liability charges than properties near the outlet since the water makes use of a greater length of the drain. Outlet liability charges also may vary based on soil type, land use or distance to the drain.

2.3.2.3 Section 24 – Special Benefit

Assessment for special benefit

Section 24 The engineer may assess for special benefit any lands for which special benefits have been provided by the drainage works.

Section 1 … "special benefit" means any additional work or feature included in the construction, repair or improvement of a drainage works that has no effect on the functioning of the drainage works.

Guidance

Drains are normally designed to accommodate the needs of a community of properties. When an individual property owner requests a feature that only benefits them, the additional cost of this feature to the project is assessed to the property as a special benefit (e.g., extra-long crossings, special surface treatment over a crossing, decorative end walls (Figure A2-2) and specialized plantings).

Figure A2-2. Crossing with decorative end wall.
Source: Municipality of Chatham-Kent, Ontario

2.3.2.4 Section 25 – Block Assessment

Engineer may assess a block, etc.

Section 25(1) The council of the local municipality may direct the engineer to assess as a block, a built-up area designated by the council, and the sum assessed therefor may be levied against all the rateable properties in the designated area proportionately on the basis of the assessed value of the land and buildings.

Assessment to be charged against public roads

Section 25(2) Where the engineer makes a block assessment under subsection (1), the engineer shall designate the proportion of the assessment to be charged against the public roads in the designated area.

Guidance

The *Drainage Act, 1990* requires that each property be assessed individually. Section 25 provides an exception to this principle by allowing a built-up area to be assessed as one block. This exception is only implemented if municipal council passes a resolution directing the engineer to assess as a block.

Block assessments are used when it is impractical to assess each property individually. For example, if there is a hamlet in the watershed of a drainage works, each residential property must be assessed. The engineering cost to assess each of these properties individually may be greater than the assessment that would be levied. The application of Section 25 allows the engineer to assess the group of properties as a single block (Figure A2-3).

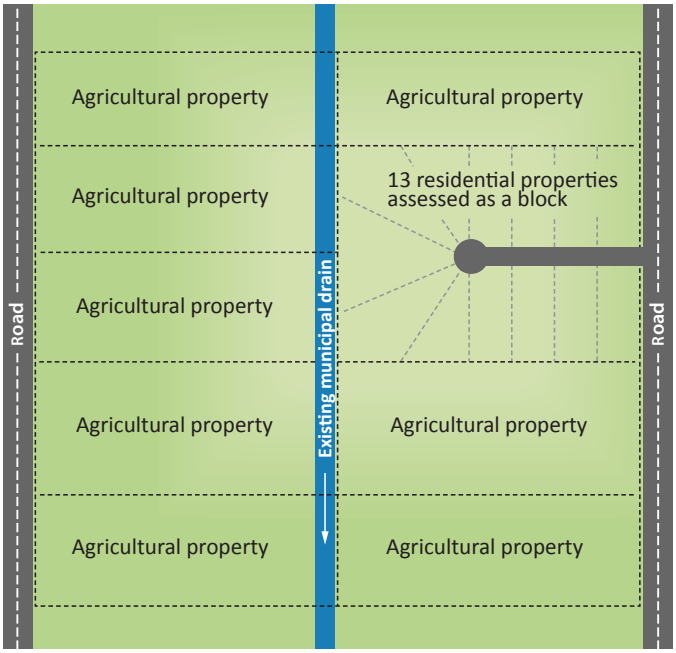


Figure A2-3. A plan showing a block or built-up area.

The municipality recovers the block assessment by levying each property within the built-up area proportionally on assessed value (i.e., the individual property assessed value divided by the block's total assessed value after the public road proportion is deducted).

2.3.2.5 Section 26 – Special Assessment to Utilities or Roads

Increased cost, how borne

Section 26 In addition to all other sums lawfully assessed against the property of a public utility or road authority under this Act, and despite the fact that the public utility or road authority is not otherwise assessable under this Act, the public utility or road authority shall be assessed for and shall pay all the increase of cost of such drainage works caused by the existence of the works of the public utility or road authority.

Section 1 … "public utility" means a person having jurisdiction over any water works, gas works, electric heat, light and power works, telegraph and telephone lines, railways however operated, street railways and works for the transmission of gas, oil, water or electrical power or energy, or any similar works supplying the general public with necessaries or conveniences.

Section 1 … "road authority" means a body having jurisdiction and control of a common and public highway or road, or any part thereof, including a street, bridge and any other structure incidental thereto and any part thereof.

Guidance

Public utilities and road authorities are assessed the increase in cost of the drainage works where a drain crosses or proposes to cross a road or public utility. However, there may also be increased costs from a drain running adjacent to a road or public utility or by following a different route to avoid a crossing of the road or public utility.

It is the duty of the municipality, in consultation with the road authority or public utility, to determine how the assessment will be paid. Drainage superintendents are encouraged to check for any franchise agreements that may dictate how special assessments are paid (see Chapter A6.2.10). Franchise agreements are usually between the municipality and private utility companies (e.g., Bell, Union Gas, Hydro One).

2.3.3 Assessment of Future Maintenance or Repair

The engineer's report will contain a method for assessing the costs of future maintenance or repair. This may be in the form of a separate maintenance schedule or simply a statement on how the assessment should be calculated.

2.3.4 Allowances

The construction of a municipal drain may result in damages or losses to individual properties. The *Drainage Act, 1990* addresses this by providing an opportunity to compensate the property owners for these damages or losses.

These allowances are paid at the time of the engineer's report to compensate for damages and losses at the time of construction and for future maintenance and repair. As a result, no allowances are paid at the time of future maintenance and repair activities.

2.3.4.1 Section 29 – Allowances for Land Used

Allowances for right-of-way, etc.

Section 29 The engineer in the report shall estimate and allow in money to the owner of any land that it is necessary to use,

(a) for the construction or improvement of a drainage works;

(b) for the disposal of material removed from drainage works;

(c) as a site for a pumping station to be used in connection with a drainage works; or

(d) as a means of access to any such pumping station, if, in the opinion of the engineer, such right-of-way is sufficient for the purposes of the drainage works, the value of any such land or the damages, if any, thereto, and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works.

Guidance

The engineer makes a financial allowance to a property owner to compensate them for land that will be used by the drain. If there is a permanent loss of land, the allowance may be based on the market value of the land. Allowances for placement of spoil from channel construction are typically paid less as it is assumed the property owner retains the right to plant and harvest crops from the area receiving the spoil. An allowance for right-of-way compensates a property owner for land that will be used periodically for future maintenance and repair.

2.3.4.2 Section 30 – Allowances for Damages

Amount for damage to ornamental trees, etc.

Section 30 The engineer shall determine the amount to be paid to persons entitled thereto for damage, if any, to ornamental trees, lawns, fences, lands and crops occasioned by the disposal of material removed from a drainage works and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works.

Guidance

An engineer may make allowances to property owners for damages caused by the construction of the municipal drain (Figure A2-4). These are the most common types of allowances encountered for a drainage project.

Figure A2-4. Damage to a soybean field resulting from drain construction.

2.3.4.3 Section 31 – Allowances for Existing Drains

Allowance for existing drains

Section 31 Where an existing drain that was not constructed on requisition or petition under this Act or any predecessor of this Act is incorporated in whole or in part in a drainage works, the engineer in the report shall estimate and allow in money to the owner of such drain or part the value to the drainage works of such drain or part and shall include such sum in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works.

Guidance

Allowances may be given to property owners to compensate them for existing private drains that will be incorporated into the municipal drain, provided they have not been previously created under the *Drainage Act, 1990*. The allowance must be fair to the owners of the private drain, who paid the original capital costs, and the other property owners in the watershed who will make use of the drain and contribute towards the compensation.

2.3.4.4 Section 32 – Allowances for Insufficient Outlet

Allowance for damage due to insufficient outlet

Section 32 Where, in the opinion of the engineer, the cost of continuing a drainage works to a sufficient outlet or the cost of constructing or improving a drainage works with sufficient capacity to carry off the water will exceed the amount of injury likely to be caused to low-lying lands along the course of or below the termination of the drainage works, instead of continuing the works to such an outlet, or making it of such capacity, the engineer may include in the estimate of cost a sufficient sum to compensate the owners of such low-lying lands for any injuries they may sustain from the drainage works, and in the report the engineer shall determine the amount to be paid to the owners of such low-lying lands in respect of such injuries.

Guidance

Drains must continue to a sufficient outlet unless the cost will exceed the amount of injury to low-lying lands. In this case, the owner of the lower lands may be compensated for the injury. The payment of the allowance addresses the common law responsibility to take a drainage system to a sufficient outlet.

If a property owner has received compensation and subsequently petitions for the downstream extension of the drainage system to address the insufficient outlet, the engineer must consider this allowance.

2.3.4.5 Section 33 – Allowances for Loss of Access

Allowance for loss of access

Section 33 Where the engineer thinks it expedient to make an allowance for loss of access to an owner instead of providing for the construction or the replacement, enlargement or other improvement of a bridge, the engineer shall in the report provide for payment to the owner of such amount as appears just by way of allowance for loss of access and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works.

Guidance

The engineer could provide an allowance to a property owner for loss of access to lands instead of constructing a bridge or culvert (Figure A2-5). If a property owner has received compensation and subsequently requests a crossing, the engineer must consider this allowance.

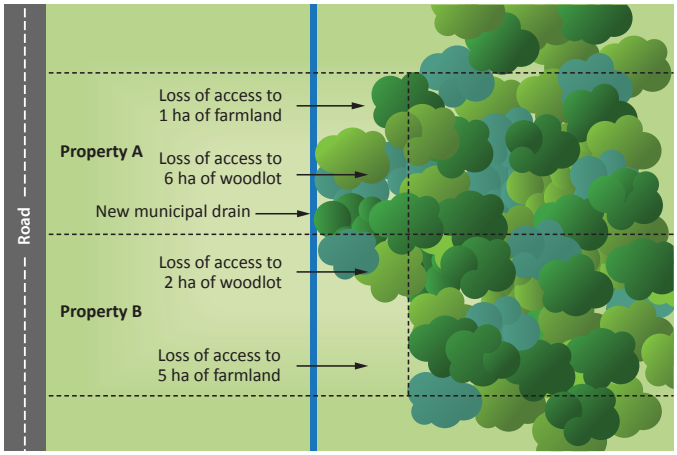


Figure A2-5. Loss of access allowance.

2.3.5 The Engineer's Report

In writing the report, the engineer must address the drainage issue and ensure it complies with all law. Review a draft of the report to ensure the drain can be properly managed in the future.

Working space

The *Drainage Act, 1990* requires the engineer to define a working space (Section 63(1)). The drainage superintendent should:

- Ensure the engineer's report clearly defines this working space or right-of-way, as well as any special requirements for contractors to access the area.
- Have the engineer clearly indicate in the report that this working area continues to exist for future maintenance and repair work, and that the landowner should keep it clear of obstructions.
- Where allowances have been provided to landowners for this working area, have the engineer indicate in the report that the landowners will not receive allowances for any future maintenance work.

Drain maintenance assessment schedules

The act allows an engineer to prepare a separate assessment schedule for drain maintenance and repair work (Section 38). Work with the engineer to develop a practical maintenance assessment schedule in a format suitable for future use; for example, a separate assessment schedule for each branch on a drain and for each reach of drain that changes in form.

Benchmarks

The act requires the engineer to establish benchmarks or permanent levels (Section 13(1)). Benchmarks are critical for the drainage superintendent to determine if any repair work is required in the future. The engineer may want input on the quantity and location of these benchmarks. Suggest the engineer use geodetic elevations, if practical (Figure A2-6).

Figure A2-6. A geodetic survey benchmark.

Disposal of materials

The act requires the engineer to indicate how the materials from the drain will be disposed of (Section 16). Ensure the engineer makes it clear in the report that "disposal" provisions also apply for future maintenance and repair work. Review the provisions to ensure they are practical and effective for any future drain maintenance and repair work (Figure A2-7).

Figure A2-7. Excavated material spread to the right of the drain on farmland.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

Abandonment

If the engineer indicates in the report the intention to replace all or part of an existing drain, make sure the report also indicates the portion of the drain being replaced is abandoned (Section 19). If this is not done, the old drain will still legally exist, and the municipality could be required to maintain or repair it in the future.

Plans, profiles and specifications

The plans, profiles and specifications are key elements of the engineer's report (Section 8(1a)) that will be used in any future repair work. While the report is being developed, review these documents thoroughly to ensure that the drain features are accurately identified on each property.

Other structures

A variety of other structures can be included in the report as part of the drainage works (Section 18). Discuss with the engineer the feasibility of including items such as sediment traps, buffer strips, etc., that may help to reduce future repair costs. Private crossings are the most common structures included in a report. Ensure the engineer's report provides sufficient physical detail about these crossings and, if appropriate, any variation in the assessment schedule for any future maintenance or repair on these structures.

Other instructions

The actions of some owners along a drain, such as unrestricted cattle access or poor tile connections, can result in damages to the drain or a restriction in the flow of the drain. Ask the engineer to include a statement in the report to remind the landowner that any future connections to the municipal drain require the prior approval of council (Section 65(5)) and that a landowner could be charged for actions they take that obstruct (Section 80) or damage the drain (Section 82).

2.3.6 On-Site Meeting

The engineer is the lead for the on-site meeting and the role of the superintendent is to support the engineer by:

- finding a suitable location for the meeting
- providing local area knowledge of existing drainage systems, utilities, problem soil types, etc. that may affect the drainage system design
- taking notes during the meeting

As the local municipal representative, the drainage superintendent is well suited to draw information out of meeting participants (Figure A2-8).

Figure A2-8. Drainage superintendent participating in an on-site meeting.

2.3.7 Meeting to Consider the Report

The council leads the meeting to consider the report and the role of the superintendent is to support council and the engineer by providing information as required.

2.3.8 Court of Revision

The composition and authority of the court of revision is addressed under Section 97 of the *Drainage Act, 1990*. The court of revision responsibility is to hear assessment appeals from property owners.

The drainage superintendent has a minor role in the administration of the court of revision. They may be expected to provide guidance on procedures. For example, the drainage superintendent may advise members of the court of revision not to mix council business with a matter before the court of revision. The court of revision is an entirely separate procedure and should be convened and adjourned as such.

2.4 Maintenance and Repair of Existing Drainage Works

Sections 74, 75, 76, 79 and 81 of the *Drainage Act, 1990* provide direction to municipalities on the maintenance and repair of drainage works originally constructed, adopted by amendment or improved under a bylaw passed under the *Drainage Act, 1990.*

There are various flow charts in Chapter 3 related to drain maintenance and repair activities.

2.4.1 Section 74 – Maintenance of Drainage Works and Cost

Maintenance of drainage works and cost

Section 74 Any drainage works constructed under a by-law passed under this Act or any predecessor of this Act, relating to the construction or improvement of a drainage works by local assessment, shall be maintained and repaired by each local municipality through which it passes, to the extent that such drainage works lies within the limits of such municipality, at the expense of all the upstream lands and roads in any way assessed for the construction or improvement of the drainage works and in the proportion determined by the then current by-law pertaining thereto until, in the case of each municipality, such provision for maintenance or repair is varied or otherwise determined by an engineer in a report or on appeal therefrom.

- Each municipality is responsible for maintaining and repairing every drain or section of drain that is:
  - constructed under a bylaw under the *Drainage Act, 1990*
  - related to the construction or improvement of the drain by local assessment
  - located within their municipal boundaries
- The cost of drain maintenance and repair is assessed to upstream lands and roads in accordance with the bylaw for that drain, including the engineer's report and assessment schedule.
- No authority is given under the act to provide a monetary allowance to property owners for drain maintenance or repair work. These allowances were originally provided to the property owners under the engineer's report.
- There is no requirement for a municipality to notify property owners of proposed drain maintenance and repair work. But working on private land means the property owners will be required to pay a share of the cost for the work. Notification is highly recommended.
- There are no rights of appeal to the Court of Revision or tribunal on assessments for drain maintenance or repair. However, if a municipality has not complied with the *Drainage Act, 1990* or its bylaw, a property owner may file an appeal on the legality of the work (i.e., drainage referee).

2.4.2 Section 75 – Collecting Costs from Assessed Lands in Other Municipalities

- When an initiating municipality proposes to repair or maintain a drain – and the costs will be shared by one or more other upstream municipalities – the council of the initiating municipality must:
  - give two readings to a bylaw (called a provisional bylaw) that must describe the repair work and the estimated cost and share to be paid by each municipality
  - serve the bylaw upon the head or clerk of all involved local municipalities
- Upstream municipalities have 40 days to appeal to the tribunal (see Section 75(1)).
- If there are no appeals – or all appeals are decided and the project will proceed – the local municipalities shall pass a bylaw as soon as possible to raise the required money and pay it within a reasonable time to the treasurer of the initiating municipality.
- Municipalities are not required to assess and levy the amount charged more than once in five years if the total expense is less than $5,000.

2.4.3 Section 76 – Varying Original Assessments for Maintenance

- Where the assessment analysis indicates that the existing report does not adequately address future maintenance, the drainage superintendent can recommend to council that a new maintenance assessment schedule be developed.
- A municipality may consider initiating a report under this section when it decides:
  - that numerous property divisions or subdivisions have occurred without the preparation of individual Section 65(1) reports
  - that a watershed has been expanded/reduced/altered but the schedule of assessment was not revised under Sections 65(3) and 65(4)
  - the existing maintenance assessment schedule is unfair or unusable
  - that municipal boundaries have been changed, altering the responsibilities for the management for the drain
  - to create or expand an area that is block assessed (Section 25)
  - to create separate assessment schedules for each main drain, branch drain or designated segment of an existing drain
  - to provide assessment instructions for work components that may be subject to special benefit assessments (Section 24) or special assessments (Section 26)

The process is summarized in Figure A2-9 and additional details are provided in Publication 852, *A Guide for Engineers Working under the Drainage Act in Ontario*.

New Assessment Schedules

Section 76

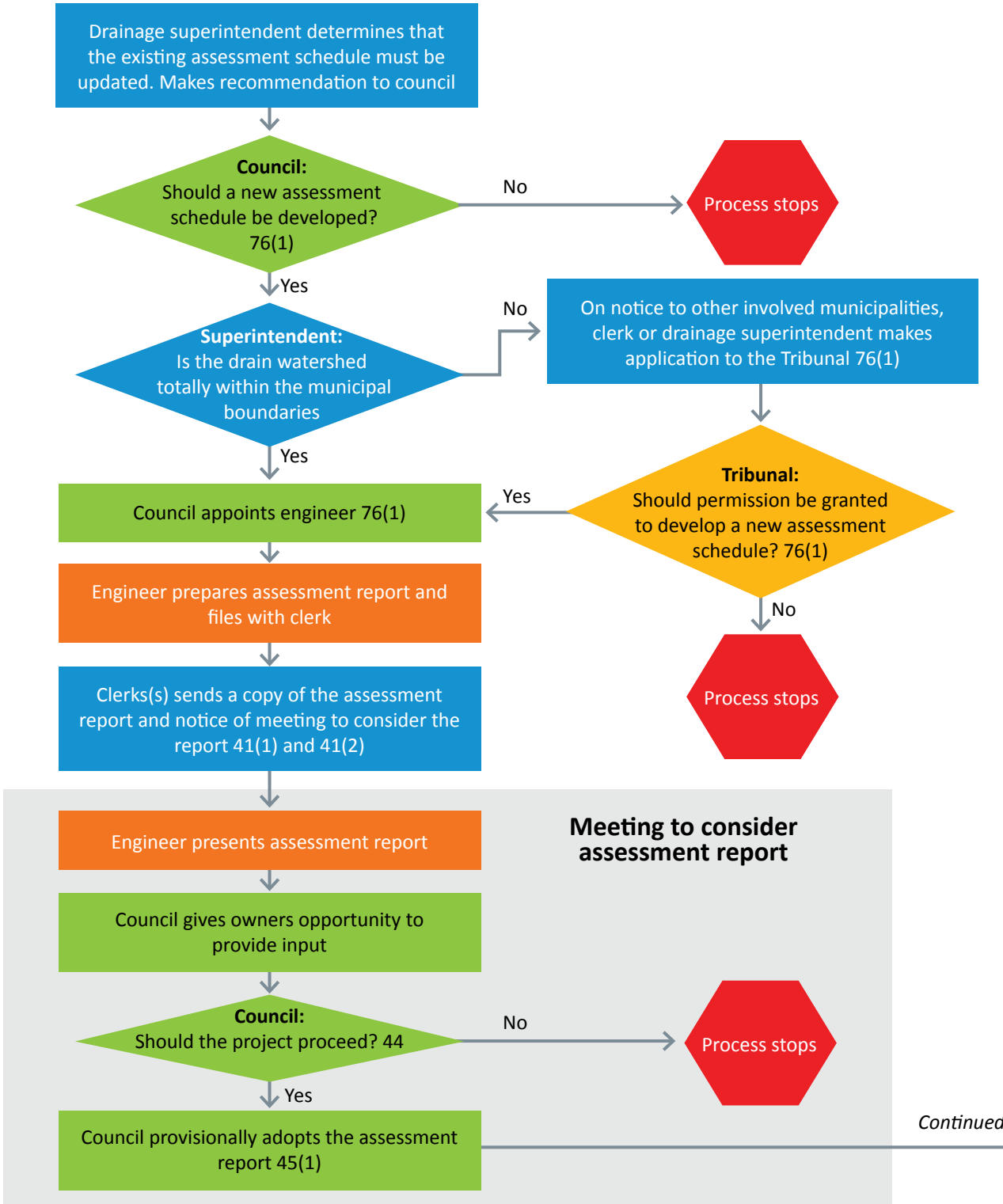


Figure A2-9. New assessment schedules (Section 76).

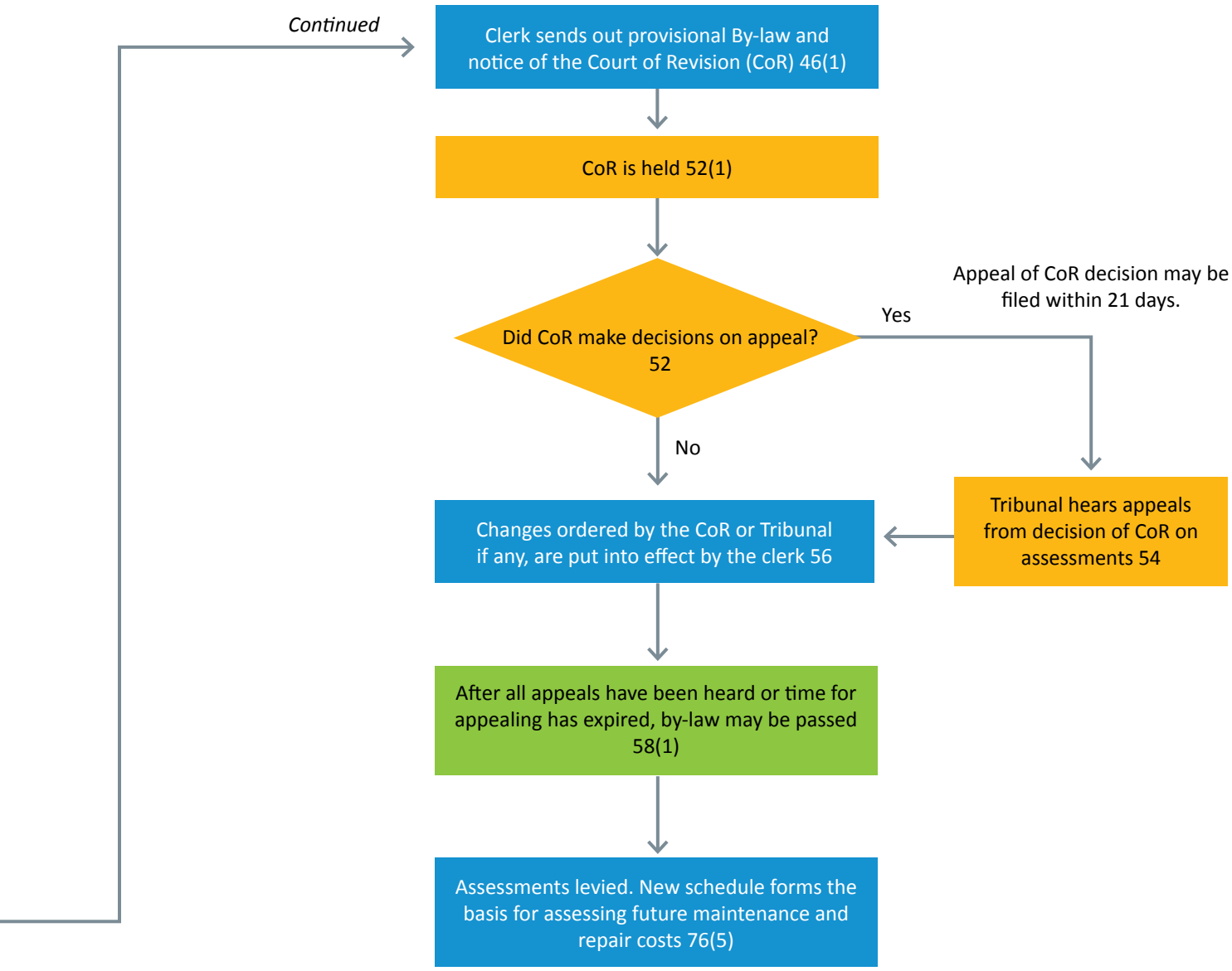
Legend

Shapes

- Proceeding Stop
- Decision Point
- General Actions
- Move to Another Process

Colours

- Engineer
- Municipal Staff
- Council of Initiating Municipality
- Appeal



2.4.4 Section 79 – Power to Compel Repairs and Liability for Damages Caused by Non-repair

Section 79

Power to compel repairs

79(1) Upon forty-five days notice served by any person affected by the condition of a drainage works, upon the head or clerk of the local municipality whose duty it is to maintain and repair the drainage works, the municipality is compellable by an order of the referee to exercise the powers and to perform the duties conferred or imposed upon it by this Act as to maintenance and repair or such of the powers and duties as to the referee appears proper, and the municipality is liable in damages to the owner whose property is so injuriously affected.

Municipality liable for damages caused by non-repair

79(2) Despite subsection (1), the local municipality whose duty it is to maintain and repair drainage works shall not become liable in damages to any person affected by reason of the non-repair of the drainage works until after service by or on behalf of such person of the notice referred to in subsection (1) upon the head or clerk of the municipality, describing with reasonable certainty the alleged lack of maintenance and repair of the drainage works.

No liability where drainage works blocked by ice or snow

79(3) The local municipality whose duty it is to maintain and repair a drainage works is not liable in damages for any injury caused by reason of a drainage works being blocked by snow or ice and overflowing the lands of any person without negligence on the part of the municipal corporation.

- Any person affected by the condition of a drain can serve notice of lack of maintenance and repair to the municipality responsible for the drain.
- If no action is taken by the municipality within 45 days of notice, the person can apply for an order from the referee to compel the municipality to maintain and repair the drain. The referee also may order damages to be paid to the person affected.
- The municipality cannot be held liable for damages to the property owner until notice is served.
- The municipality cannot be held liable for damages for a drain blocked by snow or ice and the resulting overflow.

2.4.5 Section 81 – Removal of Minor Obstructions

Council, via bylaw or resolution, can direct a drainage superintendent to remove minor obstructions that the property owner or occupant adjacent to the drainage works may not be responsible for, and the cost of the removal is assessed to the drainage works.

2.5 Improvement to Existing Drainage Works

2.5.1 Section 78 – Drain Major Improvements

Section 78(1) If a drainage works has been constructed under a by-law passed under this Act or any predecessor of this Act, and the council of the municipality that is responsible for maintaining and repairing the drainage works considers it appropriate to undertake one or more of the major improvement projects listed in subsection (1.1) for the better use, maintenance or repair of the drainage works or of lands or roads, the municipality may undertake and complete the project in accordance with the report of an engineer appointed by it and without the petition required by section 4.

Municipal council can make major improvements to existing municipal drains under the authority of Section 78 of the *Drainage Act, 1990.* The process is very similar to the one for a new municipal drain (Section 4) except there is no requirement for a petition. The process is summarized in Figure A2-10.

A broad range of improvement work can be authorized under Section 78(1.1) including:

- changing the course of the drainage works
- making a new outlet for the whole or any part of the drainage works
- constructing a tile drain under the bed of the whole or any part of the drainage works
- constructing, reconstructing or extending embankments, walls, dykes, dams, reservoirs, bridges, pumping stations or other protective works in connection with the drainage works
- extending the drainage works to an outlet
- improving or altering the drainage works if the drainage works is located on more than one property
- covering all or part of the drainage works
- consolidating two or more drainage works
- any other activity to improve the drainage works, other than an activity prescribed by the Minister as a minor improvement

Only council can initiate a drain major improvement project under Section 78. The decision to initiate a project is based on:

- the drainage superintendent recommending an improvement project to ensure the drain meets current and future drainage need (see Part B, Chapter 4, Beyond Maintenance and Repair)
- property owners requesting an improvement project using:
  - a letter
  - a form developed by the municipality
  - a form available in the Central Forms Repository, form #003-0203E "Notice of Request for Drain Major Improvement"
- the drainage superintendent should advise council if the property owner request should proceed as an improvement project based on the needs of the broader drain community
- if municipal council appoints an engineer 30 days after notifying the conservation authority(s) that has jurisdiction over the land affected by the drainage works

2.5.2 Drain Minor Improvement

Section 78(5) Despite subsections (2) to (4), the Minister may prescribe the process for approving minor improvements to a drainage works mentioned in paragraph 8 of subsection (1.1)

Minor improvement projects involve changes to address a specific need of one property rather than the entire drain. The process has been designed to allow projects to be completed in a timelier and cost effective manner. Some examples of minor improvement projects include a farmer requesting a wider crossing to accommodate larger farming equipment, the addition of a 2nd access crossing, the relocation of a drain on an individual property or the incorporation of a buffer along a drain. Property owners interested in having a minor improvement project completed on their property can initiate the process by completing the Notice of Request for Drain Minor Improvement form available in the Central Forms Repository, form #ON00264E.

A drain improvement project is a minor improvement project provided that it meets all of the criteria listed in O.Reg.500/21 under the Drainage Act. An improvement project that does not meet all of the criteria for the minor improvement process would have to be completed as a major improvement project.

Drainage Major Improvement Procedure

Section 78

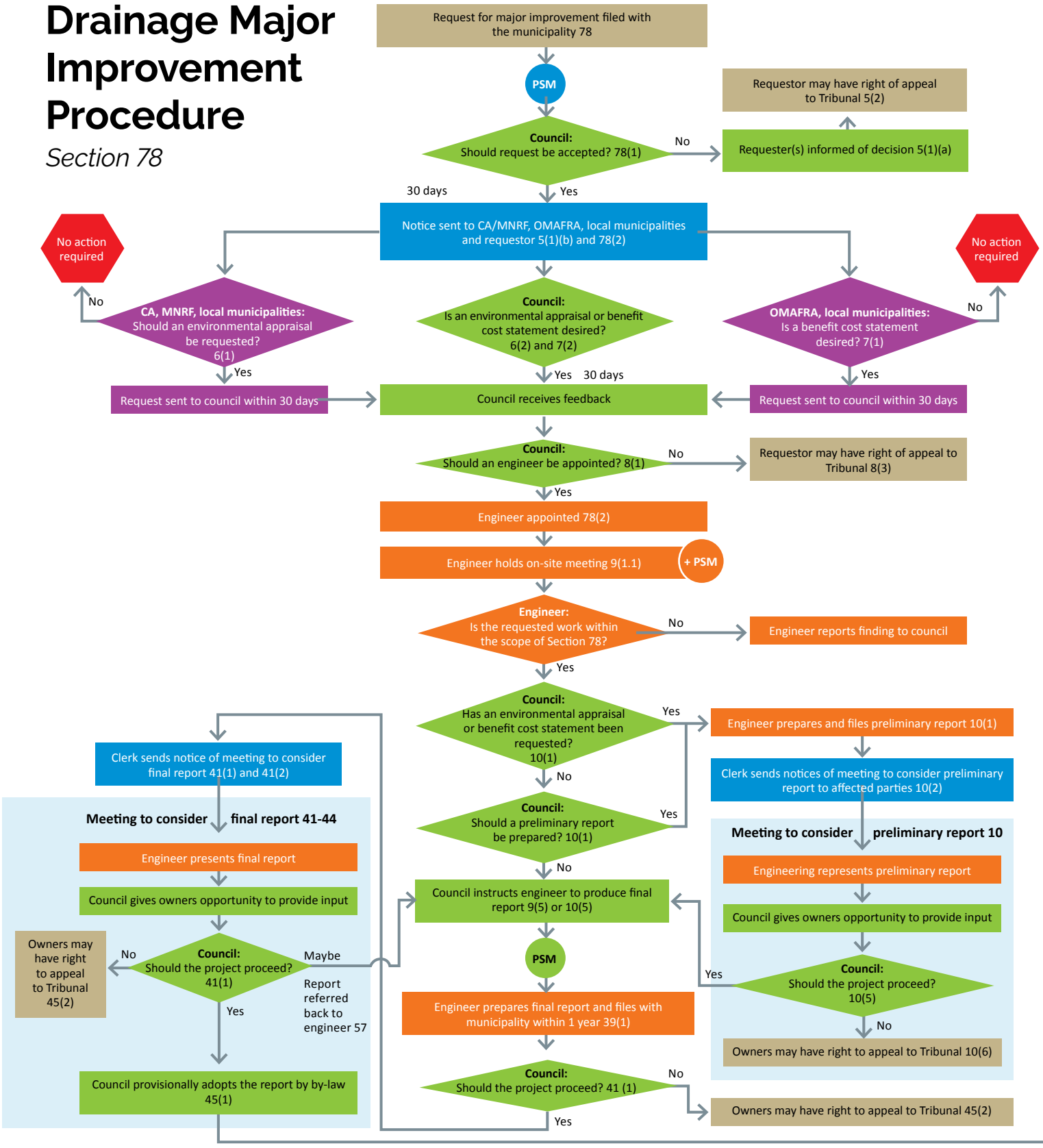
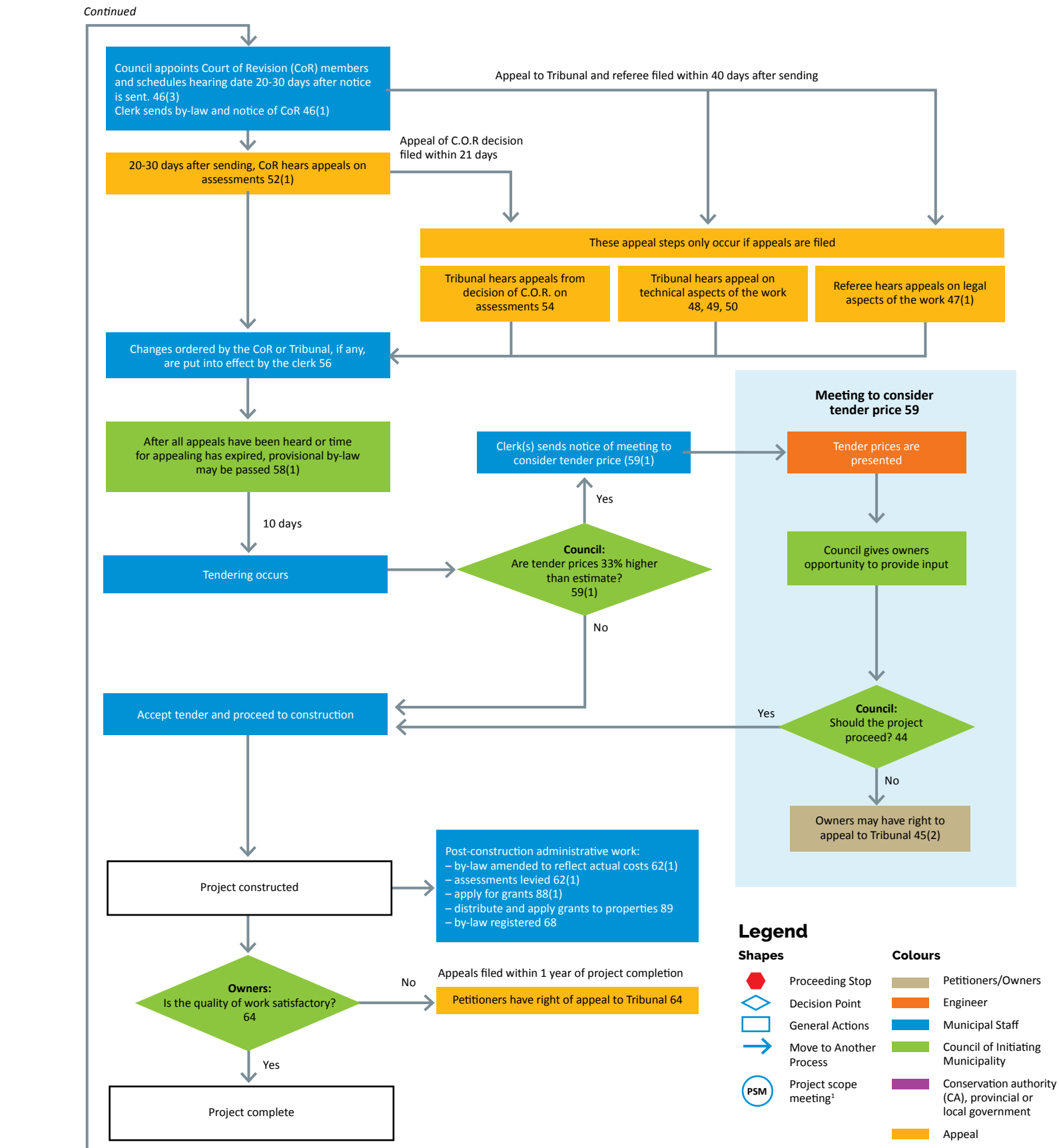


Figure A2-10. Drain major improvement process (Section 78).



1 Project scoping meetings are not required by the Drainage Act. They are a suggested addition to the process as potential means to resolve issues

2.6 Drainage Superintendent and the Commissioner

2.6.1 Sections 93 and 95(3) – Appointment, Payment, Duties and Power of the Drainage Superintendent

- Municipal council may appoint a drainage superintendent by bylaw.
- More than one municipal council may appoint the same person to be their drainage superintendent.
- The cost of employing a drainage superintendent must be paid from the general funds of the municipality.
- A drainage superintendent shall perform certain duties (see Chapter A5.2.1).
- A drainage superintendent has the same power to enter on land as given to the engineer and engineer's assistant (see Chapter A5.2.6.2).

2.6.2 Section 95 – Appointment, Duties, Payment and Power of the Commissioner

- Municipal council may appoint a commissioner by bylaw to allow for better maintenance and repair of a drainage works by pumping, embanking or carrying out other mechanical operations.
- A commissioner may:
  - contract for the purchase of fuel, erection or repairs of buildings, and purchase and repairs of machinery
  - do all other things necessary for successfully operating the drainage works and keeping the embankment in repair
- The cost of employing a commissioner forms part of the cost of the maintenance and repair of the drainage works.
- A commissioner has the same power to enter on land as given to engineer and engineer's assistant (see Section 12(1)).

2.6.3 Section 96 – Offence of Interfering with or Obstructing the Drainage Superintendent or Commissioner

- Anyone who interferes with or obstructs a drainage superintendent or commissioner is guilty of an offense and, if convicted, may be fined up to $2,000.

2.7 Other Management Responsibilities

2.7.1 Section 63 – Contractor Access to Land

- The engineer should designate working areas in the report. The contractor has the right to use this working area for the construction, improvement, maintenance or repair of a drain.
- Anyone who interferes with a contractor is guilty of an offense.

