Scheduling Maintenance for Filtration Practices

1) Has visual inspection been conducted on this location before?

It is important to determine whether this location has been previously assessed so that assessment efforts are cost effective (i.e., neither duplicated nor wasted). If previous assessment has occurred, the current assessment should verify that actions suggested by the previous assessment were completed and are effective.

2) Has it rained within the last 48 hours at this location?

Many filtration practices are designed to drain the design storm volume (i.e., water quality volume, maximum storage volume) within 48 hours (Minnesota Stormwater Manual). Assessing a filtration practice within 48 hours of a rainfall event may provide additional assessment clues than assessment during a long dry period. Additionally, rainfall within the last 48 hours at a location will alter how answers to other questions in this assessment are interpreted.

3) Does this filtration practice utilize any pretreatment practices upstream?

If any pretreatment practices exist they should also be inspected and maintained on a regular basis.

4) Access

Access to the areas upstream and downstream of the site as well as the site itself is needed in order to properly assess the practice. This is true regardless of the level of assessment applied.

5b) Are any of the inlet structures clogged?

Inlet structures should be free of any debris, sediment, vegetation, and other obstructions so that stormwater runoff can enter the filtration practice as designed. If an inlet structure is even partially clogged, suspended solids may be deposited in the upstream conveyance system or upstream areas may flood because the conveyance systems are limited by such obstructions. Any obstructions should be removed immediately to ensure proper operation of the filtration practice.

5c) Are any of the inlet structures askew or misaligned from the original design or otherwise in need of maintenance?

Misaligned inlet structures often allow stormwater runoff to enter or exit a filtration practice by means other than those intended by design or prevent stormwater runoff from entering the filtration practice at all. This condition can result in erosion, channelization, or flooding of surrounding areas, which can further exacerbate the misalignment or create other problems.

Inlet structures can become misaligned for several reasons, including frost heave of the soil, vehicular collision, and geotechnical failure. Misaligned inlet structures should be repaired or replaced as soon as possible to reduce detrimental impact. Any obstructions should be removed immediately to ensure proper operation of the infiltration practice.

Other issues requiring maintenance include large cracks in concrete structures, corrosion, dents or malformation of the structure, etc.

6) Is there standing water in the filtration practice?

Standing water in a filtration practice is the result of one of three possibilities: (1) rainfall has occurred recently such that stormwater runoff has not had 48 hours to pass through the filter, (2) the filtration rate of the practice is slow such that stormwater runoff does not pass through the filter within 48 hours, but does pass through the filter given enough time, or (3) the filter is clogged and does not filter any stormwater runoff. If it has rained in the last 48 hours (question 2), then the

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filtration practice may be functioning properly and requires additional assessment (level 2 or greater). If, however, it has not rained in the last 48 hours, it is likely that the filtration practice is affected by possibility (2) or (3), as described above.

Question 6a provides clues that may determine whether the filtration practice is clogged. Surface sheen is caused by hydrocarbon substances such as automotive oil or gasoline and may indicate illicit discharges. If hydrocarbons are not illegally discharged into the filtration practice, then a surface sheen may indicate that stormwater runoff is stored in the filtration practice such that the small amounts of hydrocarbons typically found in stormwater runoff are accumulating. If this is happening, then the filtration practice is failing. There are several illicit discharge manuals available for identifying, locating, and eliminating illicit discharges (e.g., Brown et al. 2004).

Stormwater runoff with a murky color is evidence of a large suspended solids concentration that is most likely made up of fine particle sizes such as clays and silts because sand particles settle out of standing water rapidly (as discussed in Sedimentation). Stormwater runoff with a murky color further indicates that the watershed may be a significant source of fine particle suspended solids, which can clog a filtration practice.

Stormwater runoff with a green color from algae has been stored in the filtration practice for a long period of time such that microorganisms have developed. The filtration practice is not filtering stormwater runoff and is therefore failing.

7) Is there evidence of illicit storm sewer discharges?

An illicit discharge manual (e.g., Brown et al. 2004) should be consulted for identifying and locating illicit stormwater discharges.

8) What is the approximate percentage of vegetation coverage in the practice?

Vegetation in the bottom of filtration practice can reduce its effectiveness. Plants lose approximately 30% of their root structures annually, which produces macropores. Macropores in a filtration practice often result in short circuiting of stormwater runoff and minimal sediment removal efficiency. Vegetation does, however, reduce overland flow velocities and can therefore reduce erosion and resuspension of captured solids. It can also maintain or increase filtration rates, because of the macropores, while reducing the effectiveness of filtration. There are both positives and negatives to deep-rooted vegetation in the bottom of the filtration practice. The positives, in general, outweigh the negatives because it is important to maintain filtration capacity.

9) Are there indications of any of the following in the bottom of the filtration practice?

Sediment deposition may indicate that pretreatment devices have reached sediment storage capacity, are not efficiently removing settable solids, or are not present. Sediment deposition may also indicate a significant source of sediment in the watershed that may require remediation to prevent downstream pollution. Sediment deposition limits the filtration practice surface area available for filtration and therefore can reduce the rate at which stormwater runoff volume is treated.

Erosion or channelization indicates that flow velocities entering, or in, the filtration practice are large or that stormwater runoff is entering the filtration practice by means other than those intended by design. Erosion and channelization can reduce filtration media depth and therefore reduce the practice’s effectiveness.

