Stormwater Operations and Maintenance Guide

Extended Detention Basins

Introduction

Extended Detention Basins (EDBs) detain and slowly release stormwater runoff in a controlled manner. Detention Ponds, as they are sometimes called, are designed to release the detained stormwater over a 2-to-3-day period to allow time for pollutants to settle out on the bottom of the pond. Often these features are also designed to reduce peak stormwater runoff rates by providing storage during large storm events in an effort to prevent flooding and provide public safety.

Detention Pond Components

EDBs have several components that each serve a special function and have different inspection and maintenance needs. EDB components include:

Inflow point (inlets)

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

Forebays

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.

Trickle Channels

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.

Micropools

The micropool is a small area of standing water (about 2 to 3 feet deep) just 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 an EDB where standing water is not a problem. Note that not all EDBs have micropools.

Outlet Structure

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

Spillway (Weir/Overflow)

The spillway is a part of the pond that is lower than the rest of the embankments, usually with a concrete weir, through which flood waters pass in an emergency.

Engineering details are only a representation of feature design and may not officially be accepted as City of Thornton standard details.

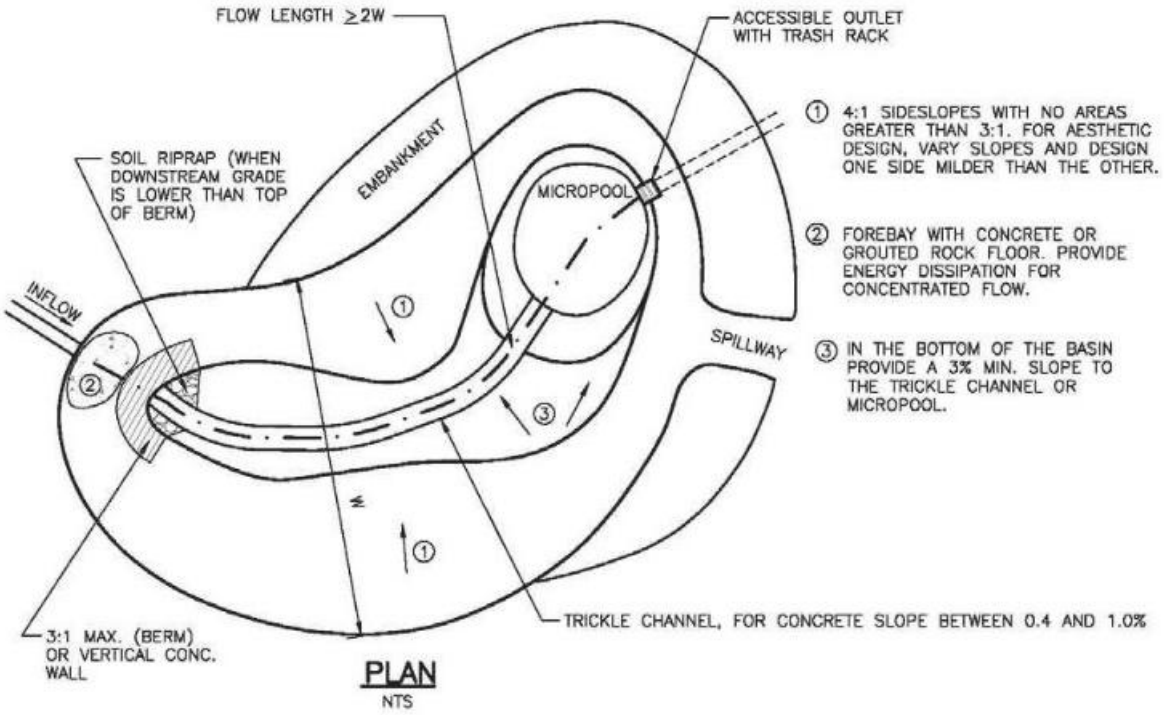

Figure EDB-3 Extended detention basin

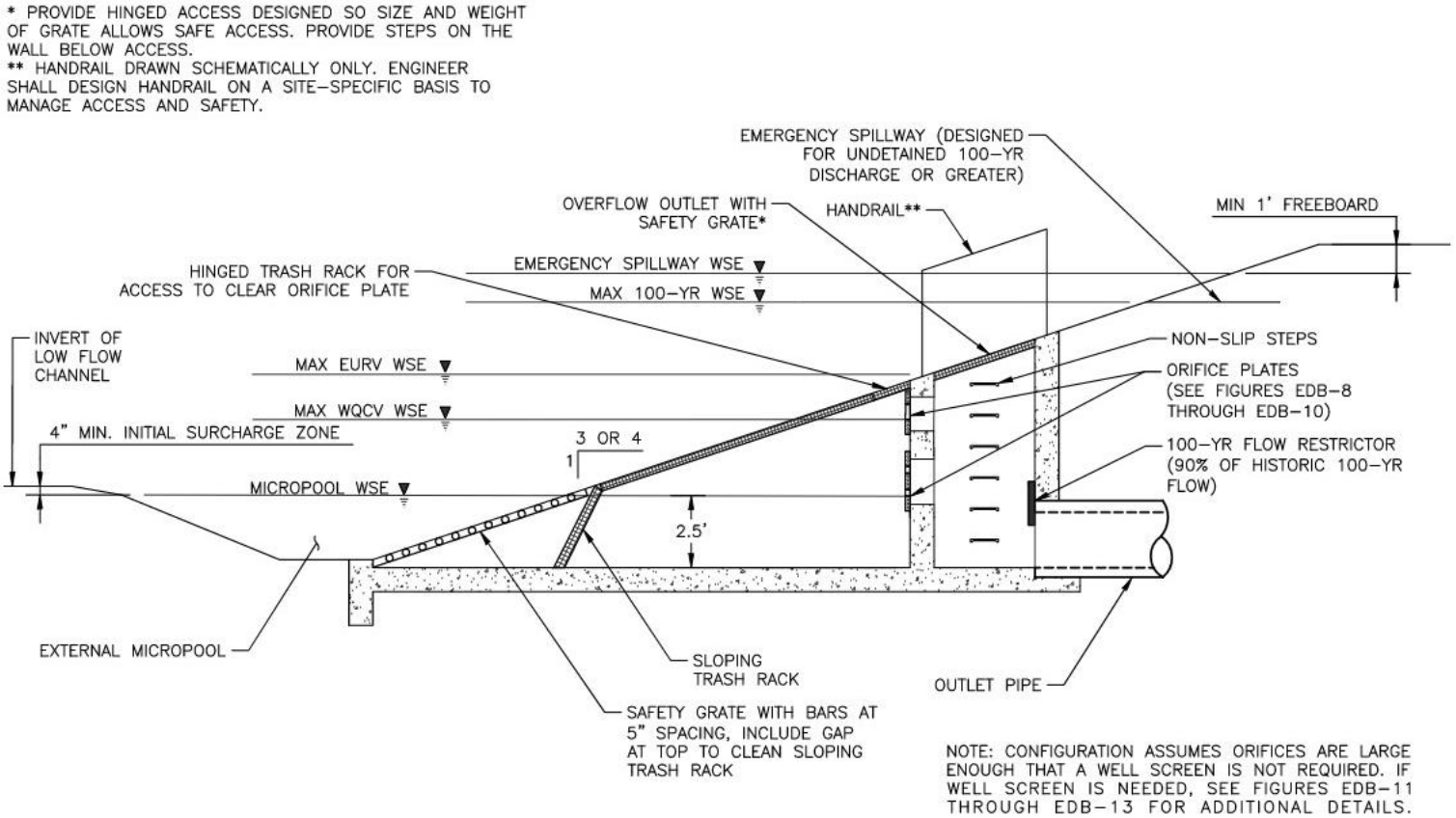

Figure EDB-5 outlet structure for full spectrum detention with external micropool & sloping trash rack section view (not to scale)

