

# APPENDIX Q

# **Stormwater Facility Maintenance Guide**



**CITY  
OF LACEY**

*Shaping Our Community Together*

After recording return document to:

City of Lacey  
Public Works  
420 College St. SE  
Lacey, WA 98509-3400

**Document Title:** Stormwater Maintenance Agreement (Commercial Individual)  
Chapter 3B of the *Stormwater Design Manual for Lacey* and Appendix  
'Q' of the *Development Guidelines & Public Works Standards*

**Owner(s)** (Last name first, then first name and initials):

1. \_\_\_\_
2. \_\_\_\_
3. Additional name(s) on page \_\_\_\_\_ of document.

**City:** City of Lacey

**Abbreviated Legal Description** (i.e. lot, block, plat or section, township, range):

\_\_\_\_\_  
\_\_\_\_\_

Actual legal is on page \_\_\_\_\_ of document.

**Assessor's Property Tax Parcel Number:** \_\_\_\_\_

**Section, Township, Range:** S \_\_\_\_\_, T \_\_\_\_\_ N, R \_\_\_\_\_, W.M.

**Fronting Street:** \_\_\_\_\_

**Cross Street:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Project HTE #:** \_\_\_\_\_

**COMMERCIAL AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO  
IMPLEMENT A POLLUTION SOURCE CONTROL PLAN**

**By and between the CITY OF LACEY, a Municipal Corporation, hereinafter called the CITY,  
and**

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**Their heirs, successors, or assigns, hereinafter called the OWNER,**

The upkeep and maintenance of stormwater facilities and the implementation of pollution source control best management practices (BMPs) is essential to the protection of water resources in the City's jurisdiction. All property owners are expected to conduct business in a manner that promotes environmental protection. This "Agreement" contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

**LEGAL DESCRIPTION:**

Whereas, the OWNER has constructed improvements, including but not limited to buildings, pavement, and stormwater facilities on the legally described above "Property". In order to further the goals of the CITY to ensure the protection and enhancement of the City's water resources, the CITY and the OWNER hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

The OWNER shall:

- 1) Implement the stormwater facility maintenance program included herein as Attachment "A".
- 2) Maintain a record, in the form of a log book, of steps taken to implement the programs referenced in (1) above. The log book shall be available for inspection by City staff at the OWNER'S residence during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-up on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The OWNER is encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

- 3) Submit an annual report to the CITY regarding implementation of the programs referenced in (1) above. The report must be submitted on or before August 15<sup>th</sup> of each calendar year and shall contain, at a minimum, the following:
  - a) Name, address, and telephone number of the association, businesses, persons, or the firm responsible for plan implementation, and the person completing the report.
  - b) Time period covered by the report.
  - c) A chronological summary of activities conducted to implement the programs referenced in (1) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with the OWNER, include a copy of the invoice for services.
  - d) An outline of planned activities for the next year.
- 4) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under items 3 above and shall be approved of by the CITY. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the CITY and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements and applications for permits.

THE CITY SHALL, AS RESOURCES ALLOW:

- 1) Provide technical assistance to the OWNER in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request at no charge to the OWNER.
- 2) Review the annual report and conduct occasional site visits to discuss performance and problems with the OWNER.
- 3) Review this Agreement with the OWNER and modify it as necessary.

## REMEDIES:

- 1) If the CITY determines that maintenance or repair work is required to be done to the stormwater facilities located on the OWNER's Property, the CITY shall give the OWNER of the Property notice of the specific maintenance and/or repair required. The CITY shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by the CITY, written notice will be sent to the persons who were given notice stating the CITY's intention to perform such maintenance and bill the OWNER for all incurred expenses. The CITY may also revoke stormwater utility rate credits (if applicable) if required maintenance is not performed.
- 2) If at any time the CITY determines that the existing system creates any imminent threat to public health or welfare, the CITY may take immediate measures to remedy said threat. However, the CITY shall also take reasonable steps to immediately notify either the Property Owner or the person in control of said Property of such imminent threat in order to enable such owner or person in control to take such immediate measures either independently or in cooperation with the CITY.
- 3) The OWNER hereby grants authority to the CITY for access to the stormwater system features, only for the purpose of performing maintenance, repair or inspection pursuant to the terms of this Agreement. The City is to be responsible, as provided by law, for any damage to the OWNER through its negligence in the construction, maintenance and operation of the stormwater facilities. Furthermore, the CITY agrees that: (a) any activities of the CITY on the Property shall not unreasonably interfere with OWNER's use of the Property; and (b) all work completed by the CITY pursuant to the rights granted hereunder shall be completed in a good and workmanlike manner and in accordance with all applicable laws, ordinances and codes.
- 4) Following any construction, installation, repair, replacement, improvement or reasonable enlargement of the capacity of the stormwater facilities, the CITY shall restore those portions of the Property affected by the CITY's construction, to the condition they were in immediately prior to such work, unless said work is at the express request of the OWNER, in which case the OWNER shall be responsible for restoration. All restoration that is the responsibility of CITY shall be performed as soon as reasonably possible following completion of any work, and shall be coordinated with OWNER so as to cause the minimum amount of disruption to the OWNER's use of the Property.
- 5) The City agrees to indemnify, defend, and hold harmless the OWNER from and against any and all liability incurred by the OWNER arising from or in any way related to the CITY's breach of any of its covenants, agreements, or obligations set forth in this Agreement, or from the CITY's negligence, intentional misconduct, or misuse of the stormwater facilities, but nothing herein shall require the CITY to indemnify the OWNER for that portion of any such liability attributable to the negligence of the OWNER.

- 6) The OWNER shall be responsible for the cost of maintenance and repair of the stormwater facility. Such responsibility shall include reimbursement to the CITY within 30 days of the receipt of an invoice for work performed by the CITY in maintaining or repairing such facility pursuant to the terms of this Agreement. Overdue payments will require the payment of interest at the current legal rate for liquidated judgements. The CITY shall have a lien for all unpaid charges together with such interest. However, notice of such lien shall not be filed by the CITY for a period of 60 days following mailing of the invoice for charges due. During such 60 days, the Property Owner or other person or agent in control of the Property shall have the right to appeal such charges to the CITY's Land Use Hearings Examiner for a final decision. Such appeal may challenge either the necessity of the maintenance or repairs performed by the CITY or the amount of the charges rendered for such maintenance or repair. Notice of such lien shall not be filed during the pendency of such appeal until final decision is rendered by the Land Use Hearings Examiner. The lien shall be foreclosed in the same manner specified by state statute for foreclosure of a mechanic's or materialman's lien. In any legal action to foreclose such lien or otherwise collect such charges, the prevailing party shall be entitled to an award for its attorney fees and costs incurred.

This Agreement is intended to protect the value and desirability of the Property described above and to benefit all the citizens of the CITY. This Agreement shall run with the land and be binding on all parties having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the CITY.

IN WITNESS WHEREOF, this instrument has been executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
(Grantor)

\_\_\_\_\_  
(Grantor)

**STATE OF WASHINGTON )**  
**) ss**  
**COUNTY OF THURSTON )**

On this day personally appeared before me \_\_\_\_\_, to me known to be the individual(s) described in and who executed the within and foregoing instrument, and acknowledged that \_\_\_\_\_ (he/she/they) signed the same as \_\_\_\_\_ (his/her/their) free and voluntary act and deed, for the uses and purposes herein mentioned.

GIVEN under my hand and official seal this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_.

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at \_\_\_\_\_  
My commission expires: \_\_\_\_\_



## Attachment “A”

### **What is Stormwater Runoff?**

When urban and suburban development covers the land with buildings, houses, streets and parking lots, much of the native topsoil, duff, trees, shrubs, and grass are replaced by asphalt and concrete. Rainfall that would have directly soaked into the ground instead stays on the surface as *stormwater runoff* making its way into storm drains (including man-made pipes, ditches, or swale networks), stormwater ponds, surface and groundwater, and eventually to Puget Sound.

### **What is a Storm Drain System and how does it work?**

The storm drain system for most developments includes components *that carry, store, cleanse, and release* the stormwater. These components work together to reduce the impacts of development on the environment. These impacts can include *flooding* which results in property damage and blocked emergency routes, *erosion* which can cause damage to salmon spawning habitat, and *pollution* which harms fish and/or drinking water supplies.

The storm drain system provides a safe method to carry stormwater to the treatment and storage areas. Swales and ponds filter pollutants from the stormwater by *physically* settling out particles, *chemically* binding pollutants to pond sediments, and *biologically* converting pollutants to less-harmful compounds. The ponds also store the treated water, releasing it gradually to a nearby stream or to groundwater. The various components of storm drain systems are described in the glossary.

### **What does Stormwater Runoff have to do with Water Quality?**

Stormwater runoff needs to be treated because it carries litter, oil, gasoline, fertilizers, pesticides, pet wastes, sediments, and anything else that can float, dissolve, or be swept along by the moving water. Left untreated, polluted stormwater can reach nearby waterways where it can harm and even kill aquatic life. It can also pollute groundwater to the extent that it must be treated before it can be used for drinking, which has actually happened in Pierce County. Nationally, stormwater is recognized as a major threat to water quality. Remember to keep everything out of stormwater systems except the rainwater they are designed to collect.

### **Your Stormwater Facility**

Stormwater facilities can be attractive as well as functional. They can provide both active and passive-use recreation areas and open space for wildlife. Perhaps you’ve noticed a wet or dry pond in your neighborhood. These different types of ponds are designed for different purposes. For example, wet ponds primarily provide treatment of stormwater. They also provide good cover and habitat for birds and small mammals, making them fine “wildlife preserves”. Dry ponds or infiltration ponds are designed to provide storage for stormwater and gradually release it downstream or allow it to filter into the ground. These types of ponds can be maintained as grassy play areas, and may even be modified to house more formal play equipment.

### **Who is Responsible for Maintaining Stormwater Facilities?**

All stormwater facilities need to be maintained. Regular maintenance ensures proper functioning and keeps the facility visually appealing. This Stormwater Facility Maintenance Guide was designed to help explain how stormwater facilities work and provide user-friendly, straightforward guidance on how to maintain them.

As a property owner or homeowner’s association, you are responsible for regularly maintaining privately owned ponds, catch basins, pipes and other drainage facilities within your subdivision. The City of Lacey maintains stormwater facilities located in public right-of-ways.

## Maintenance Checklists

The checklists in this guide are for you to use when inspecting and maintaining the stormwater facilities that you are responsible for. If you feel that you are missing a particular checklist, or you have additional facilities not identified or addressed in this guide, please contact your site developer, design engineer or the City.

The checklists are in table format for ease of use and brevity. Each checklist tells you what part of the feature to check, how often to check, what to check for and the desired outcome after maintenance is performed. Log sheets are included to help you keep track of when you last surveyed the stormwater drainage system.

Those systems using approved “emerging technologies”, such as a StormFilter™, may not find a checklist covering the specific stormwater facility. Please refer to the manufacturer’s guidelines for the appropriate maintenance activity schedule. If a checklist is provided, it is for guidance purposes only and not meant to supersede the manufacturer’s recommendations.

Although it is not intended for the inspection to involve anything too difficult or strenuous, there are a few tools that will make the job easier and safer. These tools include:

- Gloves
- A flashlight.
- A long pole or broom handle.
- Some kind of pry bar or lifting tool for pulling manhole and grate covers.
- Standard yard tools, such as a rake and a shovel.
- Measuring tool.

**SAFETY WARNING: For your safety and per OSHA regulations, you should never stick your head or any part of your body into a manhole or other type of confined space. When looking into a manhole or catch basin, stand above it and use the flashlight to help you see. Use a pole or broom handle that is long enough when you are checking sediment depths in confined spaces. NO PART OF YOUR BODY SHOULD BREAK THE PLANE OF THE OPEN HOLE.**

## Checklist Instructions

The following pages contain maintenance checklists covering most of the needs for the components of your drainage system, as well as for some components that you may not have. Let City staff know if there are any components of your drainage system that you do not recognize or are missing from these pages.

Refer to the City of Lacey Stormwater Code, LMC 14.25 for additional stormwater maintenance requirements, including maintenance frequency.

Using photocopies of these checklists and the log sheet, check off the problems that you look for each time you do an inspection. Add comments regarding problems found and actions taken on the log sheet. Keep the completed forms in your files for future reference.

You may call the City of Lacey at (360) 491-5600 for technical guidance. Please do not hesitate to call, especially if you are unsure whether a situation you have discovered may be a problem.

You should plan to complete a check for all system components on the following schedule:

- **Quarterly** - Plan to inspect the facility at least once during the following months; January, May, August, and November.
- **Annually** - The best time for an annual inspection is in the late summer, preferably September.
- **After Storms** - Also check all stormwater facilities after major storm events, defined as about 1 inch or more of precipitation in 24 hours.

## Resource Listing

If you are unsure whether a problem exists, please contact the City at the number below and ask for technical assistance with your situation. Other resources are listed for your convenience and as references associated with the checklists.

### Lacey Public Works Department

(360) 491-5600 <http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>

### City of Lacey Spill Response Team

(360) 491-5644 <http://ci.lacey.wa.us/report-a-spill>

### Thurston County Environmental Health

Hazardous Waste Disposal (oil, paint, pesticides, etc.)

(360) 754-4111 <http://www.co.thurston.wa.us/health/ehhw/index>

Solid Waste Disposal (yard waste, construction waste, contaminated soils, etc.)

(360) 786-5136 <http://www.co.thurston.wa.us/health/ehhw/index>

### WSU Thurston Co. Extension (Water Resource Ed. Programs, Envir. Stewardship info.)

(360) 786-5445 <http://www.thurston.wsu.edu/water>



## Stormwater Facility Inspection and Maintenance Procedure

Stormwater facilities play an important role in managing the 4 feet of rainfall we receive in Lacey in an average year. The term “stormwater facility” refers to any landscaped or structural feature that collects, conveys, cleans or infiltrates runoff water. There are many types of stormwater facilities, ranging from simple swales and ponds to more complicated filter systems and flow control devices. Your on-site stormwater facilities work together to control runoff water, reduce flooding, and prevent pollution.

Owners of commercial property, multifamily residential property, or single-family residential properties with privately-owned drainage and stormwater facilities are required by the City of Lacey Codes to maintain their facilities to established standards for full functionality (City of Lacey Stormwater Code, LMC 14.25). Facility owners are responsible for performing inspections of stormwater facilities, and for performing any maintenance identified by the inspections.

Basic maintenance work may be performed by the owner or property manager, although some tasks are best left to an experienced contractor. The inspection of stormwater facilities and any required maintenance work must be completed and reported annually to the City of Lacey Public Works Department by the date specified on the *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* obtainable on the City’s web site at:

<http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>.

Again, note that most large development sites will also have a Maintenance and Source Control Manual that was prepared as part of the site development, and should have been provided to the property owners. Look to your site’s Maintenance and Source Control Manual for information on the project, the facilities on the site, maintenance responsibilities, and maintenance activities.

Where a Maintenance and Source Control Manual is not available, the following steps are provided as general guidance:

### **Step 1. Identify**

The first step is facility identification, so you know what types of stormwater facilities you have. Look on the site plan of your property, and note the main facility types indicated (such as rain gardens and infiltration trenches), along with related drainage components (such as catch basins, pipes, and debris barriers). Locate the various facilities on the ground.

Note that most drainage systems consist of components for four main purposes: stormwater collection (e.g., catch basins), conveyance (e.g., pipes and swales), water quality treatment (e.g., wet ponds) and flow control (via infiltration and/or surface discharge).

To assist you in identifying components, refer to the definitions on the pages that follow.

## **Step 2. Inspect**

For all facility components that you have identified, conduct an inspection. You may conduct the inspection yourself and/or with co-owners, or you may use a property manager or vendor to perform the inspection. Refer to the following Stormwater Facility Maintenance Checklists, which describe the maintenance standards for each component, and also identify and describe defects and their remedies.

For each facility, note on the Inspection and Maintenance Checklist the condition of the facility (good, fair or poor), and any problems or other observations.

## **Step 3. Maintain**

For all facility components, if the inspection indicates maintenance is needed; have the work performed by competent personnel. Basic maintenance tasks may be performed by the property owner(s) or property manager, but difficult or potentially dangerous tasks should be performed by a qualified vendor. Be safe! Use caution when inspecting and working on or near facilities, and stay out of confined spaces such as catch basins and manholes.

Note the action taken and the date, and record this information on the Log Sheet. Mark the check boxes on the Inspection and Maintenance Checklist corresponding to the maintenance accomplished on each facility.

## **Step 4. Submit**

Submit the completed *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* by August 15 each year to: Lacey Water Resources, 420 College Street SE, Lacey, WA 98503. The completed checklist may be mailed, e-mailed (if available) or delivered in person to Lacey City Hall.

## **Common Stormwater Facilities: Identification and Actions**

*Note: General actions are described for each facility type below. Please refer to the Stormwater Facility Maintenance Standards for further details.*

### **Detention Pond:**

A shallow bowl-like depression in the land, with an area to collect and temporarily store stormwater. The pond is generally lined with grass and is intended to store stormwater to reduce runoff volumes during storms.

#### *Actions to keep detention ponds functioning:*

- Remove litter, sediment, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Inspect pond berms for any structural deficiencies

### Infiltration Basin (“Dry Pond”):

A shallow bowl-like depression in the land, with a broad, flat bottom area to collect, temporarily store, and infiltrate stormwater. An infiltration basin is designed to receive treated water and allow it to infiltrate into the soil. The infiltration basin is usually lined with grass and drains “dry” between rain events. Some playfields double as infiltration basins by design.

#### Actions to keep infiltration basins functioning:

- Remove litter, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Avoid activities within the basin that could cause erosion or soil compaction.
- Avoid using herbicides or pesticides within the basin area.
- Aerate the soil in the bottom area as needed to preserve and enhance infiltration.

### Biofiltration Swale:

A longitudinally sloped, wide, shallow, vegetation-lined channel with gently sloping sides and a flat bottom designed to remove pollutants by means of sedimentation, filtration, soil sorption, and/or plant uptake. Some water also infiltrates into the soil as it slowly flows along the swale.

#### Actions to keep swales functioning:

- Remove debris, litter, and flow obstructions from the swale.
- Mow the swale and maintain healthy grass cover.
  - Prevent dirt, rocks, and weeds from accumulating, but avoid use of herbicides (remove manually).
- Do not fill-in the swale with rocks, bark, etc.
- Aerate the soil to preserve infiltration capacity.

### Wet Pond:

A constructed pond with an impermeable liner to maintain a permanent pool of water, which provides for water quality treatment by settling and retention of sediment particles and other pollutants. The cleaner surface water is then conveyed to a nearby infiltration facility (such as a “dry detention pond”) or surface discharge. A wet pond provides a basic level of treatment, and is common in many neighborhoods.

#### Actions to keep wet ponds functioning:

- Remove litter and yard debris from within and around the pond.
- Check inflow and outflow systems. Remove any obstructions.
- Remove excess vegetation such as cattails from within the pond.
- Remove noxious weeds, but do not use herbicides (contact City for advice).

### Stormwater Wetland:

A created wetland with a permanent pool of water, similar to a wet pond, but generally shallower and with aquatic emergent plants which provide for a higher level of water quality treatment of collected stormwater through biological processes.

Actions to keep stormwater wetlands functioning:

- Remove litter and yard debris from within and around the wetland.
- Check inflow and outflow systems, and remove any obstructions.
- Remove excess vegetation such as cattails from within the wetland.
- Remove noxious weeds, but do not use herbicides (contact city for advice).

**Bioretention Cell:**

A shallow stormwater system with a designed soil mix and plants. Bioretention is a “low-impact development” (LID) practice that is integrated into a site to retain stormwater near its source. Bioretention cells are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. They also provide water quality treatment through sedimentation, filtration, adsorption, and phytoremediation. Bioretention cells function by storing stormwater as surface ponding before it filters through the underlying amended soil.

Actions to keep bioretention cells functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Rain Garden:**

Non-engineered, shallow, landscaped depressions with compost amended native soils and adapted plants that collect, absorb, and filter stormwater runoff from roof tops, driveways, patios, and other hard surfaces. Rain gardens are sized to pond and temporarily store stormwater runoff and allow stormwater to pass through the amended soil profile.

Actions to keep rain gardens functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Permeable Pavement:**

Permeable pavement (also known as pervious and porous pavement) looks very much like ordinary pavement but includes additional “void” spaces where water can pass through. After water drains through permeable pavement wearing course, it is held in a storage reservoir bed (made up of aggregate rock, or drain rock), and then infiltrates into the native soils.

Actions to keep permeable pavement functioning:

- Clean surface to remove trash, sediment, vegetation, and other accumulated debris.
- Check inflow and outflow systems and underdrains, and remove any obstructions.
- Use vacuum to remove fine sediments.

- If pavers are used, check for damaged or missing pavers and replace as needed.
- If paving grids are used, check for loss of soil, grass, and/or gravel material and replace as needed.

#### Downspout, Sheet Flow, and Concentrated Flow Dispersion:

A gravel trench or splashblock followed by a vegetated flowpath (or dispersion area) used to disperse flow and reduce runoff from impervious surfaces. Dispersion attenuates peak runoff flows by slowing the runoff entering into the conveyance system, allowing some infiltration, and providing some water quality benefits.

##### Actions to keep downspout, sheet flow, and concentrated flow dispersion functioning:

- Ensure that vegetation is not blocking flow, and perform plant maintenance as needed.
- Remove and replace dead vegetation to ensure that runoff is received in a well-vegetated area.
- Avoid activity in dispersion area to avoid compaction.
- Check for erosion of the dispersion trench or dispersal area and replace and restore gravel and/or soil.

#### Downspout Infiltration:

Includes an infiltration trench or drywell intended only for use in infiltrating runoff from roof surfaces. Infiltration trenches and drywells are backfilled with washed drain rock, allowing for temporary storage of stormwater runoff in the voids of the drain rock material. Stored runoff gradually infiltrates into the surrounding soil.

##### Actions to keep downspout infiltration functioning:

- Remove litter, leaves, debris, and obstructions from the infiltration trench or drywell.
- Stabilize adjacent landscaped areas to avoid runoff from eroding and mobilizing soil into the surface inlet.

#### Detention Tank:

An underground storage facility typically constructed with large diameter corrugated metal or HDPE pipe.

##### Actions to keep detention tanks functioning:

- Remove litter, leaves, debris, and obstructions from inlet and outlet.
- Check tank for cracks or leaks.
- Clean out any sediment or debris accumulated inside the tank.

#### Ditch:

A V-shaped channel, usually along the side of a road that collects and conveys runoff.

##### Actions to keep ditches functioning:

- Remove debris, litter and flow obstructions from the ditch.
- Do not fill-in the ditch – prevent dirt, rocks, and weeds from accumulating.
- Repair erosion on ditch side-slopes.

## Culvert:

A pipe that continues conveyance flow from a ditch or swale under the ground surface, typically under driveways and cross-streets. Usually connects (“daylights”) to another ditch, swale or pond. The end of a pipe or culvert is often surrounded by rock “riprap” to prevent soil erosion.

### Actions to keep culverts functioning:

- Remove debris, litter, and obstructions from the openings at the culvert ends.
- Remove soil, sod, and vegetation buildup from the culvert openings.
- Replace rock riprap at the culvert ends.
- Repair any damage to the culvert ends.

## Catch Basin:

An underground concrete box structure with a slotted metal grate on top that collects runoff water from the ground surface. Typically located within pavement in parking lots and in the street gutter, usually next to a curb. Grate on top lets water in and keeps larger debris out. Sediment settles in the sump in the bottom (below the pipe openings) and must be removed periodically. Catch basins have an outlet pipe between the grate and the sump, to let the cleaner water flow out to a storm pond or other location. Some catch basins have both inflow and outflow pipes, to convey collected runoff water through.

### Actions to keep catch basins functioning:

- Remove litter, leaves, debris, and obstructions from catch basin grates.
- Hire a professional to remove sediment buildup from sump, if road is privately owned.  
Catch basins in the public right-of-way are maintained by the City.

## Debris Barriers and Trash Racks:

A structural device with metal bars, to prevent debris from entering a pipe, spillway, or hydraulic structure.

### Actions to keep debris barriers and trash racks functioning:

- Remove trash, debris, vegetation, and dirt from around the structure.
- Check inflow and outflow, and remove any flow obstructions.
- Remove plants such as alder and willow that tend to grow near the pipe ends.
- Check for structural integrity; hire a professional to fix broken bars or racks.

# Stormwater Facility Maintenance Checklists

## Maintenance Standards

The following pages contain facility-specific maintenance standards, which are intended to be observable conditions for determining whether maintenance actions are required.

### Group 1: Flow Control and Treatment Facilities

- 1a Detention Ponds
- 1b Infiltration Ponds
- 1c Detention Tanks and Vaults
- 1d Wet Vaults
- 1e Wet Ponds
- 1f Stormwater Wetlands
- 1g Basic and Compost-Amended Biofiltration Swale
- 1h Wet and Continuous Inflow Biofiltration Swales
- 1i Filter Strip (Basic and CAVFS)
- 1j Sand Filter (above ground/open)
- 1k Sand Filter (below ground/closed)
- 1l Media Filter Drains
- 1m Bioretention Cells, Swales and Planter Boxes
- 1n Rain Gardens
- 1o Trees
- 1p Permeable Pavement
- 1q Vegetated Roofs
- 1r Downspout, Sheet Flow, Concentrated Flow Dispersion
- 1s Downspout Infiltration
- 1t Cisterns
- 1u Fencing, Shrubbery Screen, Other Landscaping
- 1v Manufactured Media Filters
- 1w Proprietary of Manufactured Products

**Group 2: Structure and Pretreatment**

- 2a Control Structures and Flow Restrictors
- 2b Catch Basins
- 2c Debris Barriers (trash racks)
- 2d Energy Dissipaters
- 2e Baffle Oil/Water Separators (API type)
- 2f Coalescing Plate Oil/Water Separators
- 2g Catch Basin Inserts

**Group 3: Miscellaneous Facilities and Features**

- 3a Conveyance Pipes, Culverts, Ditches and Swales
- 3b Access Roads and Easements

# **Group 1**

## ***Flow Control & Treatment***

## 1a. Detention Ponds

Detention ponds are earthen excavations that are “dry” except during and after rains, when they contain stormwater temporarily. Detention ponds store water while releasing it gradually.

Detention Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation according to applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111 and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with the Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility		Return facility to design function. ( <i>Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.</i> )	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove or remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Overgrown Vegetation Around Pond	Tree grown and dense vegetated impedes inspection, maintenance access or interferes with maintenance activity with the facility function or maintenance (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Prune or maintain trees and vegetation so they do not to hinder inspection or maintenance activities.  If trees are not interfering with access or maintenance, do not remove.	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Sediment Accumulation	Accumulated sediment that exceeds 10 percent of the designed pond depth unless otherwise specified or affects inlets or outlets of the facility.		Clean out sediment and aerate and/or re-seed the pond if deemed necessary to improve infiltration and control erosion.  <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	PVC Pond Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate), and the liner is not exposed. Maintenance is needed if liner is visible and has more than three 0.25-inch holes.		Repair or replace liner as needed. Liner is fully covered.	
	Clay Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate).		Repair or replace liner as needed.	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Emergency Overflow Spillway	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		<p>Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.</p> <p><i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i></p>	

## 1b. Infiltration Ponds, Trenches, and Galleries

Infiltration ponds, trenches, and galleries are earthen excavations or underground structures that are “dry” except during and after rains, when they contain stormwater temporarily. Infiltration ponds, trenches, and galleries store water while gradually percolating water into the ground.

Infiltration Ponds, Trenches, and Galleries					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>(Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.)</i>	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
	Tree Growth and Dense Vegetation	Tree growth and dense vegetation, which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Trees and vegetation do not hinder inspection or maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).	
Storage Area	Water Not Infiltrating	Check for water ponding in infiltration basin after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events. (Maintenance is required if a percolation test pit or test of facility indicates facility is only working at 90 percent of its designed capabilities, or if 2 inches or more sediment is present, remove).		Facility infiltrates as designed. Sediment is removed and/or facility is cleaned so that infiltration system works according to design.	
Filter Bags (if applicable)	Filled with Sediment and Debris	Maintenance is required if sediment and debris fill bag more than one-half full.		Replace filter bag or redesign system. Filter bag must be less than one-half full.	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.		Replace gravel in rock filter if needed. Water must flow through filter.	
Trenches	Observation Well (use surface of trench if well is not present)	Water ponds at surface during storm events. Less than 90 percent of design infiltration rate.		Remove and replace/clean rock and geomembrane.	
Galleries	Chambers	Check inlet and outlets and interior of chambers for deficiencies, cracks, debris, and sediment.		Remove any debris and sediment and replace or restore chambers as needed.	
		Exceeds 18 inches.		Mow grass or groundcover to a height no greater than 6 inches.	
		Bare spots.		Revegetate and stabilize immediately. No bare spots should be present.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Dikes or Berms (continued)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Screen Clogged or Missing	The bar screen over the outlet should be intact and clear of debris. Water should flow freely through the outlet pipe.		Replace screen if it is not attached. Remove any trash or debris and dispose of properly. Clean out the end pipe if necessary.	

<b>Infiltration Ponds, Trenches, and Galleries</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Presetting Ponds and Vaults	Facility or Sump Filled with Sediment and/or Debris	6 inches or designed sediment trap depth of sediment.		Remove sediment. No sediment should be present in presetting pond or vault.	
	Inadequate Sediment Settling Area	Stormwater should not enter the infiltration area without some method of settling-out solids.		Add a sediment trapping area by constructing a sump or berm for settling of solids. This area should be separate from the rest of the facility. Contact City of Lacey for guidance.	
Drain Rock	Water Ponding	If water enters the facility from the surface, inspect to see if water is ponding at the surface during storm events.  If buried drain rock, observe drawdown through observation port or cleanout.		Clear piping through facility when ponding occurs. Replace rock material/sand reservoirs as necessary. Tilling of subgrade below reservoir may be necessary (for trenches) prior to backfill. No water ponding should be present on surface during storm events.	

For manufactured infiltration galleries, designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.

### 1c. Detention Tanks and Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Detention Tanks and Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.		Vents open and functioning. Remove blockage or replace air vent if damaged.	
	Debris and Sediment	Accumulated sediment depth exceeds 10 percent of the diameter of the storage area for 50 percent of the length of storage vault or any point depth exceeds 15 percent of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 50 percent of the length of tank.)		No debris or sediment present. All sediment and debris removed from storage area.	
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).		All joint between tank/pipe sections are sealed.	
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10 percent of its design shape. (Review required by engineer to determine structural stability).		Tank/pipe repaired or replaced to design.	
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.		Vault replaced or repaired to design specifications and is structurally sound.	

## Detention Tanks and Vaults

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Storage Area (continued)	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.		Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
Catch Basins	See "Catch Basins"	See "Catch Basins."		See "Catch Basins."	

## 1d. Wet Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Wet Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris in vault, pipe or inlet/outlet (includes floatables and non-floatables).		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Accumulation	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.		Remove sediment from vault. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.		Pipe repaired and/or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened or removed, especially by one person.		Pipe repaired or replaced to proper working specifications.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed or cleared from ventilation area. A specified percentage of the vault surface area must provide ventilation to the vault interior (see design specifications).	
		Maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking warping and/or showing signs of failure as deemed by maintenance/inspection staff.		Baffles repaired or replaced to specifications.	
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.	

## 1e. Wet Ponds

Wet ponds are designed to improve water quality. They have a permanent pool of water, which slows incoming stormwater flows causing sediments and pollutants to settle-out. Wet ponds are typically deeper than other water quality BMPs, such as stormwater wetlands, and utilize the pool volume to reduce pollutant loads.

Wet Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Level	First cell is empty, doesn't hold water.		Line the first cell to maintain at least 4 feet of water. Second cell may drain, but the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.	
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No debris or sediment present. Remove and properly dispose of all trash and debris.	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.		No clogging or blockage in the inlet and outlet piping.	
	Sediment Accumulation on Pond Bottom	Accumulated sediment on pond bottom that exceeds the depth of sediment zone plus 6 inches, usually in the first cell.		Sediment removed from pond bottom. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Oil Sheen on Water	Visible and prevalent oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Locate and correct oil source. If chronic low levels of oil persist, plant wetland plants such as <i>Juncus effusus</i> (soft rush) which can uptake small concentrations of oil.	
	Erosion	Erosion of the pond's side slopes and/or scouring of pond bottom that exceeds 6 inches, or where continued erosion is prevalent.		Slopes stabilized using proper erosion control measures and repair methods.	
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.		Dike/berm is repaired to specifications.	

## Wet Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Internal Berm	Berm dividing cells should be level.		Berm surface is leveled so that water flows evenly over entire length of berm.	
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.		Rocks replaced to specifications.	
	PVC Pond Liner	Check to see if liner is visible and has more than three 0.25-inch holes, is exposed and/or torn. An indicator of a torn liner could be the pond no longer holds water (during long dry periods the water may evaporate)		Repair or replace liner as needed. Note: wet ponds usually have liners.	
	Clay Liner	Check to see if pond is holding water (during long dry periods the water may evaporate).		Repair liner to design state.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Vegetation Not Growing or Overgrown Within Pond	Presence of invasive species or sparse/excessive growth of plants.		Remove invasive species and reestablish vegetation as designed.	

## 1f. Stormwater Wetlands

Stormwater wetlands are designed to improve water quality. They are designed with emergent aquatic plants to provide biological treatment and filtering of runoff water.

Stormwater Wetlands					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No debris or sediment present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club).  Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. (Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Oil Sheen on Water	Prevalent and visible oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Source of oil located and corrected. <i>If chronic low levels of oil persist, plant emergent wetland plants such as <i>Juncus effusus</i> (soft rush) which can assist filtering small concentrations of oil.</i>	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material or damaged.		No clogging or blockage in the inlet and outlet piping.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>Evaluate using beaver deceiver and leveler devices. If beaver removal is necessary, contact WDFW Region 6 to coordinate with a Nuisance Wildlife Control Operator.</i>	
	Tree Growth and Hazard Trees	Tree growth that impedes maintenance access.		Remove hazard trees. Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., firewood or construction).	
	Tree Growth and Hazard Trees	If dead, diseased, or dying trees are identified, use a certified Arborist to determine the health of tree and whether removal is required.		Remove hazard trees.	
	Liner	Check to see if liner is visible and has more than three 0.25-inch holes, or if it is exposed and or torn. An indicator of a torn liner could be the wetland no longer holds water. (during long dry periods the water may evaporate).		Repair or replace liner as needed. Liner is fully covered.	
Forebay	Sediment Accumulation	Sediment accumulation in forebay exceeds the design depth of the sediment zone plus 6 inches.		Remove accumulated sediment from forebay bottom to the design depth of the sediment zone.	
Side Slopes of Wetland	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.	
Side Slopes of Wetland	Erosion	Any erosion observed on a compacted berm embankment.		<i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Cell	Wetland Vegetation	20 percent or more of the stormwater wetland area has dead or dying vegetation, as measured by stem counts relative to the design plant coverage.		Plants in wetland cell surviving and not interfering with wetland function. Dead or dying vegetation is replaced by like species, unless recommended otherwise by the Wetlands Consultant and approved by the city. ( <i>Watering, physical support, mulching, and weed removal may be required on a regular basis especially during the first 3 years.</i> )	
	Wetland Vegetation	Percent vegetated cover of stormwater wetland bottom area, excluding exotic and invasive species, is less than 50 percent after 2 years.		Exotic/invasive species removed. Additional plantings may be required.	
	Wetland Vegetation	Decaying vegetation produces foul odors.		Decaying vegetation is removed, preferably in late summer.	
	Wetland Vegetation	Wetland vegetation is blocking flow paths causing flow back-up and flooding.		Areas of blocking vegetation are cut back sufficient to allow design flows and prevent flooding.	
	Wetland Vegetation	Water quality monitoring indicates that wetland vegetation is contributing phosphorus and metals to downstream waters rather than sequestering them.		Water quality monitoring indicates improved water quality.  To maximize removal of wetland pollutants, wetland vegetation must be periodically harvested, particularly with respect to phosphorus and metals removal. Harvesting should occur by mid-summer before plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. Every 3 to 5 years the entire plant mass including roots should be harvested because the belowground biomass constitutes a significant reservoir (as much as half) of the nutrients and metals that are removed from stormwater by plants.	
	Sediment Accumulation	Sediment accumulation inhibits growth of wetland plants or reduces wetland volume (greater than 1 foot of sediment accumulation).		Wetland dredged to remove sediment accumulation.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Berms (dikes)	Settlements	Any part of berm that has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works.	√	Dike restored to the design elevation. <i>A professional engineer should be consulted to determine the source of the settlement.</i>	√
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.	√	Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	√
Wetland Berms Over 4 Feet in Height (dikes)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.	√	Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	√
	Obstruction	Tree growth or other blockage on emergency spillways may cause failure of the berm due to uncontrolled overtopping.	√	Remove obstruction on emergency spillway. <i>A professional engineer should be consulted for proper berm/spillway restoration.</i>	√
	Rock Missing	Check to see that the riprap protective area is intact. Only one layer of rock exists above native soil in an area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway.	√	Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.)	√
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.	√	Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	√

### 1g. Basic and Compost-Amended Biofiltration Swale

A gently-sloped channel with gentle side slopes, lined with grass (and sometimes other vegetation) to slow the flow and allow for water quality treatment and infiltration.

Basic and Compost-Amended Biofiltration Swale					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches or inhibits vegetation growth in 10 percent or more of swale.		Remove sediment deposits on grass treatment area of the biofiltration swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.	
	Standing Water	When water stands in the swale between storms and does not drain freely.		Swale must drain freely and not contain standing water between storms. Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.		Level the spreader and clean so that flows are spread evenly over entire swale width.	
	Constant Baseflow	Small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.		Base flow removed from swale. Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.	
	Poor Vegetation Coverage	Grass is sparse or bare or eroded patches occur in more than 10 percent of the swale bottom.		Swale has no bare spots and grass is thick and healthy. Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.	
	Vegetation	When the grass becomes excessively tall (higher than 10 inches); when nuisance weeds and other vegetation start to take over.		Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.	
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.		If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.	

### Basic and Compost-Amended Biofiltration Swale

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Swale	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.		Remove material so that there is no clogging or blockage in the inlet and outlet area.	
	Trash and Debris Accumulation	Trash and debris accumulated in the biofiltration swale.		No debris or sediment present. Remove trash and debris from biofiltration swale.	
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale. Cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

## 1h. Wet and Continuous Inflow Biofiltration Swales

Similar to a basic biofiltration swale (previous pages), but with modifications due to saturated soil conditions (such as, specific plants that can tolerate wet conditions).

Wet and Continuous Inflow Biofiltration Swales					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation	Sediment depth exceeds 2 inches in 10 percent of the swale treatment area.		Remove sediment deposits in treatment area.	
	Water Depth	Water not retained to a depth of about 4 inches during the wet season.		Build up or repair outlet berm so that water is retained in the wet swale.	
	Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.		Wetland vegetation fully covers bottom of swale. Cause of lack of vigor of vegetation addressed. Replant as needed.  Determine cause of lack of vigor of vegetation and correct. Replant as needed. Remove cattails and compost off site. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.	
	Inlet/Outlet	Inlet/outlet area clogged with sediment and/or debris.		Remove clogging or blockage in the inlet and outlet areas.	
	Trash and Debris Accumulation	Any plastic, paper or other waste or debris.		No debris or sediment present. Remove trash and debris from wet biofiltration swale.	
	Erosion/ Scouring	Swale has eroded or scoured due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale.  Check design flows to ensure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as <i>Juncus effusus</i> (soft rush) in wet areas or snowberry ( <i>Symphoricarpos albus</i> ) in dryer areas.	

**Wet and Continuous Inflow Biofiltration Swales**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swale (continued)	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

### 1i. Filter Strip (Basic and CAVFS)

A basic filter strip is a flat grassy area that provides treatment of unconcentrated sheet flow runoff from adjacent pavement. Can provide enhanced treatment for metals in runoff water when soil is amended with organic compost and grass is sufficiently dense.

<b>Filter Strip (basic and CAVFS)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.	
	Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.		Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3 to 4 inches.	
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.		No trash or debris present. Remove trash and debris from filter.	
	Erosion/ Scouring	Eroded or scoured areas due to flow channelization, or higher flows.		No eroded or scoured areas, cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.		Level the spreader and clean so that flows are spread evenly over entire filter width.	

### 1j. Sand Filter (above ground/open)

A typical open sand filter consists of a pretreatment system to remove sediments, a flow spreader, a sand bed, and underdrain piping. See also Sand Filter (belowground/closed).

Sand Filter (above ground/open)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment and Silt Accumulation on top layer	Sediment and silt depth exceeds 0.5 inch over 10 percent of surface area of sand filter.		No sediment deposit on grass layer of sand filter that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.		No trash or debris present. Trash and debris removed from sand filter bed.	
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.		Sediment removed from cleanouts and/or drainpipes.	
	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, flow through the overflow pipes occurs frequently, or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).	
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities. (Consider 4- to 8-hour drawdown tests).		Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.	
	Short Circuiting	Drawdown greater than 12 inches per hour. When flows become concentrated over one section of the sand filter rather than dispersed.		Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area. No leaks in the cleanouts or underdrains.	
	Erosion Damage to Slopes	Erosion over 2 inches deep where cause of damage is prevalent or potential for continued erosion is evident.		Slopes stabilized using proper erosion control measures.	
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.		Rock pad replaced or rebuilt to design specifications.	

**Sand Filter (above ground/open)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Aboveground (open sand filter) (continued)	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter. Rills and gullies on the surface of the filter can indicate improper function of the inlet flow spreader.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20 percent or any other failure to the piping.		Pipe repaired or replaced.	

### 1k. Sand Filter (below ground/closed)

Similar to an open sand filter, but installed below grade within a vault.

Sand Filter (below ground/closed)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 0.5 inch.		No sediment deposits on sand filter section that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Sediment Accumulation in Presettling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of sediment zone plus 6 inches.		No sediment deposits in first chamber of vault.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Trash and debris removed from vault and inlet/outlet piping.	
	Sediment in Drain Pipes/ Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.		No sediment or debris present. Any sediment and debris removed from cleanouts and/or drainpipes.	
	Clogged Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently, and/or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging and influent suspended solids loads (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material). <i>Other options include removal of thatch, aerating the filter surface, tilling the filter surface, replacing the top 4 inches of filter media, and inspecting geotextiles for clogging.</i>	
	Short Circuiting	Drawdown greater than 12 inches per hour. When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area. (Consider 4- to 8-hour drawdown tests.)		Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion. No leaks in the cleanouts or underdrains.	

**Sand Filter (below ground/closed)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vault (continued)	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.		Cover repaired to proper working specifications or replaced.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed/cleared from ventilation area. A specified percentage of the vault surface area must provide venting to the vault interior (per design specifications).	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles/ Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.	
Pipes	Damaged Pipes	Inlet or outlet piping damaged or broken, in need of repair.		Pipe repaired and/or replaced.	

## 11. Media Filter Drains

A filter treatment device that is typically sited along highway side slopes (conventional design) and medians (dual media filter drains), borrow ditches, or other linear depressions. Media filter drains have basic components: a gravel no-vegetation zone, a grass strip, the MFD mix bed, and a conveyance system for flows leaving the media filter drain mix.

Media Filter Drains					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Erosion, Scour, or Vehicular Damage	No vegetation zone uneven or clogged so that flows are not uniformly distributed.		Area leveled and cleaned so that flows are spread evenly.	
	Sediment Accumulation on Edge of Pavement	Flows no longer sheet flowing off of roadway. Sediment accumulation on pavement edge exceeds top of pavement elevation.		No sediment accumulation on pavement edge that impedes sheet flow. Sediment deposits removed such that flows can sheet flow off of roadway.	
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Sediment deposits removed, slope is re-leveled so that flows pass evenly through media filter drain.	
	Excessive Vegetation or Undesirable Species	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over or shades out desirable vegetation growth characteristics. See also the <a href="#">Thurston County Noxious Weeds List</a> .		Grass mowed and nuisance vegetation controlled such that flow not impeded. <i>Grass should be mowed to a height that encourages dense even herbaceous growth.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with suitable topsoil. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or areas less than 12 inches wide, repair the damaged area by filling with suitable media. If bare areas are large, generally greater than 12 inches wide, the media bed should be re-graded.</i>	

### Media Filter Drains

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Media Bed	Sediment depth inhibits free infiltration of water.		Sediment accumulation does not impeded infiltration. Sediment deposits removed and slope is re-leveled so that flows pass freely through Media Bed.	
Underdrains	Sediment	Depth of sediment within perforated pipe exceeds 0.5 inch.		Depth of sediment within perforated pipe does not exceed 0.5 inch. Flush underdrains through access ports and collect flushed sediment.	
	Trash and Debris Accumulation	Accumulated trash and debris. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No trash or debris present. Remove trash and debris from media filter.	
	Flows are Bypassing Media Filter Drain	Evidence of significant flows downslope (rills, sediment, vegetation damage, etc.) of media filter drain.		Facility functions as designed. Sediment deposits removed and slope is re-leveled so that flows pass evenly through media filter drain. If media filter drain is completely clogged, it may require a more extensive repair or replacement.	
	Media Filter Drain Mix Replacement	Water is seen on surface of the media filter drain mix from storms that are less than the 91st percentile 24-hour rain event (approximately 1.25 inches in 24 hours). Maintenance also needed on a 10-year cycle and during a preservation project.		No water ponded on surface after design storm. <i>Excavate and replace all of the media filter drain mix contained within the media filter drain.</i>	

### 1m. Bioretention Cells, Swales, and Planter Boxes

Bioretention areas are shallow stormwater systems with a designed soil mix and plants adapted to the local climate and soil moisture conditions. They are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. Most routine maintenance procedures are typical landscape care activities.

Bioretention Cells, Swales, and Planter Boxes					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
General	Trash	Trash and debris present.		No trash and debris present. Remove and properly dispose of all trash and debris.	
Concrete Sidewalls	Cracks or Failure in Concrete Planter Reservoir	Cracks wider than 0.5 inch or maintenance/inspection personnel determine that the planter is not structurally sound.		Concrete repaired or replaced.	
Rockery Sidewalls	Unstable Rockery	Rock walls are insecure.		Rockery sidewalls are stable (may require consultation with professional engineer, particularly for walls 4 feet or greater in height).	
		Erosion (gullies/rills) greater than 2 inches around inlets, outlet, and alongside slopes.		Source of erosion eliminated and damaged area stabilized (regrade, rock, vegetation, erosion control blanket). For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures are in place until permanent repairs can be made.	
		Erosion of sides causes slope to become a hazard.		The hazard is eliminated and slopes are stabilized.	
		Settlement greater than 3 inches (relative to undisturbed sections of berm).		The design height is restored with additional mulch.	
		Downstream face of berm or embankment wet, seeps or leaks evident.		Holes are plugged and berm is compacted. May require consultation with professional engineer, particularly for larger berms.	
		Any evidence of rodent holes or water piping around holes if facility acts as dam or berm.		Rodents (see "Pests: Insects/Rodents") removed and berm repaired/compacted.	
	Sediment or Debris Accumulation	Accumulation of sediment or debris to extent that infiltration rate is reduced (see "Ponded water") or surface storage capacity significantly impacted.		Sediment cleaned out to restore facility shape and depth. Damaged vegetation is replaced and mulched. Source of sediment identified and controlled (if feasible).	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Leaf Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
	Basin Inlet via Surface Flow	Soil is exposed or signs of erosion are visible.		Erosion sources repaired and controlled.	
Curb Cut Inlet	Sediment or Debris Accumulation	Sediment, vegetation, or debris partially or fully blocking inlet structure.		Curb cut is clear of debris. Source of the blockage is identified and action is taken to prevent future blockages.	
	Water Not Properly Directed to Facility	Water is not being directed properly to the facility and away from the inlet structure.		Blocks are reconfigured to direct water to facility and away from structure.	
	Erosion	Water disrupts soil media.		Splashblock is reconfigure/repaired.	
	Damaged Pipe	Pipe is damaged.		Pipe is repaired/replaced. No cracks more than 0.25 inch wide at the joint of inlet/outlet pipes exist.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots or debris. Source of the blockage is identified and action is taken to prevent future blockages.	
Inlets/ Outlet and Access Pathways	Blocked Access	Maintain access for inspections.		Vegetation is cleared within 1 foot of inlets and outlets. Access pathways are maintained.	
Ponding Area	Erosion	Water disrupts soil media.		No eroded or scoured areas in bioretention area. Cause of erosion or scour addressed. A cover of rock or cobbles or other erosion protection measure maintained (e.g., matting) to protect the ground where concentrated water enters or exits the facility (e.g., a pipe, curb cut, or swale).	
	Trash or Debris Accumulation	Trash or debris present on trash rack.		No trash or debris on trash rack. Clean and dispose trash.	
	Damaged Trash Rack	Bar screen damaged or missing.		Barrier repaired or replaced to design standards.	
	Sediment or Debris Accumulation	Sediment, vegetation, or debris accumulated at or blocking (or having the potential to block) check dam, weir, or orifice.		Blockage is cleared. Identify the source of the blockage and take actions to prevent future blockages.	