2.7.2 Section 65 – Severances, Connections and Land Use Changes

- The clerk may instruct an engineer to apportion assessments that result from severances.
- Alternatively, the owners of the subdivided land may enter into an agreement on how the assessments should be split.
- When land use changes or land from outside the watershed is connected to a drain, the clerk must instruct an engineer to inspect the land and assess a fair share of the initial construction costs for the drain to the affected land. The amount collected must be kept in an account to be used to pay for future work on the drain.
- When land is disconnected from a drain, the clerk must instruct an engineer to inspect the land and determine the amount the assessment schedule for maintenance and repair should change.

- Council approval is required to connect or disconnect land to a drainage works.
- Any engineering fees incurred under Section 65 are charged to the affected lands as determined by the engineer.

2.7.3 Section 80 – Obstructions

- If an owner or occupant of a property obstructs a drain, council should notify the individual that they must remove the obstruction within a reasonable time frame (Figures A2-11 and A2-12).
- If it is not removed within the specified time, council can direct the drainage superintendent to remove the obstruction and the cost can be charged to the property and collected in the same way as property taxes (see Chapter A4.5).

Figure A2-11. Mattresses dumped into the drain.
Source: Bill Mayes, Norfolk County, Ontario

Figure A2-12. Farm fence obstructing the drain.
Source: Bill Mayes, Norfolk County, Ontario

2.7.4 Section 82 – Damages

- A municipality can initiate legal action against anyone who destroys or injures a drainage works, including surveyor's benchmarks.
- Any damages ordered by the referee are paid to the municipality and used for the construction, improvement, maintenance or repair of the drain.
- The person who damaged the drain may be fined or imprisoned.

2.7.5 Section 84 – Abandonment

- Abandonment of all or part of a drain can be initiated in two ways under this section:
  - if ¾ of the property owners who own at least 75% of the land assessed for benefit on a drain send council a request to abandon a drain or a part of a drain (Section 84(1))
  - if council, on their own initiative, decides to consider abandoning all or part of a drain
- See Chapter A4.6 Abandonment for details on the process of how a drain is abandoned.

2.8 Grants

The authority to provide grants for work performed under the *Drainage Act, 1990* is embedded within the act itself.

2.8.1 Section 85 – Authority for the Provision of Grants

Grants may be provided towards:

- assessments on agricultural land for drain construction, improvement, maintenance and repair work
- the cost of employing a drainage superintendent
- the cost of a preliminary report (with conditions)

2.8.2 Section 86 – Limitations on Grants

There are limitations on grants to agriculture lands owned by federal, provincial or municipal governments. Also, grants are not provided for the cost of a lateral drain that serves only one property and begins and ends on that property.

2.8.3 Section 87 – Assessments on Agricultural Land

This section specifies the grant rate as:

- 33⅓% of assessments on agricultural land in southern Ontario
- 66⅔% of assessments on agricultural land in northern Ontario
- up to 80% in a territory without municipal organization
- 50% for the cost of employing a drainage superintendent (who has qualifications satisfactory to the minister)

2.8.4 Section 88 – Grant Application Submission

The grant application is submitted to the Ontario Ministry of Agriculture, Food and Rural Affairs by the council of the initiating municipality (the municipality that is performing the drain construction, improvement, maintenance and repair work). The application also indicates that grants will not be paid for interest that accrues beyond 120 days after completion of the project.

2.8.5 Section 89 – Treasurer of the Initiating Municipality

The treasurer of the initiating municipality must distribute the grant to the other involved municipalities. Each treasurer must apply the grant towards the assessments that are eligible to receive the grant.

2.8.6 Section 90 – Minister May Reduce or Withhold Payment of Grants

This section allows a reduction or withholding of grant monies "if in [the minister's] opinion the costs other than the contract price are excessive."

2.8.7 Agricultural Drainage Infrastructure Program

The Agricultural Drainage Infrastructure Program (ADIP) expands on the provision of grants through policies and encourages the development of agricultural land in an environmentally responsible manner. Drainage superintendents must understand the rules associated with the provision of grants. ontario.ca/drainage

2.9 Prescribed and Other Forms

Section 125 of the act allows the minister to make regulations prescribing forms. Regulation 381/12: FORMS under the *Drainage Act, 1990*, prescribes eight different forms covering petitions and bylaws. These eight forms, along with many others dealing with notices and appeal rights, are found in the Central Forms Repository, www.forms.ssb.gov.on.ca.

DID YOU KNOW?

Go to forms www.forms.ssb.gov.on.ca:

- to find the prescribed forms, search Regulation 381/12 forms
- to find other drainage forms, search *Drainage Act, 1990*

Chapter 3

Drain Management – Maintenance and Repair

Under the *Drainage Act, 1990*, Sections 65, 74-84, 93 and 95 provide the authority and responsibility to manage municipal drains. This chapter covers the responsibilities for maintenance and repair.

The drainage superintendent manages the maintenance and repair of municipal drains on behalf of the municipality. Figure A3-1 shows the decision process when considering initiating a drain maintenance or repair project. These projects can be initiated by either a property owner request or the drainage superintendent.

Step 1	Receive Request and Discuss Work with Property Owner
Step 2	Review the Drain File and Inspect the Drain
Step 3	Notify Property Owners
Step 4	Notify Agencies of Work
Step 5	Coordinate and Supervise the Work
Step 6	Applying for Grants and Levying the Cost

Drain Maintenance or Repair Procedures

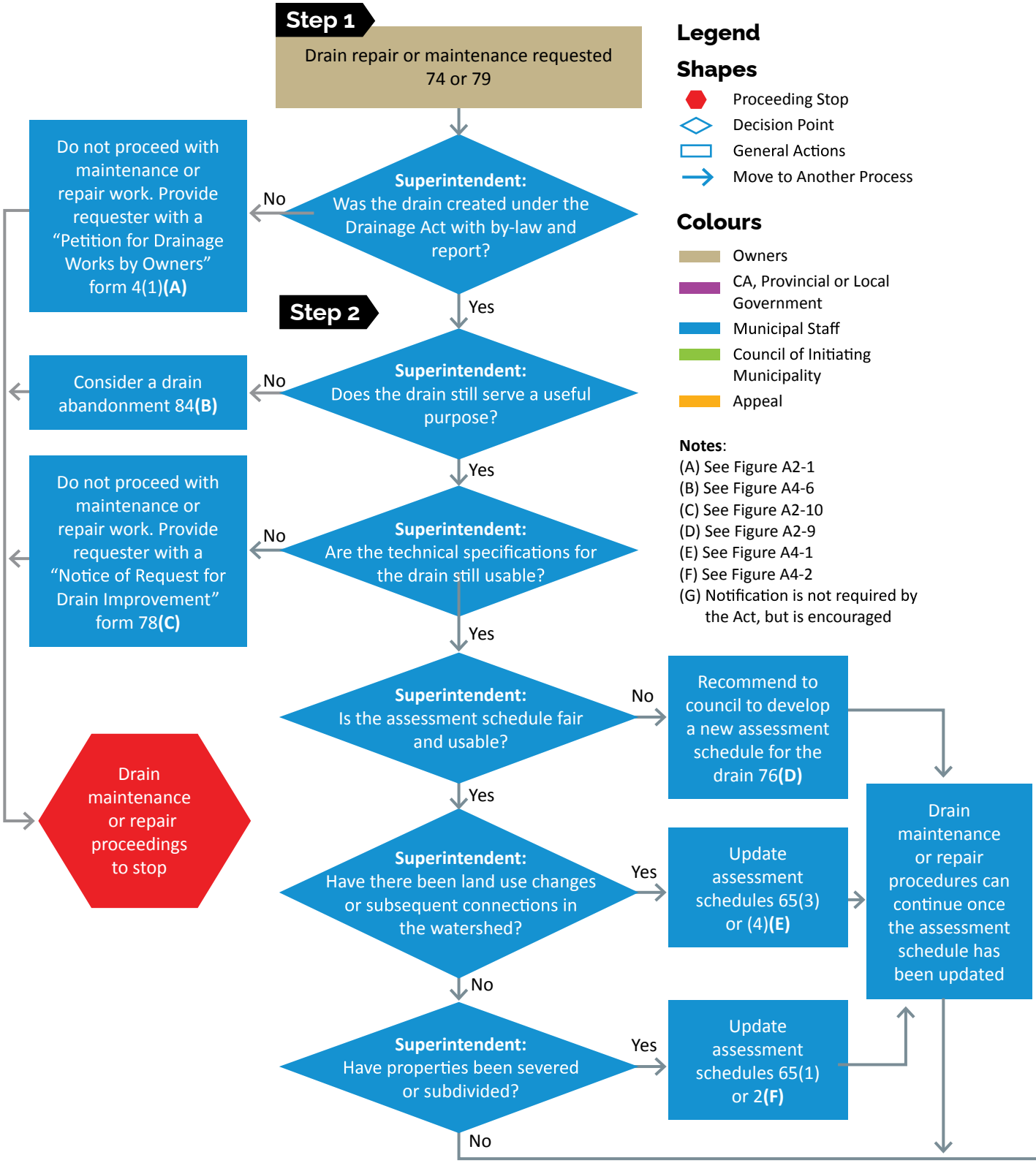
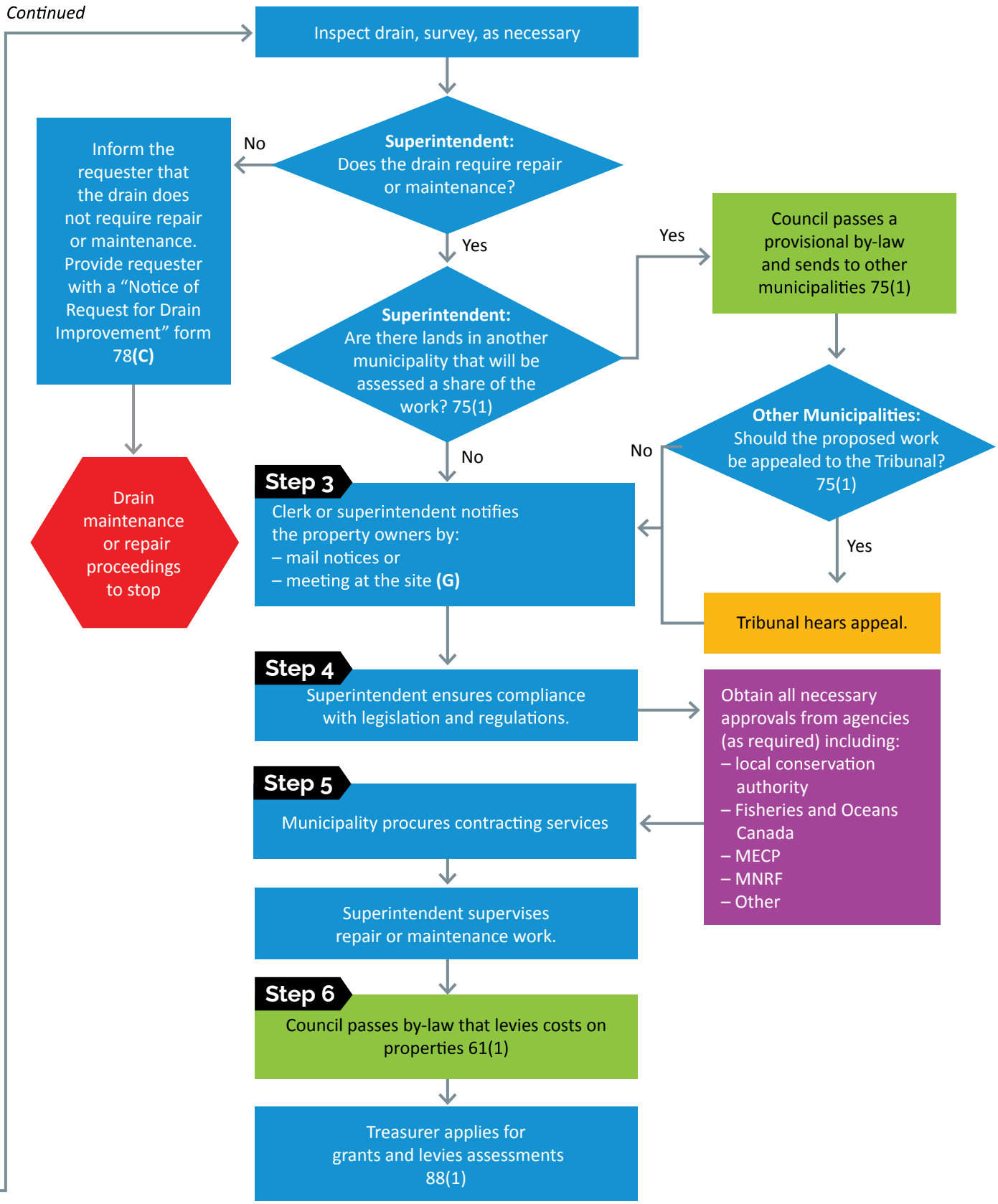


Figure A3-1. Maintenance and repair decision process.

Continued


Continued
Inspect drain, survey, as necessary
Superintendent: Does the drain require repair or maintenance?
No
Inform the requester that the drain does not require repair or maintenance. Provide requester with a "Notice of Request for Drain Improvement" form 78(C)
Drain maintenance or repair proceedings to stop
Yes
Superintendent: Are there lands in another municipality that will be assessed a share of the work? 75(1)
Yes
Council passes a provisional by-law and sends to other municipalities 75(1)
Other Municipalities: Should the proposed work be appealed to the Tribunal? 75(1)
No
Yes
Tribunal hears appeal.
No
Step 3
Clerk or superintendent notifies the property owners by:
– mail notices or
– meeting at the site (G)
Step 4
Superintendent ensures compliance with legislation and regulations.
Obtain all necessary approvals from agencies (as required) including:
– local conservation authority
– Fisheries and Oceans Canada
– MECP
– MNRF
– Other
Step 5
Municipality procures contracting services
Superintendent supervises repair or maintenance work.
Step 6
Council passes by-law that levies costs on properties 61(1)
Treasurer applies for grants and levies assessments 88(1)

3.1 Step 1: Receive Request and Discuss Work with Property Owner

If a maintenance or repair project is initiated by a property owner, the drainage superintendent has a duty to investigate the request. The request should be made in writing, preferably using form 0202 *Notice of Request for Drain Maintenance and/or Repair*, to ensure all important information is provided by the property owner.

Determine if the drain was created under the *Drainage Act, 1990*. It may be a drainage system the municipality is not responsible for (e.g., private drain, an award drain or an abandoned municipal drain).

If it is not a municipal drain, inform the property(s) of their options to have their drainage issue resolved in another way (e.g., petitioning for a drain).

If it is a municipal drain, the drainage superintendent should speak to the property owner submitting the request to ensure there is a mutual understanding about:

- the scope and nature of the drainage problem
- the property owner's expectations for the work
- the drainage superintendent's powers and limitations when completing work (e.g., the work cannot vary the design of the drain from the specifications in the current engineer's report)

DID YOU KNOW?

The Agricultural Information Atlas contains a "Constructed Drains" layer that maps the location of municipal drains in Ontario. Use this information as a guide and confirm with the municipality's records. Search online for Ag Maps.

3.2 Step 2: Review the Drain File and Inspect the Drain

Reviewing the drain file is a multi-step process. Read and consider all documentation related to the drain and physically inspect the drain. Review all related municipal bylaws (especially if the drain passes through more than one municipality) and the current engineer's report to determine if all are still relevant. Read the report and note specific instructions or specifications that will affect the work. Determine if there are multiple bylaws in effect – if there are, use the most current bylaw.

3.2.1 Does the Drain Still Serve a Useful Purpose?

Some drains may no longer be needed for their original purpose. These drains may be abandoned through a process described in Section 84. For more information see Chapter A4.6.

3.2.2 Are the Technical Specifications for the Drain Still Useable for Maintenance and Repair?

Maintenance and repair activities can only be completed to preserve or restore the drain to its original condition, as defined by the technical specifications in the engineer's report. However, there may be circumstances that requires an existing municipal drain to have work completed that goes beyond maintenance and repair due to:

- insufficient capacity caused by changes in land use and design standards
- the need for drain enhancements (e.g., grassed buffers, water control structures)
- landowner requested modifications (e.g., new crossing, drain enclosure, drain relocation)
- the need for extensive drain protection (e.g., erosion control, bank stabilization)

To complete this work, the existing specifications require modifications that must be performed through a drain improvement process described in Section 78. For more information see Chapter A2.5.

3.2.3 Is the Assessment Schedule Fair and Useable?

Existing assessment schedules may no longer be fair as a result of land use changes in the watershed. Some do not differentiate between type of drain (e.g., ditch or pipe) or branch, and it can be challenging to use these schedules to assess cost where work is completed on only a portion of the drain. To complete this work, a new assessment schedule may be required that must be developed through a process described in Section 76. For more information see Chapter A2.4.3.

3.2.4 Have there been Land Use Changes or Subsequent Connections in the Watershed?

A fair and usable assessment schedule may still need to be updated to address changes in land use or connections that have occurred. To complete this work, the existing assessment schedule may need to be updated through a process described in Section 65(3) and (4). For more information see Chapter A2.7.2.

3.2.5 Have Properties been Severed or Subdivided?

A fair and usable assessment schedule may still need to be updated to address severances that have occurred in the watershed. To complete this work, the existing assessment schedule may need to be updated through a process described in Section 65(1) and (2). For more information see Chapter A2.7.2.

The drainage superintendent should ensure that the answer to all of the above questions is 'yes' before proceeding with the scheduling or completion of any maintenance.

3.2.6 Inspect and Survey the Drain

The drainage superintendent should inspect the drain to determine the overall condition of the drain and if a survey is required (Figure A3-2). It may be necessary to compare the existing profile of the drain with the design profile to determine the extent of repair and maintenance required. The drainage superintendent should always notify the property owner(s) before entering on private property to complete a drain inspection or survey.

As a result of the inspection, it may be determined that:

- The existing drain conditions meet the specifications in the engineer's report. If the work requested is beyond repair or maintenance, it may require a drain improvement project. For more information see Chapter A2.5.
- The drain requires maintenance or repair.

Ensure the recommendation(s) is communicated in a timely and appropriate manner to all stakeholders.

Figure A3-2. Inspecting and surveying the drain.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

3.2.7 Are there Lands in Another Municipality that will be Assessed a Share of the Work?

If lands located in other municipality(s) are within the watershed of the drain work (Section 75), the council of the initiating municipality must give two readings to a bylaw and serve this provisional bylaw to the clerk of the other municipality(s) involved. The bylaw must describe the project, estimated costs and the amount to be contributed by each municipality(s). Other municipalities that are expected to contribute to the project have 40 days to file an appeal to the tribunal. If the 40 days pass without an appeal being filed, the bylaw can be given third and final reading. If appeals have been filed, the tribunal will hear the appeal and make orders respecting the bylaw.

3.3 Step 3: Notify Property Owners

3.3.1 Notification

While notification is not required for maintenance under Section 74 of the act, communication with property owners and other stakeholders is encouraged.

The complexity of the work determines:

- who needs to be notified about the work
- what information needs to be communicated
- what method is most appropriate for communicating with/among the property owners and other stakeholders

The municipality should have a policy (formal or informal) that provides guidance to the drainage superintendent on how notification is performed. An example of a municipal policy could be:

- If the work is a small project (e.g., minor tile repair or obstruction removal) then only the property owner(s) affected by the work are notified.
- If the work is a large project (e.g., channel cleanout or major tile replacement) then an on-site meeting is held. Notification may vary depending on municipal policy, which may direct the drainage superintendent to notify property owners in the entire watershed served by the drainage works or only the property owners where work will occur.

Property owners may be notified of drain maintenance or repair by mail, email or telephone depending on the complexity of the work and the municipality's policy.

3.3.2 On-Site Meeting (if required)

On-site meetings provide municipalities, regulatory agencies, property owners and other stakeholders with an opportunity to discuss their shared visions of what a successful project should look like. On-site meetings also provide an opportunity to understand the measures needed to ensure regulatory compliance.

Consider holding an on-site meeting if the project is:

- large (e.g., cost)
- complex (e.g., presence of species at risk, wetlands, timing restrictions)

3.3.2.1 Prepare for the Meeting

Holding an effective on-site meeting is very important to the success of a maintenance or repair project. As the representative of council, the drainage superintendent is the chair of the on-site meeting.

Tips to plan an effective and efficient on-site meeting include:

- Schedule the meeting according to availability of property owners and other stakeholders.
- Choose an appropriate location for the meeting:
  - can it be held on-site at the drain or should it be held indoors at a local facility?
  - parking and traffic considerations
  - best location to illustrate the 'problem'
  - accessibility including requirements under the *Accessibility for Ontarians with Disabilities Act, 2005 (*referred to as AODA)
- Consider having a representative from municipal council at the on-site meeting, if the project has the potential to be controversial.
- Identify a person to take notes at the meeting as it is difficult to effectively take notes and communicate with an audience at the same time. Detailed notes taken at the meeting should document:
  - follow up items
  - attendee comments and requests
  - decisions and agreements for action that will be useful if questions or controversy arise later
- Bring a plan showing the location of the drain, property boundaries and current ownership to encourage discussion.
- Take attendance and record contact information on a sign-in sheet.
- Consider bringing a copy of the current assessment schedule to promote transparent communication so that everyone understands how the cost will be assessed.

3.3.2.2 Prepare the Agenda and Identify Topics

Prepare an agenda and provide it to attendees either before or at the beginning of the meeting. An agenda helps the meeting facilitator stay on topic. Here is a sample agenda:

Agenda

Item	Topic
1	**Introduction** **NOTES:** • Greet attendees and introduce yourself (have the attendees sign the attendance sheet). Your role as the drainage superintendent is to ensure the attendees have a basic understanding of the *Drainage Act, 1990* including drain maintenance activities and the legal, legislative and environmental components of drain maintenance. In order to do this, you may want to: ○ discuss the purpose of the meeting ○ provide a short overview of the *Drainage Act, 1990* ○ explain how the project was initiated
2	**Works requested and/or required** **NOTES:** • Explain the history of the drain including the engineer's report, bylaw and any previous maintenance or repair work completed. • Describe the request for repair, maintenance or improvement and provide an opportunity for the attendees to provide input. • Explain working spaces and right of access: ○ Explain that allowances were provided for future maintenance and repair when the drain was originally constructed and are not provided again. ○ If challenged about access to private property, the drainage superintendent and the contractor have the right to access private land under the *Drainage Act, 1990*. ○ If other parties wish access to private land, they require permission from each property owner or authority under other legislation (e.g., *Conservation Authorities Act, 1990*). • Ask property owners to identify and mark features to be protected (e.g., tile outlets).
3	**Construction procedures and timing of work** **NOTES:** Explain the proposed construction procedures and timing and what property owners should expect during the construction phase of the project. Topics include: • project schedule and impact on cropping activities • access to the work site • for channel municipal drains: ○ brushing methods ○ brush piles, location and responsibility for burning

Agenda (continued)

Item	Topic
	○ side of excavation, determined by current engineer's report ○ placement location of excavated material ○ fence repair or replacement ○ levelling/trucking of spoil, determined by current engineer's report ○ culvert repairs/maintenance ○ erosion issues/restoration/seeding ○ environmental mitigation procedures ○ protection of tile outlets • for pipe municipal drains: ○ existing connections ○ restoration issues • site restoration
4	**Special concerns** **NOTES:** Identify and discuss environmental, safety or other concerns (e.g., property owners will not have access to the site during construction).
5	**Procurement process** **NOTES**: Review municipal policy and process for procuring contracting services for drainage work.
6	**Property owner notification process** **NOTES**: Inform the property owners how they will be notified about the timing and nature of the work to be completed on their property(s).
7	**Assessments, grants and the billing process** **Notes**: • Review the current assessment schedule for the drain and explain that costs will be prorated over the properties upstream from the location of the work. • Explain that grant eligibility for drain maintenance/repair work, under ADIP policies, requires the property be assessed at the Farm Property Class Tax Rate. • Use a map of the drainage works to identify the properties that will be assessed and those eligible for the grant. • Review the municipality's billing and collection policies and procedures.

DID YOU KNOW?

The Agricultural Information Atlas contains a layer that shows the properties that are taxed at the Farm Property Class Tax Rate in Ontario. Search online for Ag Maps.

DID YOU KNOW?

Common courtesy builds respect. Always notify property owner(s) before entering on private property to complete drain maintenance or repair.

3.4 Step 4: Notify Agencies of Work

3.4.1 Notification

Once the scope and timing of the work is established for a project, the drainage superintendent must notify other stakeholders with an interest in the work. The following are the most common stakeholders requiring notification:

- utilities (e.g., Hydro One, gas pipelines)
- conservation authority(s)
- Ontario Ministry of Environment, Conservation and Parks (MECP) if endangered species are affected
- Fisheries and Oceans Canada if work is being performed on a channel

Additional information on these and other regulatory requirements is found in Chapter A6 of this guide. Consider notifying other stakeholders who may have an interest in the drain or the watershed.

3.4.2 Drain Maintenance or Repair Notification Form

The *Drainage Act, 1990 and Conservation Authorities Act Protocol for Drain Maintenance and Repair* (also known as the DART protocol ontario.ca/document/drainage-act-and-conservation-authorities-act-protocol) was created to provide guidance to conservation authority staff and municipal representatives on how to meet the requirements of the *Drainage Act, 1990* and *Conservation Authorities Act*, *1990* for drain maintenance and repair.

The document, *Guidance for Maintaining and Repairing Municipal Drains in Ontario,* was developed to meet the requirements of the *Drainage Act, 1990* and *Fisheries Act, 1985* for drain maintenance and repair. www.dsao.net/images/Documents/Dart/General/Guidance-for-Maintaining-and-Repairing-Municipal-Drains-in-Ontario-March-7-2017-V1.0.pdf

Both documents identify the *Drain Maintenance or Repair Notification Form* as a tool to apply for permissions or authorizations to the regulations under the *Conservation Authorities Act, 1990* and the *Fisheries Act, 1985*.

The drainage superintendent must complete and submit the *Drain Maintenance or Repair Notification Form* to the local conservation authority and Fisheries and Oceans Canada. The protocol, form and a guidance document are available on the Drainage Superintendents Association of Ontario (DSAO) website, www.dsao.net.

DID YOU KNOW?

The Agricultural Information Atlas contains a "Constructed Drains" layer that maps the location of municipal drains in Ontario. The "Department of Fisheries and Oceans Drain Classification" layer can be of assistance when considering drain maintenance and repair projects. Search online for Ag Maps.

3.5 Step 5: Coordinate and Supervise the Work

The drainage superintendent should use best practices to coordinate and supervise all work in accordance with the engineer's report and the municipal procurement process.

3.5.1 Procurement Policies

Under Section 270 of the *Municipal Act, 2001*, each municipality must have a policy on the procurement of goods and services. Advice on the content of these policies is provided in *A Guide to Developing Procurement Bylaws – Meeting the requirements of the Municipal Act, 2001* (2003). Drainage superintendents should refer to their local DSAO chapter for guidance on the application of procurement policies to drainage works and discuss the requirements for procurement of drainage contracting services with their municipal treasurer or chief administrative officer.

The policy will explain how maintenance and repair work is awarded to contractors. Several procurement options may be available including:

- **time and material contract** – can be used for small jobs (e.g., tile repairs, beaver and dam removal) where the contractor is paid based upon the time spent on the project to perform the work and for materials used in construction (including the contractors mark up). These contracts can also carry a guaranteed maximum price that sets an upper limit on what the contractor can charge for the work to be completed.
- **fixed price contract** – can be used where the scope of work is clearly defined since the payment amount does not depend on resources used or time expended.
- **unit cost contract** – is based on units of work or materials rather than a single price. The payment is calculated at a specific rate for each item times the quantity of each item. For example, units may be for length of channel bottom cleaned (in metres) or amount of excavated material removed (in cubic metres). The contractor quotes a unit price based on the estimated scope of work described in the specifications developed by the drainage superintendent. This is similar to most construction and improvement projects completed under the *Drainage Act, 1990*.

3.5.2 Contracting Recommendations

When contracting services are obtained by contract, the following are recommendations:

- Each municipality should have a policy for contracting drain maintenance work.
- When tenders are published, or uninvited tenders are received, the tender document should state that "the lowest or any tender will not necessarily be accepted."

- When tenders are invited, ensure only qualified contractors are invited.
- If the municipality requires a tender deposit, it should be:
  - 10% of the tendered price for labour, equipment and materials supplied by the contractor
  - returned upon certified completion of the work
- If the municipality requires a holdback on payment, it should be:
  - 10% of each and every progress payment and held for the period of time specified in the *Construction Lien Act, 1990*
  - a 'maintenance and performance bond' acceptable to the municipality

Prior to work being performed for the municipality, municipal staff should confirm the contractor carries adequate liability insurance. Alternatively, some municipalities may require a 100% performance, labour and materials bond. The drainage superintendent should ensure they are fully aware of the insurance and bond requirements of their municipality.

Depending on municipal policy, the drainage superintendent may be involved in contract administration including:

- preparing tender documents
- obtaining necessary approvals
- obtaining pre and post construction photographs
- calling tenders or inviting bids
- checking references
- checking a contractor's WSIB clearance certificate, liability insurance and health and safety policy
- summarizing the tenders and making a recommendation to council for the award of the contract
- approving contractor payment certificates
- managing holdbacks

3.5.3 Site Supervision

Once a contractor has been retained, the superintendent is responsible for supervising the work. Ensure the work is completed in accordance with the plans, profiles and specifications in the engineer's report and the contract. Pay close attention to the following:

- grade of the drain
- crossing and outlet installations
- field tile drain connections
- catch basin and junction box installations
- the levelling of excavated material
- tree removal
- seeding
- fence repair
- permit approval conditions

Documentation is critically important to a successful project. The drainage superintendent should:

- ensure document files are complete and electronically backed up on a regular basis
- maintain field notes of conversations with contractors, property owners and other stakeholders – these notes are essential during dispute resolution.

The drainage superintendent is responsible for the project completion including site restoration. Note any deficiencies and prepare the required orders to ensure the work is completed.

3.6 Step 6: Applying for Grants and Levying the Cost

3.6.1 Apply for Grants

Sections 85-90 of the act provide instructions with respect to grants:

- After practical completion of the drain maintenance or repair work, the initiating municipality may apply for the applicable grants.
- The grant is used to reduce the assessments imposed on agricultural lands.
- When there is more than one municipality involved, the treasurer of the initiating municipality distributes the grant to the other municipalities in the proportions defined in the assessment schedules.
- In most circumstances, the treasurer of the initiating municipality will bill the other involved municipalities the net amount due (total assessments in that municipality less any anticipated grants). When the grant is received, the initiating municipality retains it.

The Agriculture Drainage Infrastructure Program policies provide further information on eligibility criteria and claiming grants for drain maintenance.

3.6.2 Levy Costs as Soon as Possible

Drain maintenance and repair should be levied on the properties as soon as practical after completion of the project (Section 75(2)). Assist the treasurer by identifying where the work was performed and the upstream properties that need to be assessed for the work.

Each municipality should pass a bylaw that levies the assessment on each affected property (Section 61(1) and 75(2)). To reduce the administrative work, attach multiple schedules to a single levying bylaw. Each schedule would show the assessments being imposed for a specific drain repair or maintenance project.

3.6.3 When to Delay Levying Costs

Section 75(3) of the act states that a municipality is not required to levy maintenance and repair costs more than once in every 5 years if the total expense incurred is less than $5,000. This can be very useful for small recurring projects on a drain (e.g., beaver dam removal, pipe repair). The drawbacks of accumulating costs include:

- more administrative work to track accumulated costs
- accumulated costs may be forgotten and the 5-year limit exceeded. If this occurs, it is uncertain if the costs incurred more than 5 years ago can still be levied.
- new property owners may object to charges being levied for work that took place before they owned the property

3.7 Types of Drain Maintenance and Repair Work

The drainage superintendent is required to coordinate and supervise the maintenance and repair project (Step 5). This section is intended to provide an overview of the types of maintenance and repair work, and methods to achieve completion.

The best advice is to engage contractors experienced in all aspects of municipal drainage projects. They have the knowledge, operators, equipment and tools to get the job done. Most projects will require contact with Ontario One Call and may require approvals from highway or road authorities. Approvals may also be required from other agencies and utilities depending on the location and the scope of the work.

3.7.1 Typical Maintenance and Repair Activities

There are many activities that are routinely completed by a drainage superintendent. The routine activities described below align with the Standard Compliance Requirements (SCR) within the DART Protocol.

For each of these activities (with the exception of item P. Standard Best Practices), approvals may be required from:

- conservation authority
- Fisheries and Oceans Canada
- Ministry of Natural Resources and Forestry

A. Brushing Bank Slope

Description: This is the removal of trees, shrubs and other vegetation from the side slopes of a municipal drain without removing the root structure or disturbing the soil (Figure A3-3).

Figure A3-3. Brushing the drain bank.
Source: Dietrich Engineering Ltd., Kitchener, Ontario.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- chainsaw
- tractor mounted boom brush cutting attachment
- hydraulic excavator with boom mounted brush cutting attachment
- hydraulic excavator with boom mounted brush rake

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- If feasible, leave some mature trees near the top of the bank. This will maintain as much shade as possible keeping the water cooler.
- Brushing may not be required on both slopes. Brush only the material that is impeding the flow of the drain or the side allowing excavator access for cleanout.
- After brushing, material left in the drain may cause a blockage that may result in flooding. Remove this cut brush with a brush rake attached to the excavator boom.
- Collect cut brush and place into piles for later burning or disposal.

B. Brushing Top of Bank

Description: This is the removal of trees and other vegetation from the top of bank of a municipal drain to allow right-of-way maintenance and site accessibility. Certain situations may require the removal of the root structure of trees or shrubs and the disturbance of the soil that may require reseeding (Figure A3-4).

Figure A3-4. Brushing the top of a bank.
Source: Dietrich Engineering Ltd., Kitchener, Ontario.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- chainsaw
- tractor mounted boom brush cutting attachment or
- hydraulic excavator with boom mounted brush cutting attachment
- hydraulic excavator with boom mounted brush rake
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Leave mature trees where possible.
- Brushing may not be required on both bank tops. Brush only material allowing excavator access for cleanout.
- After brushing, material left in the drain may cause a blockage that may result in flooding. This cut brush may have to be removed with a brush rake attached to the excavator boom.
- Except on cultivated lands, seed areas of disturbed soil using a seeder appropriate for the project.
- Collect cut brush and place into piles for later burning or disposal.

C. Debris Removal and Beaver Dam Removal

Description: The removal of log jams, garbage, beaver dams and other obstructions from municipal drains (Figure A3-5).

Figure A3-5. A beaver dam obstructing the flow of a drain.
Source: City of Kawartha Lakes, Ontario

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- straw bales and stakes or silt fence to install a check dam
- chainsaw, garden rake, shovel
- tractor backhoe with a clam attachment
- hydraulic excavator with a clam attachment
- seed mixture and hand cyclone seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Review Best Management Practices contained in Appendix 4 of *Guidance for Maintaining and Repairing Municipal Drains in Ontario*, www.dsao.net.
- Only remove beaver dam after beaver have been trapped or relocated (see Chapter A3.7.3).
- If possible, remove the beaver dam using hand tools.
- It is mandatory to install a check dam for beaver dam removal. Following completion of the work, remove the check dam.
- Remove the beaver dam gradually to prevent damage or flooding downstream.
- Except on cultivated lands, seed areas of disturbed soil using a cyclone seeder.

D. Spot Cleanout

Description: Cleanout of areas of sediment buildup that is significant enough to impede flow resulting in channel erosion or flooding concerns. This may include the cleanout of a sediment trap.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- survey flags and stakes
- check dams constructed of straw bales and stakes or a silt fence
- tractor backhoe with a ditching bucket
- hydraulic excavator with ditching bucket
- seed mixture and hand cyclone seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Mark spot cleanout areas with flags or stakes before the contractor arrives on site.
- Install check dam(s) as specified in the notification form and agency permissions. More than one may be required if spot cleanouts are required over a long section of the drain.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using a cyclone seeder

E. Culvert Replacement

Description: Replacement of a culvert in accordance with the engineer's report. Culverts must be the same diameter and length and installed at the location specified in the report (Figures A3-6 and A3-7). If the replacement of the culvert cannot comply with the engineer's report, see Chapter A3.7.4 for crossing management.

Figure A3-6. Placement of the new culvert as part of a crossing replacement.
Source: Municipality of West Elgin, Ontario

Figure A3-7. Backfilling around a new culvert.
Source: City of Kawartha Lakes, Ontario

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- survey flags and stakes
- survey equipment
- pump, intake and outlet hoses
- plate tamper and/or jumping jack tamper
- geotextile fabric, crushed stone, granular fill, quarry stone riprap
- check dams constructed of straw bales and stakes or silt fence
- tractor backhoe with a ditching bucket
- hydraulic excavator with ditching bucket
- seed mixture and hand cyclone seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Review Best Management Practices contained in Appendix 4 of *Guidance For Maintaining and Repairing Municipal Drains in Ontario*, www.dsao.net
- Establish design grade for replacement culvert based on engineer's report.
- Attempt to relocate fish downstream of the work site.
- Install check dam(s) as specified in the notification form and agency permissions.
- Excavate a sediment trap downstream of culvert and upstream of check dam.
- Depending on flow of the stream, dewatering may be required. This will require isolating the work zone and installing a suitably sized pump to bypass water downstream of the work zone. Discharge water into existing downstream vegetation.

- Remove existing culvert and earth fill to minimum 300 mm below design grade.
- Prepare minimum of 300 mm stone bed for replacement culvert.
- Install new culvert based on design grade. Embed the culvert into the stone bed by 10%.
- Backfill with crushed stone to the spring-line; continue backfilling with compacted granular 'B' to minimum of 300 mm above the pipe.
- Crossing side slopes to maximum 1.5H:1V both upstream and downstream.
- Topcoat with minimum of 150 mm granular 'A' over the travelled portion of the crossing.
- Install geotextile on the slope at both ends and cover with riprap.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using a cyclone seeder

F. Bank Stabilization and Pipe Outlet Repair

Description: Includes restoration of bank slopes to original design in the engineer's report and localized activities to prevent bank failure (e.g., the placement of riprap, seeding the bank and the use of geotextile materials) (Figure A3-8).

Figure A3-8. Bank stabilization and outlet repair. *Source: Leroux Consultant, Municipality of Champlain, Ontario*

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- geotextile fabric, crushed stone, earth/clay fill, quarry stone riprap
- check dams constructed of straw bales and stakes or silt fence
- tractor backhoe with a ditching bucket
- hydraulic excavator with ditching bucket
- except on cultivated lands, seed mixture and hand cyclone seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Review Best Management Practices contained in Appendix 5 of *Guidance for Maintaining and Repairing Municipal Drains in Ontario*, www.dsao.net

- Bank stabilization –earth/clay fill only:
  - Install check dam downstream of the work zone as specified in the notification form and agency permissions.
  - Place earth/clay fill on bank slope at slope specified in engineer's report.
  - Except on cultivated lands, seed areas of disturbed soil using a cyclone seeder.
- Bank stabilization – earth/clay fill with riprap:
  - Install check dam downstream of the work zone as specified in the notification form and agency permissions.
  - Place earth/clay fill on bank slope at slope specified in engineer's report
  - Install geotextile on the slope and cover with riprap.
  - Except on cultivated lands, seed areas of disturbed soil using a cyclone seeder.
- Pipe outlet repair:
  - Install check dam downstream of the work zone as specified in the notification form and agency permissions.
  - Excavate and remove existing outlet pipe.
  - Bed area under pipe with minimum 150 mm crushed stone and cover crushed stone and adjacent disturbed soil with geotextile fabric.
  - Reinstall pipe or replace as required and cover with riprap. Riprap should extend into ditch, below outlet, to dissipate water energy, preventing erosion.
  - Except on cultivated lands, seed areas of disturbed soil using a cyclone seeder.
- Following completion of the work, remove check dam.