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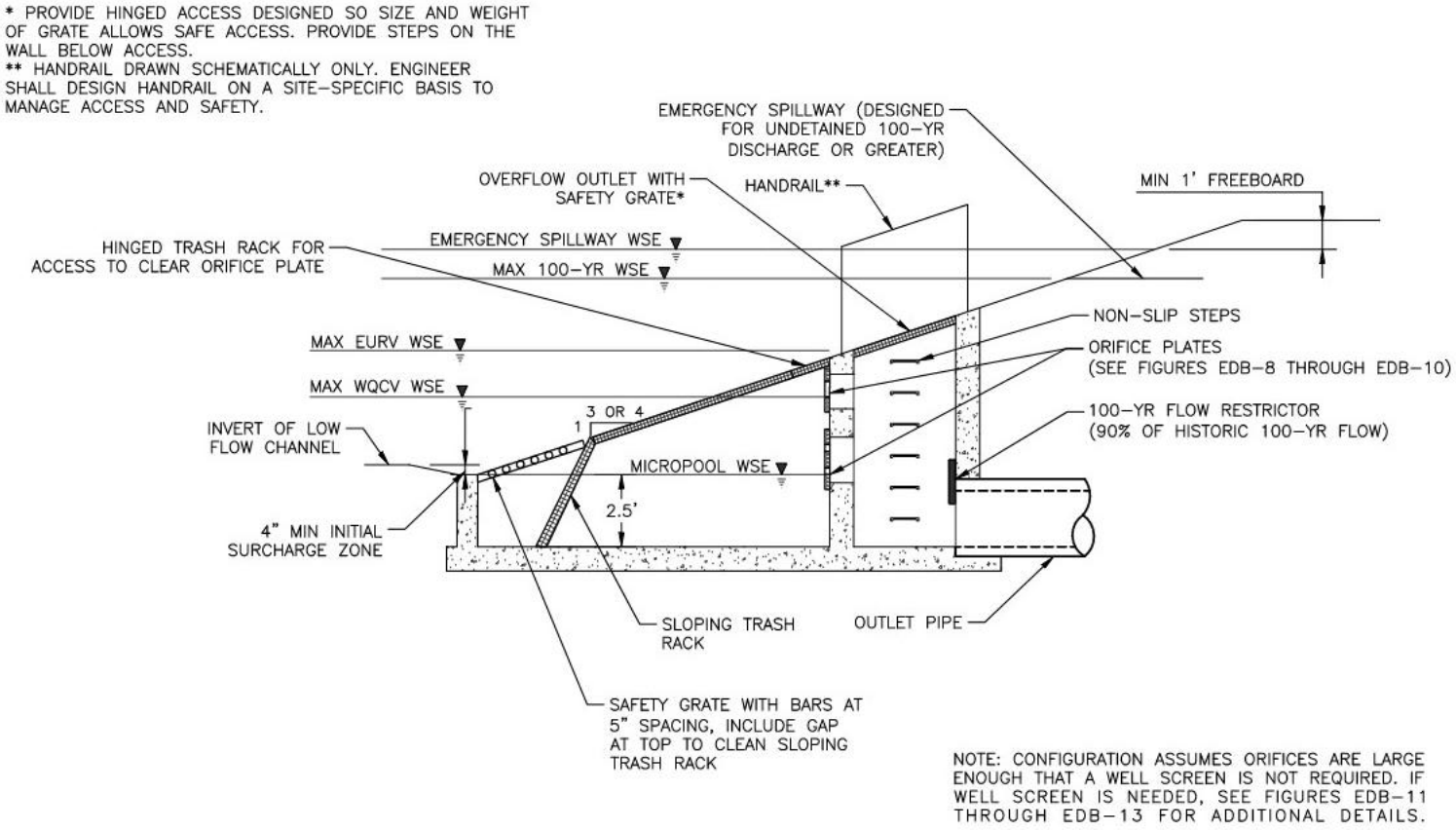

Figure EDB-6 outlet structure for full spectrum detention with internal micropool & sloping trash rack section view (not to scale)