<b>Bioretention Cells, Swales, and Planter Boxes</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Erosion	Erosion and/or undercutting is present.		No eroded or undercut areas in bioretention area. Cause of erosion or undercutting addressed. Check dam or weir is repaired.	
	Unlevel Top of Weir	Grade board or top of weir damaged or not level.		Weir restored to level position.	
	Sediment Accumulation	Sediment blocks 35 percent or more of ports/notches or, sediment fills 35 percent or more of sediment trap.		Sediment removed and disposed of.	
	Damaged or Unlevel Grade Board/Baffle	Grade board/baffle damaged or not level.		Board/baffle removed and reinstalled to level position.	
	Sediment or Debris Accumulation	Overflow spillway is partially or fully plugged with sediment or debris.		No sediment or debris in overflow.	
	Erosion	Native soil is exposed or other signs of erosion damage are present.		Erosion repaired and surface of spillway stabilized.	
	Missing Spillway Armament	Spillway armament is missing.		Armament replaced.	
Underdrain	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain. Prolonged surface ponding (see "Bioretention Soil").		Underdrains and orifice are free of sediment and debris.	
Bioretention Soil	Ponded Water	Excessive ponding water: Water overflows during storms smaller than the design event or ponded water remains in the basin 48 hours or longer after the end of a storm.		Cause of ponded water is identified and addressed: 1. Leaf or debris buildup is removed 2. Underdrain is clear 3. Other water inputs (e.g., groundwater, illicit connections) investigated 4. Contributing area verified If steps #1–4 do not solve the problem, imported bioretention soil is replaced and replanted.	
Bioretention Soil	Protection of Soil	Maintenance requiring entrance into the facility footprint.		Maintenance is performed without compacting bioretention soil media.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Bottom Swale and Upland Slope Vegetation	Less than 75 percent of swale bottom is covered with healthy/surviving vegetation.		Plants are healthy and pest free. Cause of poor vegetation growth addressed. Bioretention area is replanted as necessary to obtain 75 percent survival rate or greater. Plant selection is appropriate for site growing conditions.	
	Causing Problems for Operation of Facility	Large trees and shrubs interfere with operation of the basin or access for maintenance.		Trees and shrubs do not hinder facility performance or maintenance activities. Prune or remove large trees and shrubs.	
	Dead Trees and Shrubs	Standing dead vegetation is present.		Trees and shrubs do not hinder facility performance or maintenance activities. Dead vegetation is removed and cause of dead vegetation is addressed. Specific plants with high mortality rate are replaced with more appropriate species.	
Trees and Shrubs Adjacent to Vehicle Travel Areas (or areas where visibility needs to be maintained)	Safety Issues	Vegetation causes some visibility (line of sight) or driver safety issues.		Appropriate height for sight clearance is maintained. Regular pruning maintains visual sight lines for safety or clearance along a walk or drive. Tree or shrub is removed or transplanted if presenting a continual safety hazard.	
Emergent Vegetation	Conveyance Blocked	Vegetation compromises conveyance.		Sedges and rushes are clear of dead foliage.	
Mulch	Lack of Mulch	Bare spots (without much cover) are present or mulch covers less than 2 inches.		Facility has a maximum 3-inch layer of an appropriate type of mulch and mulch is kept away from woody stems.	
	Accumulation of Clippings	Grass or other vegetation clippings accumulate to 2 inches or greater in depth.		Clippings removed.	
	Weeds	Weeds are present (unless on edge and providing erosion control).		Weed material removed and disposed of. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Noxious Weeds	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Adjacent Facilities Compromised	Low-lying vegetation growing beyond facility edge onto sidewalks, paths, or street edge poses pedestrian safety hazard or may clog adjacent permeable pavement surfaces due to associated leaf litter, mulch, and soil.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed at facility edge. Excessive leaf litter is removed.	
	Causes Facility to Not Function Properly	Excessive vegetation density inhibits stormwater flow beyond design ponding or becomes a hazard for pedestrian and vehicular circulation and safety.		Pruning and/or thinning vegetation maintains proper plant density and aesthetics. Plants that are weak, broken, or not true to form are removed or replaced in-kind. Appropriate plants are present.	
Irrigation (if any)	NA	Irrigation system present.		Manufacturer's instructions for O&M are met.	
Plant Watering	Plant Establishment	Plant establishment period (1–3 years).		Plants are watered as necessary during periods of no rain to ensure plant establishment.	
Summer Watering (after establishment)	Drought Period	Longer term period (3+ years).		Plants are watered as necessary during drought conditions and trees are watered up to 5 years after planting.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Spill Prevention and Response	Spill Prevention	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures are implemented whenever handling or storing potential contaminants.	
	Spill Response	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
	Safety (slopes)	Erosion of sides causes slope to exceed 1:3 or otherwise becomes a hazard.		Actions taken to eliminate the hazard.	
	Safety (hydraulic structures)	Hydraulic structures (pipes, culverts, vaults, etc.) become a hazard to children playing in and around the facility.		Actions taken to eliminate the hazard (such as covering and securing any openings).	
	Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
	Edging	Grass is starting to encroach on swale.		Edging repaired.	
	Pests: Insects/Rodents	Pest of concern is present and impacting facility function.		Pests removed and facility returned to original functionality. Do not use pesticides or <i>Bacillus thuringiensis israelensis (Bti)</i> .	
	Mosquitoes	Standing water remains in the basin for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1n. Rain Gardens

Rain gardens are shallow stormwater systems with compost amended soil or imported rain garden or bioretention soil and plants adapted to the local climate and soil moisture conditions. They are similar in function to bioretention cells, but have less onerous design requirements and are generally applicable to smaller sites.

Rain Gardens					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Facility – General Requirements	Mosquitoes	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present. Rain garden drains freely and there is no standing water between storms. Cause of the standing water is addressed (see “Ponded Water”).	
	Trash	Trash and debris present.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Debris Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
Earthen Side Slopes and Berms	Erosion	Persistent soil erosion on slopes.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Rockery Sidewalls	Unstable Rockery	Rockery side walls are insecure.		Rockery sidewalls are stable (may require consultation with engineer, particularly for walls 4 feet or greater in height).	
Rain Garden Bottom Area	Sediment Accumulation	Visible sediment deposition in the rain garden that reduces drawdown time of water in the rain garden.		No sediment accumulation in rain garden, Source of sediment addressed.	
Mulch	Lack of Mulch	Bare spots (without mulch cover) are present or mulch depth less than 2 inches.		Facility has a minimum 2- to 3-inch layer of an appropriate type of mulch and is kept away from woody stems.	
Splashblock Inlet	Water Not Properly Directed to Rain Garden	Water is not being directed properly to the rain garden and away from the inlet structure. Water splashes adjacent buildings.		Blocks are reconfigured to direct water to rain garden and away from structure.	

<b>Rain Gardens</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipe Inlet/ Outlet	Erosion	Rock or cobble is removed or missing and concentrated flows are contacting soil.		No eroded or scoured areas. Cause of erosion or scour is addressed. Cover of rock or cobbles protects the ground where concentrated water flows into the rain garden from a pipe or swale.	
	Accumulated Debris	Accumulated leaves, sediment, debris or vegetation at curb cuts, inlet or outlet pipe.		Blockage is cleared.	
	Damaged Pipe	Pipe is damaged		Pipe is repaired/replaced.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots and debris.	
Access	Blocked Access	Maintain access for inspections.		Vegetation is cleared or transplanted within 1 foot of inlets and outlets.	
Ponded Water	Ponded Water	Excessive ponding water: Ponded water remains in the rain garden more than 48 hours after the end of a storm.		Rain garden drains freely and there is no standing water in the rain garden between storms. Leaf litter/debris/sediment is removed.	
Overflow	Blocked Overflow	Capacity reduced by sediment or debris.		No sediment or debris in overflow.	
	Blocking Site Distances and Sidewalks	Vegetation inhibits sight distances and sidewalks.		Sidewalks and sight distances along roadways and sidewalks are kept clear.	
	Vegetation Blocking Pipes	Vegetation is crowding inlets and outlets.		Inlets and outlets in the rain garden are clear of vegetation.	
	Unhealthy Vegetation	Yellowing: possible Nitrogen (N) deficiency Poor growth: possible Phosphorous (P) deficiency. Poor flowering, spotting or curled leaves, or weak roots or stems: possible Potassium (K) deficiency.		Plants are healthy and appropriate for site conditions.	
	Weeds	Presence of weeds.		Weeds are removed (manual methods preferred) and mulch is applied.	
Summer Watering (years 1-3)	Plant Establishment	Tree, shrubs and groundcovers in first 3 years of establishment period.		Plants are watered during plant establishment period (years 1-3).	
Summer Watering (after establishment)	Drought Conditions	Vegetation requires supplemental water.		Plants are watered during drought conditions or more often if necessary during post-establishment period (after 3 years).	

## 10. Trees

When designed in accordance with this Manual, trees can provide flow control via interception, transpiration, and increased infiltration. Most routine maintenance procedures are typical landscape care activities.

<b>Trees</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Excess or Unhealthy Growth	Health of tree at risk, or tree in conflict with other infrastructure.		Tree pruned according to industry standards to promote tree health and longevity.	
	NA	Young tree (i.e., within first 3 years).		Tree provided with supplemental irrigation and fertilization (as needed) during first three growing seasons.	
	NA	Evidence of pest activity affecting tree health.		Pest management activities implemented to reduce or eliminate pest activity, and to restore tree health.	
	Dead or Declining	Dead, damaged or declining.		Tree is replaced per planting plan or acceptable substitute.	

## 1p. Permeable Pavement

Permeable pavement is a stormwater infiltration facility that is designed to accommodate pedestrian, bicycle, and auto traffic while allowing infiltration and storage of stormwater. Permeable pavement includes porous asphalt; pervious concrete; permeable pavers and aggregate pavers; and grid systems.

Permeable Pavement					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Leaf and Debris Accumulation	Fallen leaves or debris.		Removed/disposed.	
	All Pavement Types	Sediment or debris accumulation between paver blocks, on surface of pavement, or in grid voids.		Sediment at surface does not inhibit infiltration. Remove/dispose of sediment.	
	Unstable Adjacent Area	Runoff from adjacent pervious areas deposits soil, mulch, or sediment on paving.		No deposited soil or other materials on permeable pavement or other adjacent surfacing. All exposed soils that may erode to pavement surface mulched and/or planted.	
	Wearing Course Covered by Adjacent Vegetation	Vegetation growing beyond facility edge onto sidewalks, paths, and street edge.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed to avoid overreaching the sidewalks, paths and street edge.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Conventional street sweepers equipped with vacuums, water, and brushes or pressure washer used to restore permeability. Vacuum or pressure wash the pavement two to three times annually.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Use of sand and sealant application prohibited. Protect from construction runoff.	
	Cracks	Major cracks or trip hazards.		Potholes or small cracks filled with patching mixes. Large cracks and settlement addressed by cutting and replacing the pavement section.	
	NA	Utility cuts.		Any damage or change due to utility cuts replaced in kind.	
Interlocking Concrete Paver Blocks	Missing or Damaged Paver Block	Interlocking paver block missing or damaged.		Individual damaged paver blocks removed and replaced or repaired per manufacturer's recommendations.	

### Permeable Pavement

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Interlocking Concrete Paver Blocks (continued)	Settlement	Settlement of surface. When deviation from original grade impedes function.		Original grade re-established. May require resetting.	
	Void Material is Missing or Low	Loss of aggregate material between paver blocks.		Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Gravel	Loss of Aggregate Material in Paving Grid	Loss of aggregate material in grid.		Aggregate gravel level maintained at the same level as the plastic rings or no more than 0.25 inch above the top of rings. Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Grass	Lack of Grass Coverage	Loss of soil and/or grass material in grid.		Refill and/or replant per manufacturer's recommendations. Growing medium restored, facility aerated and reseeded or planted, and vegetated area amended as needed.	
	Pipe is Damaged	Pipe is damaged.		Pipe is repaired/replaced.	
	Pipe is Clogged	Pipe is clogged.		Roots or debris is removed.	
	Erosion	Native soil exposed or other signs of erosion damage present.		No eroded or scoured areas Cause of erosion or scour is addressed.	
Underdrain Pipe	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain (may cause prolonged drawdown period).		Underdrains and orifice free of sediment and debris. Jet clean or rotary cut debris/roots from underdrain(s). If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.	
Spill Prevention and Response	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
Spill Prevention and Response (continued)	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	

## 1q. Vegetated Roofs

Vegetated roofs are areas of living vegetation installed on top of buildings, or other above-grade impervious surfaces. Design components vary depending on the vegetated roof type and site constraints, but may include a waterproofing material, a root barrier, a drainage layer, a separation fabric, a growth medium (soil), and vegetation.

Vegetated Roofs					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water is Not Infiltrating Properly	Water does not permeate growth media (runs off soil surface).		Facility infiltrates as designed. Aerate or replace media until stormwater infiltrates freely through growth media.	
	Water is Not Infiltrating Properly	Growth medium thickness is less than design thickness (due to erosion and plant uptake).		Facility infiltrates as designed. Supplement growth medium to design thickness.	
	Water is Not Infiltrating Properly	Fallen leaves or debris are present.		No leaves or debris present.	
	Erosion/ Scouring	Areas of potential erosion are visible.		Steps taken to repair or prevent erosion. Fill, hand tamp, or lightly compact, and stabilize with additional soil substrate/growth medium and additional plants.	
Erosion Control Measures	Erosion/ Scouring	Mat or other erosion control is damaged or depleted during plant establishment period.		Erosion control measures repaired/replaced until 90 percent vegetation coverage attained. Avoid application of mulch on extensive vegetated roofs.	
System Structural Components	Deteriorating Flashing, Gravel Stops, Utilities, or Other Structures on Roof	Flashing, utilities or other structures on roof are deteriorating (can serve as source of metal pollution in vegetated roof runoff).		Structural components inspected for deterioration or failure. Repair/replace as necessary.	
	Sediment, Vegetation, or Debris Accumulation	Sediment, vegetation, or debris blocks 20 percent or more of inlet structure.		Blockages cleared. Problems that led to blockage identified and corrected.	
	Damaged Inlet Pipe	Inlet pipe is in poor condition.		Repaired/replaced.	
	Clogged Inlet Pipe	Pipe is clogged.		Roots or debris removed.	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Plant Coverage	Healthy vegetative coverage falls below 90 percent (unless design specifications stipulate less than 90 percent coverage).		Bare areas planted with vegetation If necessary, install erosion control measures until percent coverage goal is attained.	
Vegetation (sedums)	NA	Extensive roof with low density sedum population.		Sedums are mulch mowed, creating cuttings from existing plants to encourage colonization.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. <i>(Coordinate with Thurston County Health Department.) Complete eradication of noxious weeds may not be possible.</i>	
	Presence of Weeds	Weeds are present.		Weed material removed and disposed of, with roots manually removed with pincer-type weeding tools, flame weeders, or hot water weeders as appropriate. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

## Vegetated Roofs

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vegetation (extensive vegetated roof)	Under Fertilization	Poor plant establishment and possible nutrient deficiency in growth medium.		Organic debris allowed to replenish and maintain long-term nutrient balance and growth medium structure. Conduct annual soil test 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately.  Minimum amount slow-release fertilizer necessary to achieve successful plant establishment is applied. Apply fertilizer only after acquiring required approval from facility owner and operator. Note that extensive vegetated roofs are designed to require zero to minimal fertilization after establishment (excess fertilization can contribute to nutrient export).	
Vegetation (intensive vegetated roof)	Under Fertilization	Fertilization may be necessary during establishment period or for plant health and survivability after establishment.		Annual soil test conducted 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately. Apply minimum amount slow-release fertilizer necessary to achieve successful plant establishment. Apply fertilizer only after acquiring required approval from facility owner and operator. Intensive vegetated roofs may require more fertilization than extensive vegetated roofs.	
Vegetation (trees and shrubs on an intensive vegetated roof)	NA	Pruning as needed.		All pruning of mature trees performed by or under the direct guidance of an ISA certified arborist.	
Irrigation system (if any)	NA	Irrigation system is not working or routine maintenance is needed.		Manufacturer's instructions for O&M have been followed.	
	NA	Summer watering – Plant establishment period (1 to 2 years).		Watered weekly during periods of no rain to ensure plant establishment (30 to 50 gallons per 100 square feet).	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	NA	Summer watering – Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover (30 to 50 gallons per 100 square feet).	
	NA	Plant establishment period (1 to 2 years).		Watered deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist. Use soaker hoses or spot water with a shower type wand when irrigation system not present.	
Vegetation (intensive vegetated roof)	NA	Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover.	
	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants provided with proper training and a copy of the Maintenance and Source Control Manual.	
Safety	NA	Insufficient egress/ingress routes and fall protection.		Egress and ingress routes maintained to design standards and fire codes. Ensure appropriate fall protection.	
Aesthetics	Poor Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
Pest Control	Mosquitoes	Standing water remains for more than three days following storms.		Standing water removed. Cause of the standing water identified, and appropriate actions taken to address the problem (e.g., aerate or replace medium, unplug drainage).	

### 1r. Downspout, Sheet Flow, Concentrated Flow Dispersion

Dispersion BMP components vary depending on the type of BMP used, but can consist of a gravel filled trench, splashblock, transition zone, vegetated flow path, berms, and/or slotted drains. Dispersion BMPs reduce peak flows by slowing stormwater runoff entering into the conveyance system, allowing for some infiltration, and providing some water quality benefits.

Downspout, Sheet Flow, Concentrated Flow Dispersion					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Directed Toward Building	Water is being directed towards building structure.		Water directed away from building structure.	
	Water Causing Erosion	Water disrupts soil media.		Blocks are reconfigured/repared and media is restored.	
Transition Zone	Erosion	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than 2 feet of width.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Dispersion Trench	Concentrated Flow	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" from edge of trench; intent is to prevent erosion damage).		No debris on trench surface. Notched grade board or other distributor type is aligned to prevent erosion. Trench is rebuilt to standards, if necessary.	
	Accumulated Debris	Accumulated trash, debris, or sediment on drain rock surface impedes sheet flow from facility.		No trash or debris present. Removed and properly dispose of all trash and debris.	
	Vegetation Impeding Flow	Vegetation/moss present on drain rock surface impedes sheet flow from facility.		Freely draining drain rock surface.	
	Accumulated Debris in Drains	Accumulation of trash, debris, or sediment in roof drains, gutters, driveway drains, area drains, etc.		No trash or debris in roof drains, gutters, driveway drains, or area drains.	
	Accumulated Debris in Inlet Pipe	Pipe from sump to trench or drywell has accumulated sediment or is plugged.		No sediment or debris in inlet/outlet pipe screen or inlet/outlet pipe.	
	Damaged Pipes	Cracked, collapsed, broken, or misaligned drain pipes.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
Sump	Accumulated Sediment	Sediment in the sump.		Sump contains no sediment.	
	Hard to Open	Cannot be easily opened.		Access lid is repaired or replaced.	
	Buried	Buried.		Access lid functions as designed (refer to record drawings for design intent).	

### Downspout, Sheet Flow, Concentrated Flow Dispersion

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing Cover	Cover missing.		Cover is replaced.	
	Inadequate Rock Cover	Only one layer of rock exists above native soil in area 6 square feet or larger, or any exposure of native soil.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Erosion (gullies/rills) greater than 2 inches deep in dispersal area.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
	Accumulated Sediment	Accumulated sediment or debris to extent that blocks or channelizes flow path.		No excess sediment or debris in dispersal area. Sediment source is addressed (if feasible).	
Ponded Water	Ponded Water	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.		System freely drains and there is no standing water in dispersion area between storms. The cause of the standing water (e.g., grade depressions, compacted soil) is addressed.	
	Plant Survival	Dispersal area vegetation in establishment period (1 to 2 years, or additional 3rd year) during extreme dry weather).		Vegetation is healthy and watered weekly during periods of no rain to ensure plant establishment.	
	Lack of Vegetation Allowing Erosion	Poor vegetation cover such that erosion is occurring.		Vegetation is healthy and watered. No eroded or scoured areas are present. Cause of erosion or scour is addressed. Plant species are appropriate for the soil and moisture conditions.	
	Vegetation Blocking Flow	Vegetation inhibits dispersed flow along flow path.		Vegetation is trimmed, weeded, or replanted to restore dispersed flow path.	
	Presence of Noxious Weeds	Any noxious or nuisance vegetation which may constitute a hazard to county personnel or the public.		Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where county personnel or the public might normally be.	
Pest Control	Mosquito Infestation	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	
Rodents	Presence of Rodents	Rodent holes or mounds disturb dispersion flow paths.		Rodents removed; holes are filled; and flow path is revegetated.	

## 1s. Downspout Infiltration

Downspout infiltration systems are trench or drywell designs intended only for use in infiltrating runoff from roof downspout drains.

Downspout Infiltration					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Inflow Disruption	Accumulated trash, debris, or sediment on drain rock surface impeding sheet flow into facility.		Sheet flow re-established. Material removed and disposed of in accordance with applicable solid waste requirements.	
	Inflow Disruption	Vegetation/moss present on drain rock surface impeding sheet flow into facility.		Material removed and sheet flow re-established.	
	Inflow Disruption	Water ponding at surface, or standing water in subgrade observation port.		Inflow to facility is consistent and no ponding is observed. Inlet piping is clear and/or rock or sand reservoirs have been replaced.	
	Conveyance Blockage	Accumulation of trash, debris, or sediment in roof drains, gutters, driveways drains, area drains, etc.		Conveyance systems are clear of debris and free-flowing.	
	Conveyance Blockage	Pipes to or from sump, trench, or drywell have accumulated sediment or is plugged.		Pipe systems are clear of debris and free-flowing.	
	Conveyance Damage	Pipes to or from sump, trench, or drywell is cracked, broken, or misaligned.		Pipe systems are undamaged and free-flowing.	
	Splash Pad Malfunction	Splash pad missing or damaged.		Splash pad installed and functioning correctly	
	Overflow	Water overflows from the gutter or downspout during rain.		First try cleaning out the gutter and downspouts. If this doesn't solve the problem, a larger drywell may be needed. Contact the city before changing the design or upgrading to a larger drywell.	
	Sediment in Sump	Excess sediment accumulate in sump.		Material removed and disposed of in accordance with applicable solid waste requirements.	
	Access Lid Problems	Access lid cannot be opened or is missing.		Access lid is functioning as designed. Refer to record drawings to confirm type, function, and required components.	

### Downspout Infiltration

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Roof	Moss	Moss and algae are taking over the shadier parts of the shingles.		Disconnect the flexible part of the downspout that leads to the drywell. Then perform moss removal as desired. Pressure wash or use fatty acid solutions instead of highly toxic pesticides or chlorine bleach. Install a zinc strip as a preventive.	

## 1t. Cisterns

Cisterns are designed to collect stormwater runoff from non-polluting surfaces (typically roofs), and to make use of the collected water. Reuse of the runoff can be for irrigation, potable, and non-potable uses, but requires different levels of storage and water quality treatment depending on the intended use.

Cisterns					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Debris Accumulation in Cistern	Debris has accumulated.		No debris in cistern. Remove and properly dispose of all debris.	
	Debris Accumulation in Gutter	Debris has accumulated.		No debris in cistern or gutters. Remove and properly dispose of all debris.	
	Debris Accumulation in Cistern	Screen has deteriorated.		Screen is in place and functions as designed.	
	NA	None. Preventive maintenance.		No debris in cistern or accumulated on screen. Remove and properly dispose of all debris.	
Low Flow Orifice	Cistern Overflows are too Frequent	Debris or other obstruction of orifice.		Low flow orifice is clean.	
	Overflow Pipe	Pipe is damaged.		Overflow pipe is watertight and does not leak. Repair/replace.	
	Overflow Pipe	Pipe is clogged.		Debris removed. Overflow pipe can convey overflow to point of discharge.	
Cistern	Accumulated Debris And/or Sediment	More than 6 inches of accumulation in bottom of cistern.		Accumulated debris and/or sediment removed.	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants are provided with proper training and a copy of the Maintenance and Source Control Manual.	
Access and Safety	NA	Access to cistern required for maintenance or cleaning.		Any opening that could allow the entry of people is marked: "DANGER—CONFINED SPACE".	
Pest Control	Mosquito Infestation	Standing water remains for more than 3 days following storms.		All inlets, overflows, and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1u. Fencing/Shrubbery Screen/Other Landscaping

Fencing, shrubbery screening, and landscaping provide flow control via interception, transpiration, and increased infiltration as well as slope protection. Most routine maintenance procedures are typical landscape care activities.

Fencing/Shrubbery Screen/Other Landscaping					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing or Broken Parts/Dead Shrubby	Any defect in the fence or screen that permits easy entry to a facility.		Fence is mended or shrubs replaced to form a solid barrier to entry.	
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.		Soil under fence replaced so that no opening exceeds 4 inches in height.	
	Unruly Vegetation	Shrubbery is growing out of control or is infested with weeds. See also <a href="#">Thurston County Noxious Weeds List</a> .		Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.	
		Posts out of plumb more than 6 inches.		Posts plumb to within 1.5 inches of plumb.	
		Top rails bent more than 6 inches.		Top rail free of bends greater than 1 inch.	
		Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.		Fence is aligned and meets design standards.	
		Missing or loose tension wire.		Tension wire in place and holding fabric.	
		Missing or loose barbed wire that is sagging more than 2.5 inches between posts.		Barbed wire in place with less than 0.75-inch sag between posts.	
		Extension arm missing, broken, or bent out of shape more than 1.5 inches.		Extension arm in place with no bends larger than 0.75 inch.	
	Deteriorated Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.		Structurally adequate posts or parts with a uniform protective coating.	
Openings in Fabric	Openings in fabric are such that an 8-inch-diameter ball could fit through.		No openings in fabric.		

## 1v. Manufactured Media Filters

Manufactured media filters are installed below grade and usually consist of a two-chambered vault that include a presettling basin and a filter bed with sand or filter media. This filter is accessed through a manhole. **DO NOT ENTER ANY TANK OR VAULT** without proper training, certification and equipment.

Manufactured Media Filters					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Top of Filter Cartridges	Sediment accumulation exceeds 0.25 inches on top of cartridges.		No sediment deposits on top of cartridges. Sediment on cartridges likely indicates that cartridges are plugged and require maintenance.	
	Sediment Accumulation	Sediment accumulation in vault exceeds 6 inches. Look for other indicators of clogged cartridges or overflow.		No sediment accumulation in vault. <i>Sediment in vault should be removed. Cartridges should be checked and replaced or serviced as needed.</i>	
	Trash and Floatable Debris Accumulation	Trash and floatable debris accumulation in vault.		No trash or other floatable debris in filter vault.	
	Filter Cartridges Submerged	Filter vault does not drain within 24 hours following storm. Look for evidence of submergence due to backwater or excessive hydrocarbon loading.		Filter media checked and replaced if needed. <i>If cartridges are plugged with oil additional treatment or source control BMP may be needed.</i>	
	Sediment Accumulation	Sediment accumulation exceeds 6 inches or 33 percent (one third) of the available sump.		Sediment accumulation less than 6 inches.	
	Trash and Floatable Debris Accumulation	Trash and/or floatable debris accumulation.		No trash or other floatable debris accumulation in forebay. Trash and/or floatable debris should be removed during inspections. <i>Significant oil accumulation may indicate the need for additional treatment or source control.</i>	
Drain Pipes/ Cleanouts	Sediment in Drain Pipes/ Cleanouts	Accumulated sediment that exceeds 20 percent of the diameter.		No sediment or debris in drainpipes or cleanouts. Sediment and debris removed.	
Below ground Vault	Access Cover Damaged/ Not working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.		Cover repaired to proper working specifications or replaced.	

<b>Manufactured Media Filters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Below ground Vault (continued)	Damaged Pipes	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.		Pipe repaired or replaced.	
		Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault repaired or replaced so that vaults meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to design specifications.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.		Media cartridges replaced.	
	Short Circuiting	Flows do not properly enter filter cartridges.		Filter cartridges replaced.	

Designers must also review the most current manufacturer guidelines for any updates or additions to the following operation and maintenance requirements.

## **1w. Proprietary or Manufactured Products**

- As with other stormwater BMPs in this appendix, proper maintenance of proprietary products such as media filters or vegetation-based treatment technologies is critical to proper facility performance. Regular maintenance ensures proper functioning and keeps the facility aesthetically appealing. Many of the same inspection and maintenance procedures outlined for the facilities described in this appendix also apply to proprietary technologies.
- Designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.
- The City of Lacey will inspect proprietary products in accordance with the applicable inspection standards to ensure that maintenance is performed properly.

# **Group 2**

## *Structures & Pretreatment*

## 2a. Control Structures and Flow Restrictors

Flow control devices are usually placed within manholes, which may be locked. They typically consist of two pipes, one placed above the other. The lower pipe will typically have a cover and a small hole drilled in it to allow for slow release of water. The upper pipe is usually larger to provide an outlet for higher flows and emergency overflows.

Control Structures and Flow Restrictors					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris (includes sediment)	Material exceeds 25 percent of sump depth or 1 foot below orifice plate.		No trash or debris present. Control structure orifice is not blocked. Remove and properly dispose of all trash and debris.	
		Structure is not securely attached to manhole wall.		Securely attach structure to wall and outlet pipe.	
		Structure is not in upright position (more than 10 percent from plumb)		Restore structure to correct position.	
		Connections to outlet pipe are not watertight and show signs of rust.		Pipe connections are water tight; structure repaired or replaced and works as designed.	
		Any holes in structure (other than designed holes).		Structure has no holes other than designed holes.	
		Cleanout gate is not watertight or is missing.		Gate is watertight and works as designed.	
		Gate cannot be moved up and down by one maintenance person.		Gate moves up and down easily and is watertight.	
		Chain/rod leading to gate is missing or damaged.		Chain is in place and works as designed.	
		Gate is rusted over 50 percent of its surface area.		Gate is repaired or replaced to meet design standards.	
	Damaged or Missing	Control device is not working properly due to missing, displaced, or bent orifice plate.		Plate is in place and works as designed.	
	Obstructions	Trash, debris, sediment or vegetation blocking the plate.		Plate is free of all obstructions and works as designed.	
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.		Pipe is free of all obstructions and works as designed.	
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	

### Control Structures and Flow Restrictors

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Manhole (continued)	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.		Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
Catch Basin	See "Catch Basins"	See "Catch Basins."		See "Catch Basins."	

## 2b. Catch Basins

These structures are typically located in the streets. The City of Lacey is responsible for routine maintenance of the pipes and structures in the public rights-of-way, while the property owner or homeowners association is responsible for maintenance of pipes and catch basins in private areas and for keeping the grates clear of debris in all areas.

<b>Catch Basins</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
		Trash, leaves or debris which is located immediately in front of the catch basin opening or is blocking inflow capacity of the basin by more than 10 percent.		Remove trash, leaves and debris located directly in front of catch basin or on grate.	
		Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches of clearance from the debris surface to the invert of the lowest pipe.		No trash or debris present. Remove and properly dispose of all trash and debris.	
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent (one-third) of its height.		Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).		Remove dead animals, etc., present within the catch basin.	
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6 inches of clearance from the sediment surface to the invert of lowest pipe.		No sediment in the catch basin.	
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (intent is to make sure no material is running into basin).		Top slab is free of holes and cracks.	

## Catch Basins

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Structure Damage to Frame and/or Top Slab (continued)	Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached		Frame is sitting flush on the riser rings or top slab and firmly attached.	
		Maintenance person determines structure is unsound.		Basin replaced or repaired to design standard	
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Pipe regouted and secure at basin wall.	
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.		Replaced or repair to design standards.	
		Vegetation growing across and blocking more than 10 percent of the basin opening.		Remove vegetation blocking opening to basin.	
		Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.		No vegetation or root growth present.	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
		Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
Catch Basin Cover (continued)	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure.  (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

**Catch Basins**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Ladder	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Grate Opening Unsafe	Grate with opening wider than 0.875 (7/8) inch.		Grate opening meets design standards.	
	Trash and Debris	Trash and debris that is blocking more than 20 percent of grate surface inletting capacity.		Grate free of trash and debris. Remove and properly dispose of all trash and debris.	
	Damaged or Missing	Grate missing or broken member(s) of the grate.		Grate is in place and meets design standards.	

**2c. Debris Barriers (trash racks)**

A metallic screen or similar structural device used to prevent debris from entering a pipe, spillway or other hydraulic structure.

<b>Debris Barriers (trash racks)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Trash and Debris	Trash or debris that is plugging more than 20 percent of the openings in the barrier.		Barrier cleared to receive design flow capacity.	
		Bars are bent out of shape more than 3 inches.		Bars in place with no bends more than 0.75 inch.	
		Bars are missing or entire barrier missing.		Bars in place according to design.	
		Bars are loose and rust is causing 50 percent deterioration to any part of barrier.		Barrier replaced or repaired to design standards.	
Inlet/Outlet Pipe		Debris barrier missing or not attached to pipe.		Barrier firmly attached to pipe.	

## 2d. Energy Dissipaters

Typically a rock splash pad at a pipe end or other discharge location, to reduce the velocity and energy of flowing water and prevent erosion. Other means of energy dissipation include drop manholes, stilling basins, and check dams.

<b>Energy Dissipaters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
<b>External:</b>					
	Missing or Moved Rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil.		Rock pad replaced to design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad replaced to design standards.	
	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20 percent of the design depth.		Pipe cleaned/flushed so it matches design.	
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.		Trench redesigned or rebuilt to standards. Water discharges from feature by sheet flow.	
	Perforations Plugged	Over half of perforations in pipe are plugged with debris and sediment.		Perforated pipe cleaned or replaced. Perforations freely discharge flow.	
	Water Flows Out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.		Facility rebuilt or redesigned to standards. No flow discharges from distributor catch basin.	
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.		No danger of landslides.	
<b>Internal:</b>					
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 50 percent of original size or any concentrated worn spot exceeding 1 square foot, which would make structure unsound.		Structure replaced to design standards. Structure in no danger of failing.	

## Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Trash and Debris	Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6-inch clearance from the debris surface to the invert of the lowest pipe.	<input type="checkbox"/>	No trash or debris present. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent of its height.	<input type="checkbox"/>	Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	<input type="checkbox"/>	Remove dead animals, etc., present within the catch basin.	<input type="checkbox"/>
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6-inch clearance from the sediment surface to the invert of lowest pipe.	<input type="checkbox"/>	No sediment in the catch basin.	<input type="checkbox"/>
		Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (Intent is to make sure no material is running into basin).	<input type="checkbox"/>	Top slab is free of holes and cracks.	<input type="checkbox"/>
		Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached	<input type="checkbox"/>	Frame is sitting flush on the riser rings or top slab and firmly attached.	<input type="checkbox"/>
		Maintenance person determines structure is unsound.	<input type="checkbox"/>	Basin replaced or repaired to design standard	<input type="checkbox"/>
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.	<input type="checkbox"/>	Pipe regROUTED and secure at basin wall.	<input type="checkbox"/>
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	<input type="checkbox"/>	Replaced or repair to design standards.	<input type="checkbox"/>

### Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

## 2e. Baffle Oil/Water Separators (API type)

An underground vault or tank designed to separate oil from runoff water via baffles.

<b>Baffle Oil/Water Separators (API type)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear without thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth.		Remove sediment deposits that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulations at the surface of the water or 6 inches of sludge in the sump.		Extract oil from vault by vactoring. Disposal must be in accordance with state and local rules and regulations. No visible oil depth on water.	
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.		Pipe repaired or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover.		Cover repaired to proper working specifications or replaced.	
		Maintenance person determines structure is unsound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Grout fillet has separated or cracked wider than 0.5 inch at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Top slab is free of holes and cracks.	
	Baffles	Baffles corroding, cracking, warping and/or show signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not securely attached to structure wall, missing rungs, cracks, or misaligned.		Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection.	

## 2f. Coalescing Plate Oil/Water Separators

An underground vault or tank designed to separate oil from runoff water via gravity.

Coalescing Plate Oil/Water Separators					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear with no thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.		Remove sediment deposits on vault bottom and plate media that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulation at the water surface.		Oil is extracted from vault using vactoring methods. Dispose of in accordance with state and local rules and regulations.  Coalescing plates are cleaned by thoroughly rinsing and flushing. Direct wash-down effluent to the sanitary sewer system where permitted. There should be no visible oil depth on water.	
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.		A portion of the media pack or the entire plate pack is replaced depending on severity of failure.	
	Damaged Pipes	Inlet or outlet piping damaged or broken or in need of repair.		Pipe repaired and or replaced.	
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	

### Coalescing Plate Oil/Water Separators

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Structure (continued)	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Replace or repair ladder so it meets specifications and is safe to use as determined by inspection.	

## 2g. Catch Basin Inserts

A structure within a catch basin, with a filter containing a pollutant-removal medium. Generally considered as an alternative to oil-water separators, these are not commonly used for permanent installations, as they tend to be maintenance-intensive.

<b>Catch Basin Inserts</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.		No sediment cap on the insert media and its unit.	
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.		No trash or debris present. Runoff freely flows into catch basin. Remove and properly dispose of all trash and debris removed from insert unit.	
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.		Effluent water from media insert is free of oils and has no visible sheen.	
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.		Remove and replace media insert.	
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.		Remove and replace media insert.	
	Media Insert Use Beyond Normal Product Life	Media has been used beyond the typical average life of media insert product.		Remove and replace media at regular intervals, depending on insert product.	

# **Group 3**

## ***Miscellaneous Facilities & Features***

### 3a. Conveyance Pipes, Culverts, Ditches, and Swales

These features contain and direct the flow of water from one location to another.

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipes	Sediment, Debris, and Vegetation	Accumulated sediment should not exceed 20 percent of the diameter of the pipe. Vegetation should not reduce free movement of water through pipes. Ensure that the protective coating is not damaged or rusted. Dents should not significantly impede flow. Pipe should not have major cracks or flaws allowing water to leak out.		Clean out pipes of all sediment and debris. Remove all vegetation so that water flows freely through pipes. Repair or replace pipe.	
	Trash and Debris	There should not be any yard waste or litter in the ditch.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Buildup	Accumulated sediment should not exceed 20 percent of the depth of the ditch.		Clean out ditch of all sediment and debris.	
	Overgrowth of Vegetation	Check for vegetation (e.g., weedy shrubs or saplings) that reduces the free movement of water through ditches or swales.		Clear blocking vegetation so that water moves freely through the ditches. Grassy vegetation should be left alone.	
	Erosion	Check around inlets and outlets for signs of erosion. Check slopes for signs of sloughing or settling. Action is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion.		Eliminate causes of erosion. Stabilize slopes by using the appropriate erosion control procedure (e.g., compact the soil, plant grass, reinforce with rock).	
	Missing Rocks	Native soil beneath the rock splash pad, check dam, or lining should not be visible.		Replace rocks to design standard.	
Swales	Vegetation	Grass cover is sparse and weedy, or areas are overgrown with woody vegetation.		Aerate soils and re-seed and mulch bare areas. Keep grass less than 8 inches high. Remove woody growth, re-contour and re-seed as necessary.	

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swales (continued)	Homeowner Conversion	Swale has been filled in or blocked by shed, woodpile, shrubbery, etc.		Speak with the homeowner and request that the swale area be restored. Contact the city to report the problem if not rectified voluntarily.	
	Swale Does Not Drain	Water stands in the swale, or flow velocity is very slow. Stagnation occurs.		A survey may be needed to check grades. Grades should be in 1 to 5 percent range if possible. If grade is less than 1 percent, underdrains may need to be installed.	

### 3b. Access Roads and Easements

These features provide access to drainage facilities for inspection and/or maintenance.

<b>Access Roads and Easements</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Access	Check to determine if there is adequate access to your stormwater facilities for maintenance vehicles.		If there is not adequate access, check with the city to determine whether an easement exists. If so, a maintenance road may need to be constructed there.	
	Blocked Roadway	Debris that could damage vehicle tires (glass or metal).		Clear all potentially damaging material.	
	Blocked Roadway	Any obstructions that reduce clearance above and along the road to less than the required width (minimum of 15 feet).		Clear above and along roadway so there is enough clearance.	
Road Surface	Bad Road Conditions	Check for potholes, ruts, mushy spots, or woody debris that limits access by maintenance vehicles.		Add gravel or remove wood as necessary.	
Shoulders and Ditches	Erosion	Check for erosion along roadway.		Repair erosion with additional soil or gravel.	

## **Glossary of Stormwater Terms**

**Best Management Practices (BMPs)** – Structural features or procedures that reduce the adverse impacts of development on the quantity and/or quality of runoff water.

**Biofilter (Swale)** – A wider and flatter vegetated version of a ditch over which runoff flows at a uniform depth and velocity. Biofilters perform best when vegetation has a thick mat of roots, leaves, and stems at the soil interface (such as grass).

**Biofiltration** – The process through which pollutant concentrations in runoff water are reduced by filtering runoff through vegetation.

**Buffer** – The zone along a sensitive area that provides protection and stability for the area's functioning. As an integral part of a stream or wetland ecosystem, the buffer provides shading, slope and bank stabilization, and input of organic debris and coarse sediments to streams. It allows room for variation in aquatic system boundaries (due to hydrologic or climatic effects), attenuation of surface water flows from precipitation and stormwater runoff, habitat for wildlife, and protection from harmful disturbance or intrusion by humans or domestic animals.

**Catch Basin** – An inlet box set into the ground, usually rectangular and made of concrete, capped with a grate that allows stormwater to enter. A sump in the bottom catches sediment.

**Check Dam** – A dam (of rock, logs, etc.) built in a gully or drainage channel to reduce flow velocity, minimize erosive scouring, promote sediment deposition, and/or enhance infiltration.

**Compost Stormwater Filter** – A treatment facility that removes sediment and pollutants from stormwater by percolating water through a layer of specially-prepared Bigleaf Maple compost. Clean water exits the bottom of the facility through a pipe, while stormwater flows in excess of the facility design overflow the compost bed and bypass the facility.

**Constructed Wetland** – A wet pond with dead storage at various depths and planted with wetland plants to enhance its treatment capabilities.

**Control Structure or Flow Restrictor** – A manhole and/or pipe structure with a flow-regulating or metering device such as a weir or plates with small holes known as orifices. The structure controls the rate at which water leaves the pond.

**Conveyance** – A mechanism or device for transporting water, including gutters, pipes, channels (natural or man-made), culverts, manholes, etc.

**Critical Areas** – Areas such as wetlands, streams, steep slopes, etc., as defined by ordinance or resolution by the jurisdiction. Also known as environmentally-sensitive areas.

**Culvert** – A conveyance device (e.g. concrete, metal or plastic pipe) which conveys water from a ditch, swale, or stream under (usually across) a roadway, driveway or embankment.

**Dead Storage** – The volume of storage in a pond below the outlet which does not drain after a storm event. This pool provides treatment of the stormwater by allowing sediments to settle out.

**Detention Facility** – A facility (e.g. a pond, vault, or pipe) in which surface water or stormwater is temporarily stored.

**Detention Pond** – A detention facility in the form of an open pond.

**Dispersion Trench** – An open-top trench filled with rip rap or gravel that takes the discharge from a pond, spreads it out, and spills (bubbles) the flow out along its entire length. Dispersion trenches are used to simulate “sheet flow” of stormwater from an area, and are often used to protect sensitive areas.

**Drainage System** – A combination of facilities for the collection, conveyance, containment, treatment, discharge and/or disposal of stormwater runoff.

**Drop Structure** – A structure for dropping water to a lower elevation and/or dissipating energy. A drop may be vertical or inclined.

**Dry Pond** – A detention facility that drains completely after a storm. This type of pond has a pipe outlet at the bottom.

**Easement** – A legal encumbrance placed against a property’s title to reserve access. Drainage easements typically provide access to pipes and/or ponds, and are generally 15 to 20 feet wide.

**Emergency Overflow or Spillway** – An area on the top edge of a pond that is slightly lower in elevation than areas around it and is normally lined with riprap for erosion protection. The emergency overflow is used only if the primary and secondary outlets of the pond fail, in the event of extreme storms or if the infiltration capability of the pond becomes significantly diminished. If the emergency overflow ever comes into play, it may mean that the pond needs to be upgraded.

**Energy Dissipater** – A rock pad at an outlet (of a pipe, channel, etc.) designed to slow the flow velocity, spread out the water leaving the outlet, and reduce the potential for erosion.

**Freeboard** – The vertical distance between the design high water mark and the top of a pond (or other structure). Most ponds have one to two feet of freeboard to prevent them from overflowing.

**Infiltration** – The soaking of water through the soil surface into the ground (percolation is essentially the same thing). Many ponds are designed to infiltrate or retain stormwater, and thus do not have a regularly used discharge pipe.

**Infiltration Facility (or Structure)** – A facility (pond or trench) which retains and percolates stormwater into the ground, having no discharge (to any surface water) under normal operating conditions.

**Junction** – Point where two or more drainage pipes or channels converge (e.g. a manhole).

**Jurisdiction** – Lacey, Olympia, Tumwater, or Thurston County (as applicable).

**Lined Pond or Conveyance** – A facility, the bottom and sides of which have been made impervious (using, for example, a plastic liner or clay/silt soil layer) to the transmission of liquids.

**Live Storage** – The volume of storage in a pond above the outlet, which drains after a storm event. This storage capacity provides flood control and habitat protection for nearby streams.

**Manhole** – A larger version of the catch basin, often round with a solid lid. Manholes allow access to underground pipes (such as storm sewers) for maintenance.

**Natural Channel** – A stream, creek, river, lake, wetland, estuary, gully, swale, ravine or any open conduit where water will concentrate and flow intermittently or continuously.

**Oil-Water Separator** – A structure or device used to remove oil and greasy solids from water. They operate by using gravity separation of liquids that have different densities. Many catch basins have a down-turned plastic elbow that provides some oil-water separation.

**Outfall** – The point where water flows from a man-made conduit, channel, or drain into a water body or other natural drainage feature.

**Retention Facility** – A facility that is designed to retain water and allow for infiltration.

**Retention Pond** – A retention facility that is an open basin or “pond.”

**Revetments** – Materials such as rock or keystones used to sustain an embankment, such as in a retaining wall.

**Riprap** – Broken rock, cobbles, or boulders placed on earth surfaces, such as on top of a berm for the emergency overflow, along steep slopes, or at the outlet of a pipe, for protection against the erosive action of water. Also used for entrances to construction sites, to prevent sediment tracking.

**Runoff** – The portion of water originating as precipitation that becomes surface flow. See “stormwater” below.

**Sand Filter** – A treatment facility that removes pollutants and sediments from stormwater by percolating stormwater through a layer of sand. Clean water exits the bottom of the facility through a pipe.

**Stormwater** – The portion of precipitation that falls on property and that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes or other features into a defined surface water body or a constructed infiltration facility. Stormwater includes wash-down water and other wastewater that enters the drainage system.

**Swale** – A shallow surface drainage conveyance with relatively gentle side slopes, generally with flow depths less than 1 foot. Essentially a broad, flat-bottomed ditch. See “biofilter.”

**Trash Rack or Bar Screen** – A device (usually a screen or bars) that fits over a pipe opening to prevent large debris such as rocks or branches from entering and partially blocking the pipe.

**Wet Pond** – A stormwater treatment pond designed with a “dead storage” volume to maintain a continuous or seasonal static water level below the pond outlet elevation.

# **Stormwater Facility Maintenance Guide**



**CITY  
OF LACEY**

*Shaping Our Community Together*

After recording return document to:

City of Lacey  
Public Works  
420 College St. SE  
Lacey, WA 98509-3400

**Document Title:** Stormwater Maintenance Agreement (Commercial Corporate)  
Chapter 3B of the *Stormwater Design Manual for Lacey* and Appendix  
'Q' of the *Development Guidelines & Public Works Standards*

**Owner(s)** (Last name first, then first name and initials):

1. \_\_\_\_
2. \_\_\_\_
3. Additional name(s) on page \_\_\_\_ of document.

**City:** City of Lacey

**Abbreviated Legal Description** (i.e. lot, block, plat or section, township, range):

\_\_\_\_\_  
\_\_\_\_\_

Actual legal is on page \_\_\_\_ of document.

**Assessor's Property Tax Parcel Number:** \_\_\_\_\_

**Section, Township, Range:** S \_\_\_\_\_, T \_\_\_\_\_ N, R \_\_\_\_\_, W.M.

**Fronting Street:** \_\_\_\_\_

**Cross Street:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Project HTE #:** \_\_\_\_\_

**COMMERCIAL AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO  
IMPLEMENT A POLLUTION SOURCE CONTROL PLAN**

**By and between the CITY OF LACEY, a Municipal Corporation, hereinafter called the CITY,  
and**

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**Their heirs, successors, or assigns, hereinafter called the OWNER,**

The upkeep and maintenance of stormwater facilities and the implementation of pollution source control best management practices (BMPs) is essential to the protection of water resources in the City's jurisdiction. All property owners are expected to conduct business in a manner that promotes environmental protection. This "Agreement" contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

**LEGAL DESCRIPTION:**

Whereas, the OWNER has constructed improvements, including but not limited to buildings, pavement, and stormwater facilities on the legally described above "Property". In order to further the goals of the CITY to ensure the protection and enhancement of the City's water resources, the CITY and the OWNER hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

The OWNER shall:

- 1) Implement the stormwater facility maintenance program included herein as Attachment "A".
- 2) Maintain a record, in the form of a log book, of steps taken to implement the programs referenced in (1) above. The log book shall be available for inspection by City staff at the OWNER'S business during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-up on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The OWNER is encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

- 3) Submit an annual report to the CITY regarding implementation of the programs referenced in (1) above. The report must be submitted on or before August 15<sup>th</sup> of each calendar year and shall contain, at a minimum, the following:
  - a) Name, address, and telephone number of the association, businesses, persons, or the firm responsible for plan implementation, and the person completing the report.
  - b) Time period covered by the report.
  - c) A chronological summary of activities conducted to implement the programs referenced in (1) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with the OWNER, include a copy of the invoice for services.
  - d) An outline of planned activities for the next year.
- 4) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under items 3 above and shall be approved of by the CITY. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the CITY and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements and applications for permits.

