

Stormwater Management: A Property Owner's Operations & Maintenance Manual

Table of Contents

1.0	Glossary	3
2.0	Introduction	3
3.0	System Components	4
3.1	Responsibilities	5
3.2	Stormwater Collection.....	5
3.2.1	Inlet Control Devices	6
3.2.2	General Inspection and Maintenance	7
3.3	Traplow	11
3.3.1	Inspection and Maintenance.....	11
3.4	Underground Storage.....	13
3.4.1	Inspection and Maintenance.....	13
3.5	Roof Storage	15
3.5.1	Inspection and Maintenance.....	15
4.0	Summary	17

1.0 Glossary

Catchbasin: Vertical underground structures with grated covers on the surface that capture stormwater.

Grading: The slope of the ground to control the direction of stormwater runoff.

Inlet Control Devices (ICDs): Orifices designed to restrict the rate of water releasing from a structure to the overall stormwater system.

Manhole: Vertical underground structures, with metal frames and covers on the surface, connecting the underground pipes to the surface. Typically installed at locations such as pipe junctions, changes in pipe alignment, or changes in pipe elevation or slope.

Onsite: Within the private property boundaries.

Ponding: Accumulation of water on a surface.

Stormwater Management System: Any infrastructure used to store or convey stormwater flows. Typically consists of catchbasins, manholes, and pipes and may include underground storages, traplows, roof storages, or Low Impact Developments (LIDs).

Surcharge: A condition in which a pipe becomes completely full of water, pressurizing the pipe and causing water levels to rise in the manholes and catchbasins.

Traplow: A designed depression in a paved (e.g. road or parking lot) or landscaped area that temporarily stores stormwater (usually less than 1 hour) on the surface during rainfall events.

Underground Storage: Infrastructure located below the surface with specific intentions to store stormwater.

2.0 Introduction

Stormwater is generated by rainfall or melted snow that flows over surfaces and enters into the stormwater management system. In natural environments, trees, plants, and soil absorb water slowly, helping to filter out pollutants and refill groundwater. However, in urban areas, hard surfaces like roads, driveways, and buildings prevent water from being absorbed leading to higher stormwater flows. The stormwater flows enter the stormwater system, which eventually discharges into rivers, creeks, or oceans.

Properties may include special features, designed to help manage stormwater runoff. Onsite stormwater storage is an important component to help enable the safe and proper function of the City of Calgary's stormwater management system. By temporarily storing stormwater, the influx of flow downstream can be offset, reducing the risk of flooding and overland flow

hazards. Completing regular onsite stormwater infrastructure maintenance is a crucial step in keeping the stormwater systems operating properly. This manual outlines the operation and maintenance procedures required to ensure onsite stormwater infrastructure functionality. Inspections and maintenance activities should only be completed when it is safe to do so, do not enter any stormwater infrastructure unless you are specifically trained and certified.

An inspection checklist is available to aid in the inspection of onsite drainage systems.

3.0 System Components

Each onsite stormwater system is unique and designed for the specific site. Despite the differences, all drainage systems share similar components. A diagram of the possible components is shown below in **Figure 3.1**.