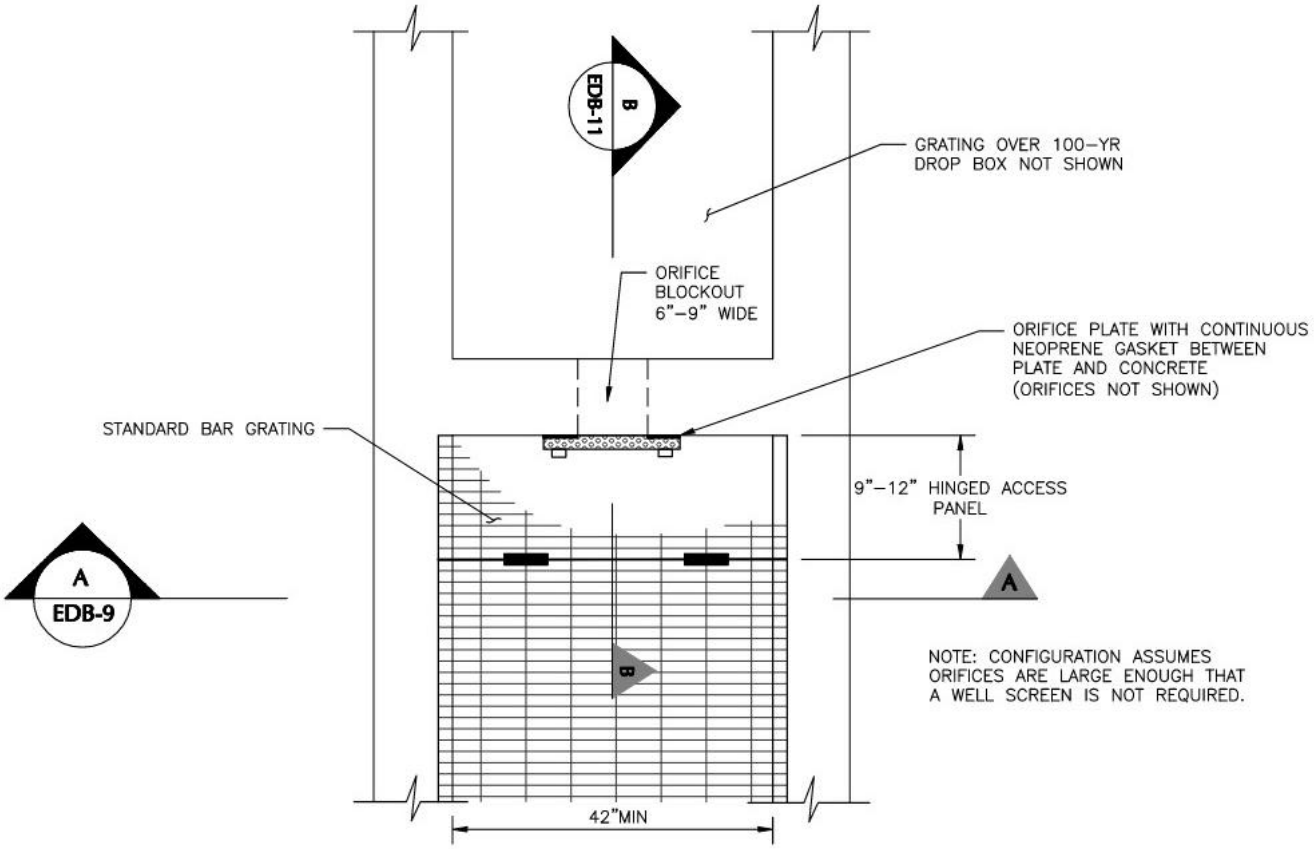

Figure EDB-8 Conceptual plan view of orifice plates with standard bar grating plan view (not to scale)