Excessive or undesirable vegetation, especially with deep roots, can cause short-circuiting or damage the subsurface collection system in a filtration practice. If the surface of the filtration practice becomes clogged or sealed, shallow root vegetation can provide pathways for stormwater runoff to reach the filter media below the surface for treatment. Vegetation in filtration practices should be controlled such that deep root vegetation does not damage the collection system or allow stormwater to short-circuit through the practice.

Bare soil or lack of healthy vegetation significantly different from the original design may indicate that the filtration practice is not operating properly. For example, if the filter was designed to include vegetation and that vegetation has died or is
unhealthy, it could indicate standing water has remained in the pond for excessively long time periods. This may also be indicated if the plants are transitioning from the original vegetation to wetland species.

Litter and debris in a filtration practice are indications that pretreatment practices are failing or not present. Litter and debris may limit the effectiveness of filtration practices by reducing the surface available for filtering stormwater runoff.

10) Are there indications of any of the following on the banks of the filtration practice?

Erosion or channelization on the banks of a filtration practice indicates that stormwater runoff is entering at a large velocity by means other than those intended by design. Erosion and channelization on the banks can fill the filtration practice with sediment from the bank and subsequently reduce the practice’s effectiveness by clogging the media and reducing the volume available for stormwater storage.

Soil slides or bulges indicate that the soil is, or potentially will be, unstable and further sliding or bulging may lead to complete bank failure. If this occurs the filtration unit could become completely clogged and the collapsed soil could be washed downstream.

Animal burrows may also lead to soil failure and clogging of the filter as described in the previous paragraph.

Seeps and wet spots indicate subsurface flow into the filter and could lead to soil slides or erosion and channelization on the banks of the practice.

Poorly vegetated areas can lead to increased erosion, which can clog the filter and lead to the collapse of the bank.

Trees on constructed slopes can damage the filtration practice and the loss of leaves in the autumn can lead to clogging of the filter. Also, the root system, if extensive enough, cannot only provide pathways for stormwater to bypass the filter, but it can also damage the filter's structural integrity and post-filter collection system.

11) Is the bottom of the filtration practice covered with a layer of silts, clays, or both?

A visible layer of silts, clays, or both is an indication that the filter media may be clogged. Filtration practices collect particles in the pore spaces of the media. If silts, clays, or both are present on the surface of the filter, the pore spaces within the filter media may be full. Additionally, silts, clays, or both present on the surface of the filter indicates that stormwater runoff is stored in the filtration practice long enough for these fine particles to settle out or for the stored stormwater runoff to evaporate and infiltrate into the surrounding soils.

12) Are any outlet structures or the emergency spillway clogged?

Like an inlet structure, the outlet structure should be free of any debris, sediment, vegetation, and other obstructions so that stormwater runoff can easily exit the filtration practice. If the outlet structure is partially or completely clogged, the filtration rate may be limited and stormwater runoff may not pass through the filtration practice in less than 48 hours, as recommended by design (Minnesota Stormwater Manual). Any obstructions should be removed immediately to ensure proper operation of the filtration practice.

12b) Is the outlet structure askew or misaligned from the original design or otherwise in need of maintenance?

Misaligned outlet structures often allow stormwater runoff to enter or exit a filtration practice by means other than those intended by design or prevent stormwater runoff from entering the filtration practice at all. This condition can result in erosion, channelization, or flooding of surrounding areas, which can further exacerbate the misalignment or create other problems.
Outlet structures can become misaligned for several reasons, including frost heave of the soil, vehicular collision, and geotechnical failure. Misaligned outlet structures should be repaired or replaced as soon as possible to reduce detrimental impact.

Other issues requiring maintenance include large cracks in concrete structures, corrosion, dents or malformation of the structure, etc.

13) Is there evidence of any of the following downstream of the outlet structure?

Conditions downstream of a filtration practice can provide evidence of the function of the practice itself. Properly designed and functioning filtration practices remove a large percentage of suspended solids from stormwater runoff. Sediment deposition downstream of a filtration practice indicates that erosion is occurring between the filtration practice and the sediment deposition or that sediments are present in the filtration practice effluent. If sediments are present in the effluent such that downstream deposition is occurring, the geotextile fabric or the subsurface collection system is likely failing. The filtration practice could require complete replacement to repair this problem.

Erosion downstream of a filtration practice indicates that flow velocities are larger than the conveyance channel can withstand. Stormwater runoff filters slowly through filtration practices and therefore downstream erosion is usually only a problem for large filtration practices that treat large volumes of stormwater runoff. Downstream erosion can be mitigated by reconstructing the conveyance such that erosion does not occur (i.e., riprap, concrete), or energy dissipaters should be installed to reduce the flow velocities (i.e., check dams).

14) Inspector's Recommendations. When is maintenance needed?

Maintenance is needed "before the next rainfall" for:
- Completely clogged inlet or overflow
- Standing water more than 48 hours after runoff has entered the practice (determine the cause)
- Significant erosion on the banks or within the basin
- Damaged/misaligned/askew inlet or overflow such that flooding or structural instability of adjacent roadways or infrastructure may result

Maintenance is needed "before the next rainy season" for:
- Partially clogged inlet or overflow
- Misaligned inlet or overflow structures that have resulted in some erosion
- Significant sediment deposition or a layer of silts or clays (capacity testing for scheduling)
- Litter, large debris, and solid waste
- Sediment deposition downstream of the practice
- Erosion downstream of the practice
- Evidence of illicit discharge
- Excessive or invasive vegetation

Maintenance is needed "within a year or two" for:
- Misaligned inlet/outlet structures that have not resulted in erosion
- Some sediment deposition (capacity testing for scheduling)

References
