Maintaining Your Stormwater Management Structure

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MARYLAND

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This manual is directed at commercial property managers who own stormwater management structures. The purpose of this manual is to describe the four types of stormwater management structures and their maintenance requirements.

Stormwater management structures are designed to collect and control precipitation and slowly release it into nearby streams. Uncontrolled stormwater can deeply erode tree-lined and meandering waterways, expose underground sewage lines, and destroy wildlife habitats.

The four major types of structures that manage stormwater are: stormwater management ponds (dry and wet), infiltration trenches, oil and grit separators, and underground storage structures. These structures are designed to control the quantity and/or quality of the stormwater that drains into the waterways. It is not unusual for multiple types of stormwater structures to be used at a site.

Howard County Code Section 18.905 states that private property owners are responsible for maintaining their own stormwater management structures. Owners should have a maintenance program that addresses every component of the stormwater structure, so that the system does not lose its intended capability to manage stormwater. This manual describes the different types of stormwater structures and their maintenance requirements. Maintenance needs will vary for different types of structures. Therefore, private owners will need to contact knowledgeable contractors and consultants for complicated maintenance and repair work.

Stormwater Management Structures

Dry Stormwater Management Ponds

Dry stormwater management ponds are man-made basins which temporarily hold stormwater after a storm and then remain dry the remainder of the time. Dry ponds control the quantity of stormwater that enters nearby streams or rivers. Prior to the mid-1980's, dry ponds represented the most common type of stormwater management facility in Howard County. (See figure 1.)

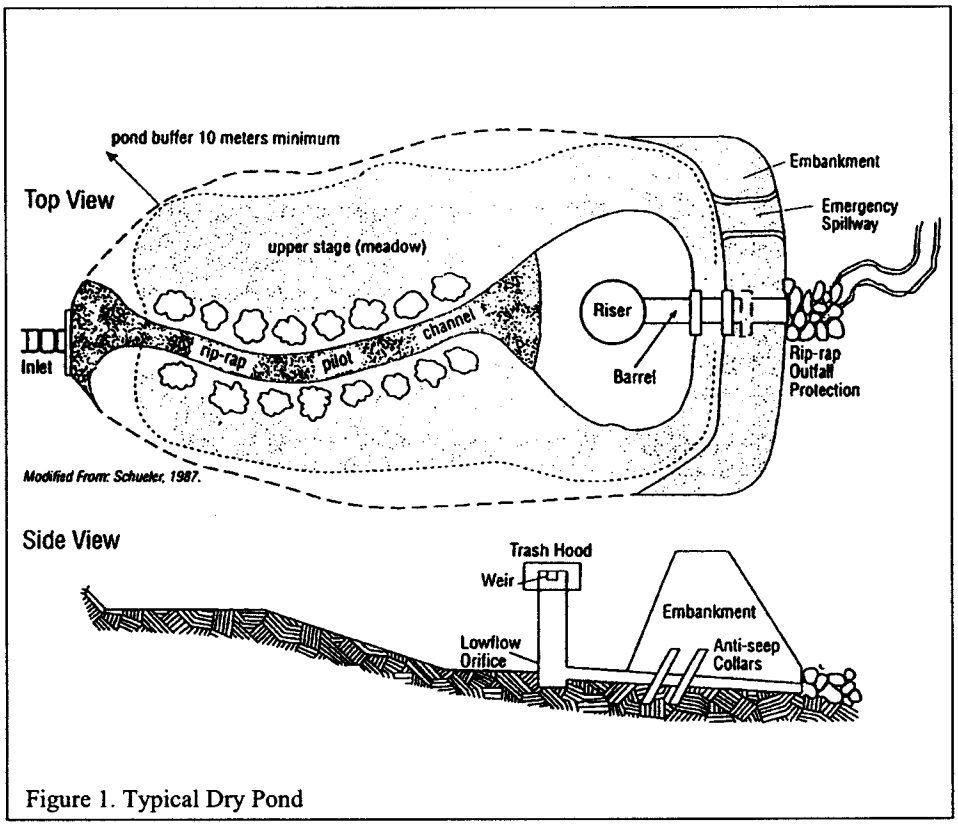


Figure 1. Typical Dry Pond

Wet Stormwater Management Ponds

Wet stormwater management ponds are man-made basins that contain permanent pools of water that function much like natural ponds. The wet pond is designed to permanently hold stormwater and slowly release it into nearby rivers and streams through an outlet device that discharges the water at a controlled rate. Over time, this permanent pool can develop into an aquatic ecosystem or wetland. (See Figure 2.)