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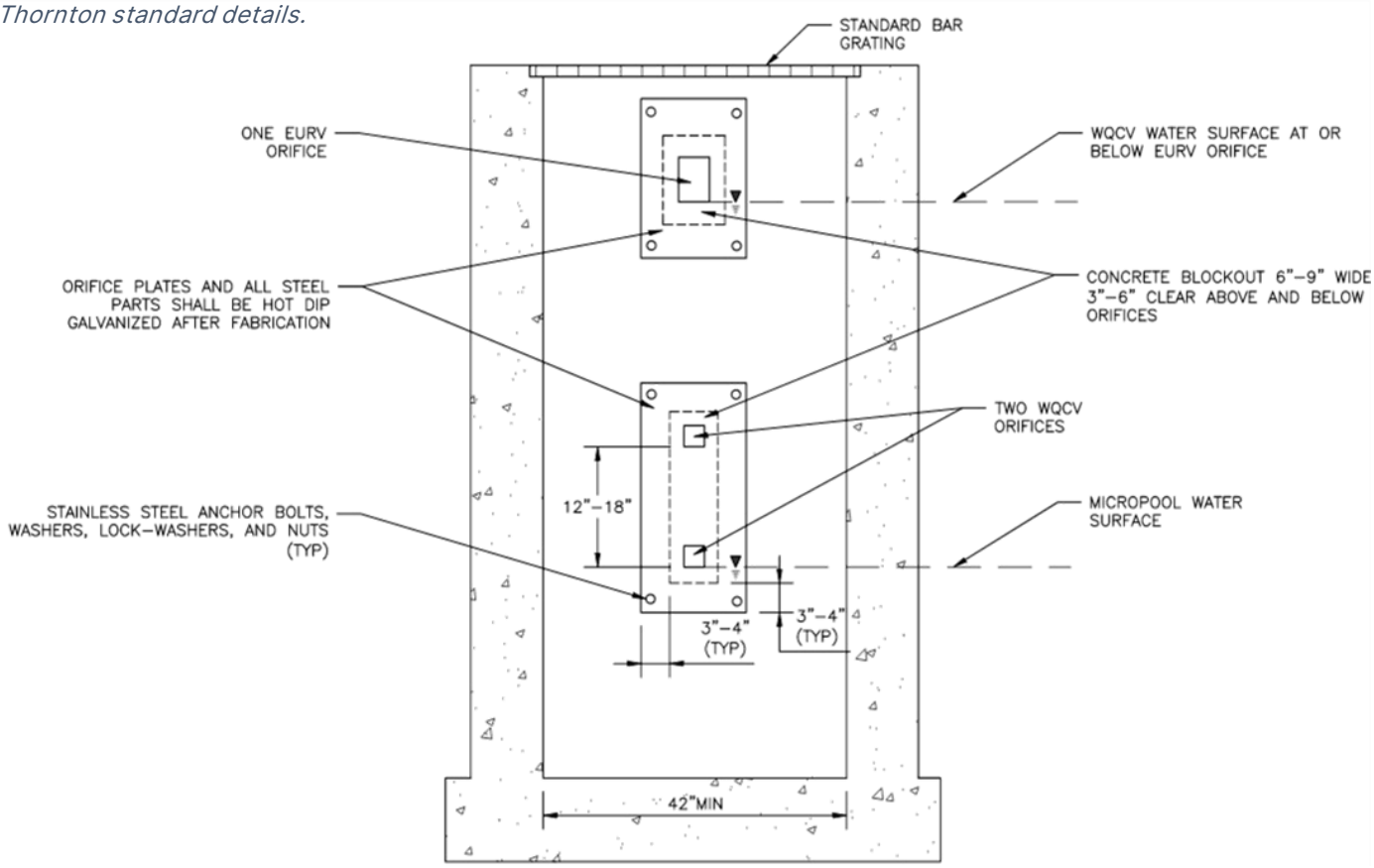

Figure EDB-9 conceptual front view of orifice plates with standard bar grating – section A section view (not to scale)

