

# managing stormwater

An introduction to maintaining  
stormwater facilities  
~ for private property owners and HOAs

Warren County  
**STORMWATER**  
DISTRICT





The Stormwater Partners of SW Washington and Clark County, Washington are credited for the original development of this manual titled Managing Stormwater: An Introduction to Maintaining Stormwater Facilities. Please contact them if you would like to use their materials by visiting [www.stormwaterpartners.com](http://www.stormwaterpartners.com).

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Stormwater filter, vortex sedimentation vault, closed detention system

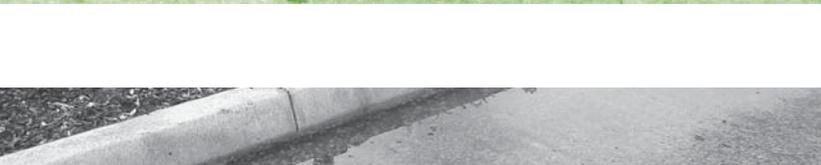
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WEBSITE: [www.wceo.us/pages/stormwater-district.html](http://www.wceo.us/pages/stormwater-district.html)





# Warren County **STORMWATER** DISTRICT

The Warren County Engineer's Office administers the County's MS4 permit under the National Pollutant Discharge Elimination System (NPDES) commonly known as Phase II. The Warren County Stormwater District was formed by the Warren County Commissioners to facilitate the coordination of this permit for other MS4 entities including the Townships of Clearcreek, Franklin, Hamilton, Turtlecreek, and Union and the Villages of Maineville and South Lebanon. The WCEO's administration includes annual reporting, planning, and meeting the requirements of the permit by collaborating with other local agencies such as the Warren County Combined Health District (WCCHD) and the Warren County Soil and Water Conservation District (WCSWCD). The goal of the program is to protect the quality of our streams, lakes, and groundwater. We also partner with other local agencies to work toward realizing this goal. See page 27 for their contact information.



Visit [www.wceo.us/pages/Stormwater-District.html](http://www.wceo.us/pages/Stormwater-District.html)

April 2012



# stormwater management

Rain becomes stormwater runoff when it flows off roofs, yards, streets and parking lots and into our streams, lakes, rivers, wetlands, and groundwater. As runoff washes over these surfaces, it picks up dirt, pet waste, litter, motor oil and a host of other pollutants and dumps them into nearby waterways.

Stormwater runoff is managed by channeling it through specially built landscaped and structural features called stormwater facilities. They remove pollutants and slow stormwater flowing into our waterways. Both functions are critical to reduce the risk of flooding and protect the health of our streams, lakes, wetlands and drinking water. Ponds, inlets, ditches and drains are part of our community's stormwater management system.

Although some stormwater treatment facilities might be maintained by your city or county, stormwater facilities often have private owners, including homeowner associations (HOAs), who must inspect and maintain them. These private facilities may serve housing developments, schools, churches, commercial buildings and parking lots.

This guidebook gives an overview of facilities **you or your association must maintain**, tips on how to maintain and fix them, how to recognize facilities in your development, and whom to contact with questions and other resources.



## HOW STORMWATER FACILITIES WORK

Some facilities are simple and small, such as a bio-filtration swale with mowed grass. Others are complex, such as a system of ponds and underground structures. All are designed to capture stormwater and treat it – usually by collecting it and filtering contaminants.

### Collect and transport stormwater

Stormwater systems typically consist of catch basins and pipes and/or open channels (ditches). They are large enough to handle runoff from infrequent, large storms. Typical system failures include reduced capacity because of clogged grates or pipes and or ditches blocked with weeds or debris. If the capacity of the conveyance system is reduced, isolated flooding and property damage can occur.

### Hold and reduce water flow

Some facilities detain and slow the flow of stormwater to surface waters. Roads, roofs and other hard surfaces increase the rate of stormwater runoff into natural streams, potentially causing stream or channel erosion and flooding. Detention facilities, such as ponds and underground vaults, store



stormwater for controlled release and help prevent downstream flooding and erosion.

