

Green Stormwater Infrastructure (GSI) Maintenance Field Guide Annual C.3 Workshop

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Environmental Services



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to improve our health, environment, and economy.

MAINTENANCE FIELD GUIDE DEVELOPMENT

Establish city-wide Maintenance Standards and Guidelines

HOW:

- Interdepartmental Working Group
 - Key take-away: picture-centric guide
- Stormwater Operations and Maintenance Inspection Group
- User input throughout



GSI MAINTENANCE FIELD GUIDE SECTIONS

1. Overview
2. Site Visit Preparation
3. Maintenance Standards
4. Maintenance Guidelines
5. Additional Resources



PURPOSE

Maintenance Standards

Trash & Debris



4 Excellent Condition

- » No trash or debris
- » Unobstructed inlets, outlets, and overflow structures
- » Regular trash and debris removal maintenance scheduled



3 Good Condition

- » Minor trash or debris
- » Regular trash and debris removal maintenance scheduled
- » Unobstructed inlets, outlets, and overflow structures



2 Moderate Condition

- » Moderate trash or debris
- » Existing trash removal schedule but increased frequency needed
- » One or more partially obstructed inlets, outlets, and/or overflow structures



1 Poor Condition

- » Significant trash or debris, requires immediate trash removal
- » Ineffective or nonexistent trash removal program
- » One or more fully obstructed inlets, outlets, and/or overflow structures

MAINTENANCE GUIDELINES

Bioretention, Flow-Through Planters, and Swales

Maintenance Guidelines for Trash & Debris

WHY IS REMOVING TRASH AND DEBRIS IMPORTANT?

Trash and debris can inhibit the flow of water through the bioretention planter and diminish treatment, aesthetics, and performance. Clogging of the surface will reduce infiltration and cause more water to bypass. Debris can also obstruct the inlets and outlet of the system causing flooding of the system and/or upstream areas.

MAINTENANCE TASKS

- » Remove by gloved hand, with a litter stick, or with a rake and a shovel during every site visit.
- » Be aware of sharp objects like needles and glass and wear appropriate personal protective equipment (PPE) when handling hazardous objects.
- » Place trash in designated receptacle. May use tarps to collect trash and debris.
- » Place vegetative debris in a compostable bag, tarp, bucket, or other receptacle and dispose of properly as green waste.
- » Rake leaves from around the facility, especially in the fall when leaves can quickly clog inlets, outlets, and overflow structures.
- » Provide garbage receptacle and ashtrays around treatment areas and facility common areas as needed.



WHAT TO DO:



SUGGESTED TOOLS

- » Dustpan and brush
- » Compostable garbage bags
- » Gloves
- » Manhole cover hook or lifter (for opening grates)
- » Push broom
- » Rakes (bow, hand, leaf, shrub, weed)
- » Shovels (drain, edging, flat, rounded, scoop)
- » Spade
- » Tarps/buckets/trash cans (to remove leaf litter/debris)
- » Litter stick
- » Wheelbarrow or push cart

WHAT NOT TO DO

- » Do not attempt to remove trash and debris with a vactor or excavator.
- » Do not dispose of leaf and plant litter in the bioretention planter.
- » Do not remove waste without PPE.
- » Limit walking within the treatment area to prevent overcompacting bioretention soil media.
- » Do not trample vegetation during routine maintenance activities.



WHAT NOT TO DO:



GSI TYPES



BIORETENTION AREA



TREE WELL FILTER



GREEN ROOFS



DETENTION BASIN



PERVIOUS PAVEMENT



INFILTRATION TRENCH



RAINWATER HARVESTING SYSTEMS

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DESIGN & USE

- Interactive and Quick Reference Guide
- Functions as a whole guide or as individual factsheet(s)
- Interconnected Maintenance Approach = **Cyclical Maintenance Approach!**



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COMPLETE MAINTENANCE INSPECTION CHECKLIST

MAINTENANCE INSPECTION CHECKLIST
Bioretention, Flow-through Planters, & Swales

Bioretention Planter Maintenance Inspection Checklist

How to Use This Form: Facility Maintenance Staff should perform maintenance inspections by following the checklist below. Refer to the "Bioretention Standards" section on pages 18-25 for guidance on condition assessments. For guidance on performing maintenance activities, refer to the "Bioretention Maintenance Guidance" section on pages 37-60.