THE CITY SHALL, AS RESOURCES ALLOW:

- 1) Provide technical assistance to the OWNER in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request at no charge to the OWNER.
- 2) Review the annual report and conduct occasional site visits to discuss performance and problems with the OWNER.
- 3) Review this Agreement with the OWNER and modify it as necessary.

## REMEDIES:

- 1) If the CITY determines that maintenance or repair work is required to be done to the stormwater facilities located on the OWNER's Property, the CITY shall give the OWNER of the Property notice of the specific maintenance and/or repair required. The CITY shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by the CITY, written notice will be sent to the persons who were given notice stating the CITY's intention to perform such maintenance and bill the OWNER for all incurred expenses. The CITY may also revoke stormwater utility rate credits (if applicable) if required maintenance is not performed.
- 2) If at any time the CITY determines that the existing system creates any imminent threat to public health or welfare, the CITY may take immediate measures to remedy said threat. However, the CITY shall also take reasonable steps to immediately notify either the Property Owner or the person in control of said Property of such imminent threat in order to enable such owner or person in control to take such immediate measures either independently or in cooperation with the CITY.
- 3) The OWNER hereby grants authority to the CITY for access to the stormwater system features, only for the purpose of performing maintenance, repair or inspection pursuant to the terms of this Agreement. The City is to be responsible, as provided by law, for any damage to the OWNER through its negligence in the construction, maintenance and operation of the stormwater facilities. Furthermore, the CITY agrees that: (a) any activities of the CITY on the Property shall not unreasonably interfere with OWNER's use of the Property; and (b) all work completed by the CITY pursuant to the rights granted hereunder shall be completed in a good and workmanlike manner and in accordance with all applicable laws, ordinances and codes.
- 4) Following any construction, installation, repair, replacement, improvement or reasonable enlargement of the capacity of the stormwater facilities, the CITY shall restore those portions of the Property affected by the CITY's construction, to the condition they were in immediately prior to such work, unless said work is at the express request of the OWNER, in which case the OWNER shall be responsible for restoration. All restoration that is the responsibility of CITY shall be performed as soon as reasonably possible following completion of any work, and shall be coordinated with OWNER so as to cause the minimum amount of disruption to the OWNER's use of the Property.
- 5) The City agrees to indemnify, defend, and hold harmless the OWNER from and against any and all liability incurred by the OWNER arising from or in any way related to the CITY's breach of any of its covenants, agreements, or obligations set forth in this Agreement, or from the CITY's negligence, intentional misconduct, or misuse of the stormwater facilities, but nothing herein shall require the CITY to indemnify the OWNER for that portion of any such liability attributable to the negligence of the OWNER.

- 6) The OWNER shall be responsible for the cost of maintenance and repair of the stormwater facility. Such responsibility shall include reimbursement to the CITY within 30 days of the receipt of an invoice for work performed by the CITY in maintaining or repairing such facility pursuant to the terms of this Agreement. Overdue payments will require the payment of interest at the current legal rate for liquidated judgements. The CITY shall have a lien for all unpaid charges together with such interest. However, notice of such lien shall not be filed by the CITY for a period of 60 days following mailing of the invoice for charges due. During such 60 days, the Property Owner or other person or agent in control of the Property shall have the right to appeal such charges to the CITY's Land Use Hearings Examiner for a final decision. Such appeal may challenge either the necessity of the maintenance or repairs performed by the CITY or the amount of the charges rendered for such maintenance or repair. Notice of such lien shall not be filed during the pendency of such appeal until final decision is rendered by the Land Use Hearings Examiner. The lien shall be foreclosed in the same manner specified by state statute for foreclosure of a mechanic's or materialman's lien. In any legal action to foreclose such lien or otherwise collect such charges, the prevailing party shall be entitled to an award for its attorney fees and costs incurred.

This Agreement is intended to protect the value and desirability of the Property described above and to benefit all the citizens of the CITY. This Agreement shall run with the land and be binding on all parties having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the CITY.



Accepted by the City of Lacey, Washington. this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

BY: \_\_\_\_\_

Scott Egger  
Director of Public Works

STATE OF WASHINGTON )  
                                  ) ss  
COUNTY OF THURSTON )

On this day and year above, personally appeared before me, **Scott Egger**, to me known to be the Public Works Director of the City of Lacey, a Municipal Corporation, who executed the foregoing instrument and acknowledged the said instrument to be the free and voluntary act and deed of said Municipal Corporation for the uses and purposes therein mentioned and on oath states he is authorized to execute the said instrument.

Given under my hand and seal this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at \_\_\_\_\_

\_\_\_\_\_  
My commission expires: \_\_\_\_\_

## Attachment “A”

### **What is Stormwater Runoff?**

When urban and suburban development covers the land with buildings, houses, streets and parking lots, much of the native topsoil, duff, trees, shrubs, and grass are replaced by asphalt and concrete. Rainfall that would have directly soaked into the ground instead stays on the surface as *stormwater runoff* making its way into storm drains (including man-made pipes, ditches, or swale networks), stormwater ponds, surface and groundwater, and eventually to Puget Sound.

### **What is a Storm Drain System and how does it work?**

The storm drain system for most developments includes components *that carry, store, cleanse, and release* the stormwater. These components work together to reduce the impacts of development on the environment. These impacts can include *flooding* which results in property damage and blocked emergency routes, *erosion* which can cause damage to salmon spawning habitat, and *pollution* which harms fish and/or drinking water supplies.

The storm drain system provides a safe method to carry stormwater to the treatment and storage areas. Swales and ponds filter pollutants from the stormwater by *physically* settling out particles, *chemically* binding pollutants to pond sediments, and *biologically* converting pollutants to less-harmful compounds. The ponds also store the treated water, releasing it gradually to a nearby stream or to groundwater. The various components of storm drain systems are described in the glossary.

### **What does Stormwater Runoff have to do with Water Quality?**

Stormwater runoff needs to be treated because it carries litter, oil, gasoline, fertilizers, pesticides, pet wastes, sediments, and anything else that can float, dissolve, or be swept along by the moving water. Left untreated, polluted stormwater can reach nearby waterways where it can harm and even kill aquatic life. It can also pollute groundwater to the extent that it must be treated before it can be used for drinking, which has actually happened in Pierce County. Nationally, stormwater is recognized as a major threat to water quality. Remember to keep everything out of stormwater systems except the rainwater they are designed to collect.

### **Your Stormwater Facility**

Stormwater facilities can be attractive as well as functional. They can provide both active and passive-use recreation areas and open space for wildlife. Perhaps you’ve noticed a wet or dry pond in your neighborhood. These different types of ponds are designed for different purposes. For example, wet ponds primarily provide treatment of stormwater. They also provide good cover and habitat for birds and small mammals, making them fine “wildlife preserves”. Dry ponds or infiltration ponds are designed to provide storage for stormwater and gradually release it downstream or allow it to filter into the ground. These types of ponds can be maintained as grassy play areas, and may even be modified to house more formal play equipment.

### **Who is Responsible for Maintaining Stormwater Facilities?**

All stormwater facilities need to be maintained. Regular maintenance ensures proper functioning and keeps the facility visually appealing. This Stormwater Facility Maintenance Guide was designed to help explain how stormwater facilities work and provide user-friendly, straightforward guidance on how to maintain them.

As a property owner or homeowner’s association, you are responsible for regularly maintaining privately owned ponds, catch basins, pipes and other drainage facilities within your subdivision. The City of Lacey maintains stormwater facilities located in public right-of-ways.

## Maintenance Checklists

The checklists in this guide are for you to use when inspecting and maintaining the stormwater facilities that you are responsible for. If you feel that you are missing a particular checklist, or you have additional facilities not identified or addressed in this guide, please contact your site developer, design engineer or the City.

The checklists are in table format for ease of use and brevity. Each checklist tells you what part of the feature to check, how often to check, what to check for and the desired outcome after maintenance is performed. Log sheets are included to help you keep track of when you last surveyed the stormwater drainage system.

Those systems using approved “emerging technologies”, such as a StormFilter™, may not find a checklist covering the specific stormwater facility. Please refer to the manufacturer’s guidelines for the appropriate maintenance activity schedule. If a checklist is provided, it is for guidance purposes only and not meant to supersede the manufacturer’s recommendations.

Although it is not intended for the inspection to involve anything too difficult or strenuous, there are a few tools that will make the job easier and safer. These tools include:

- Gloves
- A flashlight.
- A long pole or broom handle.
- Some kind of pry bar or lifting tool for pulling manhole and grate covers.
- Standard yard tools, such as a rake and a shovel.
- Measuring tool.

**SAFETY WARNING: For your safety and per OSHA regulations, you should never stick your head or any part of your body into a manhole or other type of confined space. When looking into a manhole or catch basin, stand above it and use the flashlight to help you see. Use a pole or broom handle that is long enough when you are checking sediment depths in confined spaces. NO PART OF YOUR BODY SHOULD BREAK THE PLANE OF THE OPEN HOLE.**

## Checklist Instructions

The following pages contain maintenance checklists covering most of the needs for the components of your drainage system, as well as for some components that you may not have. Let City staff know if there are any components of your drainage system that you do not recognize or are missing from these pages.

Refer to the City of Lacey Stormwater Code, LMC 14.25 for additional stormwater maintenance requirements, including maintenance frequency.

Using photocopies of these checklists and the log sheet, check off the problems that you look for each time you do an inspection. Add comments regarding problems found and actions taken on the log sheet. Keep the completed forms in your files for future reference.

You may call the City of Lacey at (360) 491-5600 for technical guidance. Please do not hesitate to call, especially if you are unsure whether a situation you have discovered may be a problem.

You should plan to complete a check for all system components on the following schedule:

- **Quarterly** - Plan to inspect the facility at least once during the following months; January, May, August, and November.
- **Annually** - The best time for an annual inspection is in the late summer, preferably September.
- **After Storms** - Also check all stormwater facilities after major storm events, defined as about 1 inch or more of precipitation in 24 hours.

## Resource Listing

If you are unsure whether a problem exists, please contact the City at the number below and ask for technical assistance with your situation. Other resources are listed for your convenience and as references associated with the checklists.

### Lacey Public Works Department

(360) 491-5600 <http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>

### City of Lacey Spill Response Team

(360) 491-5644 <http://ci.lacey.wa.us/report-a-spill>

### Thurston County Environmental Health

Hazardous Waste Disposal (oil, paint, pesticides, etc.)

(360) 754-4111 <http://www.co.thurston.wa.us/health/ehhw/index>

Solid Waste Disposal (yard waste, construction waste, contaminated soils, etc.)

(360) 786-5136 <http://www.co.thurston.wa.us/health/ehhw/index>

### WSU Thurston Co. Extension (Water Resource Ed. Programs, Envir. Stewardship info.)

(360) 786-5445 <http://www.thurston.wsu.edu/water>



## Stormwater Facility Inspection and Maintenance Procedure

Stormwater facilities play an important role in managing the 4 feet of rainfall we receive in Lacey in an average year. The term “stormwater facility” refers to any landscaped or structural feature that collects, conveys, cleans or infiltrates runoff water. There are many types of stormwater facilities, ranging from simple swales and ponds to more complicated filter systems and flow control devices. Your on-site stormwater facilities work together to control runoff water, reduce flooding, and prevent pollution.

Owners of commercial property, multifamily residential property, or single-family residential properties with privately-owned drainage and stormwater facilities are required by the City of Lacey Codes to maintain their facilities to established standards for full functionality (City of Lacey Stormwater Code, LMC 14.25). Facility owners are responsible for performing inspections of stormwater facilities, and for performing any maintenance identified by the inspections.

Basic maintenance work may be performed by the owner or property manager, although some tasks are best left to an experienced contractor. The inspection of stormwater facilities and any required maintenance work must be completed and reported annually to the City of Lacey Public Works Department by the date specified on the *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* obtainable on the City’s web site at:

<http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>.

Again, note that most large development sites will also have a Maintenance and Source Control Manual that was prepared as part of the site development, and should have been provided to the property owners. Look to your site’s Maintenance and Source Control Manual for information on the project, the facilities on the site, maintenance responsibilities, and maintenance activities.

Where a Maintenance and Source Control Manual is not available, the following steps are provided as general guidance:

### **Step 1. Identify**

The first step is facility identification, so you know what types of stormwater facilities you have. Look on the site plan of your property, and note the main facility types indicated (such as rain gardens and infiltration trenches), along with related drainage components (such as catch basins, pipes, and debris barriers). Locate the various facilities on the ground.

Note that most drainage systems consist of components for four main purposes: stormwater collection (e.g., catch basins), conveyance (e.g., pipes and swales), water quality treatment (e.g., wet ponds) and flow control (via infiltration and/or surface discharge).

To assist you in identifying components, refer to the definitions on the pages that follow.

## **Step 2. Inspect**

For all facility components that you have identified, conduct an inspection. You may conduct the inspection yourself and/or with co-owners, or you may use a property manager or vendor to perform the inspection. Refer to the following Stormwater Facility Maintenance Checklists, which describe the maintenance standards for each component, and also identify and describe defects and their remedies.

For each facility, note on the Inspection and Maintenance Checklist the condition of the facility (good, fair or poor), and any problems or other observations.

## **Step 3. Maintain**

For all facility components, if the inspection indicates maintenance is needed; have the work performed by competent personnel. Basic maintenance tasks may be performed by the property owner(s) or property manager, but difficult or potentially dangerous tasks should be performed by a qualified vendor. Be safe! Use caution when inspecting and working on or near facilities, and stay out of confined spaces such as catch basins and manholes.

Note the action taken and the date, and record this information on the Log Sheet. Mark the check boxes on the Inspection and Maintenance Checklist corresponding to the maintenance accomplished on each facility.

## **Step 4. Submit**

Submit the completed *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* by August 15 each year to: Lacey Water Resources, 420 College Street SE, Lacey, WA 98503. The completed checklist may be mailed, e-mailed (if available) or delivered in person to Lacey City Hall.

## **Common Stormwater Facilities: Identification and Actions**

*Note: General actions are described for each facility type below. Please refer to the Stormwater Facility Maintenance Standards for further details.*

### **Detention Pond:**

A shallow bowl-like depression in the land, with an area to collect and temporarily store stormwater. The pond is generally lined with grass and is intended to store stormwater to reduce runoff volumes during storms.

#### *Actions to keep detention ponds functioning:*

- Remove litter, sediment, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Inspect pond berms for any structural deficiencies

### Infiltration Basin (“Dry Pond”):

A shallow bowl-like depression in the land, with a broad, flat bottom area to collect, temporarily store, and infiltrate stormwater. An infiltration basin is designed to receive treated water and allow it to infiltrate into the soil. The infiltration basin is usually lined with grass and drains “dry” between rain events. Some playfields double as infiltration basins by design.

#### Actions to keep infiltration basins functioning:

- Remove litter, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Avoid activities within the basin that could cause erosion or soil compaction.
- Avoid using herbicides or pesticides within the basin area.
- Aerate the soil in the bottom area as needed to preserve and enhance infiltration.

### Biofiltration Swale:

A longitudinally sloped, wide, shallow, vegetation-lined channel with gently sloping sides and a flat bottom designed to remove pollutants by means of sedimentation, filtration, soil sorption, and/or plant uptake. Some water also infiltrates into the soil as it slowly flows along the swale.

#### Actions to keep swales functioning:

- Remove debris, litter, and flow obstructions from the swale.
- Mow the swale and maintain healthy grass cover.
  - Prevent dirt, rocks, and weeds from accumulating, but avoid use of herbicides (remove manually).
- Do not fill-in the swale with rocks, bark, etc.
- Aerate the soil to preserve infiltration capacity.

### Wet Pond:

A constructed pond with an impermeable liner to maintain a permanent pool of water, which provides for water quality treatment by settling and retention of sediment particles and other pollutants. The cleaner surface water is then conveyed to a nearby infiltration facility (such as a “dry detention pond”) or surface discharge. A wet pond provides a basic level of treatment, and is common in many neighborhoods.

#### Actions to keep wet ponds functioning:

- Remove litter and yard debris from within and around the pond.
- Check inflow and outflow systems. Remove any obstructions.
- Remove excess vegetation such as cattails from within the pond.
- Remove noxious weeds, but do not use herbicides (contact City for advice).

### Stormwater Wetland:

A created wetland with a permanent pool of water, similar to a wet pond, but generally shallower and with aquatic emergent plants which provide for a higher level of water quality treatment of collected stormwater through biological processes.

Actions to keep stormwater wetlands functioning:

- Remove litter and yard debris from within and around the wetland.
- Check inflow and outflow systems, and remove any obstructions.
- Remove excess vegetation such as cattails from within the wetland.
- Remove noxious weeds, but do not use herbicides (contact city for advice).

**Bioretention Cell:**

A shallow stormwater system with a designed soil mix and plants. Bioretention is a “low-impact development” (LID) practice that is integrated into a site to retain stormwater near its source. Bioretention cells are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. They also provide water quality treatment through sedimentation, filtration, adsorption, and phytoremediation. Bioretention cells function by storing stormwater as surface ponding before it filters through the underlying amended soil.

Actions to keep bioretention cells functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Rain Garden:**

Non-engineered, shallow, landscaped depressions with compost amended native soils and adapted plants that collect, absorb, and filter stormwater runoff from roof tops, driveways, patios, and other hard surfaces. Rain gardens are sized to pond and temporarily store stormwater runoff and allow stormwater to pass through the amended soil profile.

Actions to keep rain gardens functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Permeable Pavement:**

Permeable pavement (also known as pervious and porous pavement) looks very much like ordinary pavement but includes additional “void” spaces where water can pass through. After water drains through permeable pavement wearing course, it is held in a storage reservoir bed (made up of aggregate rock, or drain rock), and then infiltrates into the native soils.

Actions to keep permeable pavement functioning:

- Clean surface to remove trash, sediment, vegetation, and other accumulated debris.
- Check inflow and outflow systems and underdrains, and remove any obstructions.
- Use vacuum to remove fine sediments.

- If pavers are used, check for damaged or missing pavers and replace as needed.
- If paving grids are used, check for loss of soil, grass, and/or gravel material and replace as needed.

#### Downspout, Sheet Flow, and Concentrated Flow Dispersion:

A gravel trench or splashblock followed by a vegetated flowpath (or dispersion area) used to disperse flow and reduce runoff from impervious surfaces. Dispersion attenuates peak runoff flows by slowing the runoff entering into the conveyance system, allowing some infiltration, and providing some water quality benefits.

##### Actions to keep downspout, sheet flow, and concentrated flow dispersion functioning:

- Ensure that vegetation is not blocking flow, and perform plant maintenance as needed.
- Remove and replace dead vegetation to ensure that runoff is received in a well-vegetated area.
- Avoid activity in dispersion area to avoid compaction.
- Check for erosion of the dispersion trench or dispersal area and replace and restore gravel and/or soil.

#### Downspout Infiltration:

Includes an infiltration trench or drywell intended only for use in infiltrating runoff from roof surfaces. Infiltration trenches and drywells are backfilled with washed drain rock, allowing for temporary storage of stormwater runoff in the voids of the drain rock material. Stored runoff gradually infiltrates into the surrounding soil.

##### Actions to keep downspout infiltration functioning:

- Remove litter, leaves, debris, and obstructions from the infiltration trench or drywell.
- Stabilize adjacent landscaped areas to avoid runoff from eroding and mobilizing soil into the surface inlet.

#### Detention Tank:

An underground storage facility typically constructed with large diameter corrugated metal or HDPE pipe.

##### Actions to keep detention tanks functioning:

- Remove litter, leaves, debris, and obstructions from inlet and outlet.
- Check tank for cracks or leaks.
- Clean out any sediment or debris accumulated inside the tank.

#### Ditch:

A V-shaped channel, usually along the side of a road that collects and conveys runoff.

##### Actions to keep ditches functioning:

- Remove debris, litter and flow obstructions from the ditch.
- Do not fill-in the ditch – prevent dirt, rocks, and weeds from accumulating.
- Repair erosion on ditch side-slopes.

## Culvert:

A pipe that continues conveyance flow from a ditch or swale under the ground surface, typically under driveways and cross-streets. Usually connects (“daylights”) to another ditch, swale or pond. The end of a pipe or culvert is often surrounded by rock “riprap” to prevent soil erosion.

### Actions to keep culverts functioning:

- Remove debris, litter, and obstructions from the openings at the culvert ends.
- Remove soil, sod, and vegetation buildup from the culvert openings.
- Replace rock riprap at the culvert ends.
- Repair any damage to the culvert ends.

## Catch Basin:

An underground concrete box structure with a slotted metal grate on top that collects runoff water from the ground surface. Typically located within pavement in parking lots and in the street gutter, usually next to a curb. Grate on top lets water in and keeps larger debris out. Sediment settles in the sump in the bottom (below the pipe openings) and must be removed periodically. Catch basins have an outlet pipe between the grate and the sump, to let the cleaner water flow out to a storm pond or other location. Some catch basins have both inflow and outflow pipes, to convey collected runoff water through.

### Actions to keep catch basins functioning:

- Remove litter, leaves, debris, and obstructions from catch basin grates.
- Hire a professional to remove sediment buildup from sump, if road is privately owned.  
Catch basins in the public right-of-way are maintained by the City.

## Debris Barriers and Trash Racks:

A structural device with metal bars, to prevent debris from entering a pipe, spillway, or hydraulic structure.

### Actions to keep debris barriers and trash racks functioning:

- Remove trash, debris, vegetation, and dirt from around the structure.
- Check inflow and outflow, and remove any flow obstructions.
- Remove plants such as alder and willow that tend to grow near the pipe ends.
- Check for structural integrity; hire a professional to fix broken bars or racks.

# Stormwater Facility Maintenance Checklists

## Maintenance Standards

The following pages contain facility-specific maintenance standards, which are intended to be observable conditions for determining whether maintenance actions are required.

### Group 1: Flow Control and Treatment Facilities

- 1a Detention Ponds
- 1b Infiltration Ponds
- 1c Detention Tanks and Vaults
- 1d Wet Vaults
- 1e Wet Ponds
- 1f Stormwater Wetlands
- 1g Basic and Compost-Amended Biofiltration Swale
- 1h Wet and Continuous Inflow Biofiltration Swales
- 1i Filter Strip (Basic and CAVFS)
- 1j Sand Filter (above ground/open)
- 1k Sand Filter (below ground/closed)
- 1l Media Filter Drains
- 1m Bioretention Cells, Swales and Planter Boxes
- 1n Rain Gardens
- 1o Trees
- 1p Permeable Pavement
- 1q Vegetated Roofs
- 1r Downspout, Sheet Flow, Concentrated Flow Dispersion
- 1s Downspout Infiltration
- 1t Cisterns
- 1u Fencing, Shrubbery Screen, Other Landscaping
- 1v Manufactured Media Filters
- 1w Proprietary of Manufactured Products

**Group 2: Structure and Pretreatment**

- 2a Control Structures and Flow Restrictors
- 2b Catch Basins
- 2c Debris Barriers (trash racks)
- 2d Energy Dissipaters
- 2e Baffle Oil/Water Separators (API type)
- 2f Coalescing Plate Oil/Water Separators
- 2g Catch Basin Inserts

**Group 3: Miscellaneous Facilities and Features**

- 3a Conveyance Pipes, Culverts, Ditches and Swales
- 3b Access Roads and Easements

# **Group 1**

## ***Flow Control & Treatment***

## 1a. Detention Ponds

Detention ponds are earthen excavations that are “dry” except during and after rains, when they contain stormwater temporarily. Detention ponds store water while releasing it gradually.

Detention Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation according to applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111 and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with the Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility		Return facility to design function. ( <i>Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.</i> )	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove or remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Overgrown Vegetation Around Pond	Tree grown and dense vegetated impedes inspection, maintenance access or interferes with maintenance activity with the facility function or maintenance (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Prune or maintain trees and vegetation so they do not to hinder inspection or maintenance activities.  If trees are not interfering with access or maintenance, do not remove.	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Sediment Accumulation	Accumulated sediment that exceeds 10 percent of the designed pond depth unless otherwise specified or affects inlets or outlets of the facility.		Clean out sediment and aerate and/or re-seed the pond if deemed necessary to improve infiltration and control erosion.  <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	PVC Pond Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate), and the liner is not exposed. Maintenance is needed if liner is visible and has more than three 0.25-inch holes.		Repair or replace liner as needed. Liner is fully covered.	
	Clay Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate).		Repair or replace liner as needed.	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Emergency Overflow Spillway	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	

### Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		<p>Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.</p> <p><i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i></p>	

## 1b. Infiltration Ponds, Trenches, and Galleries

Infiltration ponds, trenches, and galleries are earthen excavations or underground structures that are “dry” except during and after rains, when they contain stormwater temporarily. Infiltration ponds, trenches, and galleries store water while gradually percolating water into the ground.

Infiltration Ponds, Trenches, and Galleries					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>(Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.)</i>	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
	Tree Growth and Dense Vegetation	Tree growth and dense vegetation, which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Trees and vegetation do not hinder inspection or maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).	
Storage Area	Water Not Infiltrating	Check for water ponding in infiltration basin after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events. (Maintenance is required if a percolation test pit or test of facility indicates facility is only working at 90 percent of its designed capabilities, or if 2 inches or more sediment is present, remove).		Facility infiltrates as designed. Sediment is removed and/or facility is cleaned so that infiltration system works according to design.	
Filter Bags (if applicable)	Filled with Sediment and Debris	Maintenance is required if sediment and debris fill bag more than one-half full.		Replace filter bag or redesign system. Filter bag must be less than one-half full.	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.		Replace gravel in rock filter if needed. Water must flow through filter.	
Trenches	Observation Well (use surface of trench if well is not present)	Water ponds at surface during storm events. Less than 90 percent of design infiltration rate.		Remove and replace/clean rock and geomembrane.	
Galleries	Chambers	Check inlet and outlets and interior of chambers for deficiencies, cracks, debris, and sediment.		Remove any debris and sediment and replace or restore chambers as needed.	
		Exceeds 18 inches.		Mow grass or groundcover to a height no greater than 6 inches.	
		Bare spots.		Revegetate and stabilize immediately. No bare spots should be present.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Dikes or Berms (continued)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Screen Clogged or Missing	The bar screen over the outlet should be intact and clear of debris. Water should flow freely through the outlet pipe.		Replace screen if it is not attached. Remove any trash or debris and dispose of properly. Clean out the end pipe if necessary.	

<b>Infiltration Ponds, Trenches, and Galleries</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Presetting Ponds and Vaults	Facility or Sump Filled with Sediment and/or Debris	6 inches or designed sediment trap depth of sediment.		Remove sediment. No sediment should be present in presetting pond or vault.	
	Inadequate Sediment Settling Area	Stormwater should not enter the infiltration area without some method of settling-out solids.		Add a sediment trapping area by constructing a sump or berm for settling of solids. This area should be separate from the rest of the facility. Contact City of Lacey for guidance.	
Drain Rock	Water Ponding	If water enters the facility from the surface, inspect to see if water is ponding at the surface during storm events.  If buried drain rock, observe drawdown through observation port or cleanout.		Clear piping through facility when ponding occurs. Replace rock material/sand reservoirs as necessary. Tilling of subgrade below reservoir may be necessary (for trenches) prior to backfill. No water ponding should be present on surface during storm events.	

For manufactured infiltration galleries, designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.

### 1c. Detention Tanks and Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Detention Tanks and Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.		Vents open and functioning. Remove blockage or replace air vent if damaged.	
	Debris and Sediment	Accumulated sediment depth exceeds 10 percent of the diameter of the storage area for 50 percent of the length of storage vault or any point depth exceeds 15 percent of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 50 percent of the length of tank.)		No debris or sediment present. All sediment and debris removed from storage area.	
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).		All joint between tank/pipe sections are sealed.	
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10 percent of its design shape. (Review required by engineer to determine structural stability).		Tank/pipe repaired or replaced to design.	
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.		Vault replaced or repaired to design specifications and is structurally sound.	

## Detention Tanks and Vaults

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Storage Area (continued)	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.		Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
Catch Basins	See "Catch Basins"	See "Catch Basins."		See "Catch Basins."	

## 1d. Wet Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Wet Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris in vault, pipe or inlet/outlet (includes floatables and non-floatables).		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Accumulation	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.		Remove sediment from vault. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.		Pipe repaired and/or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened or removed, especially by one person.		Pipe repaired or replaced to proper working specifications.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed or cleared from ventilation area. A specified percentage of the vault surface area must provide ventilation to the vault interior (see design specifications).	
		Maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking warping and/or showing signs of failure as deemed by maintenance/inspection staff.		Baffles repaired or replaced to specifications.	
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.	

## 1e. Wet Ponds

Wet ponds are designed to improve water quality. They have a permanent pool of water, which slows incoming stormwater flows causing sediments and pollutants to settle-out. Wet ponds are typically deeper than other water quality BMPs, such as stormwater wetlands, and utilize the pool volume to reduce pollutant loads.

Wet Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Level	First cell is empty, doesn't hold water.		Line the first cell to maintain at least 4 feet of water. Second cell may drain, but the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.	
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No debris or sediment present. Remove and properly dispose of all trash and debris.	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.		No clogging or blockage in the inlet and outlet piping.	
	Sediment Accumulation on Pond Bottom	Accumulated sediment on pond bottom that exceeds the depth of sediment zone plus 6 inches, usually in the first cell.		Sediment removed from pond bottom. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Oil Sheen on Water	Visible and prevalent oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Locate and correct oil source. If chronic low levels of oil persist, plant wetland plants such as <i>Juncus effusus</i> (soft rush) which can uptake small concentrations of oil.	
	Erosion	Erosion of the pond's side slopes and/or scouring of pond bottom that exceeds 6 inches, or where continued erosion is prevalent.		Slopes stabilized using proper erosion control measures and repair methods.	
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.		Dike/berm is repaired to specifications.	

## Wet Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Internal Berm	Berm dividing cells should be level.		Berm surface is leveled so that water flows evenly over entire length of berm.	
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.		Rocks replaced to specifications.	
	PVC Pond Liner	Check to see if liner is visible and has more than three 0.25-inch holes, is exposed and/or torn. An indicator of a torn liner could be the pond no longer holds water (during long dry periods the water may evaporate)		Repair or replace liner as needed. Note: wet ponds usually have liners.	
	Clay Liner	Check to see if pond is holding water (during long dry periods the water may evaporate).		Repair liner to design state.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Vegetation Not Growing or Overgrown Within Pond	Presence of invasive species or sparse/excessive growth of plants.		Remove invasive species and reestablish vegetation as designed.	

## 1f. Stormwater Wetlands

Stormwater wetlands are designed to improve water quality. They are designed with emergent aquatic plants to provide biological treatment and filtering of runoff water.

Stormwater Wetlands					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No debris or sediment present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club).  Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. (Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Oil Sheen on Water	Prevalent and visible oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Source of oil located and corrected. <i>If chronic low levels of oil persist, plant emergent wetland plants such as <i>Juncus effusus</i> (soft rush) which can assist filtering small concentrations of oil.</i>	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material or damaged.		No clogging or blockage in the inlet and outlet piping.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>Evaluate using beaver deceiver and leveler devices. If beaver removal is necessary, contact WDFW Region 6 to coordinate with a Nuisance Wildlife Control Operator.</i>	
	Tree Growth and Hazard Trees	Tree growth that impedes maintenance access.		Remove hazard trees. Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., firewood or construction).	
	Tree Growth and Hazard Trees	If dead, diseased, or dying trees are identified, use a certified Arborist to determine the health of tree and whether removal is required.		Remove hazard trees.	
	Liner	Check to see if liner is visible and has more than three 0.25-inch holes, or if it is exposed and or torn. An indicator of a torn liner could be the wetland no longer holds water. (during long dry periods the water may evaporate).		Repair or replace liner as needed. Liner is fully covered.	
Forebay	Sediment Accumulation	Sediment accumulation in forebay exceeds the design depth of the sediment zone plus 6 inches.		Remove accumulated sediment from forebay bottom to the design depth of the sediment zone.	
Side Slopes of Wetland	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.	
Side Slopes of Wetland	Erosion	Any erosion observed on a compacted berm embankment.		<i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Cell	Wetland Vegetation	20 percent or more of the stormwater wetland area has dead or dying vegetation, as measured by stem counts relative to the design plant coverage.		Plants in wetland cell surviving and not interfering with wetland function. Dead or dying vegetation is replaced by like species, unless recommended otherwise by the Wetlands Consultant and approved by the city. ( <i>Watering, physical support, mulching, and weed removal may be required on a regular basis especially during the first 3 years.</i> )	
	Wetland Vegetation	Percent vegetated cover of stormwater wetland bottom area, excluding exotic and invasive species, is less than 50 percent after 2 years.		Exotic/invasive species removed. Additional plantings may be required.	
	Wetland Vegetation	Decaying vegetation produces foul odors.		Decaying vegetation is removed, preferably in late summer.	
	Wetland Vegetation	Wetland vegetation is blocking flow paths causing flow back-up and flooding.		Areas of blocking vegetation are cut back sufficient to allow design flows and prevent flooding.	
	Wetland Vegetation	Water quality monitoring indicates that wetland vegetation is contributing phosphorus and metals to downstream waters rather than sequestering them.		Water quality monitoring indicates improved water quality.  To maximize removal of wetland pollutants, wetland vegetation must be periodically harvested, particularly with respect to phosphorus and metals removal. Harvesting should occur by mid-summer before plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. Every 3 to 5 years the entire plant mass including roots should be harvested because the belowground biomass constitutes a significant reservoir (as much as half) of the nutrients and metals that are removed from stormwater by plants.	
	Sediment Accumulation	Sediment accumulation inhibits growth of wetland plants or reduces wetland volume (greater than 1 foot of sediment accumulation).		Wetland dredged to remove sediment accumulation.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Berms (dikes)	Settlements	Any part of berm that has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works.		Dike restored to the design elevation. <i>A professional engineer should be consulted to determine the source of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Wetland Berms Over 4 Feet in Height (dikes)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Obstruction	Tree growth or other blockage on emergency spillways may cause failure of the berm due to uncontrolled overtopping.		Remove obstruction on emergency spillway. <i>A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rock Missing	Check to see that the riprap protective area is intact. Only one layer of rock exists above native soil in an area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.)	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

### 1g. Basic and Compost-Amended Biofiltration Swale

A gently-sloped channel with gentle side slopes, lined with grass (and sometimes other vegetation) to slow the flow and allow for water quality treatment and infiltration.

Basic and Compost-Amended Biofiltration Swale					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches or inhibits vegetation growth in 10 percent or more of swale.		Remove sediment deposits on grass treatment area of the biofiltration swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.	
	Standing Water	When water stands in the swale between storms and does not drain freely.		Swale must drain freely and not contain standing water between storms. Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.		Level the spreader and clean so that flows are spread evenly over entire swale width.	
	Constant Baseflow	Small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.		Base flow removed from swale. Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.	
	Poor Vegetation Coverage	Grass is sparse or bare or eroded patches occur in more than 10 percent of the swale bottom.		Swale has no bare spots and grass is thick and healthy. Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.	
	Vegetation	When the grass becomes excessively tall (higher than 10 inches); when nuisance weeds and other vegetation start to take over.		Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.	
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.		If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.	

### Basic and Compost-Amended Biofiltration Swale

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Swale	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.		Remove material so that there is no clogging or blockage in the inlet and outlet area.	
	Trash and Debris Accumulation	Trash and debris accumulated in the biofiltration swale.		No debris or sediment present. Remove trash and debris from biofiltration swale.	
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale. Cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

## 1h. Wet and Continuous Inflow Biofiltration Swales

Similar to a basic biofiltration swale (previous pages), but with modifications due to saturated soil conditions (such as, specific plants that can tolerate wet conditions).

Wet and Continuous Inflow Biofiltration Swales					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation	Sediment depth exceeds 2 inches in 10 percent of the swale treatment area.		Remove sediment deposits in treatment area.	
	Water Depth	Water not retained to a depth of about 4 inches during the wet season.		Build up or repair outlet berm so that water is retained in the wet swale.	
	Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.		Wetland vegetation fully covers bottom of swale. Cause of lack of vigor of vegetation addressed. Replant as needed.  Determine cause of lack of vigor of vegetation and correct. Replant as needed. Remove cattails and compost off site. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.	
	Inlet/Outlet	Inlet/outlet area clogged with sediment and/or debris.		Remove clogging or blockage in the inlet and outlet areas.	
	Trash and Debris Accumulation	Any plastic, paper or other waste or debris.		No debris or sediment present. Remove trash and debris from wet biofiltration swale.	
	Erosion/ Scouring	Swale has eroded or scoured due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale.  Check design flows to ensure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as <i>Juncus effusus</i> (soft rush) in wet areas or snowberry ( <i>Symphoricarpos albus</i> ) in dryer areas.	

**Wet and Continuous Inflow Biofiltration Swales**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swale (continued)	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

### 1i. Filter Strip (Basic and CAVFS)

A basic filter strip is a flat grassy area that provides treatment of unconcentrated sheet flow runoff from adjacent pavement. Can provide enhanced treatment for metals in runoff water when soil is amended with organic compost and grass is sufficiently dense.

<b>Filter Strip (basic and CAVFS)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.	
	Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.		Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3 to 4 inches.	
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.		No trash or debris present. Remove trash and debris from filter.	
	Erosion/ Scouring	Eroded or scoured areas due to flow channelization, or higher flows.		No eroded or scoured areas, cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.		Level the spreader and clean so that flows are spread evenly over entire filter width.	

### 1j. Sand Filter (above ground/open)

A typical open sand filter consists of a pretreatment system to remove sediments, a flow spreader, a sand bed, and underdrain piping. See also Sand Filter (belowground/closed).

Sand Filter (above ground/open)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment and Silt Accumulation on top layer	Sediment and silt depth exceeds 0.5 inch over 10 percent of surface area of sand filter.		No sediment deposit on grass layer of sand filter that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.		No trash or debris present. Trash and debris removed from sand filter bed.	
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.		Sediment removed from cleanouts and/or drainpipes.	
	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, flow through the overflow pipes occurs frequently, or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).	
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities. (Consider 4- to 8-hour drawdown tests).		Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.	
	Short Circuiting	Drawdown greater than 12 inches per hour. When flows become concentrated over one section of the sand filter rather than dispersed.		Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area. No leaks in the cleanouts or underdrains.	
	Erosion Damage to Slopes	Erosion over 2 inches deep where cause of damage is prevalent or potential for continued erosion is evident.		Slopes stabilized using proper erosion control measures.	
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.		Rock pad replaced or rebuilt to design specifications.	

**Sand Filter (above ground/open)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Aboveground (open sand filter) (continued)	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter. Rills and gullies on the surface of the filter can indicate improper function of the inlet flow spreader.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20 percent or any other failure to the piping.		Pipe repaired or replaced.	

### 1k. Sand Filter (below ground/closed)

Similar to an open sand filter, but installed below grade within a vault.

Sand Filter (below ground/closed)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 0.5 inch.		No sediment deposits on sand filter section that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Sediment Accumulation in Presettling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of sediment zone plus 6 inches.		No sediment deposits in first chamber of vault.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Trash and debris removed from vault and inlet/outlet piping.	
	Sediment in Drain Pipes/ Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.		No sediment or debris present. Any sediment and debris removed from cleanouts and/or drainpipes.	
	Clogged Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently, and/or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging and influent suspended solids loads (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material). <i>Other options include removal of thatch, aerating the filter surface, tilling the filter surface, replacing the top 4 inches of filter media, and inspecting geotextiles for clogging.</i>	
	Short Circuiting	Drawdown greater than 12 inches per hour. When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area. (Consider 4- to 8-hour drawdown tests.)		Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion. No leaks in the cleanouts or underdrains.	

**Sand Filter (below ground/closed)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vault (continued)	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.		Cover repaired to proper working specifications or replaced.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed/cleared from ventilation area. A specified percentage of the vault surface area must provide venting to the vault interior (per design specifications).	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles/ Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.	
Pipes	Damaged Pipes	Inlet or outlet piping damaged or broken, in need of repair.		Pipe repaired and/or replaced.	

## 11. Media Filter Drains

A filter treatment device that is typically sited along highway side slopes (conventional design) and medians (dual media filter drains), borrow ditches, or other linear depressions. Media filter drains have basic components: a gravel no-vegetation zone, a grass strip, the MFD mix bed, and a conveyance system for flows leaving the media filter drain mix.

Media Filter Drains					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Erosion, Scour, or Vehicular Damage	No vegetation zone uneven or clogged so that flows are not uniformly distributed.		Area leveled and cleaned so that flows are spread evenly.	
	Sediment Accumulation on Edge of Pavement	Flows no longer sheet flowing off of roadway. Sediment accumulation on pavement edge exceeds top of pavement elevation.		No sediment accumulation on pavement edge that impedes sheet flow. Sediment deposits removed such that flows can sheet flow off of roadway.	
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Sediment deposits removed, slope is re-leveled so that flows pass evenly through media filter drain.	
	Excessive Vegetation or Undesirable Species	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over or shades out desirable vegetation growth characteristics. See also the <a href="#">Thurston County Noxious Weeds List</a> .		Grass mowed and nuisance vegetation controlled such that flow not impeded. <i>Grass should be mowed to a height that encourages dense even herbaceous growth.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with suitable topsoil. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or areas less than 12 inches wide, repair the damaged area by filling with suitable media. If bare areas are large, generally greater than 12 inches wide, the media bed should be re-graded.</i>	

### Media Filter Drains

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Media Bed	Sediment depth inhibits free infiltration of water.		Sediment accumulation does not impeded infiltration. Sediment deposits removed and slope is re-leveled so that flows pass freely through Media Bed.	
Underdrains	Sediment	Depth of sediment within perforated pipe exceeds 0.5 inch.		Depth of sediment within perforated pipe does not exceed 0.5 inch. Flush underdrains through access ports and collect flushed sediment.	
	Trash and Debris Accumulation	Accumulated trash and debris. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No trash or debris present. Remove trash and debris from media filter.	
	Flows are Bypassing Media Filter Drain	Evidence of significant flows downslope (rills, sediment, vegetation damage, etc.) of media filter drain.		Facility functions as designed. Sediment deposits removed and slope is re-leveled so that flows pass evenly through media filter drain. If media filter drain is completely clogged, it may require a more extensive repair or replacement.	
	Media Filter Drain Mix Replacement	Water is seen on surface of the media filter drain mix from storms that are less than the 91st percentile 24-hour rain event (approximately 1.25 inches in 24 hours). Maintenance also needed on a 10-year cycle and during a preservation project.		No water ponded on surface after design storm. <i>Excavate and replace all of the media filter drain mix contained within the media filter drain.</i>	

### 1m. Bioretention Cells, Swales, and Planter Boxes

Bioretention areas are shallow stormwater systems with a designed soil mix and plants adapted to the local climate and soil moisture conditions. They are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. Most routine maintenance procedures are typical landscape care activities.

Bioretention Cells, Swales, and Planter Boxes					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
General	Trash	Trash and debris present.		No trash and debris present. Remove and properly dispose of all trash and debris.	
Concrete Sidewalls	Cracks or Failure in Concrete Planter Reservoir	Cracks wider than 0.5 inch or maintenance/inspection personnel determine that the planter is not structurally sound.		Concrete repaired or replaced.	
Rockery Sidewalls	Unstable Rockery	Rock walls are insecure.		Rockery sidewalls are stable (may require consultation with professional engineer, particularly for walls 4 feet or greater in height).	
		Erosion (gullies/rills) greater than 2 inches around inlets, outlet, and alongside slopes.		Source of erosion eliminated and damaged area stabilized (regrade, rock, vegetation, erosion control blanket). For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures are in place until permanent repairs can be made.	
		Erosion of sides causes slope to become a hazard.		The hazard is eliminated and slopes are stabilized.	
		Settlement greater than 3 inches (relative to undisturbed sections of berm).		The design height is restored with additional mulch.	
		Downstream face of berm or embankment wet, seeps or leaks evident.		Holes are plugged and berm is compacted. May require consultation with professional engineer, particularly for larger berms.	
		Any evidence of rodent holes or water piping around holes if facility acts as dam or berm.		Rodents (see "Pests: Insects/Rodents") removed and berm repaired/compacted.	
	Sediment or Debris Accumulation	Accumulation of sediment or debris to extent that infiltration rate is reduced (see "Ponded water") or surface storage capacity significantly impacted.		Sediment cleaned out to restore facility shape and depth. Damaged vegetation is replaced and mulched. Source of sediment identified and controlled (if feasible).	

## Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Leaf Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
	Basin Inlet via Surface Flow	Soil is exposed or signs of erosion are visible.		Erosion sources repaired and controlled.	
Curb Cut Inlet	Sediment or Debris Accumulation	Sediment, vegetation, or debris partially or fully blocking inlet structure.		Curb cut is clear of debris. Source of the blockage is identified and action is taken to prevent future blockages.	
	Water Not Properly Directed to Facility	Water is not being directed properly to the facility and away from the inlet structure.		Blocks are reconfigured to direct water to facility and away from structure.	
	Erosion	Water disrupts soil media.		Splashblock is reconfigure/repaired.	
	Damaged Pipe	Pipe is damaged.		Pipe is repaired/replaced. No cracks more than 0.25 inch wide at the joint of inlet/outlet pipes exist.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots or debris. Source of the blockage is identified and action is taken to prevent future blockages.	
Inlets/ Outlet and Access Pathways	Blocked Access	Maintain access for inspections.		Vegetation is cleared within 1 foot of inlets and outlets. Access pathways are maintained.	
Ponding Area	Erosion	Water disrupts soil media.		No eroded or scoured areas in bioretention area. Cause of erosion or scour addressed. A cover of rock or cobbles or other erosion protection measure maintained (e.g., matting) to protect the ground where concentrated water enters or exits the facility (e.g., a pipe, curb cut, or swale).	
	Trash or Debris Accumulation	Trash or debris present on trash rack.		No trash or debris on trash rack. Clean and dispose trash.	
	Damaged Trash Rack	Bar screen damaged or missing.		Barrier repaired or replaced to design standards.	
	Sediment or Debris Accumulation	Sediment, vegetation, or debris accumulated at or blocking (or having the potential to block) check dam, weir, or orifice.		Blockage is cleared. Identify the source of the blockage and take actions to prevent future blockages.	

