WESTMINSTER

OPERATION AND MAINTENANCE MANUAL

EXTENDED DETENTION BASINS

Project Name

Permit Number ENG##-####

Owner's Contact Information

Name: Owner's Name

Phone: Owner's Phone

Email: Owner's Email

Address: Owner's Address

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1.0 INTRODUCTION

Extended Detention Basins (EDBs) capture and temporarily store stormwater runoff long enough for most pollutants (e.g. sediment, metals, etc.) to settle out on the bottom of the basin. EDBs should be dry most of the time (with the exception of the micropool), but will hold water throughout the basin for up to 72 hours after a rain event.

EDBs have many different components. Each serve a special function and have different inspection and maintenance needs. EDB components include:

- Inflow points (inlets)
- Forebays
- Trickle Channels
- Micropools
- Outlet Structure
- Embankments – Spillways/Emergency Overflow

2.0 PROJECT DESCRIPTION

Provide a brief description of the project including total size, basins, and general location of extended detention basin(s). Reference approved drainage report along with the date of approval.

3.0 COMPLIANCE WITH STORMWATER TREATMENT FACILITY REQUIREMENTS

All property owners are responsible for ensuring that stormwater treatment facilities installed on their property are properly maintained and that they function as designed. In some cases, this maintenance responsibility may be assigned to others through special agreements. The maintenance responsibility for a stormwater treatment facility may be designated on the subdivision plat, the official development plan (ODP), and/or within a maintenance agreement for the property. Property owners should be aware of their responsibilities regarding stormwater treatment facility maintenance. **The City should be notified in writing within 60 days of any changes in maintenance responsibility of the treatment facility.**

4.0 PREVENTATIVE MEASURES TO REDUCE MAINTENANCE COSTS

The most effective way to maintain your stormwater treatment facility is to prevent the pollutants from entering the facility in the first place. Common pollutants include sediment, trash & debris, chemicals, dog wastes, runoff from stored materials, illicit discharges into the storm system and many others. A thoughtful maintenance program will include measures to address these potential contaminants, and will save money and time in the long run. Key points to consider include:

- Educate property owners/residents to be aware of how their actions affect water quality, and how they can help reduce maintenance costs.

- Keep properties, streets and gutters, and parking lots free of trash, debris, and lawn clippings. Grass clippings should be mulched or bagged. Educate landscape companies in regards to proper disposal of landscape material.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lawn care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces and put the sweepings back on the lawn.
- Be aware of leaking fluids from vehicles and equipment. Use absorbents such as cat litter to soak up drippings and dispose of according to State/Local regulations.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.
- Do not store materials outdoors (including landscape materials) unless properly protected from runoff (e.g. sediment control log).

5.0 ANNUAL REPORTING OF INSPECTION & MAINTENANCE

The following must be provided to City of Westminster on an annual basis:

- **Verification that the Stormwater facilities have been properly inspected and maintained; and**
- **Submittal of the required Inspection and Maintenance Forms.**

The annual Inspection and Maintenance forms will be facilitated through the City's online inspection software (Permitrack, https://www.mypermitrack.com/sehsvc/) and shall be submitted to the City of Westminster prior to May 31st of each year.

6.0 INSPECTING EXTENDED DETENTION BASINS

6.1 Access and Easements

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix A containing the location(s) of the access points and maintenance easements of the EDB(s) within the development. Utilization of these access points and maintenance easements ensures safety of personnel and reduces stress on vegetation.

6.2 Safety

Keep safety considerations at the forefront of inspection procedures at all times. Likely hazards should be anticipated and avoided. Never enter a confined space (outlet structure, manhole, etc.) without proper training or equipment. A confined space should never be entered without at least one additional person present. Confined spaces may not have adequate oxygen available or may contain dangerous gases.

If a toxic or flammable substance is discovered, leave the immediate area and contact 911. Nasal passages become desensitized to strong chemical odors within a few minutes. Continued exposure to strong chemicals may cause light headedness and headaches. It is important to leave the area if you encounter strong chemical odors.

Potentially dangerous (e.g., fuel chemicals, hazardous materials) substances found in the areas must be referred to emergency response immediately for response by the Hazardous Materials Unit. The emergency contact number is 911.

