## Visual Inspection for Sedimentation Practices

Visual inspection is a rapid assessment procedure for qualitatively evaluating the functionality of a stormwater best management practice (BMP). Visual inspections use a set of criteria that, under certain circumstances (described in chapter 3), determine if the stormwater BMP is malfunctioning. Detailed instructions for visual inspection of sedimentation practices are included below and reproduced in appendix B, part 3, which can be easily printed out and taken to the field.

## *Scheduling Maintenance for Dry Ponds*

The following section provides discussion about each question answered on the field data sheet above.

**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 dry ponds are designed to drain the design storm volume (i.e., water quality volume, maximum storage volume) within 48 hours (Minnesota Stormwater Steering Committee 2005). Assessing a dry pond 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) 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.

**4b)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 easily enter the dry pond. 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 dry pond.

**4c)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 dry pond by means other than those intended by design or prevent stormwater runoff from entering the dry pond 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 dry pond.

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

**5)Is there standing water in the dry pond?**

Standing water in a dry pond 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 dry pond, (2) the treatment rate of the dry pond is slow such that stormwater runoff does not pass through the dry pond within 48 hours, but does pass through the dry pond given enough time, or (3) the outlet structure is clogged and does not allow any stormwater runoff to exit the dry pond. If it has rained in the last 48 hours (question 2), then the dry pond may be functioning properly and requires additional assessment (level 2 or higher). If, however, it has not rained in the last 48 hours, it is likely that the dry pond is either option (2) or (3).

Question 3a provides clues that may determine whether the outlet structure of the dry pond is clogged. Surface sheen is caused by hydrocarbon substances such as automotive oil or gasoline and may indicate illicit discharges. If hydrocarbons are proven not to be illegally discharged into the dry pond, then a surface sheen may indicate that stormwater runoff is stored in the dry pond such that the small amounts of hydrocarbons typically found in stormwater runoff are accumulating. If this is happening, then the dry pond 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 very rapidly (as discussed in Chapter 10, Sedimentation).

Stormwater runoff with a murky color can indicate that the watershed is a significant source of fine particle suspended solids, which can quickly clog a dry pond. Murky stormwater runoff in a dry pond may indicate that stormwater runoff has recently entered the dry pond such that fine particles have not had time to settle out.

Stormwater runoff with a green color from algae or biological activity has been stored in the dry pond for a long period of time such that microorganisms have developed. Stormwater runoff is not passing though the dry pond properly and therefore the practice is failing.

**6)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.

**7)Are there indications of any of the following in the bottom of the dry pond?**

Sediment deposition may indicate either a significant source of sediment in the watershed that may require remediation to prevent downstream pollution or that the dry pond has not been recently maintained. Sediment deposition reduces the stormwater storage volume of a dry pond and can allow sediments to become resuspended during subsequent storm events.

Erosion or channelization indicates that flow velocities entering, or in, the dry pond are large or that stormwater runoff is entering the dry pond by means other than those intended by design. Erosion and channelization can reduce treatment by sedimentation within a dry pond by reducing the retention time within the pond. Additionally, previously captured sediments can become entrained by poorly or untreated stormwater and pass through the dry pond with the effluent.

Vegetation, especially with deep roots, can increase and maintain infiltration rates in dry ponds that do not have impermeable surfaces (e.g., concrete). If the surface of the dry pond becomes clogged or sealed, vegetation can provide pathways for stormwater runoff to penetrate the surface and subsequently infiltrate into the underlying soils, increasing runoff volume reduction by the dry pond. Excessive vegetation, if greater than the optimal vegetative density, can negatively impact the performance of the system. Thus, vegetation in dry ponds should only be controlled to reduce the plant density or if it is undesirable for aesthetic or nuisance reasons.

Bare soil or lack of healthy vegetation significantly different from the original design may indicate that the dry pond is not operating properly. For example, if the dry pond 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 dry pond are indications that pretreatment practices are failing or not present. Litter and debris may limit the effectiveness of a dry pond by reducing the stormwater storage volume and therefore the retention time.