### Store and treat runoff

Detention basins store or retain runoff temporarily while it soaks into the ground. This system mimics natural processes caused by trees, vegetation and microbes that help break down and remove pollutants. Retention facilities typically release less stormwater to waterways.

### Multiple facility systems

Stormwater treatment Best Management Practices (BMPs) refer to multiple approaches to treat and improve water quality. The most common include swales and wet or dry ponds. More complex systems include underground vaults with cartridge filters or oil/water separators. All these methods help remove oils, chemicals, metals and sediment from stormwater runoff before it is discharged to ground or surface water.

#### How to know if a facility is public or private

Unless there is a sign that says who owns the facility, there is no quick or universal way to tell if a facility is public or private. Generally, ditches or storm drains and pipes within the right of way are public. Facilities within private properties are often, but not always, private.



*A well-maintained drywell has no debris or standing water. This photo shows water draining after a rain storm. The holes around the wall allow water to soak into the ground. See page 19 for more information about drywells.*



## MANAGING PRIVATE STORMWATER FACILITIES

### Who is responsible?

In Warren County, public agencies or private property owners are responsible for maintaining stormwater facilities. All facilities, whether public or private, must meet the same state and local maintenance requirements for proper control and treatment of stormwater runoff.

Homes built before the 1980s typically drain to roadside ditches maintained by local government. In newer residential developments, however, one or more stormwater facilities could be part of the infrastructure.

Since 1991, local jurisdictions have required some form of stormwater detention a condition of development. Rules became more rigorous in 2003 and now stormwater detention systems must be in place when improving or constructing roads, parking lots, buildings and homes.

### Do you have a stormwater facility?

Check with your homeowners association leadership or city or Warren County Soil and Water District (WCSWCD) to see if your housing development has such a facility. Commercial and industrial developments also are required to maintain private stormwater facilities.

If you live in a residential development with a private facility, your HOA leadership should have access to information about the locations and types of facilities serving your property as well as a maintenance plan. Your HOA dues may help pay for private stormwater system maintenance.

If your residential development does not have an HOA, or the HOA has no mention of stormwater management, here's how to check to see if you have any stormwater facilities:

- Look for this information in the notes on your recorded plat of your subdivision, which is usually included with the paperwork you received

when closing the purchase of your home. Or, look in the "Covenants, Conditions, and Restrictions" (CC&Rs) for your subdivision.

- Go to page 9 to see *How to recognize stormwater facilities*.
- Contact the Soil and Water Conservation District (see page 27 for contact information) to ask an inspector to check your housing development.

### Talking to Neighbors

In some cases, homeowners don't realize there are stormwater facilities in their neighborhood. The sites often look like natural features or may not be readily visible. You might be surprised to learn there is a facility in the neighborhood, let alone that homeowners are responsible for maintaining it.

Informing your neighbors about an existing stormwater system and why it's important to your community is critical. Here are some ways to help:

- **Distribute flyers** on stormwater management to your HOA members.
- **Post information** to your community website.
- **Put a sign on the facility.**
- **Discuss the issue** at your neighborhood meetings.
- **Invite a stormwater specialist** to give a presentation to your members and lead a tour of the facility (see page 27 for contact information).
- **Tag friendly reminders near storm drains.** Check with your city or county for paints, stencils and other supplies to assist neighborhoods, education groups or other volunteers. Storm drain tags help others understand that all drains eventually empty into surface or ground water.





- **Show your neighbors pictures** and examples of stormwater management best practices used in other communities.

See [www.warrenswcd.com](http://www.warrenswcd.com)

- **Talk about the benefits** a well maintained stormwater system provides: more attractive neighborhoods, higher property value, reduced potential for flooding and protected streams and habitats.