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop.

If any hazard is found within the facility area that poses an immediate threat to public safety, contact 911 immediately.

6.3 Field Inspection Equipment

It is imperative that the appropriate equipment is taken to the field with the inspector(s). This ensures the safety of the inspector and allows the inspections to be performed as efficiently as possible. Below is a list of the equipment that may be necessary to perform Stormwater Treatment Facilities -inspections:

- Protective clothing (pants and long-sleeved shirt) and boots;
- Safety equipment (vest, hard hat, confined space entry equipment);
- Communication equipment
- Site Operation and Maintenance Manual including Stormwater Treatment Facility maps;
- Equipment to access and perform inspections via online software (tablet, phone, etc.);
- Manhole Lid Remover; and
- Shovel.
- Equipment necessary to store/dispose of material (trash bag, wheel barrel, 5-gallon bucket, etc.)

Some of the items identified may not be needed for the inspection. However, this equipment should be easily accessible (e.g. in your vehicle) .

6.4 Stormwater Treatment Facilities Locations

Inspection or maintenance personnel may utilize the stormwater facility map, located in **Appendix A**, which contains the location(s) of the EDB(s) within this development.

6.5 Extended Detention Basin (EDB) Features

EDBs have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another. For example, if a forebay is not properly maintained, it could negatively affect the performance of a downstream feature (e.g., trickle channel, micropool, etc.). Therefore, it is critical that each feature of the EDB is properly inspected and maintained to ensure that the overall facility functions as it was intended. Below is a list and description of the features within this development's EDB and the corresponding inspection items.

TABLE EDB-1
Typical Inspection and Maintenance Requirements Matrix

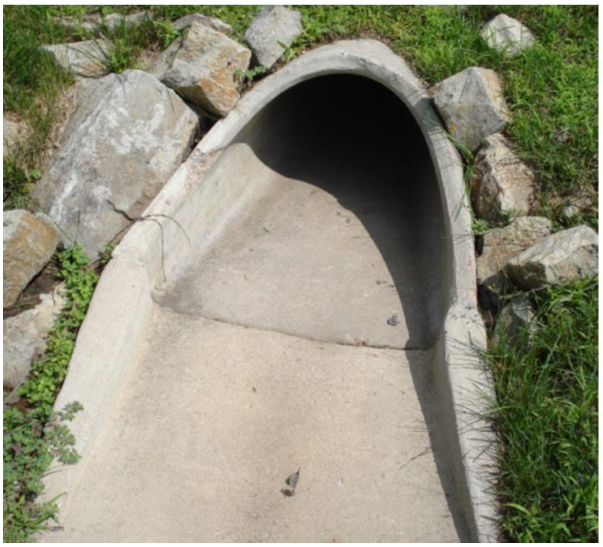
Maintenance Types	EDB Features					
	Inflow Points (inlets)	Forebay	Trickle Channel	Micropool	Outlet Structure	Embank-ments
Sediment Removal	X	X	X	X	X	
Mowing/ Weed Control						X
Trash & Debris Removal	X	X	X	X	X	
Overgrown Vegetation Removal			X	X		
Standing Water (mosquito/ algae control)				X		
Erosion			X			
Structural Repair	X	X	X	X	X	

6.5.1 Inflow Point (Inlet)

The inflow point is where stormwater runoff from the development enters the EDB through a storm sewer pipe, surface drainage channel or ditch.

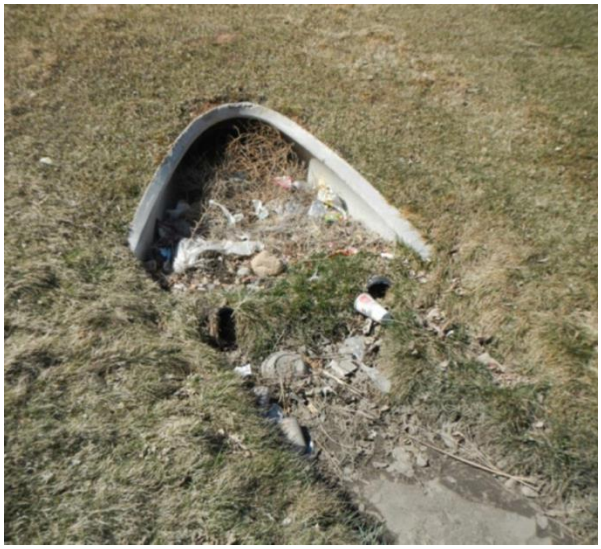
Sediment/Trash/Debris Removal

- Remove any sediment, trash or other debris that has accumulated near the inlet.
- Dispose of sediment, trash and debris in landfill