Date & Time: _____ Project Name or Address: _____ Bioretention/Planter/Swale Serviced: _____

Supervisor Name: _____ Agency/Department or Entity Performing Inspection: _____

No. of staff at the facility: ____ Start Time: _____ End Time: _____ Latest Rainfall: 0 - 24 hrs 24 - 48 hrs 2 - 3 days > 3 days

Can you access the facility? Yes No If not, why? _____

Trash & Debris Removal

- Is trash or debris present in the treatment area? Y N N/A
- Are one or more inlets, outlets, or overflow structures obstructed?

Weeds

- Are weeds present in the treatment area? Y N N/A
- Are invasive plants present?
- Are weeds about to or currently going to seed?

Plant Health

- Are all plants healthy, thriving, and aesthetically pleasing? Y N N/A
- Are there signs of diseased or distressed plants in the treatment area?

Pruning, Trimming, Dead Heading, or Thinning

- Is the system well-manicured and properly pruned? Y N N/A
- Are plants over pruned or overgrown in the treatment area?

Plant Density

- Are plants overcrowded? Y N N/A
- Are there bare spots in the treatment area?
- Are plants obstructing one or more inlets, overflows, or irrigation system?

Mulch

- Is there full coverage of at least 3" of composted arbor mulch? Y N N/A
- Is the mulch free of sediment and not clumped together?

Cobble & Flow Dissipation

- Is appropriately sized cobble placed at all inlets, outlets, and splash pads? Y N N/A
- Is the cobble free of sediment, debris and clogging?
- Are there signs of erosion at any inlets, outlets, or splash pads?

Comments / Actions Taken: _____

Erosion & Sedimentation

- Are there signs of erosion or sedimentation in the treatment area? Y N N/A
- Are the treatment area and adjacent areas protected from erosion?
- Are there signs of erosion at any inlets, outlets, or splash pads?
- Are there signs of channelization and scour, or loss of soil?

Standing Water & Vector Control

- Is all water drained from the treatment system within 72 hours from last rain? Y N N/A
- Is there evidence of mosquitoes in the treatment area?
- Is there evidence of rodent activity in the treatment area?

Structural Damage

- Is there structural damage to the treatment system? Y N N/A

Irrigation Malfunction

- Is the irrigation system functioning properly with no leaks, breaks, etc? Y N N/A
- Are all of the landscaped portions of the treatment area receiving proper irrigation?

Contamination

- Is there evidence of contamination in the treatment area? Y N N/A
- Are any Best Management Practices (BMPs) being implemented to prevent contamination?

Vandalism & Graffiti

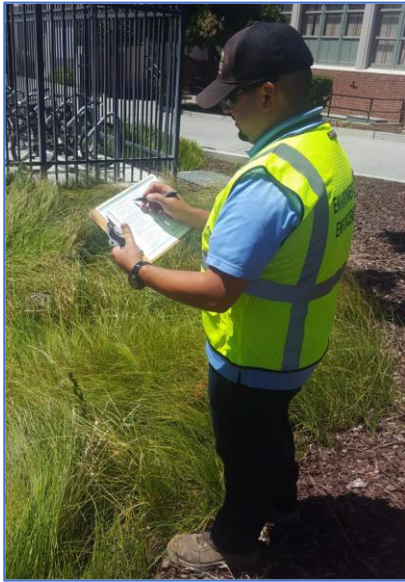
- Are there any signs of vandalism or graffiti? Y N N/A

Field Measurement/Materials Used

Amount of material (trash, debris, sediment) collected: Number of bags, pounds, or gallons/bag: _____

Materials/Tools Used: _____

MAINTENANCE APPROACH



Maintenance
Inspection
Checklist

Maintenance
Standards



Maintenance
Activities

Maintenance
Guidelines



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MAINTENANCE STANDARDS

- Level 4 = Excellent Condition
 - Continue or reduce maintenance frequency
- Level 3 = Good Condition
 - Schedule and continue maintenance at current level or increase to achieve Level 4
- Level 2 = Moderate Condition
 - Maintenance scheduled but increased maintenance frequency needed
- Level 1 = Poor Condition
 - Requires immediate maintenance and increased maintenance frequency needed
- (Dependent on Maintenance Standard for the Site and Consecutive Site Assessments)

GENERAL SAFETY CONSIDERATIONS AND TOOLS & EQUIPMENT

- Familiarize yourself with the project location and site conditions
- Determine and Be Aware of Safety Hazards
- Maintenance Inspection Checklists
- Camera
- GSI Specific Tools

SUGGESTED TOOLS

- » Dustpan and brush
- » Compostable garbage bags
- » Gloves
- » Manhole cover hook or lifter (for opening grates)
- » Push broom
- » Rakes (bow, hand, leaf, shrub, weed)
- » Shovels (drain, edging, flat, rounded, scoop)
- » Spade
- » Tarps/buckets/trash cans (to remove leaf litter/debris)
- » Litter stick
- » Wheelbarrow or push cart