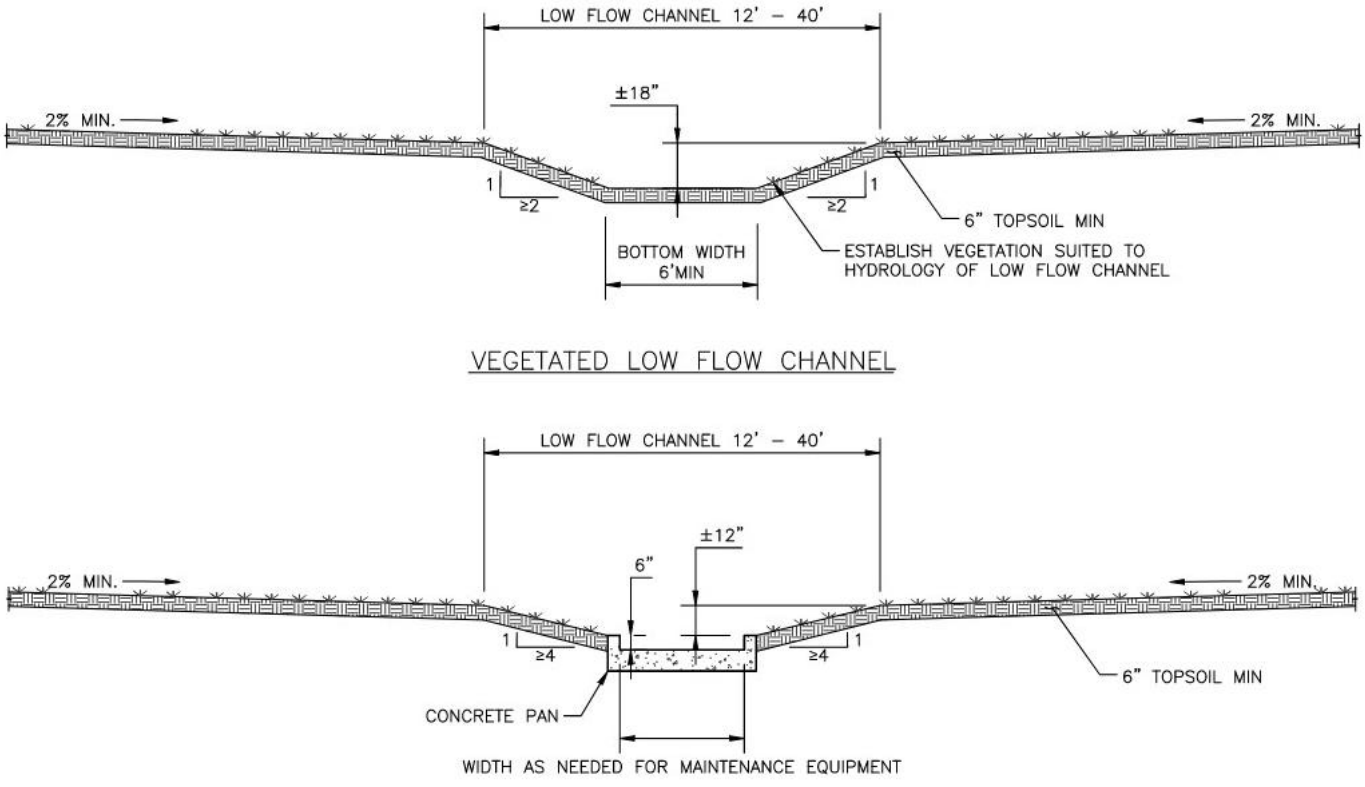

Figure EDB-2 conceptual cross sections for low flow channel with and without concrete pan section view (not to scale)

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Figure EDB-1, extended detention basin components

1. *Inlet*
2. *Energy dissipation*
3. *Forebay*
4. *Low flow channel*
5. *Initial surcharge volume*
6. *Micropool (internal micropool shown)*
7. *Outlet structure*
8. *Emergency spillway*

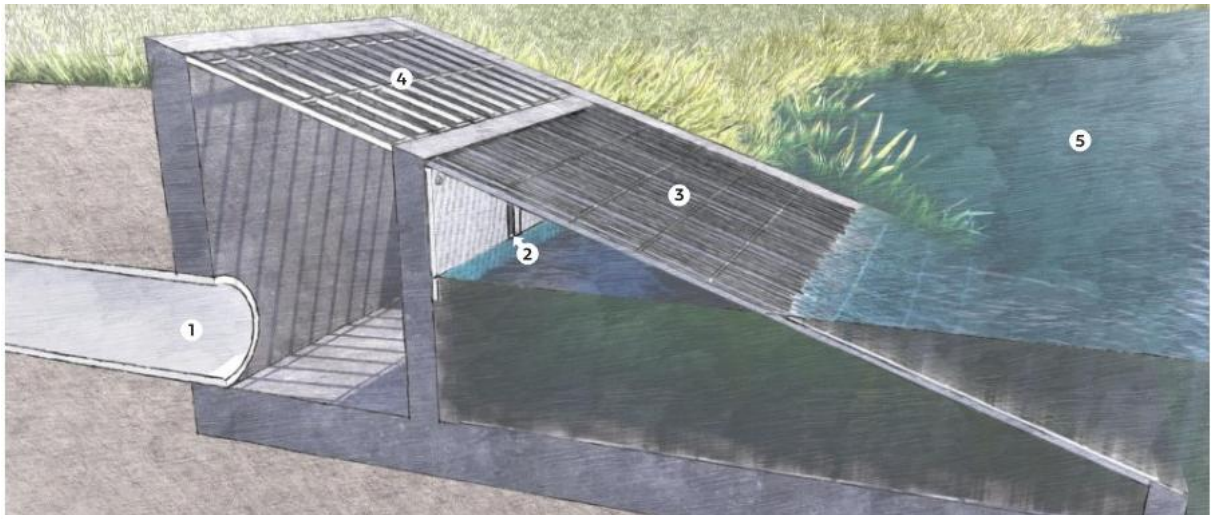

Figure 4-16 Conceptual outlet configuration for retention pond/constructed wetland basin

1. *Outlet pipe*
2. *Orifice*
3. *Trash rack*
4. *Safety grate*
5. *Constructed wetland/retention pond*

Inspections

Inspect the Extended Detention Basin (Detention Pond) at least twice annually, observing the amount of sediment in the forebay and checking for debris at the outlet structure.