G. Dyke Maintenance and Repair

Description: Replacement, repair of breaches, or bank restoration of dykes as set out in the original engineer's report (Figure A3-9)

Figure A3-9. A recently repaired dyke.
Source: Town of Bradford West Gwillimbury, Ontario

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- tractor backhoe with a ditching bucket
- hydraulic excavator with ditching bucket
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Choose conditions and equipment appropriate to minimize site disturbance by equipment (e.g., frozen or dry soil conditions or the use of load distributing machines or mats).
- Place brush, debris and sediment in a location to minimize entry into the channel.
- Perform work in appropriate flow conditions to minimize debris movement and erosion.
- Limit soil movement and erosion; use appropriate control measures before work begins and inspect and maintain those measures regularly until all disturbed areas are stabilized.
- Except on cultivated lands, seed areas of disturbed soil using the appropriate type of seeder.
- Following completion of the work, remove the check dam.

H. Water Control Structure Maintenance and Repair

Description: Structural maintenance, replacement or repair of a water control structure in accordance with the specifications under the engineer's report.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- survey equipment
- pump, intake and outlet hoses
- geotextile fabric, crushed stone, quarry stone riprap
- tractor backhoe with a ditching bucket
- hydraulic excavator with ditching bucket
- cable or chain to hoist water control structure if required
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Establish design grade of water control structure based on engineer's report.
- Attempt to relocate fish downstream of the work site.
- Install check dam(s) as specified in the notification form and agency permissions.
- Excavate a sediment trap downstream of water control structure and upstream of check dam.
- Depending on flow of the stream, dewatering may be required. This will require isolating the work zone and installing a suitably sized pump to bypass water downstream of the work zone. Discharge water into existing downstream vegetation.
- Repair or replace structure to meet specifications in the engineer's report.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate type of seeder.

I. Pump Station Maintenance and Repair

Description: Structural repairs or replacing a pump station in accordance with the specifications under the engineer's report (Figure A3-10).

Figure A3-10. A pumping station.
Source: Municipality of Chatham-Kent, Ontario

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- coffer dams to dewater the sump prior to maintenance activities of the sump and inlet for the pumping station

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.

J. Bottom Only Cleanout (Outside of Regulated Wetland Limits)

Description: Removal of accumulated sediment in a drain, including spreading of the spoil, removal of vegetation in the bottom of the channel and access to the site (Figure A3-11).

Figure A3-11. A bottom cleanout of a drain with vegetation remaining on the bank.
Source: Leroux Consultant, Municipality of Alfred-Plantagenet, Ontario

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- hydraulic excavator with ditching bucket
- survey equipment
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Install check dam(s) as specified in the notification form and agency permissions.
- Minimize flooding upstream and downstream.
- Minimize channel width to reduce sediment deposition.
- Perform work in no/low flow conditions to minimize sediment movement and erosion. Avoid work after recent precipitation or snowmelt.
- Excavate a sediment trap(s) downstream of work zone upstream of check dam.
- There should be no appreciable change in the grade of the drain with the removal of sediment.
- Remove sediment from ditch bottom and spread or dispose of material based on the criteria established in the engineer's report. If the report doesn't address sediment disposal, the material should be spread on adjacent land a minimum of 3 m from the top of the bank.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate seeder.

K. Bottom Cleanout Plus One Bank Slope (Outside of Regulated Wetland Limits)

Description: Removal of accumulated sediment in a drain, including spreading of the spoil; the removal of vegetation in the bottom of the channel and removal of slope vegetation, including root removal; and access to the site (Figure A3-12).

Figure A3-12. A bottom and left bank cleanout with vegetation remaining on the right bank.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- survey equipment
- chainsaw
- tractor mounted boom brush cutting attachment
- hydraulic excavator with boom mounted brush cutting attachment
- hydraulic excavator with ditching bucket
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Install check dam(s) as specified in the notification form and agency permissions.
- Minimize flooding upstream and downstream.
- Minimize channel width to reduce sediment deposition.
- Perform work in no/low flow conditions to minimize sediment movement and erosion. Avoid work after recent precipitation or snowmelt.
- Excavate a sediment trap(s) downstream of work zone and upstream of the check dam.
- There should be no appreciable change in the grade of the drain with the removal of sediment.
- Remove sediment and vegetation from ditch bottom and side slope. Spread or dispose of material based on the criteria established in the engineer's report. If the report doesn't address sediment disposal, the material should be spread on adjacent land a minimum of 3 m from the top of the bank.
- Leave mature trees where possible.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate seeder.

L. Full Cleanout (Outside of Regulated Wetland Limits)

Description: Removal of accumulated sediment in a drain, including spreading of the spoil; the removal of vegetation in the bottom of the channel and removal of slope vegetation, including root removal; the removal of trees and other vegetation from the top of a bank; and access to the site (Figure A3-13).

Figure A3-13. A recently completed full drain clean out. *Source: Dietrich Engineering Ltd., Kitchener, Ontario*

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- chainsaw
- tractor mounted boom brush cutting attachment
- hydraulic excavator with boom mounted brush cutting attachment
- hydraulic excavator with ditching bucket
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Install check dam(s) as specified in the notification form and agency permissions.
- Minimize flooding upstream and downstream.
- Minimize channel width to reduce sediment deposition.
- Perform work in no/low flow conditions to minimize sediment movement and erosion. Avoid work after recent precipitation or snowmelt.
- Excavate a sediment trap(s) downstream of work zone and upstream of the check dam.
- There should be no appreciable change in the grade of the drain with the removal of sediment.
- Remove sediment and vegetation from ditch bottom and side slope. Spread or dispose of material based on the criteria established in the engineer's report. If the report doesn't address sediment disposal, the material should be spread on adjacent land a minimum of 3 m from the top of the bank.
- Leave mature trees where possible.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate seeder.

M. Bottom Only Cleanout (Within Regulated Wetland Limits)

Description: Removal of accumulated sediment in a drain, including spreading of the spoil, removal of vegetation in the bottom of the channel and access to the site.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- hydraulic excavator with ditching bucket
- equipment mats
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Install check dam(s) as specified in the notification form and agency permissions.
- Minimize flooding upstream and downstream.
- Minimize channel width to reduce sediment deposition.
- Perform work in no/low flow conditions to minimize sediment movement and erosion. Avoid work after recent precipitation or snowmelt.
- Excavate a sediment trap(s) downstream of work zone and upstream of check dam
- There should be no appreciable change in the grade of the drain with the removal of sediment.
- Remove sediment from ditch bottom and spread or dispose of material based on the criteria established in the engineer's report. If the report doesn't address sediment disposal, the material should be spread on adjacent land a minimum of 3 m from the top of the bank.

- Leave mature trees where possible.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate seeder.

N. Bottom Cleanout Plus One Bank Slope (Within Regulated Wetland Limits)

Description: Removal of accumulated sediment in a drain, including spreading of the spoil; the removal of vegetation in the bottom of the channel and slope, including root removal and access to the site.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- chainsaw
- survey equipment
- tractor mounted boom brush cutting attachment
- hydraulic excavator with boom mounted brush cutting attachment
- hydraulic excavator with ditching bucket
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Install check dam(s) as specified in the notification form and agency permissions.
- Minimize flooding upstream and downstream.
- Minimize channel width to reduce sediment deposition.
- Perform work in no/low flow conditions to minimize sediment movement and erosion. Avoid work after recent precipitation or snowmelt.
- Excavate a sediment trap(s) downstream of work zone and upstream of check dam
- There should be no appreciable change in the grade of the drain with the removal of sediment.
- Remove sediment and vegetation from ditch bottom and side slope. Spread or dispose of material based on the criteria established in the engineer's report. If the report doesn't address sediment disposal, the material should be spread on adjacent land a minimum of 3 m from the top of the bank.
- Leave mature trees where possible.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate seeder.

O. Full Cleanout (Within Regulated Wetland Limits)

Description: Removal of accumulated sediment in a drain, including spreading of the spoil; the removal of vegetation in the bottom of the channel and slope, including roots, trees and other vegetation from the top of a bank and access to the site.

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- chainsaw
- survey equipment
- tractor mounted boom brush cutting attachment
- hydraulic excavator with boom mounted brush cutting attachment
- hydraulic excavator with ditching bucket
- seed mixture and seeder (see Part B, Chapter B4.3.5)

Other considerations

- Follow mitigation requirements contained in agency permissions or approvals.
- Install check dam(s) as specified in the notification form and agency permissions.
- Minimize flooding upstream and downstream.
- Minimize channel width to reduce sediment deposition.
- Perform work in no/low flow conditions to minimize sediment movement and erosion. Avoid work after recent precipitation or snowmelt.
- Excavate a sediment trap(s) downstream of work zone and upstream of check dam.
- There should be no appreciable change in the grade of the drain with the removal of sediment.
- Remove sediment and vegetation from ditch bottom and side slope. Spread or dispose of material based on the criteria established in the engineer's report. If the report doesn't address sediment disposal, the material should be spread on adjacent land a minimum of 3 m from the top of the bank.
- Leave mature trees where possible.
- Clean out the sediment trap.
- Following completion of the work, remove check dam.
- Except on cultivated lands, seed areas of disturbed soil using appropriate seeder.

P. Standard Best Practices – Pipe, Junction Box or Catch Basin Maintenance and Repair

Description

A **pipe** is a buried conduit used to convey water beneath the land surface. Maintenance and repair activities include:

- replacing a section of collapsed or broken pipe
- removing roots or other blockages

A **junction box** is a structure buried in the ground that allows the connection of various pipes entering at different elevations (Figure A3-14). Maintenance and repair activities include:

- periodic removal of sediment from junction box bottom
- repair or replacement of the junction box

A **catch basin** is an inlet structure that allows surface water to drain into a pipe municipal drain. Maintenance and repair activities include:

- periodic removal of sediment from catch basin structure
- repair or replacement of the catch basin structure

Pipe, junction box or catch basin repairs do not normally require standard compliance or other approvals. Drainage superintendents should still follow best practices while doing these repairs and notify the landowner prior to starting the work.

Figure A3-14. Repairs being made to a junction box. *Source: Dietrich Engineering Ltd., Kitchener, Ontario*

Equipment requirements

The type of equipment used will depend on the scope of the work and may include:

- check dams constructed of straw bales and stakes or silt fence
- geotextile fabric, crushed stone, quarry stone riprap
- survey equipment
- wrenches to remove grate
- non-shrinking grout, clean water, trowel and bucket
- tractor backhoe with a ditching bucket
- hydraulic excavator with ditching bucket
- cable or chain to hoist structure if required
- seed mixture and hand cyclone seeder (see Part B, Chapter B4.3.5)

Other considerations

- Review best management practices in Appendix 3, Table 1 of Guidance for Maintaining and Repairing Municipal Drains in Ontario.
- If practical, install check dam downstream of the work zone.

Pipe repair or replacement:

- strip topsoil and excavate earth fill (keep them separate)
- remove existing damaged or blocked pipe
- bed area under pipe with a minimum 150 mm of crushed stone
- reinstall pipe or replace as required and cover joints with geotextile fabric
- backfill with existing earth fill
- spread topsoil over excavated area
- except on cultivated lands, seed areas of disturbed soil using a cyclone seeder

Buried junction box repair or replacement:

- strip topsoil and excavate earth fill (keep them separate)
- remove structure if necessary
- bed area under structure with a minimum 150 mm of crushed stone
- reinstall or replace structure as required using geotextile fabric in the joints between all sections of the structure
- reinstall pipes into structure maintaining design invert elevations
- grout void between pipe and structure on the inside and outside
- wrap grouted connection with geotextile fabric
- backfill with existing earth fill
- spread topsoil over excavated area
- except on cultivated lands, seed areas of disturbed soil using a cyclone seeder

Catch basin repair or replacement:

- strip topsoil and excavate earth fill (keep them separate)
- remove structure if necessary
- bed area under structure with a minimum 150 mm of crushed stone
- reinstall or replace structure as required using geotextile fabric in the joints between all sections of the structure
- reinstall pipes into structure maintaining design invert elevations
- grout void between pipe and structure on the inside and outside
- wrap grouted connection with geotextile fabric
- backfill with crushed stone to within 300 mm from the top elevation
- lay geotextile fabric over the crushed stone around structure
- place 300 mm thickness of quarry stone riprap over the fabric
- spread topsoil over excavated area
- except on cultivated lands, seed areas of disturbed soil using a cyclone seeder

Following completion of the work, remove check dam or silt fence.

3.7.2 Vegetation Management

In addition to the brushing activities described in Chapter A.3.7.1 (A) and (B), there are other vegetation management activities performed by drainage superintendents. In general, vegetation management measures rely on mechanical (e.g., brushing, cutting) and/or chemical (e.g., sprays) methods, but future management needs can be significantly influenced if the appropriate seed mixture is used when a drain is constructed.

3.7.2.1 Spray Control

Spraying around water requires specific approvals. Drainage superintendents must ensure that contractors hired for vegetation management work on drainage works have all the necessary licenses and permits (Figure A3-15). The drainage superintendent should:

- seek professional advice before undertaking any chemical spray program
- ensure the contractor has the appropriate licenses, equipment and experience
- hire contractors that have the following:
  - industrial vegetation exterminator license
  - operator's license
  - high risk insurance
  - up to date health and safety policies
  - Safety Data Sheets (SDS) for chemicals (e.g., pesticides)

Figure A3-15. Spraying for phragmites.
Source: Giles Restoration Services Inc., Port Rowan, Ontario

3.7.2.2 Reseeding Grass

Disturbed topsoil is often rich with native seeds that grow quickly and stabilize banks and berms after excavation, limiting soil erosion and minimizing the transport of eroded soil.

Although native plants naturally rejuvenate, some areas may require reseeding with a native, non-invasive grass seed mixture during April, May, late August or September. There are some common seeding methods which have advantages and disadvantages depending on drain location, site conditions, time of year and soil conditions. They include:

- seed drill accurately place seed on level ground
- hand cyclone seeder is often used on uneven ground but it may be difficult to obtain a uniform pattern when spreading seed
- trailer mounted, hydro-seeder (Figure A3-16) applies seed and mulch at the same time but requires access and is generally more expensive

Figure A3-16. Hydro-seeding on both banks of a drain.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

Choosing the appropriate seed mixture is important to the success of grass establishment and maintenance or repair. Contact a local grass seed supplier to determine the seed mixture best suited to the area.

The following seed mixture is relatively inexpensive and suitable for most areas in Ontario:

Quick Erosion Control Cover Mixture

Mixture: 50% annual ryegrass + 50% perennial ryegrass = 100% seed mixture

Seeding rate: 56 kg/ha (50 lb/acre)

3.7.2.3 Phragmites Australis (European Common Reed)

Phragmites is an aggressive, invasive, perennial grass that survives best in areas of standing water. Its roots can grow to extreme lengths, allowing it to also survive in relatively dry areas (Figure A3-17).

Do not ignore phragmites. The sooner an infestation is dealt with, the easier and less costly it will be to manage.

Refer to *Smart Practices for the Control of Invasive Phragmites along Ontario's Roads*, 2015, developed by the Ontario Phragmites Working Group (www.opwg.ca). The document was developed to help guide effective and efficient roadside ditch control of *Phragmites australis*.

Figure A3-17. Phragmites along a drain.
Source: Dave Richards, Ontario Ministry of Natural Resources and Forestry

Impacts

Negative impacts of a phragmites infestation include:

- reduced shoreline access
- reduced recreational opportunities
- reduced aesthetic enjoyment
- reduced shoreline property values
- increased fire hazards from extensive vegetation
- blocked sight lines at road intersections
- blocked drainage ditches
- damaged asphalt roads from plant rhizomes
- outcompetes native vegetation in wetlands and riparian corridors

Control options

Control of phragmites includes herbicide application, cutting or a combination of herbicide application and cutting. Herbicide application is the most effective method of control.

In Ontario, pesticide (including herbicides) storage, disposal, use, transport and sale are regulated under the *Pesticides Act, 1990* and regulations. The use of herbicides near water is strictly regulated under the act. Application for phragmites control requires an exemption under the act. Contact the Ministry of the Environment, Conservation and Parks (MECP) for further details about the *Pesticide Act, 1990* and regulations.

Any pesticide application must be done by a licensed exterminator, which may include a drainage superintendent who holds the appropriate integrated pest management certification (www.ontarioipm.com).

3.7.2.4 Noxious Weeds

Noxious weeds also require specific control methods. Take care when inspecting and walking the drain for the presence of giant hogweed, poison hemlock, wild parsnip, poison ivy, etc., as they present a health and safety concern. For more information on noxious weeds in Ontario see OMAFRA factsheet, *Weeds Act – Frequently Asked Questions* (ontario.ca/omafra).

3.7.3 Beaver Management

The following information can assist the drainage superintendent with identifying and acting on possible beaver activity in or around the drainage works.

Beaver activity over time

Beavers generally hibernate between December and March depending on weather conditions. If the winter is mild, they may be out foraging for food. Beavers generally migrate in May and June, during their birthing season, because the breeding female in the lodge pushes out all members of the colony. The displaced beavers migrate to other areas, including nearby drainage works, and attempt to establish new habitat. They may travel 1-2 km from the original lodge.

Signs of beaver activity

Signs of beaver activity may or may not be obvious. Felled trees near the drain (Figure A3-18) and 'push-ups' – small mounds of mud/grass along the edge of the drain (Figure A3-19) – are obvious. These are 'scented' territory markers. However, when beavers burrow into watercourse banks for temporary shelter, this type of activity may be less obvious. The holes are very difficult to locate because they are usually below the water line under over-hanging grass or shrubs. Sometimes beavers place sticks and mud around the area, which may be the beginnings of a lodge. Beavers may also migrate to an area, build a dam (but not a lodge) and then return to their original location.

Figure A3-18. Signs of beaver activity include felled trees with gnawed ends.
Source: Gary Fischer, Land and Wildlife Agency of Eastern Ontario, Ottawa, Ontario

Figure A3-19. Signs of beaver activity include 'push-ups' along the edge of the drain.
Source: Gary Fischer, Land and Wildlife Agency of Eastern Ontario, Ottawa, Ontario

Where to look for a beaver dam

The most obvious sign of beaver activity is a dam or the beginnings of one. Beavers usually choose a strategic site that results in the biggest catchment of water (Figure A3-20). Examples include:

- upstream from a culvert (Figure A3-21)
- in narrow areas of a drain
- downstream of the entrance of a branch drain (Figure A3-22)

Usually, beaver lodges and activity can be found approximately 15-30 m upstream from a dam.

Figure A3-20. A beaver dam in a drain.
Source: City of Kawartha Lakes, Ontario

Figure A3-21. A beaver dam built on the upstream side of a culvert.
Source: City of Kawartha Lakes, Ontario

Figure A3-22. Beaver dam at the mouth of a branch drain.
Source: Gary Fischer, Land and Wildlife Agency of Eastern Ontario, Ottawa, Ontario

Removing beavers from a drainage works

Once a dam or other signs of beaver activity are identified, drainage superintendents must work with a trapper to have the beaver(s) removed as quickly as possible. A 'zero tolerance' approach must apply when maintaining drainage works and all beavers must be removed (Figure A3-23). Only remove a beaver before they establish a colony. Once they have young, it may be difficult to remove the beaver colony without attracting community concern.

To remove the dam, the trapper may open or breech the dam to lower the water elevation. Or it may be easier for the municipality to remove dams with mechanical equipment. In either situation, remove the dam in a gradual process to minimize downstream flooding and the potential for liability (Figure A3-24).

Figure A3-23. Signage indicating active beaver removal.
Source: City of Kawartha Lakes, Ontario

Figure A3-24. Gradual release of a dam.
Source: City of Kawartha Lakes, Ontario

Compensation for trapping services should be in the form of an hourly rate for services – not per beaver. A per animal rate constitutes a bounty and may be in violation of the *Fish and Wildlife Conservation Act, 1997* Section 11(1)(e).

Summary

Drainage superintendents should:

- check drains regularly for signs of beaver activity
- contact a trapper (names are available from local MNRF personnel or the Ontario Fur Manager's Federation, www.furmanagers.com)
- remove the beaver before removing the obstruction (dam)
- after removal, inspect the area for signs of new activity

3.7.4 Crossing Replacements

3.7.4.1 Access/Farm Culvert Crossings

Crossings on a drain include road crossings, access and farm crossings. A road crossing is where the drain passes under a road right of way. An access crossing (Figure A3-25) allows a property owner to access their property from the road right of way. While a farm crossing (Figure A3-26) provides access to a portion of a property that has been cut off from the rest of the property because of the presence of the drain.

Figure A3-25. Access crossing over a drain.
Source: Municipality of Chatham-Kent, Ontario

Figure A3-26. Farm crossing over a drain to allow access to a portion of the property due to the presence of the drain.

The drainage superintendent may encounter many different scenarios regarding the status of access and farm drain crossings. In Figure A3-27, there are three different drains on the map where one is constructed anytime, another constructed prior to 1975 and the last constructed post 1975. Depending on the date of the drain as noted by the Engineer's Report and associated bylaw, crossings have different legal status with respect to maintenance and repair and ADIP grant eligibility. The drainage superintendent must determine if the drain was established under *The Drainage Act, 1975* or earlier legislation.

Drain crossings may be privately owned if installed prior to 1975. But crossings installed after 1975 also may be privately owned if they were not included in the drainage works in a bylaw adopted by council. Secondary crossings may be assigned differently than those established when the drain was constructed depending on the timing and assessment schedule under the engineer's report adopted by bylaw.

The drainage superintendent should proceed with caution when determining the status of a crossing i.e., whether the crossing is private, primary (established at the time of drain construction) or secondary. There is a high potential for proceeding incorrectly, even for the seasoned drainage superintendent. When in doubt, the drainage superintendent should seek additional opinions from colleagues, other drainage superintendents, a drainage engineer or Ministry of Agriculture, Food and Rural Affairs (OMAFRA) staff regarding the status of a drain crossing.

Once the status of a crossing is understood, the drainage superintendent may determine whether the work qualifies as repair work and/or is eligible for a grant under the *Drainage Act, 1990* (Table 3.1). The drainage superintendent should also consult with the Agricultural Drainage Infrastructure Program (ADIP) policies to determine if a crossing is eligible for a grant.

DID YOU KNOW?

In June 1972, the Ontario Legislature established a Select Committee on Land Drainage to study agricultural land drainage in Ontario. The recommendations of the committee resulted in *The Drainage Act, 1975*, which passed third reading in July 1975 and proclaimed in force as of April 1976.

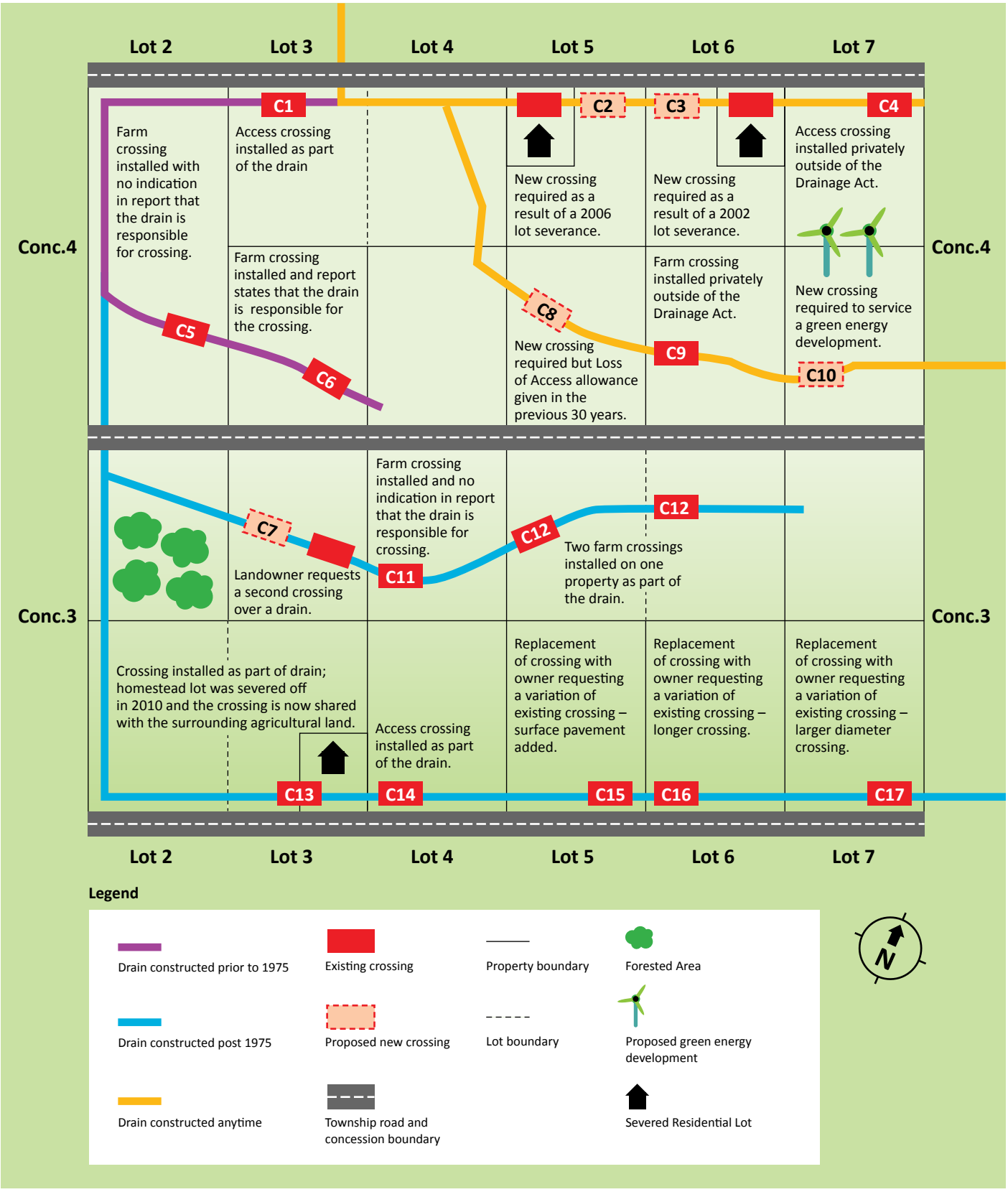


Figure A3-27. Crossing scenarios.

Table A3-1. Crossing work under the *Drainage Act, 1990*

Crossing #	Crossing Location	Drain	Description of Crossing	Proposed Work	Can the Work be Done as Drainage Act Repair?	Is the Work Eligible for ADIP grant?
C1	Conc. 4, N½ Lots 3 & 4	Prior to 1975	Access crossing installed as part of the drain (prior to 1975)	Repair (replace like for like)	Yes	Yes
C2	Conc. 4, N½ Lot 5	Constructed anytime	New crossing required as a result of a 2002 lot severance	Installation of a new crossing	No – Section 78 improvement required	Yes, provided it is a severance completed prior to July 28, 2004 – ADIP policy 2.3 (i)(ii)
C3	Conc. 4, N½ Lot 6	Constructed anytime	New crossing required as a result of a 2006 lot severance	Installation of a new crossing	No – Section 78 improvement required	No – ADIP policy 2.3 (i)(ii)
C4	Conc. 4, N½ Lot 7	Constructed anytime	Access crossing installed privately outside of DA	Repair (replace like for like)	No	No
C5	Conc. 4, Lot 2	Prior to 1975	Farm crossing installed with original drain construction (prior to 1975) – no indication in report that the drain is responsible for the crossing	Repair (replace like for like)	No	No
C6	Conc. 4, S½ Lot 3	Prior to 1975	Farm crossing installed with original drain construction (prior to 1975) – report states that the drain is responsible for the crossing	Repair (replace like for like)	Yes	Yes
C7	Conc. 3, N½ Lot 3	Post 1975	Landowner requests a 2nd crossing over the drain	Installation of a new crossing	No – Section 78 improvement required	No – ADIP policy 2.3 (i)(i)
C8	Conc. 4, S½ Lot 5	Constructed anytime	New crossing is required and loss of access allowance given in the previous 30 years	Installation of a new crossing	No – Section 78 improvement required	Partially – ADIP policy 2.3 (i)(vi)
C9	Conc. 4, S½ Lot 6	Constructed anytime	Access crossing installed privately outside of DA	Repair (replace like for like)	No	No
C10	Conc. 4, S½ Lot 7	Constructed anytime	New crossing is required to service a green energy project	Installation of a new crossing	No – Section 78 improvement required	No – ADIP policy (i)(v)
C11	Conc. 3, N½ Lot 4	Post 1975	Farm crossing installed with original drain construction (post 1975) – no indication in report that the drain is responsible for the crossing	Repair (replace like for like)	Yes	Yes

Crossing #	Crossing Location	Drain	Description of Crossing	Proposed Work	Can the Work be Done as *Drainage Act* Repair?	Is the Work Eligible for ADIP grant?
C12	Conc. 3, N½ Lots 5 & 6	Post 1975	2 crossings installed on same property as part of the drain (post 1975)	Repair (replace like for like)	Yes	One crossing eligible; one is not – ADIP policy 2.3(i)(i)
C13	Conc. 3, S½ Lots 2 & 3	Post 1975	Crossing installed part of drain (post–1975); homestead lot was severed off of in 2010 and the crossing is now shared with the surrounding ag. land	Replacement (like for like)	Yes	Yes, provided that a crossing agreement is registered – ADIP policy 2.3 (i)(iv)
C14	Conc. 3, S½ Lot 4	Post 1975	Access crossing installed as part of the drain (post 1975)	Repair (replace like for like)	Yes	Yes
C15	Conc. 3, S½ Lot 5	Post 1975	Access crossing installed as part of the drain (post 1975)	Repair (replace like for like) – owner wants surface pavement added	Crossing can be replaced but the paving of the surface depends on the report	Crossing replacement is eligible; paving of surface is not eligible – ADIP policy 2.3 (i)(iii)
C16	Conc. 3, S½ Lot 6	Post 1975	Access crossing installed as part of the drain (post 1975)	Repair (replace like for like) – owner wants a longer crossing	Original crossing can be replaced as a repair but the lengthening must be done as a Section 78 improvement	Crossing replacement is eligible as repair; adding length to the crossing is not repair. Longer crossing is eligible for grant only if a Section 78 Improvement is completed
C17	Conc. 3, S½ Lot 7	Post 1975	Access crossing installed as part of the drain (post 1975)	Repair (replace like for like) – owner wants a larger diameter crossing	No – Section 78 improvement required	Not as a repair; larger crossing is eligible for grant only if a Section 78 Improvement is completed

3.7.5 Management of Excavated Materials

Excavated materials resulting from maintenance and repair activities of a drain must be managed in accordance with the engineer's report, best practices and applicable legislation/regulation. Most material removed from the drain during repair and maintenance activities is soil that was eroded from the adjacent agricultural properties and should be spread on the property adjacent to where it is removed. This practice will minimize costs and reduce regulatory requirements since the material will be maintained on site as a beneficial use of the material.

Where a drain is constructed along a property boundary between two farms, check the engineer's report to determine if the spoils are to be spread on only one side of the drain or both in alternating maintenance events. The report specifies which properties have received an allowance for the damages caused by spreading of the material, so it should be spread fairly and consistently.

Discuss the plans for managing the spoils with the property owners ahead of the project. In some cases, the owners may wish some of the work to be completed in a different manner than specified in the engineer's report, if possible. For example, if the project includes the removal of thorny shrubs or trees (e.g., buckthorn), these plants should not be shredded and spread on site as the thorns in the soil can cause future tractor tire failures. Property owners may request that thorny shrubs or trees be removed with a chain saw and burned rather than shredded. The property owner may also ask to remove the trees themselves before the maintenance work is completed.

When it is not possible to spread the material at the time of removal from the drain, windrow the spoils in the working corridor. After the material has been allowed to drain, return to spread the spoils as needed. Coordinate the timing with the property owners to not impact current cropping practices and allow time to prepare the land for the next cropping year.

In situations where it may be necessary to haul the excavated materials off site, check with the property owners – they may have an alternative, less costly option than hauling to another site.

If the excavated material needs to be hauled off-site, consult with the Ministry of Environment, Conservation and Parks to determine all of the necessary regulatory requirements.

Publication 852 – A Guide for Engineers Working under the Drainage Act has additional information on the management of excavated materials as it relates to drain construction and improvement (ontario.ca/publications).

3.7.5.1 Drain Enclosure Requests

Drain enclosure requests are considered an improvement project and require an updated engineer's report under Section 78 of the *Drainage Act, 1990*. When a request is received from a property owner, the drainage superintendent must manage the property owners' expectations. Drainage superintendents can facilitate the request but the property owner must be informed that other agencies (e.g., Fisheries and Oceans Canada (DFO) and local conservation authorities) may not approve of the enclosure or may limit the scope of work that can be done. Do not overlook the need for an enclosure where the situation warrants one.

Check on OMAFRA's AgMaps website to see if the drain is classified by the DFO and if the agency will consider the request for a drain enclosure. Check any endangered species mapping and determine if there are any known environmental or regulatory issues that would reduce the probability of the enclosure being approved by regulatory agencies.

Indicate to the property owner that most enclosures are not eligible for grant from OMAFRA under the Agricultural Drainage Infrastructure Program (ADIP).

Determine if the enclosure may have a positive or negative affect on the future maintenance and repair of the drain. Determine if there are options to address these affects on the drain. The drainage superintendent's input to council and the engineer (that may be appointed) to complete the project is valuable.

Drainage superintendents can also request an enclosure for the drain to address a bank slumping issue, or when the drain is too close to a municipal road and there is not enough room to relocate it off of the road allowance.

3.7.6 Wetlands and the Drainage Act, 1990

There are many drains that go into or out from a wetland that may require management from time to time. Wetlands have an important hydrological role within the watershed. They are saturated areas that have hydric (waterlogged) soils and water-loving or water-tolerant plants (Figure A3-28). Wetlands occur where the water table is at or close to the surface, in low-lying areas or along the edges of lakes and rivers. While some wetlands are permanently flooded, others only flood periodically.

Figure A3-28. A drain with a wetland running through a farm field.
Source: Dietrich Engineering Limited, Waterloo, Ontario

Wetlands lessen high flows while decreasing velocity, store water and increase infiltration and groundwater recharge. They also improve water quality by allowing vegetation to remove excess nutrients (e.g., phosphorus, nitrogen) and by reducing suspended solids due to the reduction in flow velocity.

Identify existing and potential wetland areas within the watershed. Drainage superintendents will be involved with the *Drainage Act, 1990* to:

- manage a drain that goes through a wetland
- construct or enhance wetlands (see Chapter B4.3.3)
- construct new drains involving wetlands

3.7.6.1 Manage a Drain that Goes Through a Wetland

The drainage superintendent should be knowledgeable about wetland legislation (e.g., *Conservation Authorities Act*, *1990* and *Planning Act*, *1990*) and its impact on their ability to do repair work. Contact the municipal planners, conservation authority and the Ministry of Natural Resources and Forestry (MNRF) to determine the existence of the wetland.

The drainage superintendent should discuss the scope of the project with the regulatory agencies to fulfill their repair responsibilities while avoiding or minimizing impacts on the wetland. Regulatory agencies may impose conditions on the drain repair work.

3.7.6.2 Construct New Drains Involving Wetlands

The drainage superintendent may be involved in drain construction and improvement projects that interact with wetlands. Property owners may need to drain their property into or through a wetland to mitigate flooding or achieve sufficient outlet. The drainage superintendent's role in this situation is to discuss options for a solution, manage property owner's expectations and protect the wetland function. A project scoping meeting is a valuable early step to bring all interested parties together to discuss their shared visions for a successful project.

Permanent and temporary impacts on wetlands can be minimized by:

- selecting drain routes and staging areas that avoid the wetland area
- routing a pipe drain around a wetland or terminating a drain with an outlet into the wetland
- incorporating an existing channel through a wetland without performing any channelization work but providing the legal authority to remove barriers to flow (e.g., beaver dams, debris)

Chapter 4

Drain Management – Additional Responsibilities

Under the *Drainage Act, 1990*, Sections 65, 74-84, 93 and 95 assign the municipality the responsibility to manage municipal drains. This chapter covers additional management responsibilities not covered in Chapter 3.

4.1 Drain Inspection

4.1.1 Legal Authority

Section 93(3)(a) requires drainage superintendents to inspect every drainage works the municipality is responsible for and report periodically to council on the condition of those drainage works.

4.1.2 Documentation

Drainage superintendents should be familiar with the drains within their municipality and know where regular maintenance and repair may be required. Investigate areas requiring excessive repair so that the root cause(s) of the damage can be addressed.

Drainage superintendents should consider the best and most cost-effective alternatives for documenting drain conditions. If physically inspecting the drain (e.g. walking or ATV), make notes and take photographs. Aerial photographs and videos obtained via drone inspection may also be cost effective. Make sure these activities meet all legal requirements.

Channel drains may require a profile survey conducted to determine the volume of sediment that needs to be removed to re-establish the original profile.

4.2 Authorization for Emergency Work

There may be situations when emergency work is needed on an existing municipal drain but the work can't be completed as maintenance or repair because:

- design standards have changed
- replacement with a similar structure is not possible
- the structure is not referenced in the engineer's report
- the assessment schedule would result in an unfair assessment to the property owners in the watershed

These situations may include collapse or failure of a crossing required to access a farm or residence, failure of a dyke or berm holding back water or slumping of the bank of a drain along a road. Normally, the municipality would need to appoint an engineer to develop a new engineer's report prior to construction. However, due to the emergency situation and the complexity of the issue, it may not be practical or safe to complete the normal *Drainage Act, 1990* process before construction.

In these situations, a municipality or their agent may request the minister of Agriculture, Food and Rural Affairs to authorize emergency work in accordance with Section 124 of the *Drainage Act, 1990*. This section states:

"Where the Minister declares that an emergency exists, the council of a municipality may authorize emergency work under this Act before obtaining and adopting an engineer's report."

To obtain an authorization for emergency work from the minister, a letter must be sent to the minister with a copy to the drainage program coordinator.

The letter should contain the following details or answer the following questions:

- name of the drain
- brief background of the drainage system
- Why can't the problem be resolved through maintenance or repair work?
- specific location of the emergency issue (e.g., lot/concession/township, or civil address) – if possible, include a plan drawing
- describe the problem and include photographs
- What are the health and safety concerns?
- How extensive are the concerns?
- If the problem is an unsafe condition or failed crossing – who determined the crossing was unsafe?
- What alternative access arrangements or solutions were investigated?
- What are the impacts of following the normal *Drainage Act, 1990* process to replace the crossing?
- How long was the municipality aware of the problem?
- If the municipality was aware of the problem for a while, provide an explanation why action was not taken earlier?
- Has council appointed an engineer under Section 78 of the *Drainage Act, 1990*?
- Does the engineer, through preliminary investigation, support a request for authorization of emergency work?
- Are there other concerns that the minister should consider?

The minister, based on the content of the letter from the municipality and the advice of staff, will decide if an authorization for emergency work is warranted.

4.3 Spills and Pollution

4.3.1 Emergency Action and Information

If a drainage superintendent becomes aware of a spill/pollutant, they must call the MECP **Spills Action Centre (SAC)** at **1-800-268-6060.**

4.3.2 Duty to Report

The *Environmental Protection Act, 1990* (EPA) imposes reporting duties on various persons, including an employee of a municipality (e.g., drainage superintendent) who has been informed of, or is investigating, a spill.