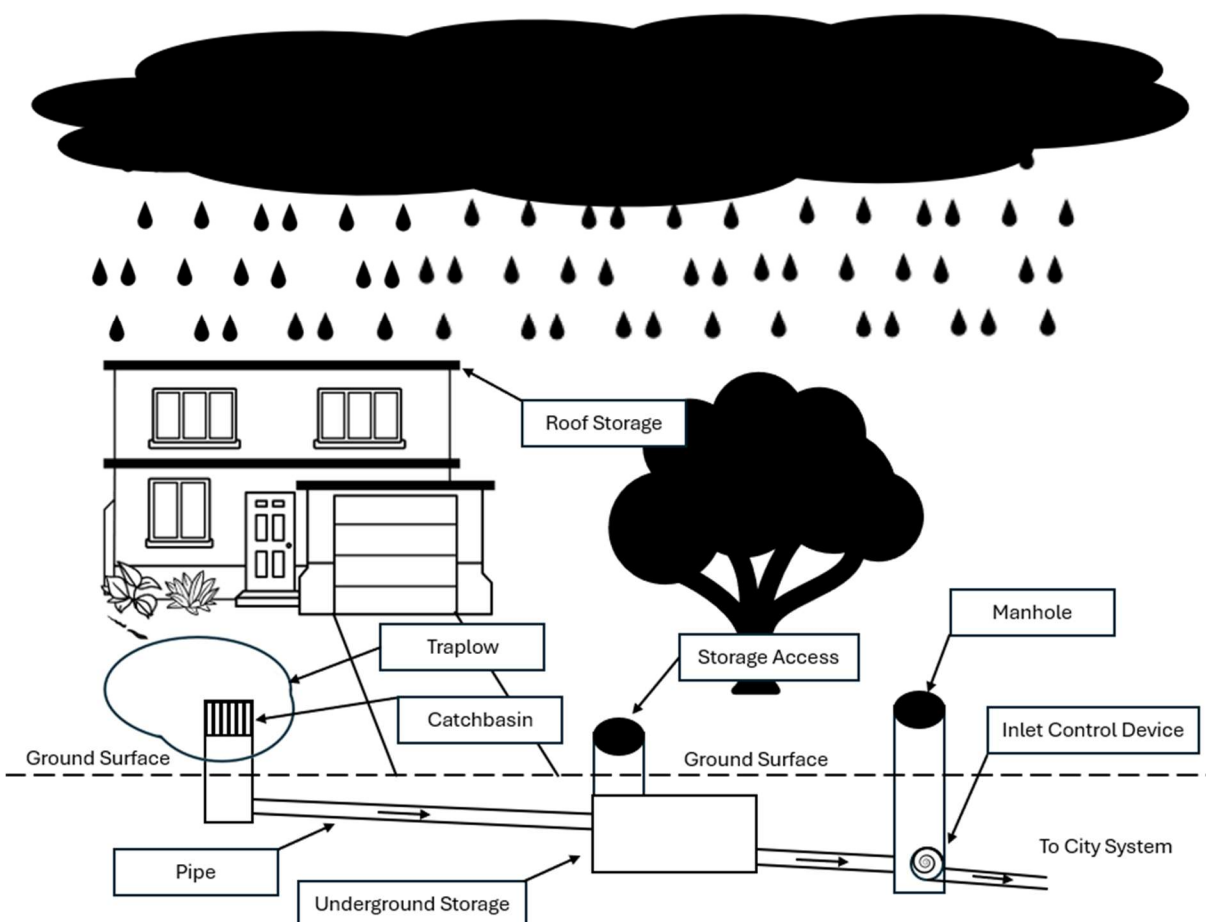


Figure 3.1: Stormwater System Components

Not all sites include the same stormwater management features. The specific components installed may vary depending on factors, such as the amount of paved surface, site grading, and downstream infrastructure restrictions.

The specific operation and maintenance requirements are further described in this guide for each component. Each lot is designed to ensure that all stormwater management features function well as a system. The most essential requirement during maintenance is to avoid removing or altering the function of the system components.

3.1 Responsibilities

On-lot drainage systems interact with public drainage infrastructure as they drain into surrounding roadways, storm pipes, and potentially storm ponds. It is the collective responsibility of the City of Calgary, the lot developer, the builder, and the property owner to ensure proper lot drainage to protect the property, the public safety, and the environment.

Property Owner

Property owners are responsible for maintaining surface drainage patterns established during the design of the property and constructed by the builders. This includes ensuring stormwater flows away from buildings and neighbouring properties. The property owner is responsible for all stormwater drainage infrastructure on their property up to the property line. This involves routinely inspecting and maintaining any stormwater system components such as clearing drains after major storms. Property owners shall not modify inlet control devices.

City of Calgary

The City of Calgary is responsible for establishing processes and guidance to protect the public, infrastructure, properties, and the environment by ensuring compliance with applicable bylaws and regulations. The maintenance of public stormwater drainage infrastructure is also the City's responsibility.

3.2 Stormwater Collection

While each site's stormwater collection system is unique, most systems include catchbasins, manholes, and pipes. Stormwater collection systems typically begin with catchbasins (**Figure 3.2**), which are the primary route for stormwater to drain into the underground pipe system. The catchbasins lead to the pipes and manholes that may connect into an underground storage system and, ultimately, to the City's stormwater management system. Some catchbasins and manholes have Inlet Control Devices (ICDs) to control the flow rate.



Figure 3.2: Flat Catchbasin Grate¹

3.2.1 Inlet Control Devices

ICDs are tools that are used at the downstream end of the onsite stormwater infrastructure to control the amount of flow that enters the City stormwater system. This is accomplished by restricting the outgoing flow to a predetermined release rate. The most common types of ICDs used within the City of Calgary are orifice plates and vortex flow control devices, pictured below (**Figure 3.3** and **Figure 3.4**).



Figure 3.3: Manhole with a Vortex Flow Control Device²



Figure 3.4: Manhole with Orifice Plate³

¹ Water Canada. Research Explores impact of BMPs in Stormwater Management. 2017. Web: <https://www.watercanada.net/research-explores-impact-of-bmps-in-stormwater-management/>

² ENVIROPRO. StormBrake™ – vortex flow control chamber. 2026. Web: <https://www.enviopro.co.uk/entry/169567/FP-McCann/StormBrake-vortex-flow-control-chamber/>

³ EXTERNAL WORKS. ACO Q-Plate – orifice plates for stormwater flow regulation. 2026. Web: <https://www.externalworksindex.co.uk/entry/117689/ACO-Water-Management/ACO-QPlate-orifice-plates-for-stormwater-flow-regulation/>

ICDs are an integral component of the overall stormwater sewer system. Slowing the release of stormwater from each contributing property into a combined stormwater system is crucial to mitigating downstream flooding and protecting natural streams and rivers.

As the stormwater flow from the site is restricted, the stormwater accumulates within the site stormwater infrastructure. The water may begin to pond aboveground in traplows, this is designed to occur and should drain within two hours. In some cases, the ICDs may become clogged with debris, this will prevent the system from draining and may result in destructive ponding on the site that lasts longer than two hours. To prevent this from happening, the manhole in which the ICD is located in should be routinely inspected and maintained as described in the section below. At no point should the ICD be altered or removed unless otherwise directed to by a qualified personal as described below.

3.2.2 General Inspection and Maintenance

Inspection and maintenance of the stormwater collection system should be completed to determine issues early and avoid site flooding. Internal inspection and maintenance of catchbasins, manholes, and underground pipes should be completed by professionals. Untrained personnel should not enter manholes or catchbasins or remove the grates/covers.

Property Owner

Property owners and managers can perform useful monthly surface-level inspections and maintenance to help maintain and identify drainage problems without entering the structures as outlined below:

- **Inspect and Clear Flow Paths:** Ensure flow paths, inlets, and outlets are open and clear of leaves, trash, soil, or grass overgrowth by removing any debris piles that may have accumulated. Remove grass overgrowth by curb cuts and blocked edges around grates. A blocked flow path can cause ponding or flooding in unexpected locations.
- **Assess Surface Conditions:** If the catchbasin or manhole is located near vegetation, ensure shrubs and grass are trimmed or mowed. Look for cracked, sunken, or damaged pavement around catchbasin and manhole grates (**Figure 3.5**), these may indicate structural issues or poor compaction. Look for long depressions that follow the pipe alignment or for cracks in the pavement above the pipe. These can indicate structural issues (i.e. deformed or cracked pipes), compaction concerns, or leakage, and a pipe inspection company should be contacted to assess the infrastructure.



Figure 3.5: Cracked Surface Surrounding a Manhole⁴

- **Assess Catchbasin Grates and Manhole Covers:** Check catchbasin grates and manhole covers for debris build up, such as leaves (**Figure 3.6**), trash, sediment, ice, or snow and clear as necessary. Make note of any cracks or missing parts on the grate or cover itself. If the damage poses a safety risk, a pipe inspection company should be contacted immediately.



Figure 3.6: Catchbasin Intake Restricted by Leaves⁵

- **Examine the Interior:** If the inside of the catchbasin or manhole is safely visible, check for any accumulated debris or sediment, as well as any damage to the concrete walls (**Figure 3.7**). If damage is present, contact a pipe inspection company to ensure no water is leaking. The opening of the pipe should be visible and not blocked. If an ICD is present, ensure it is not blocked or clogged so it may continue to operate efficiently.

⁴ All State Civil Construction Inc. Signs that a Manhole Requires Immediate Attention. N.D. Web: <https://www.allstatecivilconstructionfl.com/signs-that-a-manhole-requires-immediate-attention/>

⁵ Town of East Lyme. Flood Facts – Drainage System Maintenance. 2026. Web: <https://eltownhall.com/government/departments/public-works/engineering/flood-facts-drainage-system-maintenance/>



Figure 3.7 Cracked Manhole⁶

- **Contact a Professional:** A professional inspection should be completed annually. The type of professional contacted will depend on the needs of the system. For general inspections or structural concerns such as cracks, a pipe inspection company should be contacted. For debris/sediment removal, contact a hydrovac company.

Professional

The following information outlines the role of the professional in inspecting and maintaining the system. The maintenance performed by the professionals will depend on the issues encountered. A professional should be contacted annually to ensure efficiency of the system.

- **Interior Inspection:** The inspection should include but is not limited to: confirming the pipe connections are sealed and intact, assessing any cracks to ensure the system is still waterproof and structurally sound, and determining the amount of sediment and debris build up. The inspection may be completed by guiding a remote camera throughout the system (CCTV), a visual inspection from the surface, or if certified with confined space entry, the professional may enter the system.

⁶ Civil Engineer. Pour Planning. September 2018. Web: <https://civilengineering.engineer/2018/09/18/quality-management-and-avoiding-common-defects-pre-work-considerations-for-in-situ-reinforced-concrete/ps10-cold-joint-cores-ii/>

- **Sediment Removal:** The sediment will be removed using a hydrovac truck (**Figure 3.8**). A high-pressure water jet will be directed into the manhole or catchbasin to create a slurry. The slurry will then be removed by using a high-volume vacuum system.



Figure 3.8: Hydrovac Truck⁷

- **Seal Cracks and Joints:** The professional (certified with confined space entry) will enter the manhole or catchbasin and reseal any pipe connections or cracks.

Common Issues

The most common issues encountered with a stormwater collection system are highlighted below:

- **Clogged Inlet or Outlet:** This occurs when debris such as leaves or trash block the inlet grate or the outlet pipe (most commonly the ICD). The blockages prevent the water from draining properly and may result in localized ponding that lasts longer than two hours. If this is occurring in the system site, the property owner should remove any debris from the surface grates and contact a hydrovac company to have the interior cleaned.
- **Sediment Accumulation:** Accumulated sediment, often consisting of silts and sands, reduces the efficiency of the system to drain and store water. If a large amount of sediment is visible in the system, contact a hydrovac company to have the interior cleaned.

⁷ Associated Hydro Excavating. 5 Facts About Hydrovac Trucks. June 2023. Web: <https://www.associatedhydro.com/copy-of-5-facts-about-hydrovac-trucks>

3.3 Traplow

Traplows are typically located on the surface above a catchbasin to temporarily store runoff before the water is directed into the stormwater management system. Although surface ponding in traplows is often mistaken as a blockage or failure in the stormwater system, the ponding is intentional. Traplows play an important role in the city-wide drainage system. By temporarily storing water aboveground, the rate that water enters the pipe system can be reduced. By reducing the intake of water, the downstream infrastructure is less likely to be overwhelmed and flooding risk can be mitigated.

3.3.1 Inspection and Maintenance

To ensure traplows function properly, inspections during and after rainfall events are important to monitor its condition and capacity. Simple, yet important maintenance tasks should be performed by homeowners and property managers for the traplows located on their property.

Property Owner

Property owners and managers can perform useful monthly surface-level inspections and maintenance to help maintain and identify drainage as outlined below:

- **Observe Ponding:** Ensure the traplow is at the lowest point in the surrounding area, as grass and soil can shift over time. Ensure the water does not flow out of the traplow towards any buildings or walkways (**Figure 3.9**). Fill any depressions or settlement around the perimeter of structures with compacted materials to maintain positive lot drainage. For larger grading needs, contact a landscaping company.

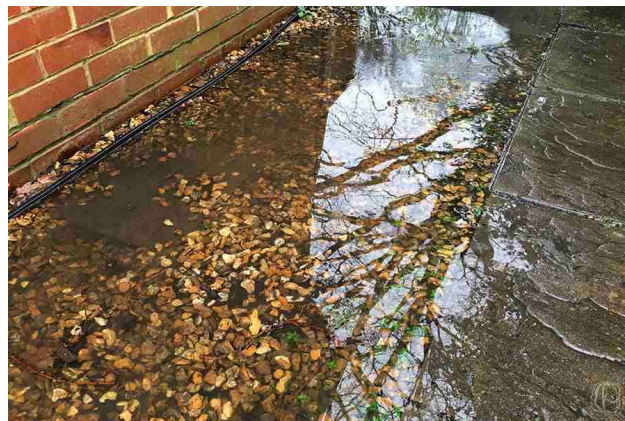


Figure 3.9 Ponding Against a Building⁸

⁸ Outdoor Aggregates. Drainage Gravel Issues. May 2026. Web: <https://outdooraggregates.com/diy/foundations/gravel-drainage-around-house/>

- **Check for Standing Water:** A traplow should empty within one to two hours after rainfall; ensure that water is no longer on the surface within that timeframe. If standing water does not drain within this period, this may indicate a blockage in the drainage system and a professional should be contacted as described in **Section 3.2.1**.
- **Remove Sediment Accumulation:** Overtime, sand, gravel, and potentially soil or mulch can accumulate within a traplow and reduce its capacity, or cause blockages downstream. Remove sediment accumulation by hand or using a rake to ensure proper drainage.
- **Inspect Vegetation Conditions:** If the traplow is in a grassed area, check that the ground is smooth, even, and mowed regularly. Watch for overgrown weeds, deep-rooted shrubs or exposed soil patches as a result of erosion. Remove weeds and trim back shrubs from the edges when necessary.

Professional

Regular professional maintenance and inspections are not required for traplows. A professional should be contacted if ponded water remains for longer than 2 hours following a storm event.

- **Regrade Area:** A landscaping company can be contacted to regrade the site to promote drainage away from buildings and other important infrastructure when required. The company may use survey equipment to ensure proper elevations as well as large equipment such as excavators to complete the work. The landscaping company must ensure that the storage size and drainage direction of the traplow area remain as designed.

Common Issues

The most common issues encountered with traplows are highlighted below:

- **Erosion:** Erosion may occur as the water flows overland and leave exposed soil or unintentional depressions on the lot. Fill any depressions with compacted materials and re establish vegetation.
- **Sediment Accumulation:** Overtime sediments such as silt and sand may accumulate in traplows and reduce the amount of storage the traplow can provide. Remove any accumulated sediment.

3.4 Underground Storage

Underground stormwater storage systems help prevent flooding by managing peak flows during storms, which reduces the strain on downstream drainage infrastructure. They are often located beneath parking lots or landscaped areas where aboveground stormwater storage is not feasible. This manual does not replace the Operations and Maintenance Manuals that are typically provided by the underground storage manufacturer. Listed below are the most typical underground storage types that are used on sites:

- **Concrete Storage:** Underground stormwater storage products that are created out of reinforced concrete (not including pipes and catchbasins).
- **HDPE Storage:** Underground stormwater storage products that are created out of High-Density Polyethylene (HDPE) (not including arched or modular storage).
- **Arched Storage:** Underground stormwater storage products that utilize an arched design to transfer loads into the surrounding aggregate backfill.
- **Modular Storage:** Underground stormwater storage products that are made up of individual units that can be interlocked to provide underground stormwater detention.

3.4.1 Inspection and Maintenance

It is important to complete inspections and maintenance to remove any sediment build up and ensure proper function of underground storage systems. When sediment and silt build up, it can lead to blockages in the system, or reduced capacity.

Property Owner

Property owners can perform monthly surface inspections and maintenance to assess the structural integrity of the system. Never enter an underground structure unless properly trained; only professionals with confined space training should perform internal inspections and maintenance to the interior of the structure.

- **Assess Surface Conditions:** Look for surface settling or depressions over the area where the system is buried (**Figure 3.10**), these may indicate structural failure and collapse of the system. Check for any cracking or areas where the pavement or landscape above the system has shifted. If any of these surface conditions are present, contact an inspection company for a thorough inspection.



Figure 3.10 Surface Settling⁹

- **Examine Access Points Covers:** Underground systems have access points for maintenance. Inspect for damaged, loose, or shifted covers. Keep the system accessible and clear by removing debris, leaves, sediment, and trash from the access or manhole cover. Ensure the cover is not buried by soil, mulch, snow, or gravel.
- **Contact a Professional:** An inspection company should be completed annually for the first few years until a maintenance schedule can be determined specifically for the storage and site.

Professional

The following information outlines the role of the professional in inspecting and maintaining underground storage. An inspection company should be contacted annually to ensure efficiency of the system until maintenance schedule can be determined based on the storage and the site.

- **Interior Inspection:** An interior inspection may be completed by guiding a remote camera throughout the storage (CCTV).
- **Sediment Removal:** The sediment will be removed using a hydrovac truck. A high-pressure water jet will be directed into the access port to create a slurry. The slurry will then be removed by using a high-volume vacuum system.

⁹ AddAline Asphalt Maintenance. Cracked Parking Lots Cost You: How Neglected Asphalt Leads to Lawsuits. July 2025. Web: <https://www.addaline.ca/cracked-parking-lots-neglected-asphalt-lawsuits/>

Common Issues

The most common issue encountered with underground storages is highlighted below:

- **Sediment Accumulation:** Accumulated sediment, often consisting of silts and sands, reduces the capacity of the storage to store water. If a large amount of sediment is present, contact a hydrovac company to have the interior cleaned.

3.5 Roof Storage

Some roofs are designed to temporarily store stormwater by raising the edges of the roof, reducing slope, and directing flow towards a controlled outlet (see **Figure 3.11**). To control the outflow from roof storages, roof drains are designed to restrict the flow during storm events. These drains typically have an insert with a weir that regulates the flow of water passing through the drain, enabling the runoff to be stored on the roof.

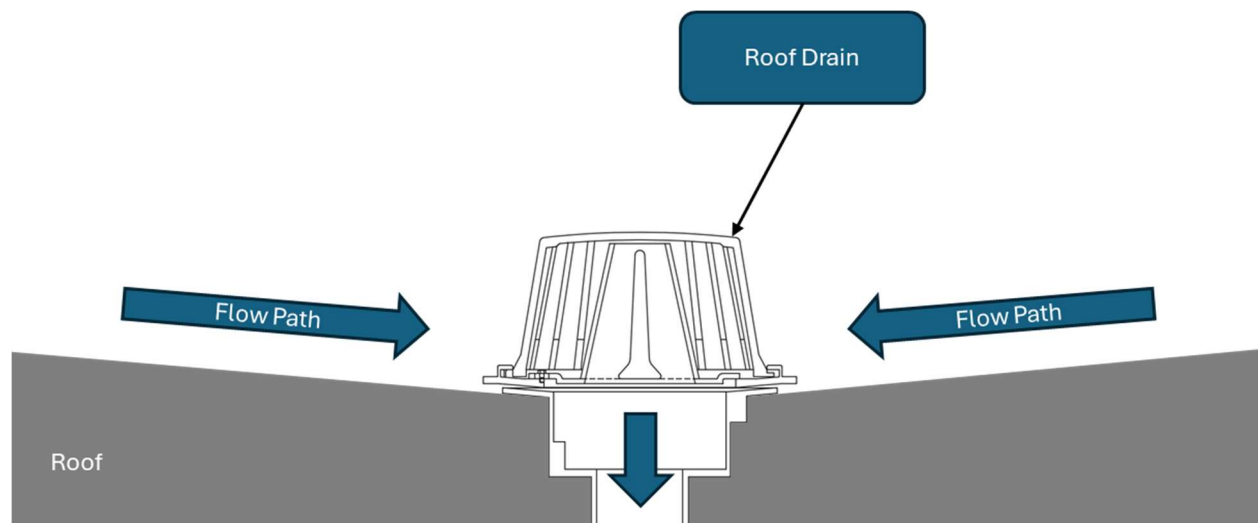


Figure 3.11: Roof Drainage

Strainers or grates are placed over the roof drains to prevent debris from blocking the drain. Water then flows through a network of pipes that lead to a downspout or scupper, which directs water away from the building.