**8)Are there indications of any of the following on the banks of the dry pond?**

Erosion or channelization on the banks of a dry pond 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 dry pond with sediments from the bank and subsequently reduce the dry pond's effectiveness by reducing the volume available for stormwater storage and treatment.

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 dry pond could lose infiltration capacity and the collapsed soil could be washed downstream.

Animal burrows may also lead to soil failure and have the same affect as described in the previous paragraph.

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

Poorly vegetated areas can lead to increased erosion and lead to the collapse of the bank.

Trees on constructed slopes can cause soil instability and the loss of leaves in the autumn can lead to clogging of inlet and outlet structures. Also, the root system, if extensive enough, can damage inlet and outlet structures.

**9)Are any outlet or overflow structures 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 dry pond. If the outlet structure is partially or completely clogged, the treatment rate may be limited and stormwater runoff may not pass through the dry pond in less than 48 hours, as recommended by design (Minnesota Stormwater Steering Committee 2005). Any obstructions should be removed immediately to ensure proper operation of the dry pond.

**10)Are any outlet or overflow structures 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 dry pond by means other than those intended by design or prevent stormwater runoff from entering the dry pond 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. Any obstructions should be removed immediately to ensure proper operation of the dry pond.

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

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

Conditions downstream of a dry pond can provide evidence of the function of the pond itself. Properly designed and functioning dry ponds should remove most sand-sized particles (0.125 to 2 mm) from stormwater runoff. Sediment deposition downstream of a dry pond indicates that erosion is occurring between the dry pond and the sediment deposition or that sediments are present in the dry pond effluent. If sediments are present in the effluent such that downstream deposition is occurring, the dry pond is likely failing.

Erosion downstream of a dry pond indicates that flow velocities are larger than the conveyance channel can withstand. The conveyance channel should be resized to accommodate the amount of flow exiting

the dry pond, or the channel should be augmented with energy dissipaters or riprap to reduce or eliminate the impact of erosion.

**13) 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 (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

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


Brown, E., D. Caraco, and R. Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessment. Center for Watershed Protection, Ellicott City, MD.

Minnesota Stormwater Steering Committee. 2005. The Minnesota Stormwater Manual. Developed by Emmons and Olivier Resources for the Stormwater Steering Committee, Minnesota Pollution Control Agency, St. Paul, MN. http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html

## *Scheduling Maintenance for Wet Ponds*

The following section provides discussion about each question answered on the field data sheet above.

**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 wet ponds are designed to drain the design storm volume (i.e., water quality volume, maximum storage volume) and return to normal water surface level within 48 hours (Minnesota Stormwater Steering Committee 2005). Assessing a wet pond 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)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.

**4b)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 easily enter the wet pond. 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 wet pond.

**4c)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 wet pond by means other than those intended by design or prevent stormwater runoff from entering the wet pond 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 wet pond.

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

**5)How many cells are in the wet pond system?**

Wet ponds are often designed as multi-cell systems to increase treatment and retention time. It is important to recognize multi-cell systems and perform this visual inspection on each of the cells in the system to ensure the entire practice is functioning properly.

**5a)Does the water in the pond have:**

Surface sheen is caused by hydrocarbon substances such as automotive oil or gasoline and may indicate illicit discharges. If hydrocarbons are proven to not be illegally discharged into the wet pond, then small amounts of hydrocarbons typically found in stormwater runoff are accumulating and remediation may be necessary to maintain the water quality of the stored runoff and prevent downstream pollution. 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 high 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 very rapidly (as discussed in Chapter 10, Sedimentation). Stormwater runoff with a murky color also indicates that the watershed may be a significant source of fine particle suspended solids or that erosion is suspending fine sediments from within the wet pond. Murky color in a wet pond further indicates that significant turbulence may be preventing suspended particles from settling. If a rainfall event has occurred in the last 48 hours, this may not be a problem. If rainfall has not occurred in the last 48 hours, murky color may be an indication of illicit discharge.

Stormwater runoff with a green color from algae or biological activity is not uncommon in a wet pond. Wet ponds with excessive algal or biologically activity may require maintenance to prevent pollution of downstream receiving waters.