INSPECTION AND MAINTENANCE PROCESS

EVERY SITE VISIT

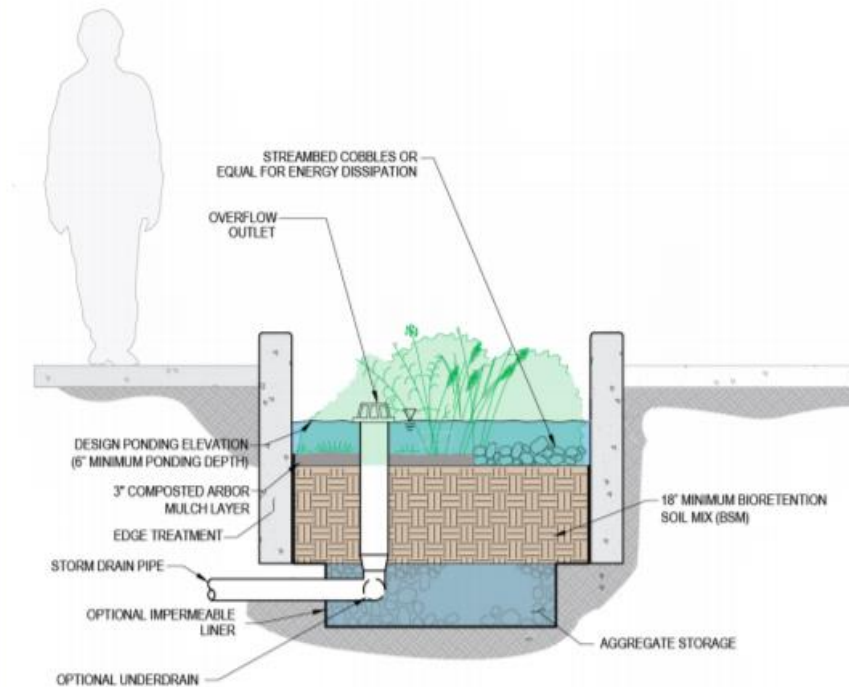
- › Initial site inspection
- › Trash and debris removal
- › Weeding

AS NEEDED

- › Inlets, outlets, and overflow structures cleared of obstructions
- › Erosion control and repair
- › Sediment removal
- › Mulching
- › Pruning or trimming vegetation
- › Plant replacement

DOCUMENT AND REPORT

- › Standing water (> 48 hours after most recent rainfall)
- › Structural damage to concrete/wood/metal elements
- › Severe erosion or sedimentation in the planter or drainage system
- › Oversized trash or debris that cannot be removed by hand
- › Irrigation leaks or evidence of other malfunction
- › Vandalism
- › Contamination



Typical Bioretention Planter At-Grade Section



MAINTENANCE CATEGORIES

Bioretention, Flow-Through Planters, and Swales

- TRASH AND DEBRIS
- WEEDS
- PLANT HEALTH
- PLANT DENSITY
- PRUNING
- MULCHING
- COBBLE & FLOW DISSIPATION
- EROSION & SEDIMENTATION
- STANDING WATER & VECTOR CONTROL
- STRUCTURAL DAMAGE
- IRRIGATION MALFUNCTION
- CONTAMINATION
- VANDALISM & GRAFFITI

MAINTENANCE STANDARDS

■ PLANT HEALTH:



4 Excellent Condition

- » All plants are healthy, thriving, and aesthetically pleasing



3 Good Condition

- » Less than 10% of plants are showing signs of distress
- » No dead plants



2 Moderate Condition

- » 10-25% of plants are distressed or dead



1 Poor Condition

- » Over 25% of plants are distressed or dead

MAINTENANCE GUIDELINES

Bioretention, Flow-Through Planters, and Swales

■ PLANT HEALTH:



MAINTENANCE STANDARDS

■ PLANT DENSITY:



4 Excellent Condition

- » 100% plant coverage at plant maturity*
- » Plants are appropriately spaced
- » No obstruction of inlets, overflow, or irrigation infrastructure

*Newly planted systems may not have full coverage, but must after plant establishment and maturity

3 Good Condition

- » At least 90% plant coverage at maturity*
- » Some sporadic bare spots present (0-10%)
- » Most plants are appropriately spaced
- » Partial obstruction of one or more inlet, overflow, or irrigation system

2 Moderate Condition

- » At least 50% plant coverage at maturity*
- » Moderate number of small bare spots with no large, continuous bare spots (10-20%)
- » Significant obstruction of one or more inlet, overflow, or irrigation system

1 Poor Condition

- » Less than 50% plant coverage at maturity*
- » Significant number of bare spots or large, continuous bare spots (More than 20%)
- » Full obstruction of one or more inlet, overflow, or irrigation system

MAINTENANCE GUIDELINES

Bioretention, Flow-Through Planters, and Swales

■ PLANT DENSITY:



MAINTENANCE STANDARDS

■ PRUNING:



4 Excellent Condition

- » All plants are well manicured, and properly pruned



3 Good Condition

- » Less than 25% of plants are overpruned or overgrown to the point that they obstruct inlets/outlets/water flow/line of sight.