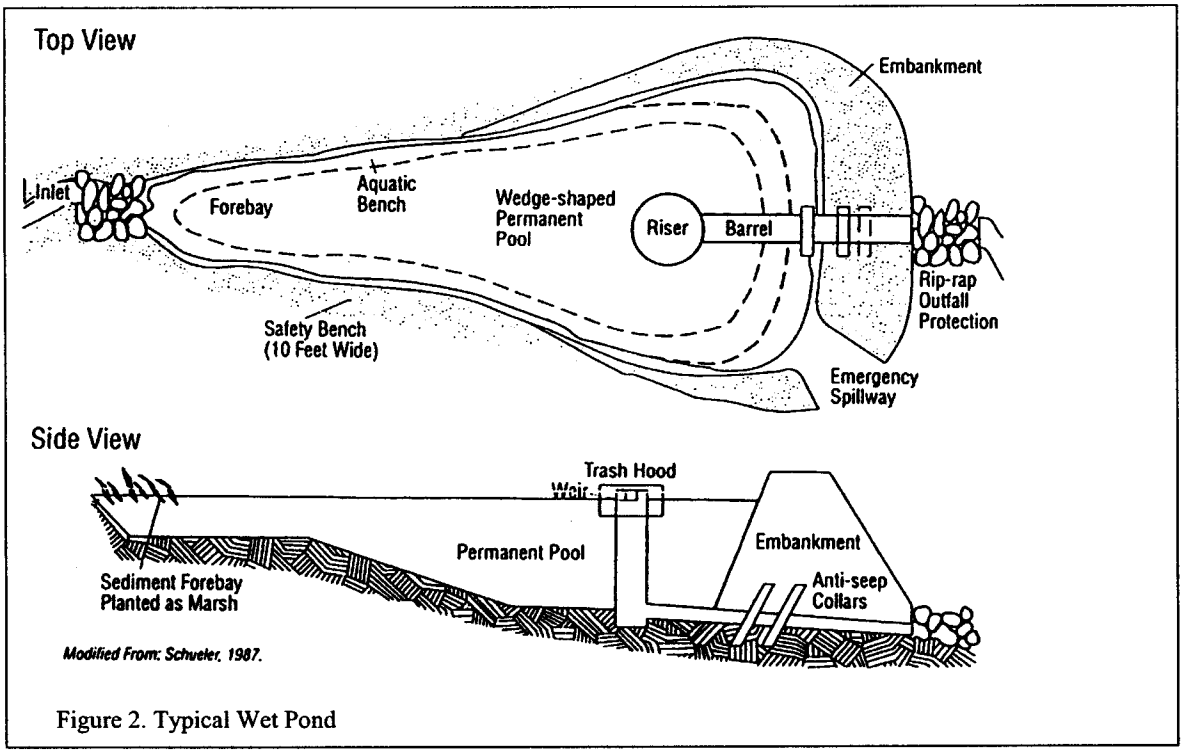


Figure 2. Typical Wet Pond

Infiltration Trenches

Infiltration trenches are excavated trenches that are filled with granular material, which collect water and allow it to slowly percolate into the ground, gradually removing pollutants. There are two basic types of infiltration trenches: dispersed input facilities and concentrated input facilities. Dispersed input facilities receive stormwater overland runoff, while concentrated input facilities receive stormwater from curbs, gutters, and pipes. (See Figure 3.)