Sediment/Trash/Debris Removal

Inflow Points/Forebays

Ensure the Inflow Points (Inlets) are kept clear of sediment and debris and remove excess vegetation which will inhibit flows entering the pond. Also remove any larger bushes or trees growing directly on or next to Inlets as they will cause damage over time. For ponds with Forebays attached to the Inflow Points, remove collected sediment and trash at least biannually.

Acceptable: Clean inlet after proper maintenance

Not acceptable: Inlet with sediment, trash and other debris that needs to be removed.

Acceptable: Clean forebay in working condition after recent maintenance. A small amount of sediment is noticeable from a recent storm, but there is no trash or other debris present.

Not acceptable: Forebay with excess sediment that needs to be removed. Vegetation growing in the forebay is a typical sign that maintenance is needed.

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Trickle Channels

Keep trickle channels clear of sediment and debris to avoid clogging and overtopping. Remove any larger bushes or trees growing directly on or next to the channel as they cause damage over time. Also identify places where water has overtopped or bypassed the channel and backfill as needed to avoid long term damage. Work should take place at least biannually.

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

Not acceptable: 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.

Micropool

Sediment removal from the micropool is required about once every one to four years and should occur when the depth of the pool has been reduced to approximately 18 inches. Small micropools may be vacuumed and larger pools may need to be pumped in order to remove all sediment from the micropool bottom. Removing sediment from the micropool will benefit mosquito control. Ensure that the sediment is disposed of properly and not placed elsewhere in the basin.

Acceptable: Using a vacuum truck to remove sediment from the micropool

Outlet Structure

The Outlet Structure Well Screen or Trash Grate should be scraped clean of debris more frequently, potentially with each mowing or large storm event. Keeping the Screen or Grate clear is the most critical part of ensuring the pond performs properly and does not hold back water longer than intended.

Acceptable: Cleaning the well screen gently using a garden rake

Not acceptable: Well screen that is clogged with debris. Maintenance is required to prevent standing water.

Acceptable: Picture of a well-maintained outlet structure

Not acceptable: Sediment, debris and vegetation built up in front of outlet structure

Mowing

When starting from seed, mow native/drought tolerant grasses only when required to deter weeds during the first three years. Following this period, mowing of native/drought tolerant grass may stop or be reduced to maintain a height of no less than 6 inches (higher mowing heights are associated with deeper roots and greater drought tolerance). In general, mowing should be done as needed to maintain appropriate height and control weeds. Mowing of manicured grasses may vary from as frequently as weekly during the summer, to no mowing during the winter. Best Practice with mowing is to ensure that clippings are not left blocking or clogging components of the detention pond.

Ideal vegetative coverage and length in a detention basin

Revegetation

If at any point vegetation in the feature should die off, ensure areas of concern are revegetated. If die off occurred due to standing water drowning out vegetation, the revegetation process would take place after any clogs are removed from the feature to allow water to return to normal levels. Revegetation may involve seeding and amending the soil to promote growth and should involve some form of top cover such as mulch or erosion blankets to protect seed/sprouts.

Not acceptable: Vegetative die off due to drowning from a plugged system.

Acceptable: Through unclogging the system and a process of reseeding, amending and mulching, vegetation as begun coming back in.

Mosquito Control

Although the design provided in this manual implements practices specifically developed to deter mosquito breeding, some level of mosquito control may be necessary if the BMP is located in close proximity to outdoor amenities. The most effective mosquito control programs include weekly inspection for signs of mosquito breeding with treatment provided when breeding is found. These inspections can be performed by a mosquito control service and typically start in mid-May and extend to mid-September. Treatment should be targeted toward mosquito larvae. Mosquitoes are more difficult to control when they are adults. This typically requires neighborhood fogging with insecticide. The use of larvicidal briquettes or "dunks" may be appropriate. These are typically effective for about one month and perform best when the basin has a hard bottom (e.g., concrete lined micropool). In general, ensure pond maintenance to avoid 6” or shallower pools of water which mosquitos breed in.