<b>Bioretention Cells, Swales, and Planter Boxes</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Erosion	Erosion and/or undercutting is present.		No eroded or undercut areas in bioretention area. Cause of erosion or undercutting addressed. Check dam or weir is repaired.	
	Unlevel Top of Weir	Grade board or top of weir damaged or not level.		Weir restored to level position.	
	Sediment Accumulation	Sediment blocks 35 percent or more of ports/notches or, sediment fills 35 percent or more of sediment trap.		Sediment removed and disposed of.	
	Damaged or Unlevel Grade Board/Baffle	Grade board/baffle damaged or not level.		Board/baffle removed and reinstalled to level position.	
	Sediment or Debris Accumulation	Overflow spillway is partially or fully plugged with sediment or debris.		No sediment or debris in overflow.	
	Erosion	Native soil is exposed or other signs of erosion damage are present.		Erosion repaired and surface of spillway stabilized.	
	Missing Spillway Armament	Spillway armament is missing.		Armament replaced.	
Underdrain	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain. Prolonged surface ponding (see "Bioretention Soil").		Underdrains and orifice are free of sediment and debris.	
Bioretention Soil	Ponded Water	Excessive ponding water: Water overflows during storms smaller than the design event or ponded water remains in the basin 48 hours or longer after the end of a storm.		Cause of ponded water is identified and addressed: <ol style="list-style-type: none"> <li>1. Leaf or debris buildup is removed</li> <li>2. Underdrain is clear</li> <li>3. Other water inputs (e.g., groundwater, illicit connections) investigated</li> <li>4. Contributing area verified</li> </ol> If steps #1–4 do not solve the problem, imported bioretention soil is replaced and replanted.	
Bioretention Soil	Protection of Soil	Maintenance requiring entrance into the facility footprint.		Maintenance is performed without compacting bioretention soil media.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Bottom Swale and Upland Slope Vegetation	Less than 75 percent of swale bottom is covered with healthy/surviving vegetation.		Plants are healthy and pest free. Cause of poor vegetation growth addressed. Bioretention area is replanted as necessary to obtain 75 percent survival rate or greater. Plant selection is appropriate for site growing conditions.	
	Causing Problems for Operation of Facility	Large trees and shrubs interfere with operation of the basin or access for maintenance.		Trees and shrubs do not hinder facility performance or maintenance activities. Prune or remove large trees and shrubs.	
	Dead Trees and Shrubs	Standing dead vegetation is present.		Trees and shrubs do not hinder facility performance or maintenance activities. Dead vegetation is removed and cause of dead vegetation is addressed. Specific plants with high mortality rate are replaced with more appropriate species.	
Trees and Shrubs Adjacent to Vehicle Travel Areas (or areas where visibility needs to be maintained)	Safety Issues	Vegetation causes some visibility (line of sight) or driver safety issues.		Appropriate height for sight clearance is maintained. Regular pruning maintains visual sight lines for safety or clearance along a walk or drive. Tree or shrub is removed or transplanted if presenting a continual safety hazard.	
Emergent Vegetation	Conveyance Blocked	Vegetation compromises conveyance.		Sedges and rushes are clear of dead foliage.	
Mulch	Lack of Mulch	Bare spots (without much cover) are present or mulch covers less than 2 inches.		Facility has a maximum 3-inch layer of an appropriate type of mulch and mulch is kept away from woody stems.	
	Accumulation of Clippings	Grass or other vegetation clippings accumulate to 2 inches or greater in depth.		Clippings removed.	
	Weeds	Weeds are present (unless on edge and providing erosion control).		Weed material removed and disposed of. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Noxious Weeds	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Adjacent Facilities Compromised	Low-lying vegetation growing beyond facility edge onto sidewalks, paths, or street edge poses pedestrian safety hazard or may clog adjacent permeable pavement surfaces due to associated leaf litter, mulch, and soil.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed at facility edge. Excessive leaf litter is removed.	
	Causes Facility to Not Function Properly	Excessive vegetation density inhibits stormwater flow beyond design ponding or becomes a hazard for pedestrian and vehicular circulation and safety.		Pruning and/or thinning vegetation maintains proper plant density and aesthetics. Plants that are weak, broken, or not true to form are removed or replaced in-kind. Appropriate plants are present.	
Irrigation (if any)	NA	Irrigation system present.		Manufacturer's instructions for O&M are met.	
Plant Watering	Plant Establishment	Plant establishment period (1–3 years).		Plants are watered as necessary during periods of no rain to ensure plant establishment.	
Summer Watering (after establishment)	Drought Period	Longer term period (3+ years).		Plants are watered as necessary during drought conditions and trees are watered up to 5 years after planting.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Spill Prevention and Response	Spill Prevention	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures are implemented whenever handling or storing potential contaminants.	
	Spill Response	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
	Safety (slopes)	Erosion of sides causes slope to exceed 1:3 or otherwise becomes a hazard.		Actions taken to eliminate the hazard.	
	Safety (hydraulic structures)	Hydraulic structures (pipes, culverts, vaults, etc.) become a hazard to children playing in and around the facility.		Actions taken to eliminate the hazard (such as covering and securing any openings).	
	Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
	Edging	Grass is starting to encroach on swale.		Edging repaired.	
	Pests: Insects/Rodents	Pest of concern is present and impacting facility function.		Pests removed and facility returned to original functionality. Do not use pesticides or <i>Bacillus thuringiensis israelensis (Bti)</i> .	
	Mosquitoes	Standing water remains in the basin for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1n. Rain Gardens

Rain gardens are shallow stormwater systems with compost amended soil or imported rain garden or bioretention soil and plants adapted to the local climate and soil moisture conditions. They are similar in function to bioretention cells, but have less onerous design requirements and are generally applicable to smaller sites.

Rain Gardens					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Facility – General Requirements	Mosquitoes	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present. Rain garden drains freely and there is no standing water between storms. Cause of the standing water is addressed (see “Ponded Water”).	
	Trash	Trash and debris present.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Debris Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
Earthen Side Slopes and Berms	Erosion	Persistent soil erosion on slopes.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Rockery Sidewalls	Unstable Rockery	Rockery side walls are insecure.		Rockery sidewalls are stable (may require consultation with engineer, particularly for walls 4 feet or greater in height).	
Rain Garden Bottom Area	Sediment Accumulation	Visible sediment deposition in the rain garden that reduces drawdown time of water in the rain garden.		No sediment accumulation in rain garden, Source of sediment addressed.	
Mulch	Lack of Mulch	Bare spots (without mulch cover) are present or mulch depth less than 2 inches.		Facility has a minimum 2- to 3-inch layer of an appropriate type of mulch and is kept away from woody stems.	
Splashblock Inlet	Water Not Properly Directed to Rain Garden	Water is not being directed properly to the rain garden and away from the inlet structure. Water splashes adjacent buildings.		Blocks are reconfigured to direct water to rain garden and away from structure.	

<b>Rain Gardens</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipe Inlet/ Outlet	Erosion	Rock or cobble is removed or missing and concentrated flows are contacting soil.		No eroded or scoured areas. Cause of erosion or scour is addressed. Cover of rock or cobbles protects the ground where concentrated water flows into the rain garden from a pipe or swale.	
	Accumulated Debris	Accumulated leaves, sediment, debris or vegetation at curb cuts, inlet or outlet pipe.		Blockage is cleared.	
	Damaged Pipe	Pipe is damaged		Pipe is repaired/replaced.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots and debris.	
Access	Blocked Access	Maintain access for inspections.		Vegetation is cleared or transplanted within 1 foot of inlets and outlets.	
Ponded Water	Ponded Water	Excessive ponding water: Ponded water remains in the rain garden more than 48 hours after the end of a storm.		Rain garden drains freely and there is no standing water in the rain garden between storms. Leaf litter/debris/sediment is removed.	
Overflow	Blocked Overflow	Capacity reduced by sediment or debris.		No sediment or debris in overflow.	
	Blocking Site Distances and Sidewalks	Vegetation inhibits sight distances and sidewalks.		Sidewalks and sight distances along roadways and sidewalks are kept clear.	
	Vegetation Blocking Pipes	Vegetation is crowding inlets and outlets.		Inlets and outlets in the rain garden are clear of vegetation.	
	Unhealthy Vegetation	Yellowing: possible Nitrogen (N) deficiency Poor growth: possible Phosphorous (P) deficiency. Poor flowering, spotting or curled leaves, or weak roots or stems: possible Potassium (K) deficiency.		Plants are healthy and appropriate for site conditions.	
	Weeds	Presence of weeds.		Weeds are removed (manual methods preferred) and mulch is applied.	
Summer Watering (years 1-3)	Plant Establishment	Tree, shrubs and groundcovers in first 3 years of establishment period.		Plants are watered during plant establishment period (years 1-3).	
Summer Watering (after establishment)	Drought Conditions	Vegetation requires supplemental water.		Plants are watered during drought conditions or more often if necessary during post-establishment period (after 3 years).	

## 10. Trees

When designed in accordance with this Manual, trees can provide flow control via interception, transpiration, and increased infiltration. Most routine maintenance procedures are typical landscape care activities.

<b>Trees</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Excess or Unhealthy Growth	Health of tree at risk, or tree in conflict with other infrastructure.		Tree pruned according to industry standards to promote tree health and longevity.	
	NA	Young tree (i.e., within first 3 years).		Tree provided with supplemental irrigation and fertilization (as needed) during first three growing seasons.	
	NA	Evidence of pest activity affecting tree health.		Pest management activities implemented to reduce or eliminate pest activity, and to restore tree health.	
	Dead or Declining	Dead, damaged or declining.		Tree is replaced per planting plan or acceptable substitute.	

## 1p. Permeable Pavement

Permeable pavement is a stormwater infiltration facility that is designed to accommodate pedestrian, bicycle, and auto traffic while allowing infiltration and storage of stormwater. Permeable pavement includes porous asphalt; pervious concrete; permeable pavers and aggregate pavers; and grid systems.

Permeable Pavement					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Leaf and Debris Accumulation	Fallen leaves or debris.		Removed/disposed.	
	All Pavement Types	Sediment or debris accumulation between paver blocks, on surface of pavement, or in grid voids.		Sediment at surface does not inhibit infiltration. Remove/dispose of sediment.	
	Unstable Adjacent Area	Runoff from adjacent pervious areas deposits soil, mulch, or sediment on paving.		No deposited soil or other materials on permeable pavement or other adjacent surfacing. All exposed soils that may erode to pavement surface mulched and/or planted.	
	Wearing Course Covered by Adjacent Vegetation	Vegetation growing beyond facility edge onto sidewalks, paths, and street edge.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed to avoid overreaching the sidewalks, paths and street edge.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Conventional street sweepers equipped with vacuums, water, and brushes or pressure washer used to restore permeability. Vacuum or pressure wash the pavement two to three times annually.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Use of sand and sealant application prohibited. Protect from construction runoff.	
	Cracks	Major cracks or trip hazards.		Potholes or small cracks filled with patching mixes. Large cracks and settlement addressed by cutting and replacing the pavement section.	
	NA	Utility cuts.		Any damage or change due to utility cuts replaced in kind.	
Interlocking Concrete Paver Blocks	Missing or Damaged Paver Block	Interlocking paver block missing or damaged.		Individual damaged paver blocks removed and replaced or repaired per manufacturer's recommendations.	

## Permeable Pavement

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Interlocking Concrete Paver Blocks (continued)	Settlement	Settlement of surface. When deviation from original grade impedes function.		Original grade re-established. May require resetting.	
	Void Material is Missing or Low	Loss of aggregate material between paver blocks.		Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Gravel	Loss of Aggregate Material in Paving Grid	Loss of aggregate material in grid.		Aggregate gravel level maintained at the same level as the plastic rings or no more than 0.25 inch above the top of rings. Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Grass	Lack of Grass Coverage	Loss of soil and/or grass material in grid.		Refill and/or replant per manufacturer's recommendations. Growing medium restored, facility aerated and reseeded or planted, and vegetated area amended as needed.	
	Pipe is Damaged	Pipe is damaged.		Pipe is repaired/replaced.	
	Pipe is Clogged	Pipe is clogged.		Roots or debris is removed.	
	Erosion	Native soil exposed or other signs of erosion damage present.		No eroded or scoured areas Cause of erosion or scour is addressed.	
Underdrain Pipe	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain (may cause prolonged drawdown period).		Underdrains and orifice free of sediment and debris. Jet clean or rotary cut debris/roots from underdrain(s). If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.	
Spill Prevention and Response	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
Spill Prevention and Response (continued)	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	

## 1q. Vegetated Roofs

Vegetated roofs are areas of living vegetation installed on top of buildings, or other above-grade impervious surfaces. Design components vary depending on the vegetated roof type and site constraints, but may include a waterproofing material, a root barrier, a drainage layer, a separation fabric, a growth medium (soil), and vegetation.

Vegetated Roofs					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water is Not Infiltrating Properly	Water does not permeate growth media (runs off soil surface).		Facility infiltrates as designed. Aerate or replace media until stormwater infiltrates freely through growth media.	
	Water is Not Infiltrating Properly	Growth medium thickness is less than design thickness (due to erosion and plant uptake).		Facility infiltrates as designed. Supplement growth medium to design thickness.	
	Water is Not Infiltrating Properly	Fallen leaves or debris are present.		No leaves or debris present.	
	Erosion/ Scouring	Areas of potential erosion are visible.		Steps taken to repair or prevent erosion. Fill, hand tamp, or lightly compact, and stabilize with additional soil substrate/growth medium and additional plants.	
Erosion Control Measures	Erosion/ Scouring	Mat or other erosion control is damaged or depleted during plant establishment period.		Erosion control measures repaired/replaced until 90 percent vegetation coverage attained. Avoid application of mulch on extensive vegetated roofs.	
System Structural Components	Deteriorating Flashing, Gravel Stops, Utilities, or Other Structures on Roof	Flashing, utilities or other structures on roof are deteriorating (can serve as source of metal pollution in vegetated roof runoff).		Structural components inspected for deterioration or failure. Repair/replace as necessary.	
	Sediment, Vegetation, or Debris Accumulation	Sediment, vegetation, or debris blocks 20 percent or more of inlet structure.		Blockages cleared. Problems that led to blockage identified and corrected.	
	Damaged Inlet Pipe	Inlet pipe is in poor condition.		Repaired/replaced.	
	Clogged Inlet Pipe	Pipe is clogged.		Roots or debris removed.	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Plant Coverage	Healthy vegetative coverage falls below 90 percent (unless design specifications stipulate less than 90 percent coverage).		Bare areas planted with vegetation If necessary, install erosion control measures until percent coverage goal is attained.	
Vegetation (sedums)	NA	Extensive roof with low density sedum population.		Sedums are mulch mowed, creating cuttings from existing plants to encourage colonization.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. <i>(Coordinate with Thurston County Health Department.) Complete eradication of noxious weeds may not be possible.</i>	
	Presence of Weeds	Weeds are present.		Weed material removed and disposed of, with roots manually removed with pincer-type weeding tools, flame weeders, or hot water weeders as appropriate. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

## Vegetated Roofs

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vegetation (extensive vegetated roof)	Under Fertilization	Poor plant establishment and possible nutrient deficiency in growth medium.		<p>Organic debris allowed to replenish and maintain long-term nutrient balance and growth medium structure. Conduct annual soil test 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately.</p> <p>Minimum amount slow-release fertilizer necessary to achieve successful plant establishment is applied. Apply fertilizer only after acquiring required approval from facility owner and operator. Note that extensive vegetated roofs are designed to require zero to minimal fertilization after establishment (excess fertilization can contribute to nutrient export).</p>	
Vegetation (intensive vegetated roof)	Under Fertilization	Fertilization may be necessary during establishment period or for plant health and survivability after establishment.		<p>Annual soil test conducted 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately. Apply minimum amount slow-release fertilizer necessary to achieve successful plant establishment.</p> <p>Apply fertilizer only after acquiring required approval from facility owner and operator. Intensive vegetated roofs may require more fertilization than extensive vegetated roofs.</p>	
Vegetation (trees and shrubs on an intensive vegetated roof)	NA	Pruning as needed.		All pruning of mature trees performed by or under the direct guidance of an ISA certified arborist.	
Irrigation system (if any)	NA	Irrigation system is not working or routine maintenance is needed.		Manufacturer's instructions for O&M have been followed.	
	NA	Summer watering – Plant establishment period (1 to 2 years).		Watered weekly during periods of no rain to ensure plant establishment (30 to 50 gallons per 100 square feet).	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	NA	Summer watering – Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover (30 to 50 gallons per 100 square feet).	
	NA	Plant establishment period (1 to 2 years).		Watered deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist. Use soaker hoses or spot water with a shower type wand when irrigation system not present.	
Vegetation (intensive vegetated roof)	NA	Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover.	
	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants provided with proper training and a copy of the Maintenance and Source Control Manual.	
Safety	NA	Insufficient egress/ingress routes and fall protection.		Egress and ingress routes maintained to design standards and fire codes. Ensure appropriate fall protection.	
Aesthetics	Poor Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
Pest Control	Mosquitoes	Standing water remains for more than three days following storms.		Standing water removed. Cause of the standing water identified, and appropriate actions taken to address the problem (e.g., aerate or replace medium, unplug drainage).	

### 1r. Downspout, Sheet Flow, Concentrated Flow Dispersion

Dispersion BMP components vary depending on the type of BMP used, but can consist of a gravel filled trench, splashblock, transition zone, vegetated flow path, berms, and/or slotted drains. Dispersion BMPs reduce peak flows by slowing stormwater runoff entering into the conveyance system, allowing for some infiltration, and providing some water quality benefits.

Downspout, Sheet Flow, Concentrated Flow Dispersion					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Directed Toward Building	Water is being directed towards building structure.		Water directed away from building structure.	
	Water Causing Erosion	Water disrupts soil media.		Blocks are reconfigured/repared and media is restored.	
Transition Zone	Erosion	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than 2 feet of width.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Dispersion Trench	Concentrated Flow	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" from edge of trench; intent is to prevent erosion damage).		No debris on trench surface. Notched grade board or other distributor type is aligned to prevent erosion. Trench is rebuilt to standards, if necessary.	
	Accumulated Debris	Accumulated trash, debris, or sediment on drain rock surface impedes sheet flow from facility.		No trash or debris present. Removed and properly dispose of all trash and debris.	
	Vegetation Impeding Flow	Vegetation/moss present on drain rock surface impedes sheet flow from facility.		Freely draining drain rock surface.	
	Accumulated Debris in Drains	Accumulation of trash, debris, or sediment in roof drains, gutters, driveway drains, area drains, etc.		No trash or debris in roof drains, gutters, driveway drains, or area drains.	
	Accumulated Debris in Inlet Pipe	Pipe from sump to trench or drywell has accumulated sediment or is plugged.		No sediment or debris in inlet/outlet pipe screen or inlet/outlet pipe.	
	Damaged Pipes	Cracked, collapsed, broken, or misaligned drain pipes.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
Sump	Accumulated Sediment	Sediment in the sump.		Sump contains no sediment.	
	Hard to Open	Cannot be easily opened.		Access lid is repaired or replaced.	
	Buried	Buried.		Access lid functions as designed (refer to record drawings for design intent).	

### Downspout, Sheet Flow, Concentrated Flow Dispersion

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing Cover	Cover missing.		Cover is replaced.	
	Inadequate Rock Cover	Only one layer of rock exists above native soil in area 6 square feet or larger, or any exposure of native soil.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Erosion (gullies/rills) greater than 2 inches deep in dispersal area.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
	Accumulated Sediment	Accumulated sediment or debris to extent that blocks or channelizes flow path.		No excess sediment or debris in dispersal area. Sediment source is addressed (if feasible).	
Ponded Water	Ponded Water	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.		System freely drains and there is no standing water in dispersion area between storms. The cause of the standing water (e.g., grade depressions, compacted soil) is addressed.	
	Plant Survival	Dispersal area vegetation in establishment period (1 to 2 years, or additional 3rd year) during extreme dry weather).		Vegetation is healthy and watered weekly during periods of no rain to ensure plant establishment.	
	Lack of Vegetation Allowing Erosion	Poor vegetation cover such that erosion is occurring.		Vegetation is healthy and watered. No eroded or scoured areas are present. Cause of erosion or scour is addressed. Plant species are appropriate for the soil and moisture conditions.	
	Vegetation Blocking Flow	Vegetation inhibits dispersed flow along flow path.		Vegetation is trimmed, weeded, or replanted to restore dispersed flow path.	
	Presence of Noxious Weeds	Any noxious or nuisance vegetation which may constitute a hazard to county personnel or the public.		Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where county personnel or the public might normally be.	
Pest Control	Mosquito Infestation	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	
Rodents	Presence of Rodents	Rodent holes or mounds disturb dispersion flow paths.		Rodents removed; holes are filled; and flow path is revegetated.	

## 1s. Downspout Infiltration

Downspout infiltration systems are trench or drywell designs intended only for use in infiltrating runoff from roof downspout drains.

<b>Downspout Infiltration</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Inflow Disruption	Accumulated trash, debris, or sediment on drain rock surface impeding sheet flow into facility.		Sheet flow re-established. Material removed and disposed of in accordance with applicable solid waste requirements.	
	Inflow Disruption	Vegetation/moss present on drain rock surface impeding sheet flow into facility.		Material removed and sheet flow re-established.	
	Inflow Disruption	Water ponding at surface, or standing water in subgrade observation port.		Inflow to facility is consistent and no ponding is observed. Inlet piping is clear and/or rock or sand reservoirs have been replaced.	
	Conveyance Blockage	Accumulation of trash, debris, or sediment in roof drains, gutters, driveways drains, area drains, etc.		Conveyance systems are clear of debris and free-flowing.	
	Conveyance Blockage	Pipes to or from sump, trench, or drywell have accumulated sediment or is plugged.		Pipe systems are clear of debris and free-flowing.	
	Conveyance Damage	Pipes to or from sump, trench, or drywell is cracked, broken, or misaligned.		Pipe systems are undamaged and free-flowing.	
	Splash Pad Malfunction	Splash pad missing or damaged.		Splash pad installed and functioning correctly	
	Overflow	Water overflows from the gutter or downspout during rain.		First try cleaning out the gutter and downspouts. If this doesn't solve the problem, a larger drywell may be needed. Contact the city before changing the design or upgrading to a larger drywell.	
	Sediment in Sump	Excess sediment accumulate in sump.		Material removed and disposed of in accordance with applicable solid waste requirements.	
	Access Lid Problems	Access lid cannot be opened or is missing.		Access lid is functioning as designed. Refer to record drawings to confirm type, function, and required components.	

### Downspout Infiltration

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Roof	Moss	Moss and algae are taking over the shadier parts of the shingles.		Disconnect the flexible part of the downspout that leads to the drywell. Then perform moss removal as desired. Pressure wash or use fatty acid solutions instead of highly toxic pesticides or chlorine bleach. Install a zinc strip as a preventive.	

## 1t. Cisterns

Cisterns are designed to collect stormwater runoff from non-polluting surfaces (typically roofs), and to make use of the collected water. Reuse of the runoff can be for irrigation, potable, and non-potable uses, but requires different levels of storage and water quality treatment depending on the intended use.

Cisterns					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Debris Accumulation in Cistern	Debris has accumulated.		No debris in cistern. Remove and properly dispose of all debris.	
	Debris Accumulation in Gutter	Debris has accumulated.		No debris in cistern or gutters. Remove and properly dispose of all debris.	
	Debris Accumulation in Cistern	Screen has deteriorated.		Screen is in place and functions as designed.	
	NA	None. Preventive maintenance.		No debris in cistern or accumulated on screen. Remove and properly dispose of all debris.	
Low Flow Orifice	Cistern Overflows are too Frequent	Debris or other obstruction of orifice.		Low flow orifice is clean.	
	Overflow Pipe	Pipe is damaged.		Overflow pipe is watertight and does not leak. Repair/replace.	
	Overflow Pipe	Pipe is clogged.		Debris removed. Overflow pipe can convey overflow to point of discharge.	
Cistern	Accumulated Debris And/or Sediment	More than 6 inches of accumulation in bottom of cistern.		Accumulated debris and/or sediment removed.	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants are provided with proper training and a copy of the Maintenance and Source Control Manual.	
Access and Safety	NA	Access to cistern required for maintenance or cleaning.		Any opening that could allow the entry of people is marked: "DANGER—CONFINED SPACE".	
Pest Control	Mosquito Infestation	Standing water remains for more than 3 days following storms.		All inlets, overflows, and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1u. Fencing/Shrubbery Screen/Other Landscaping

Fencing, shrubbery screening, and landscaping provide flow control via interception, transpiration, and increased infiltration as well as slope protection. Most routine maintenance procedures are typical landscape care activities.

<b>Fencing/Shrubbery Screen/Other Landscaping</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Missing or Broken Parts/Dead Shrubby	Any defect in the fence or screen that permits easy entry to a facility.		Fence is mended or shrubs replaced to form a solid barrier to entry.	
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.		Soil under fence replaced so that no opening exceeds 4 inches in height.	
	Unruly Vegetation	Shrubbery is growing out of control or is infested with weeds. See also <a href="#">Thurston County Noxious Weeds List</a> .		Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.	
		Posts out of plumb more than 6 inches.		Posts plumb to within 1.5 inches of plumb.	
		Top rails bent more than 6 inches.		Top rail free of bends greater than 1 inch.	
		Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.		Fence is aligned and meets design standards.	
		Missing or loose tension wire.		Tension wire in place and holding fabric.	
		Missing or loose barbed wire that is sagging more than 2.5 inches between posts.		Barbed wire in place with less than 0.75-inch sag between posts.	
		Extension arm missing, broken, or bent out of shape more than 1.5 inches.		Extension arm in place with no bends larger than 0.75 inch.	
	Deteriorated Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.		Structurally adequate posts or parts with a uniform protective coating.	
	Openings in Fabric	Openings in fabric are such that an 8-inch-diameter ball could fit through.		No openings in fabric.	

## 1v. Manufactured Media Filters

Manufactured media filters are installed below grade and usually consist of a two-chambered vault that include a presettling basin and a filter bed with sand or filter media. This filter is accessed through a manhole. **DO NOT ENTER ANY TANK OR VAULT** without proper training, certification and equipment.

Manufactured Media Filters					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Top of Filter Cartridges	Sediment accumulation exceeds 0.25 inches on top of cartridges.		No sediment deposits on top of cartridges. Sediment on cartridges likely indicates that cartridges are plugged and require maintenance.	
	Sediment Accumulation	Sediment accumulation in vault exceeds 6 inches. Look for other indicators of clogged cartridges or overflow.		No sediment accumulation in vault. <i>Sediment in vault should be removed. Cartridges should be checked and replaced or serviced as needed.</i>	
	Trash and Floatable Debris Accumulation	Trash and floatable debris accumulation in vault.		No trash or other floatable debris in filter vault.	
	Filter Cartridges Submerged	Filter vault does not drain within 24 hours following storm. Look for evidence of submergence due to backwater or excessive hydrocarbon loading.		Filter media checked and replaced if needed. <i>If cartridges are plugged with oil additional treatment or source control BMP may be needed.</i>	
	Sediment Accumulation	Sediment accumulation exceeds 6 inches or 33 percent (one third) of the available sump.		Sediment accumulation less than 6 inches.	
	Trash and Floatable Debris Accumulation	Trash and/or floatable debris accumulation.		No trash or other floatable debris accumulation in forebay. Trash and/or floatable debris should be removed during inspections. <i>Significant oil accumulation may indicate the need for additional treatment or source control.</i>	
Drain Pipes/ Cleanouts	Sediment in Drain Pipes/ Cleanouts	Accumulated sediment that exceeds 20 percent of the diameter.		No sediment or debris in drainpipes or cleanouts. Sediment and debris removed.	
Below ground Vault	Access Cover Damaged/ Not working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.		Cover repaired to proper working specifications or replaced.	

<b>Manufactured Media Filters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Below ground Vault (continued)	Damaged Pipes	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.		Pipe repaired or replaced.	
		Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault repaired or replaced so that vaults meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to design specifications.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.		Media cartridges replaced.	
	Short Circuiting	Flows do not properly enter filter cartridges.		Filter cartridges replaced.	

Designers must also review the most current manufacturer guidelines for any updates or additions to the following operation and maintenance requirements.

## **1w. Proprietary or Manufactured Products**

- As with other stormwater BMPs in this appendix, proper maintenance of proprietary products such as media filters or vegetation-based treatment technologies is critical to proper facility performance. Regular maintenance ensures proper functioning and keeps the facility aesthetically appealing. Many of the same inspection and maintenance procedures outlined for the facilities described in this appendix also apply to proprietary technologies.
- Designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.
- The City of Lacey will inspect proprietary products in accordance with the applicable inspection standards to ensure that maintenance is performed properly.

# **Group 2**

## *Structures & Pretreatment*

## 2a. Control Structures and Flow Restrictors

Flow control devices are usually placed within manholes, which may be locked. They typically consist of two pipes, one placed above the other. The lower pipe will typically have a cover and a small hole drilled in it to allow for slow release of water. The upper pipe is usually larger to provide an outlet for higher flows and emergency overflows.

Control Structures and Flow Restrictors					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris (includes sediment)	Material exceeds 25 percent of sump depth or 1 foot below orifice plate.		No trash or debris present. Control structure orifice is not blocked. Remove and properly dispose of all trash and debris.	
		Structure is not securely attached to manhole wall.		Securely attach structure to wall and outlet pipe.	
		Structure is not in upright position (more than 10 percent from plumb)		Restore structure to correct position.	
		Connections to outlet pipe are not watertight and show signs of rust.		Pipe connections are water tight; structure repaired or replaced and works as designed.	
		Any holes in structure (other than designed holes).		Structure has no holes other than designed holes.	
		Cleanout gate is not watertight or is missing.		Gate is watertight and works as designed.	
		Gate cannot be moved up and down by one maintenance person.		Gate moves up and down easily and is watertight.	
		Chain/rod leading to gate is missing or damaged.		Chain is in place and works as designed.	
		Gate is rusted over 50 percent of its surface area.		Gate is repaired or replaced to meet design standards.	
	Damaged or Missing	Control device is not working properly due to missing, displaced, or bent orifice plate.		Plate is in place and works as designed.	
	Obstructions	Trash, debris, sediment or vegetation blocking the plate.		Plate is free of all obstructions and works as designed.	
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.		Pipe is free of all obstructions and works as designed.	
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	

### Control Structures and Flow Restrictors

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Manhole (continued)	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.		Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
Catch Basin	See "Catch Basins"	See "Catch Basins."		See "Catch Basins."	

## 2b. Catch Basins

These structures are typically located in the streets. The City of Lacey is responsible for routine maintenance of the pipes and structures in the public rights-of-way, while the property owner or homeowners association is responsible for maintenance of pipes and catch basins in private areas and for keeping the grates clear of debris in all areas.

<b>Catch Basins</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
		Trash, leaves or debris which is located immediately in front of the catch basin opening or is blocking inflow capacity of the basin by more than 10 percent.		Remove trash, leaves and debris located directly in front of catch basin or on grate.	
		Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches of clearance from the debris surface to the invert of the lowest pipe.		No trash or debris present. Remove and properly dispose of all trash and debris.	
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent (one-third) of its height.		Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).		Remove dead animals, etc., present within the catch basin.	
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6 inches of clearance from the sediment surface to the invert of lowest pipe.		No sediment in the catch basin.	
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (intent is to make sure no material is running into basin).		Top slab is free of holes and cracks.	

## Catch Basins

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Structure Damage to Frame and/or Top Slab (continued)	Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached		Frame is sitting flush on the riser rings or top slab and firmly attached.	
		Maintenance person determines structure is unsound.		Basin replaced or repaired to design standard	
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Pipe regouted and secure at basin wall.	
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.		Replaced or repair to design standards.	
		Vegetation growing across and blocking more than 10 percent of the basin opening.		Remove vegetation blocking opening to basin.	
		Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.		No vegetation or root growth present.	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
		Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
Catch Basin Cover (continued)	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure.  (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

**Catch Basins**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Ladder	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Grate Opening Unsafe	Grate with opening wider than 0.875 (7/8) inch.		Grate opening meets design standards.	
	Trash and Debris	Trash and debris that is blocking more than 20 percent of grate surface inletting capacity.		Grate free of trash and debris. Remove and properly dispose of all trash and debris.	
	Damaged or Missing	Grate missing or broken member(s) of the grate.		Grate is in place and meets design standards.	

**2c. Debris Barriers (trash racks)**

A metallic screen or similar structural device used to prevent debris from entering a pipe, spillway or other hydraulic structure.

<b>Debris Barriers (trash racks)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Trash and Debris	Trash or debris that is plugging more than 20 percent of the openings in the barrier.		Barrier cleared to receive design flow capacity.	
		Bars are bent out of shape more than 3 inches.		Bars in place with no bends more than 0.75 inch.	
		Bars are missing or entire barrier missing.		Bars in place according to design.	
		Bars are loose and rust is causing 50 percent deterioration to any part of barrier.		Barrier replaced or repaired to design standards.	
Inlet/Outlet Pipe		Debris barrier missing or not attached to pipe.		Barrier firmly attached to pipe.	

## 2d. Energy Dissipaters

Typically a rock splash pad at a pipe end or other discharge location, to reduce the velocity and energy of flowing water and prevent erosion. Other means of energy dissipation include drop manholes, stilling basins, and check dams.

<b>Energy Dissipaters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
<b>External:</b>					
	Missing or Moved Rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil.		Rock pad replaced to design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad replaced to design standards.	
	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20 percent of the design depth.		Pipe cleaned/flushed so it matches design.	
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.		Trench redesigned or rebuilt to standards. Water discharges from feature by sheet flow.	
	Perforations Plugged	Over half of perforations in pipe are plugged with debris and sediment.		Perforated pipe cleaned or replaced. Perforations freely discharge flow.	
	Water Flows Out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.		Facility rebuilt or redesigned to standards. No flow discharges from distributor catch basin.	
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.		No danger of landslides.	
<b>Internal:</b>					
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 50 percent of original size or any concentrated worn spot exceeding 1 square foot, which would make structure unsound.		Structure replaced to design standards. Structure in no danger of failing.	

## Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Trash and Debris	Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6-inch clearance from the debris surface to the invert of the lowest pipe.	<input type="checkbox"/>	No trash or debris present. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent of its height.	<input type="checkbox"/>	Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	<input type="checkbox"/>	Remove dead animals, etc., present within the catch basin.	<input type="checkbox"/>
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6-inch clearance from the sediment surface to the invert of lowest pipe.	<input type="checkbox"/>	No sediment in the catch basin.	<input type="checkbox"/>
		Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (Intent is to make sure no material is running into basin).	<input type="checkbox"/>	Top slab is free of holes and cracks.	<input type="checkbox"/>
		Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached	<input type="checkbox"/>	Frame is sitting flush on the riser rings or top slab and firmly attached.	<input type="checkbox"/>
		Maintenance person determines structure is unsound.	<input type="checkbox"/>	Basin replaced or repaired to design standard	<input type="checkbox"/>
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.	<input type="checkbox"/>	Pipe regROUTED and secure at basin wall.	<input type="checkbox"/>
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	<input type="checkbox"/>	Replaced or repair to design standards.	<input type="checkbox"/>

### Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

## 2e. Baffle Oil/Water Separators (API type)

An underground vault or tank designed to separate oil from runoff water via baffles.

<b>Baffle Oil/Water Separators (API type)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear without thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth.		Remove sediment deposits that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulations at the surface of the water or 6 inches of sludge in the sump.		Extract oil from vault by vactoring. Disposal must be in accordance with state and local rules and regulations. No visible oil depth on water.	
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.		Pipe repaired or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover.		Cover repaired to proper working specifications or replaced.	
		Maintenance person determines structure is unsound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Grout fillet has separated or cracked wider than 0.5 inch at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Top slab is free of holes and cracks.	
	Baffles	Baffles corroding, cracking, warping and/or show signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not securely attached to structure wall, missing rungs, cracks, or misaligned.		Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection.	

## 2f. Coalescing Plate Oil/Water Separators

An underground vault or tank designed to separate oil from runoff water via gravity.

Coalescing Plate Oil/Water Separators					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear with no thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.		Remove sediment deposits on vault bottom and plate media that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulation at the water surface.		Oil is extracted from vault using vactoring methods. Dispose of in accordance with state and local rules and regulations.  Coalescing plates are cleaned by thoroughly rinsing and flushing. Direct wash-down effluent to the sanitary sewer system where permitted. There should be no visible oil depth on water.	
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.		A portion of the media pack or the entire plate pack is replaced depending on severity of failure.	
	Damaged Pipes	Inlet or outlet piping damaged or broken or in need of repair.		Pipe repaired and or replaced.	
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	

### Coalescing Plate Oil/Water Separators

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Structure (continued)	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Replace or repair ladder so it meets specifications and is safe to use as determined by inspection.	

## 2g. Catch Basin Inserts

A structure within a catch basin, with a filter containing a pollutant-removal medium. Generally considered as an alternative to oil-water separators, these are not commonly used for permanent installations, as they tend to be maintenance-intensive.

<b>Catch Basin Inserts</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.		No sediment cap on the insert media and its unit.	
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.		No trash or debris present. Runoff freely flows into catch basin. Remove and properly dispose of all trash and debris removed from insert unit.	
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.		Effluent water from media insert is free of oils and has no visible sheen.	
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.		Remove and replace media insert.	
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.		Remove and replace media insert.	
	Media Insert Use Beyond Normal Product Life	Media has been used beyond the typical average life of media insert product.		Remove and replace media at regular intervals, depending on insert product.	

# **Group 3**

## ***Miscellaneous Facilities & Features***

### 3a. Conveyance Pipes, Culverts, Ditches, and Swales

These features contain and direct the flow of water from one location to another.

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipes	Sediment, Debris, and Vegetation	Accumulated sediment should not exceed 20 percent of the diameter of the pipe. Vegetation should not reduce free movement of water through pipes. Ensure that the protective coating is not damaged or rusted. Dents should not significantly impede flow. Pipe should not have major cracks or flaws allowing water to leak out.		Clean out pipes of all sediment and debris. Remove all vegetation so that water flows freely through pipes. Repair or replace pipe.	
	Trash and Debris	There should not be any yard waste or litter in the ditch.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Buildup	Accumulated sediment should not exceed 20 percent of the depth of the ditch.		Clean out ditch of all sediment and debris.	
	Overgrowth of Vegetation	Check for vegetation (e.g., weedy shrubs or saplings) that reduces the free movement of water through ditches or swales.		Clear blocking vegetation so that water moves freely through the ditches. Grassy vegetation should be left alone.	
	Erosion	Check around inlets and outlets for signs of erosion. Check slopes for signs of sloughing or settling. Action is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion.		Eliminate causes of erosion. Stabilize slopes by using the appropriate erosion control procedure (e.g., compact the soil, plant grass, reinforce with rock).	
	Missing Rocks	Native soil beneath the rock splash pad, check dam, or lining should not be visible.		Replace rocks to design standard.	
Swales	Vegetation	Grass cover is sparse and weedy, or areas are overgrown with woody vegetation.		Aerate soils and re-seed and mulch bare areas. Keep grass less than 8 inches high. Remove woody growth, re-contour and re-seed as necessary.	

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swales (continued)	Homeowner Conversion	Swale has been filled in or blocked by shed, woodpile, shrubbery, etc.		Speak with the homeowner and request that the swale area be restored. Contact the city to report the problem if not rectified voluntarily.	
	Swale Does Not Drain	Water stands in the swale, or flow velocity is very slow. Stagnation occurs.		A survey may be needed to check grades. Grades should be in 1 to 5 percent range if possible. If grade is less than 1 percent, underdrains may need to be installed.	

### 3b. Access Roads and Easements

These features provide access to drainage facilities for inspection and/or maintenance.

<b>Access Roads and Easements</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Access	Check to determine if there is adequate access to your stormwater facilities for maintenance vehicles.		If there is not adequate access, check with the city to determine whether an easement exists. If so, a maintenance road may need to be constructed there.	
	Blocked Roadway	Debris that could damage vehicle tires (glass or metal).		Clear all potentially damaging material.	
	Blocked Roadway	Any obstructions that reduce clearance above and along the road to less than the required width (minimum of 15 feet).		Clear above and along roadway so there is enough clearance.	
Road Surface	Bad Road Conditions	Check for potholes, ruts, mushy spots, or woody debris that limits access by maintenance vehicles.		Add gravel or remove wood as necessary.	
Shoulders and Ditches	Erosion	Check for erosion along roadway.		Repair erosion with additional soil or gravel.	

## Glossary of Stormwater Terms

**Best Management Practices (BMPs)** – Structural features or procedures that reduce the adverse impacts of development on the quantity and/or quality of runoff water.

**Biofilter (Swale)** – A wider and flatter vegetated version of a ditch over which runoff flows at a uniform depth and velocity. Biofilters perform best when vegetation has a thick mat of roots, leaves, and stems at the soil interface (such as grass).

**Biofiltration** – The process through which pollutant concentrations in runoff water are reduced by filtering runoff through vegetation.

**Buffer** – The zone along a sensitive area that provides protection and stability for the area's functioning. As an integral part of a stream or wetland ecosystem, the buffer provides shading, slope and bank stabilization, and input of organic debris and coarse sediments to streams. It allows room for variation in aquatic system boundaries (due to hydrologic or climatic effects), attenuation of surface water flows from precipitation and stormwater runoff, habitat for wildlife, and protection from harmful disturbance or intrusion by humans or domestic animals.

**Catch Basin** – An inlet box set into the ground, usually rectangular and made of concrete, capped with a grate that allows stormwater to enter. A sump in the bottom catches sediment.

**Check Dam** – A dam (of rock, logs, etc.) built in a gully or drainage channel to reduce flow velocity, minimize erosive scouring, promote sediment deposition, and/or enhance infiltration.

**Compost Stormwater Filter** – A treatment facility that removes sediment and pollutants from stormwater by percolating water through a layer of specially-prepared Bigleaf Maple compost. Clean water exits the bottom of the facility through a pipe, while stormwater flows in excess of the facility design overflow the compost bed and bypass the facility.

**Constructed Wetland** – A wet pond with dead storage at various depths and planted with wetland plants to enhance its treatment capabilities.

**Control Structure or Flow Restrictor** – A manhole and/or pipe structure with a flow-regulating or metering device such as a weir or plates with small holes known as orifices. The structure controls the rate at which water leaves the pond.

**Conveyance** – A mechanism or device for transporting water, including gutters, pipes, channels (natural or man-made), culverts, manholes, etc.

**Critical Areas** – Areas such as wetlands, streams, steep slopes, etc., as defined by ordinance or resolution by the jurisdiction. Also known as environmentally-sensitive areas.

**Culvert** – A conveyance device (e.g. concrete, metal or plastic pipe) which conveys water from a ditch, swale, or stream under (usually across) a roadway, driveway or embankment.

**Dead Storage** – The volume of storage in a pond below the outlet which does not drain after a storm event. This pool provides treatment of the stormwater by allowing sediments to settle out.

**Detention Facility** – A facility (e.g. a pond, vault, or pipe) in which surface water or stormwater is temporarily stored.

**Detention Pond** – A detention facility in the form of an open pond.

**Dispersion Trench** – An open-top trench filled with rip rap or gravel that takes the discharge from a pond, spreads it out, and spills (bubbles) the flow out along its entire length. Dispersion trenches are used to simulate “sheet flow” of stormwater from an area, and are often used to protect sensitive areas.

**Drainage System** – A combination of facilities for the collection, conveyance, containment, treatment, discharge and/or disposal of stormwater runoff.

**Drop Structure** – A structure for dropping water to a lower elevation and/or dissipating energy. A drop may be vertical or inclined.

**Dry Pond** – A detention facility that drains completely after a storm. This type of pond has a pipe outlet at the bottom.

**Easement** – A legal encumbrance placed against a property’s title to reserve access. Drainage easements typically provide access to pipes and/or ponds, and are generally 15 to 20 feet wide.

**Emergency Overflow or Spillway** – An area on the top edge of a pond that is slightly lower in elevation than areas around it and is normally lined with riprap for erosion protection. The emergency overflow is used only if the primary and secondary outlets of the pond fail, in the event of extreme storms or if the infiltration capability of the pond becomes significantly diminished. If the emergency overflow ever comes into play, it may mean that the pond needs to be upgraded.

**Energy Dissipater** – A rock pad at an outlet (of a pipe, channel, etc.) designed to slow the flow velocity, spread out the water leaving the outlet, and reduce the potential for erosion.

**Freeboard** – The vertical distance between the design high water mark and the top of a pond (or other structure). Most ponds have one to two feet of freeboard to prevent them from overflowing.

**Infiltration** – The soaking of water through the soil surface into the ground (percolation is essentially the same thing). Many ponds are designed to infiltrate or retain stormwater, and thus do not have a regularly used discharge pipe.

**Infiltration Facility (or Structure)** – A facility (pond or trench) which retains and percolates stormwater into the ground, having no discharge (to any surface water) under normal operating conditions.

**Junction** – Point where two or more drainage pipes or channels converge (e.g. a manhole).

**Jurisdiction** – Lacey, Olympia, Tumwater, or Thurston County (as applicable).

**Lined Pond or Conveyance** – A facility, the bottom and sides of which have been made impervious (using, for example, a plastic liner or clay/silt soil layer) to the transmission of liquids.

**Live Storage** – The volume of storage in a pond above the outlet, which drains after a storm event. This storage capacity provides flood control and habitat protection for nearby streams.

**Manhole** – A larger version of the catch basin, often round with a solid lid. Manholes allow access to underground pipes (such as storm sewers) for maintenance.

**Natural Channel** – A stream, creek, river, lake, wetland, estuary, gully, swale, ravine or any open conduit where water will concentrate and flow intermittently or continuously.

**Oil-Water Separator** – A structure or device used to remove oil and greasy solids from water. They operate by using gravity separation of liquids that have different densities. Many catch basins have a down-turned plastic elbow that provides some oil-water separation.

**Outfall** – The point where water flows from a man-made conduit, channel, or drain into a water body or other natural drainage feature.

**Retention Facility** – A facility that is designed to retain water and allow for infiltration.

**Retention Pond** – A retention facility that is an open basin or “pond.”

**Revetments** – Materials such as rock or keystones used to sustain an embankment, such as in a retaining wall.

**Riprap** – Broken rock, cobbles, or boulders placed on earth surfaces, such as on top of a berm for the emergency overflow, along steep slopes, or at the outlet of a pipe, for protection against the erosive action of water. Also used for entrances to construction sites, to prevent sediment tracking.

**Runoff** – The portion of water originating as precipitation that becomes surface flow. See “stormwater” below.

**Sand Filter** – A treatment facility that removes pollutants and sediments from stormwater by percolating stormwater through a layer of sand. Clean water exits the bottom of the facility through a pipe.

**Stormwater** – The portion of precipitation that falls on property and that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes or other features into a defined surface water body or a constructed infiltration facility. Stormwater includes wash-down water and other wastewater that enters the drainage system.

**Swale** – A shallow surface drainage conveyance with relatively gentle side slopes, generally with flow depths less than 1 foot. Essentially a broad, flat-bottomed ditch. See “biofilter.”

**Trash Rack or Bar Screen** – A device (usually a screen or bars) that fits over a pipe opening to prevent large debris such as rocks or branches from entering and partially blocking the pipe.

**Wet Pond** – A stormwater treatment pond designed with a “dead storage” volume to maintain a continuous or seasonal static water level below the pond outlet elevation.

# **Stormwater Facility Maintenance Guide**



**CITY  
OF LACEY**

*Shaping Our Community Together*

After recording return document to:

City of Lacey  
Public Works  
420 College St. SE  
Lacey, WA 98509-3400

**Document Title:** Stormwater Maintenance Agreement (Residential Corporate)  
Chapter 3B of the *Stormwater Design Manual for Lacey* and Appendix  
'Q' of the *Development Guidelines & Public Works Standards*

**Owner(s)** (Last name first, then first name and initials):

1. \_\_\_\_
2. \_\_\_\_
3. Additional name(s) on page \_\_\_\_\_ of document.

**City:** City of Lacey

**Abbreviated Legal Description** (i.e. lot, block, plat or section, township, range):

\_\_\_\_\_  
\_\_\_\_\_

Actual legal is on page \_\_\_\_\_ of document.

**Assessor's Property Tax Parcel Number:** \_\_\_\_\_

**Section, Township, Range:** S \_\_\_\_\_, T \_\_\_\_\_ N, R \_\_\_\_\_, W.M.

**Fronting Street:** \_\_\_\_\_

**Cross Street:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Project HTE #:** \_\_\_\_\_

**RESIDENTIAL AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO  
IMPLEMENT A POLLUTION SOURCE CONTROL PLAN**

**By and between the CITY OF LACEY, a Municipal Corporation, hereinafter called the CITY,  
and**

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**Their heirs, successors, or assigns, hereinafter called the OWNER,**

The upkeep and maintenance of stormwater facilities and the implementation of pollution source control best management practices (BMPs) is essential to the protection of water resources in the City's jurisdiction. All property owners are expected to conduct business in a manner that promotes environmental protection. This "Agreement" contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

**LEGAL DESCRIPTION:**

Whereas, the OWNER has constructed improvements, including but not limited to buildings, pavement, and stormwater facilities on the legally described above "Property". In order to further the goals of the CITY to ensure the protection and enhancement of the City's water resources, the CITY and the OWNER hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

The OWNER shall:

- 1) Implement the stormwater facility maintenance program included herein as Attachment "A".
- 2) Maintain a record, in the form of a log book, of steps taken to implement the programs referenced in (1) above. The log book shall be available for inspection by City staff at the OWNER'S business during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-up on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The OWNER is encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

- 3) Submit an annual report to the CITY regarding implementation of the programs referenced in (1) above. The report must be submitted on or before August 15<sup>th</sup> of each calendar year and shall contain, at a minimum, the following:
  - a) Name, address, and telephone number of the association, businesses, persons, or the firm responsible for plan implementation, and the person completing the report.
  - b) Time period covered by the report.
  - c) A chronological summary of activities conducted to implement the programs referenced in (1) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with the OWNER, include a copy of the invoice for services.
  - d) An outline of planned activities for the next year.
- 4) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under items 3 above and shall be approved of by the CITY. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the CITY and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements and applications for permits.

THE CITY SHALL, AS RESOURCES ALLOW:

- 1) Provide technical assistance to the OWNER in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request at no charge to the OWNER.
- 2) Review the annual report and conduct occasional site visits to discuss performance and problems with the OWNER.
- 3) Review this Agreement with the OWNER and modify it as necessary.

## REMEDIES:

- 1) If the CITY determines that maintenance or repair work is required to be done to the stormwater facilities located on the OWNER's Property, the CITY shall give the OWNER of the Property notice of the specific maintenance and/or repair required. The CITY shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by the CITY, written notice will be sent to the persons who were given notice stating the CITY's intention to perform such maintenance and bill the OWNER for all incurred expenses. The CITY may also revoke stormwater utility rate credits (if applicable) if required maintenance is not performed.
- 2) If at any time the CITY determines that the existing system creates any imminent threat to public health or welfare, the CITY may take immediate measures to remedy said threat. However, the CITY shall also take reasonable steps to immediately notify either the Property Owner or the person in control of said Property of such imminent threat in order to enable such owner or person in control to take such immediate measures either independently or in cooperation with the CITY.
- 3) The OWNER hereby grants authority to the CITY for access to the stormwater system features, only for the purpose of performing maintenance, repair or inspection pursuant to the terms of this Agreement. The City is to be responsible, as provided by law, for any damage to the OWNER through its negligence in the construction, maintenance and operation of the stormwater facilities. Furthermore, the CITY agrees that: (a) any activities of the CITY on the Property shall not unreasonably interfere with OWNER's use of the Property; and (b) all work completed by the CITY pursuant to the rights granted hereunder shall be completed in a good and workmanlike manner and in accordance with all applicable laws, ordinances and codes.
- 4) Following any construction, installation, repair, replacement, improvement or reasonable enlargement of the capacity of the stormwater facilities, the CITY shall restore those portions of the Property affected by the CITY's construction, to the condition they were in immediately prior to such work, unless said work is at the express request of the OWNER, in which case the OWNER shall be responsible for restoration. All restoration that is the responsibility of CITY shall be performed as soon as reasonably possible following completion of any work, and shall be coordinated with OWNER so as to cause the minimum amount of disruption to the OWNER's use of the Property.
- 5) The City agrees to indemnify, defend, and hold harmless the OWNER from and against any and all liability incurred by the OWNER arising from or in any way related to the CITY's breach of any of its covenants, agreements, or obligations set forth in this Agreement, or from the CITY's negligence, intentional misconduct, or misuse of the stormwater facilities, but nothing herein shall require the CITY to indemnify the OWNER for that portion of any such liability attributable to the negligence of the OWNER.

- 6) The OWNER shall be responsible for the cost of maintenance and repair of the stormwater facility. Such responsibility shall include reimbursement to the CITY within 30 days of the receipt of an invoice for work performed by the CITY in maintaining or repairing such facility pursuant to the terms of this Agreement. Overdue payments will require the payment of interest at the current legal rate for liquidated judgements. The CITY shall have a lien for all unpaid charges together with such interest. However, notice of such lien shall not be filed by the CITY for a period of 60 days following mailing of the invoice for charges due. During such 60 days, the Property Owner or other person or agent in control of the Property shall have the right to appeal such charges to the CITY's Land Use Hearings Examiner for a final decision. Such appeal may challenge either the necessity of the maintenance or repairs performed by the CITY or the amount of the charges rendered for such maintenance or repair. Notice of such lien shall not be filed during the pendency of such appeal until final decision is rendered by the Land Use Hearings Examiner. The lien shall be foreclosed in the same manner specified by state statute for foreclosure of a mechanic's or materialman's lien. In any legal action to foreclose such lien or otherwise collect such charges, the prevailing party shall be entitled to an award for its attorney fees and costs incurred.

This Agreement is intended to protect the value and desirability of the Property described above and to benefit all the citizens of the CITY. This Agreement shall run with the land and be binding on all parties having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the CITY.



Accepted by the City of Lacey, Washington. this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

BY: \_\_\_\_\_

Scott Egger  
Director of Public Works

STATE OF WASHINGTON )  
  ) ss  
COUNTY OF THURSTON )

On this day and year above, personally appeared before me, **Scott Egger**, to me known to be the Public Works Director of the City of Lacey, a Municipal Corporation, who executed the foregoing instrument and acknowledged the said instrument to be the free and voluntary act and deed of said Municipal Corporation for the uses and purposes therein mentioned and on oath states he is authorized to execute the said instrument.

Given under my hand and seal this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at \_\_\_\_\_

\_\_\_\_\_  
My commission expires: \_\_\_\_\_

## Attachment “A”

### **What is Stormwater Runoff?**

When urban and suburban development covers the land with buildings, houses, streets and parking lots, much of the native topsoil, duff, trees, shrubs, and grass are replaced by asphalt and concrete. Rainfall that would have directly soaked into the ground instead stays on the surface as *stormwater runoff* making its way into storm drains (including man-made pipes, ditches, or swale networks), stormwater ponds, surface and groundwater, and eventually to Puget Sound.

### **What is a Storm Drain System and how does it work?**

The storm drain system for most developments includes components *that carry, store, cleanse, and release* the stormwater. These components work together to reduce the impacts of development on the environment. These impacts can include *flooding* which results in property damage and blocked emergency routes, *erosion* which can cause damage to salmon spawning habitat, and *pollution* which harms fish and/or drinking water supplies.

The storm drain system provides a safe method to carry stormwater to the treatment and storage areas. Swales and ponds filter pollutants from the stormwater by *physically* settling out particles, *chemically* binding pollutants to pond sediments, and *biologically* converting pollutants to less-harmful compounds. The ponds also store the treated water, releasing it gradually to a nearby stream or to groundwater. The various components of storm drain systems are described in the glossary.

### **What does Stormwater Runoff have to do with Water Quality?**

Stormwater runoff needs to be treated because it carries litter, oil, gasoline, fertilizers, pesticides, pet wastes, sediments, and anything else that can float, dissolve, or be swept along by the moving water. Left untreated, polluted stormwater can reach nearby waterways where it can harm and even kill aquatic life. It can also pollute groundwater to the extent that it must be treated before it can be used for drinking, which has actually happened in Pierce County. Nationally, stormwater is recognized as a major threat to water quality. Remember to keep everything out of stormwater systems except the rainwater they are designed to collect.

### **Your Stormwater Facility**

Stormwater facilities can be attractive as well as functional. They can provide both active and passive-use recreation areas and open space for wildlife. Perhaps you’ve noticed a wet or dry pond in your neighborhood. These different types of ponds are designed for different purposes. For example, wet ponds primarily provide treatment of stormwater. They also provide good cover and habitat for birds and small mammals, making them fine “wildlife preserves”. Dry ponds or infiltration ponds are designed to provide storage for stormwater and gradually release it downstream or allow it to filter into the ground. These types of ponds can be maintained as grassy play areas, and may even be modified to house more formal play equipment.

### **Who is Responsible for Maintaining Stormwater Facilities?**

All stormwater facilities need to be maintained. Regular maintenance ensures proper functioning and keeps the facility visually appealing. This Stormwater Facility Maintenance Guide was designed to help explain how stormwater facilities work and provide user-friendly, straightforward guidance on how to maintain them.

As a property owner or homeowner’s association, you are responsible for regularly maintaining privately owned ponds, catch basins, pipes and other drainage facilities within your subdivision. The City of Lacey maintains stormwater facilities located in public right-of-ways.

## Maintenance Checklists

The checklists in this guide are for you to use when inspecting and maintaining the stormwater facilities that you are responsible for. If you feel that you are missing a particular checklist, or you have additional facilities not identified or addressed in this guide, please contact your site developer, design engineer or the City.

The checklists are in table format for ease of use and brevity. Each checklist tells you what part of the feature to check, how often to check, what to check for and the desired outcome after maintenance is performed. Log sheets are included to help you keep track of when you last surveyed the stormwater drainage system.

Those systems using approved “emerging technologies”, such as a StormFilter™, may not find a checklist covering the specific stormwater facility. Please refer to the manufacturer’s guidelines for the appropriate maintenance activity schedule. If a checklist is provided, it is for guidance purposes only and not meant to supersede the manufacturer’s recommendations.

Although it is not intended for the inspection to involve anything too difficult or strenuous, there are a few tools that will make the job easier and safer. These tools include:

- Gloves
- A flashlight.
- A long pole or broom handle.
- Some kind of pry bar or lifting tool for pulling manhole and grate covers.
- Standard yard tools, such as a rake and a shovel.
- Measuring tool.

**SAFETY WARNING: For your safety and per OSHA regulations, you should never stick your head or any part of your body into a manhole or other type of confined space. When looking into a manhole or catch basin, stand above it and use the flashlight to help you see. Use a pole or broom handle that is long enough when you are checking sediment depths in confined spaces. NO PART OF YOUR BODY SHOULD BREAK THE PLANE OF THE OPEN HOLE.**

## Checklist Instructions

The following pages contain maintenance checklists covering most of the needs for the components of your drainage system, as well as for some components that you may not have. Let City staff know if there are any components of your drainage system that you do not recognize or are missing from these pages.

Refer to the City of Lacey Stormwater Code, LMC 14.25 for additional stormwater maintenance requirements, including maintenance frequency.

Using photocopies of these checklists and the log sheet, check off the problems that you look for each time you do an inspection. Add comments regarding problems found and actions taken on the log sheet. Keep the completed forms in your files for future reference.

You may call the City of Lacey at (360) 491-5600 for technical guidance. Please do not hesitate to call, especially if you are unsure whether a situation you have discovered may be a problem.

You should plan to complete a check for all system components on the following schedule:

- **Quarterly** - Plan to inspect the facility at least once during the following months; January, May, August, and November.
- **Annually** - The best time for an annual inspection is in the late summer, preferably September.
- **After Storms** - Also check all stormwater facilities after major storm events, defined as about 1 inch or more of precipitation in 24 hours.

## Resource Listing

If you are unsure whether a problem exists, please contact the City at the number below and ask for technical assistance with your situation. Other resources are listed for your convenience and as references associated with the checklists.

### Lacey Public Works Department

(360) 491-5600 <http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>

### City of Lacey Spill Response Team

(360) 491-5644 <http://ci.lacey.wa.us/report-a-spill>

### Thurston County Environmental Health

Hazardous Waste Disposal (oil, paint, pesticides, etc.)

(360) 754-4111 <http://www.co.thurston.wa.us/health/ehhw/index>

Solid Waste Disposal (yard waste, construction waste, contaminated soils, etc.)

(360) 786-5136 <http://www.co.thurston.wa.us/health/ehhw/index>

### WSU Thurston Co. Extension (Water Resource Ed. Programs, Envir. Stewardship info.)

(360) 786-5445 <http://www.thurston.wsu.edu/water>



## Stormwater Facility Inspection and Maintenance Procedure

Stormwater facilities play an important role in managing the 4 feet of rainfall we receive in Lacey in an average year. The term “stormwater facility” refers to any landscaped or structural feature that collects, conveys, cleans or infiltrates runoff water. There are many types of stormwater facilities, ranging from simple swales and ponds to more complicated filter systems and flow control devices. Your on-site stormwater facilities work together to control runoff water, reduce flooding, and prevent pollution.

Owners of commercial property, multifamily residential property, or single-family residential properties with privately-owned drainage and stormwater facilities are required by the City of Lacey Codes to maintain their facilities to established standards for full functionality (City of Lacey Stormwater Code, LMC 14.25). Facility owners are responsible for performing inspections of stormwater facilities, and for performing any maintenance identified by the inspections.

Basic maintenance work may be performed by the owner or property manager, although some tasks are best left to an experienced contractor. The inspection of stormwater facilities and any required maintenance work must be completed and reported annually to the City of Lacey Public Works Department by the date specified on the *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* obtainable on the City’s web site at:

<http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>.

Again, note that most large development sites will also have a Maintenance and Source Control Manual that was prepared as part of the site development, and should have been provided to the property owners. Look to your site’s Maintenance and Source Control Manual for information on the project, the facilities on the site, maintenance responsibilities, and maintenance activities.

Where a Maintenance and Source Control Manual is not available, the following steps are provided as general guidance:

### **Step 1. Identify**

The first step is facility identification, so you know what types of stormwater facilities you have. Look on the site plan of your property, and note the main facility types indicated (such as rain gardens and infiltration trenches), along with related drainage components (such as catch basins, pipes, and debris barriers). Locate the various facilities on the ground.

Note that most drainage systems consist of components for four main purposes: stormwater collection (e.g., catch basins), conveyance (e.g., pipes and swales), water quality treatment (e.g., wet ponds) and flow control (via infiltration and/or surface discharge).

To assist you in identifying components, refer to the definitions on the pages that follow.

## **Step 2. Inspect**

For all facility components that you have identified, conduct an inspection. You may conduct the inspection yourself and/or with co-owners, or you may use a property manager or vendor to perform the inspection. Refer to the following Stormwater Facility Maintenance Checklists, which describe the maintenance standards for each component, and also identify and describe defects and their remedies.

For each facility, note on the Inspection and Maintenance Checklist the condition of the facility (good, fair or poor), and any problems or other observations.

## **Step 3. Maintain**

For all facility components, if the inspection indicates maintenance is needed; have the work performed by competent personnel. Basic maintenance tasks may be performed by the property owner(s) or property manager, but difficult or potentially dangerous tasks should be performed by a qualified vendor. Be safe! Use caution when inspecting and working on or near facilities, and stay out of confined spaces such as catch basins and manholes.

Note the action taken and the date, and record this information on the Log Sheet. Mark the check boxes on the Inspection and Maintenance Checklist corresponding to the maintenance accomplished on each facility.

## **Step 4. Submit**

Submit the completed *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* by August 15 each year to: Lacey Water Resources, 420 College Street SE, Lacey, WA 98503. The completed checklist may be mailed, e-mailed (if available) or delivered in person to Lacey City Hall.

## **Common Stormwater Facilities: Identification and Actions**

*Note: General actions are described for each facility type below. Please refer to the Stormwater Facility Maintenance Standards for further details.*

### **Detention Pond:**

A shallow bowl-like depression in the land, with an area to collect and temporarily store stormwater. The pond is generally lined with grass and is intended to store stormwater to reduce runoff volumes during storms.

#### *Actions to keep detention ponds functioning:*

- Remove litter, sediment, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Inspect pond berms for any structural deficiencies

### Infiltration Basin (“Dry Pond”):

A shallow bowl-like depression in the land, with a broad, flat bottom area to collect, temporarily store, and infiltrate stormwater. An infiltration basin is designed to receive treated water and allow it to infiltrate into the soil. The infiltration basin is usually lined with grass and drains “dry” between rain events. Some playfields double as infiltration basins by design.

#### Actions to keep infiltration basins functioning:

- Remove litter, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Avoid activities within the basin that could cause erosion or soil compaction.
- Avoid using herbicides or pesticides within the basin area.
- Aerate the soil in the bottom area as needed to preserve and enhance infiltration.

### Biofiltration Swale:

A longitudinally sloped, wide, shallow, vegetation-lined channel with gently sloping sides and a flat bottom designed to remove pollutants by means of sedimentation, filtration, soil sorption, and/or plant uptake. Some water also infiltrates into the soil as it slowly flows along the swale.

#### Actions to keep swales functioning:

- Remove debris, litter, and flow obstructions from the swale.
- Mow the swale and maintain healthy grass cover.
  - Prevent dirt, rocks, and weeds from accumulating, but avoid use of herbicides (remove manually).
- Do not fill-in the swale with rocks, bark, etc.
- Aerate the soil to preserve infiltration capacity.

### Wet Pond:

A constructed pond with an impermeable liner to maintain a permanent pool of water, which provides for water quality treatment by settling and retention of sediment particles and other pollutants. The cleaner surface water is then conveyed to a nearby infiltration facility (such as a “dry detention pond”) or surface discharge. A wet pond provides a basic level of treatment, and is common in many neighborhoods.

#### Actions to keep wet ponds functioning:

- Remove litter and yard debris from within and around the pond.
- Check inflow and outflow systems. Remove any obstructions.
- Remove excess vegetation such as cattails from within the pond.
- Remove noxious weeds, but do not use herbicides (contact City for advice).

### Stormwater Wetland:

A created wetland with a permanent pool of water, similar to a wet pond, but generally shallower and with aquatic emergent plants which provide for a higher level of water quality treatment of collected stormwater through biological processes.

Actions to keep stormwater wetlands functioning:

- Remove litter and yard debris from within and around the wetland.
- Check inflow and outflow systems, and remove any obstructions.
- Remove excess vegetation such as cattails from within the wetland.
- Remove noxious weeds, but do not use herbicides (contact city for advice).

**Bioretention Cell:**

A shallow stormwater system with a designed soil mix and plants. Bioretention is a “low-impact development” (LID) practice that is integrated into a site to retain stormwater near its source. Bioretention cells are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. They also provide water quality treatment through sedimentation, filtration, adsorption, and phytoremediation. Bioretention cells function by storing stormwater as surface ponding before it filters through the underlying amended soil.

Actions to keep bioretention cells functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Rain Garden:**

Non-engineered, shallow, landscaped depressions with compost amended native soils and adapted plants that collect, absorb, and filter stormwater runoff from roof tops, driveways, patios, and other hard surfaces. Rain gardens are sized to pond and temporarily store stormwater runoff and allow stormwater to pass through the amended soil profile.

Actions to keep rain gardens functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Permeable Pavement:**

Permeable pavement (also known as pervious and porous pavement) looks very much like ordinary pavement but includes additional “void” spaces where water can pass through. After water drains through permeable pavement wearing course, it is held in a storage reservoir bed (made up of aggregate rock, or drain rock), and then infiltrates into the native soils.

Actions to keep permeable pavement functioning:

- Clean surface to remove trash, sediment, vegetation, and other accumulated debris.
- Check inflow and outflow systems and underdrains, and remove any obstructions.
- Use vacuum to remove fine sediments.

- If pavers are used, check for damaged or missing pavers and replace as needed.
- If paving grids are used, check for loss of soil, grass, and/or gravel material and replace as needed.

#### Downspout, Sheet Flow, and Concentrated Flow Dispersion:

A gravel trench or splashblock followed by a vegetated flowpath (or dispersion area) used to disperse flow and reduce runoff from impervious surfaces. Dispersion attenuates peak runoff flows by slowing the runoff entering into the conveyance system, allowing some infiltration, and providing some water quality benefits.

##### Actions to keep downspout, sheet flow, and concentrated flow dispersion functioning:

- Ensure that vegetation is not blocking flow, and perform plant maintenance as needed.
- Remove and replace dead vegetation to ensure that runoff is received in a well-vegetated area.
- Avoid activity in dispersion area to avoid compaction.
- Check for erosion of the dispersion trench or dispersal area and replace and restore gravel and/or soil.

#### Downspout Infiltration:

Includes an infiltration trench or drywell intended only for use in infiltrating runoff from roof surfaces. Infiltration trenches and drywells are backfilled with washed drain rock, allowing for temporary storage of stormwater runoff in the voids of the drain rock material. Stored runoff gradually infiltrates into the surrounding soil.

##### Actions to keep downspout infiltration functioning:

- Remove litter, leaves, debris, and obstructions from the infiltration trench or drywell.
- Stabilize adjacent landscaped areas to avoid runoff from eroding and mobilizing soil into the surface inlet.

#### Detention Tank:

An underground storage facility typically constructed with large diameter corrugated metal or HDPE pipe.

##### Actions to keep detention tanks functioning:

- Remove litter, leaves, debris, and obstructions from inlet and outlet.
- Check tank for cracks or leaks.
- Clean out any sediment or debris accumulated inside the tank.

#### Ditch:

A V-shaped channel, usually along the side of a road that collects and conveys runoff.

##### Actions to keep ditches functioning:

- Remove debris, litter and flow obstructions from the ditch.
- Do not fill-in the ditch – prevent dirt, rocks, and weeds from accumulating.
- Repair erosion on ditch side-slopes.

## Culvert:

A pipe that continues conveyance flow from a ditch or swale under the ground surface, typically under driveways and cross-streets. Usually connects (“daylights”) to another ditch, swale or pond. The end of a pipe or culvert is often surrounded by rock “riprap” to prevent soil erosion.

### Actions to keep culverts functioning:

- Remove debris, litter, and obstructions from the openings at the culvert ends.
- Remove soil, sod, and vegetation buildup from the culvert openings.
- Replace rock riprap at the culvert ends.
- Repair any damage to the culvert ends.

## Catch Basin:

An underground concrete box structure with a slotted metal grate on top that collects runoff water from the ground surface. Typically located within pavement in parking lots and in the street gutter, usually next to a curb. Grate on top lets water in and keeps larger debris out. Sediment settles in the sump in the bottom (below the pipe openings) and must be removed periodically. Catch basins have an outlet pipe between the grate and the sump, to let the cleaner water flow out to a storm pond or other location. Some catch basins have both inflow and outflow pipes, to convey collected runoff water through.

### Actions to keep catch basins functioning:

- Remove litter, leaves, debris, and obstructions from catch basin grates.
- Hire a professional to remove sediment buildup from sump, if road is privately owned.  
Catch basins in the public right-of-way are maintained by the City.

## Debris Barriers and Trash Racks:

A structural device with metal bars, to prevent debris from entering a pipe, spillway, or hydraulic structure.

### Actions to keep debris barriers and trash racks functioning:

- Remove trash, debris, vegetation, and dirt from around the structure.
- Check inflow and outflow, and remove any flow obstructions.
- Remove plants such as alder and willow that tend to grow near the pipe ends.
- Check for structural integrity; hire a professional to fix broken bars or racks.

# Stormwater Facility Maintenance Checklists

## Maintenance Standards

The following pages contain facility-specific maintenance standards, which are intended to be observable conditions for determining whether maintenance actions are required.

### Group 1: Flow Control and Treatment Facilities

- 1a Detention Ponds
- 1b Infiltration Ponds
- 1c Detention Tanks and Vaults
- 1d Wet Vaults
- 1e Wet Ponds
- 1f Stormwater Wetlands
- 1g Basic and Compost-Amended Biofiltration Swale
- 1h Wet and Continuous Inflow Biofiltration Swales
- 1i Filter Strip (Basic and CAVFS)
- 1j Sand Filter (above ground/open)
- 1k Sand Filter (below ground/closed)
- 1l Media Filter Drains
- 1m Bioretention Cells, Swales and Planter Boxes
- 1n Rain Gardens
- 1o Trees
- 1p Permeable Pavement
- 1q Vegetated Roofs
- 1r Downspout, Sheet Flow, Concentrated Flow Dispersion
- 1s Downspout Infiltration
- 1t Cisterns
- 1u Fencing, Shrubbery Screen, Other Landscaping
- 1v Manufactured Media Filters
- 1w Proprietary of Manufactured Products

**Group 2: Structure and Pretreatment**

- 2a Control Structures and Flow Restrictors
- 2b Catch Basins
- 2c Debris Barriers (trash racks)
- 2d Energy Dissipaters
- 2e Baffle Oil/Water Separators (API type)
- 2f Coalescing Plate Oil/Water Separators
- 2g Catch Basin Inserts

**Group 3: Miscellaneous Facilities and Features**

- 3a Conveyance Pipes, Culverts, Ditches and Swales
- 3b Access Roads and Easements

# **Group 1**

## ***Flow Control & Treatment***

## 1a. Detention Ponds

Detention ponds are earthen excavations that are “dry” except during and after rains, when they contain stormwater temporarily. Detention ponds store water while releasing it gradually.

Detention Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation according to applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111 and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with the Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility		Return facility to design function. ( <i>Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.</i> )	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove or remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Overgrown Vegetation Around Pond	Tree grown and dense vegetated impedes inspection, maintenance access or interferes with maintenance activity with the facility function or maintenance (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Prune or maintain trees and vegetation so they do not to hinder inspection or maintenance activities.  If trees are not interfering with access or maintenance, do not remove.	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Sediment Accumulation	Accumulated sediment that exceeds 10 percent of the designed pond depth unless otherwise specified or affects inlets or outlets of the facility.		Clean out sediment and aerate and/or re-seed the pond if deemed necessary to improve infiltration and control erosion.  <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	PVC Pond Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate), and the liner is not exposed. Maintenance is needed if liner is visible and has more than three 0.25-inch holes.		Repair or replace liner as needed. Liner is fully covered.	
	Clay Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate).		Repair or replace liner as needed.	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Emergency Overflow Spillway	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	

### Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		<p>Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.</p> <p><i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i></p>	

## 1b. Infiltration Ponds, Trenches, and Galleries

Infiltration ponds, trenches, and galleries are earthen excavations or underground structures that are “dry” except during and after rains, when they contain stormwater temporarily. Infiltration ponds, trenches, and galleries store water while gradually percolating water into the ground.

Infiltration Ponds, Trenches, and Galleries					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>(Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.)</i>	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
	Tree Growth and Dense Vegetation	Tree growth and dense vegetation, which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Trees and vegetation do not hinder inspection or maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).	
Storage Area	Water Not Infiltrating	Check for water ponding in infiltration basin after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events. (Maintenance is required if a percolation test pit or test of facility indicates facility is only working at 90 percent of its designed capabilities, or if 2 inches or more sediment is present, remove).		Facility infiltrates as designed. Sediment is removed and/or facility is cleaned so that infiltration system works according to design.	
Filter Bags (if applicable)	Filled with Sediment and Debris	Maintenance is required if sediment and debris fill bag more than one-half full.		Replace filter bag or redesign system. Filter bag must be less than one-half full.	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.		Replace gravel in rock filter if needed. Water must flow through filter.	
Trenches	Observation Well (use surface of trench if well is not present)	Water ponds at surface during storm events. Less than 90 percent of design infiltration rate.		Remove and replace/clean rock and geomembrane.	
Galleries	Chambers	Check inlet and outlets and interior of chambers for deficiencies, cracks, debris, and sediment.		Remove any debris and sediment and replace or restore chambers as needed.	
		Exceeds 18 inches.		Mow grass or groundcover to a height no greater than 6 inches.	
		Bare spots.		Revegetate and stabilize immediately. No bare spots should be present.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	

### Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Dikes or Berms (continued)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Screen Clogged or Missing	The bar screen over the outlet should be intact and clear of debris. Water should flow freely through the outlet pipe.		Replace screen if it is not attached. Remove any trash or debris and dispose of properly. Clean out the end pipe if necessary.	

<b>Infiltration Ponds, Trenches, and Galleries</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Presetting Ponds and Vaults	Facility or Sump Filled with Sediment and/or Debris	6 inches or designed sediment trap depth of sediment.		Remove sediment. No sediment should be present in presetting pond or vault.	
	Inadequate Sediment Settling Area	Stormwater should not enter the infiltration area without some method of settling-out solids.		Add a sediment trapping area by constructing a sump or berm for settling of solids. This area should be separate from the rest of the facility. Contact City of Lacey for guidance.	
Drain Rock	Water Ponding	If water enters the facility from the surface, inspect to see if water is ponding at the surface during storm events.  If buried drain rock, observe drawdown through observation port or cleanout.		Clear piping through facility when ponding occurs. Replace rock material/sand reservoirs as necessary. Tilling of subgrade below reservoir may be necessary (for trenches) prior to backfill. No water ponding should be present on surface during storm events.	

For manufactured infiltration galleries, designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.

### 1c. Detention Tanks and Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Detention Tanks and Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.		Vents open and functioning. Remove blockage or replace air vent if damaged.	
	Debris and Sediment	Accumulated sediment depth exceeds 10 percent of the diameter of the storage area for 50 percent of the length of storage vault or any point depth exceeds 15 percent of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 50 percent of the length of tank.)		No debris or sediment present. All sediment and debris removed from storage area.	
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).		All joint between tank/pipe sections are sealed.	
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10 percent of its design shape. (Review required by engineer to determine structural stability).		Tank/pipe repaired or replaced to design.	
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.		Vault replaced or repaired to design specifications and is structurally sound.	

## Detention Tanks and Vaults

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Storage Area (continued)	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.		Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
Catch Basins	See "Catch Basins"	See "Catch Basins."		See "Catch Basins."	

## 1d. Wet Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Wet Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris in vault, pipe or inlet/outlet (includes floatables and non-floatables).		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Accumulation	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.		Remove sediment from vault. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.		Pipe repaired and/or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened or removed, especially by one person.		Pipe repaired or replaced to proper working specifications.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed or cleared from ventilation area. A specified percentage of the vault surface area must provide ventilation to the vault interior (see design specifications).	
		Maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking warping and/or showing signs of failure as deemed by maintenance/inspection staff.		Baffles repaired or replaced to specifications.	
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.	

## 1e. Wet Ponds

Wet ponds are designed to improve water quality. They have a permanent pool of water, which slows incoming stormwater flows causing sediments and pollutants to settle-out. Wet ponds are typically deeper than other water quality BMPs, such as stormwater wetlands, and utilize the pool volume to reduce pollutant loads.

Wet Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Level	First cell is empty, doesn't hold water.		Line the first cell to maintain at least 4 feet of water. Second cell may drain, but the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.	
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No debris or sediment present. Remove and properly dispose of all trash and debris.	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.		No clogging or blockage in the inlet and outlet piping.	
	Sediment Accumulation on Pond Bottom	Accumulated sediment on pond bottom that exceeds the depth of sediment zone plus 6 inches, usually in the first cell.		Sediment removed from pond bottom. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Oil Sheen on Water	Visible and prevalent oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Locate and correct oil source. If chronic low levels of oil persist, plant wetland plants such as <i>Juncus effusus</i> (soft rush) which can uptake small concentrations of oil.	
	Erosion	Erosion of the pond's side slopes and/or scouring of pond bottom that exceeds 6 inches, or where continued erosion is prevalent.		Slopes stabilized using proper erosion control measures and repair methods.	
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.		Dike/berm is repaired to specifications.	

## Wet Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Internal Berm	Berm dividing cells should be level.		Berm surface is leveled so that water flows evenly over entire length of berm.	
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.		Rocks replaced to specifications.	
	PVC Pond Liner	Check to see if liner is visible and has more than three 0.25-inch holes, is exposed and/or torn. An indicator of a torn liner could be the pond no longer holds water (during long dry periods the water may evaporate)		Repair or replace liner as needed. Note: wet ponds usually have liners.	
	Clay Liner	Check to see if pond is holding water (during long dry periods the water may evaporate).		Repair liner to design state.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Vegetation Not Growing or Overgrown Within Pond	Presence of invasive species or sparse/excessive growth of plants.		Remove invasive species and reestablish vegetation as designed.	

## 1f. Stormwater Wetlands

Stormwater wetlands are designed to improve water quality. They are designed with emergent aquatic plants to provide biological treatment and filtering of runoff water.

Stormwater Wetlands					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No debris or sediment present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club).  Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. (Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Oil Sheen on Water	Prevalent and visible oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Source of oil located and corrected. <i>If chronic low levels of oil persist, plant emergent wetland plants such as <i>Juncus effusus</i> (soft rush) which can assist filtering small concentrations of oil.</i>	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material or damaged.		No clogging or blockage in the inlet and outlet piping.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>Evaluate using beaver deceiver and leveler devices. If beaver removal is necessary, contact WDFW Region 6 to coordinate with a Nuisance Wildlife Control Operator.</i>	
	Tree Growth and Hazard Trees	Tree growth that impedes maintenance access.		Remove hazard trees. Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., firewood or construction).	
	Tree Growth and Hazard Trees	If dead, diseased, or dying trees are identified, use a certified Arborist to determine the health of tree and whether removal is required.		Remove hazard trees.	
	Liner	Check to see if liner is visible and has more than three 0.25-inch holes, or if it is exposed and or torn. An indicator of a torn liner could be the wetland no longer holds water. (during long dry periods the water may evaporate).		Repair or replace liner as needed. Liner is fully covered.	
Forebay	Sediment Accumulation	Sediment accumulation in forebay exceeds the design depth of the sediment zone plus 6 inches.		Remove accumulated sediment from forebay bottom to the design depth of the sediment zone.	
Side Slopes of Wetland	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.	
Side Slopes of Wetland	Erosion	Any erosion observed on a compacted berm embankment.		<i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Cell	Wetland Vegetation	20 percent or more of the stormwater wetland area has dead or dying vegetation, as measured by stem counts relative to the design plant coverage.		Plants in wetland cell surviving and not interfering with wetland function. Dead or dying vegetation is replaced by like species, unless recommended otherwise by the Wetlands Consultant and approved by the city. ( <i>Watering, physical support, mulching, and weed removal may be required on a regular basis especially during the first 3 years.</i> )	
	Wetland Vegetation	Percent vegetated cover of stormwater wetland bottom area, excluding exotic and invasive species, is less than 50 percent after 2 years.		Exotic/invasive species removed. Additional plantings may be required.	
	Wetland Vegetation	Decaying vegetation produces foul odors.		Decaying vegetation is removed, preferably in late summer.	
	Wetland Vegetation	Wetland vegetation is blocking flow paths causing flow back-up and flooding.		Areas of blocking vegetation are cut back sufficient to allow design flows and prevent flooding.	
	Wetland Vegetation	Water quality monitoring indicates that wetland vegetation is contributing phosphorus and metals to downstream waters rather than sequestering them.		Water quality monitoring indicates improved water quality.  To maximize removal of wetland pollutants, wetland vegetation must be periodically harvested, particularly with respect to phosphorus and metals removal. Harvesting should occur by mid-summer before plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. Every 3 to 5 years the entire plant mass including roots should be harvested because the belowground biomass constitutes a significant reservoir (as much as half) of the nutrients and metals that are removed from stormwater by plants.	
	Sediment Accumulation	Sediment accumulation inhibits growth of wetland plants or reduces wetland volume (greater than 1 foot of sediment accumulation).		Wetland dredged to remove sediment accumulation.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Berms (dikes)	Settlements	Any part of berm that has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works.		Dike restored to the design elevation. <i>A professional engineer should be consulted to determine the source of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Wetland Berms Over 4 Feet in Height (dikes)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Obstruction	Tree growth or other blockage on emergency spillways may cause failure of the berm due to uncontrolled overtopping.		Remove obstruction on emergency spillway. <i>A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rock Missing	Check to see that the riprap protective area is intact. Only one layer of rock exists above native soil in an area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.)	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

### 1g. Basic and Compost-Amended Biofiltration Swale

A gently-sloped channel with gentle side slopes, lined with grass (and sometimes other vegetation) to slow the flow and allow for water quality treatment and infiltration.

Basic and Compost-Amended Biofiltration Swale					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches or inhibits vegetation growth in 10 percent or more of swale.		Remove sediment deposits on grass treatment area of the biofiltration swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.	
	Standing Water	When water stands in the swale between storms and does not drain freely.		Swale must drain freely and not contain standing water between storms. Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.		Level the spreader and clean so that flows are spread evenly over entire swale width.	
	Constant Baseflow	Small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.		Base flow removed from swale. Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.	
	Poor Vegetation Coverage	Grass is sparse or bare or eroded patches occur in more than 10 percent of the swale bottom.		Swale has no bare spots and grass is thick and healthy. Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.	
	Vegetation	When the grass becomes excessively tall (higher than 10 inches); when nuisance weeds and other vegetation start to take over.		Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.	
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.		If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.	

### Basic and Compost-Amended Biofiltration Swale

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Swale	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.		Remove material so that there is no clogging or blockage in the inlet and outlet area.	
	Trash and Debris Accumulation	Trash and debris accumulated in the biofiltration swale.		No debris or sediment present. Remove trash and debris from biofiltration swale.	
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale. Cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

## 1h. Wet and Continuous Inflow Biofiltration Swales

Similar to a basic biofiltration swale (previous pages), but with modifications due to saturated soil conditions (such as, specific plants that can tolerate wet conditions).

Wet and Continuous Inflow Biofiltration Swales					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation	Sediment depth exceeds 2 inches in 10 percent of the swale treatment area.		Remove sediment deposits in treatment area.	
	Water Depth	Water not retained to a depth of about 4 inches during the wet season.		Build up or repair outlet berm so that water is retained in the wet swale.	
	Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.		Wetland vegetation fully covers bottom of swale. Cause of lack of vigor of vegetation addressed. Replant as needed.  Determine cause of lack of vigor of vegetation and correct. Replant as needed. Remove cattails and compost off site. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.	
	Inlet/Outlet	Inlet/outlet area clogged with sediment and/or debris.		Remove clogging or blockage in the inlet and outlet areas.	
	Trash and Debris Accumulation	Any plastic, paper or other waste or debris.		No debris or sediment present. Remove trash and debris from wet biofiltration swale.	
	Erosion/ Scouring	Swale has eroded or scoured due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale.  Check design flows to ensure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as <i>Juncus effusus</i> (soft rush) in wet areas or snowberry ( <i>Symphoricarpos albus</i> ) in dryer areas.	

**Wet and Continuous Inflow Biofiltration Swales**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swale (continued)	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

### 1i. Filter Strip (Basic and CAVFS)

A basic filter strip is a flat grassy area that provides treatment of unconcentrated sheet flow runoff from adjacent pavement. Can provide enhanced treatment for metals in runoff water when soil is amended with organic compost and grass is sufficiently dense.

<b>Filter Strip (basic and CAVFS)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.	
	Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.		Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3 to 4 inches.	
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.		No trash or debris present. Remove trash and debris from filter.	
	Erosion/ Scouring	Eroded or scoured areas due to flow channelization, or higher flows.		No eroded or scoured areas, cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.		Level the spreader and clean so that flows are spread evenly over entire filter width.	

### 1j. Sand Filter (above ground/open)

A typical open sand filter consists of a pretreatment system to remove sediments, a flow spreader, a sand bed, and underdrain piping. See also Sand Filter (belowground/closed).

Sand Filter (above ground/open)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment and Silt Accumulation on top layer	Sediment and silt depth exceeds 0.5 inch over 10 percent of surface area of sand filter.		No sediment deposit on grass layer of sand filter that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.		No trash or debris present. Trash and debris removed from sand filter bed.	
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.		Sediment removed from cleanouts and/or drainpipes.	
	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, flow through the overflow pipes occurs frequently, or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).	
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities. (Consider 4- to 8-hour drawdown tests).		Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.	
	Short Circuiting	Drawdown greater than 12 inches per hour. When flows become concentrated over one section of the sand filter rather than dispersed.		Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area. No leaks in the cleanouts or underdrains.	
	Erosion Damage to Slopes	Erosion over 2 inches deep where cause of damage is prevalent or potential for continued erosion is evident.		Slopes stabilized using proper erosion control measures.	
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.		Rock pad replaced or rebuilt to design specifications.	

**Sand Filter (above ground/open)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Aboveground (open sand filter) (continued)	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter. Rills and gullies on the surface of the filter can indicate improper function of the inlet flow spreader.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20 percent or any other failure to the piping.		Pipe repaired or replaced.	

### 1k. Sand Filter (below ground/closed)

Similar to an open sand filter, but installed below grade within a vault.

Sand Filter (below ground/closed)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 0.5 inch.		No sediment deposits on sand filter section that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Sediment Accumulation in Presettling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of sediment zone plus 6 inches.		No sediment deposits in first chamber of vault.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Trash and debris removed from vault and inlet/outlet piping.	
	Sediment in Drain Pipes/ Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.		No sediment or debris present. Any sediment and debris removed from cleanouts and/or drainpipes.	
	Clogged Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently, and/or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging and influent suspended solids loads (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material). <i>Other options include removal of thatch, aerating the filter surface, tilling the filter surface, replacing the top 4 inches of filter media, and inspecting geotextiles for clogging.</i>	
	Short Circuiting	Drawdown greater than 12 inches per hour. When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area. (Consider 4- to 8-hour drawdown tests.)		Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion. No leaks in the cleanouts or underdrains.	

**Sand Filter (below ground/closed)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vault (continued)	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.		Cover repaired to proper working specifications or replaced.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed/cleared from ventilation area. A specified percentage of the vault surface area must provide venting to the vault interior (per design specifications).	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles/ Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.	
Pipes	Damaged Pipes	Inlet or outlet piping damaged or broken, in need of repair.		Pipe repaired and/or replaced.	

## 11. Media Filter Drains

A filter treatment device that is typically sited along highway side slopes (conventional design) and medians (dual media filter drains), borrow ditches, or other linear depressions. Media filter drains have basic components: a gravel no-vegetation zone, a grass strip, the MFD mix bed, and a conveyance system for flows leaving the media filter drain mix.

Media Filter Drains					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Erosion, Scour, or Vehicular Damage	No vegetation zone uneven or clogged so that flows are not uniformly distributed.		Area leveled and cleaned so that flows are spread evenly.	
	Sediment Accumulation on Edge of Pavement	Flows no longer sheet flowing off of roadway. Sediment accumulation on pavement edge exceeds top of pavement elevation.		No sediment accumulation on pavement edge that impedes sheet flow. Sediment deposits removed such that flows can sheet flow off of roadway.	
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Sediment deposits removed, slope is re-leveled so that flows pass evenly through media filter drain.	
	Excessive Vegetation or Undesirable Species	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over or shades out desirable vegetation growth characteristics. See also the <a href="#">Thurston County Noxious Weeds List</a> .		Grass mowed and nuisance vegetation controlled such that flow not impeded. <i>Grass should be mowed to a height that encourages dense even herbaceous growth.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with suitable topsoil. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or areas less than 12 inches wide, repair the damaged area by filling with suitable media. If bare areas are large, generally greater than 12 inches wide, the media bed should be re-graded.</i>	

### Media Filter Drains

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Media Bed	Sediment depth inhibits free infiltration of water.		Sediment accumulation does not impeded infiltration. Sediment deposits removed and slope is re-leveled so that flows pass freely through Media Bed.	
Underdrains	Sediment	Depth of sediment within perforated pipe exceeds 0.5 inch.		Depth of sediment within perforated pipe does not exceed 0.5 inch. Flush underdrains through access ports and collect flushed sediment.	
	Trash and Debris Accumulation	Accumulated trash and debris. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No trash or debris present. Remove trash and debris from media filter.	
	Flows are Bypassing Media Filter Drain	Evidence of significant flows downslope (rills, sediment, vegetation damage, etc.) of media filter drain.		Facility functions as designed. Sediment deposits removed and slope is re-leveled so that flows pass evenly through media filter drain. If media filter drain is completely clogged, it may require a more extensive repair or replacement.	
	Media Filter Drain Mix Replacement	Water is seen on surface of the media filter drain mix from storms that are less than the 91st percentile 24-hour rain event (approximately 1.25 inches in 24 hours). Maintenance also needed on a 10-year cycle and during a preservation project.		No water ponded on surface after design storm. <i>Excavate and replace all of the media filter drain mix contained within the media filter drain.</i>	

### 1m. Bioretention Cells, Swales, and Planter Boxes

Bioretention areas are shallow stormwater systems with a designed soil mix and plants adapted to the local climate and soil moisture conditions. They are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. Most routine maintenance procedures are typical landscape care activities.

Bioretention Cells, Swales, and Planter Boxes					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
General	Trash	Trash and debris present.		No trash and debris present. Remove and properly dispose of all trash and debris.	
Concrete Sidewalls	Cracks or Failure in Concrete Planter Reservoir	Cracks wider than 0.5 inch or maintenance/inspection personnel determine that the planter is not structurally sound.		Concrete repaired or replaced.	
Rockery Sidewalls	Unstable Rockery	Rock walls are insecure.		Rockery sidewalls are stable (may require consultation with professional engineer, particularly for walls 4 feet or greater in height).	
		Erosion (gullies/rills) greater than 2 inches around inlets, outlet, and alongside slopes.		Source of erosion eliminated and damaged area stabilized (regrade, rock, vegetation, erosion control blanket). For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures are in place until permanent repairs can be made.	
		Erosion of sides causes slope to become a hazard.		The hazard is eliminated and slopes are stabilized.	
		Settlement greater than 3 inches (relative to undisturbed sections of berm).		The design height is restored with additional mulch.	
		Downstream face of berm or embankment wet, seeps or leaks evident.		Holes are plugged and berm is compacted. May require consultation with professional engineer, particularly for larger berms.	
		Any evidence of rodent holes or water piping around holes if facility acts as dam or berm.		Rodents (see "Pests: Insects/Rodents") removed and berm repaired/compacted.	
	Sediment or Debris Accumulation	Accumulation of sediment or debris to extent that infiltration rate is reduced (see "Ponded water") or surface storage capacity significantly impacted.		Sediment cleaned out to restore facility shape and depth. Damaged vegetation is replaced and mulched. Source of sediment identified and controlled (if feasible).	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Leaf Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
	Basin Inlet via Surface Flow	Soil is exposed or signs of erosion are visible.		Erosion sources repaired and controlled.	
Curb Cut Inlet	Sediment or Debris Accumulation	Sediment, vegetation, or debris partially or fully blocking inlet structure.		Curb cut is clear of debris. Source of the blockage is identified and action is taken to prevent future blockages.	
	Water Not Properly Directed to Facility	Water is not being directed properly to the facility and away from the inlet structure.		Blocks are reconfigured to direct water to facility and away from structure.	
	Erosion	Water disrupts soil media.		Splashblock is reconfigure/repaired.	
	Damaged Pipe	Pipe is damaged.		Pipe is repaired/replaced. No cracks more than 0.25 inch wide at the joint of inlet/outlet pipes exist.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots or debris. Source of the blockage is identified and action is taken to prevent future blockages.	
Inlets/ Outlet and Access Pathways	Blocked Access	Maintain access for inspections.		Vegetation is cleared within 1 foot of inlets and outlets. Access pathways are maintained.	
Ponding Area	Erosion	Water disrupts soil media.		No eroded or scoured areas in bioretention area. Cause of erosion or scour addressed. A cover of rock or cobbles or other erosion protection measure maintained (e.g., matting) to protect the ground where concentrated water enters or exits the facility (e.g., a pipe, curb cut, or swale).	
	Trash or Debris Accumulation	Trash or debris present on trash rack.		No trash or debris on trash rack. Clean and dispose trash.	
	Damaged Trash Rack	Bar screen damaged or missing.		Barrier repaired or replaced to design standards.	
	Sediment or Debris Accumulation	Sediment, vegetation, or debris accumulated at or blocking (or having the potential to block) check dam, weir, or orifice.		Blockage is cleared. Identify the source of the blockage and take actions to prevent future blockages.	

<b>Bioretention Cells, Swales, and Planter Boxes</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Erosion	Erosion and/or undercutting is present.		No eroded or undercut areas in bioretention area. Cause of erosion or undercutting addressed. Check dam or weir is repaired.	
	Unlevel Top of Weir	Grade board or top of weir damaged or not level.		Weir restored to level position.	
	Sediment Accumulation	Sediment blocks 35 percent or more of ports/notches or, sediment fills 35 percent or more of sediment trap.		Sediment removed and disposed of.	
	Damaged or Unlevel Grade Board/Baffle	Grade board/baffle damaged or not level.		Board/baffle removed and reinstalled to level position.	
	Sediment or Debris Accumulation	Overflow spillway is partially or fully plugged with sediment or debris.		No sediment or debris in overflow.	
	Erosion	Native soil is exposed or other signs of erosion damage are present.		Erosion repaired and surface of spillway stabilized.	
	Missing Spillway Armament	Spillway armament is missing.		Armament replaced.	
Underdrain	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain. Prolonged surface ponding (see "Bioretention Soil").		Underdrains and orifice are free of sediment and debris.	
Bioretention Soil	Ponded Water	Excessive ponding water: Water overflows during storms smaller than the design event or ponded water remains in the basin 48 hours or longer after the end of a storm.		Cause of ponded water is identified and addressed: 1. Leaf or debris buildup is removed 2. Underdrain is clear 3. Other water inputs (e.g., groundwater, illicit connections) investigated 4. Contributing area verified If steps #1–4 do not solve the problem, imported bioretention soil is replaced and replanted.	
Bioretention Soil	Protection of Soil	Maintenance requiring entrance into the facility footprint.		Maintenance is performed without compacting bioretention soil media.	

## Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Bottom Swale and Upland Slope Vegetation	Less than 75 percent of swale bottom is covered with healthy/surviving vegetation.		Plants are healthy and pest free. Cause of poor vegetation growth addressed. Bioretention area is replanted as necessary to obtain 75 percent survival rate or greater. Plant selection is appropriate for site growing conditions.	
	Causing Problems for Operation of Facility	Large trees and shrubs interfere with operation of the basin or access for maintenance.		Trees and shrubs do not hinder facility performance or maintenance activities. Prune or remove large trees and shrubs.	
	Dead Trees and Shrubs	Standing dead vegetation is present.		Trees and shrubs do not hinder facility performance or maintenance activities. Dead vegetation is removed and cause of dead vegetation is addressed. Specific plants with high mortality rate are replaced with more appropriate species.	
Trees and Shrubs Adjacent to Vehicle Travel Areas (or areas where visibility needs to be maintained)	Safety Issues	Vegetation causes some visibility (line of sight) or driver safety issues.		Appropriate height for sight clearance is maintained. Regular pruning maintains visual sight lines for safety or clearance along a walk or drive. Tree or shrub is removed or transplanted if presenting a continual safety hazard.	
Emergent Vegetation	Conveyance Blocked	Vegetation compromises conveyance.		Sedges and rushes are clear of dead foliage.	
Mulch	Lack of Mulch	Bare spots (without much cover) are present or mulch covers less than 2 inches.		Facility has a maximum 3-inch layer of an appropriate type of mulch and mulch is kept away from woody stems.	
	Accumulation of Clippings	Grass or other vegetation clippings accumulate to 2 inches or greater in depth.		Clippings removed.	
	Weeds	Weeds are present (unless on edge and providing erosion control).		Weed material removed and disposed of. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Noxious Weeds	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Adjacent Facilities Compromised	Low-lying vegetation growing beyond facility edge onto sidewalks, paths, or street edge poses pedestrian safety hazard or may clog adjacent permeable pavement surfaces due to associated leaf litter, mulch, and soil.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed at facility edge. Excessive leaf litter is removed.	
	Causes Facility to Not Function Properly	Excessive vegetation density inhibits stormwater flow beyond design ponding or becomes a hazard for pedestrian and vehicular circulation and safety.		Pruning and/or thinning vegetation maintains proper plant density and aesthetics. Plants that are weak, broken, or not true to form are removed or replaced in-kind. Appropriate plants are present.	
Irrigation (if any)	NA	Irrigation system present.		Manufacturer's instructions for O&M are met.	
Plant Watering	Plant Establishment	Plant establishment period (1–3 years).		Plants are watered as necessary during periods of no rain to ensure plant establishment.	
Summer Watering (after establishment)	Drought Period	Longer term period (3+ years).		Plants are watered as necessary during drought conditions and trees are watered up to 5 years after planting.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Spill Prevention and Response	Spill Prevention	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures are implemented whenever handling or storing potential contaminants.	
	Spill Response	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
	Safety (slopes)	Erosion of sides causes slope to exceed 1:3 or otherwise becomes a hazard.		Actions taken to eliminate the hazard.	
	Safety (hydraulic structures)	Hydraulic structures (pipes, culverts, vaults, etc.) become a hazard to children playing in and around the facility.		Actions taken to eliminate the hazard (such as covering and securing any openings).	
	Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
	Edging	Grass is starting to encroach on swale.		Edging repaired.	
	Pests: Insects/Rodents	Pest of concern is present and impacting facility function.		Pests removed and facility returned to original functionality. Do not use pesticides or <i>Bacillus thuringiensis israelensis (Bti)</i> .	
	Mosquitoes	Standing water remains in the basin for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1n. Rain Gardens

Rain gardens are shallow stormwater systems with compost amended soil or imported rain garden or bioretention soil and plants adapted to the local climate and soil moisture conditions. They are similar in function to bioretention cells, but have less onerous design requirements and are generally applicable to smaller sites.

<b>Rain Gardens</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Facility – General Requirements	Mosquitoes	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present. Rain garden drains freely and there is no standing water between storms. Cause of the standing water is addressed (see “Ponded Water”).	
	Trash	Trash and debris present.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Debris Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
Earthen Side Slopes and Berms	Erosion	Persistent soil erosion on slopes.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Rockery Sidewalls	Unstable Rockery	Rockery side walls are insecure.		Rockery sidewalls are stable (may require consultation with engineer, particularly for walls 4 feet or greater in height).	
Rain Garden Bottom Area	Sediment Accumulation	Visible sediment deposition in the rain garden that reduces drawdown time of water in the rain garden.		No sediment accumulation in rain garden, Source of sediment addressed.	
Mulch	Lack of Mulch	Bare spots (without mulch cover) are present or mulch depth less than 2 inches.		Facility has a minimum 2- to 3-inch layer of an appropriate type of mulch and is kept away from woody stems.	
Splashblock Inlet	Water Not Properly Directed to Rain Garden	Water is not being directed properly to the rain garden and away from the inlet structure. Water splashes adjacent buildings.		Blocks are reconfigured to direct water to rain garden and away from structure.	

<b>Rain Gardens</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipe Inlet/ Outlet	Erosion	Rock or cobble is removed or missing and concentrated flows are contacting soil.		No eroded or scoured areas. Cause of erosion or scour is addressed. Cover of rock or cobbles protects the ground where concentrated water flows into the rain garden from a pipe or swale.	
	Accumulated Debris	Accumulated leaves, sediment, debris or vegetation at curb cuts, inlet or outlet pipe.		Blockage is cleared.	
	Damaged Pipe	Pipe is damaged		Pipe is repaired/replaced.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots and debris.	
Access	Blocked Access	Maintain access for inspections.		Vegetation is cleared or transplanted within 1 foot of inlets and outlets.	
Ponded Water	Ponded Water	Excessive ponding water: Ponded water remains in the rain garden more than 48 hours after the end of a storm.		Rain garden drains freely and there is no standing water in the rain garden between storms. Leaf litter/debris/sediment is removed.	
Overflow	Blocked Overflow	Capacity reduced by sediment or debris.		No sediment or debris in overflow.	
	Blocking Site Distances and Sidewalks	Vegetation inhibits sight distances and sidewalks.		Sidewalks and sight distances along roadways and sidewalks are kept clear.	
	Vegetation Blocking Pipes	Vegetation is crowding inlets and outlets.		Inlets and outlets in the rain garden are clear of vegetation.	
	Unhealthy Vegetation	Yellowing: possible Nitrogen (N) deficiency Poor growth: possible Phosphorous (P) deficiency. Poor flowering, spotting or curled leaves, or weak roots or stems: possible Potassium (K) deficiency.		Plants are healthy and appropriate for site conditions.	
	Weeds	Presence of weeds.		Weeds are removed (manual methods preferred) and mulch is applied.	
Summer Watering (years 1-3)	Plant Establishment	Tree, shrubs and groundcovers in first 3 years of establishment period.		Plants are watered during plant establishment period (years 1-3).	
Summer Watering (after establishment)	Drought Conditions	Vegetation requires supplemental water.		Plants are watered during drought conditions or more often if necessary during post-establishment period (after 3 years).	

## 10. Trees

When designed in accordance with this Manual, trees can provide flow control via interception, transpiration, and increased infiltration. Most routine maintenance procedures are typical landscape care activities.

<b>Trees</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Excess or Unhealthy Growth	Health of tree at risk, or tree in conflict with other infrastructure.		Tree pruned according to industry standards to promote tree health and longevity.	
	NA	Young tree (i.e., within first 3 years).		Tree provided with supplemental irrigation and fertilization (as needed) during first three growing seasons.	
	NA	Evidence of pest activity affecting tree health.		Pest management activities implemented to reduce or eliminate pest activity, and to restore tree health.	
	Dead or Declining	Dead, damaged or declining.		Tree is replaced per planting plan or acceptable substitute.	

## 1p. Permeable Pavement

Permeable pavement is a stormwater infiltration facility that is designed to accommodate pedestrian, bicycle, and auto traffic while allowing infiltration and storage of stormwater. Permeable pavement includes porous asphalt; pervious concrete; permeable pavers and aggregate pavers; and grid systems.

Permeable Pavement					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Leaf and Debris Accumulation	Fallen leaves or debris.		Removed/disposed.	
	All Pavement Types	Sediment or debris accumulation between paver blocks, on surface of pavement, or in grid voids.		Sediment at surface does not inhibit infiltration. Remove/dispose of sediment.	
	Unstable Adjacent Area	Runoff from adjacent pervious areas deposits soil, mulch, or sediment on paving.		No deposited soil or other materials on permeable pavement or other adjacent surfacing. All exposed soils that may erode to pavement surface mulched and/or planted.	
	Wearing Course Covered by Adjacent Vegetation	Vegetation growing beyond facility edge onto sidewalks, paths, and street edge.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed to avoid overreaching the sidewalks, paths and street edge.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Conventional street sweepers equipped with vacuums, water, and brushes or pressure washer used to restore permeability. Vacuum or pressure wash the pavement two to three times annually.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Use of sand and sealant application prohibited. Protect from construction runoff.	
	Cracks	Major cracks or trip hazards.		Potholes or small cracks filled with patching mixes. Large cracks and settlement addressed by cutting and replacing the pavement section.	
	NA	Utility cuts.		Any damage or change due to utility cuts replaced in kind.	
Interlocking Concrete Paver Blocks	Missing or Damaged Paver Block	Interlocking paver block missing or damaged.		Individual damaged paver blocks removed and replaced or repaired per manufacturer's recommendations.	

### Permeable Pavement

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Interlocking Concrete Paver Blocks (continued)	Settlement	Settlement of surface. When deviation from original grade impedes function.		Original grade re-established. May require resetting.	
	Void Material is Missing or Low	Loss of aggregate material between paver blocks.		Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Gravel	Loss of Aggregate Material in Paving Grid	Loss of aggregate material in grid.		Aggregate gravel level maintained at the same level as the plastic rings or no more than 0.25 inch above the top of rings. Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Grass	Lack of Grass Coverage	Loss of soil and/or grass material in grid.		Refill and/or replant per manufacturer's recommendations. Growing medium restored, facility aerated and reseeded or planted, and vegetated area amended as needed.	
	Pipe is Damaged	Pipe is damaged.		Pipe is repaired/replaced.	
	Pipe is Clogged	Pipe is clogged.		Roots or debris is removed.	
	Erosion	Native soil exposed or other signs of erosion damage present.		No eroded or scoured areas Cause of erosion or scour is addressed.	
Underdrain Pipe	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain (may cause prolonged drawdown period).		Underdrains and orifice free of sediment and debris. Jet clean or rotary cut debris/roots from underdrain(s). If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.	
Spill Prevention and Response	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
Spill Prevention and Response (continued)	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	

## 1q. Vegetated Roofs

Vegetated roofs are areas of living vegetation installed on top of buildings, or other above-grade impervious surfaces. Design components vary depending on the vegetated roof type and site constraints, but may include a waterproofing material, a root barrier, a drainage layer, a separation fabric, a growth medium (soil), and vegetation.

Vegetated Roofs					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water is Not Infiltrating Properly	Water does not permeate growth media (runs off soil surface).		Facility infiltrates as designed. Aerate or replace media until stormwater infiltrates freely through growth media.	
	Water is Not Infiltrating Properly	Growth medium thickness is less than design thickness (due to erosion and plant uptake).		Facility infiltrates as designed. Supplement growth medium to design thickness.	
	Water is Not Infiltrating Properly	Fallen leaves or debris are present.		No leaves or debris present.	
	Erosion/ Scouring	Areas of potential erosion are visible.		Steps taken to repair or prevent erosion. Fill, hand tamp, or lightly compact, and stabilize with additional soil substrate/growth medium and additional plants.	
Erosion Control Measures	Erosion/ Scouring	Mat or other erosion control is damaged or depleted during plant establishment period.		Erosion control measures repaired/replaced until 90 percent vegetation coverage attained. Avoid application of mulch on extensive vegetated roofs.	
System Structural Components	Deteriorating Flashing, Gravel Stops, Utilities, or Other Structures on Roof	Flashing, utilities or other structures on roof are deteriorating (can serve as source of metal pollution in vegetated roof runoff).		Structural components inspected for deterioration or failure. Repair/replace as necessary.	
	Sediment, Vegetation, or Debris Accumulation	Sediment, vegetation, or debris blocks 20 percent or more of inlet structure.		Blockages cleared. Problems that led to blockage identified and corrected.	
	Damaged Inlet Pipe	Inlet pipe is in poor condition.		Repaired/replaced.	
	Clogged Inlet Pipe	Pipe is clogged.		Roots or debris removed.	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Plant Coverage	Healthy vegetative coverage falls below 90 percent (unless design specifications stipulate less than 90 percent coverage).		Bare areas planted with vegetation If necessary, install erosion control measures until percent coverage goal is attained.	
Vegetation (sedums)	NA	Extensive roof with low density sedum population.		Sedums are mulch mowed, creating cuttings from existing plants to encourage colonization.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. <i>(Coordinate with Thurston County Health Department.) Complete eradication of noxious weeds may not be possible.</i>	
	Presence of Weeds	Weeds are present.		Weed material removed and disposed of, with roots manually removed with pincer-type weeding tools, flame weeders, or hot water weeders as appropriate. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation (extensive vegetated roof)	Under Fertilization	Poor plant establishment and possible nutrient deficiency in growth medium.		Organic debris allowed to replenish and maintain long-term nutrient balance and growth medium structure. Conduct annual soil test 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately.  Minimum amount slow-release fertilizer necessary to achieve successful plant establishment is applied. Apply fertilizer only after acquiring required approval from facility owner and operator. Note that extensive vegetated roofs are designed to require zero to minimal fertilization after establishment (excess fertilization can contribute to nutrient export).	
Vegetation (intensive vegetated roof)	Under Fertilization	Fertilization may be necessary during establishment period or for plant health and survivability after establishment.		Annual soil test conducted 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately. Apply minimum amount slow-release fertilizer necessary to achieve successful plant establishment. Apply fertilizer only after acquiring required approval from facility owner and operator. Intensive vegetated roofs may require more fertilization than extensive vegetated roofs.	
Vegetation (trees and shrubs on an intensive vegetated roof)	NA	Pruning as needed.		All pruning of mature trees performed by or under the direct guidance of an ISA certified arborist.	
Irrigation system (if any)	NA	Irrigation system is not working or routine maintenance is needed.		Manufacturer's instructions for O&M have been followed.	
	NA	Summer watering – Plant establishment period (1 to 2 years).		Watered weekly during periods of no rain to ensure plant establishment (30 to 50 gallons per 100 square feet).	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	NA	Summer watering – Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover (30 to 50 gallons per 100 square feet).	
	NA	Plant establishment period (1 to 2 years).		Watered deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist. Use soaker hoses or spot water with a shower type wand when irrigation system not present.	
Vegetation (intensive vegetated roof)	NA	Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover.	
	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants provided with proper training and a copy of the Maintenance and Source Control Manual.	
Safety	NA	Insufficient egress/ingress routes and fall protection.		Egress and ingress routes maintained to design standards and fire codes. Ensure appropriate fall protection.	
Aesthetics	Poor Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
Pest Control	Mosquitoes	Standing water remains for more than three days following storms.		Standing water removed. Cause of the standing water identified, and appropriate actions taken to address the problem (e.g., aerate or replace medium, unplug drainage).	

### 1r. Downspout, Sheet Flow, Concentrated Flow Dispersion

Dispersion BMP components vary depending on the type of BMP used, but can consist of a gravel filled trench, splashblock, transition zone, vegetated flow path, berms, and/or slotted drains. Dispersion BMPs reduce peak flows by slowing stormwater runoff entering into the conveyance system, allowing for some infiltration, and providing some water quality benefits.

Downspout, Sheet Flow, Concentrated Flow Dispersion					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Directed Toward Building	Water is being directed towards building structure.		Water directed away from building structure.	
	Water Causing Erosion	Water disrupts soil media.		Blocks are reconfigured/repared and media is restored.	
Transition Zone	Erosion	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than 2 feet of width.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Dispersion Trench	Concentrated Flow	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" from edge of trench; intent is to prevent erosion damage).		No debris on trench surface. Notched grade board or other distributor type is aligned to prevent erosion. Trench is rebuilt to standards, if necessary.	
	Accumulated Debris	Accumulated trash, debris, or sediment on drain rock surface impedes sheet flow from facility.		No trash or debris present. Removed and properly dispose of all trash and debris.	
	Vegetation Impeding Flow	Vegetation/moss present on drain rock surface impedes sheet flow from facility.		Freely draining drain rock surface.	
	Accumulated Debris in Drains	Accumulation of trash, debris, or sediment in roof drains, gutters, driveway drains, area drains, etc.		No trash or debris in roof drains, gutters, driveway drains, or area drains.	
	Accumulated Debris in Inlet Pipe	Pipe from sump to trench or drywell has accumulated sediment or is plugged.		No sediment or debris in inlet/outlet pipe screen or inlet/outlet pipe.	
	Damaged Pipes	Cracked, collapsed, broken, or misaligned drain pipes.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
Sump	Accumulated Sediment	Sediment in the sump.		Sump contains no sediment.	
	Hard to Open	Cannot be easily opened.		Access lid is repaired or replaced.	
	Buried	Buried.		Access lid functions as designed (refer to record drawings for design intent).	

### Downspout, Sheet Flow, Concentrated Flow Dispersion

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing Cover	Cover missing.		Cover is replaced.	
	Inadequate Rock Cover	Only one layer of rock exists above native soil in area 6 square feet or larger, or any exposure of native soil.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Erosion (gullies/rills) greater than 2 inches deep in dispersal area.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
	Accumulated Sediment	Accumulated sediment or debris to extent that blocks or channelizes flow path.		No excess sediment or debris in dispersal area. Sediment source is addressed (if feasible).	
Ponded Water	Ponded Water	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.		System freely drains and there is no standing water in dispersion area between storms. The cause of the standing water (e.g., grade depressions, compacted soil) is addressed.	
	Plant Survival	Dispersal area vegetation in establishment period (1 to 2 years, or additional 3rd year) during extreme dry weather).		Vegetation is healthy and watered weekly during periods of no rain to ensure plant establishment.	
	Lack of Vegetation Allowing Erosion	Poor vegetation cover such that erosion is occurring.		Vegetation is healthy and watered. No eroded or scoured areas are present. Cause of erosion or scour is addressed. Plant species are appropriate for the soil and moisture conditions.	
	Vegetation Blocking Flow	Vegetation inhibits dispersed flow along flow path.		Vegetation is trimmed, weeded, or replanted to restore dispersed flow path.	
	Presence of Noxious Weeds	Any noxious or nuisance vegetation which may constitute a hazard to county personnel or the public.		Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where county personnel or the public might normally be.	
Pest Control	Mosquito Infestation	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	
Rodents	Presence of Rodents	Rodent holes or mounds disturb dispersion flow paths.		Rodents removed; holes are filled; and flow path is revegetated.	

## 1s. Downspout Infiltration

Downspout infiltration systems are trench or drywell designs intended only for use in infiltrating runoff from roof downspout drains.

<b>Downspout Infiltration</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Inflow Disruption	Accumulated trash, debris, or sediment on drain rock surface impeding sheet flow into facility.		Sheet flow re-established. Material removed and disposed of in accordance with applicable solid waste requirements.	
	Inflow Disruption	Vegetation/moss present on drain rock surface impeding sheet flow into facility.		Material removed and sheet flow re-established.	
	Inflow Disruption	Water ponding at surface, or standing water in subgrade observation port.		Inflow to facility is consistent and no ponding is observed. Inlet piping is clear and/or rock or sand reservoirs have been replaced.	
	Conveyance Blockage	Accumulation of trash, debris, or sediment in roof drains, gutters, driveways drains, area drains, etc.		Conveyance systems are clear of debris and free-flowing.	
	Conveyance Blockage	Pipes to or from sump, trench, or drywell have accumulated sediment or is plugged.		Pipe systems are clear of debris and free-flowing.	
	Conveyance Damage	Pipes to or from sump, trench, or drywell is cracked, broken, or misaligned.		Pipe systems are undamaged and free-flowing.	
	Splash Pad Malfunction	Splash pad missing or damaged.		Splash pad installed and functioning correctly	
	Overflow	Water overflows from the gutter or downspout during rain.		First try cleaning out the gutter and downspouts. If this doesn't solve the problem, a larger drywell may be needed. Contact the city before changing the design or upgrading to a larger drywell.	
	Sediment in Sump	Excess sediment accumulate in sump.		Material removed and disposed of in accordance with applicable solid waste requirements.	
	Access Lid Problems	Access lid cannot be opened or is missing.		Access lid is functioning as designed. Refer to record drawings to confirm type, function, and required components.	

### Downspout Infiltration

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Roof	Moss	Moss and algae are taking over the shadier parts of the shingles.		Disconnect the flexible part of the downspout that leads to the drywell. Then perform moss removal as desired. Pressure wash or use fatty acid solutions instead of highly toxic pesticides or chlorine bleach. Install a zinc strip as a preventive.	

## 1t. Cisterns

Cisterns are designed to collect stormwater runoff from non-polluting surfaces (typically roofs), and to make use of the collected water. Reuse of the runoff can be for irrigation, potable, and non-potable uses, but requires different levels of storage and water quality treatment depending on the intended use.

Cisterns					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Debris Accumulation in Cistern	Debris has accumulated.		No debris in cistern. Remove and properly dispose of all debris.	
	Debris Accumulation in Gutter	Debris has accumulated.		No debris in cistern or gutters. Remove and properly dispose of all debris.	
	Debris Accumulation in Cistern	Screen has deteriorated.		Screen is in place and functions as designed.	
	NA	None. Preventive maintenance.		No debris in cistern or accumulated on screen. Remove and properly dispose of all debris.	
Low Flow Orifice	Cistern Overflows are too Frequent	Debris or other obstruction of orifice.		Low flow orifice is clean.	
	Overflow Pipe	Pipe is damaged.		Overflow pipe is watertight and does not leak. Repair/replace.	
	Overflow Pipe	Pipe is clogged.		Debris removed. Overflow pipe can convey overflow to point of discharge.	
Cistern	Accumulated Debris And/or Sediment	More than 6 inches of accumulation in bottom of cistern.		Accumulated debris and/or sediment removed.	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants are provided with proper training and a copy of the Maintenance and Source Control Manual.	
Access and Safety	NA	Access to cistern required for maintenance or cleaning.		Any opening that could allow the entry of people is marked: "DANGER—CONFINED SPACE".	
Pest Control	Mosquito Infestation	Standing water remains for more than 3 days following storms.		All inlets, overflows, and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1u. Fencing/Shrubbery Screen/Other Landscaping

Fencing, shrubbery screening, and landscaping provide flow control via interception, transpiration, and increased infiltration as well as slope protection. Most routine maintenance procedures are typical landscape care activities.

Fencing/Shrubbery Screen/Other Landscaping					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing or Broken Parts/Dead Shrubby	Any defect in the fence or screen that permits easy entry to a facility.		Fence is mended or shrubs replaced to form a solid barrier to entry.	
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.		Soil under fence replaced so that no opening exceeds 4 inches in height.	
	Unruly Vegetation	Shrubbery is growing out of control or is infested with weeds. See also <a href="#">Thurston County Noxious Weeds List</a> .		Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.	
		Posts out of plumb more than 6 inches.		Posts plumb to within 1.5 inches of plumb.	
		Top rails bent more than 6 inches.		Top rail free of bends greater than 1 inch.	
		Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.		Fence is aligned and meets design standards.	
		Missing or loose tension wire.		Tension wire in place and holding fabric.	
		Missing or loose barbed wire that is sagging more than 2.5 inches between posts.		Barbed wire in place with less than 0.75-inch sag between posts.	
		Extension arm missing, broken, or bent out of shape more than 1.5 inches.		Extension arm in place with no bends larger than 0.75 inch.	
	Deteriorated Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.		Structurally adequate posts or parts with a uniform protective coating.	
Openings in Fabric	Openings in fabric are such that an 8-inch-diameter ball could fit through.		No openings in fabric.		

## 1v. Manufactured Media Filters

Manufactured media filters are installed below grade and usually consist of a two-chambered vault that include a presettling basin and a filter bed with sand or filter media. This filter is accessed through a manhole. **DO NOT ENTER ANY TANK OR VAULT** without proper training, certification and equipment.

Manufactured Media Filters					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Top of Filter Cartridges	Sediment accumulation exceeds 0.25 inches on top of cartridges.		No sediment deposits on top of cartridges. Sediment on cartridges likely indicates that cartridges are plugged and require maintenance.	
	Sediment Accumulation	Sediment accumulation in vault exceeds 6 inches. Look for other indicators of clogged cartridges or overflow.		No sediment accumulation in vault. <i>Sediment in vault should be removed. Cartridges should be checked and replaced or serviced as needed.</i>	
	Trash and Floatable Debris Accumulation	Trash and floatable debris accumulation in vault.		No trash or other floatable debris in filter vault.	
	Filter Cartridges Submerged	Filter vault does not drain within 24 hours following storm. Look for evidence of submergence due to backwater or excessive hydrocarbon loading.		Filter media checked and replaced if needed. <i>If cartridges are plugged with oil additional treatment or source control BMP may be needed.</i>	
	Sediment Accumulation	Sediment accumulation exceeds 6 inches or 33 percent (one third) of the available sump.		Sediment accumulation less than 6 inches.	
	Trash and Floatable Debris Accumulation	Trash and/or floatable debris accumulation.		No trash or other floatable debris accumulation in forebay. Trash and/or floatable debris should be removed during inspections. <i>Significant oil accumulation may indicate the need for additional treatment or source control.</i>	
Drain Pipes/ Cleanouts	Sediment in Drain Pipes/ Cleanouts	Accumulated sediment that exceeds 20 percent of the diameter.		No sediment or debris in drainpipes or cleanouts. Sediment and debris removed.	
Below ground Vault	Access Cover Damaged/ Not working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.		Cover repaired to proper working specifications or replaced.	

<b>Manufactured Media Filters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Below ground Vault (continued)	Damaged Pipes	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.		Pipe repaired or replaced.	
		Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault repaired or replaced so that vaults meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to design specifications.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.		Media cartridges replaced.	
	Short Circuiting	Flows do not properly enter filter cartridges.		Filter cartridges replaced.	

Designers must also review the most current manufacturer guidelines for any updates or additions to the following operation and maintenance requirements.

## **1w. Proprietary or Manufactured Products**

- As with other stormwater BMPs in this appendix, proper maintenance of proprietary products such as media filters or vegetation-based treatment technologies is critical to proper facility performance. Regular maintenance ensures proper functioning and keeps the facility aesthetically appealing. Many of the same inspection and maintenance procedures outlined for the facilities described in this appendix also apply to proprietary technologies.
- Designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.
- The City of Lacey will inspect proprietary products in accordance with the applicable inspection standards to ensure that maintenance is performed properly.

# **Group 2**

## *Structures & Pretreatment*

## 2a. Control Structures and Flow Restrictors

Flow control devices are usually placed within manholes, which may be locked. They typically consist of two pipes, one placed above the other. The lower pipe will typically have a cover and a small hole drilled in it to allow for slow release of water. The upper pipe is usually larger to provide an outlet for higher flows and emergency overflows.

Control Structures and Flow Restrictors					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris (includes sediment)	Material exceeds 25 percent of sump depth or 1 foot below orifice plate.		No trash or debris present. Control structure orifice is not blocked. Remove and properly dispose of all trash and debris.	
		Structure is not securely attached to manhole wall.		Securely attach structure to wall and outlet pipe.	
		Structure is not in upright position (more than 10 percent from plumb)		Restore structure to correct position.	
		Connections to outlet pipe are not watertight and show signs of rust.		Pipe connections are water tight; structure repaired or replaced and works as designed.	
		Any holes in structure (other than designed holes).		Structure has no holes other than designed holes.	
		Cleanout gate is not watertight or is missing.		Gate is watertight and works as designed.	
		Gate cannot be moved up and down by one maintenance person.		Gate moves up and down easily and is watertight.	
		Chain/rod leading to gate is missing or damaged.		Chain is in place and works as designed.	
		Gate is rusted over 50 percent of its surface area.		Gate is repaired or replaced to meet design standards.	
	Damaged or Missing	Control device is not working properly due to missing, displaced, or bent orifice plate.		Plate is in place and works as designed.	
	Obstructions	Trash, debris, sediment or vegetation blocking the plate.		Plate is free of all obstructions and works as designed.	
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.		Pipe is free of all obstructions and works as designed.	
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	

### Control Structures and Flow Restrictors

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole (continued)	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)	<input type="checkbox"/>	Mechanism opens with proper tools.	<input type="checkbox"/>
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	<input type="checkbox"/>	Cover can be removed and reinstalled by one maintenance person.	<input type="checkbox"/>
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.	<input type="checkbox"/>	Ladder meets design standards and allows maintenance persons safe access.	<input type="checkbox"/>
Catch Basin	See “Catch Basins”	See “Catch Basins.”	<input type="checkbox"/>	See “Catch Basins.”	<input type="checkbox"/>

## 2b. Catch Basins

These structures are typically located in the streets. The City of Lacey is responsible for routine maintenance of the pipes and structures in the public rights-of-way, while the property owner or homeowners association is responsible for maintenance of pipes and catch basins in private areas and for keeping the grates clear of debris in all areas.

<b>Catch Basins</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
		Trash, leaves or debris which is located immediately in front of the catch basin opening or is blocking inflow capacity of the basin by more than 10 percent.		Remove trash, leaves and debris located directly in front of catch basin or on grate.	
		Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches of clearance from the debris surface to the invert of the lowest pipe.		No trash or debris present. Remove and properly dispose of all trash and debris.	
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent (one-third) of its height.		Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).		Remove dead animals, etc., present within the catch basin.	
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6 inches of clearance from the sediment surface to the invert of lowest pipe.		No sediment in the catch basin.	
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (intent is to make sure no material is running into basin).		Top slab is free of holes and cracks.	

## Catch Basins

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Structure Damage to Frame and/or Top Slab (continued)	Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached		Frame is sitting flush on the riser rings or top slab and firmly attached.	
		Maintenance person determines structure is unsound.		Basin replaced or repaired to design standard	
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Pipe regouted and secure at basin wall.	
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.		Replaced or repair to design standards.	
		Vegetation growing across and blocking more than 10 percent of the basin opening.		Remove vegetation blocking opening to basin.	
		Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.		No vegetation or root growth present.	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
		Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
Catch Basin Cover (continued)	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure.  (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

**Catch Basins**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Ladder	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Grate Opening Unsafe	Grate with opening wider than 0.875 (7/8) inch.		Grate opening meets design standards.	
	Trash and Debris	Trash and debris that is blocking more than 20 percent of grate surface inletting capacity.		Grate free of trash and debris. Remove and properly dispose of all trash and debris.	
	Damaged or Missing	Grate missing or broken member(s) of the grate.		Grate is in place and meets design standards.	

## 2c. Debris Barriers (trash racks)

A metallic screen or similar structural device used to prevent debris from entering a pipe, spillway or other hydraulic structure.

<b>Debris Barriers (trash racks)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Trash and Debris	Trash or debris that is plugging more than 20 percent of the openings in the barrier.		Barrier cleared to receive design flow capacity.	
		Bars are bent out of shape more than 3 inches.		Bars in place with no bends more than 0.75 inch.	
		Bars are missing or entire barrier missing.		Bars in place according to design.	
		Bars are loose and rust is causing 50 percent deterioration to any part of barrier.		Barrier replaced or repaired to design standards.	
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe.		Barrier firmly attached to pipe.	

## 2d. Energy Dissipaters

Typically a rock splash pad at a pipe end or other discharge location, to reduce the velocity and energy of flowing water and prevent erosion. Other means of energy dissipation include drop manholes, stilling basins, and check dams.

<b>Energy Dissipaters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
<b>External:</b>					
	Missing or Moved Rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil.		Rock pad replaced to design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad replaced to design standards.	
	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20 percent of the design depth.		Pipe cleaned/flushed so it matches design.	
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.		Trench redesigned or rebuilt to standards. Water discharges from feature by sheet flow.	
	Perforations Plugged	Over half of perforations in pipe are plugged with debris and sediment.		Perforated pipe cleaned or replaced. Perforations freely discharge flow.	
	Water Flows Out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.		Facility rebuilt or redesigned to standards. No flow discharges from distributor catch basin.	
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.		No danger of landslides.	
<b>Internal:</b>					
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 50 percent of original size or any concentrated worn spot exceeding 1 square foot, which would make structure unsound.		Structure replaced to design standards. Structure in no danger of failing.	

## Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Trash and Debris	Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6-inch clearance from the debris surface to the invert of the lowest pipe.	<input type="checkbox"/>	No trash or debris present. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent of its height.	<input type="checkbox"/>	Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	<input type="checkbox"/>	Remove dead animals, etc., present within the catch basin.	<input type="checkbox"/>
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6-inch clearance from the sediment surface to the invert of lowest pipe.	<input type="checkbox"/>	No sediment in the catch basin.	<input type="checkbox"/>
		Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (Intent is to make sure no material is running into basin).	<input type="checkbox"/>	Top slab is free of holes and cracks.	<input type="checkbox"/>
		Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached	<input type="checkbox"/>	Frame is sitting flush on the riser rings or top slab and firmly attached.	<input type="checkbox"/>
		Maintenance person determines structure is unsound.	<input type="checkbox"/>	Basin replaced or repaired to design standard	<input type="checkbox"/>
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.	<input type="checkbox"/>	Pipe regROUTED and secure at basin wall.	<input type="checkbox"/>
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	<input type="checkbox"/>	Replaced or repair to design standards.	<input type="checkbox"/>

### Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

## 2e. Baffle Oil/Water Separators (API type)

An underground vault or tank designed to separate oil from runoff water via baffles.

<b>Baffle Oil/Water Separators (API type)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear without thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth.		Remove sediment deposits that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulations at the surface of the water or 6 inches of sludge in the sump.		Extract oil from vault by vactoring. Disposal must be in accordance with state and local rules and regulations. No visible oil depth on water.	
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.		Pipe repaired or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover.		Cover repaired to proper working specifications or replaced.	
		Maintenance person determines structure is unsound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Grout fillet has separated or cracked wider than 0.5 inch at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Top slab is free of holes and cracks.	
	Baffles	Baffles corroding, cracking, warping and/or show signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not securely attached to structure wall, missing rungs, cracks, or misaligned.		Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection.	

## 2f. Coalescing Plate Oil/Water Separators

An underground vault or tank designed to separate oil from runoff water via gravity.

Coalescing Plate Oil/Water Separators					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear with no thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.		Remove sediment deposits on vault bottom and plate media that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulation at the water surface.		Oil is extracted from vault using vactoring methods. Dispose of in accordance with state and local rules and regulations.  Coalescing plates are cleaned by thoroughly rinsing and flushing. Direct wash-down effluent to the sanitary sewer system where permitted. There should be no visible oil depth on water.	
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.		A portion of the media pack or the entire plate pack is replaced depending on severity of failure.	
	Damaged Pipes	Inlet or outlet piping damaged or broken or in need of repair.		Pipe repaired and or replaced.	
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	

### Coalescing Plate Oil/Water Separators

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Structure (continued)	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Replace or repair ladder so it meets specifications and is safe to use as determined by inspection.	

## 2g. Catch Basin Inserts

A structure within a catch basin, with a filter containing a pollutant-removal medium. Generally considered as an alternative to oil-water separators, these are not commonly used for permanent installations, as they tend to be maintenance-intensive.

<b>Catch Basin Inserts</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.		No sediment cap on the insert media and its unit.	
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.		No trash or debris present. Runoff freely flows into catch basin. Remove and properly dispose of all trash and debris removed from insert unit.	
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.		Effluent water from media insert is free of oils and has no visible sheen.	
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.		Remove and replace media insert.	
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.		Remove and replace media insert.	
	Media Insert Use Beyond Normal Product Life	Media has been used beyond the typical average life of media insert product.		Remove and replace media at regular intervals, depending on insert product.	

# **Group 3**

## ***Miscellaneous Facilities & Features***

### 3a. Conveyance Pipes, Culverts, Ditches, and Swales

These features contain and direct the flow of water from one location to another.

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipes	Sediment, Debris, and Vegetation	Accumulated sediment should not exceed 20 percent of the diameter of the pipe. Vegetation should not reduce free movement of water through pipes. Ensure that the protective coating is not damaged or rusted. Dents should not significantly impede flow. Pipe should not have major cracks or flaws allowing water to leak out.		Clean out pipes of all sediment and debris. Remove all vegetation so that water flows freely through pipes. Repair or replace pipe.	
	Trash and Debris	There should not be any yard waste or litter in the ditch.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Buildup	Accumulated sediment should not exceed 20 percent of the depth of the ditch.		Clean out ditch of all sediment and debris.	
	Overgrowth of Vegetation	Check for vegetation (e.g., weedy shrubs or saplings) that reduces the free movement of water through ditches or swales.		Clear blocking vegetation so that water moves freely through the ditches. Grassy vegetation should be left alone.	
	Erosion	Check around inlets and outlets for signs of erosion. Check slopes for signs of sloughing or settling. Action is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion.		Eliminate causes of erosion. Stabilize slopes by using the appropriate erosion control procedure (e.g., compact the soil, plant grass, reinforce with rock).	
	Missing Rocks	Native soil beneath the rock splash pad, check dam, or lining should not be visible.		Replace rocks to design standard.	
Swales	Vegetation	Grass cover is sparse and weedy, or areas are overgrown with woody vegetation.		Aerate soils and re-seed and mulch bare areas. Keep grass less than 8 inches high. Remove woody growth, re-contour and re-seed as necessary.	

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swales (continued)	Homeowner Conversion	Swale has been filled in or blocked by shed, woodpile, shrubbery, etc.		Speak with the homeowner and request that the swale area be restored. Contact the city to report the problem if not rectified voluntarily.	
	Swale Does Not Drain	Water stands in the swale, or flow velocity is very slow. Stagnation occurs.		A survey may be needed to check grades. Grades should be in 1 to 5 percent range if possible. If grade is less than 1 percent, underdrains may need to be installed.	

### 3b. Access Roads and Easements

These features provide access to drainage facilities for inspection and/or maintenance.

<b>Access Roads and Easements</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Access	Check to determine if there is adequate access to your stormwater facilities for maintenance vehicles.		If there is not adequate access, check with the city to determine whether an easement exists. If so, a maintenance road may need to be constructed there.	
	Blocked Roadway	Debris that could damage vehicle tires (glass or metal).		Clear all potentially damaging material.	
	Blocked Roadway	Any obstructions that reduce clearance above and along the road to less than the required width (minimum of 15 feet).		Clear above and along roadway so there is enough clearance.	
Road Surface	Bad Road Conditions	Check for potholes, ruts, mushy spots, or woody debris that limits access by maintenance vehicles.		Add gravel or remove wood as necessary.	
Shoulders and Ditches	Erosion	Check for erosion along roadway.		Repair erosion with additional soil or gravel.	

## **Glossary of Stormwater Terms**

**Best Management Practices (BMPs)** – Structural features or procedures that reduce the adverse impacts of development on the quantity and/or quality of runoff water.

**Biofilter (Swale)** – A wider and flatter vegetated version of a ditch over which runoff flows at a uniform depth and velocity. Biofilters perform best when vegetation has a thick mat of roots, leaves, and stems at the soil interface (such as grass).

**Biofiltration** – The process through which pollutant concentrations in runoff water are reduced by filtering runoff through vegetation.

**Buffer** – The zone along a sensitive area that provides protection and stability for the area's functioning. As an integral part of a stream or wetland ecosystem, the buffer provides shading, slope and bank stabilization, and input of organic debris and coarse sediments to streams. It allows room for variation in aquatic system boundaries (due to hydrologic or climatic effects), attenuation of surface water flows from precipitation and stormwater runoff, habitat for wildlife, and protection from harmful disturbance or intrusion by humans or domestic animals.

**Catch Basin** – An inlet box set into the ground, usually rectangular and made of concrete, capped with a grate that allows stormwater to enter. A sump in the bottom catches sediment.

**Check Dam** – A dam (of rock, logs, etc.) built in a gully or drainage channel to reduce flow velocity, minimize erosive scouring, promote sediment deposition, and/or enhance infiltration.

**Compost Stormwater Filter** – A treatment facility that removes sediment and pollutants from stormwater by percolating water through a layer of specially-prepared Bigleaf Maple compost. Clean water exits the bottom of the facility through a pipe, while stormwater flows in excess of the facility design overflow the compost bed and bypass the facility.

**Constructed Wetland** – A wet pond with dead storage at various depths and planted with wetland plants to enhance its treatment capabilities.

**Control Structure or Flow Restrictor** – A manhole and/or pipe structure with a flow-regulating or metering device such as a weir or plates with small holes known as orifices. The structure controls the rate at which water leaves the pond.

**Conveyance** – A mechanism or device for transporting water, including gutters, pipes, channels (natural or man-made), culverts, manholes, etc.

**Critical Areas** – Areas such as wetlands, streams, steep slopes, etc., as defined by ordinance or resolution by the jurisdiction. Also known as environmentally-sensitive areas.

**Culvert** – A conveyance device (e.g. concrete, metal or plastic pipe) which conveys water from a ditch, swale, or stream under (usually across) a roadway, driveway or embankment.

**Dead Storage** – The volume of storage in a pond below the outlet which does not drain after a storm event. This pool provides treatment of the stormwater by allowing sediments to settle out.

**Detention Facility** – A facility (e.g. a pond, vault, or pipe) in which surface water or stormwater is temporarily stored.

**Detention Pond** – A detention facility in the form of an open pond.

**Dispersion Trench** – An open-top trench filled with rip rap or gravel that takes the discharge from a pond, spreads it out, and spills (bubbles) the flow out along its entire length. Dispersion trenches are used to simulate “sheet flow” of stormwater from an area, and are often used to protect sensitive areas.

**Drainage System** – A combination of facilities for the collection, conveyance, containment, treatment, discharge and/or disposal of stormwater runoff.

**Drop Structure** – A structure for dropping water to a lower elevation and/or dissipating energy. A drop may be vertical or inclined.

**Dry Pond** – A detention facility that drains completely after a storm. This type of pond has a pipe outlet at the bottom.

**Easement** – A legal encumbrance placed against a property’s title to reserve access. Drainage easements typically provide access to pipes and/or ponds, and are generally 15 to 20 feet wide.

**Emergency Overflow or Spillway** – An area on the top edge of a pond that is slightly lower in elevation than areas around it and is normally lined with riprap for erosion protection. The emergency overflow is used only if the primary and secondary outlets of the pond fail, in the event of extreme storms or if the infiltration capability of the pond becomes significantly diminished. If the emergency overflow ever comes into play, it may mean that the pond needs to be upgraded.

**Energy Dissipater** – A rock pad at an outlet (of a pipe, channel, etc.) designed to slow the flow velocity, spread out the water leaving the outlet, and reduce the potential for erosion.

**Freeboard** – The vertical distance between the design high water mark and the top of a pond (or other structure). Most ponds have one to two feet of freeboard to prevent them from overflowing.

**Infiltration** – The soaking of water through the soil surface into the ground (percolation is essentially the same thing). Many ponds are designed to infiltrate or retain stormwater, and thus do not have a regularly used discharge pipe.

**Infiltration Facility (or Structure)** – A facility (pond or trench) which retains and percolates stormwater into the ground, having no discharge (to any surface water) under normal operating conditions.

**Junction** – Point where two or more drainage pipes or channels converge (e.g. a manhole).

**Jurisdiction** – Lacey, Olympia, Tumwater, or Thurston County (as applicable).

**Lined Pond or Conveyance** – A facility, the bottom and sides of which have been made impervious (using, for example, a plastic liner or clay/silt soil layer) to the transmission of liquids.

**Live Storage** – The volume of storage in a pond above the outlet, which drains after a storm event. This storage capacity provides flood control and habitat protection for nearby streams.

**Manhole** – A larger version of the catch basin, often round with a solid lid. Manholes allow access to underground pipes (such as storm sewers) for maintenance.

**Natural Channel** – A stream, creek, river, lake, wetland, estuary, gully, swale, ravine or any open conduit where water will concentrate and flow intermittently or continuously.

**Oil-Water Separator** – A structure or device used to remove oil and greasy solids from water. They operate by using gravity separation of liquids that have different densities. Many catch basins have a down-turned plastic elbow that provides some oil-water separation.

**Outfall** – The point where water flows from a man-made conduit, channel, or drain into a water body or other natural drainage feature.

**Retention Facility** – A facility that is designed to retain water and allow for infiltration.

**Retention Pond** – A retention facility that is an open basin or “pond.”

**Revetments** – Materials such as rock or keystones used to sustain an embankment, such as in a retaining wall.

**Riprap** – Broken rock, cobbles, or boulders placed on earth surfaces, such as on top of a berm for the emergency overflow, along steep slopes, or at the outlet of a pipe, for protection against the erosive action of water. Also used for entrances to construction sites, to prevent sediment tracking.

**Runoff** – The portion of water originating as precipitation that becomes surface flow. See “stormwater” below.

**Sand Filter** – A treatment facility that removes pollutants and sediments from stormwater by percolating stormwater through a layer of sand. Clean water exits the bottom of the facility through a pipe.

**Stormwater** – The portion of precipitation that falls on property and that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes or other features into a defined surface water body or a constructed infiltration facility. Stormwater includes wash-down water and other wastewater that enters the drainage system.

**Swale** – A shallow surface drainage conveyance with relatively gentle side slopes, generally with flow depths less than 1 foot. Essentially a broad, flat-bottomed ditch. See “biofilter.”

**Trash Rack or Bar Screen** – A device (usually a screen or bars) that fits over a pipe opening to prevent large debris such as rocks or branches from entering and partially blocking the pipe.

**Wet Pond** – A stormwater treatment pond designed with a “dead storage” volume to maintain a continuous or seasonal static water level below the pond outlet elevation.

# **Stormwater Facility Maintenance Guide**



**CITY  
OF LACEY**

*Shaping Our Community Together*

After recording return document to:

City of Lacey  
Public Works  
420 College St. SE  
Lacey, WA 98509-3400

**Document Title:** Stormwater Maintenance Agreement (Residential Individual)  
Chapter 3B of the *Stormwater Design Manual for Lacey* and Appendix  
'Q' of the *Development Guidelines & Public Works Standards*

**Owner(s)** (Last name first, then first name and initials):

1. \_\_\_\_
2. \_\_\_\_
3. Additional name(s) on page \_\_\_\_\_ of document.

**City:** City of Lacey

**Abbreviated Legal Description** (i.e. lot, block, plat or section, township, range):

\_\_\_\_\_  
\_\_\_\_\_

Actual legal is on page \_\_\_\_\_ of document.

**Assessor's Property Tax Parcel Number:** \_\_\_\_\_

**Section, Township, Range:** S \_\_\_\_\_, T \_\_\_\_\_ N, R \_\_\_\_\_, W.M.

**Fronting Street:** \_\_\_\_\_

**Cross Street:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Project HTE #:** \_\_\_\_\_

**RESIDENTIAL AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO  
IMPLEMENT A POLLUTION SOURCE CONTROL PLAN**

**By and between the CITY OF LACEY, a Municipal Corporation, hereinafter called the CITY,  
and**

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**Their heirs, successors, or assigns, hereinafter called the OWNER,**

The upkeep and maintenance of stormwater facilities and the implementation of pollution source control best management practices (BMPs) is essential to the protection of water resources in the City's jurisdiction. All property owners are expected to conduct business in a manner that promotes environmental protection. This "Agreement" contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

**LEGAL DESCRIPTION:**

Whereas, the OWNER has constructed improvements, including but not limited to buildings, pavement, and stormwater facilities on the legally described above "Property". In order to further the goals of the CITY to ensure the protection and enhancement of the City's water resources, the CITY and the OWNER hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

The OWNER shall:

- 1) Implement the stormwater facility maintenance program included herein as Attachment "A".
- 2) Maintain a record, in the form of a log book, of steps taken to implement the programs referenced in (1) above. The log book shall be available for inspection by City staff at the OWNER'S residence during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-up on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The OWNER is encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

- 3) Submit an annual report to the CITY regarding implementation of the programs referenced in (1) above. The report must be submitted on or before August 15<sup>th</sup> of each calendar year and shall contain, at a minimum, the following:
  - a) Name, address, and telephone number of the association, businesses, persons, or the firm responsible for plan implementation, and the person completing the report.
  - b) Time period covered by the report.
  - c) A chronological summary of activities conducted to implement the programs referenced in (1) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with the OWNER, include a copy of the invoice for services.
  - d) An outline of planned activities for the next year.
- 4) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under items 3 above and shall be approved of by the CITY. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the CITY and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements and applications for permits.

THE CITY SHALL, AS RESOURCES ALLOW:

- 1) Provide technical assistance to the OWNER in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request at no charge to the OWNER.
- 2) Review the annual report and conduct occasional site visits to discuss performance and problems with the OWNER.
- 3) Review this Agreement with the OWNER and modify it as necessary.

## REMEDIES:

- 1) If the CITY determines that maintenance or repair work is required to be done to the stormwater facilities located on the OWNER's Property, the CITY shall give the OWNER of the Property notice of the specific maintenance and/or repair required. The CITY shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by the CITY, written notice will be sent to the persons who were given notice stating the CITY's intention to perform such maintenance and bill the OWNER for all incurred expenses. The CITY may also revoke stormwater utility rate credits (if applicable) if required maintenance is not performed.
- 2) If at any time the CITY determines that the existing system creates any imminent threat to public health or welfare, the CITY may take immediate measures to remedy said threat. However, the CITY shall also take reasonable steps to immediately notify either the Property Owner or the person in control of said Property of such imminent threat in order to enable such owner or person in control to take such immediate measures either independently or in cooperation with the CITY.
- 3) The OWNER hereby grants authority to the CITY for access to the stormwater system features, only for the purpose of performing maintenance, repair or inspection pursuant to the terms of this Agreement. The City is to be responsible, as provided by law, for any damage to the OWNER through its negligence in the construction, maintenance and operation of the stormwater facilities. Furthermore, the CITY agrees that: (a) any activities of the CITY on the Property shall not unreasonably interfere with OWNER's use of the Property; and (b) all work completed by the CITY pursuant to the rights granted hereunder shall be completed in a good and workmanlike manner and in accordance with all applicable laws, ordinances and codes.
- 4) Following any construction, installation, repair, replacement, improvement or reasonable enlargement of the capacity of the stormwater facilities, the CITY shall restore those portions of the Property affected by the CITY's construction, to the condition they were in immediately prior to such work, unless said work is at the express request of the OWNER, in which case the OWNER shall be responsible for restoration. All restoration that is the responsibility of CITY shall be performed as soon as reasonably possible following completion of any work, and shall be coordinated with OWNER so as to cause the minimum amount of disruption to the OWNER's use of the Property.
- 5) The City agrees to indemnify, defend, and hold harmless the OWNER from and against any and all liability incurred by the OWNER arising from or in any way related to the CITY's breach of any of its covenants, agreements, or obligations set forth in this Agreement, or from the CITY's negligence, intentional misconduct, or misuse of the stormwater facilities, but nothing herein shall require the CITY to indemnify the OWNER for that portion of any such liability attributable to the negligence of the OWNER.

- 6) The OWNER shall be responsible for the cost of maintenance and repair of the stormwater facility. Such responsibility shall include reimbursement to the CITY within 30 days of the receipt of an invoice for work performed by the CITY in maintaining or repairing such facility pursuant to the terms of this Agreement. Overdue payments will require the payment of interest at the current legal rate for liquidated judgements. The CITY shall have a lien for all unpaid charges together with such interest. However, notice of such lien shall not be filed by the CITY for a period of 60 days following mailing of the invoice for charges due. During such 60 days, the Property Owner or other person or agent in control of the Property shall have the right to appeal such charges to the CITY's Land Use Hearings Examiner for a final decision. Such appeal may challenge either the necessity of the maintenance or repairs performed by the CITY or the amount of the charges rendered for such maintenance or repair. Notice of such lien shall not be filed during the pendency of such appeal until final decision is rendered by the Land Use Hearings Examiner. The lien shall be foreclosed in the same manner specified by state statute for foreclosure of a mechanic's or materialman's lien. In any legal action to foreclose such lien or otherwise collect such charges, the prevailing party shall be entitled to an award for its attorney fees and costs incurred.

This Agreement is intended to protect the value and desirability of the Property described above and to benefit all the citizens of the CITY. This Agreement shall run with the land and be binding on all parties having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the CITY.

IN WITNESS WHEREOF, this instrument has been executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
(Grantor)

\_\_\_\_\_  
(Grantor)

**STATE OF WASHINGTON )**  
**) ss**  
**COUNTY OF THURSTON )**

On this day personally appeared before me \_\_\_\_\_, to me known to be the individual(s) described in and who executed the within and foregoing instrument, and acknowledged that \_\_\_\_\_ (he/she/they) signed the same as \_\_\_\_\_ (his/her/their) free and voluntary act and deed, for the uses and purposes herein mentioned.

GIVEN under my hand and official seal this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_.

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at \_\_\_\_\_  
My commission expires: \_\_\_\_\_



## Attachment “A”

### **What is Stormwater Runoff?**

When urban and suburban development covers the land with buildings, houses, streets and parking lots, much of the native topsoil, duff, trees, shrubs, and grass are replaced by asphalt and concrete. Rainfall that would have directly soaked into the ground instead stays on the surface as *stormwater runoff* making its way into storm drains (including man-made pipes, ditches, or swale networks), stormwater ponds, surface and groundwater, and eventually to Puget Sound.

### **What is a Storm Drain System and how does it work?**

The storm drain system for most developments includes components *that carry, store, cleanse, and release* the stormwater. These components work together to reduce the impacts of development on the environment. These impacts can include *flooding* which results in property damage and blocked emergency routes, *erosion* which can cause damage to salmon spawning habitat, and *pollution* which harms fish and/or drinking water supplies.

The storm drain system provides a safe method to carry stormwater to the treatment and storage areas. Swales and ponds filter pollutants from the stormwater by *physically* settling out particles, *chemically* binding pollutants to pond sediments, and *biologically* converting pollutants to less-harmful compounds. The ponds also store the treated water, releasing it gradually to a nearby stream or to groundwater. The various components of storm drain systems are described in the glossary.

### **What does Stormwater Runoff have to do with Water Quality?**

Stormwater runoff needs to be treated because it carries litter, oil, gasoline, fertilizers, pesticides, pet wastes, sediments, and anything else that can float, dissolve, or be swept along by the moving water. Left untreated, polluted stormwater can reach nearby waterways where it can harm and even kill aquatic life. It can also pollute groundwater to the extent that it must be treated before it can be used for drinking, which has actually happened in Pierce County. Nationally, stormwater is recognized as a major threat to water quality. Remember to keep everything out of stormwater systems except the rainwater they are designed to collect.

### **Your Stormwater Facility**

Stormwater facilities can be attractive as well as functional. They can provide both active and passive-use recreation areas and open space for wildlife. Perhaps you’ve noticed a wet or dry pond in your neighborhood. These different types of ponds are designed for different purposes. For example, wet ponds primarily provide treatment of stormwater. They also provide good cover and habitat for birds and small mammals, making them fine “wildlife preserves”. Dry ponds or infiltration ponds are designed to provide storage for stormwater and gradually release it downstream or allow it to filter into the ground. These types of ponds can be maintained as grassy play areas, and may even be modified to house more formal play equipment.

### **Who is Responsible for Maintaining Stormwater Facilities?**

All stormwater facilities need to be maintained. Regular maintenance ensures proper functioning and keeps the facility visually appealing. This Stormwater Facility Maintenance Guide was designed to help explain how stormwater facilities work and provide user-friendly, straightforward guidance on how to maintain them.

As a property owner or homeowner’s association, you are responsible for regularly maintaining privately owned ponds, catch basins, pipes and other drainage facilities within your subdivision. The City of Lacey maintains stormwater facilities located in public right-of-ways.

## Maintenance Checklists

The checklists in this guide are for you to use when inspecting and maintaining the stormwater facilities that you are responsible for. If you feel that you are missing a particular checklist, or you have additional facilities not identified or addressed in this guide, please contact your site developer, design engineer or the City.

The checklists are in table format for ease of use and brevity. Each checklist tells you what part of the feature to check, how often to check, what to check for and the desired outcome after maintenance is performed. Log sheets are included to help you keep track of when you last surveyed the stormwater drainage system.

Those systems using approved “emerging technologies”, such as a StormFilter™, may not find a checklist covering the specific stormwater facility. Please refer to the manufacturer’s guidelines for the appropriate maintenance activity schedule. If a checklist is provided, it is for guidance purposes only and not meant to supersede the manufacturer’s recommendations.

Although it is not intended for the inspection to involve anything too difficult or strenuous, there are a few tools that will make the job easier and safer. These tools include:

- Gloves
- A flashlight.
- A long pole or broom handle.
- Some kind of pry bar or lifting tool for pulling manhole and grate covers.
- Standard yard tools, such as a rake and a shovel.
- Measuring tool.

**SAFETY WARNING: For your safety and per OSHA regulations, you should never stick your head or any part of your body into a manhole or other type of confined space. When looking into a manhole or catch basin, stand above it and use the flashlight to help you see. Use a pole or broom handle that is long enough when you are checking sediment depths in confined spaces. NO PART OF YOUR BODY SHOULD BREAK THE PLANE OF THE OPEN HOLE.**

## Checklist Instructions

The following pages contain maintenance checklists covering most of the needs for the components of your drainage system, as well as for some components that you may not have. Let City staff know if there are any components of your drainage system that you do not recognize or are missing from these pages.

Refer to the City of Lacey Stormwater Code, LMC 14.25 for additional stormwater maintenance requirements, including maintenance frequency.

Using photocopies of these checklists and the log sheet, check off the problems that you look for each time you do an inspection. Add comments regarding problems found and actions taken on the log sheet. Keep the completed forms in your files for future reference.

You may call the City of Lacey at (360) 491-5600 for technical guidance. Please do not hesitate to call, especially if you are unsure whether a situation you have discovered may be a problem.

You should plan to complete a check for all system components on the following schedule:

- **Quarterly** - Plan to inspect the facility at least once during the following months; January, May, August, and November.
- **Annually** - The best time for an annual inspection is in the late summer, preferably September.
- **After Storms** - Also check all stormwater facilities after major storm events, defined as about 1 inch or more of precipitation in 24 hours.

## Resource Listing

If you are unsure whether a problem exists, please contact the City at the number below and ask for technical assistance with your situation. Other resources are listed for your convenience and as references associated with the checklists.

### Lacey Public Works Department

(360) 491-5600 <http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>

### City of Lacey Spill Response Team

(360) 491-5644 <http://ci.lacey.wa.us/report-a-spill>

### Thurston County Environmental Health

Hazardous Waste Disposal (oil, paint, pesticides, etc.)

(360) 754-4111 <http://www.co.thurston.wa.us/health/ehhw/index>

Solid Waste Disposal (yard waste, construction waste, contaminated soils, etc.)

(360) 786-5136 <http://www.co.thurston.wa.us/health/ehhw/index>

### WSU Thurston Co. Extension (Water Resource Ed. Programs, Envir. Stewardship info.)

(360) 786-5445 <http://www.thurston.wsu.edu/water>



## Stormwater Facility Inspection and Maintenance Procedure

Stormwater facilities play an important role in managing the 4 feet of rainfall we receive in Lacey in an average year. The term “stormwater facility” refers to any landscaped or structural feature that collects, conveys, cleans or infiltrates runoff water. There are many types of stormwater facilities, ranging from simple swales and ponds to more complicated filter systems and flow control devices. Your on-site stormwater facilities work together to control runoff water, reduce flooding, and prevent pollution.

Owners of commercial property, multifamily residential property, or single-family residential properties with privately-owned drainage and stormwater facilities are required by the City of Lacey Codes to maintain their facilities to established standards for full functionality (City of Lacey Stormwater Code, LMC 14.25). Facility owners are responsible for performing inspections of stormwater facilities, and for performing any maintenance identified by the inspections.

Basic maintenance work may be performed by the owner or property manager, although some tasks are best left to an experienced contractor. The inspection of stormwater facilities and any required maintenance work must be completed and reported annually to the City of Lacey Public Works Department by the date specified on the *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* obtainable on the City’s web site at:

<http://www.ci.lacey.wa.us/city-government/city-departments/public-works/water-resources/storm-and-surface-water-programs/private-facilities>.

Again, note that most large development sites will also have a Maintenance and Source Control Manual that was prepared as part of the site development, and should have been provided to the property owners. Look to your site’s Maintenance and Source Control Manual for information on the project, the facilities on the site, maintenance responsibilities, and maintenance activities.

Where a Maintenance and Source Control Manual is not available, the following steps are provided as general guidance:

### **Step 1. Identify**

The first step is facility identification, so you know what types of stormwater facilities you have. Look on the site plan of your property, and note the main facility types indicated (such as rain gardens and infiltration trenches), along with related drainage components (such as catch basins, pipes, and debris barriers). Locate the various facilities on the ground.

Note that most drainage systems consist of components for four main purposes: stormwater collection (e.g., catch basins), conveyance (e.g., pipes and swales), water quality treatment (e.g., wet ponds) and flow control (via infiltration and/or surface discharge).

To assist you in identifying components, refer to the definitions on the pages that follow.

## **Step 2. Inspect**

For all facility components that you have identified, conduct an inspection. You may conduct the inspection yourself and/or with co-owners, or you may use a property manager or vendor to perform the inspection. Refer to the following Stormwater Facility Maintenance Checklists, which describe the maintenance standards for each component, and also identify and describe defects and their remedies.

For each facility, note on the Inspection and Maintenance Checklist the condition of the facility (good, fair or poor), and any problems or other observations.

## **Step 3. Maintain**

For all facility components, if the inspection indicates maintenance is needed; have the work performed by competent personnel. Basic maintenance tasks may be performed by the property owner(s) or property manager, but difficult or potentially dangerous tasks should be performed by a qualified vendor. Be safe! Use caution when inspecting and working on or near facilities, and stay out of confined spaces such as catch basins and manholes.

Note the action taken and the date, and record this information on the Log Sheet. Mark the check boxes on the Inspection and Maintenance Checklist corresponding to the maintenance accomplished on each facility.

## **Step 4. Submit**

Submit the completed *Stormwater Facilities Inspection and Maintenance Annual Reporting Form* by August 15 each year to: Lacey Water Resources, 420 College Street SE, Lacey, WA 98503. The completed checklist may be mailed, e-mailed (if available) or delivered in person to Lacey City Hall.

## **Common Stormwater Facilities: Identification and Actions**

*Note: General actions are described for each facility type below. Please refer to the Stormwater Facility Maintenance Standards for further details.*

### **Detention Pond:**

A shallow bowl-like depression in the land, with an area to collect and temporarily store stormwater. The pond is generally lined with grass and is intended to store stormwater to reduce runoff volumes during storms.

#### *Actions to keep detention ponds functioning:*

- Remove litter, sediment, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Inspect pond berms for any structural deficiencies

### Infiltration Basin (“Dry Pond”):

A shallow bowl-like depression in the land, with a broad, flat bottom area to collect, temporarily store, and infiltrate stormwater. An infiltration basin is designed to receive treated water and allow it to infiltrate into the soil. The infiltration basin is usually lined with grass and drains “dry” between rain events. Some playfields double as infiltration basins by design.

#### Actions to keep infiltration basins functioning:

- Remove litter, yard debris, and problem vegetation such as Scotch broom.
- Maintain a healthy grass cover to prevent erosion and weed growth.
- Repair erosion, and replace rock riprap at pipe ends.
- Avoid activities within the basin that could cause erosion or soil compaction.
- Avoid using herbicides or pesticides within the basin area.
- Aerate the soil in the bottom area as needed to preserve and enhance infiltration.

### Biofiltration Swale:

A longitudinally sloped, wide, shallow, vegetation-lined channel with gently sloping sides and a flat bottom designed to remove pollutants by means of sedimentation, filtration, soil sorption, and/or plant uptake. Some water also infiltrates into the soil as it slowly flows along the swale.

#### Actions to keep swales functioning:

- Remove debris, litter, and flow obstructions from the swale.
- Mow the swale and maintain healthy grass cover.
  - Prevent dirt, rocks, and weeds from accumulating, but avoid use of herbicides (remove manually).
- Do not fill-in the swale with rocks, bark, etc.
- Aerate the soil to preserve infiltration capacity.

### Wet Pond:

A constructed pond with an impermeable liner to maintain a permanent pool of water, which provides for water quality treatment by settling and retention of sediment particles and other pollutants. The cleaner surface water is then conveyed to a nearby infiltration facility (such as a “dry detention pond”) or surface discharge. A wet pond provides a basic level of treatment, and is common in many neighborhoods.

#### Actions to keep wet ponds functioning:

- Remove litter and yard debris from within and around the pond.
- Check inflow and outflow systems. Remove any obstructions.
- Remove excess vegetation such as cattails from within the pond.
- Remove noxious weeds, but do not use herbicides (contact City for advice).

### Stormwater Wetland:

A created wetland with a permanent pool of water, similar to a wet pond, but generally shallower and with aquatic emergent plants which provide for a higher level of water quality treatment of collected stormwater through biological processes.

Actions to keep stormwater wetlands functioning:

- Remove litter and yard debris from within and around the wetland.
- Check inflow and outflow systems, and remove any obstructions.
- Remove excess vegetation such as cattails from within the wetland.
- Remove noxious weeds, but do not use herbicides (contact city for advice).

**Bioretention Cell:**

A shallow stormwater system with a designed soil mix and plants. Bioretention is a “low-impact development” (LID) practice that is integrated into a site to retain stormwater near its source. Bioretention cells are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. They also provide water quality treatment through sedimentation, filtration, adsorption, and phytoremediation. Bioretention cells function by storing stormwater as surface ponding before it filters through the underlying amended soil.

Actions to keep bioretention cells functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Rain Garden:**

Non-engineered, shallow, landscaped depressions with compost amended native soils and adapted plants that collect, absorb, and filter stormwater runoff from roof tops, driveways, patios, and other hard surfaces. Rain gardens are sized to pond and temporarily store stormwater runoff and allow stormwater to pass through the amended soil profile.

Actions to keep rain gardens functioning:

- Remove litter, weeds and fallen leaves. Do not use herbicides or pesticides.
- Check inflow and outflow systems, and remove any obstructions.
- Repair erosion; cover bare spots with organic mulch.
- Perform plant maintenance as needed, such as pruning branches.
- Remove dead vegetation and replace dead plants with same varieties.

**Permeable Pavement:**

Permeable pavement (also known as pervious and porous pavement) looks very much like ordinary pavement but includes additional “void” spaces where water can pass through. After water drains through permeable pavement wearing course, it is held in a storage reservoir bed (made up of aggregate rock, or drain rock), and then infiltrates into the native soils.

Actions to keep permeable pavement functioning:

- Clean surface to remove trash, sediment, vegetation, and other accumulated debris.
- Check inflow and outflow systems and underdrains, and remove any obstructions.
- Use vacuum to remove fine sediments.

- If pavers are used, check for damaged or missing pavers and replace as needed.
- If paving grids are used, check for loss of soil, grass, and/or gravel material and replace as needed.

#### Downspout, Sheet Flow, and Concentrated Flow Dispersion:

A gravel trench or splashblock followed by a vegetated flowpath (or dispersion area) used to disperse flow and reduce runoff from impervious surfaces. Dispersion attenuates peak runoff flows by slowing the runoff entering into the conveyance system, allowing some infiltration, and providing some water quality benefits.

##### Actions to keep downspout, sheet flow, and concentrated flow dispersion functioning:

- Ensure that vegetation is not blocking flow, and perform plant maintenance as needed.
- Remove and replace dead vegetation to ensure that runoff is received in a well-vegetated area.
- Avoid activity in dispersion area to avoid compaction.
- Check for erosion of the dispersion trench or dispersal area and replace and restore gravel and/or soil.

#### Downspout Infiltration:

Includes an infiltration trench or drywell intended only for use in infiltrating runoff from roof surfaces. Infiltration trenches and drywells are backfilled with washed drain rock, allowing for temporary storage of stormwater runoff in the voids of the drain rock material. Stored runoff gradually infiltrates into the surrounding soil.

##### Actions to keep downspout infiltration functioning:

- Remove litter, leaves, debris, and obstructions from the infiltration trench or drywell.
- Stabilize adjacent landscaped areas to avoid runoff from eroding and mobilizing soil into the surface inlet.

#### Detention Tank:

An underground storage facility typically constructed with large diameter corrugated metal or HDPE pipe.

##### Actions to keep detention tanks functioning:

- Remove litter, leaves, debris, and obstructions from inlet and outlet.
- Check tank for cracks or leaks.
- Clean out any sediment or debris accumulated inside the tank.

#### Ditch:

A V-shaped channel, usually along the side of a road that collects and conveys runoff.

##### Actions to keep ditches functioning:

- Remove debris, litter and flow obstructions from the ditch.
- Do not fill-in the ditch – prevent dirt, rocks, and weeds from accumulating.
- Repair erosion on ditch side-slopes.

## Culvert:

A pipe that continues conveyance flow from a ditch or swale under the ground surface, typically under driveways and cross-streets. Usually connects (“daylights”) to another ditch, swale or pond. The end of a pipe or culvert is often surrounded by rock “riprap” to prevent soil erosion.

### Actions to keep culverts functioning:

- Remove debris, litter, and obstructions from the openings at the culvert ends.
- Remove soil, sod, and vegetation buildup from the culvert openings.
- Replace rock riprap at the culvert ends.
- Repair any damage to the culvert ends.

## Catch Basin:

An underground concrete box structure with a slotted metal grate on top that collects runoff water from the ground surface. Typically located within pavement in parking lots and in the street gutter, usually next to a curb. Grate on top lets water in and keeps larger debris out. Sediment settles in the sump in the bottom (below the pipe openings) and must be removed periodically. Catch basins have an outlet pipe between the grate and the sump, to let the cleaner water flow out to a storm pond or other location. Some catch basins have both inflow and outflow pipes, to convey collected runoff water through.

### Actions to keep catch basins functioning:

- Remove litter, leaves, debris, and obstructions from catch basin grates.
- Hire a professional to remove sediment buildup from sump, if road is privately owned.  
Catch basins in the public right-of-way are maintained by the City.

## Debris Barriers and Trash Racks:

A structural device with metal bars, to prevent debris from entering a pipe, spillway, or hydraulic structure.

### Actions to keep debris barriers and trash racks functioning:

- Remove trash, debris, vegetation, and dirt from around the structure.
- Check inflow and outflow, and remove any flow obstructions.
- Remove plants such as alder and willow that tend to grow near the pipe ends.
- Check for structural integrity; hire a professional to fix broken bars or racks.

# Stormwater Facility Maintenance Checklists

## Maintenance Standards

The following pages contain facility-specific maintenance standards, which are intended to be observable conditions for determining whether maintenance actions are required.

### Group 1: Flow Control and Treatment Facilities

- 1a Detention Ponds
- 1b Infiltration Ponds
- 1c Detention Tanks and Vaults
- 1d Wet Vaults
- 1e Wet Ponds
- 1f Stormwater Wetlands
- 1g Basic and Compost-Amended Biofiltration Swale
- 1h Wet and Continuous Inflow Biofiltration Swales
- 1i Filter Strip (Basic and CAVFS)
- 1j Sand Filter (above ground/open)
- 1k Sand Filter (below ground/closed)
- 1l Media Filter Drains
- 1m Bioretention Cells, Swales and Planter Boxes
- 1n Rain Gardens
- 1o Trees
- 1p Permeable Pavement
- 1q Vegetated Roofs
- 1r Downspout, Sheet Flow, Concentrated Flow Dispersion
- 1s Downspout Infiltration
- 1t Cisterns
- 1u Fencing, Shrubbery Screen, Other Landscaping
- 1v Manufactured Media Filters
- 1w Proprietary of Manufactured Products

**Group 2: Structure and Pretreatment**

- 2a Control Structures and Flow Restrictors
- 2b Catch Basins
- 2c Debris Barriers (trash racks)
- 2d Energy Dissipaters
- 2e Baffle Oil/Water Separators (API type)
- 2f Coalescing Plate Oil/Water Separators
- 2g Catch Basin Inserts

**Group 3: Miscellaneous Facilities and Features**

- 3a Conveyance Pipes, Culverts, Ditches and Swales
- 3b Access Roads and Easements

# **Group 1**

## ***Flow Control & Treatment***

## 1a. Detention Ponds

Detention ponds are earthen excavations that are “dry” except during and after rains, when they contain stormwater temporarily. Detention ponds store water while releasing it gradually.

Detention Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation according to applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111 and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with the Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility		Return facility to design function. ( <i>Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.</i> )	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove or remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Overgrown Vegetation Around Pond	Tree grown and dense vegetated impedes inspection, maintenance access or interferes with maintenance activity with the facility function or maintenance (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Prune or maintain trees and vegetation so they do not to hinder inspection or maintenance activities.  If trees are not interfering with access or maintenance, do not remove.	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.  <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Sediment Accumulation	Accumulated sediment that exceeds 10 percent of the designed pond depth unless otherwise specified or affects inlets or outlets of the facility.		Clean out sediment and aerate and/or re-seed the pond if deemed necessary to improve infiltration and control erosion.  <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	PVC Pond Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate), and the liner is not exposed. Maintenance is needed if liner is visible and has more than three 0.25-inch holes.		Repair or replace liner as needed. Liner is fully covered.	
	Clay Liner	An indicator of a torn liner could be the pond no longer holds water. Check to see if the pond holds water during dry periods (during long dry periods the water may evaporate).		Repair or replace liner as needed.	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Emergency Overflow Spillway	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	

## Detention Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		<p>Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.</p> <p><i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i></p>	

## 1b. Infiltration Ponds, Trenches, and Galleries

Infiltration ponds, trenches, and galleries are earthen excavations or underground structures that are “dry” except during and after rains, when they contain stormwater temporarily. Infiltration ponds, trenches, and galleries store water while gradually percolating water into the ground.

Infiltration Ponds, Trenches, and Galleries					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No trash or debris present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil’s club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dam	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>(Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator.)</i>	
	Insects	Insects such as wasps and hornets interfering with maintenance activities, or mosquitoes becoming a nuisance.		Remove insects. For mosquito control, eliminate stagnant water. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>	
	Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements).		Remove hazard trees.	
	Tree Growth and Dense Vegetation	Tree growth and dense vegetation, which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).		Trees and vegetation do not hinder inspection or maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).	
Storage Area	Water Not Infiltrating	Check for water ponding in infiltration basin after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events. (Maintenance is required if a percolation test pit or test of facility indicates facility is only working at 90 percent of its designed capabilities, or if 2 inches or more sediment is present, remove).		Facility infiltrates as designed. Sediment is removed and/or facility is cleaned so that infiltration system works according to design.	
Filter Bags (if applicable)	Filled with Sediment and Debris	Maintenance is required if sediment and debris fill bag more than one-half full.		Replace filter bag or redesign system. Filter bag must be less than one-half full.	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.		Replace gravel in rock filter if needed. Water must flow through filter.	
Trenches	Observation Well (use surface of trench if well is not present)	Water ponds at surface during storm events. Less than 90 percent of design infiltration rate.		Remove and replace/clean rock and geomembrane.	
Galleries	Chambers	Check inlet and outlets and interior of chambers for deficiencies, cracks, debris, and sediment.		Remove any debris and sediment and replace or restore chambers as needed.	
		Exceeds 18 inches.		Mow grass or groundcover to a height no greater than 6 inches.	
		Bare spots.		Revegetate and stabilize immediately. No bare spots should be present.	
Side Slopes	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion or where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Settlement	Any part of the dike or berm that has settled more than 4 inches lower than designed.		Build the dike or berm back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	

## Infiltration Ponds, Trenches, and Galleries

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Dikes or Berms (continued)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rocks Missing	Check to see that the riprap protective area is intact. Maintenance is need if only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of outflow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.) If any native soil is exposed, cover soil with rock riprap.	
	Tree Growth	Check emergency spillways for tree growth that creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.		Remove trees on emergency spillway. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all pond areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms, a professional engineer should be consulted to resolve source of erosion.</i>	
	Screen Clogged or Missing	The bar screen over the outlet should be intact and clear of debris. Water should flow freely through the outlet pipe.		Replace screen if it is not attached. Remove any trash or debris and dispose of properly. Clean out the end pipe if necessary.	

<b>Infiltration Ponds, Trenches, and Galleries</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Presettling Ponds and Vaults	Facility or Sump Filled with Sediment and/or Debris	6 inches or designed sediment trap depth of sediment.		Remove sediment. No sediment should be present in presettling pond or vault.	
	Inadequate Sediment Settling Area	Stormwater should not enter the infiltration area without some method of settling-out solids.		Add a sediment trapping area by constructing a sump or berm for settling of solids. This area should be separate from the rest of the facility. Contact City of Lacey for guidance.	
Drain Rock	Water Ponding	If water enters the facility from the surface, inspect to see if water is ponding at the surface during storm events.  If buried drain rock, observe drawdown through observation port or cleanout.		Clear piping through facility when ponding occurs. Replace rock material/sand reservoirs as necessary. Tilling of subgrade below reservoir may be necessary (for trenches) prior to backfill. No water ponding should be present on surface during storm events.	

For manufactured infiltration galleries, designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.

### 1c. Detention Tanks and Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Detention Tanks and Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.		Vents open and functioning. Remove blockage or replace air vent if damaged.	
	Debris and Sediment	Accumulated sediment depth exceeds 10 percent of the diameter of the storage area for 50 percent of the length of storage vault or any point depth exceeds 15 percent of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 50 percent of the length of tank.)		No debris or sediment present. All sediment and debris removed from storage area.	
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).		All joint between tank/pipe sections are sealed.	
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10 percent of its design shape. (Review required by engineer to determine structural stability).		Tank/pipe repaired or replaced to design.	
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.		Vault replaced or repaired to design specifications and is structurally sound.	

## Detention Tanks and Vaults

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Storage Area (continued)	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.		Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
Catch Basins	See "Catch Basins"	See "Catch Basins."		See "Catch Basins."	

## 1d. Wet Vaults

These types of storage structures are usually underground and accessed via a manhole. DO NOT ENTER ANY TANK OR VAULT without proper training, certification and equipment.

Wet Vaults					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris	Accumulated trash and debris in vault, pipe or inlet/outlet (includes floatables and non-floatables).		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Accumulation	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.		Remove sediment from vault. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.		Pipe repaired and/or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened or removed, especially by one person.		Pipe repaired or replaced to proper working specifications.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed or cleared from ventilation area. A specified percentage of the vault surface area must provide ventilation to the vault interior (see design specifications).	
		Maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking warping and/or showing signs of failure as deemed by maintenance/inspection staff.		Baffles repaired or replaced to specifications.	
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.	

## 1e. Wet Ponds

Wet ponds are designed to improve water quality. They have a permanent pool of water, which slows incoming stormwater flows causing sediments and pollutants to settle-out. Wet ponds are typically deeper than other water quality BMPs, such as stormwater wetlands, and utilize the pool volume to reduce pollutant loads.

Wet Ponds					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Level	First cell is empty, doesn't hold water.		Line the first cell to maintain at least 4 feet of water. Second cell may drain, but the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.	
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. In general, there should be no visual evidence of dumping.		No debris or sediment present. Remove and properly dispose of all trash and debris.	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.		No clogging or blockage in the inlet and outlet piping.	
	Sediment Accumulation on Pond Bottom	Accumulated sediment on pond bottom that exceeds the depth of sediment zone plus 6 inches, usually in the first cell.		Sediment removed from pond bottom. <i>(If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)</i>	
	Oil Sheen on Water	Visible and prevalent oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Locate and correct oil source. If chronic low levels of oil persist, plant wetland plants such as <i>Juncus effusus</i> (soft rush) which can uptake small concentrations of oil.	
	Erosion	Erosion of the pond's side slopes and/or scouring of pond bottom that exceeds 6 inches, or where continued erosion is prevalent.		Slopes stabilized using proper erosion control measures and repair methods.	
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.		Dike/berm is repaired to specifications.	

## Wet Ponds

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Internal Berm	Berm dividing cells should be level.		Berm surface is leveled so that water flows evenly over entire length of berm.	
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.		Rocks replaced to specifications.	
	PVC Pond Liner	Check to see if liner is visible and has more than three 0.25-inch holes, is exposed and/or torn. An indicator of a torn liner could be the pond no longer holds water (during long dry periods the water may evaporate)		Repair or replace liner as needed. Note: wet ponds usually have liners.	
	Clay Liner	Check to see if pond is holding water (during long dry periods the water may evaporate).		Repair liner to design state.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club). Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Vegetation Not Growing or Overgrown Within Pond	Presence of invasive species or sparse/excessive growth of plants.		Remove invasive species and reestablish vegetation as designed.	

## 1f. Stormwater Wetlands

Stormwater wetlands are designed to improve water quality. They are designed with emergent aquatic plants to provide biological treatment and filtering of runoff water.

Stormwater Wetlands					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Trash and Debris	Accumulated trash and debris. Dumping of yard wastes such as grass clippings and branches into pond. Presence of glass, plastic, metal, foam, or paper. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No debris or sediment present. Remove and properly dispose all trash and debris.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public (such as Scotch broom or blackberry vines, poison oak, tansy ragwort, stinging nettles, or devil's club).  Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. (Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Oil Sheen on Water	Prevalent and visible oil sheen.		Oil removed from water using oil-absorbent pads or Vactor truck. Source of oil located and corrected. <i>If chronic low levels of oil persist, plant emergent wetland plants such as <i>Juncus effusus</i> (soft rush) which can assist filtering small concentrations of oil.</i>	
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material or damaged.		No clogging or blockage in the inlet and outlet piping.	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm. Water should not be able to flow through the rodent holes.		Remove rodents and repair the dam or berm. <i>(Coordinate with Thurston County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>	
	Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.		Return facility to design function. <i>Evaluate using beaver deceiver and leveler devices. If beaver removal is necessary, contact WDFW Region 6 to coordinate with a Nuisance Wildlife Control Operator.</i>	
	Tree Growth and Hazard Trees	Tree growth that impedes maintenance access.		Remove hazard trees. Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., firewood or construction).	
	Tree Growth and Hazard Trees	If dead, diseased, or dying trees are identified, use a certified Arborist to determine the health of tree and whether removal is required.		Remove hazard trees.	
	Liner	Check to see if liner is visible and has more than three 0.25-inch holes, or if it is exposed and or torn. An indicator of a torn liner could be the wetland no longer holds water. (during long dry periods the water may evaporate).		Repair or replace liner as needed. Liner is fully covered.	
Forebay	Sediment Accumulation	Sediment accumulation in forebay exceeds the design depth of the sediment zone plus 6 inches.		Remove accumulated sediment from forebay bottom to the design depth of the sediment zone.	
Side Slopes of Wetland	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance.	
Side Slopes of Wetland	Erosion	Any erosion observed on a compacted berm embankment.		<i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

## Stormwater Wetlands

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Cell	Wetland Vegetation	20 percent or more of the stormwater wetland area has dead or dying vegetation, as measured by stem counts relative to the design plant coverage.		Plants in wetland cell surviving and not interfering with wetland function. Dead or dying vegetation is replaced by like species, unless recommended otherwise by the Wetlands Consultant and approved by the city. ( <i>Watering, physical support, mulching, and weed removal may be required on a regular basis especially during the first 3 years.</i> )	
	Wetland Vegetation	Percent vegetated cover of stormwater wetland bottom area, excluding exotic and invasive species, is less than 50 percent after 2 years.		Exotic/invasive species removed. Additional plantings may be required.	
	Wetland Vegetation	Decaying vegetation produces foul odors.		Decaying vegetation is removed, preferably in late summer.	
	Wetland Vegetation	Wetland vegetation is blocking flow paths causing flow back-up and flooding.		Areas of blocking vegetation are cut back sufficient to allow design flows and prevent flooding.	
	Wetland Vegetation	Water quality monitoring indicates that wetland vegetation is contributing phosphorus and metals to downstream waters rather than sequestering them.		Water quality monitoring indicates improved water quality.  To maximize removal of wetland pollutants, wetland vegetation must be periodically harvested, particularly with respect to phosphorus and metals removal. Harvesting should occur by mid-summer before plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. Every 3 to 5 years the entire plant mass including roots should be harvested because the belowground biomass constitutes a significant reservoir (as much as half) of the nutrients and metals that are removed from stormwater by plants.	
	Sediment Accumulation	Sediment accumulation inhibits growth of wetland plants or reduces wetland volume (greater than 1 foot of sediment accumulation).		Wetland dredged to remove sediment accumulation.	

Stormwater Wetlands					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Wetland Berms (dikes)	Settlements	Any part of berm that has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works.		Dike restored to the design elevation. <i>A professional engineer should be consulted to determine the source of the settlement.</i>	
	Seepage	Check for water flowing through the pond berm and ongoing erosion with potential for erosion to continue.		Repair berm to eliminate seepage and erosion. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>	
Wetland Berms Over 4 Feet in Height (dikes)	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.		Remove trees on berms. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise, the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Obstruction	Tree growth or other blockage on emergency spillways may cause failure of the berm due to uncontrolled overtopping.		Remove obstruction on emergency spillway. <i>A professional engineer should be consulted for proper berm/spillway restoration.</i>	
	Rock Missing	Check to see that the riprap protective area is intact. Only one layer of rock exists above native soil in an area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway.		Restore rocks and pad depth to design standards. (Riprap on inside slopes need not be replaced.)	
	Erosion	Maintenance is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion. Maintenance is needed where any erosion is observed on a compacted berm embankment. Check all wetland areas, particularly around inlets and outlets, as well as at berms for signs of sliding or settling.		Try to determine what has caused the erosion and fix it. Stabilize slopes by using appropriate erosion control measure(s); e.g., reinforcing the slope with rock, planting grass, or compacting the soil. Contact the City of Lacey for assistance. <i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>	

### 1g. Basic and Compost-Amended Biofiltration Swale

A gently-sloped channel with gentle side slopes, lined with grass (and sometimes other vegetation) to slow the flow and allow for water quality treatment and infiltration.

Basic and Compost-Amended Biofiltration Swale					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches or inhibits vegetation growth in 10 percent or more of swale.		Remove sediment deposits on grass treatment area of the biofiltration swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.	
	Standing Water	When water stands in the swale between storms and does not drain freely.		Swale must drain freely and not contain standing water between storms. Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.		Level the spreader and clean so that flows are spread evenly over entire swale width.	
	Constant Baseflow	Small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.		Base flow removed from swale. Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.	
	Poor Vegetation Coverage	Grass is sparse or bare or eroded patches occur in more than 10 percent of the swale bottom.		Swale has no bare spots and grass is thick and healthy. Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.	
	Vegetation	When the grass becomes excessively tall (higher than 10 inches); when nuisance weeds and other vegetation start to take over.		Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.	
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.		If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.	

### Basic and Compost-Amended Biofiltration Swale

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Swale	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.		Remove material so that there is no clogging or blockage in the inlet and outlet area.	
	Trash and Debris Accumulation	Trash and debris accumulated in the biofiltration swale.		No debris or sediment present. Remove trash and debris from biofiltration swale.	
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale. Cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

## 1h. Wet and Continuous Inflow Biofiltration Swales

Similar to a basic biofiltration swale (previous pages), but with modifications due to saturated soil conditions (such as, specific plants that can tolerate wet conditions).

Wet and Continuous Inflow Biofiltration Swales					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Sediment Accumulation	Sediment depth exceeds 2 inches in 10 percent of the swale treatment area.		Remove sediment deposits in treatment area.	
	Water Depth	Water not retained to a depth of about 4 inches during the wet season.		Build up or repair outlet berm so that water is retained in the wet swale.	
	Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.		Wetland vegetation fully covers bottom of swale. Cause of lack of vigor of vegetation addressed. Replant as needed.  Determine cause of lack of vigor of vegetation and correct. Replant as needed. Remove cattails and compost off site. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.	
	Inlet/Outlet	Inlet/outlet area clogged with sediment and/or debris.		Remove clogging or blockage in the inlet and outlet areas.	
	Trash and Debris Accumulation	Any plastic, paper or other waste or debris.		No debris or sediment present. Remove trash and debris from wet biofiltration swale.	
	Erosion/ Scouring	Swale has eroded or scoured due to flow channelization, or higher flows.		No eroded or scoured areas in biofiltration swale.  Check design flows to ensure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as <i>Juncus effusus</i> (soft rush) in wet areas or snowberry ( <i>Symphoricarpos albus</i> ) in dryer areas.	

**Wet and Continuous Inflow Biofiltration Swales**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swale (continued)	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	

### 1i. Filter Strip (Basic and CAVFS)

A basic filter strip is a flat grassy area that provides treatment of unconcentrated sheet flow runoff from adjacent pavement. Can provide enhanced treatment for metals in runoff water when soil is amended with organic compost and grass is sufficiently dense.

<b>Filter Strip (basic and CAVFS)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.	
	Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.		Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3 to 4 inches.	
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.		No trash or debris present. Remove trash and debris from filter.	
	Erosion/ Scouring	Eroded or scoured areas due to flow channelization, or higher flows.		No eroded or scoured areas, cause of erosion or scour addressed. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.		Level the spreader and clean so that flows are spread evenly over entire filter width.	

### 1j. Sand Filter (above ground/open)

A typical open sand filter consists of a pretreatment system to remove sediments, a flow spreader, a sand bed, and underdrain piping. See also Sand Filter (belowground/closed).

Sand Filter (above ground/open)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment and Silt Accumulation on top layer	Sediment and silt depth exceeds 0.5 inch over 10 percent of surface area of sand filter.		No sediment deposit on grass layer of sand filter that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.		No trash or debris present. Trash and debris removed from sand filter bed.	
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.		Sediment removed from cleanouts and/or drainpipes.	
	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, flow through the overflow pipes occurs frequently, or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).	
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities. (Consider 4- to 8-hour drawdown tests).		Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.	
	Short Circuiting	Drawdown greater than 12 inches per hour. When flows become concentrated over one section of the sand filter rather than dispersed.		Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area. No leaks in the cleanouts or underdrains.	
	Erosion Damage to Slopes	Erosion over 2 inches deep where cause of damage is prevalent or potential for continued erosion is evident.		Slopes stabilized using proper erosion control measures.	
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.		Rock pad replaced or rebuilt to design specifications.	

**Sand Filter (above ground/open)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Aboveground (open sand filter) (continued)	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter. Rills and gullies on the surface of the filter can indicate improper function of the inlet flow spreader.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20 percent or any other failure to the piping.		Pipe repaired or replaced.	

### 1k. Sand Filter (below ground/closed)

Similar to an open sand filter, but installed below grade within a vault.

Sand Filter (below ground/closed)					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 0.5 inch.		No sediment deposits on sand filter section that would impede permeability of the filter section. Silt scraped off during dry periods using steel rakes or other devices. Surface layer of the media striated.	
	Sediment Accumulation in Presettling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of sediment zone plus 6 inches.		No sediment deposits in first chamber of vault.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Trash and debris removed from vault and inlet/outlet piping.	
	Sediment in Drain Pipes/ Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.		No sediment or debris present. Any sediment and debris removed from cleanouts and/or drainpipes.	
	Clogged Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently, and/or hydraulic conductivity is less than 1 inch per hour.		Sand filter infiltrates as designed. Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging and influent suspended solids loads (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material). <i>Other options include removal of thatch, aerating the filter surface, tilling the filter surface, replacing the top 4 inches of filter media, and inspecting geotextiles for clogging.</i>	
	Short Circuiting	Drawdown greater than 12 inches per hour. When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area. (Consider 4- to 8-hour drawdown tests.)		Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion. No leaks in the cleanouts or underdrains.	

**Sand Filter (below ground/closed)**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vault (continued)	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.		Cover repaired to proper working specifications or replaced.	
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Ventilation	Ventilation area blocked or plugged.		Blocking material removed/cleared from ventilation area. A specified percentage of the vault surface area must provide venting to the vault interior (per design specifications).	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Baffles/ Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.	
Pipes	Damaged Pipes	Inlet or outlet piping damaged or broken, in need of repair.		Pipe repaired and/or replaced.	

## 11. Media Filter Drains

A filter treatment device that is typically sited along highway side slopes (conventional design) and medians (dual media filter drains), borrow ditches, or other linear depressions. Media filter drains have basic components: a gravel no-vegetation zone, a grass strip, the MFD mix bed, and a conveyance system for flows leaving the media filter drain mix.

Media Filter Drains					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Erosion, Scour, or Vehicular Damage	No vegetation zone uneven or clogged so that flows are not uniformly distributed.		Area leveled and cleaned so that flows are spread evenly.	
	Sediment Accumulation on Edge of Pavement	Flows no longer sheet flowing off of roadway. Sediment accumulation on pavement edge exceeds top of pavement elevation.		No sediment accumulation on pavement edge that impedes sheet flow. Sediment deposits removed such that flows can sheet flow off of roadway.	
	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.		Sediment deposits removed, slope is re-leveled so that flows pass evenly through media filter drain.	
	Excessive Vegetation or Undesirable Species	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over or shades out desirable vegetation growth characteristics. See also the <a href="#">Thurston County Noxious Weeds List</a> .		Grass mowed and nuisance vegetation controlled such that flow not impeded. <i>Grass should be mowed to a height that encourages dense even herbaceous growth.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with suitable topsoil. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.</i>	
	Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.		No eroded or scoured areas. <i>For ruts or areas less than 12 inches wide, repair the damaged area by filling with suitable media. If bare areas are large, generally greater than 12 inches wide, the media bed should be re-graded.</i>	

### Media Filter Drains

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Media Bed	Sediment depth inhibits free infiltration of water.		Sediment accumulation does not impeded infiltration. Sediment deposits removed and slope is re-leveled so that flows pass freely through Media Bed.	
Underdrains	Sediment	Depth of sediment within perforated pipe exceeds 0.5 inch.		Depth of sediment within perforated pipe does not exceed 0.5 inch. Flush underdrains through access ports and collect flushed sediment.	
	Trash and Debris Accumulation	Accumulated trash and debris. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.		No trash or debris present. Remove trash and debris from media filter.	
	Flows are Bypassing Media Filter Drain	Evidence of significant flows downslope (rills, sediment, vegetation damage, etc.) of media filter drain.		Facility functions as designed. Sediment deposits removed and slope is re-leveled so that flows pass evenly through media filter drain. If media filter drain is completely clogged, it may require a more extensive repair or replacement.	
	Media Filter Drain Mix Replacement	Water is seen on surface of the media filter drain mix from storms that are less than the 91st percentile 24-hour rain event (approximately 1.25 inches in 24 hours). Maintenance also needed on a 10-year cycle and during a preservation project.		No water ponded on surface after design storm. <i>Excavate and replace all of the media filter drain mix contained within the media filter drain.</i>	

### 1m. Bioretention Cells, Swales, and Planter Boxes

Bioretention areas are shallow stormwater systems with a designed soil mix and plants adapted to the local climate and soil moisture conditions. They are designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. Most routine maintenance procedures are typical landscape care activities.

Bioretention Cells, Swales, and Planter Boxes					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
General	Trash	Trash and debris present.		No trash and debris present. Remove and properly dispose of all trash and debris.	
Concrete Sidewalls	Cracks or Failure in Concrete Planter Reservoir	Cracks wider than 0.5 inch or maintenance/inspection personnel determine that the planter is not structurally sound.		Concrete repaired or replaced.	
Rockery Sidewalls	Unstable Rockery	Rock walls are insecure.		Rockery sidewalls are stable (may require consultation with professional engineer, particularly for walls 4 feet or greater in height).	
		Erosion (gullies/rills) greater than 2 inches around inlets, outlet, and alongside slopes.		Source of erosion eliminated and damaged area stabilized (regrade, rock, vegetation, erosion control blanket). For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures are in place until permanent repairs can be made.	
		Erosion of sides causes slope to become a hazard.		The hazard is eliminated and slopes are stabilized.	
		Settlement greater than 3 inches (relative to undisturbed sections of berm).		The design height is restored with additional mulch.	
		Downstream face of berm or embankment wet, seeps or leaks evident.		Holes are plugged and berm is compacted. May require consultation with professional engineer, particularly for larger berms.	
		Any evidence of rodent holes or water piping around holes if facility acts as dam or berm.		Rodents (see "Pests: Insects/Rodents") removed and berm repaired/compacted.	
	Sediment or Debris Accumulation	Accumulation of sediment or debris to extent that infiltration rate is reduced (see "Ponded water") or surface storage capacity significantly impacted.		Sediment cleaned out to restore facility shape and depth. Damaged vegetation is replaced and mulched. Source of sediment identified and controlled (if feasible).	

## Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Leaf Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
	Basin Inlet via Surface Flow	Soil is exposed or signs of erosion are visible.		Erosion sources repaired and controlled.	
Curb Cut Inlet	Sediment or Debris Accumulation	Sediment, vegetation, or debris partially or fully blocking inlet structure.		Curb cut is clear of debris. Source of the blockage is identified and action is taken to prevent future blockages.	
	Water Not Properly Directed to Facility	Water is not being directed properly to the facility and away from the inlet structure.		Blocks are reconfigured to direct water to facility and away from structure.	
	Erosion	Water disrupts soil media.		Splashblock is reconfigure/repaired.	
	Damaged Pipe	Pipe is damaged.		Pipe is repaired/replaced. No cracks more than 0.25 inch wide at the joint of inlet/outlet pipes exist.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots or debris. Source of the blockage is identified and action is taken to prevent future blockages.	
Inlets/ Outlet and Access Pathways	Blocked Access	Maintain access for inspections.		Vegetation is cleared within 1 foot of inlets and outlets. Access pathways are maintained.	
Ponding Area	Erosion	Water disrupts soil media.		No eroded or scoured areas in bioretention area. Cause of erosion or scour addressed. A cover of rock or cobbles or other erosion protection measure maintained (e.g., matting) to protect the ground where concentrated water enters or exits the facility (e.g., a pipe, curb cut, or swale).	
	Trash or Debris Accumulation	Trash or debris present on trash rack.		No trash or debris on trash rack. Clean and dispose trash.	
	Damaged Trash Rack	Bar screen damaged or missing.		Barrier repaired or replaced to design standards.	
	Sediment or Debris Accumulation	Sediment, vegetation, or debris accumulated at or blocking (or having the potential to block) check dam, weir, or orifice.		Blockage is cleared. Identify the source of the blockage and take actions to prevent future blockages.	

<b>Bioretention Cells, Swales, and Planter Boxes</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Erosion	Erosion and/or undercutting is present.		No eroded or undercut areas in bioretention area. Cause of erosion or undercutting addressed. Check dam or weir is repaired.	
	Unlevel Top of Weir	Grade board or top of weir damaged or not level.		Weir restored to level position.	
	Sediment Accumulation	Sediment blocks 35 percent or more of ports/notches or, sediment fills 35 percent or more of sediment trap.		Sediment removed and disposed of.	
	Damaged or Unlevel Grade Board/Baffle	Grade board/baffle damaged or not level.		Board/baffle removed and reinstalled to level position.	
	Sediment or Debris Accumulation	Overflow spillway is partially or fully plugged with sediment or debris.		No sediment or debris in overflow.	
	Erosion	Native soil is exposed or other signs of erosion damage are present.		Erosion repaired and surface of spillway stabilized.	
	Missing Spillway Armament	Spillway armament is missing.		Armament replaced.	
Underdrain	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain. Prolonged surface ponding (see "Bioretention Soil").		Underdrains and orifice are free of sediment and debris.	
Bioretention Soil	Ponded Water	Excessive ponding water: Water overflows during storms smaller than the design event or ponded water remains in the basin 48 hours or longer after the end of a storm.		Cause of ponded water is identified and addressed: 1. Leaf or debris buildup is removed 2. Underdrain is clear 3. Other water inputs (e.g., groundwater, illicit connections) investigated 4. Contributing area verified If steps #1–4 do not solve the problem, imported bioretention soil is replaced and replanted.	
Bioretention Soil	Protection of Soil	Maintenance requiring entrance into the facility footprint.		Maintenance is performed without compacting bioretention soil media.	

## Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Bottom Swale and Upland Slope Vegetation	Less than 75 percent of swale bottom is covered with healthy/surviving vegetation.		Plants are healthy and pest free. Cause of poor vegetation growth addressed. Bioretention area is replanted as necessary to obtain 75 percent survival rate or greater. Plant selection is appropriate for site growing conditions.	
	Causing Problems for Operation of Facility	Large trees and shrubs interfere with operation of the basin or access for maintenance.		Trees and shrubs do not hinder facility performance or maintenance activities. Prune or remove large trees and shrubs.	
	Dead Trees and Shrubs	Standing dead vegetation is present.		Trees and shrubs do not hinder facility performance or maintenance activities. Dead vegetation is removed and cause of dead vegetation is addressed. Specific plants with high mortality rate are replaced with more appropriate species.	
Trees and Shrubs Adjacent to Vehicle Travel Areas (or areas where visibility needs to be maintained)	Safety Issues	Vegetation causes some visibility (line of sight) or driver safety issues.		Appropriate height for sight clearance is maintained. Regular pruning maintains visual sight lines for safety or clearance along a walk or drive. Tree or shrub is removed or transplanted if presenting a continual safety hazard.	
Emergent Vegetation	Conveyance Blocked	Vegetation compromises conveyance.		Sedges and rushes are clear of dead foliage.	
Mulch	Lack of Mulch	Bare spots (without much cover) are present or mulch covers less than 2 inches.		Facility has a maximum 3-inch layer of an appropriate type of mulch and mulch is kept away from woody stems.	
	Accumulation of Clippings	Grass or other vegetation clippings accumulate to 2 inches or greater in depth.		Clippings removed.	
	Weeds	Weeds are present (unless on edge and providing erosion control).		Weed material removed and disposed of. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Noxious Weeds	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. ( <i>Coordinate with Thurston County Health Department.</i> ) Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. (Apply requirements of adopted integrated pest management policies for the use of herbicides.) <i>Complete eradication of noxious weeds may not be possible.</i>	
	Adjacent Facilities Compromised	Low-lying vegetation growing beyond facility edge onto sidewalks, paths, or street edge poses pedestrian safety hazard or may clog adjacent permeable pavement surfaces due to associated leaf litter, mulch, and soil.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed at facility edge. Excessive leaf litter is removed.	
	Causes Facility to Not Function Properly	Excessive vegetation density inhibits stormwater flow beyond design ponding or becomes a hazard for pedestrian and vehicular circulation and safety.		Pruning and/or thinning vegetation maintains proper plant density and aesthetics. Plants that are weak, broken, or not true to form are removed or replaced in-kind. Appropriate plants are present.	
Irrigation (if any)	NA	Irrigation system present.		Manufacturer's instructions for O&M are met.	
Plant Watering	Plant Establishment	Plant establishment period (1–3 years).		Plants are watered as necessary during periods of no rain to ensure plant establishment.	
Summer Watering (after establishment)	Drought Period	Longer term period (3+ years).		Plants are watered as necessary during drought conditions and trees are watered up to 5 years after planting.	

### Bioretention Cells, Swales, and Planter Boxes

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Spill Prevention and Response	Spill Prevention	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures are implemented whenever handling or storing potential contaminants.	
	Spill Response	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
	Safety (slopes)	Erosion of sides causes slope to exceed 1:3 or otherwise becomes a hazard.		Actions taken to eliminate the hazard.	
	Safety (hydraulic structures)	Hydraulic structures (pipes, culverts, vaults, etc.) become a hazard to children playing in and around the facility.		Actions taken to eliminate the hazard (such as covering and securing any openings).	
	Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
	Edging	Grass is starting to encroach on swale.		Edging repaired.	
	Pests: Insects/Rodents	Pest of concern is present and impacting facility function.		Pests removed and facility returned to original functionality. Do not use pesticides or <i>Bacillus thuringiensis israelensis (Bti)</i> .	
	Mosquitoes	Standing water remains in the basin for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1n. Rain Gardens

Rain gardens are shallow stormwater systems with compost amended soil or imported rain garden or bioretention soil and plants adapted to the local climate and soil moisture conditions. They are similar in function to bioretention cells, but have less onerous design requirements and are generally applicable to smaller sites.

Rain Gardens					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Facility – General Requirements	Mosquitoes	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present. Rain garden drains freely and there is no standing water between storms. Cause of the standing water is addressed (see “Ponded Water”).	
	Trash	Trash and debris present.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Debris Accumulation	Accumulated leaves in facility.		No leaves clogging outlet structure or impeding water flow.	
Earthen Side Slopes and Berms	Erosion	Persistent soil erosion on slopes.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Rockery Sidewalls	Unstable Rockery	Rockery side walls are insecure.		Rockery sidewalls are stable (may require consultation with engineer, particularly for walls 4 feet or greater in height).	
Rain Garden Bottom Area	Sediment Accumulation	Visible sediment deposition in the rain garden that reduces drawdown time of water in the rain garden.		No sediment accumulation in rain garden, Source of sediment addressed.	
Mulch	Lack of Mulch	Bare spots (without mulch cover) are present or mulch depth less than 2 inches.		Facility has a minimum 2- to 3-inch layer of an appropriate type of mulch and is kept away from woody stems.	
Splashblock Inlet	Water Not Properly Directed to Rain Garden	Water is not being directed properly to the rain garden and away from the inlet structure. Water splashes adjacent buildings.		Blocks are reconfigured to direct water to rain garden and away from structure.	

<b>Rain Gardens</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipe Inlet/ Outlet	Erosion	Rock or cobble is removed or missing and concentrated flows are contacting soil.		No eroded or scoured areas. Cause of erosion or scour is addressed. Cover of rock or cobbles protects the ground where concentrated water flows into the rain garden from a pipe or swale.	
	Accumulated Debris	Accumulated leaves, sediment, debris or vegetation at curb cuts, inlet or outlet pipe.		Blockage is cleared.	
	Damaged Pipe	Pipe is damaged		Pipe is repaired/replaced.	
	Clogged Pipe	Pipe is clogged.		Pipe is clear of roots and debris.	
Access	Blocked Access	Maintain access for inspections.		Vegetation is cleared or transplanted within 1 foot of inlets and outlets.	
Ponded Water	Ponded Water	Excessive ponding water: Ponded water remains in the rain garden more than 48 hours after the end of a storm.		Rain garden drains freely and there is no standing water in the rain garden between storms. Leaf litter/debris/sediment is removed.	
Overflow	Blocked Overflow	Capacity reduced by sediment or debris.		No sediment or debris in overflow.	
	Blocking Site Distances and Sidewalks	Vegetation inhibits sight distances and sidewalks.		Sidewalks and sight distances along roadways and sidewalks are kept clear.	
	Vegetation Blocking Pipes	Vegetation is crowding inlets and outlets.		Inlets and outlets in the rain garden are clear of vegetation.	
	Unhealthy Vegetation	Yellowing: possible Nitrogen (N) deficiency Poor growth: possible Phosphorous (P) deficiency. Poor flowering, spotting or curled leaves, or weak roots or stems: possible Potassium (K) deficiency.		Plants are healthy and appropriate for site conditions.	
	Weeds	Presence of weeds.		Weeds are removed (manual methods preferred) and mulch is applied.	
Summer Watering (years 1-3)	Plant Establishment	Tree, shrubs and groundcovers in first 3 years of establishment period.		Plants are watered during plant establishment period (years 1-3).	
Summer Watering (after establishment)	Drought Conditions	Vegetation requires supplemental water.		Plants are watered during drought conditions or more often if necessary during post-establishment period (after 3 years).	

## 10. Trees

When designed in accordance with this Manual, trees can provide flow control via interception, transpiration, and increased infiltration. Most routine maintenance procedures are typical landscape care activities.

<b>Trees</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>✓ Check</b>	<b>What To Do for Desired Condition</b>	<b>✓ Done</b>
	Excess or Unhealthy Growth	Health of tree at risk, or tree in conflict with other infrastructure.		Tree pruned according to industry standards to promote tree health and longevity.	
	NA	Young tree (i.e., within first 3 years).		Tree provided with supplemental irrigation and fertilization (as needed) during first three growing seasons.	
	NA	Evidence of pest activity affecting tree health.		Pest management activities implemented to reduce or eliminate pest activity, and to restore tree health.	
	Dead or Declining	Dead, damaged or declining.		Tree is replaced per planting plan or acceptable substitute.	

## 1p. Permeable Pavement

Permeable pavement is a stormwater infiltration facility that is designed to accommodate pedestrian, bicycle, and auto traffic while allowing infiltration and storage of stormwater. Permeable pavement includes porous asphalt; pervious concrete; permeable pavers and aggregate pavers; and grid systems.

Permeable Pavement					
Drainage System Feature	Problem or Defect	Conditions To Check For	✓ Check	What To Do for Desired Condition	✓ Done
	Leaf and Debris Accumulation	Fallen leaves or debris.		Removed/disposed.	
	All Pavement Types	Sediment or debris accumulation between paver blocks, on surface of pavement, or in grid voids.		Sediment at surface does not inhibit infiltration. Remove/dispose of sediment.	
	Unstable Adjacent Area	Runoff from adjacent pervious areas deposits soil, mulch, or sediment on paving.		No deposited soil or other materials on permeable pavement or other adjacent surfacing. All exposed soils that may erode to pavement surface mulched and/or planted.	
	Wearing Course Covered by Adjacent Vegetation	Vegetation growing beyond facility edge onto sidewalks, paths, and street edge.		Vegetation does not impede function of adjacent facilities or pose as safety hazard. Groundcovers and shrubs trimmed to avoid overreaching the sidewalks, paths and street edge.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Conventional street sweepers equipped with vacuums, water, and brushes or pressure washer used to restore permeability. Vacuum or pressure wash the pavement two to three times annually.	
	NA	None. Maintenance to prevent clogging with fine sediment.		Use of sand and sealant application prohibited. Protect from construction runoff.	
	Cracks	Major cracks or trip hazards.		Potholes or small cracks filled with patching mixes. Large cracks and settlement addressed by cutting and replacing the pavement section.	
	NA	Utility cuts.		Any damage or change due to utility cuts replaced in kind.	
Interlocking Concrete Paver Blocks	Missing or Damaged Paver Block	Interlocking paver block missing or damaged.		Individual damaged paver blocks removed and replaced or repaired per manufacturer's recommendations.	

### Permeable Pavement

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Interlocking Concrete Paver Blocks (continued)	Settlement	Settlement of surface. When deviation from original grade impedes function.		Original grade re-established. May require resetting.	
	Void Material is Missing or Low	Loss of aggregate material between paver blocks.		Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Gravel	Loss of Aggregate Material in Paving Grid	Loss of aggregate material in grid.		Aggregate gravel level maintained at the same level as the plastic rings or no more than 0.25 inch above the top of rings. Refill per manufacturer's recommendations.	
Open-Celled Paving Grid with Grass	Lack of Grass Coverage	Loss of soil and/or grass material in grid.		Refill and/or replant per manufacturer's recommendations. Growing medium restored, facility aerated and reseeded or planted, and vegetated area amended as needed.	
	Pipe is Damaged	Pipe is damaged.		Pipe is repaired/replaced.	
	Pipe is Clogged	Pipe is clogged.		Roots or debris is removed.	
	Erosion	Native soil exposed or other signs of erosion damage present.		No eroded or scoured areas Cause of erosion or scour is addressed.	
Underdrain Pipe	Blocked Underdrain	Plant roots, sediment or debris reducing capacity of underdrain (may cause prolonged drawdown period).		Underdrains and orifice free of sediment and debris. Jet clean or rotary cut debris/roots from underdrain(s). If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.	
Spill Prevention and Response	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
Spill Prevention and Response (continued)	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	

## 1q. Vegetated Roofs

Vegetated roofs are areas of living vegetation installed on top of buildings, or other above-grade impervious surfaces. Design components vary depending on the vegetated roof type and site constraints, but may include a waterproofing material, a root barrier, a drainage layer, a separation fabric, a growth medium (soil), and vegetation.

Vegetated Roofs					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water is Not Infiltrating Properly	Water does not permeate growth media (runs off soil surface).		Facility infiltrates as designed. Aerate or replace media until stormwater infiltrates freely through growth media.	
	Water is Not Infiltrating Properly	Growth medium thickness is less than design thickness (due to erosion and plant uptake).		Facility infiltrates as designed. Supplement growth medium to design thickness.	
	Water is Not Infiltrating Properly	Fallen leaves or debris are present.		No leaves or debris present.	
	Erosion/ Scouring	Areas of potential erosion are visible.		Steps taken to repair or prevent erosion. Fill, hand tamp, or lightly compact, and stabilize with additional soil substrate/growth medium and additional plants.	
Erosion Control Measures	Erosion/ Scouring	Mat or other erosion control is damaged or depleted during plant establishment period.		Erosion control measures repaired/replaced until 90 percent vegetation coverage attained. Avoid application of mulch on extensive vegetated roofs.	
System Structural Components	Deteriorating Flashing, Gravel Stops, Utilities, or Other Structures on Roof	Flashing, utilities or other structures on roof are deteriorating (can serve as source of metal pollution in vegetated roof runoff).		Structural components inspected for deterioration or failure. Repair/replace as necessary.	
	Sediment, Vegetation, or Debris Accumulation	Sediment, vegetation, or debris blocks 20 percent or more of inlet structure.		Blockages cleared. Problems that led to blockage identified and corrected.	
	Damaged Inlet Pipe	Inlet pipe is in poor condition.		Repaired/replaced.	
	Clogged Inlet Pipe	Pipe is clogged.		Roots or debris removed.	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Vegetation	Plant Coverage	Healthy vegetative coverage falls below 90 percent (unless design specifications stipulate less than 90 percent coverage).		Bare areas planted with vegetation If necessary, install erosion control measures until percent coverage goal is attained.	
Vegetation (sedums)	NA	Extensive roof with low density sedum population.		Sedums are mulch mowed, creating cuttings from existing plants to encourage colonization.	
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> .		Eliminate danger of poisonous vegetation where maintenance personnel or the public might normally be. Completely remove invasive, noxious, or nonnative vegetation in accordance with applicable regulations. <i>(Coordinate with Thurston County Health Department.)</i> Do not spray chemicals on vegetation without guidance or city approval. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality. <i>(Coordinate with Thurston County Health Department.) Complete eradication of noxious weeds may not be possible.</i>	
	Presence of Weeds	Weeds are present.		Weed material removed and disposed of, with roots manually removed with pincer-type weeding tools, flame weeders, or hot water weeders as appropriate. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.	

## Vegetated Roofs

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Vegetation (extensive vegetated roof)	Under Fertilization	Poor plant establishment and possible nutrient deficiency in growth medium.		Organic debris allowed to replenish and maintain long-term nutrient balance and growth medium structure. Conduct annual soil test 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately.  Minimum amount slow-release fertilizer necessary to achieve successful plant establishment is applied. Apply fertilizer only after acquiring required approval from facility owner and operator. Note that extensive vegetated roofs are designed to require zero to minimal fertilization after establishment (excess fertilization can contribute to nutrient export).	
Vegetation (intensive vegetated roof)	Under Fertilization	Fertilization may be necessary during establishment period or for plant health and survivability after establishment.		Annual soil test conducted 2 to 3 weeks prior to the spring growth flush to assess need for fertilizer. Utilize test results to adjust fertilizer type and quantity appropriately. Apply minimum amount slow-release fertilizer necessary to achieve successful plant establishment. Apply fertilizer only after acquiring required approval from facility owner and operator. Intensive vegetated roofs may require more fertilization than extensive vegetated roofs.	
Vegetation (trees and shrubs on an intensive vegetated roof)	NA	Pruning as needed.		All pruning of mature trees performed by or under the direct guidance of an ISA certified arborist.	
Irrigation system (if any)	NA	Irrigation system is not working or routine maintenance is needed.		Manufacturer's instructions for O&M have been followed.	
	NA	Summer watering – Plant establishment period (1 to 2 years).		Watered weekly during periods of no rain to ensure plant establishment (30 to 50 gallons per 100 square feet).	

## Vegetated Roofs

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	NA	Summer watering – Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover (30 to 50 gallons per 100 square feet).	
	NA	Plant establishment period (1 to 2 years).		Watered deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist. Use soaker hoses or spot water with a shower type wand when irrigation system not present.	
Vegetation (intensive vegetated roof)	NA	Longer term period (2+ years).		Watered during drought conditions or more often if necessary to maintain plant cover.	
	NA	Storage or use of potential contaminants in the vicinity of facility.		Spill prevention measures exercised whenever handling or storing potential contaminants.	
	Release of Pollutants	Any evidence of contaminants such as oil, gasoline, concrete slurries, paint, etc.		Spills are cleaned up as soon as possible to prevent contamination of stormwater. No contaminants or pollutants present. <i>(Coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.)</i>	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants provided with proper training and a copy of the Maintenance and Source Control Manual.	
Safety	NA	Insufficient egress/ingress routes and fall protection.		Egress and ingress routes maintained to design standards and fire codes. Ensure appropriate fall protection.	
Aesthetics	Poor Aesthetics	Damage/vandalism/debris accumulation.		Facility restored to original aesthetic conditions.	
Pest Control	Mosquitoes	Standing water remains for more than three days following storms.		Standing water removed. Cause of the standing water identified, and appropriate actions taken to address the problem (e.g., aerate or replace medium, unplug drainage).	

### 1r. Downspout, Sheet Flow, Concentrated Flow Dispersion

Dispersion BMP components vary depending on the type of BMP used, but can consist of a gravel filled trench, splashblock, transition zone, vegetated flow path, berms, and/or slotted drains. Dispersion BMPs reduce peak flows by slowing stormwater runoff entering into the conveyance system, allowing for some infiltration, and providing some water quality benefits.

Downspout, Sheet Flow, Concentrated Flow Dispersion					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Water Directed Toward Building	Water is being directed towards building structure.		Water directed away from building structure.	
	Water Causing Erosion	Water disrupts soil media.		Blocks are reconfigured/repared and media is restored.	
Transition Zone	Erosion	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than 2 feet of width.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
Dispersion Trench	Concentrated Flow	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" from edge of trench; intent is to prevent erosion damage).		No debris on trench surface. Notched grade board or other distributor type is aligned to prevent erosion. Trench is rebuilt to standards, if necessary.	
	Accumulated Debris	Accumulated trash, debris, or sediment on drain rock surface impedes sheet flow from facility.		No trash or debris present. Removed and properly dispose of all trash and debris.	
	Vegetation Impeding Flow	Vegetation/moss present on drain rock surface impedes sheet flow from facility.		Freely draining drain rock surface.	
	Accumulated Debris in Drains	Accumulation of trash, debris, or sediment in roof drains, gutters, driveway drains, area drains, etc.		No trash or debris in roof drains, gutters, driveway drains, or area drains.	
	Accumulated Debris in Inlet Pipe	Pipe from sump to trench or drywell has accumulated sediment or is plugged.		No sediment or debris in inlet/outlet pipe screen or inlet/outlet pipe.	
	Damaged Pipes	Cracked, collapsed, broken, or misaligned drain pipes.		No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.	
Sump	Accumulated Sediment	Sediment in the sump.		Sump contains no sediment.	
	Hard to Open	Cannot be easily opened.		Access lid is repaired or replaced.	
	Buried	Buried.		Access lid functions as designed (refer to record drawings for design intent).	

### Downspout, Sheet Flow, Concentrated Flow Dispersion

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing Cover	Cover missing.		Cover is replaced.	
	Inadequate Rock Cover	Only one layer of rock exists above native soil in area 6 square feet or larger, or any exposure of native soil.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad is repaired/replaced to meet design standards.	
	Erosion	Erosion (gullies/rills) greater than 2 inches deep in dispersal area.		No eroded or scoured areas. Cause of erosion or scour is addressed.	
	Accumulated Sediment	Accumulated sediment or debris to extent that blocks or channelizes flow path.		No excess sediment or debris in dispersal area. Sediment source is addressed (if feasible).	
Ponded Water	Ponded Water	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.		System freely drains and there is no standing water in dispersion area between storms. The cause of the standing water (e.g., grade depressions, compacted soil) is addressed.	
	Plant Survival	Dispersal area vegetation in establishment period (1 to 2 years, or additional 3rd year) during extreme dry weather).		Vegetation is healthy and watered weekly during periods of no rain to ensure plant establishment.	
	Lack of Vegetation Allowing Erosion	Poor vegetation cover such that erosion is occurring.		Vegetation is healthy and watered. No eroded or scoured areas are present. Cause of erosion or scour is addressed. Plant species are appropriate for the soil and moisture conditions.	
	Vegetation Blocking Flow	Vegetation inhibits dispersed flow along flow path.		Vegetation is trimmed, weeded, or replanted to restore dispersed flow path.	
	Presence of Noxious Weeds	Any noxious or nuisance vegetation which may constitute a hazard to county personnel or the public.		Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where county personnel or the public might normally be.	
Pest Control	Mosquito Infestation	Standing water remains for more than three days following storms.		All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.	
Rodents	Presence of Rodents	Rodent holes or mounds disturb dispersion flow paths.		Rodents removed; holes are filled; and flow path is revegetated.	

## 1s. Downspout Infiltration

Downspout infiltration systems are trench or drywell designs intended only for use in infiltrating runoff from roof downspout drains.

Downspout Infiltration					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Inflow Disruption	Accumulated trash, debris, or sediment on drain rock surface impeding sheet flow into facility.		Sheet flow re-established. Material removed and disposed of in accordance with applicable solid waste requirements.	
	Inflow Disruption	Vegetation/moss present on drain rock surface impeding sheet flow into facility.		Material removed and sheet flow re-established.	
	Inflow Disruption	Water ponding at surface, or standing water in subgrade observation port.		Inflow to facility is consistent and no ponding is observed. Inlet piping is clear and/or rock or sand reservoirs have been replaced.	
	Conveyance Blockage	Accumulation of trash, debris, or sediment in roof drains, gutters, driveways drains, area drains, etc.		Conveyance systems are clear of debris and free-flowing.	
	Conveyance Blockage	Pipes to or from sump, trench, or drywell have accumulated sediment or is plugged.		Pipe systems are clear of debris and free-flowing.	
	Conveyance Damage	Pipes to or from sump, trench, or drywell is cracked, broken, or misaligned.		Pipe systems are undamaged and free-flowing.	
	Splash Pad Malfunction	Splash pad missing or damaged.		Splash pad installed and functioning correctly	
	Overflow	Water overflows from the gutter or downspout during rain.		First try cleaning out the gutter and downspouts. If this doesn't solve the problem, a larger drywell may be needed. Contact the city before changing the design or upgrading to a larger drywell.	
	Sediment in Sump	Excess sediment accumulate in sump.		Material removed and disposed of in accordance with applicable solid waste requirements.	
	Access Lid Problems	Access lid cannot be opened or is missing.		Access lid is functioning as designed. Refer to record drawings to confirm type, function, and required components.	

### Downspout Infiltration

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Roof	Moss	Moss and algae are taking over the shadier parts of the shingles.		Disconnect the flexible part of the downspout that leads to the drywell. Then perform moss removal as desired. Pressure wash or use fatty acid solutions instead of highly toxic pesticides or chlorine bleach. Install a zinc strip as a preventive.	

## 1t. Cisterns

Cisterns are designed to collect stormwater runoff from non-polluting surfaces (typically roofs), and to make use of the collected water. Reuse of the runoff can be for irrigation, potable, and non-potable uses, but requires different levels of storage and water quality treatment depending on the intended use.

Cisterns					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Debris Accumulation in Cistern	Debris has accumulated.		No debris in cistern. Remove and properly dispose of all debris.	
	Debris Accumulation in Gutter	Debris has accumulated.		No debris in cistern or gutters. Remove and properly dispose of all debris.	
	Debris Accumulation in Cistern	Screen has deteriorated.		Screen is in place and functions as designed.	
	NA	None. Preventive maintenance.		No debris in cistern or accumulated on screen. Remove and properly dispose of all debris.	
Low Flow Orifice	Cistern Overflows are too Frequent	Debris or other obstruction of orifice.		Low flow orifice is clean.	
	Overflow Pipe	Pipe is damaged.		Overflow pipe is watertight and does not leak. Repair/replace.	
	Overflow Pipe	Pipe is clogged.		Debris removed. Overflow pipe can convey overflow to point of discharge.	
Cistern	Accumulated Debris And/or Sediment	More than 6 inches of accumulation in bottom of cistern.		Accumulated debris and/or sediment removed.	
Training and Documentation	NA	Training/written guidance is required for proper O&M.		Property owners and tenants are provided with proper training and a copy of the Maintenance and Source Control Manual.	
Access and Safety	NA	Access to cistern required for maintenance or cleaning.		Any opening that could allow the entry of people is marked: "DANGER—CONFINED SPACE".	
Pest Control	Mosquito Infestation	Standing water remains for more than 3 days following storms.		All inlets, overflows, and other openings are protected with mosquito screens. No mosquito infestation present.	

## 1u. Fencing/Shrubbery Screen/Other Landscaping

Fencing, shrubbery screening, and landscaping provide flow control via interception, transpiration, and increased infiltration as well as slope protection. Most routine maintenance procedures are typical landscape care activities.

Fencing/Shrubbery Screen/Other Landscaping					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Missing or Broken Parts/Dead Shrubbery	Any defect in the fence or screen that permits easy entry to a facility.		Fence is mended or shrubs replaced to form a solid barrier to entry.	
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.		Soil under fence replaced so that no opening exceeds 4 inches in height.	
	Unruly Vegetation	Shrubbery is growing out of control or is infested with weeds. See also <a href="#">Thurston County Noxious Weeds List</a> .		Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.	
		Posts out of plumb more than 6 inches.		Posts plumb to within 1.5 inches of plumb.	
		Top rails bent more than 6 inches.		Top rail free of bends greater than 1 inch.	
		Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.		Fence is aligned and meets design standards.	
		Missing or loose tension wire.		Tension wire in place and holding fabric.	
		Missing or loose barbed wire that is sagging more than 2.5 inches between posts.		Barbed wire in place with less than 0.75-inch sag between posts.	
		Extension arm missing, broken, or bent out of shape more than 1.5 inches.		Extension arm in place with no bends larger than 0.75 inch.	
	Deteriorated Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.		Structurally adequate posts or parts with a uniform protective coating.	
Openings in Fabric	Openings in fabric are such that an 8-inch-diameter ball could fit through.		No openings in fabric.		

## 1v. Manufactured Media Filters

Manufactured media filters are installed below grade and usually consist of a two-chambered vault that include a presettling basin and a filter bed with sand or filter media. This filter is accessed through a manhole. **DO NOT ENTER ANY TANK OR VAULT** without proper training, certification and equipment.

Manufactured Media Filters					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Sediment Accumulation on Top of Filter Cartridges	Sediment accumulation exceeds 0.25 inches on top of cartridges.		No sediment deposits on top of cartridges. Sediment on cartridges likely indicates that cartridges are plugged and require maintenance.	
	Sediment Accumulation	Sediment accumulation in vault exceeds 6 inches. Look for other indicators of clogged cartridges or overflow.		No sediment accumulation in vault. <i>Sediment in vault should be removed. Cartridges should be checked and replaced or serviced as needed.</i>	
	Trash and Floatable Debris Accumulation	Trash and floatable debris accumulation in vault.		No trash or other floatable debris in filter vault.	
	Filter Cartridges Submerged	Filter vault does not drain within 24 hours following storm. Look for evidence of submergence due to backwater or excessive hydrocarbon loading.		Filter media checked and replaced if needed. <i>If cartridges are plugged with oil additional treatment or source control BMP may be needed.</i>	
	Sediment Accumulation	Sediment accumulation exceeds 6 inches or 33 percent (one third) of the available sump.		Sediment accumulation less than 6 inches.	
	Trash and Floatable Debris Accumulation	Trash and/or floatable debris accumulation.		No trash or other floatable debris accumulation in forebay. Trash and/or floatable debris should be removed during inspections. <i>Significant oil accumulation may indicate the need for additional treatment or source control.</i>	
Drain Pipes/ Cleanouts	Sediment in Drain Pipes/ Cleanouts	Accumulated sediment that exceeds 20 percent of the diameter.		No sediment or debris in drainpipes or cleanouts. Sediment and debris removed.	
Below ground Vault	Access Cover Damaged/ Not working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.		Cover repaired to proper working specifications or replaced.	

<b>Manufactured Media Filters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Below ground Vault (continued)	Damaged Pipes	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.		Pipe repaired or replaced.	
		Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault repaired or replaced so that vaults meets design specifications and is structurally sound.	
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of inlet/outlet pipe.	
	Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to design specifications.	
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.		Media cartridges replaced.	
	Short Circuiting	Flows do not properly enter filter cartridges.		Filter cartridges replaced.	

Designers must also review the most current manufacturer guidelines for any updates or additions to the following operation and maintenance requirements.

## **1w. Proprietary or Manufactured Products**

- As with other stormwater BMPs in this appendix, proper maintenance of proprietary products such as media filters or vegetation-based treatment technologies is critical to proper facility performance. Regular maintenance ensures proper functioning and keeps the facility aesthetically appealing. Many of the same inspection and maintenance procedures outlined for the facilities described in this appendix also apply to proprietary technologies.
- Designers must review and apply the most current manufacturer guidelines and recommendations for facility operation and maintenance.
- The City of Lacey will inspect proprietary products in accordance with the applicable inspection standards to ensure that maintenance is performed properly.

# **Group 2**

## *Structures & Pretreatment*

## 2a. Control Structures and Flow Restrictors

Flow control devices are usually placed within manholes, which may be locked. They typically consist of two pipes, one placed above the other. The lower pipe will typically have a cover and a small hole drilled in it to allow for slow release of water. The upper pipe is usually larger to provide an outlet for higher flows and emergency overflows.

Control Structures and Flow Restrictors					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Trash and Debris (includes sediment)	Material exceeds 25 percent of sump depth or 1 foot below orifice plate.		No trash or debris present. Control structure orifice is not blocked. Remove and properly dispose of all trash and debris.	
		Structure is not securely attached to manhole wall.		Securely attach structure to wall and outlet pipe.	
		Structure is not in upright position (more than 10 percent from plumb)		Restore structure to correct position.	
		Connections to outlet pipe are not watertight and show signs of rust.		Pipe connections are water tight; structure repaired or replaced and works as designed.	
		Any holes in structure (other than designed holes).		Structure has no holes other than designed holes.	
		Cleanout gate is not watertight or is missing.		Gate is watertight and works as designed.	
		Gate cannot be moved up and down by one maintenance person.		Gate moves up and down easily and is watertight.	
		Chain/rod leading to gate is missing or damaged.		Chain is in place and works as designed.	
		Gate is rusted over 50 percent of its surface area.		Gate is repaired or replaced to meet design standards.	
	Damaged or Missing	Control device is not working properly due to missing, displaced, or bent orifice plate.		Plate is in place and works as designed.	
	Obstructions	Trash, debris, sediment or vegetation blocking the plate.		Plate is free of all obstructions and works as designed.	
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.		Pipe is free of all obstructions and works as designed.	
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole access cover/lid is in place and secure.	

### Control Structures and Flow Restrictors

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole (continued)	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread (may not apply to self-locking lids)	<input type="checkbox"/>	Mechanism opens with proper tools.	<input type="checkbox"/>
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	<input type="checkbox"/>	Cover can be removed and reinstalled by one maintenance person.	<input type="checkbox"/>
	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.	<input type="checkbox"/>	Ladder meets design standards and allows maintenance persons safe access.	<input type="checkbox"/>
Catch Basin	See "Catch Basins"	See "Catch Basins."	<input type="checkbox"/>	See "Catch Basins."	<input type="checkbox"/>

## 2b. Catch Basins

These structures are typically located in the streets. The City of Lacey is responsible for routine maintenance of the pipes and structures in the public rights-of-way, while the property owner or homeowners association is responsible for maintenance of pipes and catch basins in private areas and for keeping the grates clear of debris in all areas.

<b>Catch Basins</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
		Trash, leaves or debris which is located immediately in front of the catch basin opening or is blocking inflow capacity of the basin by more than 10 percent.		Remove trash, leaves and debris located directly in front of catch basin or on grate.	
		Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches of clearance from the debris surface to the invert of the lowest pipe.		No trash or debris present. Remove and properly dispose of all trash and debris.	
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent (one-third) of its height.		Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).		Remove dead animals, etc., present within the catch basin.	
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6 inches of clearance from the sediment surface to the invert of lowest pipe.		No sediment in the catch basin.	
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (intent is to make sure no material is running into basin).		Top slab is free of holes and cracks.	

## Catch Basins

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
General (continued)	Structure Damage to Frame and/or Top Slab (continued)	Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached		Frame is sitting flush on the riser rings or top slab and firmly attached.	
		Maintenance person determines structure is unsound.		Basin replaced or repaired to design standard	
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Pipe regouted and secure at basin wall.	
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.		Replaced or repair to design standards.	
		Vegetation growing across and blocking more than 10 percent of the basin opening.		Remove vegetation blocking opening to basin.	
		Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.		No vegetation or root growth present.	
	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
		Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
Catch Basin Cover (continued)	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure.  (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

**Catch Basins**

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Ladder	Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.		Ladder meets design standards and allows maintenance persons safe access.	
	Grate Opening Unsafe	Grate with opening wider than 0.875 (7/8) inch.		Grate opening meets design standards.	
	Trash and Debris	Trash and debris that is blocking more than 20 percent of grate surface inletting capacity.		Grate free of trash and debris. Remove and properly dispose of all trash and debris.	
	Damaged or Missing	Grate missing or broken member(s) of the grate.		Grate is in place and meets design standards.	

**2c. Debris Barriers (trash racks)**

A metallic screen or similar structural device used to prevent debris from entering a pipe, spillway or other hydraulic structure.

<b>Debris Barriers (trash racks)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Trash and Debris	Trash or debris that is plugging more than 20 percent of the openings in the barrier.		Barrier cleared to receive design flow capacity.	
		Bars are bent out of shape more than 3 inches.		Bars in place with no bends more than 0.75 inch.	
		Bars are missing or entire barrier missing.		Bars in place according to design.	
		Bars are loose and rust is causing 50 percent deterioration to any part of barrier.		Barrier replaced or repaired to design standards.	
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe.		Barrier firmly attached to pipe.	

## 2d. Energy Dissipaters

Typically a rock splash pad at a pipe end or other discharge location, to reduce the velocity and energy of flowing water and prevent erosion. Other means of energy dissipation include drop manholes, stilling basins, and check dams.

<b>Energy Dissipaters</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
<b>External:</b>					
	Missing or Moved Rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil.		Rock pad replaced to design standards.	
	Erosion	Soil erosion in or adjacent to rock pad.		Rock pad replaced to design standards.	
	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20 percent of the design depth.		Pipe cleaned/flushed so it matches design.	
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.		Trench redesigned or rebuilt to standards. Water discharges from feature by sheet flow.	
	Perforations Plugged	Over half of perforations in pipe are plugged with debris and sediment.		Perforated pipe cleaned or replaced. Perforations freely discharge flow.	
	Water Flows Out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.		Facility rebuilt or redesigned to standards. No flow discharges from distributor catch basin.	
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.		No danger of landslides.	
<b>Internal:</b>					
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 50 percent of original size or any concentrated worn spot exceeding 1 square foot, which would make structure unsound.		Structure replaced to design standards. Structure in no danger of failing.	

## Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Trash and Debris	Trash or debris (in basin) that exceeds 60 percent of the sump depth as measured from bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6-inch clearance from the debris surface to the invert of the lowest pipe.	<input type="checkbox"/>	No trash or debris present. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Trash or debris in any inlet or outlet pipe blocking more than 33 percent of its height.	<input type="checkbox"/>	Inlet and outlet pipes free of trash or debris. Remove and properly dispose of all trash and debris.	<input type="checkbox"/>
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	<input type="checkbox"/>	Remove dead animals, etc., present within the catch basin.	<input type="checkbox"/>
	Sediment	Sediment (in basin) exceeds 60 percent of sump depth as measured from the bottom of basin to invert of lowest pipe into or out of basin, but in no case less than a minimum of 6-inch clearance from the sediment surface to the invert of lowest pipe.	<input type="checkbox"/>	No sediment in the catch basin.	<input type="checkbox"/>
		Top slab has holes larger than 2 square inches or cracks wider than 0.25 inch (Intent is to make sure no material is running into basin).	<input type="checkbox"/>	Top slab is free of holes and cracks.	<input type="checkbox"/>
		Frame not sitting flush on top slab, i.e., separation of more than 0.75 inch of the frame from the top slab. Frame not securely attached	<input type="checkbox"/>	Frame is sitting flush on the riser rings or top slab and firmly attached.	<input type="checkbox"/>
		Maintenance person determines structure is unsound.	<input type="checkbox"/>	Basin replaced or repaired to design standard	<input type="checkbox"/>
		Grout fillet has separated or cracked wider than 0.5 inch and longer than 1 foot at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.	<input type="checkbox"/>	Pipe regROUTED and secure at basin wall.	<input type="checkbox"/>
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	<input type="checkbox"/>	Replaced or repair to design standards.	<input type="checkbox"/>

### Energy Dissipaters

Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
Manhole/ Chamber (continued)	Contamination and Pollution	Presence of contaminants such as oil, gasoline, concrete slurries, paint, obnoxious color, odor, or sludge.		Locate the source of the pollution and remove contaminants or pollutants present. <i>Report and coordinate source control, removal, and/or cleanup with City of Lacey Spill Response Team (360) 491-5644, Moderate Risk Waste Program at Thurston County Environmental Health (360) 754-4111, and/or Dept. of Ecology Spill Response (800) 424-8802.</i>	
	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		Catch basin cover is in place and secured.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5 inch of thread.		Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)		Cover can be removed by one maintenance person.	

## 2e. Baffle Oil/Water Separators (API type)

An underground vault or tank designed to separate oil from runoff water via baffles.

<b>Baffle Oil/Water Separators (API type)</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear without thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth.		Remove sediment deposits that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulations at the surface of the water or 6 inches of sludge in the sump.		Extract oil from vault by vactoring. Disposal must be in accordance with state and local rules and regulations. No visible oil depth on water.	
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.		Pipe repaired or replaced.	
	Access Cover Damaged/ Not Working	Cover cannot be opened, corrosion/deformation of cover.		Cover repaired to proper working specifications or replaced.	
		Maintenance person determines structure is unsound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
		Grout fillet has separated or cracked wider than 0.5 inch at the joint of any inlet/outlet pipe, or any evidence of soil entering basin.		Top slab is free of holes and cracks.	
	Baffles	Baffles corroding, cracking, warping and/or show signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not securely attached to structure wall, missing rungs, cracks, or misaligned.		Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection.	

## 2f. Coalescing Plate Oil/Water Separators

An underground vault or tank designed to separate oil from runoff water via gravity.

Coalescing Plate Oil/Water Separators					
Drainage System Feature	Problem or Defect	Conditions To Check For	√ Check	What To Do for Desired Condition	√ Done
	Dirty Discharge Water	Inspect discharge water for obvious signs of poor water quality.		Effluent discharge from vault should be clear with no thick visible sheen.	
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.		Remove sediment deposits on vault bottom and plate media that would impede flow through the vault and reduce separation efficiency.	
	Trash and Debris	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.		No trash or debris present. Remove and properly dispose of all trash and debris from vault and inlet/outlet piping.	
	Oil Accumulation	Oil accumulation at the water surface.		Oil is extracted from vault using vactoring methods. Dispose of in accordance with state and local rules and regulations.  Coalescing plates are cleaned by thoroughly rinsing and flushing. Direct wash-down effluent to the sanitary sewer system where permitted. There should be no visible oil depth on water.	
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.		A portion of the media pack or the entire plate pack is replaced depending on severity of failure.	
	Damaged Pipes	Inlet or outlet piping damaged or broken or in need of repair.		Pipe repaired and or replaced.	
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.		Baffles repaired or replaced to specifications.	
	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.		Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	

### Coalescing Plate Oil/Water Separators

<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Structure (continued)	Vault Structure Damage – Includes Cracks. Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.		Replace or repair ladder so it meets specifications and is safe to use as determined by inspection.	

## 2g. Catch Basin Inserts

A structure within a catch basin, with a filter containing a pollutant-removal medium. Generally considered as an alternative to oil-water separators, these are not commonly used for permanent installations, as they tend to be maintenance-intensive.

<b>Catch Basin Inserts</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.		No sediment cap on the insert media and its unit.	
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.		No trash or debris present. Runoff freely flows into catch basin. Remove and properly dispose of all trash and debris removed from insert unit.	
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.		Effluent water from media insert is free of oils and has no visible sheen.	
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.		Remove and replace media insert.	
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.		Remove and replace media insert.	
	Media Insert Use Beyond Normal Product Life	Media has been used beyond the typical average life of media insert product.		Remove and replace media at regular intervals, depending on insert product.	

# **Group 3**

## ***Miscellaneous Facilities & Features***

### 3a. Conveyance Pipes, Culverts, Ditches, and Swales

These features contain and direct the flow of water from one location to another.

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Pipes	Sediment, Debris, and Vegetation	Accumulated sediment should not exceed 20 percent of the diameter of the pipe. Vegetation should not reduce free movement of water through pipes. Ensure that the protective coating is not damaged or rusted. Dents should not significantly impede flow. Pipe should not have major cracks or flaws allowing water to leak out.		Clean out pipes of all sediment and debris. Remove all vegetation so that water flows freely through pipes. Repair or replace pipe.	
	Trash and Debris	There should not be any yard waste or litter in the ditch.		No trash or debris present. Remove and properly dispose of all trash and debris.	
	Sediment Buildup	Accumulated sediment should not exceed 20 percent of the depth of the ditch.		Clean out ditch of all sediment and debris.	
	Overgrowth of Vegetation	Check for vegetation (e.g., weedy shrubs or saplings) that reduces the free movement of water through ditches or swales.		Clear blocking vegetation so that water moves freely through the ditches. Grassy vegetation should be left alone.	
	Erosion	Check around inlets and outlets for signs of erosion. Check slopes for signs of sloughing or settling. Action is needed where eroded damage is over 2 inches deep and where there is potential for continued erosion.		Eliminate causes of erosion. Stabilize slopes by using the appropriate erosion control procedure (e.g., compact the soil, plant grass, reinforce with rock).	
	Missing Rocks	Native soil beneath the rock splash pad, check dam, or lining should not be visible.		Replace rocks to design standard.	
Swales	Vegetation	Grass cover is sparse and weedy, or areas are overgrown with woody vegetation.		Aerate soils and re-seed and mulch bare areas. Keep grass less than 8 inches high. Remove woody growth, re-contour and re-seed as necessary.	

<b>Conveyance Pipes, Culverts, Ditches, and Swales</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
Swales (continued)	Homeowner Conversion	Swale has been filled in or blocked by shed, woodpile, shrubbery, etc.		Speak with the homeowner and request that the swale area be restored. Contact the city to report the problem if not rectified voluntarily.	
	Swale Does Not Drain	Water stands in the swale, or flow velocity is very slow. Stagnation occurs.		A survey may be needed to check grades. Grades should be in 1 to 5 percent range if possible. If grade is less than 1 percent, underdrains may need to be installed.	

### 3b. Access Roads and Easements

These features provide access to drainage facilities for inspection and/or maintenance.

<b>Access Roads and Easements</b>					
<b>Drainage System Feature</b>	<b>Problem or Defect</b>	<b>Conditions To Check For</b>	<b>√ Check</b>	<b>What To Do for Desired Condition</b>	<b>√ Done</b>
General	Access	Check to determine if there is adequate access to your stormwater facilities for maintenance vehicles.		If there is not adequate access, check with the city to determine whether an easement exists. If so, a maintenance road may need to be constructed there.	
	Blocked Roadway	Debris that could damage vehicle tires (glass or metal).		Clear all potentially damaging material.	
	Blocked Roadway	Any obstructions that reduce clearance above and along the road to less than the required width (minimum of 15 feet).		Clear above and along roadway so there is enough clearance.	
Road Surface	Bad Road Conditions	Check for potholes, ruts, mushy spots, or woody debris that limits access by maintenance vehicles.		Add gravel or remove wood as necessary.	
Shoulders and Ditches	Erosion	Check for erosion along roadway.		Repair erosion with additional soil or gravel.	

## Glossary of Stormwater Terms

**Best Management Practices (BMPs)** – Structural features or procedures that reduce the adverse impacts of development on the quantity and/or quality of runoff water.

**Biofilter (Swale)** – A wider and flatter vegetated version of a ditch over which runoff flows at a uniform depth and velocity. Biofilters perform best when vegetation has a thick mat of roots, leaves, and stems at the soil interface (such as grass).

**Biofiltration** – The process through which pollutant concentrations in runoff water are reduced by filtering runoff through vegetation.

**Buffer** – The zone along a sensitive area that provides protection and stability for the area's functioning. As an integral part of a stream or wetland ecosystem, the buffer provides shading, slope and bank stabilization, and input of organic debris and coarse sediments to streams. It allows room for variation in aquatic system boundaries (due to hydrologic or climatic effects), attenuation of surface water flows from precipitation and stormwater runoff, habitat for wildlife, and protection from harmful disturbance or intrusion by humans or domestic animals.

**Catch Basin** – An inlet box set into the ground, usually rectangular and made of concrete, capped with a grate that allows stormwater to enter. A sump in the bottom catches sediment.

**Check Dam** – A dam (of rock, logs, etc.) built in a gully or drainage channel to reduce flow velocity, minimize erosive scouring, promote sediment deposition, and/or enhance infiltration.

**Compost Stormwater Filter** – A treatment facility that removes sediment and pollutants from stormwater by percolating water through a layer of specially-prepared Bigleaf Maple compost. Clean water exits the bottom of the facility through a pipe, while stormwater flows in excess of the facility design overflow the compost bed and bypass the facility.

**Constructed Wetland** – A wet pond with dead storage at various depths and planted with wetland plants to enhance its treatment capabilities.

**Control Structure or Flow Restrictor** – A manhole and/or pipe structure with a flow-regulating or metering device such as a weir or plates with small holes known as orifices. The structure controls the rate at which water leaves the pond.

**Conveyance** – A mechanism or device for transporting water, including gutters, pipes, channels (natural or man-made), culverts, manholes, etc.

**Critical Areas** – Areas such as wetlands, streams, steep slopes, etc., as defined by ordinance or resolution by the jurisdiction. Also known as environmentally-sensitive areas.

**Culvert** – A conveyance device (e.g. concrete, metal or plastic pipe) which conveys water from a ditch, swale, or stream under (usually across) a roadway, driveway or embankment.

**Dead Storage** – The volume of storage in a pond below the outlet which does not drain after a storm event. This pool provides treatment of the stormwater by allowing sediments to settle out.

**Detention Facility** – A facility (e.g. a pond, vault, or pipe) in which surface water or stormwater is temporarily stored.

**Detention Pond** – A detention facility in the form of an open pond.

**Dispersion Trench** – An open-top trench filled with rip rap or gravel that takes the discharge from a pond, spreads it out, and spills (bubbles) the flow out along its entire length. Dispersion trenches are used to simulate “sheet flow” of stormwater from an area, and are often used to protect sensitive areas.

**Drainage System** – A combination of facilities for the collection, conveyance, containment, treatment, discharge and/or disposal of stormwater runoff.

**Drop Structure** – A structure for dropping water to a lower elevation and/or dissipating energy. A drop may be vertical or inclined.

**Dry Pond** – A detention facility that drains completely after a storm. This type of pond has a pipe outlet at the bottom.

**Easement** – A legal encumbrance placed against a property’s title to reserve access. Drainage easements typically provide access to pipes and/or ponds, and are generally 15 to 20 feet wide.

**Emergency Overflow or Spillway** – An area on the top edge of a pond that is slightly lower in elevation than areas around it and is normally lined with riprap for erosion protection. The emergency overflow is used only if the primary and secondary outlets of the pond fail, in the event of extreme storms or if the infiltration capability of the pond becomes significantly diminished. If the emergency overflow ever comes into play, it may mean that the pond needs to be upgraded.

**Energy Dissipater** – A rock pad at an outlet (of a pipe, channel, etc.) designed to slow the flow velocity, spread out the water leaving the outlet, and reduce the potential for erosion.

**Freeboard** – The vertical distance between the design high water mark and the top of a pond (or other structure). Most ponds have one to two feet of freeboard to prevent them from overflowing.

**Infiltration** – The soaking of water through the soil surface into the ground (percolation is essentially the same thing). Many ponds are designed to infiltrate or retain stormwater, and thus do not have a regularly used discharge pipe.

**Infiltration Facility (or Structure)** – A facility (pond or trench) which retains and percolates stormwater into the ground, having no discharge (to any surface water) under normal operating conditions.

**Junction** – Point where two or more drainage pipes or channels converge (e.g. a manhole).

**Jurisdiction** – Lacey, Olympia, Tumwater, or Thurston County (as applicable).

**Lined Pond or Conveyance** – A facility, the bottom and sides of which have been made impervious (using, for example, a plastic liner or clay/silt soil layer) to the transmission of liquids.

**Live Storage** – The volume of storage in a pond above the outlet, which drains after a storm event. This storage capacity provides flood control and habitat protection for nearby streams.

**Manhole** – A larger version of the catch basin, often round with a solid lid. Manholes allow access to underground pipes (such as storm sewers) for maintenance.

**Natural Channel** – A stream, creek, river, lake, wetland, estuary, gully, swale, ravine or any open conduit where water will concentrate and flow intermittently or continuously.

**Oil-Water Separator** – A structure or device used to remove oil and greasy solids from water. They operate by using gravity separation of liquids that have different densities. Many catch basins have a down-turned plastic elbow that provides some oil-water separation.

**Outfall** – The point where water flows from a man-made conduit, channel, or drain into a water body or other natural drainage feature.

**Retention Facility** – A facility that is designed to retain water and allow for infiltration.

**Retention Pond** – A retention facility that is an open basin or “pond.”

**Revetments** – Materials such as rock or keystones used to sustain an embankment, such as in a retaining wall.

**Riprap** – Broken rock, cobbles, or boulders placed on earth surfaces, such as on top of a berm for the emergency overflow, along steep slopes, or at the outlet of a pipe, for protection against the erosive action of water. Also used for entrances to construction sites, to prevent sediment tracking.

**Runoff** – The portion of water originating as precipitation that becomes surface flow. See “stormwater” below.

**Sand Filter** – A treatment facility that removes pollutants and sediments from stormwater by percolating stormwater through a layer of sand. Clean water exits the bottom of the facility through a pipe.

**Stormwater** – The portion of precipitation that falls on property and that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes or other features into a defined surface water body or a constructed infiltration facility. Stormwater includes wash-down water and other wastewater that enters the drainage system.

**Swale** – A shallow surface drainage conveyance with relatively gentle side slopes, generally with flow depths less than 1 foot. Essentially a broad, flat-bottomed ditch. See “biofilter.”

**Trash Rack or Bar Screen** – A device (usually a screen or bars) that fits over a pipe opening to prevent large debris such as rocks or branches from entering and partially blocking the pipe.

**Wet Pond** – A stormwater treatment pond designed with a “dead storage” volume to maintain a continuous or seasonal static water level below the pond outlet elevation.