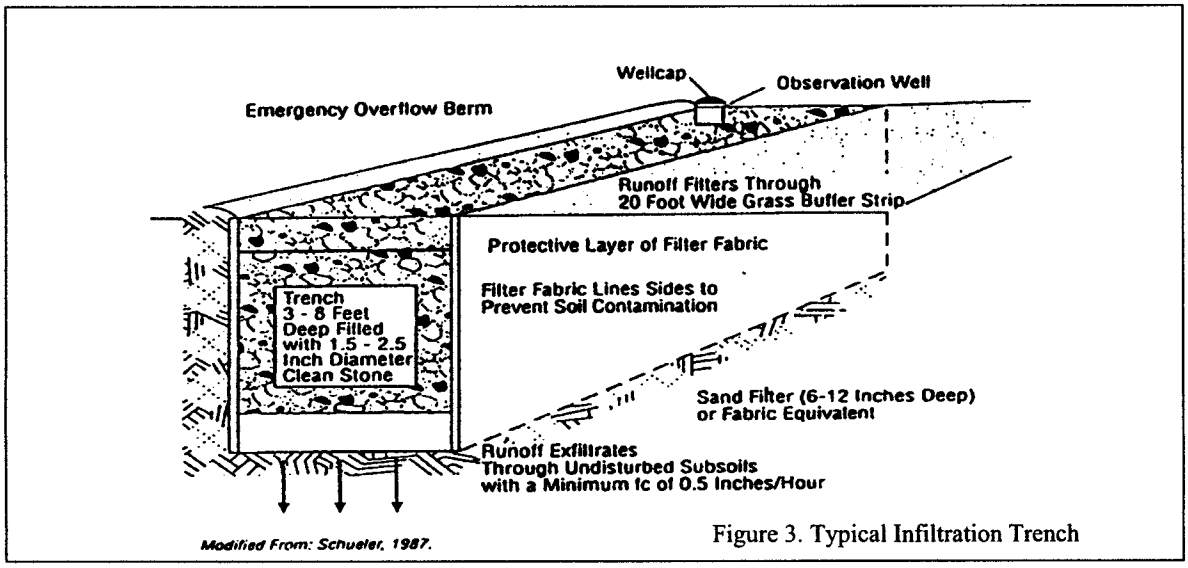


Figure 3. Typical Infiltration Trench

Oil/Grit Separator

Oil/Grit separators are also known as water quality inlets and consist of multiple stage, underground concrete storage structures that are designed to remove oil and grit from stormwater. These structures are usually found near parking lots and other paved structures on commercial sites. Oil/Grit separators require routine removal of the materials that accumulate in their storage chambers. (See Figure 4.)