When calling the SAC line, a person in the public service will be asked to provide their name and telephone number, and they should attempt to provide the name and telephone number of the discharger. The only other details required of a person in the public service are the date and time of the spill – or discovery of the spill, and its location – although it is helpful if the person also provides their best assessment of the consequences of the spill.

Every reasonable effort should be made by the drainage superintendent to control, mitigate and contain a spill into a municipal drain.

4.3.3. Responsibilities for a Spill

Under Section 93 of the EPA, those who had control of the spilled pollutant and the owner of the pollutant are both responsible for containment and cleanup.

Municipalities, under Sections 100 and 100.1 of the EPA, are given the authority to respond to spills, the right to enter property for the purpose of response, and the right and a mechanism, the municipality's order, to recover costs from those the act holds accountable for the spill.

Get an official order from the MECP for managing the spill/pollutant. Without an official MECP order, it may be more difficult for a municipality to collect or recover the cost of cleanup activities. The issuance of an order also ensures the municipality or contracted workers gain access to private property for cleanup purposes.

4.4 Assessment Schedule Updates

Assessments used for future maintenance of a drainage works may be changed or varied from the original engineer's report under Section 65 of the act when:

- lands within a watershed are subsequently divided by change in ownership
- lands not originally within a watershed are subsequently connected to a drainage works
- lands originally serviced and assessed within a drainage works are subsequently disconnected from the drainage works
- the nature or extent of use of lands within a watershed is subsequently changed

In all of the above, the assessment may be divided or varied by an engineer instructed by the municipal clerk to inspect the lands and report to municipal council. The process to update assessment schedules due to land use changes and subsequent connections or disconnections (Section 65(3) and (4)) are described in Figure A4-1.

The process to update assessment schedules due to severances and subdivisions (Section 65(1) and (2)) are described in Figure A4-2.

Updating Assessment Schedules – Land Use Changes or Connections

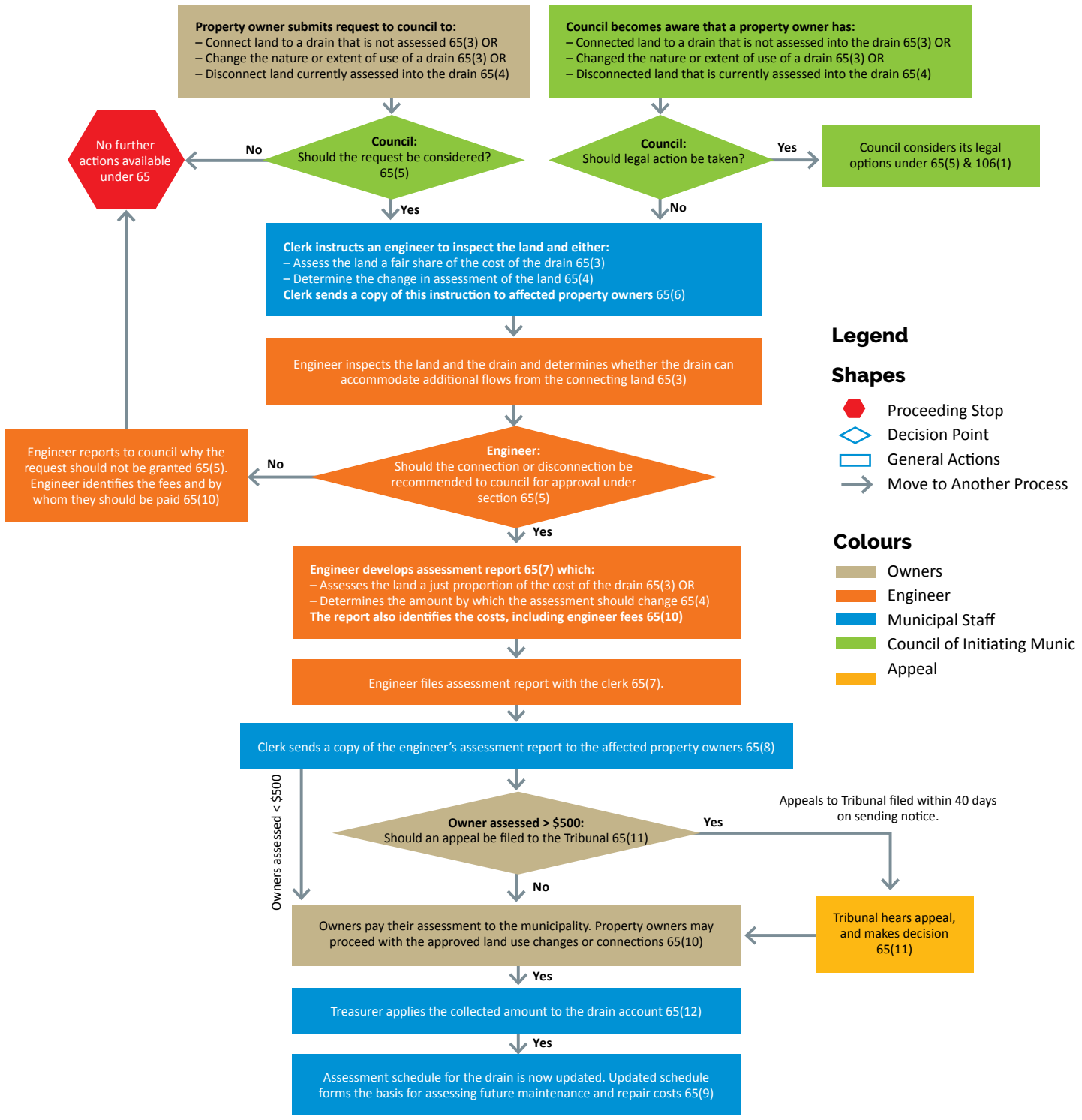


Figure A4-1. Updating assessment schedules – land use changes or connections.

Updating Assessment Schedules – Severances or Subdivided Land

Section 65(1) and (2)

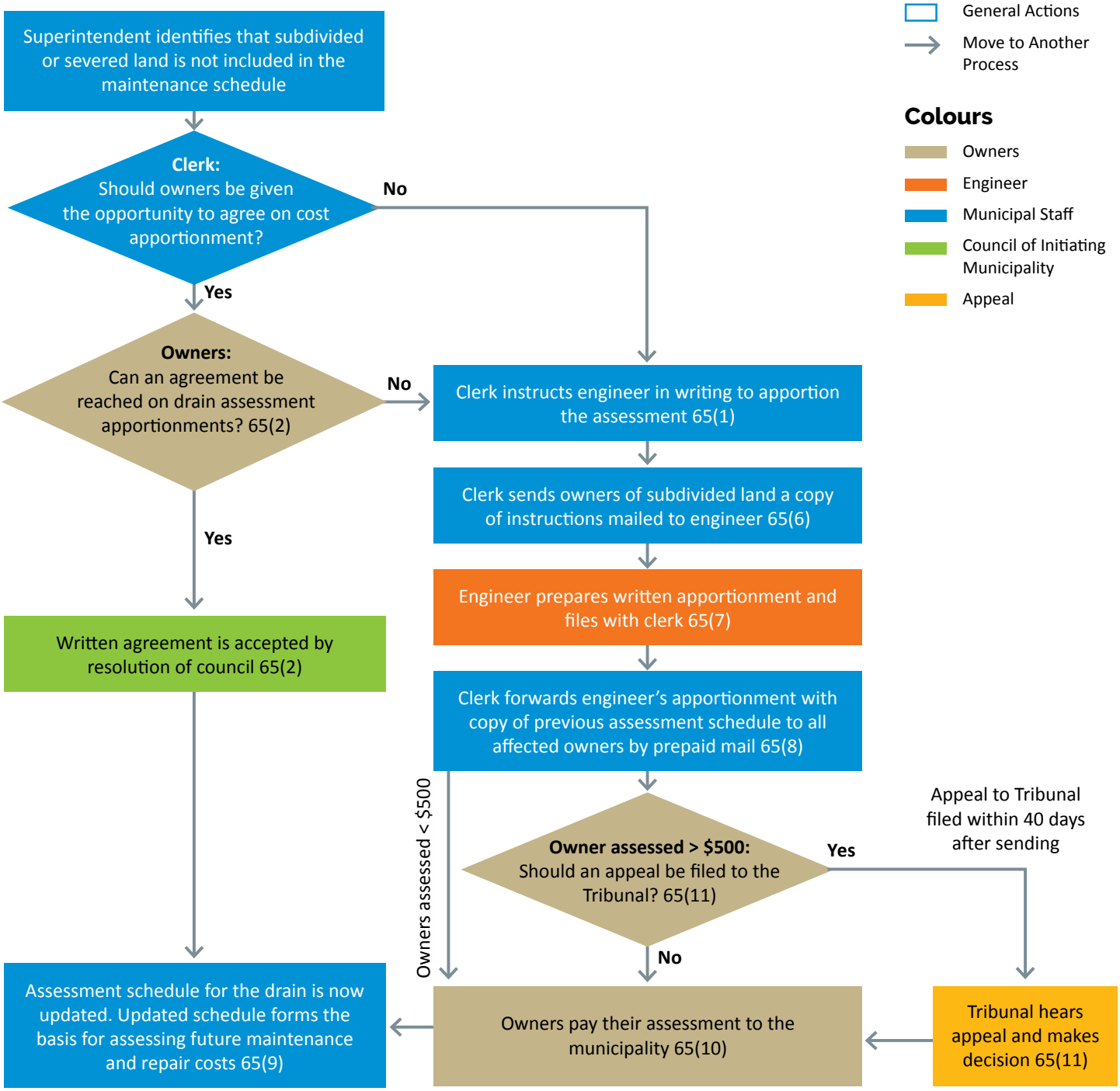


Figure A4-2. Updating assessment schedules – severances or subdivided land.

4.4.1 Land Use Changes

Drivers for land use change

Municipal zoning and building departments should notify the drainage superintendent and involve them in any changes to land use and construction activities to avoid serious impacts to the drainage works.

At a minimum, the drainage superintendent should screen all building projects to ensure new construction will not interfere with existing drainage works infrastructure and rights-of-way.

The building inspector is responsible for approving lot grading plans, input from the drainage superintendent is very valuable and should be sought where possible.

4.4.2 Severances and Subdivided Land

When lands within a watershed are subsequently divided by change in ownership, the new owners of the divided lands may file a mutual agreement with the municipal clerk and have it approved by resolution of municipal council without the appointment of an engineer.

4.5 Enforcement

Enforcement under the *Drainage Act, 1990* is not well understood or consistently applied. A municipality should have effective procedures and tools to protect the overall system from obstructions and damage. This is important in the day to day activities of the drainage superintendent but may become more important as the drainage community incorporates more environmental features (e.g., riparian buffers, wetlands, etc.) into drains.

The *Drainage Act, 1990* is enabling legislation and provides a process to be followed for the construction, improvement, maintenance and repair of drains. The act is not enforcement legislation since it is does not:

- assign powers and duties of the minister
- designate or assign powers of provincial officers or bylaw officers
- prescribe inspections or orders by province or municipality
- have strongly worded contravention sections

There are some enforcement provisions within the act including Section 80 that deals with obstructions and Section 82 that addresses damage.

4.5.1 Section 80 – Obstruction

Section 80 states,

"…when a drain becomes obstructed by a dam, low bridge, fence, washing out of a private drain, or other obstruction, for which the owner or occupant of the land adjoining the drainage works is responsible, so that the free flow of water is impeded…"

A drain obstructed by what?

The drain can be obstructed by a few specific examples identified in the legislation. Figure A4-3 shows a low bridge that may be an obstruction to the drain. However, it includes the wording "other obstructions" that can include:

- garbage
- filling in a ditch drain
- installing an undersized crossing
- any material dumped into a drain
- a tree planted over a pipe drain or in the working space

Figure A4-3. A low bridge over a drain that may cause an obstruction.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

What defines an obstruction?

An obstruction occurs when the free flow of water is impeded by the obstruction, where obstruction is defined as preventing or hindering movement. If the drain is not flowing or is not capable of flowing at the design capacity, this may be an obstruction to the drain. If unsure if the drain is obstructed, the drainage superintendent should consider seeking professional advice from a drainage engineer.

Who is responsible to remove the obstruction?

In some cases, the property owner adjacent to the obstruction may be responsible for its removal. But the municipality must have proof of who is responsible for the obstruction, if challenged. It is not always possible to know who is responsible for the material in the drain. For example, a mattress and other garbage dumped in a drain along an adjacent roadway, the adjacent landowner is likely not responsible for the obstruction. The drainage superintendent should charge the costs of the removal to the entire drain under Section 81.

Next steps

Once it has been determined that the drain is obstructed and there is a responsible property owner, Section 80, continues:

"…the person owning or occupying the land shall, upon reasonable notice sent by council…or the drainage superintendent…remove such obstruction… if not so removed with the time specified in the notice… the [municipality] shall forthwith cause it to be removed, and the cost… is payable to the municipality by the owner…"

The drainage superintendent must notify the property owner responsible for the obstruction that is to be removed within a specified time period.

It is best to provide a written notice to ensure a record is made of the request. If a verbal notice is given, the drainage superintendent should document the conversation. The notice should be clear and identify that if the work is not completed with the specified time period, the obstruction will be removed by the drainage superintendent and the cost charged to the property owner.

The timeframe provided to the property owner to remove the obstruction is situation specific and could range from immediately, 5 days, 10 days, 30 days, etc. The timeframe should be reasonable based on the nature and scope of work required, and dependent on the level of risk of flooding upstream properties.

If the obstruction is not removed by the property owner within the specified time period, the municipality must act immediately. Due diligence should be exercised since if not, the municipality could be found liable for damages to other properties.

The *Drainage Act, 1990* does not provide a timeline for appeals to notices issued under Section 80. The municipality should consider waiting until a decision is rendered, if aware of an appeal or legal challenge, and balance this with level of risk to the drain and other properties.

Guidelines for the drainage superintendent

Attend the site to observe the situation directly since the obstruction may have been reported by another property owner. Exercise the power of entry to access the drain as defined in Section 95(3) of the *Drainage Act, 1990*. The superintendent should write an inspection report which should include:

- date of inspection
- name of person completing the inspection
- name of drain and location of alleged obstruction
- property owner information and legal property description
- reason for conducting the inspection (complaint based, etc.)
- inspection observations, findings and recommendations for removal
- document any professional assistance that was used to determine if the obstruction impedes the drain

Issue the formal notice to landowner about the obstruction with:

- required actions with completion dates (e.g., do it themselves, hire a contractor, etc.)
- statement if municipal supervision is required during the work
- landowner reporting requirements
- statement about subsequent steps to be taken by the municipality if obstruction not removed
- a copy of the inspection report

Complete a follow-up inspection to see if obstruction has been adequately removed within the required timeframe. If completed adequately, close the file with correspondence back to property owner.

If not completed, issue formal notice that the obstruction will be removed by the municipality and the cost will be charged to the property owner.

If not completed adequately, decide whether to issue a follow-up notice to have property owner complete any outstanding work with new date(s) or issue formal notice that the obstruction will be removed by the municipality.

4.5.2 Section 82 – Damage

Section 82 reads:

"A municipality… may bring an action for damages against any person who destroys or injures in any way a drainage works…"

Damage to a drain is different than an obstruction – an obstruction implies the flow capacity is reduced. Destroy means to end the existence of something. Injury means physical harm that impairs the value, usefulness or normal function of something. Some examples of damages to the drain include:

- removal of a buffer (Figures A4-4 and A4-5)
- relocating a ditch drain
- improper outlet connection(s) that erode the bank of a ditch drain
- farming equipment breaking a pipe drain

Figures A4-4. A wide buffer created as part of the drain.

Figure A4-5. Damage to a municipal drain by the removal of a buffer that was incorporated into the drain by the engineer's report and bylaw.

The process to seek damages from a property owner is initiated by the municipality through an action for damages to the drainage referee. This process usually requires a lawyer and there are time delays to initiate and see the process through to completion. If the damage to the drain is the result of an obstruction to the drain, it may be quicker to use the process defined by Section 80.

Section 82 continues:

"Every person who obstructs, fills up or injures or destroys by any means a drainage works, is guilty of an offence and on conviction, in addition to liability in damages, is liable to a fine… or to imprisonment…"

The provisions of Section 82 do not address the immediate issue of damage to the drain. The current set fine in the *Drainage Act, 1990* is not more than $1,000, which will likely act as a mild deterrent only. There is no record of anyone going to jail for damaging a drain, but a municipality may consider using this provision for repeat offender or serious issues of damage.

4.6 Abandonment

The *Drainage Act, 1990* allows for abandonment of an existing municipal drain in part or its entirety. This process can be initiated one of three ways:

- An engineer appointed for the construction (Section 4) or improvement (Section 78) of a municipal drain may abandon any drain or part of it that is no longer useful or is to be replaced with a new drain.
- Council receives an abandonment petition from landowners within the watershed of the drain (Section 84(1)).
- Council initiates the abandonment (Section 84(2)).

This section provides a suggested procedure to abandon an existing municipal drain initiated by council or an abandonment petition under Section 84 of the *Drainage Act, 1990* (Figure A4-6).

Suggested process to abandon a drain

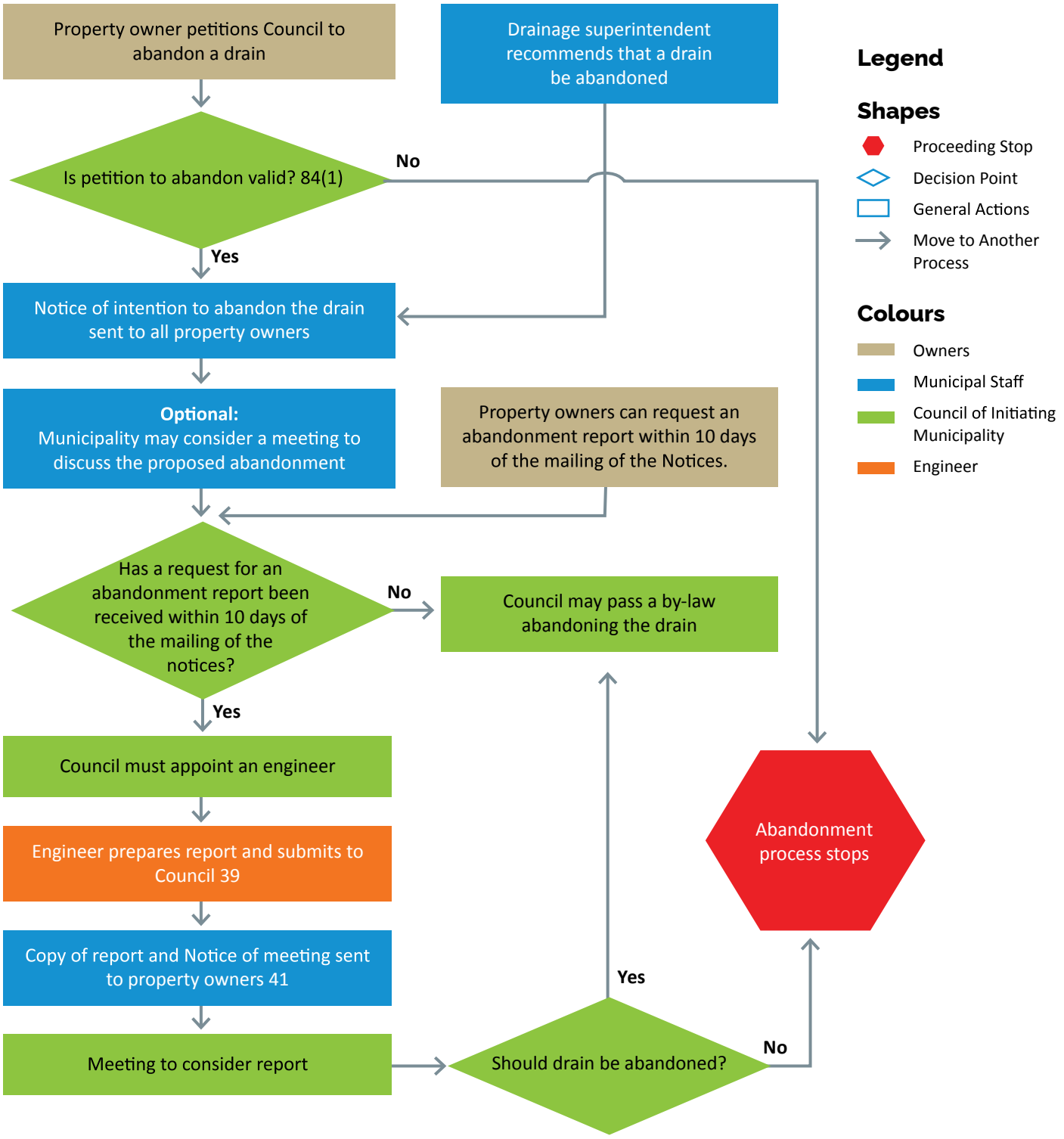


Figure A4-6. Suggested process to abandon a drain.

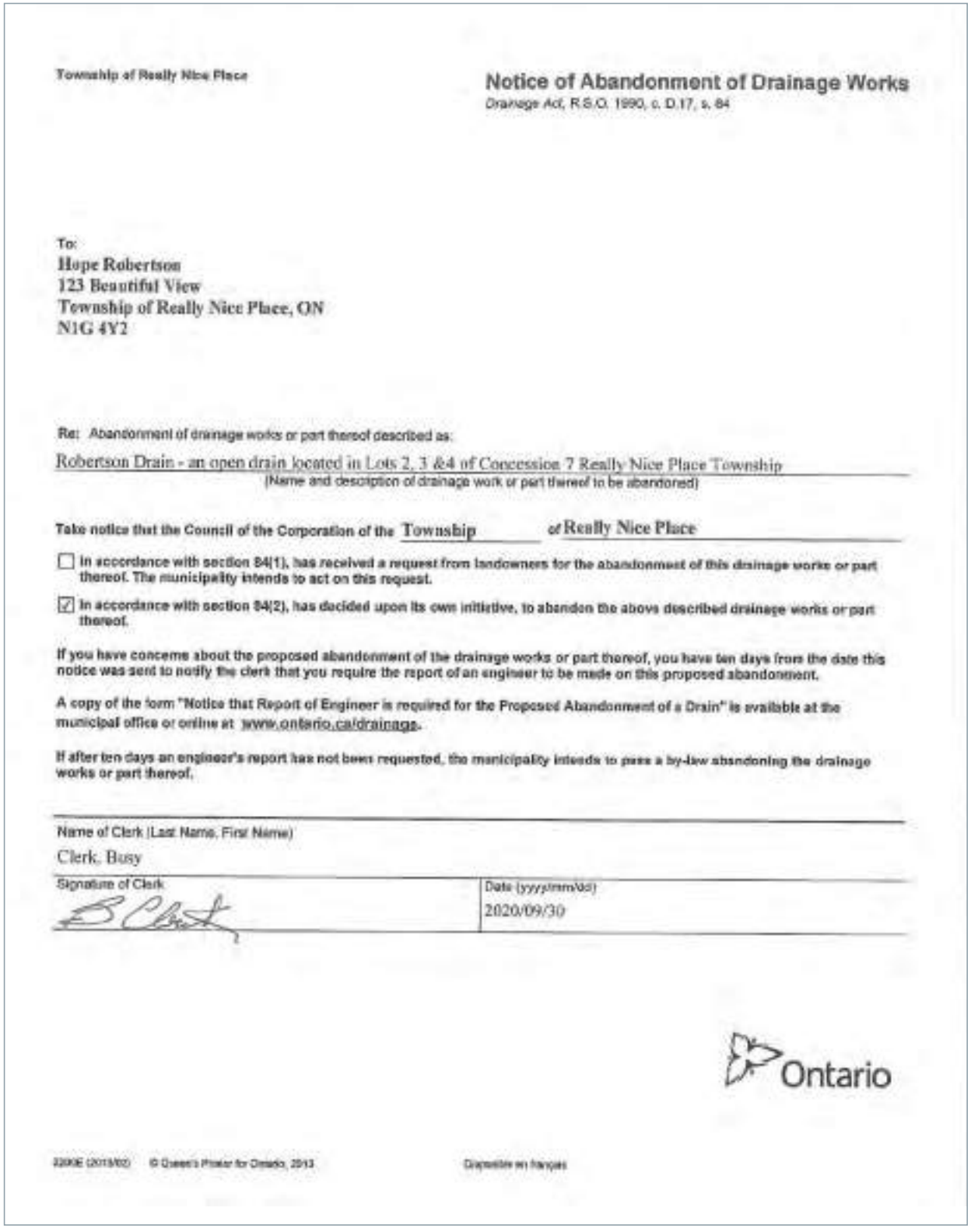
The drainage superintendent may make a recommendation to municipal council to abandon all or part of a drainage works based on their knowledge of the drain, land use, its current state and property owner sentiment.

If the abandonment is initiated by petition, the validity of the abandonment petition must be checked to ensure it complies with Section 84(1). To be valid, the petition must be signed by at least ¾ of the property owners that own at least ¾ of the area assessed for benefit. The validity of the petition can be checked by the drainage superintendent on behalf of the municipality.

Whether the abandonment is initiated by council or petition, municipal council must send a notice of intention to abandon the drain (or a portion of the drain) to all property owners assessed for the drain. A sample notice is found in Figure A4-7.

Although not a requirement of the *Drainage Act, 1990*, council may want to consider hosting a meeting to discuss the proposed abandonment of the municipal drain. This meeting gives the municipality an opportunity to explain why the drain is being abandoned under the *Drainage Act, 1990* and how drainage will be accommodated in the future. The drainage superintendent can play an important role during this meeting as a liaison between the property owners and council.

All property owners have an opportunity to request by written notice, an “abandonment report” within 10 days of the mailing of the notices. If no notice is received, council may abandon all or a portion of the drain by bylaw with no future obligation to that portion of the drain including maintenance and repair. Figure A4-8 is an example of an abandonment bylaw.



Township of Really Nice Place

Notice of Abandonment of Drainage Works

Drainage Act, R.S.O. 1990, c. D.17, s. 84

To:
Hope Robertson
123 Beautiful View
Township of Really Nice Place, ON
N1G 4Y2

Re: Abandonment of drainage works or part thereof described as:

Robertson Drain - an open drain located in Lots 2, 3 &4 of Concession 7 Really Nice Place Township
(Name and description of drainage work or part thereof to be abandoned)

Take notice that the Council of the Corporation of the Township of Really Nice Place

☐ In accordance with section 84(1), has received a request from landowners for the abandonment of this drainage works or part thereof. The municipality intends to act on this request.

☑ In accordance with section 84(2), has decided upon its own initiative, to abandon the above described drainage works or part thereof.

If you have concerns about the proposed abandonment of the drainage works or part thereof, you have ten days from the date this notice was sent to notify the clerk that you require the report of an engineer to be made on this proposed abandonment.

A copy of the form "Notice that Report of Engineer is required for the Proposed Abandonment of a Drain" is available at the municipal office or online at www.ontario.ca/drainage.

If after ten days an engineer's report has not been requested, the municipality intends to pass a by-law abandoning the drainage works or part thereof.

Name of Clerk (Last Name, First Name)
Clerk, Busy

Signature of Clerk

Date (yyyy/mm/dd)
2020/09/30

Ontario

3260E (2013/02) © Queen's Printer for Ontario, 2013 Disponible en français

Figure A4-7. A notice of abandonment of drainage works for the Robertson Drain.

THE CORPORATION OF THE TOWNSHIP OF REALLY NICE PLACE

BY-LAW No. 28-2020

A by-law to provide for the abandonment of the ROBERTSON Municipal Drain within the limits of the Township of Really Nice Place.

WHEREAS pursuant to the provisions of Section 84 of the Drainage Act, R.S.O. 1990, c.d.17 states a Council may by by-law abandon the Drainage Works, and thereafter Municipality has no further obligation with respect to the Drainage Works;

AND WHEREAS three-quarters of the owners of land assessed for benefit in respect to a portion of the ROBERTSON Municipal Drain in the Township of Really Nice Place have requested in writing for the abandonment of such Drainage Works;

AND WHEREAS the owners of land in the Township of Really Nice Place assessed for a portion of the ROBERTSON Municipal Drain were notified of the Township's intention to abandon such Drainage Works and no notice from any of the aforementioned owners was received requiring a report of an Engineer was made on such proposed abandonment;

NOW THEREFORE the Council of the Township of Really Nice Place enacts as follows:

1. That the portion of the **ROBERTSON** Municipal Drain from station 0+00 to station 5+60 in Lots 2, 3 & 4 of Concession 7be abandoned.
2. That hereafter the Township of Really Nice Place has no further obligation with respect to the said drainage works.
3. That the provisions of this by-law shall become effective on the date of passing thereof.

READ A FIRST AND SECOND TIME THIS 13TH DAY OF NOVEMBER 2020

READ A THIRD TIME AND FINALLY PASSED THIS 22ND DAY OF DECEMBER 2020

REEVE CLERK

Figure A4-8. Abandonment bylaw for the Robertson Drain.

If a notice of an "abandonment report" is received, council must appoint an engineer to:

- examine the drainage works
- create a report with his recommendations about the proposed abandonment including:
  - any necessary work in connection to the abandonment
  - the sale of any assets
  - the cost of abandonment
  - all other appropriate matters
- assess all costs including engineer's compensation and damage allowances against persons liable to assessment in connection with the drainage works in such proportions as appear just.

After the report is completed by the engineer, the next steps are:

1. engineer files the completed report with municipal council (Section 39)
2. council sends a copy of the report and a notice for a meeting to consider the report to all parties (Section 41)
3. the meeting to consider the abandonment report is held

After a report has been accepted that recommends abandonment, council may pass a bylaw abandoning the drain or a portion of the drain. At this point, the procedure continues as in a petition drain (Section 4) including the right to appeal to the tribunal.

Once the drain has been abandoned, the municipality no longer has any *Drainage Act, 1990* responsibilities for the drainage system. If there are drainage issues following the abandonment of the drain, then common law would apply.

DID YOU KNOW?

Specify who pays for the engineer's report.

The engineer must specify in their report who pays for the engineer's report on the abandonment of the drain. The report is not eligible for a grant to cover the cost of the preparation of report.

4.7 Property Transfer

Property ownership changes occur on a regular basis within most municipalities. Under real estate law, a seller must disclose encumbrances on a property including drainage works of which they were duly notified.

Legal advisors and real estate agents often neglect to inquire about drainage issues. They may assume these issues are covered under a regular tax/zoning certificate, but rarely are.

Drainage superintendents should try to educate their local legal advisors and real estate agents about the importance of obtaining drainage information during the sale of a property.

Drainage superintendents can work with the municipal clerk and finance departments to develop a drainage information/certificate form to disclose encumbrances on a property related to drainage works. The requester of the information may pay a fee for provision of the completed form. The requirement for a fee may be included in the municipality's "Fees and Services Bylaw."

The drainage certificate should identify:

- property roll number
- a list of drainage works that service the property
- a map showing what portions of the property lie within each watershed serviced by each drainage works
- unbilled maintenance and/or repair charges for each drainage works
- scheduled maintenance and/or repair projects that directly affect the property
- engineer's report(s) in progress (if any) that affect the property

Chapter 5

Roles and Responsibilities

5.1 Municipal Council

5.1.1 Role

The council of the municipality has a central responsibility to administer the *Drainage Act, 1990* process. They must respond to any petitions for drainage presented to them and have a responsibility to manage any existing drains that were created under an earlier municipal bylaw. In some municipalities, council has delegated some of this authority to a drainage board created under the Municipal Act, 2001.

Many of council's responsibilities under the *Drainage Act, 1990,* are implemented through the following staff:

- drainage superintendent
- clerk
- treasurer and/or finance department
- drainage commissioner

Council may also hire the services of engineers and contractors. This guide contains various flow charts to help council understand how and when council, or their delegates, engage in the process under the act.

5.1.2 Responsibilities

Council should ensure:

- they are aware of their responsibilities under the act such as:
  - a duty to respond to petitions within a specified time period
  - the process for the construction and improvement of drains
  - administration of the court of revision
  - keep municipal drains maintained and repaired
  - financial responsibilities
  - appoint a drainage superintendent
- they clearly communicate their directions for implementing responsibilities to staff – that may be done through the development of municipal policies.

5.1.2.1 Appointment of a Drainage Superintendent

The *Municipal Act, 2001* gives the municipality authority to appoint officers and servants for carrying into effect the provisions of any act. The *Drainage Act, 1990,* gives the municipality the authority to appoint a drainage superintendent and indicates their duties and powers.

A drainage superintendent must be appointed by bylaw to initiate, supervise and assist in the maintenance, repair and construction of drains under the act. A copy of the appointing bylaw is sent to the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) with a request for approval of the appointment by the Minister. The appointment of a ministry-approved drainage superintendent allows the municipality to obtain grants for maintenance and repair work performed under the act. For information on the qualifications required for a drainage superintendent, refer to Chapter A5.2.3.

When appointing a new drainage superintendent, the municipality should carefully review the qualifications of all candidates to ensure the most competent individual possesses technical knowledge, shows leadership and communicates effectively.

5.2 Drainage Superintendent

Under the *Drainage Act, 1990, t*he drainage superintendent shall (Section 93(3)):

- for every drainage works that the municipality is responsible for:
    - conduct periodic inspections
    - initiate and supervise the maintenance and repair of drainage works
- assist in the construction or improvement of drainage works
- report to council periodically on the condition of the drains and on the activities of the drainage superintendent as applicable

On direction from council, the drainage superintendent will remove from any drainage works all weeds, brushwood and fallen timber or other minor obstructions that the owner or occupant of the lands adjacent to the drainage works may not be responsible for (Section 81).

The drainage superintendent has the right to enter onto lands in the performance of their duties (Section 95(3)), but it is recommended that the property owner is notified in advance. These duties are the same as the engineer's duties (Section 12(1)) and include the right to:

- enter onto lands
- plant the stakes that they consider necessary for the performance of the work
- survey the drain and adjoining land as required
- follow appropriate biosecurity procedures when entering land

The drainage superintendent should become the local expert on the *Drainage Act, 1990* and is expected to provide guidance to municipal staff and council on the procedures of the act.

5.2.1 Responsibilities and Activities

The responsibilities of the drainage superintendent are described in various sections of the *Drainage Act, 1990.* The responsibilities and activities of the drainage superintendent may be described as follows:

General

- document all work related activities for accurate reporting
- investigate drainage concerns expressed by property owners
- advise council and property owners on
  - using the act to resolve issues
  - procedures under the act
  - appeal procedures under the act
- provide all relevant available information to council to assist them in making informed decisions about petitions, management of drains and drainage issues
- provide information about municipal drains to stakeholders (e.g., planners, clerks, treasurers, road authorities, property owners, real estate agents)
- prepare and verify ADIP grant applications for drain maintenance and repair work and for the municipal cost of employing the drainage superintendent

Drain inspection

- become familiar with the drainage works within the municipality that are authorized under the *Drainage Act, 1990*
- inspect and report to council on the condition of each drainage works in the municipality

Drain maintenance and repair

- initiate and supervise the maintenance and repair of any drainage works in accordance with the current bylaw and required approval agencies (e.g., Fisheries and Oceans Canada, Ontario Ministry of Natural Resources and Forestry and local conservation authorities)
- conduct on-site meetings for maintenance and repair projects as required
- call tenders for work and advise council on tenders
- when council is notified that a drain is out of repair (Section 79(1)), investigate and report to council (Figure A5-1)
- when council directs a property owner to remove an obstruction from a drain (Section 80(1)), investigate the property owner's progress and report back to council (see Chapter A2.7.3) (Figure A5-2)
- use good construction and environmental practices when maintaining and repairing drainage works in accordance with the act

Figure A5-1. Investigation showing damage to a road along a drain.
Source: Town of Bradford West Gwillimbury, Ontario

Figure A5-2. An obstruction in the drain to be removed by the property owner.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

New drain and drain improvement projects

- assist property owners in completing a petition form (do not circulate the petition)
- provide the appointed engineer with all available background information
- attend on-site meetings for construction and improvement projects to provide assistance to the engineer and property owners
- review and comment on the draft engineer's report
- attend the meeting to consider the report and provide advice as required
- provide comment and/or testimony to appeal bodies (e.g., Court of Revision, tribunal), as required
- act as a liaison between council, the engineer, contractor and property owners
- may visit the site, check compliance with specifications and report progress to council
- participate in the final inspection of the drain project and report deficiencies to the appointed engineer

Other drain management

- provide comments on severances and subdivisions that impact municipal drains
- encourage property owners to implement soil and water best management practices to improve drain water quality
- encourage property owners and municipalities to take advantage of funding programs to offset the additional costs of implementing soil and water best management practices
- consider climate change and environmental stewardship when managing drainage works (see Part B of this guide)

5.2.2 Conduct

The drainage superintendent should:

- behave in a manner that brings credit to the municipality, the position and the Drainage Superintendents Association of Ontario (DSAO) – they are indirectly the servant of the electorate, but directly responsible to council who, in turn, are responsible for ensuring the requirements of the *Drainage Act, 1990* are met
- establish professional relationships with contractors
- maintain impartiality; do not participate in municipal politics or be influenced by political considerations
- participate in the local chapter of DSAO and provide input to the board of directors, DSAO
- strive to create, in co-operation with DSAO, uniformity across the province in
  - the application of drainage concepts
  - the supervision of drain-related work
  - relationships with council, provincial ministries and other agencies

5.2.3 Qualifications

Drainage superintendents must have and develop technical, leadership and communication skills.

Technical knowledge

- understanding and interest in agriculture, agricultural and rural drainage
- interest in continuing professional development throughout their career
- a working knowledge of the *Drainage Act, 1990*
- knowledge of other drainage legislation including the *Tile Drainage Act, 1990* and the *Agricultural Tile Drainage Installation Act, 1990*
- awareness of environmental issues and legislation
- ability to read and thoroughly understand drainage reports and plans in both imperial and metric units
- competence in surveying techniques including performing surveys, completing and interpreting plan and profile drawings and checking grades on site
- familiarity with construction techniques and understanding of the capabilities and limitations of various types of excavation equipment and/or operators
- experience in construction supervision and administration
- ability to maintain timely and detailed records

Leadership

- take a leadership role in the management of all municipal drains
- ability to make decisions to the mutual benefit of property owners and council
- consistent approach to making decisions
- ability to organize and lead public meetings
- well-developed project management skills (e.g., organization, coordination, budgeting, record keeping)

Communications

- ability to communicate effectively to property owners, council, municipal staff, engineers, contractors, representatives of government or other agencies
- ability to handle difficult situations with tact and diplomacy
- negotiation skills (e.g., with the public, contractors, engineers, environmental agencies)
- public speaking and presentation skills

5.2.4 Grant Eligibility

For the municipality to be eligible to receive a grant for the cost of employing a drainage superintendent, the superintendent's qualifications must be approved by OMAFRA. The qualifications required by OMAFRA include successful completion of:

- Drainage Superintendent's Course, Business Development Centre, University of Guelph Ridgetown Campus
- survey training achieved through one of the following:
    - college or university course (transcript)
    - Primary Drainage Course, Business Development Centre, University of Guelph Ridgetown Campus
    - Municipal surveying course, Ontario Good Roads Association (OGRA certificate)
    - OMAFRA may consider extensive surveying experience under an Ontario land surveyor or drainage engineer (letter of reference)

DID YOU KNOW?

Following OMAFRA approval, costs for additional training may be considered through municipal grant applications to cover the cost of employing a drainage superintendent.

5.2.5 The Drainage Superintendent and Council

The drainage superintendent must have a clear understanding of the municipal expectations in managing municipal drains, usually done through policies and guidelines. If there is no direction, consider approaching council to establish specific policies or guidelines.