Not acceptable: Presence of mosquito larvae in a waterbody

Summary of Extended Detention Basin (EDB) Maintenance Activities

Mowing

- Frequency: twice annually
- Look for: excessive grass height/aesthetics
- Action: no less than 6-inch grass height

Trash/debris removal

- Frequency: twice annually
- Look for: trash and debris in EDB
- Action: remove and dispose of trash and debris

Forebay/Trickle Channel/Micropool/Outlet Structure Cleaning

- Frequency: as needed after significant rain events; minimum of twice annually
- Look for: clogged features; ponding water
- Action: remove and dispose of debris/trash/sediment to allow outlet to function properly

Weed control

- Frequency: twice annually
- Look for: noxious weeds; unwanted vegetation
- Action: treat with herbicide or hand-pull (consult local weed specialist)

Erosion repair

- Frequency: as needed based upon inspection
- Look for: rills/gullies forming on side slopes, trickle channel, and other areas
- Action: Repair eroded areas, revegetate and address source of erosion

Drain cleaning/jet vac

- Frequency: as needed based upon inspection
- Look for: sediment build-up/non-draining system
- Action: Clean drains/jet vac areas if needed

Major sediment removal

- Frequency: as needed based upon inspections
- Look for: large quantities of sediment/ reduced pond capacity
- Action: Remove and dispose of sediment and repair vegetation or replace sand as needed

Structural repair

- Frequency: as needed based on inspections
- Look for: deterioration and/or damage to structural components such as broken concrete, damaged pipes, outlet structure
- Action: Structural repair to restore the structure to its original design

Mosquito treatment

- Frequency: As needed
- Look for: Standing water/mosquito habitat
- Action: Treat with EPA approved chemicals

Algae treatment

- Frequency: As needed
- Look for: Standing water/algal growth/green color
- Action: Treat with EPA approved chemicals

Vegetation removal/tree thinning

- Frequency: As needed based upon inspection
- Look for: Large trees/wood vegetations in lower area of pond
- Action: Remove vegetation and restore grade and surface

Stormwater Quality Feature Inspection Checklist

Feature: _____ Date: _____

Inspected by: _____

Type of Inspection: ☐ Routine ☐ Storm Event _____ (# of days since event)

General Observations:

- Is water flowing?
- Standing water (more than 48 hours after the last storm event)?
    - Depth:
- Any evidence of obstructions or erosion in vicinity of the feature that could affect performance?

General Conditions:

- Do the feature sides/slopes/bottom show signs of settling, cracking, sloughing or other problems?
- Do the embankments, emergency spillway (if applicable), or side slopes show any erosion or instability?
- Is there any evidence of animal burrowing or other activity that could contribute to instability or increased erosion?
- Is there evidence of encroachment into or improper use of the feature?
- Do vegetated areas need mowing or thinning i.e. grass, cattails, willows, trees etc.?
- Are there areas that need to be re-vegetated?
- Is there general accumulation of trash, debris and/or litter to be removed around the feature?
- Any signs of vandalism or other activity that could affect performance of the feature?
- Unusual Algae blooms? (May signal too many nutrients in runoff; identify dog activity and clippings management)

Structural Conditions:

- Are the pipes/inlets going into or out of the feature clogged or obstructed?
- If applicable are concrete trickle channels in the feature clogged, undercut or damaged? (Detention Ponds)
- If applicable is the filter media evenly distributed and unclogged? (Rain Gardens, Sand Filters, etc.)
- If applicable is the underdrain clear of sediment or debris; as viewed through inspection port? (Rain Gardens, Sand Filters, Underground features)
- If applicable is there debris or other obstructions directly in front of or inside the Outlet Structure/Overflow?
- If applicable is the orifice and/or trash rack obstructed? (Detention Ponds)
- Is there any structural damage to the outlet structure?
- Do any safety features, such as fences, gates or locks need repair or replacement?
- If applicable, do the Stormwater Educational Signage features need cleaning or repair?

Overall Feature Condition

☐ Feature has numerous or severe issues which could impact water quality or public safety and needs immediate repair.
☐ Feature has minor issues and needs maintenance.
☐ Feature has no issues of note.

Notes: