

## **Bioretention Best Management Practice - Operation and Maintenance Manual**

\_\_\_\_\_ agrees to keep maintenance records on the bioretention best management practice(s) located on the \_\_\_\_\_ site. The maintenance records shall be kept at the site in a set location, and shall be made available to the City of Hickory upon request. Any deficiencies found during inspections of the bioretention best management practice(s) shall be corrected, repaired, or replaced immediately.

Important operation and maintenance procedures:

1. Immediately after the bioretention cell is established, the plants shall be watered twice weekly if necessary until the plants become established (commonly six weeks).
2. Snow, mulch, or other material shall NEVER be piled on the surface of the bioretention cell.
3. Heavy equipment shall NEVER be driven over the bioretention cell.
4. Special care shall be taken to prevent sediment from entering the bioretention cell.
5. Once every two years, a soil test of the soil media shall be conducted.

After the bioretention cell is established, \_\_\_\_\_ shall be responsible to perform the following inspection activities. Any deficiencies found during inspections of the bioretention best management practice(s) shall be corrected, repaired, or replaced immediately.

### **I. Monthly or after every 1-inch rainfall, whichever comes first:**

- a. Inspect the bioretention area for proper drawdown or evidence of clogging.
- b. Remove trash and debris from bioretention area.
- c. Clear trash and debris from catch basin grates, bottom of catch basin, and check outlet pipe for clogging.
- d. Check the condition of the plants and replace as necessary. Remove weeds and unwanted vegetation. Reshape mulch to repair voids and washed out areas.
- e. Check for soil erosion on perimeter slopes in bioretention or contributing areas and repair eroded areas before the next rainfall.
- f. Check for evidence of sediment in the bioretention area and remove sediment.
- g. Check the condition of the gravel verge and clean/replace as necessary.
- h. Mow the perimeter slopes and surrounding area.
- i. Check the condition of the inlet and outlet pipes, grassed swales, and dissipaters.

### **II. Annually**

- a. Prune plants according to best professional practices.
- b. Renew mulch to 3-inch depth. Replace mulch every 3 years.
- c. Perform soil testing every 2 years to determine P-index and pH.

### **III. General**

- a. All components of bioretention area to be kept in working order.
- b. This property and bioretention area are also subject to the Operation and Maintenance Agreement filed in relation to this project.
- c. Table 1 below contains potential problems and the remedial actions to be taken.

**Table 1 – Potential Problems and Remedial Actions**

<b>BMP Element</b>	<b>Potential Problems</b>	<b>Remedial Action</b>
Entire BMP	Trash/debris is present	Remove the trash/debris.
Perimeter of the bioretention cell	Areas of bare soil and/or erosive gullies are present	Regrade the soil if necessary to remove the gullies and then plant ground cover. Provide lime and fertilizer if necessary. Water if necessary until ground cover is reestablished.
Pipe Inlet	Pipe is clogged.	Unclog the pipe and dispose of the material properly.
Pipe Inlet	Pipe is cracked or damaged.	Repair or replace.
Swale Inlet	Erosion is occurring in the swale.	Regrade the swale if necessary. Install turf matting if necessary. Reestablish ground cover. Determine if rip rap is needed to avoid future erosion.
Stone Verge	Stone verge is clogged or covered in sediment.	Remove sediment and stone and replace with clean stone. Dispose of waste material off-site.
Pretreatment Area	Flow is bypassing the pretreatment area and/or gullies have formed	Regrade if necessary to route all flow to the pretreatment area. Restablize the area after grading.
Pretreatment Area	Sediment accumulation is visible.	Search for source of the sediment and remedy the problem. Remove the sediment and restablize the pretreatment area. Dispose of sediment off-site.
Pretreatment Area	Erosion has occurred.	Provide additional erosion control protection such as reinforced turf matting or riprap if needed to prevent future erosion problems.
Pretreatment Area	Weeds are present.	Remove the weeds.
Forebay	Rip rap is clogged with sediment.	Search for source of the sediment and remedy the problem. Remove the sediment and replace the rip rap if necessary. Dispose of sediment off-site.
Bioretention Cell - Vegetation	Puning is needed to maintain plant health.	Prune according to best professional practices.

<b>BMP Element</b>	<b>Potential Problems</b>	<b>Remedial Action</b>
Bioretention Cell - Vegetation	Plants are dead, dying, or diseased.	Determine the source of the problem. Is it soils, disease, etc.? Remedy the problem and replace the plants. If a soil test indicates it is necessary, provide a one-time fertilizer application to establish the plants.
Bioretention Cell - Vegetation	Tree stakes and wires are present six months after planting.	Remove the tree stakes and wires.
Bioretention Cell – Mulch	Mulch is breaking down or has floated away.	Spot mulch if there are only random void areas. Replace whole mulch layer if necessary by removing the remaining mulch and replacing it with triple shredded hardwood mulch at a maximum depth of three inches.
Bioretention Cell – Soil Media	Soil media is clogged with sediment.	Determine the extent of the clogging. Remove and replace as much of the soil media as necessary. Dispose of sediment off-site. Search for the source of the sediment and remedy the problem if possible.
Bioretention Cell – Mulch	Mulch is clogged with sediment.	Remove as much of the mulch as necessary and replace it with triple shredded hardwood mulch at a maximum depth of the three inches. Dispose of the mulch off-site. Search for the source of the sediment and remedy the problem if possible.
Bioretention Cell – Soil Media	A soil test shows that the pH has dropped.	Dolomitic lime shall be applied as recommended by the soil test report.

<b>BMP Element</b>	<b>Potential Problems</b>	<b>Remedial Action</b>
Bioretention Cell – Soil Media	A soil test indicates that heavy metals have accumulated in the soil media.	Toxic soils shall be removed , disposed of properly off-site, and replaced with new soil media.
Underdrain System	Clogging has occurred.	Wash out the underdrain system.
Drop Inlet	Clogging has occurred.	Clean out the drop inlet and dispose of sediment off-site.
Flow splitting structure	Orifice is clogged.	Unclog the orifice.
Outlet	Erosion at the outlet.	Repair the eroded area as necessary.