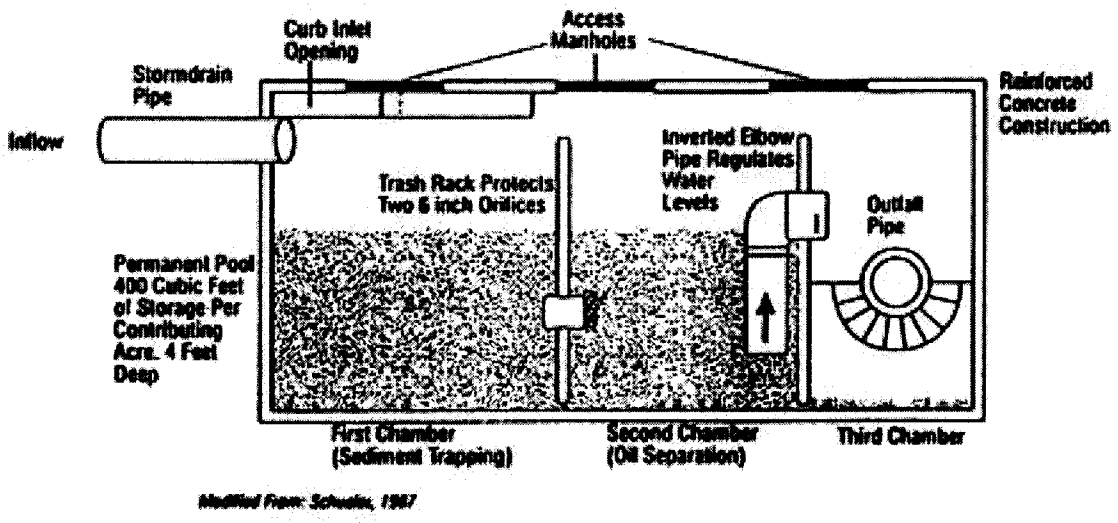


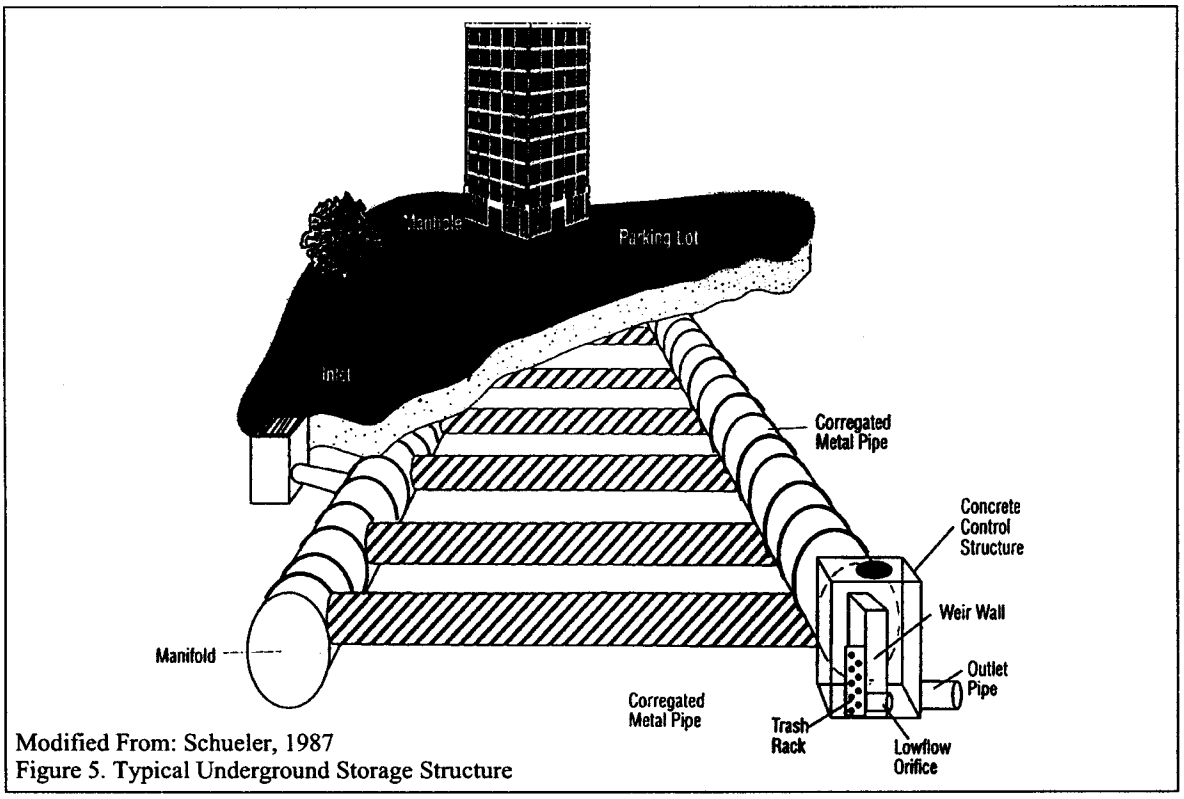
Figure 4. Typical Oil/Grit Separator

Underground Storage Structures

In areas where there is little space to build a stormwater storage pond, underground storage structures have been constructed to manage the large amounts of water that run off the land. These underground structures are designed to direct and temporarily store water and slowly release it to nearby rivers and streams. An underground structure usually consists of a weir and underground pipes constructed under a commercial parking lot. The inspection and maintenance of these structures requires specialized training and certification. (See Figure 5.)

Who Should Carry Out The Maintenance?

The facility owner is responsible for ensuring that the facility is maintained. Some activities such as litter removal and mowing can be effectively undertaken by facility owners; however, it is usually worth the cost to have a professional do the more difficult work. Mowing and handling a wheelbarrow can be dangerous on the sloping embankments of a detention basin. Filling eroded areas and soil disturbing activities, such as re-seeding or replanting vegetation, are



Modified From: Schueler, 1987
Figure 5. Typical Underground Storage Structure

also tasks that a professional landscaping firm should manage. If these tasks are not performed properly, erosion may occur and sediment can accumulate at a much faster rate. Grading and sediment removal are tasks that are best left to professional contractors who will be able to identify potential problems early on when it is more cost-effective to make repairs or alterations.

Your General Maintenance Program

Stormwater structures must be maintained over time so that they may perform their two major functions - stormwater storage and stormwater quality improvement. A consistent maintenance program is the best way to ensure that a structure will continue to perform its water quality and quantity functions.

This section outlines the general maintenance needs for stormwater management structures in Howard County. Stormwater management structures will require routine and non-routine maintenance. Routine maintenance such as visual inspections, vegetation management, and the regular removal of debris and litter provides a variety of benefits such as reducing the chance of clogging outlet structures, trash racks, risers and other facility components. It is important to note that while general maintenance tasks are suggested, actual maintenance needs will vary according to site specific conditions. Table 1 lists components of a general maintenance program.