2 Moderate Condition

- » 25–50% of plants are overpruned or overgrown.



1 Poor Condition

- » Over 50% of plants are overpruned or overgrown

MAINTENANCE GUIDELINES

Bioretention, Flow-Through Planters, and Swales

■ PRUNING:



MAINTENANCE STANDARDS

■ COBBLE AND FLOW:



4 Excellent Condition

- » Appropriately sized and placed, clean cobble, splash pads, or flow dissipaters

3 Good Condition

- » Still fully functional but showing signs of impacts, sedimentation, and clogging

2 Moderate Condition

- » Functioning poorly and are showing signs of impacts, sedimentation, and clogging

1 Poor Condition

- » Not functioning at all and heavily impacted by sediment, debris, or are clogged
- » Inappropriate or missing cobble, splash pad, or flow dissipaters

MAINTENANCE GUIDELINES

Bioretention, Flow-Through Planters, and Swales

■ COBBLE AND FLOW:



MAINTENANCE STANDARDS

■ WEEDS:



4 Excellent Condition

- » No weeds
- » Weed abatement plan in place

3 Good Condition

- » Sporadic weeds (under 5% coverage) with no invasive species present
- » Weeds have not gone to seed
- » Weed abatement plan in place

2 Moderate Condition

- » Moderate weed infestation (5-25% weed coverage)
- » Weeds have gone to seed
- » Lacking weed abatement plan

1 Poor Condition

- » Weed infestation covering 25% or more of the system and invasive species present
- » Weeds have gone to seed and new weeds have become established
- » Lacking weed abatement plan

MAINTENANCE GUIDELINES

Bioretention, Flow-Through Planters, and Swales

WEEDS:



COMMON WEEDS



BUR CLOVER

Description: Stems grow to 2 feet long and tend to trail along the ground but may grow upright. Leaves divide into three round leaflets, resembling those of a clover. Leaflets have serrated edges.

Removal: Grab at base and hand pull or use a trowel to get tap root completely (easy to remove, especially in soft soils).



CUTLEAF GERANIUM

Description: Remains prostrate in turf. Rosette with long-stalked leaves. Has a beak where flowers are growing.

Removal: Grab at base and hand pull or use a trowel to get tap root completely (easy to remove, especially in soft soils).



CATCHWEED BEDSTRAW

Description: Seed leaves are oblong with slightly notched tips. Mature bedstraw has 6-foot-long square stems. Forms dense mats that sprawl on the ground or over other vegetation. Leaves are whorled and have small hair-like structures. Small, four-parted, white or greenish-white flowers.

Removal: Pull gently from base if accessible to get entire root out (easy to remove, especially in soft soils).



DANDELION

Description: Seed leaves are oval and hairless. The first and next few leaves are football-shaped to oblong, taper at the base, and have weakly toothed edges.

Removal: Push leaves aside to get at base of plant, remove taproot completely (moderately easy to remove in soft soils but will regrow if any part of taproot remains).



RESOURCES

- [City of San Jose Stormwater Program - http://www.sanjoseca.gov/stormwater](http://www.sanjoseca.gov/stormwater)
- [South Bay Green Gardens - https://www.southbaygreengardens.org](https://www.southbaygreengardens.org)
- [Santa Clara Valley Urban Runoff Pollution Prevention Program - http://scvurppp-w2k.com/new_dev.shtml](http://scvurppp-w2k.com/new_dev.shtml)
- [ReScape California/Bay Friendly - https://rescapeca.org/](https://rescapeca.org/)
- [UC Master Gardeners - http://mgsantaclara.ucanr.edu](http://mgsantaclara.ucanr.edu)
- [CA Native Plant Society - https://calscape.org/](https://calscape.org/)



PILOT TRAINING AND NEXT STEPS



Outdoor Pilot Training at Roosevelt Park

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THANK YOU!



QUESTIONS?

Delivering world class utility services and programs to improve our health, environment, and economy.