Clean inlet after proper maintenance.

√



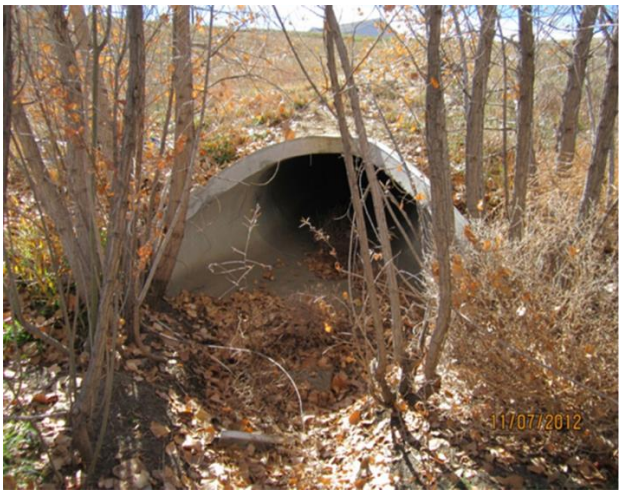
Large, woody vegetation near the outlet will eventually damage the concrete inlet pipe.

X

Vegetation Removal

Excess vegetation near the inlet can limit flow into the EDB and cause damage to the inlet structure.

- Remove excess vegetation (especially large, woody vegetation) from the area around the inlet.
- Do not wait for vegetation to get too large. It is much easier and less expensive to remove vegetation when it is small.



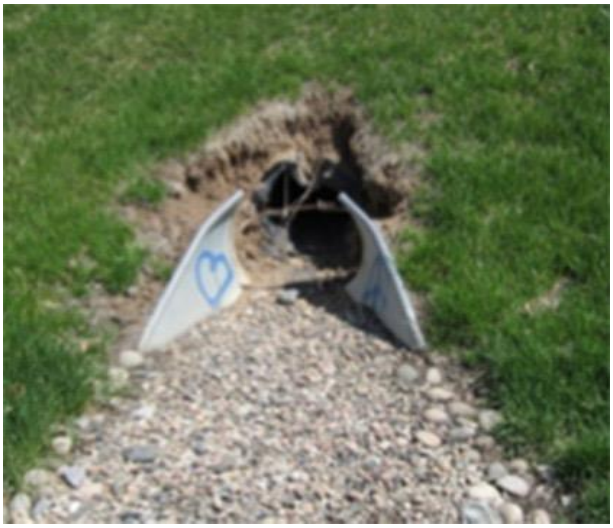
Inlet with sediment, trash and other debris that needs to be removed

X

Erosion/Structural Damage

Identifying early signs of erosion and fixing the problem can prevent more expensive repairs later.

- Look for erosion and structural damage near the inlet.
- Minor erosion/structural repair may include adding riprap to provide energy dissipation and minor concrete patching.
- Major erosion/structural repair may require consultation with an engineer and/or the City of Westminster.



Example of major structural damage to inlet. The inlet pipe has separated from the wing wall.

X

Concrete chase-type inlet with major damage due to erosion

X

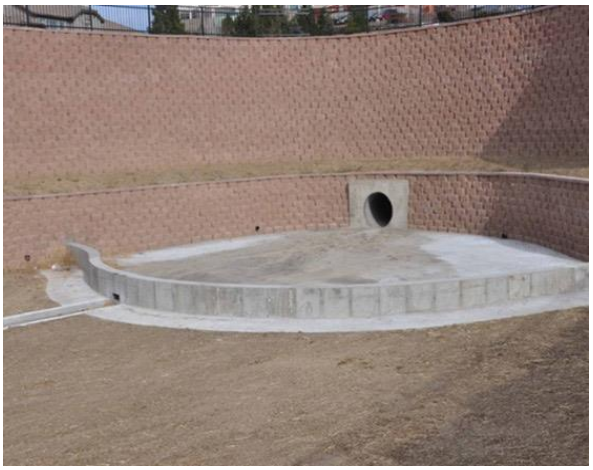
6.5.2 Forebay

The forebay is located below the inflow point and is designed to remove large particles, trash and other debris. It is typically made of concrete and has a flat bottom for easier maintenance. Frequent (2 to 4 times per year) forebay maintenance is much less expensive than removing sediment from other parts of the EDB.

Sediment/Trash/Debris Removal

- Remove any sediment, trash, or other debris that has accumulated in the forebay.

- For large forebays, heavy machinery (skid-steer, long-reach excavator, front-end loader) may be used.
- Dispose of sediment, trash and debris in landfill.
- Wet sediment may need to dry several days before the landfill will accept it. (Needs to be contained while drying)

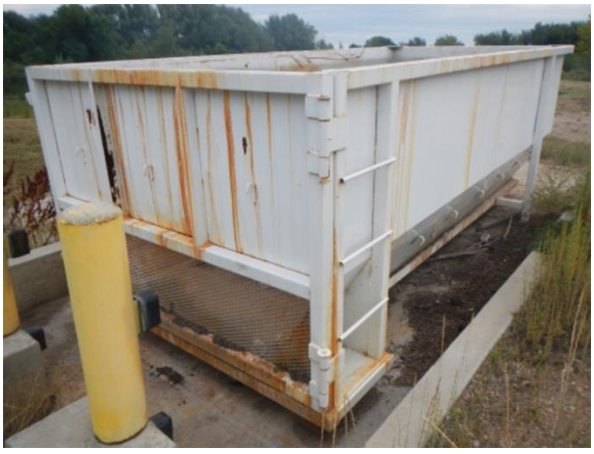


Clean forebay in working condition after recent maintenance.

√

Forebay with excess sediment that needs to be removed. Vegetation growing in the forebay is a typical sign that maintenance is needed

X



Roll off bin used to dry sediment prior to taking to the landfill.

√

Drain Pipe/Weir Clogging

Runoff exits the forebay through a drain pipe or weir.

- Make sure the forebay drain pipe or weir is not clogged so that runoff can flow freely through.

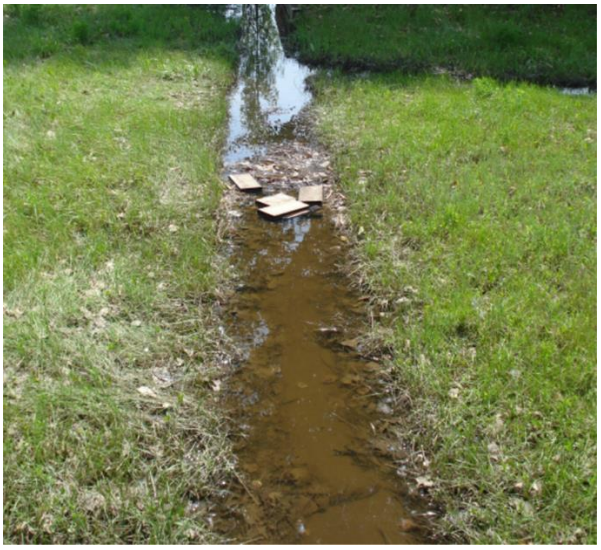
6.5.3 Trickle Channel

The trickle channel conveys small flows from the forebay (or inlet) to the micropool (or outlet structure). Trickle channels are typically concrete, but may also be constructed of rock. Concrete channels are typically easier to maintain. However, other materials are more aesthetically pleasing.

Sediment/Trash/Debris Removal

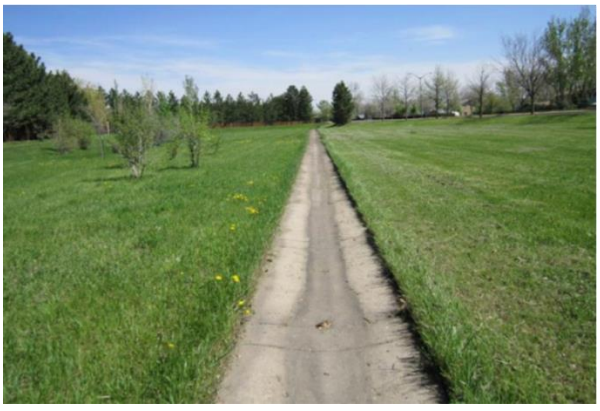
Sediment and debris that is left to accumulate in the trickle channel will eventually block the flow of water. Water that is diverted out of the trickle channel will cause damage to the nearby vegetation and erosion within the EDB.

- Remove any sediment, trash or other debris (e.g., grass clippings) that has accumulated in the trickle channel.
- Dispose of sediment, trash and debris in landfill.



Trickle channel that needs maintenance. Standing water in the trickle channel is a sign that sediment and other debris are blocking the flow of water

X



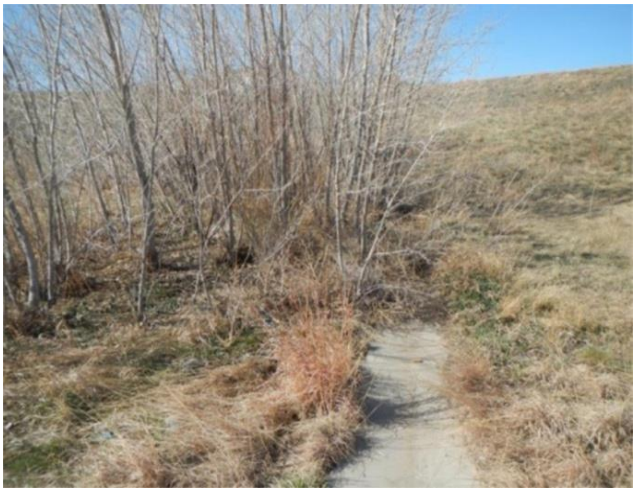
Clean trickle channel with no sediment, debris or woody vegetation nearby

√

Woody Vegetation Removal

Left unmanaged, woody vegetation can damage the trickle channel. It is easier and cheaper to remove when it is small.

- Remove woody vegetation growing near the trickle channel.



Example of woody vegetation growing near trickle channel. This vegetation should be removed to prevent future damage

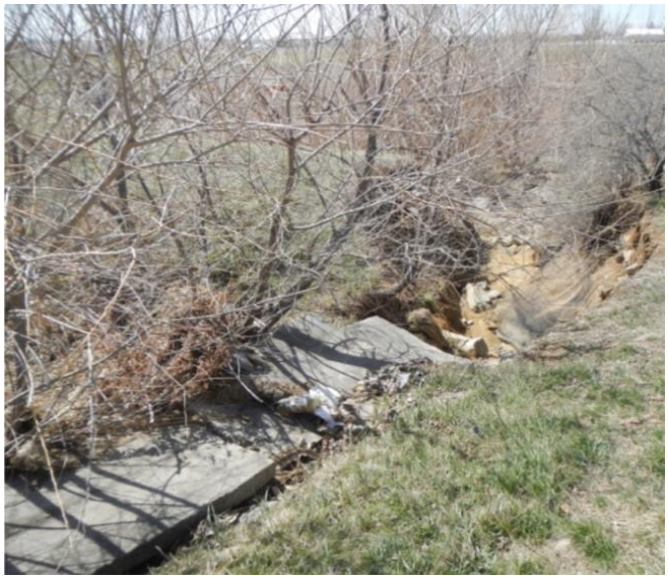
X

Erosion/Structural Damage

- Look for erosion and structural damage near the trickle channel.
- Major erosion/structural repair may require consultation with an engineer and/or the City of Westminster.

Example of woody vegetation growing near trickle channel. This vegetation should be removed to prevent future damage

X

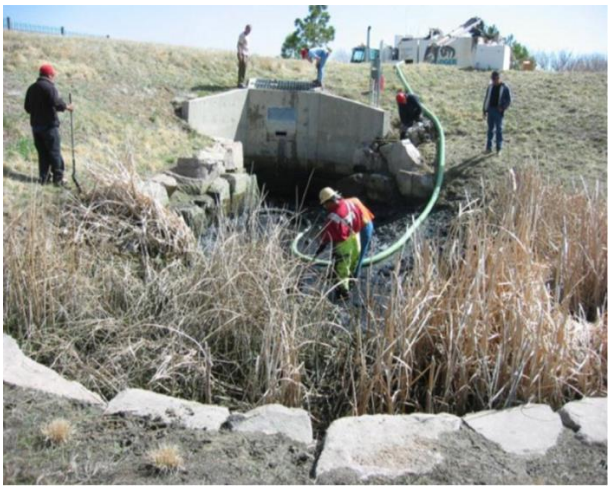


6.5.4 Micropool

The micropool is a small area of standing water (about 2 to 3 feet deep) directly in front of the outlet structure. It is designed to prevent the outlet structure from clogging by maintaining a constant pool of water and is the only area in the EDB where standing water is not a problem. Note: Not all existing EDBs have micropools.

Sediment Removal

- Measure depth of sediment in the micropool.
- Remove sediment once 12 inches of sediment has accumulated.
- Sediment removal may require a vacuum truck that is capable of removing both sediment and water.
- Dispose of sediment in landfill.
- Wet sediment may need to dry several days before the landfill will accept it.



Using vacuum truck to remove sediment from the micropool

Mosquito/Algae Treatment

- Micropools are designed with deep water depths (2 to 3 feet) to limit mosquito breeding. If large amounts of mosquitos are present during inspection, appropriate amounts of "insecticide" may be applied by certified mosquito control applicators.

- Algae consume stormwater pollutants and are beneficial to stormwater quality treatment. Excess algae in the micropool may be removed mechanically (and disposed of in a landfill) if it is clogging the trash rack. Use of "algaecides" to control algae is not encouraged, most of them contain chemicals that can be harmful to aquatic life downstream.

Oil/Chemical Sheens

- The presence of oil/chemical sheens in the micropool indicate a possible illicit discharge upstream of the EDB.
- If an oil/chemical sheen is present, report this to the City of Westminster's Stormwater Hotline (stormwaterhotline@cityofwestminster.us, 303-706-3367) to assist with proper removal/disposal.

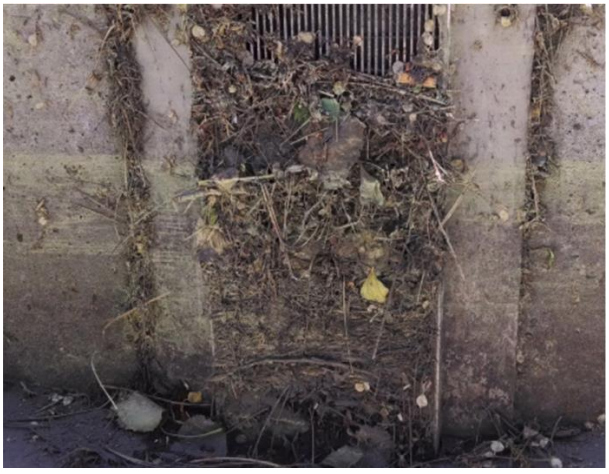
6.5.5 Outlet Structure

The outlet structure controls the rate that stored runoff is discharged from the EDB. It includes several different components (e.g., well screen, orifice plate, trash rack) that each require frequent maintenance. Inadequate maintenance of these components can cause severe problems with the EDB performance; including standing water, inadequate pollutant removal and downstream flooding.

It is a violation of Westminster City Code to modify the outlet structure without approval from the City of Westminster Community Development Department.

Well Screen/Trash Rack Clogging

- The well screen and trash rack will clog with grass and other debris frequently.
- Gently scrape the debris off the well screen/trash rack using a rake and dispose of the material in a landfill. Do not leave the material on site.
- If the well screen/trash rack is not cleaned frequently, the EDB will have standing water problems.