3.5.1 Inspection and Maintenance

Inspections and maintenance should happen twice a year and are critical to identifying and remediating any blockages or damage to the roof storage system.

Property Owner

Property owners can preform maintenance tasks if it is safe on the roof to do so.

- **Clear Gutters and Drains:** Examine gutters, downspouts, roof drains and scuppers regularly for debris or blockages (**Figure 3.12**). Clear leaves, twigs, and other debris from the roof and drainage components to prevent clogging and ensure proficient drainage. If water drains over asphalt shingles, grit may be present at the drain. Clean gutters and drainage components in the fall or winter each year.



Figure 3.12 Roof Drain¹⁰

- **Assess Roof Surface Conditions:** Look for signs of ponding water or areas where water tends to collect (**Figure 3.13**). This includes visible pools of water and/or water stains or discolouration. This may indicate a drainage concern, and a professional roof maintenance company should be contacted.



Figure 3.13 Ponding on Roof¹¹

¹⁰ ID Flat Roof. Flat Roof Scupper Drainage: All You Need to Know About Scuppers. 2025. Web: <https://idflatroof.com/flat-roof-scupper/>

¹¹ Rescue My Roof. 6 Most Common Roofing Problems (& How to Handle Them). April 2023. Web: <https://rescue-my-roof.com/blog/most-common-roofing-problems/>

- **Proper Downspout Direction:** Make sure downspouts are directed towards intended flow paths to traplows, catchbasins, or grassed areas where water may be absorbed into the ground.

Professional

The following information outlines the role of the professional in inspecting and maintaining roof storage. A roof maintenance company should be contacted annually to ensure efficiency of the system until maintenance schedule can be determined based on the site.

- **Debris Removal:** A roof maintenance company will remove any debris that may have accumulated on the roof.
- **Leak Repair:** A roof maintenance company will inspect and identify any damage or leaks and repair them as needed.
- **Roof Remediation:** A roof maintenance company will identify low spots and fill them in as needed. In extreme cases, this may involve structural modifications to the roof.

Common Issues

The most common issue encountered with roof storage is highlighted below:

- **Debris Accumulation:** Debris such as leaves and branches may accumulate on roofs from nearby trees. This may clog the gutters, downspouts, and scuppers and prevent the water from draining. If this occurs, remove any debris that may have accumulated on the roof.

4.0 Summary

Temporarily storing stormwater on private lots can reduce the risk of flooding downstream by slowing the release of water. Completing regular onsite stormwater infrastructure inspections and maintenance is a crucial step in keeping the stormwater systems operating properly. Properly operating stormwater systems can protect your property as well as upstream and downstream properties from flooding impacts.

Inspections and maintenance activities should only be completed when it is safe to do so. Never enter an underground structure unless properly trained. A summary of maintenance activities for each component of the stormwater system is shown below in **Table 4.1**

Table 4.1 Maintenance Summary

Component	Property Owner		Professional		
	Frequency	Maintenance Tasks	Type	Frequency	Maintenance Tasks
Stormwater Collection	Monthly	- Inspect and clear flow paths - Assess surface conditions - Assess catchbasin grates and manhole covers - Examine the interior through grates	- Pipe Inspection Company - Hydrovac	Annually	- Interior inspection - Sediment removal - Seal cracks and joints
Traplow	Monthly	- Observe ponding timing - Remove sediment accumulation - Inspect vegetation conditions	Landscaping company	When required	Regrade area
Underground Storage	Monthly	- Assess surface conditions - Examine access points covers	- Hydrovac - Inspection Company	Annually	- Interior inspection - Sediment removal
Roof Storage	Twice Annually	- Clear gutters and drains - Assess roof surface conditions - Proper downspout direction	Roof Maintenance Company	Annually	- Debris removal - Leak repair