Invasive, tolerant fish species like carp (*Cyprinus carpio*) or shiner minnows (*Notropiscornutus*) are indications of poor water quality in the wet pond (low dissolved oxygen, turbid, limited habitat) such that tolerant and invasive species are present. More information should be gathered to determine the cause of the poor water quality, and remediation should be performed.

**6)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.

**7)Does the wet pond smell like gasoline or oil?**

If a wet pond smells like gasoline or oil it is possible that hydrocarbon substances such as automotive oil or gasoline are being illicitly discharged into the practice or upstream in the watershed. If hydrocarbons are proven not to be illegally discharged into the wet pond, then an oil/gasoline smell may indicate that small amounts of hydrocarbons typically found in stormwater runoff are accumulating in the wet pond. For more information on identifying, locating, and eliminating illicit discharges refer to a manual such as Brown et al. (2004).

**8)Are there indications of any of the following in the bottom of the wet pond?**

Sediment deposition may indicate either a significant source of sediment in the watershed that may require remediation to prevent downstream pollution or that the wet pond has not been recently maintained. Sediment deposition reduces the stormwater storage volume of a wet pond and can allow sediments to become resuspended during subsequent storm events.

Vegetation, especially with deep roots, can increase and maintain infiltration rates in wet ponds that do not have impermeable surfaces (e.g., concrete). If the surface of the wet pond becomes clogged or sealed, vegetation can provide pathways for stormwater runoff to penetrate the surface and subsequently infiltrate into the underlying soils, increasing runoff volume reduction by the wet pond. Excessive vegetation, if greater than the optimal vegetative density, can negatively impact the performance of the system. Thus, vegetation in wet ponds should only be controlled to reduce the plant density or if it is undesirable for aesthetic or nuisance reasons.

Bare soil or lack of healthy vegetation significantly different from the original design may indicate that the wet pond is not operating properly. For example, if the wet pond was designed to include vegetation and that vegetation has died or is unhealthy, it could indicate that the wet pond is not operating as designed.

Litter and debris in a wet pond are indications that pretreatment practices are failing or not present. Litter and debris may limit the effectiveness of wet pond by reducing the stormwater storage volume and therefore the retention time.

**9)Are there indications of any of the following on the banks of the wet pond?**

Erosion or channelization on the banks of a wet pond 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 wet pond with sediments from the bank and subsequently reduce the volume available for stormwater storage and treatment.

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 dry pond could lose infiltration capacity and the collapsed soil could be washed downstream.

Animal burrows may also lead to soil failure and have the same affect as described in the previous paragraph.

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

Poorly vegetated areas can lead to increased erosion and lead to the collapse of the bank.

Trees on constructed slopes can cause soil instability and the loss of leaves in the autumn can lead to clogging of inlet and outlet structures. Also, the root system, if extensive enough, can inhibit the proper operation of inlet and outlet structures.

**10)Are any outlet or overflow structures clogged?**

Like an inlet structure, the outlet or overflow structures should be free of any debris, sediment, vegetation, and other obstructions so that stormwater runoff can easily exit the wet pond. If the outlet structure is partially or completely clogged, the treatment rate may be limited and stormwater runoff may not pass through the wet pond in less than 48 hours, which can result in flooding or untreated stormwater runoff passing as overflow. Any obstructions should be removed immediately to ensure proper operation of the wet pond.

**10b)Are any of the outlet or overflow structures 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 wet pond by means other than those intended by design or prevent stormwater runoff from entering the wet pond 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. Any obstructions should be removed immediately to ensure proper operation of the wet pond.

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

**11)Is there evidence of any of the following downstream of the outlet structure:**

Conditions downstream of a wet pond can provide evidence of the function of the pond itself. Properly designed and functioning wet ponds should remove most sand-sized particles (0.125 to 2 mm) from stormwater runoff. Sediment deposition downstream of a wet pond indicates that erosion is occurring between the wet pond and the sediment deposition or that sediments are present in the wet pond effluent. If sediments are present in the effluent such that downstream deposition is occurring, the wet pond is likely failing.