Well screen that is clogged with debris. Maintenance is required to prevent standing water

X

Cleaning the well screen gently using a garden rake.

√

Well Screen and/or Orifice Plate Missing/Removed

When the well screen and/or orifice plate becomes clogged creating standing water issues, owners/citizens may remove those components to allow water to flow through the EDB. This is **NOT** an acceptable solution as it prevents pollutants from being removed within the EDB.

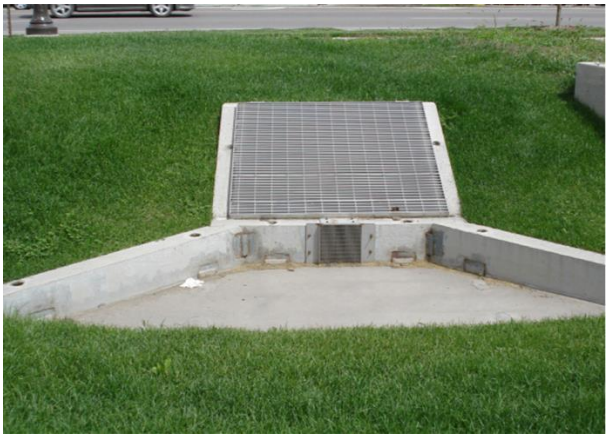
- If the well screen and/or orifice plate is removed, it should be re-installed.
- If the well screen and/or orifice plate are missing, contact the City of Westminster (303-658-2120) who may provide information for the installation of a new one.

Picture of outlet structure with orifice plate removed. Orifice plate must be re-installed

X

Sediment/Trash/Debris Removal

- Remove any sediment, trash or other debris that has accumulated within or in front of the outlet structure.
- Dispose of sediment, trash and debris in landfill.
- Wet sediment may need to dry several days before the landfill will accept it.
- Frequent (2 to 4 times per year) removal of these materials will limit clogging of the outlet structure.



Picture of well-maintained outlet structure

√

Sediment, debris and vegetation built up in front of outlet structure

X

6.6 Inspection and Maintenance Forms

EDB inspections are facilitated within the City's post-construction inspection software, Permitrack (https://www.mypermitrack.com/). The property owner or designee will be set up with login information to this software to conduct inspections. If you are having troubles accessing this inspection software, please reach out the City of Westminster Community Development, Engineering Division (303-658-2400). Each inspection shall be reviewed and submitted by the property owner or property manager to the City of Westminster per the requirements of this Operation and Maintenance Manual. **Refer to section 3.0 for Annual Reporting requirements.**

7.0 MAINTENANCE ACTIVITIES

A typical EDB Maintenance Program will consist of three broad categories of work; Routine, Minor, and Major Maintenance Activities. Within each category of work, a variety of maintenance activities can be performed on an EDB. A maintenance activity can be specific to each feature within the EDB, or general to the overall facility.

7.1 Routine Maintenance Activities

The majority of this work consists of regularly scheduled mowing and trash and debris pickups for stormwater treatment facilities during the growing season. This also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times per year. These items can be completed without any prior correspondence with the City of Westminster; however, completed inspection forms shall be submitted to the City of Westminster by March 31st of each year.

TABLE EDB-2
Summary of Routine Maintenance Activities

Maintenance Activity	Minimum Frequency	Issues to Look For	Maintenance Action
Mowing	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 4 to 6 inches
Trash/Debris Removal	Twice Annually	Trash & debris in EDB	Remove and dispose of trash and debris
Forebay/Trickle Channel/Micropool/Outlet Structure Cleaning	As needed after significant rain events – twice annually min.	Clogged features; ponding water	Remove and dispose of debris/trash/ sediment to allow outlet to function properly
Weed Control	Twice annually	Noxious weeds; unwanted vegetation	Treat w/ herbicide or hand pull (Consult local weed specialist)
Mosquito Treatment	As needed	Standing water/mosquito habitat	Treat w/ EPA approved chemicals
Algae Treatment	As needed	Standing water/Algal growth/green color	Treat w/ EPA approved chemicals

7.2 Minor Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance or operational problems. Most of this work can be completed by a small crew, tools, and small equipment. These items require prior correspondence with the City of Westminster and require inspection/maintenance forms to be submitted to the City. Contact the City of Westminster Community Development, Engineering Division at 303-658-2120.