Some examples include:

- action to be taken for ongoing maintenance problems
- minor repairs for items contained in a drainage report
- informal meetings to consider drain maintenance work
- frequency of reporting to council
- procurement for drainage specific services
- superintendent's role in the supervision of drains under construction
- frequency and methodology of inspection of drains
- direction to the engineer (e.g., crossing width, buffer strips)
- approaches for maintenance and inspection (see below)

There are two different approaches to drain inspection and maintenance: reactive and proactive.

Reactive

Some councils prefer drainage superintendents to only undertake work requested by a property owner because the property owner(s) pay for the drain repair. The municipality will only inspect after receiving a written maintenance request from a property owner(s) or the road authority. Many municipalities have drainage maintenance or repair request forms available for property owners to complete and return to the drainage superintendent. Drainage superintendents must react to these requests in a timely manner.

Proactive

A proactive approach does not require a request for work from a property owner. Drains are inspected on a defined cycle and work is performed as the need is identified.

5.2.6 The Drainage Superintendent and the Engineer

In performing their duties under the act, the drainage superintendent must develop a strong relationship with the engineer appointed to provide professional services related to the drainage works. The drainage superintendent and the engineer should have a mutual understanding of each other's role and activities.

The role of the engineer is discussed in Part A, Chapter 14 of the document, *A Guide for Engineers Working under the Drainage Act, 1990 in Ontario*, Publication 852, OMAFRA, 2017, (ontario.ca/publications).

The drainage superintendent has two main roles with respect to the role and activities of the engineer – as council's representative and as the engineer's assistant.

5.2.6.1 Council's Representative

Council is the engineer's client for the preparation of reports under Sections 4, 76 and 78. The drainage superintendent is the representative of council and lead contact between council and the engineer. The drainage superintendent must ensure specific concerns and/or needs related to management of the drainage works are addressed.

The drainage superintendent should provide input to the engineer:

- at the start of a drainage project
- at the on-site meeting
- during site surveys and field examinations
- at project scoping meetings with agencies and property owners
- by reviewing and commenting on the draft report

The drainage superintendent should discuss the following with the engineer:

- design options, their implications and new techniques
- inclusion of special features to help reduce long-term maintenance frequency and cost (e.g., buffer strips, sediment traps)
- access routes, working limits and staging areas
- a maintenance assessment schedule that facilitates billing of drain maintenance costs (e.g., on a sub-watershed level or branch-by-branch basis)
- location, extent and longevity of benchmarks
- disposal of materials excavated from the drain
- management options for drains or parts of drains abandoned under Section 19
- details on the plans, profiles and specifications being developed for the report
- special features included in the report (e.g., crossings, sediment traps, buffer strips, controlled outlets)
- clearing and grubbing and the method of disposal
- as-built drawings that demonstrate any changes from the original drawings and how significant deviations are to be managed
- expected impacts of climate change
- all other details related to the drainage work

For future management of the drain, the drainage superintendent should ensure the report contains the following:

- a glossary of technical terms (e.g., benefit, outlet liability, design storms)
- a statement that crop damage allowances will not be paid for future drain maintenance and repair
- a statement that subsequent connections to the drain require approval from council
- a statement that obstructions and damages to the drainage works are prohibited
- a statement providing instruction for future maintenance and repair
- a method to calculate the value of special benefit assessments

5.2.6.2 Engineer's Assistant

The engineer is responsible for directing, reviewing and accepting survey and site examination work, and approving changes to the design and contract.

The drainage superintendent may assist the engineer with some or all of the following activities to reduce project costs for engineering services:

- information (e.g., history of the drain and access to files and reports)
- liaison (e.g., local knowledge in communicating with property owners and approval agencies)
- surveying and site examinations
- construction supervision
- communications (e.g., provide assistance addressing questions, concerns and resolving conflicts)
- contract administration

DID YOU KNOW?

The *Drainage Act, 1990* allows a drainage superintendent to certify the completion of a project under an engineer's report (Sections 60, 64 and 88(2)). When this occurs, the municipality assumes some accountability for the construction of the drain.

5.2.7 The Drainage Superintendent and DSAO

Drainage superintendents are encouraged to participate in the Drainage Superintendents Association of Ontario (DSAO) (www.dsao.net). Attendance at these meetings and events:

- creates uniformity in approach to drainage problems
- permits exchange of personal experience to resolve problems
- gives participants access to speakers knowledgeable in drainage topics
- provides a forum for discussion of regional problems
- provides participants with the opportunity to hear and receive annual reports from OMAFRA and the DSAO board of directors

The DSAO has a provincial board of directors, appointed by chapter nomination, which meets several times yearly. The DSAO board interacts with the chapter members, OMAFRA and other agencies, in resolving current issues, developing policy and establishing uniformity of procedures.

5.3 Drainage Commissioner

A drainage commissioner may be appointed by council to manage a specific drainage system (e.g., pump station, water control structure, dyke system) (Section 95).

Although independent, commissioners work under the direction of the drainage superintendent, they are a very important part of operating and maintaining a drainage works. Commissioners are typically property owners or local residents that live in the area and are familiar with the drainage works. They may also get a physical feeling for when and how to operate the system. For example, if a certain tile outlet is not visible above the water level, then it is time to operate the manual pump.

The relationship between the drainage superintendent and commissioner is important. Clear communications and expectations of the roles and responsibilities of the commissioner is critical. Regular meetings between the drainage superintendent, commissioner and property owners can ensure the drainage needs of the system are being identified and addressed. There may be situations that the commissioner can manage by themselves – other situations may require the notification of the drainage superintendent. Commissioners typically complete routine operation, maintenance and repair such as daily checks and operation of the stations, cleaning the intake screens, exercising any backup power systems installed, regular maintenance such as lube, replacing pump seals, etc., ordering fuel and frequent dyke inspection. The superintendent is responsible for more significant maintenance activities such as pump and electrical system replacement.

Municipalities are encouraged to consider health and safety issues and insurance coverage for commissioners due to the nature of their work. Insurance fees are chargeable to the appropriate drainage works.

5.4 Property Owners

Property owners play a central role under the *Drainage Act, 1990:*

- petitioning for the construction of new drains
- requesting improvements to existing drains
- identifying issues and requesting maintenance and repair to existing drains
- identifying environmental opportunities
- financing of all work for the drainage system

The engineer's report for a specific drainage works may describe property owner responsibilities. Drainage superintendents should be prepared to:

- advise property owners on their role and responsibilities under the act
- provide watershed maps, copies of reports, plans and profiles
- provide information about existing infrastructure
- discuss options for obtaining legal outlet and resolving drainage issues

5.4.1 Property Owner Responsibilities

Drainage superintendents must communicate the following to property owners:

- if planning to drain land into an existing municipal drain, notify the drainage superintendent to determine:
  - if the land being drained is assessed into the drainage works (Section 65(3))
  - if the land being drained will be disconnected from another drainage works (Section 65(4))
  - if there are specific locations for connecting to pipe municipal drains
  - the required freeboard for connecting to ditch municipal drains
  - any other connections specific requirements according to municipal policy and/or the current engineer's report
- don't obstruct the flow of the drain in any way
- report any obstructions to the drainage superintendent as soon as observed
- remove debris from catch basins or inlets
- notify the municipality if maintenance or repair of a drain is required
- only outlet unpolluted water (e.g., septic tank effluent, milk house waste, manure yard waste or other pollutants are not permitted in the drain)
- do not destroy or damage any feature including buffer strips and sediment control devices
- allow the drainage superintendent, engineer, assistants and contractors access to the drainage works and a working easement adjacent to the drain (as specified in the engineer's report)
- do not perform any repairs to a drainage works – all problems or issues with the drain or a feature on the drain should be discussed with the drainage superintendent
- do not plant trees or build fences or structures in the unregistered working space adjacent to a drainage works – a property owner may be held responsible for the cost of removing these features if this is necessary to allow drain maintenance
- do not store materials (e.g., brush, lumber or floatable materials) near the drain –these items may float away or obstruct the drain during a storm event

- do not alter any part of a drainage works (e.g., catch basins, grassed waterways and berms) – if a property owner performs unauthorized work on a drain that results in damages to the drain or to the property of others, they may be held responsible for paying the cost of repairing the damages
- do not attempt to remove a beaver dam – if one is in a drainage works, the property owner should contact the drainage superintendent

5.4.2 Maintenance and Repair Projects

Property owners should be made aware of the following:

- there are no appeals on assessments for maintenance after the engineer's report is adopted and the bylaw passed
- no allowances (e.g., compensation for crop damages or right-of-way) are given under maintenance

Grants are available for drain maintenance projects. The property must be eligible for the Farm Property Class Tax Rate (www.omafra.gov.on.ca/english/policy/ftaxfaq.html) to qualify for grants under the *Drainage Act, 1990.* The current grant rate is:

- 33⅓% in southern Ontario
- 66⅔% in northern Ontario

Chapter 6

Legislation

This j provides information on other applicable legislation and policies that must be considered by drainage superintendents. It is not an exhaustive list of legislation that could apply to drainage work and does not cover legislation that pertains to construction and contract administration.

For more information on the federal legislation mentioned in the guide, consult www.laws-lois.justice.gc.ca.

For more information on the provincial legislation mentioned in the guide, consult ontario.ca/laws.

For case law decisions involving this legislation, consult the Canadian Legal Information Institute (CanLII) – Decisions of Ontario Appeal Bodies www.canlii.org/en/on.

6.1 Federal Legislation

6.1.1 Fisheries Act, 1985 and the Species at Risk Act, 2002

The *Fisheries Act*, *1985* administered by Fisheries and Oceans Canada, prohibits the harmful alteration, disruption or destruction of fish habitat and the death of fish during maintenance and repair activities (Figure A6-1). The act also prohibits the release of deleterious substances into fish bearing waters.

Figure A6-1. Fish habitat.
Source: Fisheries and Oceans Canada

The *Species at Risk Act, 2002* provides for the recovery of species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened. Fisheries and Oceans Canada is mandated to protect aquatic species listed under the *Species at Risk Act, 2002* including their residences and critical habitat, and to provide for their recovery (Figure A6-2).

The drainage superintendent should contact Fisheries and Oceans Canada to determine if a *Fisheries Act, 1985* authorization and/or *Species at Risk Act, 2002* permit is required to carry out the drainage works.

More information is available in the document, *Guidance for Maintaining and Repairing Municipal Drains in Ontario*, Version 1.0, March 23, 2017, Central and Arctic Region, Fisheries and Oceans Canada, Burlington, Ontario. Contact the Fish and Fish Habitat Protection Program at: FisheriesProtection@dfo-mpo.gc.ca or 1-855-852-8320 and on the DSAO website under resources (www.dsao.net).

Figure A6-2. Some of the Canadian aquatic wildlife species that are protected.
Source: Fisheries and Oceans Canada

6.1.2 Canadian Navigable Waters Act, 1985

The *Canadian Navigable Waters Act, 1985*, administered by Transport Canada, prohibits works in a variety of forms that may impact navigable waters, unless the works have been approved by the minister. More information can be found by contacting the Ontario Region Office of Transport Canada.

6.2 Provincial Legislation

6.2.1 *Accessibility for Ontarians With Disabilities Act, 2005*

The Accessibility for Ontarians With Disabilities Act, 2005 was enacted for the purpose of improving accessibility standards for Ontarians with physical and mental disabilities to all public establishments by 2025.

Drainage superintendents should be trained to meet and follow their municipality's AODA requirements and policies. For drainage work, the drainage superintendent should consider the accessibility of meeting locations and report formats (e.g., Can all attendees hear the proceedings? Can everyone read the report? Is the report compatible with digital devices?).

6.2.2 *Agricultural Tile Drainage Installation Act, 1990*

The *Agricultural Tile Drainage Installation Act, 1990*, regulates all businesses, machines and machine operators involved in installing a drainage works (Figure A6-3). The definition of a "drainage works" is a drainage system constructed of tile, pipe or tubing of any material beneath the surface of agricultural land, including integral inlets and outlets, for the purpose of improving the productivity of the land. Contractors who install tile drainage on agricultural land using a tile drainage machine, must obtain licences. For more information, see OMAFRA factsheet, *Agricultural Drainage Licensing* (ontario.ca/omafra).

Figure A6-3. Installation of tile drainage.

DID YOU KNOW?

Land Improvement Contractors of Ontario promote the professional installation of quality pipe on agricultural lands, www.drainage.org.

DID YOU KNOW?

The names and locations of tile drainage contractors, licenced in Ontario, are found on ontario.ca.

6.2.3 *Conservation Authorities Act, 1990*

The *Conservation Authorities Act, 1990* is administered by the province and provides municipalities within a common watershed the ability to request the minister to establish a conservation authority for local resource management work.

Drainage Act and Conservation Authorities Act Protocol; Protocol for Municipalities and Conservation Authorities in Drain Maintenance and Repair Activities, 2012, DART Protocol, Government of Ontario guides municipalities and conservation authorities in fulfilling their responsibilities under the *Drainage Act, 1990* and *Conservation Authorities Act, 1990,* respectively, without compromising the intent of either statute. The emphasis is on working together to find common ground.

DID YOU KNOW?

To find a local conservation authority and more information go to Conservation Ontario, www.conservationontario.ca.

6.2.4 Endangered Species Act, 2007

In Ontario, the *Endangered Species Act, 2007* (ESA) provides for the identification, protection and recovery of species at risk and their habitats. In general, the ESA prohibits the killing, harming, harassing, capturing or taking a living member of an extirpated, endangered or threatened species and prohibits damaging or destroying the habitat of endangered or threatened species. The ESA contains provisions for permits, agreements and regulations to allow activities, including drainage, to occur that might otherwise be prohibited.

6.2.5 Fish and Wildlife Conservation Act, 1997

The *Fish and Wildlife Conservation Act, 1997* provides for the management, maintenance and rehabilitation of all Ontario's fish and wildlife resources. Municipal drains that require beaver, muskrat and other wildlife removal must be done in compliance with the act.

6.2.6 Municipal Freedom of Information and Protection of Privacy Act, 1990

The purpose of the *Municipal Freedom of Information and Protection of Privacy Act, 1990* is to provide a right of access to information under the control of institutions and to protect the privacy of individuals.

Drainage superintendents should follow municipal policy and procedures in the collection and release of personal information collected for drain projects (e.g., phone numbers, email addresses, etc.). If in doubt, the drainage superintendent should discuss the matter with the municipality's FIPPA coordinator.

When collecting personal information, consider including the following statement:

NOTE TO APPLICANT: The applicant(s) acknowledge that the information submitted could be disclosed in the event of a request made under the *Municipal Freedom of Information and Protection of Privacy Act*. Information submitted in confidence should be clearly marked "confidential." Information provided on this form is that of the organization and not the personal information of the applicant.

6.2.7 Invasive Species Act, 2015

The *Invasive Species Act, 2015* promotes action to protect communities from invasive species through prevention, early detection, rapid response and eradication of invasive species in the province. An invasive species is one that is not native to a specific location (an introduced species) and tends to spread to a degree believed to cause damage to the environment, human economy or human health. Common invasive species that are encountered by drainage superintendents along drains include phragmites, giant hogweed and purple loosestrife (Figure A6-4).

Figure A6-4. Phragmites is an invasive species. *Source: Dave Richards, Ontario Ministry of Natural Resources and Forests*

Additional resources

- Invasive Phragmites (*Phragmites australis)* Best Management Practice Technical Document for Land Managers, March 2017, Early Detection & Rapid Response (EDRR) Network Ontario project

6.2.8 Lakes and Rivers Improvement Act, 1990

The *Lakes and Rivers Improvement Act, 1990* provides for:

- the management, protection, preservation and use of the waters of the lakes and rivers of Ontario and the land under them
- the protection and equitable exercise of public rights in or over the waters of the lakes and rivers of Ontario
- the protection of the interests of riparian owners
- the management, perpetuation and use of the fish, wildlife and other natural resources dependent on the lakes and rivers
- the protection of the natural features of the lakes and rivers, and their shores and banks
- the protections of persons and of property by ensuring that dams are suitably located, constructed, operated and maintained and are of an appropriate nature

Most work performed under the *Drainage Act, 1990* is exempt from the *Lakes and Rivers Improvement Act, 1990* with the exception of dam projects (e.g., pumping stations, water control structures).

Figure A6-5. Dam constructed under the provisions of the *Lakes and Rivers Improvement Act, 1990*.

6.2.9 Municipal Act, 2001

The *Municipal Act, 2001* authorizes the creation, administration and government of municipalities in Ontario. It allows municipalities to:

- Adopt and maintain policies for the procurement of goods and services, public accountability for its actions, public transparency for its actions, and the delegation of its powers and duties. The drainage superintendent must comply with these policies when obtaining and contracting with service providers for maintenance and repair activities.

- Regulate the cutting of trees by passing forest conservation bylaws. These may be locally referred to as the "tree-cutting bylaw". For construction and improvement of drainage works, approval may be required to clear working space through woodlots. The drainage superintendent is encouraged to notify the forest conservation officer of the municipality when drain maintenance or repair activity may result in tree removal. The drainage superintendent should provide input to new or proposed amendments to forest conservation bylaw(s) in their area to ensure drainage interests are identified and accommodated.

6.2.10 Municipal Franchises Act, 1990

The *Municipal Franchises Act, 1990* defines a franchise as the granting of a legal right, power or privilege from a level of government to a utility company (i.e., natural and other gas distributors). A franchise agreement is required between a municipality and the gas company.

The Model Franchise Agreement gives municipal consent to gas companies to access highways, ditches and road allowances to lay, construct, maintain, replace, remove, operate and repair a gas system for the distribution, storage and transmission of gas in and through the municipality.

The Model Franchise Agreement states that "*Where the gas system may affect a municipal drain, the Gas Company shall also file a copy of the Plan with the Corporation's Drainage Superintendent for purposes of the Drainage Act, or such other person designated by the Corporation as responsible for the drain*."

The Model Franchise Agreement also contains provisions for cost sharing when a utility, subject to the agreement, must be altered. This may apply to the payment of special assessments under Section 26 of the *Drainage Act, 1990*.

The drainage superintendent should determine if any franchise agreements exist that could be affected by planned activity on drainage works.

6.2.11 Ontario Heritage Act, 1990

The *Ontario Heritage Act, 1990*, c. O.18 provides powers to municipalities and the Province to identify and conserve cultural heritage resources. The act is administered by the Ministry of Tourism, Culture and Sport (MTCS).

Drainage works and activities can have a direct effect on cultural heritage resources and may also indirectly affect sites in the vicinity of the project area. For example, the construction of drainage works could alter the visual setting or other physical relationships that contribute to the cultural heritage value of an archaeological site or a spiritual/sacred site (Figure A6-6).

Figure A6-6. A drain located next to a cultural heritage site.
Source: Town of Lakeshore, Ontario

6.2.12 Planning Act, 1990

The *Planning Act, 1990* sets ground rules for land use planning and describes how land uses may be controlled and who may control the uses.

Planning Act, 1990 policies that may impact drainage include:

- Provincial Policy Statement
- Regional Natural Heritage System for the Growth Plan for the Greater Golden Horseshoe and/or MNRF Natural Heritage Reference Manual
- Agricultural System Policy
- Greenbelt Plan
- Growth Plan for the Greater Golden Horseshoe
- Lake Simcoe Protection Plan
- Niagara Escarpment Plan
- Oak Ridges Moraine Conservation Plan

The drainage superintendent should talk to the municipal planning department to determine relevant regional plans and their application to drainage act activities.

6.2.13 Ontario Underground Infrastructure Notification System Act, 2012

The Ontario Underground Infrastructure Notification System Act, 2012 requires that all utility companies are members of Ontario One Call (1-800-400-2255). All excavations require locates and companies will provide them for engineering purposes free of charge.

There is a requirement for all municipalities that own or operate underground pipes or cables to register with Ontario One Call. Request for locates are normally directed to the municipal public works department but if municipal drains are involved, requests may be directed to the drainage superintendent for review.

6.2.14 Pesticides Act, 1990

The *Pesticides Act, 1990* regulates the sale, use, transportation, storage and disposal of pesticides in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use.

All registered pesticides have a label that lists the approved uses and conditions of use for that specific pesticide. A permit is required to apply a pesticide in water and restrictions apply if spraying near water.

6.2.15 Public Transportation and Highway Improvement Act, 1990

Through the *Public Transportation and Highway Improvement Act, 1990,* municipalities are required to obtain encroachment permits if proposing to perform any work on Ontario Ministry of Transportation (MTO) rights-of-way. Ontario Traffic Manual – Book 7 – Temporary Conditions provides the basic minimum typical guidelines for traffic control to achieve a satisfactory level of safety for workers and motorists (ontario.ca/publications).

As a road authority and a property owner, the MTO directives detail their involvement and relationship with drainage projects, including those performed under the *Drainage Act, 1990*. Encroachment permits are likely required.

When work involves roadways regulated under the *Public Transportation and Highway Improvement Act, 1990,* the drainage superintendent should ensure appropriate approvals, plans and permits are obtained.

6.2.16 Tile Drainage Act, 1990

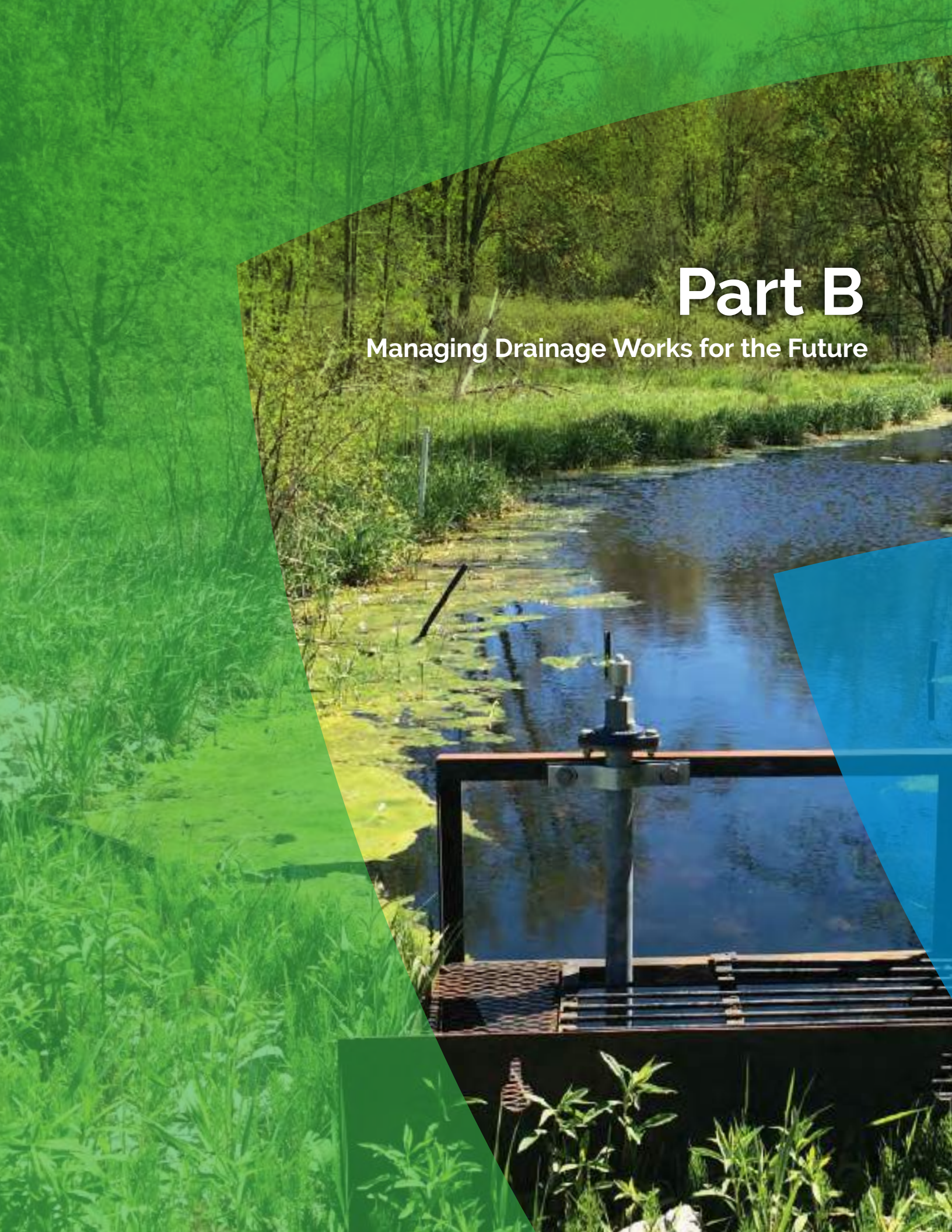
The *Tile Drainage Act, 1990,* authorizes the Tile Loan Program to provide agricultural property owners with access to loans to help them finance tile drainage projects.

Although drainage superintendents have no direct responsibility under the *Tile Drainage Act, 1990* they may be appointed by their municipality as an inspector of drainage (more commonly known as a tile inspector) under the legislation. See OMAFRA factsheet, *Tile Loan Program* for more information (ontario.ca/omafra)

6.2.17 Weed Control Act, 1990

Ontario's *Weed Control Act, 1990*, facilitates the control of noxious weeds on lands (in close proximity to lands) used for agricultural or horticultural purposes. Under Ontario's *Weed Control Act, 1990*, farmers and landowners have a legal obligation to manage noxious weeds species on their properties.

The act requires municipalities to appoint a weed inspector. If notified about noxious weeds on lands close to land used for agricultural or horticultural purpose, the weed inspector can order the weeds destroyed. If weeds are not destroyed within a set time, the municipality can use its staff to destroy the weeds and add the cost to the property owner's tax bill.



Part B

Managing Drainage Works for the Future

Table of Contents

Managing Drainage Works for the Future

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 1

The Drainage Superintendent Professional

1.1 Knowledge, Skills, Abilities

The profession of drainage superintendent requires the individual to have:

- legal knowledge related to legislation, regulations and common law
- communications skills to ensure stakeholders are well served
- technical abilities related to construction and surveying

The primary responsibility of the drainage superintendent is to maintain, repair and operate the municipality's drainage works constructed under the *Drainage Act, 1990*.

Specific responsibilities of the drainage superintendent vary by municipality and are found in Part A of this guide. Table B1.1 provides required and recommended areas of proficiency for drainage superintendents.

Table B1-1. Drainage superintendent required/recommended proficiencies

Education		
Description	**Methods of Improvement/Tools**	**Proficiency**
• Drainage Superintendents Course	• Offered by the University of Guelph Ridgetown Campus (UofG Ridgetown) in partnership with OMAFRA	• Required before appointment • Recommended retake every 10 years

Education (continued)

Description	Methods of Improvement/Tools	Proficiency
• Training in profile surveying	• University or college courses • Primary Drainage Course offered by UofG Ridgetown in partnership with OMAFRA • Municipal Survey course offered by Ontario Good Roads Association	• Required

Technical Skill: new practices, technologies and products

Description	Methods of Improvement/Tools	Proficiency
• Excellent knowledge of past and current practices, installation technologies and products used • Knowledge of new practices and installation technologies (e.g., low impact development (LID), trenchless technologies, drones) • Knowledge of new products (e.g., erosion control products, pipes) • Knowledge of environmental stewardship and the value of green infrastructure (e.g., wetlands, riparian buffers, sediment traps)	• Reading electronic newsletters from (e.g., product manufacturers, construction industry) • Following online links to agencies and environmental groups to learn more • Attending conferences	• Required • Level: in-depth

Knowledge: *Drainage Act, 1990; Tile Drainage Act, 1990*

Description	Methods of Improvement/Tools	Proficiency
• Assists property owners with drafting and submitting, but not circulating, a drainage works petition, and provides advice regarding any petition received • Works to understand how different sections of the *Drainage Act, 1990* intersect with each other • Communicates the intricacies of the *Drainage Act, 1990* to council, agency members and property owners • May also be appointed as inspector of drainage under Section 4 of the *Tile Drainage Act, 1990*, with duties as listed	• Drainage Superintendents Course offered by UofG Ridgetown in partnership with OMAFRA • Mentorship with senior drainage superintendent • Drainage Superintendents Association of Ontario (DSAO) chapter meetings and/or annual convention	• Highly recommended • Level: in-depth

Knowledge: common law of water in Ontario

Description	Methods of Improvement/Tools	Proficiency
• Understands the rights and responsibilities of property owners • Understands and explains common law principals to property owners • Provides information to property owners about their options under the *Drainage Act, 1990*	• Drainage Superintendents Course offered by UofG Ridgetown in partnership with OMAFRA • Mentorship with senior drainage superintendent	• Highly recommended • Level: in-depth

Knowledge: application of related legislation and regulations

Description	Methods of Improvement/Tools	Proficiency
• Knowledge of legislation and regulations that impact drainage superintendent duties and the related administrative agencies (Ontario Ministry of Environment, Conservation and Parks (MECP), Ontario Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO), OMAFRA, conservation authorities, Ministry of Transportation of Ontario (MTO), etc.) • Identifies and obtains required permits and approvals for drainage works from relevant agencies and authorities	• Contact with federal and provincial government staff to obtain guidance on legislation and regulations • Workshops or training sessions provided by regulatory agencies • DSAO chapter meetings and/or annual convention • *Drainage Act and Conservation Authorities Act Protocol*; referred to as the DART Protocol; see Part A of this guide • *Guidance for Maintaining and Repairing Municipal Drains In Ontario*; see Part A of this guide	• Highly recommended • Level: continuous improvement

Interpersonal Skills: communications

Description	Methods of Improvement/Tools	Proficiency
• Communicates professionally, as a representative of the municipality, with all stakeholders (e.g., council members, property owners, agency representatives) • Attends and/or presents to council and participates in committees and working groups • Prepares reports and provides information on drainage matters to council, property owners, contractors and consultants at council meetings • Liaises with all stakeholders (e.g., council, property owners, engineer, government agencies), Court of Revision, contractors, during management and work processes associated with drainage works (e.g., petition, construction, improvement, maintenance, repair) • Conducts public and on-site meetings • Attends and/or testifies before the Agriculture, Food and Rural Affairs Appeal Tribunal (AFRAAT) and judicial discoveries and hearings	• Uses consistent templates to present information (e.g., agenda, report, letter) • Uses an agenda to ensure all topics are addressed at each meeting • Uses multiple methods of communication with stakeholders (e.g., email, phone call, newsletter)	• Highly recommended • Level: continuous improvement

Knowledge: local municipality, agriculture

Description	Methods of Improvement/Tools	Proficiency
• Understands agricultural sector • Understands how local municipality functions • Local knowledge of history, locations and conditions of drains • Knowledge of local farming practices and soil conditions	• Attending community events to meet residents, participating in community life and developing networks • Building working relationships with community leaders • Finding local mentorship • Developing relationships with farmers and local farm organizations	• Recommended • Level: continuous improvement

Knowledge: storm water management and municipal engineering principles, practices and standards

Description	Methods of Improvement/Tools	Proficiency

• Current knowledge of drain design, construction and maintenance practices	• Normally acquired through:
	  ○ diploma in engineering technology or civil engineering technology
	  ○ degree in civil engineering
	• Attendance at conferences, workshops, seminars
		• Recommended
		• Level: continuous improvement

Project Management Skills: ability to manage drainage works construction and maintenance projects

Description	Methods of Improvement/Tools	Proficiency
• Manages maintenance and repair of drainage works, in accordance with legislation, regulations and bylaws including: site visits, surveys, tenders, proposals, quotations, inspections, payment certificates and reports • Acts as project manager for large drainage projects • Develops scope of work • Develops program and annual budgets and advises municipal treasurer • Prepares reports for municipal council, senior managers and affected property owners • Identifies and applies for funding from external sources • Maintains and updates drainage works records, drawings and drainage data including geographic information system (GIS) records • Understands the capabilities and limitations of various types of excavation equipment	• Taking project management courses • Using project management software • Seeking mentorship opportunities with experienced drainage superintendents, engineers or contractors	• Recommended • Level: continuous improvement

Interpersonal Skills: public speaking

Description	Methods of Improvement/Tools	Proficiency
• Informs property owners of drainage works procedures and meetings • Conducts public and on-site meetings • Delivers training sessions to council and other stakeholders	• Rehearsing before any major public speaking engagements • Ensuring facilities are appropriate to communicate the message (e.g., can the audience hear the discussion and/or see the presentation) • Taking public speaking courses	• Recommended • Level: continuous improvement

Interpersonal Skills: facilitation

Description	Methods of Improvement/Tools	Proficiency
• Facilitates communication among stakeholders that helps avoid or minimize potential conflict and build consensus on a course of action	• Keeping participants engaged and interacting • Presenting points clearly and persuasively • Responding to questions • Adapting to meet participants' needs • See Chapter B3 Engaging Stakeholders	• Recommended • Level: continuous improvement

Interpersonal Skills: negotiation

Description	Methods of Improvement/Tools	Proficiency
• Helps resolve drainage issues among property owners • Strives to relieve tension among those affected by an issue • Anticipates issues and prevents conflict before it arises	• Looking for ways to add value to the conversation • Taking alternative dispute resolution (ADR) courses	• Recommended • Level: continuous improvement

Interpersonal Skills: tact and diplomacy

Description	Methods of Improvement/Tools	Proficiency
• Uses tact and diplomacy to achieve positive results • Mediates, negotiates and problem solves with multiple parties • Responds professionally to complaints about drainage issues • Conduct oneself as a professional representing the municipality	• Building positive working relationships with regulatory staff, property owners and other stakeholders	• Recommended • Level: continuous improvement

Technical Skill: general technical

Description	Methods of Improvement/Tools	Proficiency

• Excellent knowledge of mathematics
• General technical knowledge of drainage works, sanitary sewers, road construction and maintenance
• Understands and interprets technical information in drainage reports including: engineered drawings and survey information
• Provides technical advice and assistance to other municipal staff
	• Normally acquired through:
	  ○ diploma in engineering technology or civil engineering technology
	  ○ degree in civil engineering
		• Recommended
		• Level: continuous improvement

1.2 Conduct

Drainage superintendents serve their municipalities and the public. They should:

- provide council with all relevant available information on an issue to assist council in making an informed decision on that issue
- be courteous, patient and understanding to earn the respect of the public and council – they are indirectly responsible to the electorate, but directly responsible to council who, in turn, are responsible for ensuring the requirements of the *Drainage Act, 1990* are met
- conduct themselves in a manner that brings credit to the municipality, the position and the DSAO
- not participate in municipal politics or be influenced by political considerations in order to maintain their impartiality and properly discharge their duties
- provide concise, firm and friendly direction to municipal employees and contractors
- develop and maintain relationships with council and representatives of provincial ministries and other agencies
- consider climate change and environmental stewardship when managing drainage works

1.3 Drainage Superintendents Association of Ontario (DSAO) Membership

All drainage superintendents and commissioners are encouraged to participate in regional chapter meetings of the DSAO. The cost may be recovered under the grant for the cost of employing a drainage superintendent administered by OMAFRA. Attendance at these meetings:

- builds consensus for uniform approaches to drainage problems
- allows participants to hear knowledgeable speakers
- provides a forum for discussion of regional problems and personal approaches to resolving common issues

The DSAO has a provincial board of directors, which is elected annually and meets several times per year. The board works with chapter members, OMAFRA and other agencies to resolve current issues, develop policy and establish uniform procedures. Additional information on the DSAO is found on their website www.dsao.net

Figure B1-1. Drainage Superintendents Association of Ontario.
Source: DSAO

1.4 Liaise with the Engineer

1.4.1 Engineer's Role

The *Drainage Act, 1990* places the main responsibilities for the development and construction of new drains or the improvement of existing drains on council and the appointed drainage engineer.

1.4.2 Drainage Superintendent's Role

The drainage superintendent is responsible for the management of the drainage works once it is constructed and should be considered a client of the engineer.

Council may instruct the engineer to submit the engineer's report for review by the drainage superintendent before filing the report with the clerk. This provides an opportunity for council, and the drainage superintendent on council's behalf, to ask questions and make changes if necessary. The drainage superintendent must ensure the engineer's report for a proposed drainage project meets the expectations of council and the property owners in the watershed of the drainage works.

In general, the drainage superintendent should confirm the report includes:

- maintenance clauses
- assessments for future maintenance and repair
- locations of benchmarks, levelling, rights-of-way, accesses
- design elements and notes as discussed during development of the plans

1.4.3 Ensure Content in Engineer's Report

There are several important items the drainage superintendent must ensure are in the engineer's report.

1.4.3.1 Definitions

Since property owners may approach the drainage superintendent with questions about the report, the engineer should define the *Drainage Act, 1990* terms commonly used in drainage works projects (e.g., benefit, outlet assessment, allowance, right-of-way, etc.).

1.4.3.2 Working Space

The Drainage Act, 1990 requires the engineer to define a working space (Section 63(1)). The drainage superintendent should ensure the engineer's report clearly defines the working space or right-of-way and any special requirements for contractors to access the area. The drainage superintendent may also want the engineer to state in the report that the working area continues to exist for future maintenance and repair work and affected property owners should keep it clear of obstructions. Where allowances are provided to property owners for the working area, the engineer should state in the report that property owners will not receive allowances for any future maintenance work.

1.4.3.3 Drain Maintenance Assessment Schedules

The act allows an engineer to prepare a separate assessment schedule for drain maintenance and repair work (Section 38). The engineer and drainage superintendent should work together to develop a practical "maintenance" assessment schedule in a format suitable for future use (e.g., a separate assessment schedule for each branch on a drain) and for each interval of drain that changes in nature (e.g., from open channel to pipe drain).

1.4.3.4 Benchmarks

The act requires the engineer to establish benchmarks or permanent levels (Section 13(1)). This critical information is required by the drainage superintendent when determining if and when any repair or maintenance work is required in the future. The engineer may ask the drainage superintendent for input on the preferred quantity and location of the benchmarks. If it is practical to access a geodetic benchmark, the drainage superintendent may suggest the engineer use geodetic elevations.

1.4.3.5 Disposal of Materials

The act requires the engineer to indicate in the report how the materials from the drain will be disposed of (Section 16). The drainage superintendent should ensure the engineer states in the report that the provisions for disposal of materials also apply for future maintenance and repair work. The drainage superintendent should review the provisions to ensure they are practical and effective for future drain maintenance and repair work.

1.4.3.6 Abandonment

If the engineer intends to replace all or part of an existing drain, the drainage superintendent must confirm the engineer's report includes a statement of abandonment regarding the old part of the drain that is being replaced (Section 19). If this is not done, the old drain will still legally exist, and the drainage superintendent and the municipality could be required to maintain or repair it in the future.

1.4.3.7 Plans, Profiles and Specifications

The plans, profiles and specifications are key elements of the engineer's report (Section 8(1)(a)) that the drainage superintendent will use during future maintenance or repair work. When the report is being developed, the drainage superintendent should thoroughly review the plans, profiles and specifications to ensure they are accurate (e.g., names of property owners, names and locations of other drains, etc.). The drainage superintendent should also ensure they understand the information and know how to use it effectively during future work.

1.4.3.8 Other Structures

A variety of other structures may be included in the engineer's report as part of the drainage works (Section 18). Private crossings are the most common structure. The drainage superintendent may want to discuss with the engineer the feasibility of including other structures (e.g., sediment traps, buffer strips, water control structures) that may reduce future maintenance costs. The drainage superintendent should ensure the engineer's report provides enough detail about the crossings or control structures to allow maintenance or repair in the future, and notes variations in the maintenance/repair assessment schedule for work on these structures.

1.4.3.9 Other Instructions

The actions of some property owners along a drainage works (e.g., installing inadequate field tile drain connections or allowing cattle unrestricted access to a drain) may restrict the flow of water or cause damage to the drainage works. To protect the drainage works, the drainage superintendent should ask the engineer to state in the report that future connections to the drainage works require prior approval of council (Section 65(5)) and that a property owner may be charged if they are responsible for obstructing (Section 80) or damaging the drainage works (Section 82).