TABLE 1. COMPONENTS OF A GENERAL MAINTENANCE PROGRAM

Routine	Non-Routine
Visual Inspection	Bank Stabilization
Vegetation Management	Sediment Removal
Debris/Litter Control	Outlet Structure Maintenance / Replacement
Maintaining Undisturbed Areas Around Infiltration Trenches/Basins	Maintenance of Mechanical Components (dependent on age of structure)
Cleaning of Oil/Grit Separators	

Specific Maintenance and Inspection Needs

Howard County's Stormwater Management Regulations require that private owners conduct routine and non-routine inspection and maintenance of their stormwater management structures. The County has developed the following specific inspection and maintenance needs for each of the four stormwater management structure types.

1) Ponds

Inspections

Ponds should be inspected once a year, addressing the items listed in Table 2.

TABLE 2. MINIMUM INSPECTION CHECKLIST FOR PONDS.

- Obstructions of the inlet or outlet devices by trash and debris
- Excessive erosion or sedimentation in the basin
- Cracking or settling of the dam
- Low spots in the bottom of a dry pond
- Deterioration of pipes
- Condition of the emergency spillway
- Stability of the side-slopes
- Upstream and downstream channel conditions
- Signs of vandalism

Vegetation Management

Grass is usually used around and in storage ponds to prevent erosion and to filter sediment. The grass near the pond should not be over-fertilized, or the excessive nutrients will be washed into the pond and contribute to the growth of algae. Grass should be cut no shorter than 6-8 inches.

Sediment Removal

One of the main purposes of a stormwater management pond is to remove sediment from stormwater. As water flows through the pond, sediment will accumulate and eventually will need to be removed. Stormwater management structures vary in design and shape. Therefore, there is no general rule for the frequency of sediment removal. Upstream conditions such as land use, type of land cover (vegetated vs. paved), and soil types are important factors in determining how rapidly sediment will accumulate in a pond.

Sediment removal is usually the single largest cost of maintaining a stormwater management structure. Owners are responsible for maintaining the facility and should plan ahead, setting aside the necessary funds to pay for sediment removal. The best solution to sediment removal is to designate an on-site area or a site adjacent to the facility where the sediment can be disposed. This area will need to located outside of the floodplain. If such a disposal area is not available, the sediment will need to be transported and disposed of off-site. Transportation costs and disposal fees can greatly increase the cost of sediment removal. Once the sediment is removed, the bottom of the basin and any disturbed areas will need to be stabilized and re-vegetated, or the structure will quickly clog and require sediment removal again.

Wet sediment is more difficult and expensive to remove than dry sediment. In some cases, a wet pond can be drained of water and allowed to dry so that heavy equipment can remove the sediment from the bottom of the pond. In cases where this is not practical, it may be necessary to remove sediment using hydraulic dredging from the shoreline. The additional cost of sediment removal for a wet pond is sometimes partially offset by the longer interval between dredging cycles. Wet sediment is not accepted at many disposal sites, so the material often must be dried (dewatered) prior to disposal. This extra step adds to the cost and requires a place where wet material can be temporarily placed to dry.

2) Oil/Grit Separators

Inspections

Oil/grit separators should be inspected once a year.

Sediment Removal

Oil/grit separators provide some settling of pollutants. Yearly pumping and cleaning will prevent this pollution from entering nearby streams and affecting water quality. Sediment should be removed and disposed of at a licensed facility.

3) Infiltration Trenches

Inspections

Infiltration trenches are often clogged by sediment and it is important to conduct a regular inspection to determine if sediment removal is required. Most infiltration trenches have a grassed and/or gravel filter, which removes sediment before the stormwater enters the trench. Keeping this sediment filter clean is vital to ensuring the long-term performance of the infiltration trench.

The performance of an infiltration trench should be monitored as part of a routine inspection schedule. The observation well installed in most trenches can be used to determine the time it takes water to infiltrate into the soil after a storm event. This determination can be made through multiple readings or a "one-stop" method. When using multiple readings, several water level readings can be made over a period of days after a large storm, thus giving the water infiltration rate. The alternative method is a "one stop" method where a single water level reading is taken and compared to the local rainfall record. The "one stop" method is less accurate than the multiple reading method; however, it does provide enough information to approximate the emptying time of the trench and will identify trenches that are severely clogged.

Sediment Removal

Sediment removal in infiltration trenches will depend on the manner in which stormwater enters an infiltration trench. Concentrated input facilities will have an in-line filter system or sediment trap. If you have any questions on how routine sediment removal is to be performed for a given structure, please contact the Stormwater Management Division for instructions.