Erosion downstream of a wet pond indicates that flow velocities are larger than the conveyance channel can withstand. The conveyance channel should be resized to accommodate the amount of flow exiting the wet pond, or the channel should be augmented with energy dissipaters or riprap to reduce or eliminate the impact of erosion.

**12) Inspector's Recommendations. When is maintenance needed?**

Maintenance is needed “before the next rainfall” for:

- Completely clogged inlet or overflow
- 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 (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


Brown, E., D. Caraco, and R. Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessment. Center for Watershed Protection, Ellicott City, MD.

Minnesota Stormwater Steering Committee. 2005. The Minnesota Stormwater Manual. Developed by Emmons and Olivier Resources for the Stormwater Steering Committee, Minnesota Pollution Control Agency, St. Paul, MN. http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html

## *Scheduling Maintenance for Underground Sedimentation Devices*

The following section provides discussion about each question answered on the field data sheet above.

**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?**

Some underground sedimentation devices are designed to drain the design storm volume (i.e., water quality volume, maximum storage volume) and return to normal water surface level within 48 hours. Assessing an underground sedimentation device 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)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.

**4b)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 easily enter the underground device. 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 underground sedimentation device.

**4c)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 underground device by means other than those intended by design or prevent stormwater runoff from entering the underground sedimentation device 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 and geotechnical failure. Misaligned inlet 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.

**5)Is a significant amount of water entering the underground sedimentation device?**

Water entering an underground sedimentation device can be an indication that either (1) rainfall has occurred recently and the device is treating stormwater runoff or (2) water is entering the stormwater conveyance system from a leak, spill, or surface application (e.g., lawn watering, etc.).

**6)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.**

**7)Are there excessive amounts of solids, non-floating debris, vegetation, or other objects that could be hindering performance or be re-suspended and exit the system during subsequent runoff events?**

Excessive amounts of solids, debris, vegetation, or other objects in an underground sedimentation device can reduce storage volume and subsequently treatment efficiency. Maintenance should be preformed to remove these obstructions.

7b)

If the unit has any cracks, leaks, or joint failures, or any other avenues for water to pass, stormwater may be prematurely exiting the system or groundwater may be infiltrating into the unit. In both cases the unit is not operating as designed. The unit may also not be performing as designed if it is corroded, has dents or other abnormalities on interior components, or if the orientation of any components deviates from their original alignment.

**8) Are any outlet structures 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 underground sedimentation device. If the outlet structure is partially or completely clogged, the treatment rate may be limited and stormwater runoff may not pass through the underground sedimentation device quickly, resulting in potential flooding of surrounding areas or conveyance systems, or untreated stormwater runoff bypassing the underground sedimentation device. Any obstructions should be removed immediately to ensure proper operation of the underground sedimentation device.

**8b)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 an underground sedimentation device by means other than those intended by design or prevent stormwater runoff from entering the underground sedimentation device 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 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.

**9)Is there evidence of any of the following downstream of the outlet structure:**

Conditions downstream of an underground sedimentation device can provide evidence of the function of the practice itself. Properly sized and functioning wet vaults or proprietary devices should remove most sand-sized particles (0.125 to 2 mm) from stormwater runoff. Sediment deposition downstream of an underground sedimentation device indicates that erosion is occurring between the underground sedimentation device and the sediment deposition or that sediments are present in the underground sedimentation device effluent. The sediment storage capacity of the underground sedimentation device may have been reached and maintenance may be required to remove captured sediments.

Erosion downstream of an underground sedimentation device indicates that flow velocities are larger than the conveyance channel can withstand. The conveyance channel should be resized to accommodate the amount of flow exiting the underground sedimentation device, or the channel should be augmented with energy dissipaters or riprap to reduce or eliminate the impact of erosion.

**10) Inspector's Recommendations. When is maintenance needed?**

Maintenance is needed “before the next rainfall” for:

- Completely clogged inlet or overflow
- Structural instability of the practice
- 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 (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
- Leaks, Leaking pipes, or manholes
- Significant cracks, joint failures, corrosion

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

Brown, E., D. Caraco, and R. Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessment. Center for Watershed Protection, Ellicott City, MD.