1.4.4 Understand Costs – Assessment, Compensation, Allowances

The drainage superintendent should understand how costs are determined and applied under the *Drainage Act, 1990* – see Part A, Chapters A2.3.2 – A2.3.4 of this guide for additional information. After reviewing the engineer's report, the drainage superintendent should ensure they fully understand the costs associated with the project. When the engineer is not present, the drainage superintendent must be able to explain the costs to council, property owners and other stakeholders.

Understanding how assessments are determined requires training and experience. The lands within the watershed served by the drainage works are evaluated by the engineer and assigned/assessed a monetary value that relates to the costs of the drainage works. Several types of assessment are available under the act, which the engineer may use to determine the total assessment on a parcel of land including: benefit, outlet and injuring liability, special benefit, block assessment, special assessment to utilities or roads, assessment of future maintenance and repair. Assessments are made for the initial construction or improvement costs and for future repair and maintenance costs.

DID YOU KNOW?

Understand how the engineer determines assessments.

Take the time to learn how assessments are calculated. The process is described in *A Guide for Engineers Working Under the Drainage Act, 1990 in Ontario* and the OMAFRA factsheet, *Understanding Drainage Assessments* (ontario.ca/omafra). For each project, review the engineer's report and discuss the assessment schedule with the engineer. Be prepared to answer questions from property owners. For a copy of the guide, go to ontario.ca/publications and search for Publication 852.

1.4.5 Coordinate Efforts

The drainage superintendent should discuss with the engineer:

- the arrangement for construction supervision of projects
- the impacts of the project on other affected municipality(s) (Section 50) to ensure the initiating municipality's rights are protected and there are no grounds for appeal
- the implementation of the procedures of the *Drainage Act, 1990* to ensure compliance (e.g., the drainage superintendent should ensure the proper forms are used throughout the process)

While the drainage superintendent should be considered a client of the engineer, the drainage superintendent can also act as an assistant to the engineer. Section 93(3)(c) of the *Drainage Act, 1990* states that "A drainage superintendent for a municipality shall …assist in the construction or improvement of the drainage works for which the municipality is responsible …".

In 1975, the position of drainage superintendent was created in amendments to the *Drainage Act, 1990*. For new drain construction and improvement projects, it was envisioned that the drainage superintendent could be responsible for liaison with property owners, arranging construction tenders, evaluating contractor bids, providing council with recommendations and providing on-site supervision of these projects – with guidance from the drainage engineer.

Chapter 2

Identifying Needs

2.1 Identifying Current and Future Drainage Needs

The drainage superintendent must understand the current and future drainage needs of their municipality and stakeholders. The drainage superintendent can obtain this knowledge by:

- continually improving their skills and experiences (Chapter B1)
- engaging with stakeholders, including organizations, with an interest in drainage works under the *Drainage Act, 1990* (Chapter B3)
- knowing what options are available to ensure drainage works are constructed and maintained to meet current and future needs (Chapter B4)
- learning from what others have done (Chapter B5)

2.2 Managing Change

To ensure current and future drainage meets the needs of their municipality and stakeholders, the drainage superintendent must be ready to identify and respond to change.

Change comes in many forms:

- precipitation patterns shift causing increased periods of drought or flooding
- more water and flooding damages natural habitat, infrastructure and buildings, and increases risk to human and animal health and safety
- land uses change and urban development continues expanding into agricultural areas – some drainage works originally constructed to meet agricultural needs are now within urban areas, which may affect assessments and maintenance needs
- legislation, regulations and policies change to meet society's demands for greater accountability

- agency approaches to implementing policies and enforcing regulations change to ensure they are addressing new realities and meeting their responsibilities
- municipal council or staff members change on a regular basis and previously accepted ideas may need to be re-explained and new support sought

Human needs drive change and create opportunities. A drainage superintendent can use these opportunities to help people respond to change. Individual and organizational needs are a response to one or more drivers of change, which include:

- economics
- regulations
- social pressure (e.g., peer pressure, life events)
- stewardship
- a crisis or catastrophic event

The drainage superintendent can make change easier for those involved by:

- listening to and understanding the stressors that individuals or groups are experiencing
- developing ways to help them move to a more positive outcome
- ensuring expectations are balanced with actual outcomes

To ensure continuous improvement, the drainage superintendent should take the time to consider what is working and what is not and adjust their approach to manage change among stakeholders.

2.3 What is Green Infrastructure?

Green infrastructure includes natural and constructed elements in our environment that provide ecological (i.e., the relationship between living things and their environment) and hydrological (i.e., the movement, distribution and quality of water) functions and processes. Green infrastructure includes a wide range of elements from river systems and natural heritage parks to urban forests and green roofs. Traditionally, drainage infrastructure was designed with one objective in mind – to drain water. By integrating green infrastructure elements such as riparian buffers (Figure B2-1) and wetlands into drainage works, drainage infrastructure can also enhance ecological and hydrological functions and processes within municipalities, and provide social, environmental and economic benefits.

Green infrastructure can:

- mitigate the effects of climate change (e.g., reduce flooding hazards and increase water security during drought)
- improve water quality
- reduce erosion and keep soil where it belongs (i.e., in a field or along the banks of a watercourse)
- increase the resiliency of communities to more frequent and intense storm events and changing environmental conditions
- improve the habitat of plants and animals

Figure B2-1. A drain with a riparian buffer is a good example of green infrastructure.

Figure B2-2. A drainage system (yellow lines) with green infrastructure in balance with the agricultural landscape.

2.4 Drainage for the Future

When the *Drainage Act* was first passed in 1859, it was used to drain marginal farmland, swampy areas and wetlands to increase the productivity and amount of agricultural land in Ontario. Today, the *Drainage Act, 1990* is used to achieve broader watershed management goals by incorporating green infrastructure in balance with the need for drainage in agricultural, rural and urban areas (Figure B2-2). It is increasingly important that drainage works function in both capacities to their fullest potential.

The world continues to pursue the stewardship aspirations and resiliency embodied in the idea of sustainable development. Drainage – when managed to meet current and future needs – represents real-life, ground-level decisions that affect people, our planet and the prosperity of all.

Chapter 3

Engaging Stakeholders

3.1 Introduction

3.1.1 What is Stakeholder Engagement?

Stakeholder engagement is the effort made by the drainage superintendent to understand, involve and communicate, at the right time, with stakeholders about their needs and interests on activities and decision-making processes about drainage works.

For example, a written communication may be emailed to a property owner 4 weeks before the meeting, so the property owner can attend and ensure their concerns are addressed. Timely notice is important, so all stakeholders have the opportunity to participate.

3.1.2 Identifying Stakeholders

From the drainage superintendent's perspective, a stakeholder is any individual or group who can affect, or be affected by, a drainage works.

Who does this include? Consider more than property owners served by the drainage works. The stakeholder list is much larger and includes individuals and groups who focus on local concerns and issues, as well as others who tend to focus on municipal, provincial, federal and, for some, global issues. An example list of stakeholders is provided in Table B3-1.

New drainage superintendents should consider mapping their stakeholders to fully appreciate the type and number of stakeholders they must engage with to meet legislated requirements. Mapping also helps identify interests, issues of concern and relationships among stakeholders. Once stakeholders are known, then develop a plan of engagement.

Table B3-1. Stakeholders in drainage works have different interests

Focus of Interests	Stakeholder Type
Local	• affected property owners
Local/municipal	• council / drainage committee of council • municipal staff including drainage superintendent • adjacent affected municipalities
Local/provincial	• drainage engineer
Municipal	• rate payers/public
Provincial	• provincial government/regulatory agencies (e.g., conservation authorities, MNRF)
Federal	• federal government/regulatory agencies (e.g., DFO)
Various	• funding agencies • society • future generations • environmental groups • utilities

3.1.3 How Much Engagement is Enough?

Some stakeholders focus on site-specific issues or concerns because they own property in the watershed served by a drainage works. Other stakeholders may focus on site-specific issues or concerns because they represent wider municipal, provincial, federal or global needs (e.g., source water protection, pollinator habitat, climate change).

What level of engagement should the drainage superintendent undertake with each type of stakeholder? The answer can change with the issue. Stakeholder engagement is a dynamic process. The drainage superintendent must recognize existing issues and emerging concerns and be ready to adjust their approach to engagement.

The drainage superintendent should consider matching stakeholder engagement with:

- legislated requirements
- need to develop trust and respect with individuals and groups within their community
- the actions required to attain and maintain operational excellence on behalf of the municipality and council they represent

3.1.4 Engaging the Farm Community

The drainage superintendent engages with rural and urban property owners when fulfilling their responsibilities under the *Drainage Act, 1990*. When the property owner is a farmer, the drainage superintendent should be aware of unique circumstances associated with farm businesses and farming (Figure B3-1).

Figure B3-1. A drainage superintendent meeting with farm business staff.

3.1.4.1 Insights on engaging the agricultural community

- For many farmers, their business and home are the same place – located at the 'home farm'. Personal and professional lives are intertwined and often inseparable in farming communities.
- Community events and farm organizations provide the drainage superintendent with opportunities to meet stakeholders and build relationships.
- Each drainage superintendent should:
  - strive to understand the history between farmers, local residents and government – it may be positive or may be a significant barrier to collaborative work
  - respect the knowledge individuals have for their operation and industry
  - get to know the leaders in their community whose ideas resonate with their peers (often other farmers) and may lead to positive action on a drainage issue
  - keep conversations confidential
  - find local mentorship (e.g., reach out to neighbouring drainage superintendents to share ideas, experiences and opportunities and get involved in the local DSAO chapter)
- When meeting with farm property owners, the drainage superintendent should:
  - meet individuals in their environment (i.e., at the farm, at a summer BBQ or at a farm organization's annual general meeting (AGM))
  - avoid scheduling meeting during planting, spraying, harvesting and other key farming activity times
  - ask about biosecurity precautions before visiting a farm

- dress appropriately for the farm visit
- look for and obey signs at the farm that direct entry, biosecurity, traffic, etc.
- park their vehicle facing out and in a location that is not in the way of potential farm activity
- never enter a barn or operational area without the express permission of the farmer

3.1.5 Indigenous Communities and the Duty to Consult

If an indigenous community is a stakeholder in a drainage works, the drainage superintendent must seek advice on how to proceed to ensure the duty of the Crown is met.

DID YOU KNOW?

Learn about Ontario treaties and reserves.

To identify and learn about treaties that involve your municipality and to find reserves in Ontario, search online at ontario.ca (key words: map, treaties, reserves). Treaties are legal agreements that set out the rights and responsibilities of First Nations and the provincial and federal governments.

The drainage superintendent must understand their role as a municipal representative within the larger context of the relationship between government and indigenous communities. The duty to consult is one key element.

- The "duty to consult" refers to Ontario's constitutional obligation to consult an indigenous community when Ontario has knowledge of an established or credibly asserted indigenous or treaty right and contemplates conduct that may adversely affect that right.
- The duty to consult is grounded in the honour of the Crown and stems from the constitutional protection accorded to indigenous and treaty rights under Section 35 of the *Constitution Act, 1982*.
- Canadian courts have since provided extensive guidance on the constitutional protections provided for indigenous and treaty rights.
- Ontario is of the view that municipalities have a duty to consult in some circumstances because they make decisions with the potential to adversely impact the exercise of indigenous and treaty rights.
- Municipalities engage with indigenous communities in a variety of ways, including when constructing new roads, developing active parkland, as well as infrastructure planning, land use planning, and directing growth and development in their communities.
- As approval authorities, municipalities are in a unique position to consult with and accommodate indigenous communities' concerns that are brought forward. Municipalities can also mitigate, minimize or avoid adverse impacts of their decisions. For example, municipalities that approve plans for subdivisions have the ability to realign the lot layout to mitigate or avoid a site that is sacred to an indigenous community.
- In other circumstances, municipalities may be third party project proponents seeking approvals, permits or authorizations for the project from Ontario. In these instances, ministries may delegate procedural aspects of consultation to municipalities.

3.1.6 Outcomes of Strong Relationships

By building strong relationships, the drainage superintendent will:

- develop a better understanding of the impact of policies and regulations at their local level, which allows them to effectively advocate for their stakeholders
- facilitate positive collaborations across municipal boundaries
- enable their own ongoing learning and professional development

3.2 Step-By-Step Approach to Stakeholder Engagement

Engagement is an ongoing cycle. Effective engagement strategies incorporate feedback and experience to create a cycle of continuous improvement that:

- enhances decision-making processes
- incorporates green infrastructure into drainage works that provides environmental, social and economic benefits (Chapter B2)

3.2.1 Steps to Stakeholder Engagement

The following steps are adapted from the Facility Reporting Project, *Guide to Stakeholder Engagement*, November 2007.

3.2.1.1 Step 1 Plan – Identify Stakeholders and Their Interests

a) identify stakeholders

b) review advice in Section B3.1.4, Engaging the Farm Community

c) when an indigenous community is a stakeholder, seek advice and assistance from within the indigenous community to ensure the engagement approach is appropriate

d) establish an engagement strategy including objectives, scope and actions

3.2.1.2 Step 2 Engage – Interact with Stakeholders

Depending on the scope of the project, it may be beneficial to plan and hold a drain maintenance site meeting with appropriate stakeholders

3.2.1.3 Step 3 Make Decisions – Use Stakeholder Input to Determine Actions

a) review feedback (e.g., debrief with the engineer after a site meeting)

b) consider each stakeholder's involvement in decisions about a drainage works

c) evaluate stakeholder priorities (e.g., compare legislated requirements and property owner requests)

d) evaluate competing interests (e.g., conservation authority comments and property owner requests)

e) decide what to do and what not to do:

   - ensure the engineer includes property owner requests, or provides a rationale for not including a request, in the drainage works and the engineer's report;
   - encourage the engineer to integrate green infrastructure into the drainage works that provides environmental, social and economic benefits (Chapter B2)

f) enable an ongoing discussion – continue to engage stakeholders

3.2.1.4 Step 4 Evaluate – Determine the Effectiveness of Stakeholder Engagement Processes

a) take time to learn from the experience, discuss with a mentor and adjust the approach to individuals and groups

b) review advice in Section B3.1.4 Engaging the Farm Community

c) if an indigenous community was a stakeholder, seek advice and assistance from within the indigenous community to ensure the engagement approach was appropriate

DID YOU KNOW?

For complex decisions, use structured decision-making (SDM).

The PrOACT (Problem, Objectives and Measures, Alternatives, Consequences, and Trade-offs) Structured Decision-Making framework* is a method for creating a clear and concise summary of a problem and the possible solutions. The framework helps:

- define the problem under consideration
- determine who needs to be involved in the process of developing alternatives (helps create a shared understanding of how people with different interests and perspectives view different options)
- compare the trade-offs created by each alternative solution to the problem

Search online at Industry Canada (www.ic.gc.ca) for the factsheet, *Decision-Making for Sustainability;* or on an internet browser for *Triple Bottom Line and Structured Decision-Making A Case Study of BC Hydro* for the full document.

* Hammond, Keeney and Raiffa. 1998. Smart Choices: A Practical Guide to Making Better Decisions

3.3 Engagement Toolbox

3.3.1 Right Tool, Right Time

The drainage superintendent engages with stakeholders in numerous ways. Effective and efficient engagement requires:

- preparation
- a willingness to try new approaches
- a clear and concise project plan that includes engagement goals and strategy
- training, practice and learning from experience

Table B3-2 includes a list of engagement tools and suggestions on when to use them.

Table B3-2. Engagement tools and examples of when to use them

Engagement Tool	Examples of When to Use
Pre-Engagement Preparation	
Scope of work	Document scope of work defining what you will and will not do
Funding sources	Find out about funding sources and use the information to support a preferred solution
Business case	All stakeholders want to know the costs and benefits of the work or project
Spoken Communications	
In person, one-to-one	Having a personal conversation will help avoid misunderstandings
Phone call one-to-one (voice)	Organizing meeting; 1st contact
Conference call	All individuals need: • opportunity to provide input or • hear same information
Video call (visual and voice)	Group meeting and saves travel costs
Presentations: informal	On-site meeting
Presentations: formal	Council meeting
Written Communications	
Email	Informal delivery of information – use to coordinate work
Letter	Formal delivery of information
Notice	To meet legal requirements for notice
Report	Formal documentation of work – often includes recommendations arising from review and analysis
Social media	Engage and deliver information to the public – tone is casual

Group Functions	
Meetings	Planning work
Exhibitor booths	Information exchange – engage wider community
Demonstrations	Information exchange – engage wider community
Tours	Information exchange – engage wider community
Events	Information exchange – engage wider community

3.3.2 Pre-engagement Preparation

3.3.2.1 Scope of Work

The drainage superintendent must know the *Drainage Act, 1990* and understand the legislated processes, and the municipality's policies and practices. From this knowledge, the drainage superintendent can develop a scope of work that outlines the objectives, methods, timelines, resources and outcomes that are required to accomplish drainage-related work, whether the work is a line item in the annual budget or a one-time project that will impact ongoing work. The drainage superintendent should not underestimate the value of preparing a scope of work template for a task or project.

3.3.2.2 Funding Sources

The drainage superintendent should take the time to know and understand what funding sources are available to support drainage work. Funding stakeholders recognize the key role that the drainage superintendent plays in promoting green infrastructure and ensuring it is implemented and maintained. Be sure the aims and goals of funding sources do not compromise the needs of the property owners on the drain.

DID YOU KNOW?

Follow the money!

For information on potential funding sources, go to the DSAO website, www.dsao.net

3.3.3 Communications

3.3.3.1 Conversations

Talking to others, as a basic form of communication, has changed significantly with the widespread use of technology (e.g., text messaging, email, social media). However, spoken communication provides immediate feedback and allows those involved to move the planning process much further and faster. Choose the right form of communication for the situation and for the client – communication with a councillor may require an email where coordinating a meeting time could be done by text message.

3.3.3.2 Presentations

Presentations take the following formats:

- informal presentation of information (e.g., slides, written information to hand out) can be presented anywhere (e.g., at a kitchen table, on site at a drainage works) and questions may be integrated throughout the presentation
- formal presentation of information (e.g., slides, written information to hand out, report) is generally presented in formal settings (e.g., meeting room, council chambers) – time is limited allowed for questions from the audience at the end

The drainage superintendent should consider the following when making a presentation:

- use support material (e.g., slide presentation, handouts)
- for slideshow presentations:
  - do not read from the slide
  - all content on a slide should have meaning to everyone in the room – if the slide cannot be read from the back of the room, do not put it in the presentation
  - avoid full sentences that encourage reading as opposed to listening – use bulleted points to communicate the concept
  - try to avoid having more than three bullets per slide – otherwise, important messaging may be 'lost'
  - remember that 'a picture is worth a thousand words' – include pictures to help get the message across

3.3.3.3 Written Communications

Written communications can be used to engage your audience using a variety of methods (e.g., email, letter, notice, social media). Written communications may be used to provide formal notice, keep track of decisions and provide direction. For emails and letters, the key action and message should be written in the first sentence or paragraph. Details including the reason(s) for the request and/or the background follow below.

3.3.4 Group Functions

The drainage superintendent regularly leads and participates in group functions (e.g., meetings, exhibitor booths, demonstrations, tours and events). Group functions provide opportunities for community outreach and education about the importance of drainage to agriculture and food production, and the ecological goods and services that drainage works provide to society.

3.3.4.1 Meetings

The drainage superintendent regularly organizes and leads meetings related to work and projects under the *Drainage Act, 1990*. When running a meeting, the drainage superintendent should:

- develop a friendly and enjoyable atmosphere for meetings – ensure the room is accessible to all, introduce everyone and consider using name tags
- ensure everyone is aware of the agenda and the time allocated to each item
- designate someone to record the information generated, or at least gather the information to compile after the meeting
- make sure everyone is heard

- read body language and visual cues to ensure everyone is participating in the meeting
- speak with professionalism and integrity and hold onto your personal opinions
- consider arranging for refreshments to keep the energy up and help break up the session
- strive to wrap up on time – if more time is required for an item, ask the group for permission to extend the time and keep to the revised timeline
- finish on a positive note – summarize key learnings and decisions, clarify next steps and list what each person needs to do

3.3.4.2 Demonstrations and Tours

Demonstrations and tours provide an opportunity for the drainage superintendent to highlight drainage projects with innovative features (Figure B3-2). When organizing demonstrations and tours, the drainage superintendent should consider:

- highlighting key features with additional information (e.g., handouts, posters, signs)
- providing an agenda including transportation timing and parking
- using audio equipment in the bus and/or at the site
- providing refreshments
- advising participants on weather-appropriate clothing
- ensuring the invitation list is complete and appropriate (e.g., property owners, agency representatives, potential funding partners)

Figure B3-2. Site tours are a great opportunity to showcase projects and innovative features.

Demonstration sites, which are often highlighted during tours, show alternate ways to construct and maintain drainage works and are an excellent tool for stakeholder engagement. Signs (Figure B3-3) and handouts are very important communication tools:

- Consider using signs placed at key points on the site so participants understand the project and the partners involved. Signs located at the roadside of different demonstration sites build awareness and understanding of efforts to improve and enhance the ecological goods and services provided by drainage works.
- Signs:
  - provide key information about demonstration sites and acknowledge funding partners and participants
  - use before and after photographs to help visitors see what the site is demonstrating
  - help visitors understand how a project supports initiatives related to drainage and addresses broader agricultural and environmental issues
- Handouts during a tour (e.g., map of route and sites) help tour attendees understand where they are going and what they can expect to see.

- Apply for funding for signs or invite sponsors to pay for them.
- Project partners often provide funding for signs to ensure they are recognized. Commercial businesses may also sponsor signs if they can include their name and logo on the sign.

Figure B3-3. Signs at demonstration sites build awareness.

3.3.4.3 Events, Media and Displays

To build support for activities related to drainage works, the drainage superintendent should support, promote and participate in community outreach and education initiatives by the municipality and other local groups.

Media spokesperson

Some municipalities may have their own media spokesperson responsible for communicating about events. If so, the drainage superintendent should ensure the spokesperson has the knowledge required to communicate appropriately with the media and the wider community. Showing the spokesperson various types of drainage works on-site is one way to focus their attention on the issues, concerns and attributes of drainage works in the municipality.

Media advisory guidelines

Understanding how to draw media to an event is an important skill for drainage superintendents. Media advisories should pique the curiosity of reporters and editors, but not give away the entire story. A media advisory should be one or two sentences long and is not a mini news release.

Here are some reminders about media advisories and the logistical details to include:

- time, date and location of the event
- important persons who will attend or speak at the event
- important information or announcements at the event
- special arrangements for media (information sessions or post-announcement interview opportunities)
- map and directions if the event is in an unfamiliar location
- “Attention Photo Editors” written near the headline if the event provides an opportunity to take photographs of important persons or other visuals
- contact name for the person providing assistance to media
- contact name for the person providing assistance to the public (if different than the media contact)

News release guidelines

A news release tells a story in a simple, compelling way and should attract the attention of reporters and editors. News releases may be posted online for the general public to read.

A news release should be no more than 1 page and include up to 7 sections.

1) **Headline** – Use three to six words to grab the reader's attention and compel them to read on, emphasizing the benefit to the intended audience.
2) **Sub-headline** – Use less than nine words.
3) **News** – Use the lead (the first sentence) to explain result or benefit. What is new or different? Answer basic questions – who, what, where, when and why? Use short sentences (15 words or less), four or five paragraphs and less than 150 words in total.
4) **Quotes** – Include one or two brief, meaningful quotes (no more than two sentences), use a period at the end of the quote and add the name and title of speaker below it.
5) **Quick facts** – Illustrate the story, demonstrate progress, make it meaningful. Use two or three facts, aim for the "wow" factor and compel readers to think "ah-ha!" Use statistics, direct observations or timelines that emphasize a point.
6) **Learn more** – Link to what the reader wants to know. Cross-promote related programs and services. Use lively language – visit, see, find. Create only one hyperlink for each 'learn more' bullet.
7) **Contacts** – Name contact person(s) and how to reach them. Ensure there is a contact for the public who may see the release on the newsroom.

Remember: keep it simple and do not try to cover too much. Use short sentences and paragraphs. Be direct and descriptive. Choose everyday words and avoid jargon, technical terms and acronyms. Use the active voice rather than passive – active = subject + verb + object (e.g., Rural green infrastructure saves money.).

Displays and booths

Events often provide an opportunity to set up a display or booth where the drainage superintendent and other stakeholders can disseminate information and discuss issues with interested persons (Figure B3-4).

Figure B3-4. Having a booth at a farm or trade show is a good way to engage with stakeholders.

The following are some reminders about displays and booths:

- staff the display or booth with individuals who can discuss the issues
- stand while talking to visitors
- choose a high pedestrian traffic area
- use visuals, photographs, maps, etc.
- update display and booth content regularly
- consider providing refreshments or promotional material to attract visitors
- do not eat at the booth
- provide contact details for more information
- provide take away information
- record visitor contact information when issues are raised
- follow up on promises after the event

3.4 Green Infrastructure Business Case

The drainage superintendent can help stakeholders understand the importance of improving capacity, resiliency and biodiversity in drainage works to help offset the impacts of climate change, among other benefits. Consider organizations and local community groups promoting green infrastructure (e.g., MNRF, conservation authorities, Ducks Unlimited Canada) as potential partners in drainage projects.

Using the tools in the engagement toolbox, the drainage superintendent can help stakeholders understand the immediate and long-term benefits and costs of a drainage enhancement through the development of a green infrastructure business case.

3.4.1 What is a Green Infrastructure Business Case?

If a new drain or a drain improvement project is proposed, the drainage superintendent should consider preparing a 'green infrastructure' business case for council, property owners and other stakeholders to support the recommended action. The Provincial Policy Statement (2020) states that: "Green infrastructure means natural and human-made elements that provide ecological and hydrological functions and processes." Drainage works generally meet this definition.

A green infrastructure business case is a verbal or written proposal that:

- identifies challenges and opportunities
- describes and recommends a preferred solution
- presents alternative solutions and why they are not the preferred solution
- identifies, using a cost-benefit analysis (CBA), the monetized and non-monetized impacts that could occur if the preferred solution is implemented

Most business cases focus on determining the return on investment (ROI) related to monetized line items. This includes goods and services that have a known cash value (e.g., the cost of cleaning out 500 m of channel bottom using a custom operator).

To ensure the full value of a task or project is understood, include the costs and benefits that are non-monetized (i.e., goods and services that do not have a known cash value) but do have an intuitive value to stakeholders. There are many practices that have both environmental and economic benefits to the drainage system. These include:

- buffer strips
- grassed waterways
- wetlands
- sediment ponds
- natural channel design
- two-stage channel
- barefoot box culvert (Figure B3-5)
- water and sediment control basins (WASCoBs)
- biofilters

Figure B3-5. Example of green infrastructure feature – barefoot box culvert.
Source: R. J. Burnside, Guelph, Ontario

The potential benefits include:

- improved water quality
- reduced flooding
- increased infiltration
- reduced soil erosion
- increased water storage
- improved habitat (fish, wildlife, pollinators)
- reduced construction costs
- reduced maintenance and repair

For example, the addition of buffers will maintain stable channel banks, leading to less soil erosion and sediment in the channel bottom, and to a lower frequency of cleanout resulting in:

- reduced, long-term cost of maintenance
- reduced cost of repairs due to improved resiliency to withstand flooding
- no change or decrease in channel water-holding capacity
- improved biodiversity resulting in improved channel bank stability plus additional ecological benefits

DID YOU KNOW?

How much is a benefit worth?

The method(s) for assigning a cash value to non-monetized ecological goods and services are beyond the scope of this guide.

For more information, search online for "natural capital valuation methods."

Example: Each year, the Credit River watershed provides at least $371 million CAD (2007) in ecological services to area residents including: wetlands ($187M); riparian forest ($51M); water ($15M). The data is drawn from the report, *Natural Credit – Estimating the Value of Natural Capital in the Credit River Watershed*

3.4.2 Developing the Contents of a Green Infrastructure Business Case

A typical business case includes the following:

1) Executive summary
   - issue
   - expected outcome(s)
   - recommendation(s)
   - justification
2) Current situation
   - problem statement
   - impacts
3) Recommended action
   - overview
   - goals
   - objectives
   - detailed description
   - assumptions
   - expected outcome
   - constraints
   - milestones
4) Financial proof
   - include green infrastructure cost-benefit analysis
   - the drainage superintendent should include the relevant green infrastructure practice(s) and benefit(s) and discuss site-specific impacts on costs and benefits
5) Alignment
   - strategic
   - legal
6) Approvals
   - identification of stakeholders, approvals, resources required and timelines
7) Alternative actions
   - include do nothing (status quo) option
   - summary of options
   - reasons for selecting the recommended option
8) Conclusion
   - summary of the findings
9) Supporting materials

DID YOU KNOW?

Business case templates.

If your municipality does not have a business case template for use, then search online as many samples are available for free download.

Note: All business case templates must be adapted to show the true costs and benefits, including monetized and non-monetized line items, of a task or project to property owners in a drainage works, the municipality and society.

Chapter 4

Beyond Maintenance and Repair

4.1 Introduction

The primary responsibility of the drainage superintendent is maintenance and repair of drainage works. They may also encounter issues that extend beyond their regular maintenance and repair duties. The purpose of this chapter is to identify these issues – and the tools the drainage superintendent can use to address them – so that drainage works are constructed and maintained to meet current and future needs. (Table B4-1).

For technical information about specific issues and tools see Part B of OMAFRA Publication 852, *A Guide for Engineers Working under the Drainage Act in Ontario*.

The *Drainage Act, 1990*, Section 1, provides the following definitions:

- "maintenance" means the preservation of the drainage works
- "repair" means the restoration of the drainage works to its original condition
- "improvement" means any modification of or addition to a drainage works intended to increase the effectiveness of the system

Table B4-1 summarizes the issues related to drainage works that the drainage superintendent may encounter, and identifies the tools available to help resolve them:

✔ Tools shown in green are readily used by the drainage superintendent during repair and maintenance activities.

▲ Tools shown in yellow indicate the drainage superintendent should exercise caution using these for repair and maintenance activities.

⬢ Tools shown in red require an engineer's report because the work represents an improvement to the drainage works.

Some of the 'caution' tools (yellow) are in current use and may be the right practice to address the existing issue. The drainage superintendent should be aware of the risks associated with these tools without an engineer's report – and using them requires the cooperation and agreement of the property owners in the watershed.

Alternatively, the 'caution' tools (e.g., installing a buffer beside a drain) can be implemented voluntarily (i.e., not under an engineer's report) by property owners because it is the right tool, in the right place, for improving soil erosion control, water quality and/or aquatic habitat.

The remainder of this chapter provides guidance on what tools to use to address common issues associated with drainage works.

Table B4-1. A summary of issues and tools for drainage works sustainability

		Issue							
Tool	**Page**	**Manage Climate Change Impacts**	**Stabilize Banks**	**Control Soil Erosion**	**Improve Aquatic Habitat**	**Support Pollinator Health**	**Control Sediment Movement**	**Manage Surface Water**	**Improve Water Quality**
▲ Check Dams	162			X			X	X	X
⬢ Constructed or Enhanced Wetlands	162	X		X	X	X	X	X	X
▲ Drop Inlets	164		X	X				X	
✔ Established Vegetation	164		X	X		X	X	X	X
▲ Grassed Waterways	165			X			X	X	X
▲ Gravel Substrates	167				X				
⬢ Littoral Shelves	167				X				
⬢ Live Cribwalls	168		X	X					

Tool	Page	Issue							
		Manage Climate Change Impacts	Stabilize Banks	Control Soil Erosion	Improve Aquatic Habitat	Support Pollinator Health	Control Sediment Movement	Manage Surface Water	Improve Water Quality
✔ Live Cuttings	169		X	X					
✔ Low Flow Channels	170		X		X		X		X
▲ Low Impact Development (LID)	171	X		X		X	X	X	X
⬢ LUNKERS	172				X				
✔ Mulching	173			X			X	X	X
✔ Native Vegetated Sod Mats	173		X	X			X	X	X
⬢ Natural Channel Design	174	X		X	X	X	X		X
▲ Newbury Weirs	175				X				
▲ Riparian Buffers	176		X	X		X	X	X	X
▲ Riprap Armouring	177		X	X			X		X
✔ Rolled Erosion Control Products	178		X	X			X		X
▲ Root Wads	178		X	X	X		X		

Tool	Page	Issue							
		Manage Climate Change Impacts	Stabilize Banks	Control Soil Erosion	Improve Aquatic Habitat	Support Pollinator Health	Control Sediment Movement	Manage Surface Water	Improve Water Quality
Sediment Traps (Deep Pools)	179				X		X		X
Self-Forming Over-Wide Channels	180	X	X	X	X		X		X
Silt Fences	181			X			X	X	X
Staged Sediment Removal	182				X		X		
Storm Water Management Ponds	183	X		X	X	X	X	X	X
Temporary Pooling Areas	184			X			X	X	X
Turbidity Curtains	184						X		X
Two-Stage Channels	185	X		X	X		X		X
Water and Sediment Control Basins (WASCoBs)	186			X			X	X	X

4.2 Issues

4.2.1 Managing Climate Change Impacts

4.2.1.1 Description

The intensity, duration and frequency of extreme weather events are shifting. Uncertainty lies in the level of change that will occur and the resulting impact on drainage infrastructure.

Projected climate trends for Ontario to the year 2050 include warmer annual temperatures. Average temperatures in Ontario have increased by 1.4°C since 1948. Northern Ontario will warm faster than other parts of Ontario, and winters will warm faster than summers. In southern Ontario, the number of days/year exceeding 30°C is expected to more than double by 2050.

Climate change gives rise to erratic weather patterns and a series of impacts:

- across Ontario, annual total precipitation amounts will increase
- in southern and northern Ontario, winter precipitation will increase
- in southern Ontario, more precipitation will fall as rain due to increased temperatures
- precipitation will decrease during summer months
- the frequency and intensity of extreme weather will increase due to higher temperatures
- in northern Ontario, spring precipitation will increase – and when combined with snowmelt – may result in an increased risk of flooding (Figure B4-1)
- heat waves and drought will be more frequent and last longer

Figure B4-1. Impacts of climate change on a drainage system**.**
Source: Dietrich Engineering Ltd., Kitchener, Ontario

4.2.1.2 Why Care?

Drainage superintendents who are aware of the impacts of climate change can recognize ways to make changes that meet current and future drainage needs. Although the impacts of climate change are difficult to address simply through drain maintenance and repair work, they can be addressed when making improvements to existing drainage works or in new drain designs. Drains designed to address climate change impacts are more resilient to extreme events and should reduce the frequency of repair and need for additional improvements.

The drainage superintendent should:

- encourage the municipality to undertake a vulnerability assessment to identify drainage systems that are susceptible to a changing climate
- prepare contingency plans to offset risks for:
  - areas where the risk of flooding and the risk to human health and safety are probable
  - areas with a risk of impact from extreme rainfall events, where risk to human health and safety are probable

- recommend to council that the engineer appointed for a project should incorporate measures to offset climate change impacts into the drain design
- educate property owners on the impacts of climate change on drainage systems and the importance of designing drains that include measures to lessen or mitigate those impacts (e.g., improve resiliency) to reduce repair costs

4.2.1.3 Tools

For new drain designs, some of the impacts of climate change can be mitigated by:

Tool **Page**

4.2.2 Stabilizing Banks

4.2.2.1 Description

A drain bank includes three areas (i.e., toe of the bank, bank slope and top of bank).

- The **toe of the bank** is located at the very bottom of the slope. It is the area of the bank most often in contact with water and susceptible to soil erosion caused by water flow in the drainage system.
- The **bank slope** is above the toe, but below the top of bank. During higher flow events, it can be affected by the flow of water in the channel and can be impacted by human and animal activity on the bank (e.g., cattle and equipment access, muskrat burrows). The bank slope is prone to erosion caused by surface water moving down the slope into the drain channel.
- The **top of bank** area is located above the bank slope and adjacent to land use activities. Bank instability can be caused by activities (e.g., tillage close to the bank edge, heavy loads or traffic along the bank edge) and by surface water moving across the top of bank, down the slope and into the drain channel.

4.2.2.2 Why Care?

Bank failures (Figure B4-2) can cause a variety of problems on drainage works including:

- sediment deposition in the bottom of the drain may cause flow obstructions, lead to increased drain maintenance activity and may have negative impacts on aquatic habitat
- a loss of usable land for the property owner

Figure B4-2. Bank failure along a drain.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

The drainage superintendent should:

- identify the cause of the bank instability:
  - if due to adjacent land use, work with the property owner or occupant to have them address the issue
  - if drain related, determine the most appropriate tool to reduce the likelihood of future bank instability
- restore and stabilize any localized failures using some of the appropriate tools listed
- recommend the appointment of an engineer under Section 78 of the *Drainage Act, 1990* if the failures are significant

4.2.2.3 Tools

Address bank instability with:

Tool **Page**

4.2.3 Controlling Soil Erosion

4.2.3.1 Description

Soil erosion is a natural process where soil particles are separated and removed from the soil mass and transported by water or wind. The transportation step is called sediment movement. As the velocity of the water or wind slows down, sedimentation occurs – where soil particles are deposited or come to rest (e.g., in watercourses or on adjacent lands). The best way to limit sedimentation is to avoid activities that cause erosion (Figure B4-3).

Figure B4-3. Sediment in a drain caused by failure of the drain bank.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

In a drainage system, activities that disturb soil either in the drain (e.g., sediment removal from the bottom of the drain and/or vegetation removal) or on land adjacent to the drain, can increase erosion by destabilizing the soil and increasing its exposure to water or wind.

If conditions in a drainage channel result in turbulent water flow with high velocities, some areas of the channel may be more susceptible to erosion and require permanent erosion protection. Examples include:

- steep sections
- drainage outfalls
- sections immediately upstream or downstream of culverts
- locations where surface water enters a ditch
- sharp bends
- backfilled areas
- locations with abrupt changes of grade

Drain repair and maintenance activities increase the potential for soil erosion, sediment movement and sedimentation. The removal of vegetation exposes soil to rainfall and runoff until vegetation is re-established. As a result, temporary erosion protection and sediment control measures are often required at culverts and bridgework sites, construction yards and staging areas to minimize the impacts of erosion and sedimentation.

Drain repair and maintenance activities may require temporary storage of excavated materials on-site. These spoil piles are highly susceptible to erosion. Wherever possible, the drainage superintendent should avoid creating spoil piles by spreading or removing the excavated materials. If a spoil pile is necessary, locate it as far away from the drain as practical, and install silt fences.

4.2.3.2 Why Care?

Minimizing erosion will extend the life of the drain, reduce maintenance costs, reduce the movement of sediment and sedimentation, and keep topsoil on the field.

The drainage superintendent should:

- identify the cause of the erosion:
  - if due to adjacent land use, work with the property owner or occupant to have them address the issue
  - if drain related, determine the most appropriate tool to reduce the likelihood of future erosion
- determine if the erosion has resulted in sedimentation in the bottom of the drain – if so, address it through a drain cleanout (Chapter A3.6)

4.2.3.3 Tools

Reduce the potential for erosion through:

Tool **Page**

4.2.4 Improving Aquatic Habitat

4.2.4.1 Description

The form of channel drainage works varies from natural watercourses that meander through woodlots and wetlands to highly channelized, constructed watercourses that flow through or beside agricultural fields or, in some cases, housing subdivisions. Trees, shrubs and other plants growing along the banks of a drainage works produce food and shelter for aquatic species such as fish (Figure B4-4). Insects fall from overhanging branches into the water and are eaten by aquatic species. When branches shade the water, they lower the temperature and improve fish habitat. Branches and other woody debris that fall into the water provide cover and materials for spawning. Watercourses that meander develop pool and riffle formations, which are key aquatic habitat features.