For trenches using dispersed input, routine sediment removal usually means removing the top 6 to 12 inches of filter gravel and replacing the filter cloth sediment barrier that covers the aggregate reservoir. A layer of clean filter gravel replaces the gravel removed. Bare spots or damaged areas in the grass filter strip should be sodded upon removal of the sediment.

If water is flowing over the infiltration trench, the observation well should be inspected to determine the cause. This is especially critical for concentrated input facilities that use sediment traps. When the sediment trap becomes full, sediment laden water will be conveyed into the trench. In structures that are "dispersed input" or surface-fed, a clogged sediment barrier usually inhibits water flow into the trench, causing water to pass through the overflow channel prematurely. If the infiltration trench remains full of water after a rainfall, and causes regular overflow, then the aggregate stone must be excavated and the facility rebuilt.

4) Underground Storage Structures

Inspections

Underground storage structures should be inspected once a year. These structures store rainwater from a storm and then slowly release it into nearby streams. Underground storage structures can be located under parking lots, easements on private property, or any land that has been designated to store rainwater. Underground storage structures are considered to be confined spaces. These structures must be inspected by certified professionals with specialized equipment and confined space entry training.

Sediment Removal

Underground water storage and control structures will require periodic pumping and cleaning. The sediment must be disposed of at an approved facility. Maintenance of underground storage structures should be performed by professionals with certified confined space entry training.

How Much Will It Cost to Maintain a Stormwater Management Structure?

Routine costs for maintaining a stormwater management structure are highly site-specific and factors such as the type of development, landscaping, the number of inspections, the amount of debris and litter, mechanical components maintenance, vegetation management, and other tasks can cause total costs to vary greatly. It is possible, however, to determine the costs for certain general maintenance tasks by soliciting proposals from qualified contractors. The costs for routine and non-routine tasks should be evaluated separately since they vary dramatically.

One of the larger fixed costs in dredging a stormwater management structure is the mobilization and demobilization of the required machinery and personnel. Large wet ponds will often require a waterborne operation during which an excavator or a crane must be mounted to a floating barge and moved into position.

Once mobilization has occurred, the costs of physically dredging sediment from a stormwater storage structure will depend on the total amount of the sediment removed. Costs for dredging will depend on: the size and depth of the facility, the volume of sediment trapped in the structure, ease of access to the structure, and whether or not the on-site disposal of the dredge material is possible. The least expensive method of disposal is on-site disposal. If on-site disposal is not possible, then transportation of the dredged material will be necessary. Transportation is often the most expensive part of the disposal process.

Planning Ahead

The costs of maintaining a stormwater structure can be considerable, particularly when dredging or other non-routine maintenance is needed. To lessen the financial impact of non-routine maintenance costs, responsible parties should consider creating a maintenance fund to which regular contributions can be made prior to maintenance being necessary.

For More Information

For more information on managing your stormwater management structure, contact the following offices:

- Howard County Department of Public Works, Stormwater Management Division, at (410) 313-6570.
- Howard County Cooperative Extension Office (for fertilizer, herbicide and planting tips) at (410) 313-2702.

Glossary

Basin - a shallow, rounded depression often containing water.

Dry Ponds - a depression in the ground that temporarily holds stormwater and stays dry the majority of the time.

Easement - a right or a privilege that a person may have on another person's land.

Filter Cloth Sediment Barrier - a geotextile fabric that allows water, but not soil, to pass through.

Floodplain - a plain along a waterway which holds flows during major storms.

Grading - to make the ground level or sloped evenly.

Dredge - a device consisting of a net attached to a frame that is dragged along the bottom of a body of water.

Infiltration Trenches - trenches that are filled with granular material and allow water to percolate into the ground.

Oil/Grit Separators - a structure with chambers that allows water, oil, and grit to be separated.

Ponding - the accumulation of water.

Sediment - soil that settles to the bottom of liquid.

Staging Area - a work preparation area where sediment can be placed during dredging.

Stormwater - precipitation resulting from a storm event.

Weir - an obstruction with an opening, usually placed in a waterway, which measures the rate of flow.

Wet Ponds - a depression in the ground that maintains a standing pool of water.

Wetland - marshy areas that are usually set aside for wildlife.

Underground Storage Structures - large underground tanks or structures that hold and slowly discharge stormwater.