TABLE EDB-3
Summary of Minor Maintenance Activities

Maintenance Activity	Minimum Frequency	Issues to Look For	Maintenance Action
Sediment Removal	As needed; typically every 1-2 years	Sediment build-up/decrease in pond volume.	Remove and dispose of sediment
Erosion Repair	As needed based upon inspection	Rills/gullies forming on side slopes, trickle channel, & other areas	Repair eroded areas, revegetate & address source of erosion
Vegetation Removal/ Tree Thinning	As needed based upon inspection	Large trees/wood vegetation in lower area of pond	Remove vegetation & restore grade and surface
Dain Cleaning/ Jet Vac	As needed based upon inspection	Sediment build-up/non-draining system	Clean drains/ Jet Vac areas if needed

7.3 Major Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater facilities. All of this work requires consultation with the City of Westminster to ensure the proper maintenance is performed. This work requires that the Engineering Staff review the original design and construction drawings to assess the situation and determine the necessary maintenance. This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants.

TABLE EDB-4
Summary of Major Maintenance Activities

Maintenance Activity	Minimum Frequency	Issues to Look For	Maintenance Action
Major Sediment Removal	As needed based upon inspections	Large quantities of sediment/ reduced pond capacity	Remove and dispose of sediment & repair vegetation as needed

Maintenance Activity	Minimum Frequency	Issues to Look For	Maintenance Action
Major Erosion Repair	As needed based upon inspections	Severe erosion including gullies, excessive soil displacement, & areas of settlement/holes	Repair erosion, determine cause, and address to avoid future erosion
Structural Repair	As needed based on inspections	Deterioration and/or damage to structural components – broken concrete, damaged pipes, outlet structure	Structural repair to restore the structure to its original design

APPENDIX A

Extended Detention Basin Construction/Maintenance Plan

(NOTE: Add Plans. Don't need to include this page**)**

Plan and Profile Sheet shall include:

- ☐ Location and labels for all major features of EDB (inflow structure(s), forebay, micropool, trickle channel, access road, outlet structure (works), spillway, maintenance access ramps, embankment, etc.)
- ☐ Contours
- ☐ Area or boundary of responsibility if an agreement is in place. Include agreement documents as an attachment.
- ☐ Other utilities in vicinity of EDB
- ☐ Total mow area including approximate mow boundaries on each side of EDB.
- ☐ Cross-reference to EDB Operation and Maintenance Detail Sheets
- ☐ Linework and legend for right-of-way lines, lot lines, easements, tracts
- ☐ Hatch indicting permanent water elevation in micropool

Profile view shall include:

- ☐ Location and labels for all major features of EDB (inflow structure(s), forebay, micropool, trickle channel, access road, outlet work(s), spillway, maintenance access ramps, embankment, etc.)
- ☐ Invert elevations at major features of EDB (inflow structure(s), forebay, micropool, outlet work(s)
- ☐ Permanent pool elevation of micropool
- ☐ Water quality water surface elevation
- ☐ Water surface elevation of all applicable storm events

Detail Sheet shall include:

- ☐ Volume provided by the EDB forebay and micropool, including the WQCV
- ☐ WQCV drain time
- ☐ Seed mix
- ☐ Duplicate the following tables from the Operation and Maintenance Manual document:
    - TABLE EDB-1 – Typical Inspection and Maintenance Requirements Matrix
    - TABLE EDB-2 – Summary of Routine Maintenance Activities
    - TABLE EDB-3 – Summary of Minor Maintenance Activities
    - TABLE EDB-4 – Summary of Major Maintenance Activities
- ☐ Water quality outlet works detail, including water quality plate detail
- ☐ Maintenance access road detail
- ☐ Trickle channel typical section
- ☐ Forebay edge detail (or cross section) which includes maximum allowed sediment depth in forebay
- ☐ Forebay release structure detail
- ☐ Spillway detail(s) including cutoff wall