Figure B4-4. A naturalized drain with lots of plant life along the banks.
Source: City of Kawartha Lakes, Ontario

In Ontario, many channel drainage works – especially well-established ones – have not been cleaned out on a regular basis and have developed the characteristics of good fish habitat that supports large numbers of fish and a high variety of species. Even if the drainage works is highly channelized, it can still support the habitat for many fish species. Drains that remain dry for most of the year may also provide important fish habitat. Even if no fish species are present in a drainage works, the drain indirectly supports aquatic species by providing water, nutrients and food to a downstream connected watercourse.

4.2.4.2 Why Care?

Drain maintenance and repair activities can affect aquatic species and their habitat in many ways. The greatest impact of drain maintenance and repair activity is at or near the work site. However, the effects may be evident downstream with a negative impact on the diversity of the aquatic community residing in the drain.

The drainage superintendent should:

- become familiar with the Fisheries and Oceans Canada publication, *Guidance for Maintaining and Repairing Municipal Drains in Ontario*
- use drain maintenance and repair techniques that protect aquatic habitat and the ability of the drain to function efficiently
- adhere to timing windows
- use measures that offset losses resulting from a project when negative impacts on aquatic species are unavoidable

4.2.4.3 Tools

Increase the potential to improve aquatic habitat through:

4.2.5 Supporting Pollinator Health

4.2.5.1 Description

Pollinators are living organisms that help transfer pollen from one flowering plant to another. Bees are the most common pollinators. Other pollinators include butterflies, moths, wasps, flies, some types of beetles, hummingbirds and certain bats. Bees and other insect pollinators are critical to the production of many crops and play an essential ecological role.

Populations of bees and other pollinators are declining for the following reasons:

- **Loss of habitat** – Pollinators require natural spaces with vegetation and flowering plants to live and forage for food (e.g., pollen and nectar). Pollinator habitat is lost through development, mining and agricultural activities.
- **Non-native species** – Pollinators require specific plants that provide food and habitat. Native plants or wildflowers needed by pollinators may be outcompeted by non-native species. Non-native plants may attract pollinators away from native species that are more nutritious and better food sources. Non-native species of pollinators may compete with native pollinators for pollen and nectar.

4.2.5.2 Why Care?

While the health of pollinators is not directly related to the management of drainage works, it is a concern for agricultural communities served by drainage works. It is also a societal concern linked to food security, and an indicator of ecosystem health.

Establishing vegetation on channel drainage works is important for protecting the drain from soil erosion and bank destabilization. Vegetation can also be used to address the issue of pollinator health (Figure B4-5). The drainage superintendent should:

- look for opportunities to incorporate vegetative species that support pollinator health into their maintenance activities
- encourage the engineer to incorporate vegetative species that support pollinator health into the design of drain construction and improvement projects

Figure B4-5. Ontario's native jewelweed is a good pollinator species to plant along a drain.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

4.2.5.3 Tools

Improve pollinator health by:

Tool	Page
• B4.3.3 Constructed or Enhanced Wetlands	162
• B4.3.5 Established Vegetation	164
• B4.3.12 Low Impact Development (LID)	171
• B4.3.16 Natural Channel Design	174
• B4.3.18 Riparian Buffers	176
• B4.3.26 Storm Water Management Ponds	183

4.2.6 Controlling Sediment Movement

4.2.6.1 Description

Soil erosion is a natural process where soil particles are separated and removed from the soil mass and transported by water or wind. The transportation step is called sediment movement. As the velocity of the water or wind slows down, sedimentation occurs – the process where the soil particles are deposited or come to rest (e.g., in water courses or on adjacent lands). The best way to limit sedimentation is to avoid activities that cause soil erosion by maintaining vegetation and avoiding leaving the soil barren (Figure B4-6) or limit sediment movement (see B4.2.3 for additional information).

Figure B4-6. Soil erosion resulting from not maintaining a vegetated cover (barren soil).
Source: City of Kawartha Lakes, Ontario.

4.2.6.2 Why Care?

The movement of sediment can have the following impacts on:

- **Water quality** – Pesticides and nutrients can become attached to soil particles, which are transported and deposited as sediment in water bodies such as drains, rivers or lakes. Over time, these pesticides and nutrients may be released from sediment and impact water quality.
- **Deposition** – When the flow rate of sediment-laden water slows down, sediment settles out. When this occurs in drainage works, flow capacity is reduced. When deposition occurs behind dams or pump stations in drainage works, the effectiveness of these structures is reduced because of reducing water storage volume. In some larger drains, deposition can also result in barriers to navigation.
- **Fisheries/aquatic habitat** – Sediment directly affects fish populations in several ways:
    - Suspended sediment decreases light penetration into water, which affects the feeding and schooling practices of fish and can lead to reduced survival.
    - Suspended sediment in high concentrations irritates the gills of fish and can cause death. Sediment can also affect their eyes and scales making them more susceptible to infection and disease.
    - Sediment particles absorb warmth from the sun and increase water temperature, stressing some species of fish.
    - Suspended sediment in high concentrations can dislodge plants, invertebrates and insects in the stream bed – affecting the food source of fish and can result in smaller and fewer fish.
    - Settling sediments can bury and suffocate fish eggs.
- **Pumping systems** – When water is taken from a drainage works for irrigation or pumped to improve drainage, sediment in the water can wear out the pumps.

Repair activities that disturb any part of the drain (e.g., drain cleanouts and/or vegetation removal) may increase sediment movement by destabilizing the channel bank or bottom, and increasing exposure to water and wind.

Minimizing sediment movement will reduce sedimentation, extend the life of the drain, reduce maintenance costs and keep topsoil on the field.

The drainage superintendent should:

- identify the cause of the sediment movement:
    - if due to adjacent land use, work with the property owner or occupant to have them address the issue
    - if drain related, determine the most appropriate tool to reduce the likelihood of future sediment movement
- determine if the movement of sediment has resulted in sedimentation in the bottom of the drain – if so, address through a drain cleanout (see Chapter A3.7)

There are many tools for controlling the movement of sediment, although they are all guided by one or more of the following principles:

- stabilize eroded soil with natural or synthetic material
- eliminate concentrated water flow through areas of eroded soil particles
- reduce the speed of surface water runoff to limit the movement of sediment
- trap sediment before it enters the drain or in controlled locations within the drain

4.2.6.3 Tools

Reduce sediment movement and control sedimentation by:

4.2.7 Managing Surface Water

4.2.7.1 Description

Generally, precipitation is dissipated through infiltration, evapotranspiration, storage, extraction for agricultural or other human uses and as runoff. Runoff water that is transported over the surface of the ground before reaching a channel is referred to as overland flow or surface water flow.

4.2.7.2 Why Care?

Although surface water flow, or runoff, is a natural process, it must be managed because runoff can be a major contributor to other issues affecting drainage works (Figure B4-7) including:

- **Erosion** – Surface water flow over bare soils or during extreme rainfall events can result in erosion causing rills or even deep gullies that, under the right circumstances, may destabilize a drain bank and contribute to drain erosion.
- **Sediment movement** – Once the erosion process begins, surface water flow can transport soil particles into the drain.
- **Water quality** – Along with soil particles, surface water flow can pick up and transport pesticides and nutrients that were applied to the land. Surface water also transports crop residues and natural debris such as leaves and branches. All this material can end up in channel drainage works and impact water quality.

Figure B4-7. Surface water moving across agricultural land.
Source: Leroux Consultant, City of Clarence-Rockland, Ontario

Where possible, manage surface water flow as it significantly contributes to other issues affecting the drainage works.

The drainage superintendent should:

- identify opportunities to limit or control the flow of surface water at the source – this may require working with adjoining property owners
- identify opportunities to slow down the flow of surface water before it enters the drain
- identify opportunities to limit the impacts of surface water on the drain

4.2.7.3 Tools

Manage the movement of surface water by:

Tool **Page**

4.2.8 Improving Water Quality

4.2.8.1 Description

Water quality is a broad term used to describe the characteristics of water relative to its intended use. Drainage works are used to move water away from land and into the river system where it has many uses – from fish habitat to drinking water to recreation to transportation.

The quality of water in drainage works is impaired by two main sources:

- activities on the surrounding landscape (e.g., farming, construction, natural erosion)
- activities during drain maintenance and repair (e.g., brushing, vegetation control, cleanout)

The drainage superintendent has direct influence/control over drain maintenance and repair activities that impact water quality. They have far less influence, however, on water quality impacts resulting from surrounding land uses.

A general description of water quality impacts include:

- **Sediment** – The definitions and impacts of sediment and sedimentation is covered in Chapter B4.2.6 Controlling Sediment Movement. In addition to the issues identified in this chapter, the movement of sediment results in suspended solids in the water. The greater the amount of suspended sediment in the water, the murkier it appears and the higher the measured turbidity – an indicator of water quality impairment (Figure B4-8).
- **Nutrients** – Nitrogen and phosphorus are the nutrients of greatest concern. High levels of these nutrients in water in the drain encourages plant growth, which can lead to increased plant biomass, usually in the form of undesirable aquatic plants and algae.
- **Pesticides and other chemicals** – Pesticides are used to manage weeds and other pests for a variety of land uses (e.g., farms, golf courses, vegetation control on drains, residential areas). Three common types of pesticides are herbicides, insecticides, fungicides. In an agricultural setting, the benefits of pesticides include: increased food production, improved crop quality, prevention of diseases.

Figure B4-8. Turbid water in a drain due to erosion.

Other chemicals are found in the landscape and can pose risks to water quality. Fuels (e.g., diesel and gasoline, motor oils) and other petroleum-based products (e.g., paint thinners) may be present if spilled or disposed of improperly. Copper and zinc are used as animal feed additives and can accumulate in soils receiving heavy applications of manure. Cadmium and zinc from fertilizers, particularly phosphorus products, may also build up in soils. If these pesticides and other chemicals enter the drain, they may impact water quality.

4.2.8.2 Why Care?

Sediment – Increased turbidity may limit the growth of aquatic plants and favour the growth of algae. Sediment can result in reduced visibility for animals and aquatic life that use sight to find food. Disinfection of drinking water is much less effective in waters high in particulates because pathogens can be shielded or protected by the particles. By blocking light penetration, large algal populations can eliminate all competition from plants rooted in the sediments.

Nutrients – When plant nutrients from fertilizers, decomposed crop residues and agricultural waste products run off into fresh water, they speed up the eutrophication of water bodies. Eutrophication occurs when a body of water becomes overly enriched with minerals and nutrients, promoting excessive growth of plants and algae. This process normally occurs over very long periods of time – accelerating it can have a range of negative impacts.

Algae are most often the dominant plants in eutrophic waters. Under conditions of unchecked algae growth:

- mats of algae may physically block water intakes
- the attractiveness of water bodies for recreation may be reduced
- the demand for dissolved oxygen through dead plant material decomposition may increase
- fish kills and loss of other aquatic life resulting from oxygen depletion may occur

  - unpleasant tastes and odours in drinking water may occur
  - some species of cyanobacteria (e.g., blue-green algae) produce toxic compounds

- **Pesticides and other chemicals** – Pesticides can travel great distances through the environment. Pesticides can harm or kill organisms that are not considered pests and may have a negative impact on the aquatic life within the drainage system.

The drainage superintendent should:

- minimize the movement and deposition of sediment
- ensure that any pesticide applicator retained for drain maintenance is trained and certified to properly handle and apply pesticides
- encourage property owners to implement practices that reduce the amount of soil, sediment and nutrients entering the drain e.g., riparian buffers
- where appropriate, use tools on the drain that will improve water quality

4.2.8.3 Tools

Improve water quality in drains through:

Tool **Page**

4.3 Tools

4.3.1 Introduction

What tools can the drainage superintendent use to help resolve drainage issues, and when should they use them?

This section of the guide provides a description of each tool, lists the issues it can help resolve, things to consider when using the tool, and whether it can be used during repair or maintenance activities – or requires an engineer to complete an engineer's report before use.

4.3.1.1 Erosion and Sediment Control

Many of the tools address erosion and sediment control issues. Although these tools may be used on either a temporary or permanent basis, they are all guided by one or more of the following principles:

- stabilize soil with natural or synthetic material
- eliminate concentrated water flow through potentially erosive areas
- reduce the speed of surface water runoff to limit the erosive potential of water
- trap sediment on site to prevent degradation of water quality and habitat

For drain construction or improvement projects, the drainage superintendent should discuss the design of the erosion and sediment control plan and strategy with the project engineer to ensure the plan considers extreme weather events.

The drainage superintendent can assist the engineer with:

- determining the components of the drainage works and work area that are susceptible to erosion and require sediment control measures
- selecting and designing appropriate erosion and sediment control measures considering material availability, previous experience, agency requirements and costs
- ensuring sediment and erosion control measures comply with agency regulations

The drainage superintendent should be knowledgeable about erosion and sediment control techniques. The following temporary measures should be implemented during maintenance and repair projects:

- maintain as much native vegetation in and around the channel as possible to protect soil stability in the area
- move excavated material away from the channel to avoid erosion causing re-entry of soil into the channel
- use seeding, riprap and sediment traps, silt fences, temporary pooling areas, turbidity curtains, erosion control blankets, dust control, etc., to manage soil and sediment that may impair water quality and negatively impact aquatic habitat

DID YOU KNOW?

Plan for future maintenance.

Sediment retention measures (incorporated into the design of a drain) require frequent observation and maintenance (cleanouts) to ensure they are working as intended. If not, the measure that was a sediment-phosphorus-nitrogen sink (storage zone) will become a source and feed back into the system.

4.3.1.2 Channel Enhancements

Channel enhancements benefit a drainage works by:

- conserving soil to improve water quality and reduce nutrient transport
- improving fish and wildlife habitat
- providing grade control and energy dissipation
- protecting adjacent land and infrastructure

Experience is required when designing channel enhancements. They can be more complex than other options and require specialized expertise, knowledge of research findings and field examinations of similar natural water channels.

Traditionally, drainage systems have been designed as straight trapezoidal channels to ensure efficient drainage. Alternative designs (e.g., self-forming channels and natural channel designs) use approaches that mimic natural watercourses. Some of these alternative channel design options are presented as tools in this chapter (Chapter B4.3.16 Natural Channel Design).

4.3.2 Check Dams

4.3.2.1 Description

A check dam creates an area within a channel where water is ponded to reduce its velocity and allow sediment to settle out (Figure B4-9). Check dams are constructed across drainage channels and consist of rocks, sandbags, straw bales or logs.

Figure B4-9. A rock check dam installed in a drain.
Source: Tulloch Engineering, Espanola, Ontario

4.3.2.2 Issues

Check dams are used to:

- improve surface water management when installed where surface water runoff enters the drain
- manage erosion in the channel
- control sediment movement by trapping it and stopping it from moving downstream
- help improve water quality, as a result

4.3.2.3 Considerations

Some drainage superintendents use check dams as part of their repair and maintenance activities. Use caution as installing a check dam changes the drain profile/elevation from the original engineer's report. A check dam could reduce the capacity of the drain and cause flooding on the lands of upstream property owners – this could make the municipality liable for damages. A check dam can also be an impediment to fish migration and would require a permit to be installed.

4.3.2.4 Can This Tool be Used for Repair and Maintenance?

Use caution – the drainage superintendent may consider installing one or more check dams as a work of maintenance especially in situations where a dam will protect the integrity of the drain, have a negligible impact on drain capacity and water levels, and fish migration is not a factor.

No, if a check dam is expected to improve some function of the drain, then a new engineer's report is required.

4.3.3 Constructed or Enhanced Wetlands

4.3.3.1 Description

Constructed or enhanced wetlands are built in locations within a watershed for the purpose of enhancing flood control, water quality (by controlling sediment and nutrients) and/or wildlife habitat. Using the *Drainage Act, 1990*, water control structures such as dams (Figure B4-10), dykes or weirs (Figure B4-11) can be incorporated into existing drainage works to raise the water level in the surrounding area. Constructed or enhancements to wetlands should be strategically located based on topography and land use, and in consultation with property owners (Figure B4-12).

Figure B4-10. A water control structure (dam).
Source: Dietrich Engineering Limited, Waterloo, Ontario

Figure B4-11. A water control structure (weir).
Source: Municipality of West Elgin, Ontario

Figure B4-12. A wetland enhancement project.

4.3.3.2 Issues

Constructed or enhanced wetlands are used to:

- address climate change impacts by providing additional water storage capacity within the drainage system
- reduce erosion and sediment movement, and manage surface water, by slowing down the velocity of water in the channel, which may improve water quality
- provide additional aquatic habitat

4.3.3.3 Considerations

Constructed or enhanced wetlands may require conversion of land from other uses including agricultural production.

4.3.3.4 Can This Tool be Used for Repair and Maintenance?

No, constructed or enhanced wetlands cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. They can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

The drainage superintendent could work with property owners, conservation authority staff and other agencies (e.g., Ducks Unlimited) to identify opportunities to construct or enhance wetlands as part of existing drainage works. Collaboration may take the form of funding or technical advice.

DID YOU KNOW?

Drainage works do more than drain land.

The broad definition of "drainage works" under the *Drainage Act, 1990* provides a unique opportunity to design solutions to drainage problems that incorporate water retention, wetland protection/enhancement and soil management techniques. These opportunities are best explored at the project scoping meetings (Chapter A3.7.6.2).

4.3.4 Drop Inlets

4.3.4.1 Description

Drop inlets are pipes specifically designed to convey water from the drain top of bank to the toe of the bank (Figure B4-13). The intent is to prevent surface water runoff from concentrating and running down the bank slope and eroding the soil.

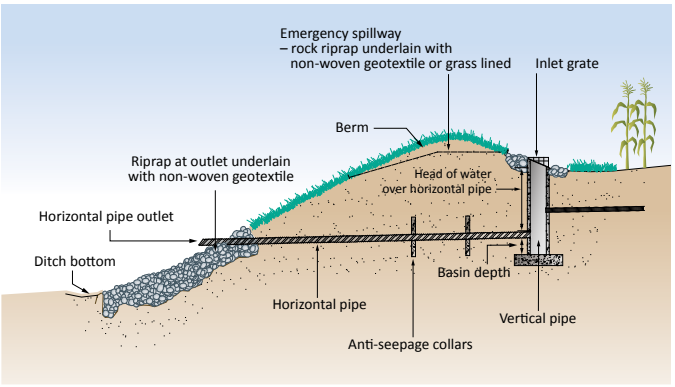


Figure B4-13. Drop inlet.

4.3.4.2 Issues

Drop inlets are used to:

- reduce bank erosion
- reduce bank instability
- manage surface water runoff from adjacent lands

4.3.4.3 Considerations

None.

4.3.4.4 Can This Tool be Used for Repair and Maintenance?

No, a drop inlet cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. It can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

Alternatively, the drainage superintendent could work with a property owner who, on their own initiative, wants to install a drop inlet on their land.

4.3.5 Established Vegetation

4.3.5.1 Description

Established vegetation on previously exposed soil reduces the potential for soil erosion by holding the soil in place.

Right seed, right time

The drainage superintendent who uses this tool should choose a seed mixture based on soil type and climate to ensure good vegetative growth. Seeding specifications and selection criteria are provided in *Ontario Provincial Standard Specification* (OPSS), either OPSS.PROV 804 or OPSS.MUNI 804, as applicable. Local experience may identify seed mixtures that are more appropriate than the OPSS recommendations. The drainage superintendent should be aware of previous successful seeding practices in the area of the drainage works. Choosing a seed mixture with a high potential for successful establishment will save resources and time and provide early control of erosion.

Seeding should occur during the growing season (approximately late April to mid-October) depending on the local climate. The mid-summer months may be too hot and dry to allow for good seed germination and vegetation growth, and daily weather conditions may influence seeding times.

If high water velocities are anticipated in the drain channel before vegetation is established, the drainage superintendent should install temporary erosion control blankets over the seed to protect it and the drain bank.

4.3.5.2 Issues

Established vegetation is used to:

- manage surface water runoff from adjacent lands
- reduce bank erosion
- reduce bank instability
- control sediment movement
- help improve water quality, as a result – particularly in areas that are barren or susceptible to erosion

Established vegetation may also provide pollinator habitat and benefits to endangered species if the appropriate species of plants are included in the seed mixture.

4.3.5.3 Considerations

The drainage superintendent should communicate with property owners to ensure they understand the purpose of establishing vegetation. The drainage superintendent should listen carefully to and address the concerns of property owners about establishing the plant species included in the proposed seed mixture. Some property owners may have a different viewpoint (e.g., they may consider some plant species to be weeds) that could affect the productivity of adjacent cropland.

4.3.5.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can establish, repair and maintain vegetation on the banks of a drain channel. Do not establish the vegetation beyond the channel unless clearly authorized in the engineer's report.

4.3.6 Grassed Waterways

4.3.6.1 Description

Grassed waterways are permanently vegetated channels that are broad, shallow and usually have a parabolic shape (Figures B4-14 and B4-15). Their purpose is to manage surface water runoff from large storm events and direct it into the drainage works with minimal erosion. The vegetative cover on a grassed waterway slows water velocity and protects the channel surface from erosion. Grassed waterways are most effective in topographic areas with significant gradients and erodible soils.

Figure B4-14. Aerial view of grassed waterways.
Source: Ausable Bayfield Conservation Authority, Ontario

Figure B4-15. Field view of a grassed waterway.

For each drainage works in their municipality, the drainage superintendent should know whether one or more grassed waterways are included in the engineer's report.

If a grassed waterway is included in the engineer's report, it is part of the drainage works and the municipality is responsible for its management. The property owner is restricted from interfering with the waterway on their land.

If a grassed waterway is not included in the engineer's report, it is a private drain and the property owner is responsible for its management. The municipality is not responsible and has no control over its management.

4.3.6.2 Issues

Grassed waterways are used to:

- manage surface water runoff from adjacent lands
- reduce erosion
- control sediment movement
- help improve water quality, as a result

4.3.6.3 Considerations

A properly designed grassed waterway may take land out of agricultural production resulting in a trade-off between land use and continued land loss due to uncontrolled erosion.

OMAFRA's Publication 832, *Agricultural Erosion Control Structures – A Design and Construction Manual* (revised 2017), provides detailed information on the design of grassed waterways (ontario.ca/publications).

4.3.6.4 Can This Tool be Used for Repair and Maintenance?

No, a new grassed waterway cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. It can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

Yes, for an existing grassed waterway that is included in an engineer's report for a drainage works, regular maintenance activities (e.g., mowing) can be carried out.

Alternatively, the drainage superintendent could work with a property owner who, on their own initiative, wants to install a grassed waterway on their land.

4.3.7 Gravel Substrates

4.3.7.1 Description

The channel substrate (the material on the bottom of the drain) determines, to a large extent, the type and density of aquatic plant and fish species that can be supported in the drain. Gravel substrates (Figure B4-16) limit the growth of aquatic vegetation compared to sand or organic substrates. But some species of fish such as smallmouth bass need a gravel substrate for spawning.

Figure B4-16. Gravel substrates for spawning.
Source: K. Smart Associates Ltd., Kitchener, Ontario

4.3.7.2 Issues

Gravel substrates are used to:

- improve aquatic habitat by creating spawning areas for certain species of fish

4.3.7.3 Considerations

None.

4.3.7.4 Can This Tool be Used for Repair and Maintenance?

Use caution – the addition of gravel substrate is typically implemented through the construction or improvement procedures of the *Drainage Act, 1990* with a new engineer's report. Gravel substrate can only be added to the drain as a maintenance activity if there is good reason to believe it will preserve the drain.

4.3.8 Littoral Shelves

4.3.8.1 Description

Littoral shelves (Figure B4-17) are shallow, submerged, plateau areas constructed along the sides of deeper channels or ponds. They provide a location suitable for the growth of emergent aquatic vegetation (i.e., plants that grow in water) whose tops emerge above the normal water surface. Littoral shelves add habitat diversity and/or mimic pre-construction conditions.

Figure B4-17. A dewatered channel with a littoral shelf on the right side of the channel.
Source: K. Smart & Associates Ltd., Kitchener, Ontario

4.3.8.2 Issues

Littoral shelves are used to:

- create aquatic habitat for certain types of fish and other aquatic species by encouraging the growth of emergent aquatic vegetation

4.3.8.3 Considerations

None.

4.3.8.4 Can This Tool be Used for Repair and Maintenance?

No, it cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. Littoral shelves can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.9 Live Cribwalls

4.3.9.1 Description

A live cribwall is a retaining wall made from untreated timbers, soil, rocks and live cuttings, used to stabilize steep slopes and eroded banks.

Logs or timbers are fastened together in an interlocking box-like pattern and anchored into the bank slope. The base of the structure is filled with rock up to the stream bed elevation. Soil and live cuttings are placed in the structure from the stream bed elevation up to the top of the structure. The logs or timbers provide immediate stability above and below the water level, and the live cuttings take root and provide long-term bank stabilization (Figures B4-18, B4-19 and B4-20). The mature structure protects the channel bank from erosion and provides habitat for wildlife.

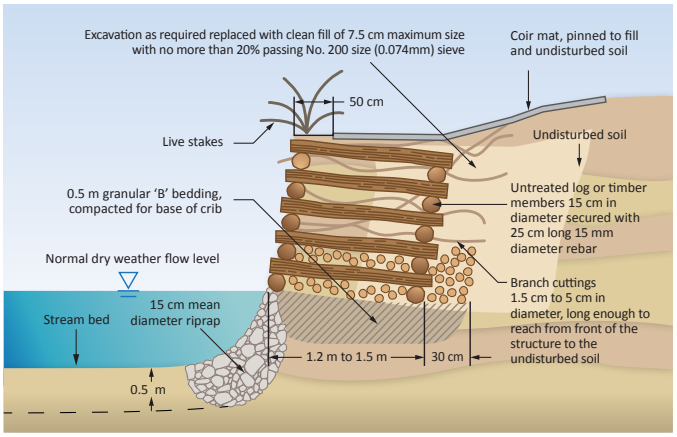


Figure B4-18. A live cribwall.
Source: Ian D. Smith, Lydian Environmental Consulting and Erin Lee, P. Eng., Urban & Environmental Management Inc., Niagara Falls, Ontario

Figure B4-19. Construction of a live cribwall.
Source: Ian D. Smith, Lydian Environmental Consulting, Niagara Falls, Ontario

Figure B4-20. Live cribwall 2 years after construction. *Source: Ian D. Smith, Lydian Environmental Consulting, Niagara Falls, Ontario*

4.3.9.2 Issues

Using a structure with natural characteristics, live cribwalls are used to:

- manage bank instability
- reduce erosion
- improve aquatic and wildlife habitat

4.3.9.3 Considerations

None.

4.3.9.4 Can This Tool be Used for Repair and Maintenance?

No, it cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. Live cribwalls can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.10 Live Cuttings

4.3.10.1 Description

Live cuttings are leafless stem cuttings from woody plant species that are easily established when planted in soil (Figure B4-21). These cuttings are planted in various configurations to achieve vegetative and soil stabilization goals.

Figure B4-21. A live cutting placed in the stream bank.

4.3.10.2 Issues

Compared to seeding techniques, live cuttings are used to:

- quickly reduce erosion
- manage bank instability

4.3.10.3 Considerations

None.

4.3.10.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent may plant live cuttings on the banks of the drain channel. Live cuttings should not be established beyond the channel unless clearly authorized in the engineer's report.

4.3.11 Low Flow Channels

4.3.11.1 Description

Typical drain repair involves the removal of all sediment from the bottom or bed of a drain. The creation of a low flow channel does leave some of this sediment in place. Cut a smaller channel into the existing sediment at the bottom of the drain so only a portion of the sediment is removed (creating a 'channel within a channel'). The low flow channel concentrates the flow of water during dry periods and creates a drain that is similar to a designed two-stage channel. A low flow channel can be straight or winding (Figure B4-22).

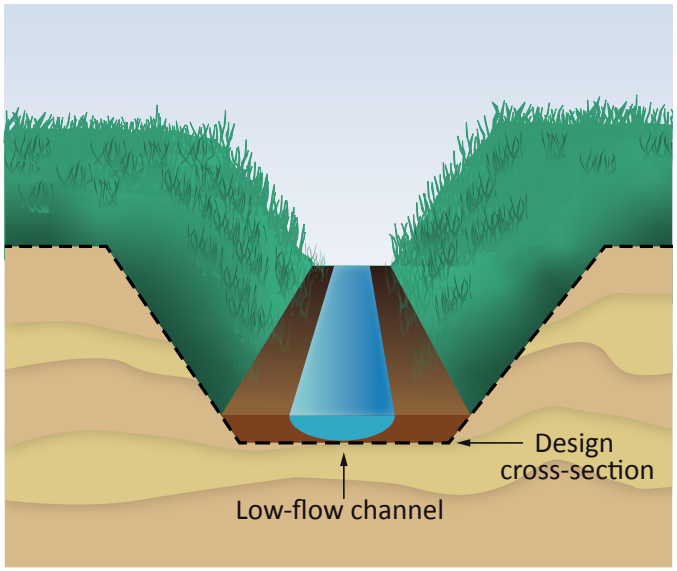


Figure B4-22. Low flow channel concentrates water during low flow periods.
Source: Adapted from Figure 6 of the Drainage Act and Conservation Authorities Act Protocol

4.3.11.2 Issues

Low flow channels are used to:

- reduce bank instability by concentrating the flow of water away from the drain bank
- control sediment movement
- help improve water quality, and aquatic and terrestrial habitat, as a result

4.3.11.3 Considerations

In addition to the issues listed above, using a low flow channel:

- may decrease future maintenance requirements because, during low flow periods, water that is concentrated in the low flow channel will flow at a higher rate (i.e., velocity), resulting in less sediment accumulation in the drain bottom
- does not require additional land, in contrast to a two-stage channel, because the low flow channel is created within the limits of the existing channel banks

When considering a low flow channel, the drainage superintendent should be aware that:

- costs may increase with the use of specialized equipment
- the low flow channel may not maintain its shape if it is cut into deposited sediment that is unstable and prone to sediment movement
- disturbed sediment at the bottom of the drain may increase future maintenance requirements and/or result in negative impacts on aquatic habitat

4.3.11.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can create a low flow channel during repair activities. But some property owners may object to the partial removal of sediment from the channel bottom. The drainage superintendent must have good reasons for using the technique, which they can present to concerned property owners.

4.3.12 Low Impact Development (LID)

4.3.12.1 Description

Low impact development (LID) refers to an approach to storm water management that focuses on maintaining natural hydrologic processes. Usually LID is used in urban development, but some principles can be applied in rural areas as well.

The objectives of LID are to:

- control storm water volume and peak flow
- improve water quality

The LID approach mimics natural processes including:

- infiltration
- evaporation
- transpiration
- filtration through plants and soil layers
- biodegradation by soil bacteria

Some examples of LID features include:

- rainwater harvesting
- infiltration trenches
- vegetated filter strips
- bioretention facilities
- permeable pavements (Figure B4-23)
- rain gardens
- bioswales

Figure B4-23. Permeable paving is used to increase the infiltration of water.
Source: Credit Valley Conservation Authority

For more information on these features, see OMAFRA Publication 852, *A Guide for Engineers Working under the Drainage Act in Ontario* (ontario.ca/publications).

4.3.12.2 Issues

LID are used to:

- address climate change impacts
- improve surface water management
- reduce erosion
- manage sediment movement
- help improve water quality and support pollinator health, as a result

4.3.12.3 Considerations

Typically, LID has been implemented on private land and not in association with a drainage works. But it may be possible to use the process established under the *Drainage Act, 1990* to:

- include low impact development (LID) on appropriate lands within the drainage works watershed to protect the drainage works infrastructure
- develop an assessment that would distribute the costs appropriately

4.3.12.4 Can This Tool be Used for Repair and Maintenance?

No, LID features cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. LID can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

Alternatively, the drainage superintendent could work with a property owner who, on their own initiative, wants to install LID features on their land.

4.3.13 Lunkers

4.3.13.1 Description

LUNKERS (i.e., little underwater neighbourhood keepers encompassing rheotactic salmonids) are structures used to stabilize stream banks and enhance aquatic habitat by providing edge-of-stream cover for fish. They are constructed of wood or stone and resemble a wood pallet with spacers, flow openings and wood planks overtop (Figure B4-24). The structures are installed on the outside bend of a watercourse below the low-flow water level. Stream flow through the structures is required to prevent sediment accumulation.

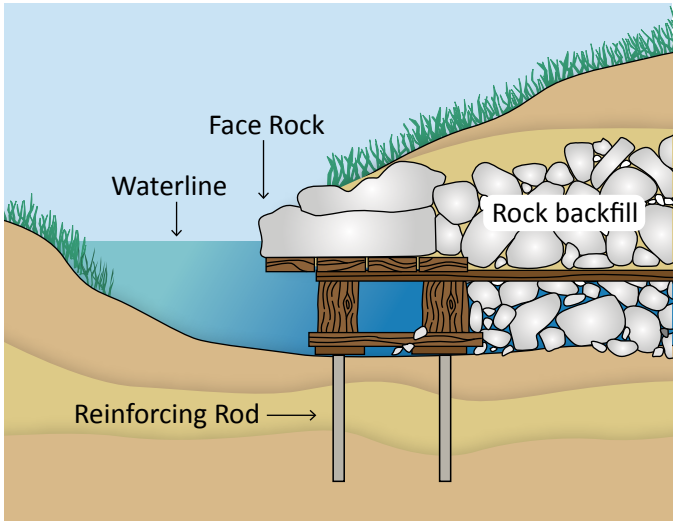


Figure B4-24. Cross-section of a LUNKERS structure. *Source: Wisconsin Department of Natural Resources, USA*

4.3.13.2 Issues

LUNKERS are used to:

- improve aquatic habitat by providing shade and cover for certain species of fish

4.3.13.3 Considerations

These features require specialized expertise to design and install successfully.

4.3.13.4 Can This Tool be Used for Repair and Maintenance?

No, it cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. LUNKERs can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.14 Mulching

4.3.14.1 Description

Mulching occurs when organic mulch, compost or other biodegradable material is spread over recently seeded, bare soil. The mulch protects the soil from erosion and conserves soil moisture, which promotes plant growth.

4.3.14.2 Issues

Mulching is used on a temporary basis to:

- reduce erosion
- control sediment movement
- manage surface water runoff
- help improve water quality and the potential for successfully establishing vegetation (Chapter B4.3.5 Established Vegetation) along the drain, as a result

4.3.14.3 Considerations

Mulching is more expensive than seeding. Also, if seeding cannot be done until spring, mulching exposed soil overwinter may prevent erosion (Figure B4-25) in the mulched area.

Figure B4-25. Straw/hay mulch spread on exposed soil surrounding a sediment trap.
Source: Ausable Bayfield Conservation Authority, Ontario

4.3.14.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can mulch the banks of a drain channel during maintenance activities.

4.3.15 Native Vegetated Sod Mats

4.3.15.1 Description

Native vegetated sod mats are strips of vegetation, including the underlying root and topsoil structure, that are taken from a donor site (with property owner permission) from the vicinity of the drainage project. They may be used when:

- channel banks are completely exposed
- channel bank protection cannot be achieved with seeding
- sod mats are available close by from an area not susceptible to erosion

To ensure successful establishment, place sod mats on a roughly graded bank, carefully tamped or packed in place and watered as soon as possible (Figure B4-26 and B4-27). The stripped land – where the sod mats were obtained – should be reseeded.

Figure B4-26. Native vegetated sod mats – donor site
Source: R&M Construction, Acton, Ontario

Figure B4-27. Native vegetated sod mats – installed along a drain.
Source: R&M Construction, Acton, Ontario

4.3.15.2 Issues

Native vegetated sod mats are used to quickly establish vegetation to help:

- manage surface water runoff
- reduce erosion
- control sediment movement
- reduce bank instability
- help improve water quality, as a result

Native vegetated sod mats provide ground cover that is consistent with the surrounding vegetation, which extends terrestrial habitat to the edge of the drain.

4.3.15.3 Considerations

The use of native vegetated sod mats requires a suitable nearby source of material and permission from the property owner to remove it. Establishing native vegetated sod mats on a drain is more expensive than seeding.

4.3.15.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can place native vegetated sod mats on the banks of a drain channel during maintenance activities.

4.3.16 Natural Channel Design

4.3.16.1 Description

Natural channel design involves constructing a drainage system that mimics natural watercourse functions, including flow capacity, sediment transport, habitat and channel stability (Figure B4-28).

Natural channels consist of base flow or inset channels, overflow channels and channel-shaping features such as meanders, riffles, pools and steps.

- **Meanders** are recurring bends in a watercourse that create a snaking pattern across the watercourse's floodplain.
- **Riffles** are areas of gravel substrate, shallow depth and steeper slope. The water moves faster over riffles, which oxygenates the water. Riffles are often found where the channel enters and exits a meander bend.
- **Pools** are located between riffles on flat sections with little or no slope and tend to be deeper than the average channel depth. Pools remove fine sediment from the water.
- **Steps** are vertical drops in the channel with a pool located at the bottom of the step to dissipate energy.

Figure B4-28. A natural channel design.
Source: K. Smart Associates Limited, Kitchener, Ontario

4.3.16.2 Issues

Depending on the significance of the design feature of the drain, natural channel design are used to:

- address climate change impacts
- manage surface water runoff
- reduce bank instability
- control erosion
- control sediment movement
- help improve water quality, aquatic and terrestrial habitat, and support pollinator health, as a result

4.3.16.3 Considerations

In addition to the issues listed above, using a natural channel design:

- reduces maintenance requirements
- creates an aesthetically pleasing channel
- reduces the frequency of flooding onto adjacent lands because the floodplain increases the overall flow capacity of the channel

When considering using a natural channel design, the drainage superintendent should be aware that:

- efficient farming practices (e.g., cropping along straight lines of travel) may be disrupted by the meander of the channel
- conversion of land from other uses, including agricultural production, may be required
- initial design and construction costs are higher than traditional channel designs

4.3.16.4 Can This Tool be Used for Repair and Maintenance?

No, natural channels cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. They can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.17 Newbury Weirs

4.3.17.1 Description

Newbury weirs are in-channel, rock riffle structures intended to simulate natural riffles and pools in channels (Figure B4-29) (see Chapter B4.3.16 Natural Channel Design). They provide grade control over low drops in the channel and enhance habitat diversity. Unlike traditional weirs, Newbury weirs enable fish passage upstream over grade changes. Riffles also improve water quality by increasing dissolved oxygen concentrations.

Figure B4-29. Newbury weir.
Source: Ian D. Smith, Lydian Environmental Consulting

4.3.17.2 Issues

Newbury weirs are used to:

- improve aquatic habitat including habitat for some species at risk
- improve water quality by enhancing dissolved oxygen concentrations (an indicator of water quality)

4.3.17.3 Considerations

This feature requires specialized expertise to design a successful installation. The drainage superintendent should consider whether the weir could reduce the capacity of the drain.

4.3.17.4 Can This Tool be Used for Repair and Maintenance?

Use caution if installing one or more Newbury weirs as a work of maintenance – especially for situations where a weir will protect the integrity of the drain and have a negligible impact on drain capacity and water levels.

No, if a Newbury weir is expected to improve some function of the drain, then a new engineer's report is required.

4.3.18 Riparian Buffers

4.3.18.1 Description

Riparian buffers (Figure B4-30) are vegetated strips of land along drainage ditches or natural watercourses. They are sometimes referred to as buffers or buffer strips. Riparian buffers establish a permanently vegetated area between adjacent fields and watercourses. Buffer strip vegetation includes native species of grasses, wildflowers, shrubs and trees.

In some cases, the strategic location and custom design of riparian buffers is more effective than using a standard 'one-size-fits-all' approach.

Figure B4-30. An example of a wide buffer.
Source: Ausable Bayfield Conservation Authority, Ontario

4.3.18.2 Issues

Riparian buffers are used to:

- improve surface water management
- address some effects of erosion
- reduce sediment movement
- reduce bank instability
- help improve water quality, provide habitat for some species at risk and support pollinator health, as a result

4.3.18.3 Considerations

When considering using riparian buffers, the drainage superintendent should be aware that:

- technical information about riparian buffers is in OMAFRA Publication 852, *A Guide for Engineers Working under the Drainage Act*, Part B, Chapter 9 Riparian Buffers (ontario.ca/publications).
- riparian buffers included as part of a drainage works may require the municipality to complete maintenance or repair activities such as:
  - mowing
  - removing accumulated sediments
  - replacing damaged or dead vegetation
  - repairing concentrated flow channels
  - creating berms or diversions in areas of concentrated flow
  - controlling weeds throughout the buffer and specifically around any trees
- conversion of land from other uses, including agricultural production, may be required

4.3.18.4 Can This Tool be Used for Repair and Maintenance?

No, riparian buffers cannot be implemented as a work of maintenance under the *Drainage Act, 1990*. Riparian buffers can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

Alternatively, the drainage superintendent could work with a property owner who, on their own initiative, wants to install a riparian buffer on their land.

4.3.19 Riprap Armouring

4.3.19.1 Description

Large angular stones (under laid with geotextile) are placed on bank slopes or in channels to protect the underlying soil from erosion. In riprap applications, using various sizes of stones (i.e., a gradation of sizes) enables interlocking and creates stability that resists the force of the water (Figure B4-31).

Figure B4-31. Riprap armouring of a drain.
Source: Leroux Consultant, The Nation, Ontario

4.3.19.2 Issues

Riprap armouring are used to:

- reduce bank instability
- reduce erosion
- control sediment movement
- help improve water quality, as a result

4.3.19.3 Considerations

None.

4.3.19.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can use riprap armouring as a work of maintenance if used in conjunction with the repair of a localized bank failure.

No, if channel bank failures are significant (e.g., over 30 m in length) or if riprap armouring is expected to improve some function of the drain, then a new engineer's report is required.

4.3.20 Rolled Erosion Control Products

4.3.20.1 Description

Rolled erosion control products are prefabricated blankets made of natural or synthetic materials (Figure B4-32). Erosion control blankets are made of natural materials that biodegrade over time. Turf reinforcement mats are made of synthetic materials for permanent erosion control. These blankets or mats are installed on steep slopes, channels or shorelines to protect seeded areas, stabilize soil and prevent erosion until plant cover is established.

Figure B4-32. Rolled erosion control product installed on the banks of a drain.

4.3.20.2 Issues

Rolled erosion control products are used to:

- reduce bank instability
- reduce erosion
- control sediment movement
- help improve water quality, as a result

4.3.20.3 Considerations

Rolled erosion control products are more expensive than seeding and mulching but may be most appropriate on unstable soils, steep bank slopes and/or in locations where establishing vegetation may otherwise be difficult.

4.3.20.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can place rolled erosion control products on the banks of a drain channel during maintenance activities.

4.3.21 Root Wads

4.3.21.1 Description

Root wads (Figure B4-33) consist of a tree root mass and may include a length of the tree trunk. Root wads may be placed individually or in groups on littoral shelves (Figure B4-17) (see Chapter B4.3.8 Littoral Shelves) or at the toe of the channel bank to provide bank stabilization and fish habitat.

Figure B4-33. A close-up of a root wad.

4.3.21.2 Issues

Root wads are used to:

- reduce bank instability
- reduce erosion
- control sediment movement
- help improve water quality and aquatic habitat, as a result

4.3.21.3 Considerations

None.

4.3.21.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can install root wads as a work of maintenance if they are expected to help preserve the drain.

No, if root wads are expected to improve some function of the drain, then a new engineer's report is required.

4.3.22 Sediment Traps (Deep Pools)

4.3.22.1 Description

A sediment trap (Figure B4-34) creates an area within a channel where water ponds and slows down, allowing time for sediment to settle out. A deep pool provides variable water depths for variable fish habitat. Sediment traps/deep pools are both formed by over excavation of the channel. If possible, traps should be located for ease of access because periodic removal of sediment is required.

Figure B4-34. An example of an offline sediment trap. *Source: Ausable Bayfield Conservation Authority, Ontario*

4.3.22.2 Issues

Sediment traps/deep pools are used to:

- reduce sediment movement
- help improve water quality and improve aquatic habitat (deep pools), as a result

4.3.22.3 Considerations

Sediment traps/deep pools require regular maintenance to remove sediment to effectively trap additional sediment. Over excavating a channel where fine sand or silt soils are present may increase bank instability.

4.3.22.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can install a sediment trap/deep pool as a work of maintenance if they are expected to help preserve the drain.

No, if a sediment trap/deep pool is expected to improve some function of the drain, then a new engineer's report is required.

4.3.23 Self-Forming Over-Wide Channels

4.3.23.1 Description

The self-forming approach to channel design involves construction of an over-wide channel. Within the over-wide channel, a stable inset channel is formed naturally – complete with bars, benches and vegetation – into the optimal form for the watershed and valley conditions, which may range from a well-defined channel to a less well-defined channel (e.g., one with wetland features) (Figures B4-35 and B4-36).

Figure B4-35. Self-forming channel (after construction).
Source: Jon Witter, Ohio State University, Ohio, USA

Figure B4-36. Self-forming channel (1-year-old).
Image Source: Ausable Bayfield Conservation Authority, Ontario
Illustration: Jon Witter, Ohio State University, Ohio, USA

4.3.23.2 Issues

Self-forming over-wide channels are used to:

- address climate change impacts
- reduce bank instability
- control erosion
- control sediment movement
- help improve water quality, and aquatic and terrestrial habitat, as a result

4.3.23.3 Considerations

In addition to the issues listed above, using self-forming over-wide channels:

- reduces maintenance requirements compared to other constructed channels
- provides more natural features
- increases overall flow capacity due to the presence of a floodplain, reducing frequency of flooding on adjacent lands

When considering using self-forming over-wide channels, the drainage superintendent should be aware that:

- conversion of land from other uses, including agricultural production, may be required
- initial construction costs are higher than traditional channel designs
- self-forming over-wide channels may become blocked with vegetation (e.g., phragmites) resulting in a management challenge

4.3.23.4 Can This Tool be Used for Repair and Maintenance?

No, self-forming over-wide channels cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. They can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.24 Silt Fences

4.3.24.1 Description

A silt fence is a temporary structure designed to slow down surface water runoff from disturbed areas so that sediment in the water will settle out, be retained on the upside of the fence and not enter the drain channel. Silt fence is made of a porous geotextile material anchored to the ground and supported by posts (Figure B4-37).

Figure B4-37. A silt fence installed next to a drain.

4.3.24.2 Issues

Silt fences are used to:

- manage surface water runoff
- reduce erosion by slowing down water flow
- control sediment movement
- help improve water quality, as a result

4.3.24.3 Considerations

To maximize the cost-benefit associated with installing silt fences, they should be located strategically (i.e., in areas prone to erosion and high surface water flow). Silt fences require ongoing monitoring and repair throughout the life of the project to ensure they function properly. Silt fences must be removed after completion of the project.

4.3.24.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can install silt fences as a work of maintenance during repair of a drainage works.

4.3.25 Staged Sediment Removal

4.3.25.1 Description

Staged sediment removal is a drain maintenance management technique. Accumulated sediment is removed from designated sections of a drain at a pre-determined time/year, while other sections remain in an unmodified state until a future maintenance period (Figure B4-38).

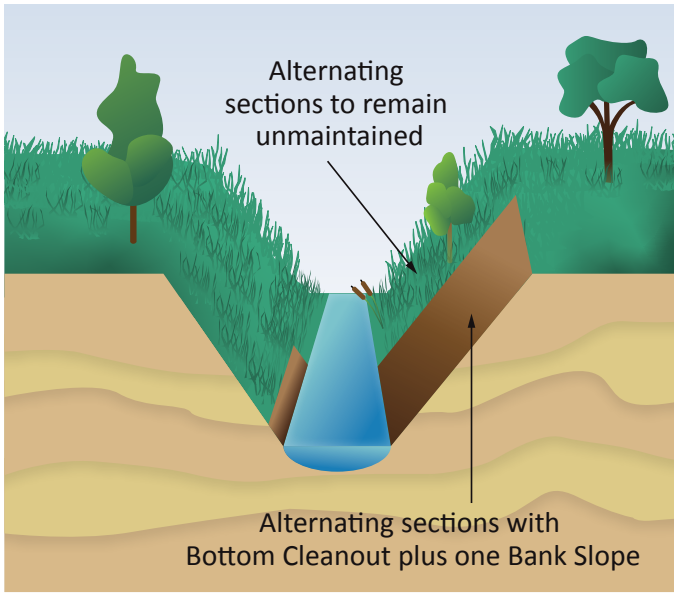


Figure B4-38. Staged sediment removal.

4.3.25.2 Issues

Staged sediment removal is used to:

- control sediment movement in sections of a drain
- help improve aquatic habitat, as a result

4.3.25.3 Considerations

Staged sediment removal can have significant, positive impacts on maintaining aquatic habitat and populations. Fish may be able to move to unmodified sections of the drain while work is ongoing and return to the modified section of the drain shortly after work is completed.

The drainage superintendent should select sections of a drain in greatest need of repair (i.e., most impacted by sediment or overgrown vegetation) to maintain the overall capacity of the drainage works.

When considering using staged sediment removal, the drainage superintendent should be aware that it will take more than one year to complete the work. This timeframe may result in additional costs for mobilization and demobilization of contractors and equipment.

4.3.25.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can implement staged sediment removal during repair activities.

4.3.26 Storm Water Management Ponds

4.3.26.1 Description

A storm water management (SWM) pond is a constructed pond or water retention area with a constricted outlet. This area reduces the effects of water flow by temporarily retaining water before releasing it downstream in a drainage works. A SWM also reduces the amount of sediment transported downstream because retained water slows down, allowing time for sediment deposition.

There are three types of SWM ponds:

- wetlands are usually larger in surface area and have a permanent shallow water depth (e.g., less than 0.5 m deep)
- wet ponds always hold water and have a greater water depth than wetlands (Figure B4-39)
- dry ponds only hold water during storm events (Figure B4-40)

Figure B4-39. A wet pond always contains water.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

Figure B4-40. A dry pond.
Source: Dietrich Engineering Ltd., Kitchener, Ontario

4.3.26.2 Issues

SWM ponds are used to:

- address climate change impacts by storing water on the landscape
- manage surface water
- reduce erosion
- control sediment movement
- help improve water quality and aquatic habitat, and support pollinator health, as a result

4.3.26.3 Considerations

SWM ponds may require conversion of land from other uses, including agricultural production. The amount of land required depends on the size of the watershed served by the drainage works. Approvals for development of a SWM pond may be required under the Ontario Water Resources Act, 1990.

4.3.26.4 Can This Tool be Used for Repair and Maintenance?

No, SWM ponds cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. SWM ponds can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.27 Temporary Pooling Areas

4.3.27.1 Description

Temporary pooling areas are constructed downslope from stockpiles of soil, large areas of exposed soil or other areas prone to erosion. When used in conjunction with silt fences (see Chapter B4.3.24 Silt Fences), temporary pooling areas can minimize the movement of sediment into a drainage works.

Surface water runoff containing sediment is collected and stored in a temporary pooling area, allowing the sediment to settle out over time. The pooling area is constructed off-line with overflow provisions to a channel outlet and a method for diverting or pumping the clean water away from the pool. The size of a temporary pooling area is defined by available space and topography.

4.3.27.2 Issues

Temporary pooling areas are used to:

- manage surface water
- manage erosion
- control sediment movement
- help improve water quality, as a result

4.3.27.3 Considerations

Temporary pooling areas may require land for installation – the amount is determined by site specific conditions. But temporary pooling areas, by their very nature, are meant to be decommissioned and the original land use can continue once the drainage project is completed.

4.3.27.4 Can This Tool be Used for Repair and Maintenance?

Yes, superintendents can use temporary pooling areas as a work of maintenance during the repair of a drainage works.

4.3.28 Turbidity Curtains

4.3.28.1 Description

A turbidity curtain is made of a porous geotextile material used in slow-moving water to contain suspended sediment during construction activities. It is anchored or weighted to the bottom of a water body and supported by posts or suspended by floats. This sediment control measure is suitable in conditions with slow currents (e.g., the outlet of a lake or wetland) and fine sediment that takes a long time to settle out.

4.3.28.2 Issues

Turbidity curtains can be used as a temporary measure to:

- control sediment movement within the drain channel
- help improve water quality, as a result

4.3.28.3 Considerations

To maximize the cost-benefit associated with installing turbidity curtains, monitor regularly and repair as needed during the project to ensure they continue to function properly. Turbidity curtains must be removed after completion of the project.

4.3.28.4 Can This Tool be Used for Repair and Maintenance?

Yes, the drainage superintendent can install a turbidity curtain as a work of maintenance during the repair of a drainage works.

4.3.29 Two-Stage Channels

4.3.29.1 Description

Two-stage channels (Figure B4-41) incorporate a low-flow inset channel (thalweg i.e., the line of lowest elevation within the channel or Stage 1 channel) to convey base flow and small storm events, with benching on each side to create a floodplain to convey higher flows (overflow or Stage 2 channel).

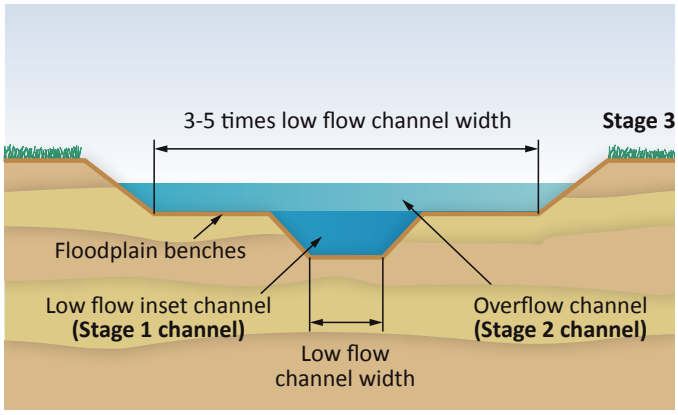


Figure B4-41. Cross-section of a two-stage channel.

4.3.29.2 Issues

Two-stage channels are used to:

- address climate change impacts
- reduce bank instability
- control erosion
- control sediment movement
- help improve water quality and aquatic habitat, as a result

4.3.29.3 Considerations

In addition to the issues listed above, using two-stage channels:

- reduces maintenance requirements compared to traditional channel designs
- provides more natural features
- increases overall flow capacity due to the presence of a floodplain, which reduces frequency of flooding on adjacent lands

When considering using two-stage channels, the drainage superintendent should be aware that:

- conversion of more land from other uses – including agricultural production – may be required and the cost of conversion may be higher compared to a more traditional design
- initial construction costs are higher than traditional channel designs
- two-stage channels may become blocked with vegetation (e.g., phragmites) resulting in a management challenge

4.3.29.4 Can This Tool be Used for Repair and Maintenance?

No, two-stage channels cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. They can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

4.3.30 Water and Sediment Control Basins (WASCoBs)

4.3.30.1 Description

A water and sediment control basin (WASCoB) consists of:

- an earthen embankment, terrace or berm constructed across the slope of land
- a ponding area upstream of the embankment/ terrace/berm
- a pipe or tile outlet to control discharge (Figure B4-42)

WASCoBs intercept surface water runoff and release it at a controlled rate, resulting in slower overland flows and reduced erosion and sediment deposition.

Figure B4-42. A WASCoB with berm and inlet.

4.3.30.2 Issues

WASCoBs are used to:

- manage surface water runoff
- control erosion
- control sediment movement
- help improve water quality, as a result

4.3.30.3 Considerations

When considering using WASCoBs, the drainage superintendent should be aware that:

- conversion of land from other uses, including agricultural production, may be required depending on the size of the contributing watershed, topography and design of the berm
- WASCoBs may not be appropriate to serve an individual property
- timely and appropriate maintenance may depend on adjacent land use (e.g., crop production) the municipality does not control

OMAFRA's Publication 832, Agricultural Erosion Control Structures – A Design and Construction Manual (revised 2017), provides detailed information on the design of WASCoBs (ontario.ca/publications).

4.3.30.4 Can This Tool be Used for Repair and Maintenance?

No, new WASCoBs cannot be implemented as a work of repair or maintenance under the *Drainage Act, 1990*. WASCoBs can only be implemented through the construction or improvement procedures of the act with a new engineer's report.

Alternatively, the drainage superintendent could work with a property owner who, on their own initiative, wants to install WASCoBs on their land.

Chapter 5

Case Studies

The case studies presented in this chapter illustrate several real examples where a drainage superintendent addressed a challenge within an existing drainage system. Each case study defines the challenge, provides an approach taken, the resulting outcomes and the lessons learned.

5.1 Case: Municipality of Central Huron, Steenstra Municipal Drain

5.1.1 Summary

1	Drainage work	• Improvement of an existing channel municipal drain under Section 78, *Drainage Act, 1990*
2	Challenge	• Stabilize highly erodible soils and protect cold water fish habitat (with migratory fish)
3	Approach	• Integrated green infrastructure elements to enhance ecological and hydrological functions and processes (Chapter B2.3) • Engineer's report recommended improvement to the drainage works through: ○ riffles and pools to improve fish habitat ○ riparian buffer and brush layering to enhance bank protection and provide fish habitat benefits ○ earthen erosion control berm to address impacts of soil erosion from agricultural lands ○ off-line constructed wetlands to capture sediment

4	Outcome	• Banks stabilized and ongoing maintenance not required • Fisheries habitat improved • Off-line constructed wetlands require infrequent maintenance to remove accumulated sediment
5	Lessons	• The project provided opportunities for collaboration amongst landowners, agencies and funding partners • Green infrastructure development can accommodate agricultural and natural environment objectives
6	Need more?	• Review Part B, Chapters 3 and 4 • Contact the drainage superintendent, Municipality of Central Huron

5.1.2 Background

The Steenstra Municipal Drain is located in the Municipality of Central Huron (former Goderich Ward) and is an existing drainage works that includes an open channel and closed pipe system. Frequent maintenance was required in conditions with highly erodible soils and fish habitat concerns including cold water with migratory fish. Past attempts to stabilize the highly erodible soils at the site were unsuccessful.

The engineer's report (Section 78) recommended innovative approaches to improvement to the drainage works through:

- A fluvial geomorphologist addressed fish habitat concerns by designing riffles and pools in the channel and off-line constructed wetlands to capture sediment.
- Bioengineering was used along the channel to enhance bank protection and habitat.
- A riparian buffer (260 m length x 6 m width) along the east side of the drain was used to enhance bank protection.
- An earthen erosion control berm was established at the upstream end of the channel to help address impacts of soil erosion from agricultural lands.

5.1.2.1 Partners

Project partners included:

- Ausable Bayfield Conservation Authority (ABCA)
- Bayfield Anglers
- Fisheries and Oceans Canada (DFO)
- Friends of Bayfield River
- Huron Clean Water Project (HCWP)
- Huron Stewardship Council
- Ministry of Natural Resources and Forestry (MNRF), Canada-Ontario Agreement (COA), Community Fisheries and Wildlife Involvement Program (CFWIP)
- Municipal staff
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
- PARISH Geomorphic Ltd.
- Property owners
- R.J. Burnside Engineering
- Trout Unlimited
- Wetland Habitat

5.1.2.2 Funding

- total project cost $143,500 including:
  - $82,000 construction,
  - $16,000 allowances,
  - $35,500 engineering,
  - $10,000 sundry

5.1.2.3 Picture Gallery

Figure B5-1. Steenstra drain – signage for the Steenstra municipal drain demonstration project.
Source: Municipality of Central Huron, Ontario

Figure B5-2. Steenstra Drain – Condition of the Drain in 2005.
Municipality of Central Huron, Ontario

Figure B5-3. Steenstra Drain – Bioengineered channel bank for protection and habitat (2020).
Source: Municipality of Central Huron, Ontario

Figure B5-4. Steenstra Drain – Sediment issues caused by highly erodible soils.
Source: Municipality of Central Huron, Ontario

Figure B5-6. Steenstra Drain – Constructed sediment trap.
Source: Municipality of Central Huron, Ontario

Figure B5-5. Steenstra Drain – Location where the sediment trap will be constructed as part of the project.
Source: Municipality of Central Huron, Ontario

Figure B5-7. Steenstra Drain – Sediment trap after a high flow event.
Source: Municipality of Central Huron, Ontario

Figure B5-8. Steenstra Drain – Construction.
Source: Municipality of Central Huron, Ontario

Figure B5-10. Steenstra Drain – Construction of the bioengineered channel bank.
Source: Municipality of Central Huron, Ontario

Figure B5-9. Steenstra Drain – Channel stabilization, riffle/pool sequences for fish habitat.
Source: Municipality of Central Huron, Ontario

5.2 Case: City of Ottawa, Hazeldean Road Drain and Watercourse Management Plan

5.2.1 Summary

1	Drainage work	• Petition for a new drain under Section 4, *Drainage Act, 1990*
2	Challenge	• Resolving drainage issues for property owners while minimizing impacts on a provincially significant wetland (PSW)
3	Approach	• Create a drainage works with minimal channelization work – the channel through the wetland was not realigned, deepened or widened • The main focus of the work was beaver dam removal and control to provide adequate drainage while maintaining water levels in the wetland • An annual limit is placed on future maintenance activities to minimize disruption to the wetland
4	Outcome	• Achieved objective of accommodating both interests (i.e., sufficient outlet with no or minimum impact on wetland) • Improved water conveyance along the watercourse • Reduced runoff and flooding due to heavy rains • Created a natural buffer to drought events • Maintained features, characteristics and boundaries of the provincially significant wetland (PSW) • Maintained habitat for flora and fauna
5	Lessons	• *Drainage Act, 1990* can be used to provide drainage while protecting the natural environment • All stakeholders benefit from developing and maintaining green infrastructure
6	Need more?	• Contact the drainage superintendent, City of Ottawa

5.2.2 Background

The *Hazeldean Road Drain and Watercourse Management Plan* was created in response to a property owner petition under Section 4, *Drainage Act, 1990* to improve and maintain conveyance in an existing natural watercourse (Upper Poole Creek) through a provincially significant wetland (PSW). The property owners required sufficient outlet to drain their lands. Wetland proponents were concerned about the potential impacts of the work. The watercourse is approximately 5,000 m long and the area drained is approximately 860 ha (including approximately 200 ha of the Goulbourn wetland complex). While the *Drainage Act, 1990* provides a process to resolve drainage issues, there was a need to address the concerns of wetland proponents. A project scoping meeting was held at the outset with stakeholders including the drainage superintendent, property owners, regulatory agencies and local elected representatives.

The objective was to accommodate both interests (i.e., ongoing sufficient outlet with no or minimum impact on a provincially significant wetland (PSW)). This was done in two ways:

1) Obstruction removal

The Section 4 petition under the *Drainage Act, 1990* incorporated Upper Poole Creek into a municipal drain. Work was done to restore the drain channel to pre-existing conditions, remove obstructions and allow for surface drainage of abutting lands.

As a municipal drain, the drainage superintendent may access the entire length of the drain to undertake obstruction removal as necessary (e.g., beaver dams) in the future. Obstruction removal in the existing watercourse assists in managing water flow while maintaining wetland characteristics and benefits.

2) Maintenance of existing channel

The main purpose of the work was beaver dam (obstruction) removal and control. As a result, the depressional wetland areas within the watershed were unaffected by the drainage and watercourse management plans.

The existing channel through the wetland was not realigned, deepened or widened. An annual limit was placed on future maintenance activities to minimize disruption to the wetland. The effects of beavers were reduced while natural water flow along the watercourse and drain were maintained.

5.2.2.1 Partners

- drainage engineer, Stantec Consulting Ltd.
- drainage superintendent, City of Ottawa
- Mississippi Valley Conservation Authority (MVCA)
- property owners

5.2.2.2 Picture Gallery

Figure B5-11. Hazeldean Road Drain – obstruction in the drain caused by beaver activity.
Source: City of Ottawa, Ontario

Figure B5-12. Hazeldean Road Drain – cross culvert under the Trans Canada trail.
Source: City of Ottawa, Ontario

Figure B5-13. Hazeldean Road Drain – viewing platform from the Trans Canada trail overlooking the drain.
Source: City of Ottawa, Ontario

5.3 Case: Norfolk County, Dry Creek Municipal Drain

5.3.1 Summary

1	Drainage work	• Restoration of headwater wetlands on an existing channel municipal drain under Section 78, *Drainage Act, 1990*
2	Challenge	• Restore functioning wetlands in drainage works without negatively impacting adjacent agricultural practices
3	Approach	• Used the *Drainage Act, 1990* as the framework for project development, which allows design alteration to occur, builds communal acceptance through consultation and ensures proper design and investment under bylaw • Developed support from a wide range of project partners • Committed resources to determining feasibility and creating a sound project plan • Developed opportunities for long-term involvement
4	Outcome	• Returned watershed to natural functioning ecosystem • Developed long-lasting, key relationships with multiple agencies concerned with better water management on the landscape
5	Lessons	• Very important to create a vision, gather support and develop a robust project plan
6	Need more?	• Contact the Norfolk County Drainage Services • Contact the Aylmer Office of the Ontario Ministry of Natural Resources and Forestry

5.3.2 Background

The objective of the project was to determine the feasibility of restoring wetlands on the Dry Creek Municipal Drain near Tillsonburg, Ontario, and its associated water storage, recharge and discharge functions in drainage works (municipal drains) without negatively impacting adjacent agricultural practices.

A broad definition of drainage works in the *Drainage Act, 1990* allows for the creation of innovative features such as water control structures to restore headwater wetlands. The *Drainage Act, 1990* provides the framework for project development and allows alteration of the drain design, builds communal acceptance through consultation, and ensures proper design and investment under bylaw.

The main challenges were determining the best method or approach for:

- getting property owner support for the project
- altering water flow to re-create wetland conditions (i.e., "plugging the leak" in the drain by constructing a water control structure)

The benefits of the work include:

- protection of an adequate drainage outlet for agricultural lands
- decreasing the need for sediment removal from the drain
- restoration of functioning wetlands with the following attributes:
    - improved discharge and recharge functions during dry periods
    - increased wetland habitats within existing ecosystems including provision and support of fish and wildlife habitats
    - improved water quality within affected landscapes
    - improved surface and groundwater storage
    - enhanced ability of the landscape to buffer against drought conditions
    - soil conservation
- fostering co-operation between property owners and other interest groups
- increased public awareness of the importance of wetlands

5.3.2.1 Lessons

It is very important to create a vision, gather support and develop a robust project plan. Key lessons include:

- property owner interest and involvement are critical – do not proceed without them
- choose an appropriate location (i.e., wetland restoration is most applicable in headwater areas)
- do the homework on hydrology and natural features – complete a project feasibility study including biological and social inventory recommendations for consideration by affected municipalities
- obtain professional engineering and drainage reports to determine the size of watershed upstream of the proposed location and other important details
- ensure all structures are engineered to accommodate the amount of water that will flow through the system

5.3.2.2 Partners

- Conservation Ontario Wetland Habitat Fund
- Drainage Superintendents Association of Ontario
- Ducks Unlimited Canada
- Ontario Ministry of Agriculture Food and Rural Affairs
- Ontario Ministry of Environment, Conservation and Parks
- Ontario Ministry of Natural Resources and Forestry
- Ontario Stewardship
- Norfolk County
- Norfolk Land Stewardship Council
- Norfolk Water Supply Enhancement Project
- property owners

5.3.2.3 Picture Gallery

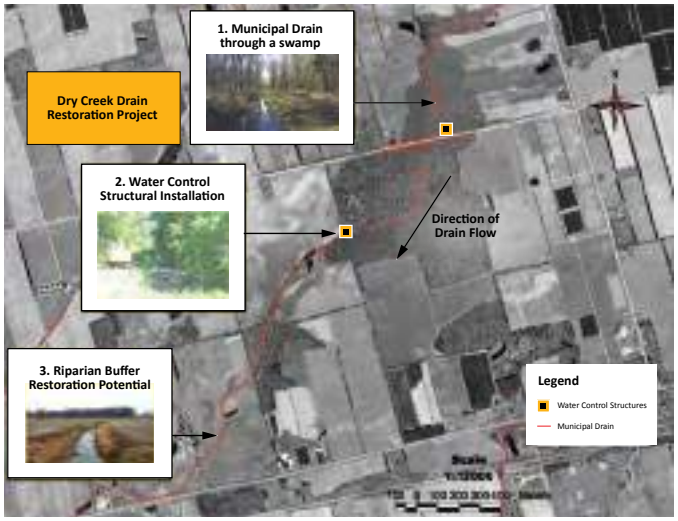


Figure B5-14. Dry Creek – map showing multiple projects across the Dry Creek watershed to achieve wetland restoration.
Source: Dave Richards, Ontario Ministry of Natural Resources and Forestry

Figure B5-15. Dry Creek – before restoration, the creek would run dry.
Source: Dave Richards, Ontario Ministry of Natural Resources and Forestry

Figure B5-16. Dry Creek – installation of one of the water control structures.
Source: Dave Richards, Ontario Ministry of Natural Resources and Forestry

Figure B5-17. Dry Creek – after restoration, the creek now retains water in the restored wetland.
Source: Dave Richards, Ontario Ministry of Natural Resources and Forestry

Figure B5-18. Dry Creek – a downstream view from the water control structure in Figure B5-17.
Source: Bill Mayes, Norfolk County, Ontario

Figure B5-20. Dry Creek – before the project started, the creek had minimal buffers.
Source: Dave Richards, Ontario Ministry of Natural Resources and Forestry

Figure B5-19. Dry Creek – looking upstream from one of the many water control structures along the creek.
Source: Bill Mayes, Norfolk County, Ontario

Figure B5-21. Dry Creek – large buffers along the creek were established as part of the project.
Source: Bill Mayes, Norfolk County, Ontario

5.4 Case: Southdown District Stormwater Servicing and Environmental Management Plan

5.4.1 Summary

1	Drainage work	• Creation of an urban stormwater management system under Section 4 of the *Drainage Act, 1990*
2	Challenge	• Resolve local flooding by implementing low impact drainage (LID) infrastructure for urban stormwater management under the *Drainage Act, 1990*
3	Approach	• Implement a local drainage solution within an urban setting by bringing together multiple private and public property owners • Local conservation authority promoted, encouraged and supported the use of the *Drainage Act, 1990*, to implement LID within the watershed
4	Outcome	• Property owners were overwhelmingly receptive • Communal approach means LID design elements can be established on properties where they are best suited • An insufficient outlet (i.e., local flooding issues) was resolved by improving the water retention and infiltration in the headland areas of the watershed • Participating businesses accessed the City of Mississauga's stormwater credits and received compensation for providing stormwater management services to the broader community
5	Lessons	• Municipalities can use the *Drainage Act, 1990* process in urban areas to establish cost-effective stormwater management programs across private, industrial, commercial and retail lands • Communal approach encourages 'best fit' design of LID rather than working with individual land owners • Commitment to stakeholder engagement is critical • The financial incentive from the stormwater credit system encouraged landowner participation by offsetting *Drainage Act, 1990 assessments*
6	Need more?	• Review Chapter B4.3.12 Low Impact Development (LID) • Contact Credit Valley Conservation • Contact City of Mississauga re: Southdown District Stormwater Servicing and Environmental Management Plan • The Sustainable Technologies Evaluation Program (STEP) Water partners (i.e., Credit Valley Conservation, Toronto and Region Conservation Authority and Lake Simcoe Region Conservation Authority) have produced many resources on the application of LID

5.4.2 Background

The Southdown District, located in the southwest part of the City of Mississauga, lacked any meaningful stormwater controls. The study area was a 36.5 ha (90 acre) bundle of public and private properties, including 14 individual parcels and several stretches of municipal roadway. There were limited stormwater management practices in this watershed because:

- there was no apparent way to ensure the long-term protection of the infrastructure
- retrofitting older urban developments on a lot-by-lot basis was not cost effective compared to the earned stormwater credit

Within the watershed, there was a need for flood protection and water quality improvements. Credit Valley Conservation saw the *Drainage Act, 1990* as a powerful tool for urban settings to construct green infrastructure (e.g., low impact development) to address these issues, and provide social and economic value.

The process brought together multiple private and public property owners to implement a communal drainage solution. The process used one drainage engineer and one set of permits across multiple properties to overcome many of the financial and technical limitations associated with lot-by-lot implementation of LID infrastructure.

Green infrastructure – typically established within the tight confines of a road right-of-way – can be installed on private lands where it is more cost effective. As an added incentive, property owners were eligible for a credit of up to 50% on the stormwater utility fee they pay to the City of Mississauga.

The endorsement and support of the Credit Valley Conservation corporate board and the local City of Mississauga council member was important to the success of the project. Credit Valley Conservation served as project lead, on behalf of the City of Mississauga. which included:

- identification of property owners
- study area definition
- coordination of an engineering consulting team

The City of Mississauga had no prior experience using the *Drainage Act, 1990*, so hiring an experienced drainage superintendent was an effective tool to communicate, coordinate and encourage compromise amongst stakeholders. This process was key to bringing property owners together and achieving widespread support for the project. The drainage superintendent was instrumental in building relationships and was an impartial source of information for all stakeholders.

Visits with individual property owners provided an educational opportunity related to the *Drainage Act, 1990* process and the benefits of installing LID infrastructure on their property. Numerous knowledge transfer and outreach events (e.g., conferences, symposia, publications, webinars and presentations) were held.

5.4.2.1 Partners

- City of Mississauga's Engineering department
- Credit Valley Conservation
- K. Smart Associates Ltd.
- private, industrial, commercial and retail property owners

5.4.2.2 Funding Sources

- Clean Water Wastewater Fund
- Credit Valley Conservation
- Natural Resources Canada
- Region of Peel Water Use Efficiency Program
- in-kind resources from stormwater management product manufacturers (e.g., ADS Canada, Ecoraster Ltd.)

5.4.2.3 Picture Gallery

Figure B5-22. Southdown – drainage issue despite the existence of storm sewers.
Source: Credit Valley Conservation, Mississauga, Ontario

Figure B5-24. Southdown – onsite meeting with property owners in the study area.
Source: Credit Valley Conservation, Mississauga, Ontario

Figure B5-23. Southdown – drainage issues in the Southdown area.
Source: Credit Valley Conservation, Mississauga, Ontario

Figure B5-25. Southdown – the engineer's conceptual design of the Southdown stormwater retrofit.
Source: Credit Valley Conservation, Mississauga, Ontario

5.5 Case: Town of Kingsville, Phragmites Control

5.5.1 Summary

1	Drainage work	• Maintenance and repair of an existing channel municipal drain under Section 74 of the *Drainage Act, 1990*
2	Challenge	• Find and implement an effective control of invasive phragmites vegetation to maintain water flow in drainage works with property owner approval
3	Approach	• Drainage superintendent identified the need for phragmites control • Tried and tested multiple methods of phragmites control that were cost effective and publicly acceptable
4	Outcome	• Obtained support of council and property owners for an acceptable, cost-effective, annual phragmites control program • Currently use a 'wet-blade' system – mowing with a blade that is constantly and completely wet with herbicide, which is 'wiped' onto freshly cut stems • Repair (mowing) and maintenance (use of herbicide), as defined by the *Drainage Act*, *1990*, occurred at the same time • Program costs were recovered by an assessment under the *Drainage Act, 1990*, to property owners
5	Lessons	• Searching for hard-to-find solutions takes perseverance and patience
6	Need more?	• Contact the drainage superintendent, Town of Kingsville • Review Chapter A3.7.2 Vegetation Management • Smart Practices for the *Control of Invasive Phragmites along Ontario's Roads*, Ontario Phragmites Working Group (www.opwg.ca)

5.5.2 Background

The following is a true story of drainage superintendent Ken Vegh's search for a solution to phragmites control.

"I became the drainage superintendent for the Town of Kingsville in June of 2009. Within the first six months, it was apparent to me there was a problem with vegetation growth within our municipal drains that impeded water flow and caused several roadside sight line issues. At the time, I had no idea what the vegetation growth was, but I had seen it through my travels along every type of roadway. Through my own research, I discovered the vegetation that was rapidly taking over our drains is known as phragmites.

At that time, I believed that by making a few phone calls and doing some research online, I would discover an established method of controlling phragmites (also known as 'phrag') and soon solve the problem.

The initial strategy was to inform council of the challenges and problems presented by phragmites, including the future problems that would occur if we stood idly by and did nothing.

In 2011, we tried cutting phragmites in the drains with a boom mower apparatus. I used this method because Essex County highways used this approach. At first, it looked like this method was successful but, within a few weeks the plants appeared to grow with a vengeance and before long the drain was filled with vibrant new phragmites growth. I began to call other municipalities within Essex County and found that no one had a successful method of phragmites control. As a matter of fact, no one had identified it as a problem. I then contacted a representative from the Ministry of Transportation to inquire about the methods that were used along the 400 series highways. That's when I learned about applying herbicide as a control method. It was apparent, however, there was no method of phragmites control that achieved 100% success. More research was needed, and more landowners were beginning to voice their concerns regarding phragmites and the need to find a solution.

In 2012, we decided to control phragmites by applying a combination of a glyphosate and oil. The glyphosate is the active ingredient in Roundup® herbicide and the oil is a type of surfactant that helps the glyphosate product stick to the plant to achieve optimal results. Within a short time, the results were promising but also it became apparent that, due to the optics of the application method, we weren't going to be able to continue this method. A pickup truck pulling a trailer with a spray tank and an applicator holding a large spray wand is definitely more accepted by the public in remote areas of phragmites control than along roadside municipal drains fronting planted crops, greenhouse operations and houses. Time for more research.

Without a tried-and-true method, we did not attempt to control phragmites in 2013. The number of landowners voicing their concerns about phragmites increased. Throughout my research in 2013, the 'wet blade' method (i.e., mowing with a blade that is constantly and completely wet with herbicide, which is 'wiped' onto freshly cut stems) kept resurfacing as a method of herbicide application that would alleviate most of the concerns of the residents of Kingsville. And, as luck would have it, a conversation led to locating a local contractor who had just purchased a wet blade and tractor for the sole purpose of controlling phragmites.

After a meeting with the contractor in the winter of 2014, it was decided we would jump in with both feet and try this method on all of our municipal drains within the Town of Kingsville.

We have been using this method since 2014. As of 2018, we have no intention of changing course and we have not received any negative comments from any landowner regarding the control method we are using."

5.5.2.1 Outcome

"For the first two attempts, we used the same 3 km stretch of the Charles Grainger drain in Kingsville to determine the effectiveness of each method. The cutting method used in 2011 was proven neither effective or cost efficient. In 2012, our herbicide application method achieved better results in terms of control – but other challenges around public acceptance of the method were discovered.

In 2014, we established our Town of Kingsville phragmites control program using the wet blade method throughout the entire municipal drain system within our town limits. This was mainly due to:

- increasing public pressure
- continuing proliferation of phragmites within our drains
- our confidence that the wet blade technique of cutting phragmites and applying herbicide to the stalks would work

2018 will be the fifth year of our phragmites control program and the evidence is clear that progress is being made every year."

5.5.2.2 Funding

The annual budget for phragmites control is $85,000. This is recovered through an assessment to property owners under the *Drainage Act, 1990*.

5.5.2.3 Picture Gallery

Figure B5-26. Kingsville – cutting phragmites in the drain with a boom mower apparatus. *Source: Town of Kingsville, Ontario*

ontario.ca/omafra