### Cost of maintaining a private stormwater facility

If properly constructed and maintained, residential stormwater facilities can be relatively inexpensive to keep in proper working condition. However, major repairs can require professional assistance and be much more costly. Nearly all facilities likely will need some type of major service at some point.

Property owners should set aside money for routine maintenance as well as the occasions when outside expertise or equipment is needed to maintain, upgrade or repair a system. Costs of maintaining a facility will vary depending on the level of maintenance needed.

### Guidelines for maintaining private stormwater facilities

The best way to limit big repairs and ensure that your facilities are working properly is to follow a regular inspection and maintenance plan. For small, simple facilities, such as biofiltration swales, much of the maintenance can be done by neighbors or landscaping firms. More complex facilities require professional maintenance and repair.

You should have a current maintenance plan for your neighborhood's stormwater facilities. A plan might be outlined in your HOA's records or your CC&Rs. If neither is available, a maintenance plan should be formulated. It should include:

- A schedule for routine maintenance.
- A record-keeping system for inspections and maintenance activities.

- Maintenance standards and procedures (such as mowing grass if higher than 10 inches, no standing water); see [www.wceo.us/pages/Stormwater-District.html](http://www.wceo.us/pages/Stormwater-District.html)
- Designated volunteers and/or professionals responsible for inspections. Some local agencies routinely inspect private facilities; ask for a copy of the inspection report. See page 27 for contact information.
- Designated volunteers and/or professionals responsible for maintenance.

Managing your stormwater system requires a combination of simple routine maintenance, such as raking leaves and mowing and removing grass debris. A significant amount of the work can be done by neighbors or those who do your regular grounds keeping.

Occasionally, a contractor may need to be brought in. For example, for working in an underground vault or using a vacuum truck to clean a catch basin, you should consult a professional with the tools and training to complete the job safely and correctly. You should be sure that you, your HOA and anyone hired are properly insured.

The *Facilities maintenance guidelines* section (pages 11-20 or 24) has more information about stormwater facilities, how each works, how to maintain them and how to recognize problems, as well as hints about how to fix them.

**REMEMBER:** To fully comply with local laws, you need to check the maintenance manual for your area (see page 27 for local agency contacts). It contains comprehensive lists for recognizing potential problems and how to maintain facilities. You also can find the manuals online at [www.wceo.us/pages/stormwater-district.html](http://www.wceo.us/pages/stormwater-district.html)



# recognize your facility

## HOW TO RECOGNIZE STORMWATER FACILITIES

Your homeowners association should have access to information about the locations and types of facilities serving your property. If the facility is privately maintained, the association also should have a maintenance plan.

If your residential development does not have a homeowners association or association documents have no mention of stormwater management, look for information about locations and types of

facilities on the recorded plat for your subdivision or in your property deed under “Covenants, Conditions, and Restrictions.” (CC&Rs).

The pictures and descriptions below should help you recognize stormwater facilities. Some may have fences around them for safety, especially those with standing water. If the facilities have problems, however, identification can be difficult.

For more information about facilities in your development, contact your local agency (see page 27) and ask a stormwater inspector to visit.

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### Dry facilities

Dry most of the time, these facilities contain water during and after rain storms. Water should disappear within three days after the rain stops.



▲ **Rain garden** (page 11) is a bowl-shaped garden where rainwater percolates into soil and native, deep-rooted plants.

▼ **Biofiltration swale** (page 11) is a flat-bottomed channel where pollutants are removed by filtration, infiltration and settling.



▲ **Detention basin** (page 13) Stormwater is temporarily stored and slowly released through an outlet pipe. Natural-appearing vegetation is common.

▼ **Filter strip** (page 11) is a strip of grass along paved areas such as a road or parking lot. Contaminants are filtered out of the water as it flows away.





## Wet facilities

These facilities typically contain water year-round and often have significant aquatic vegetation. Water levels could rise during a storm, but should not breach the structure.



▲ **Retention Pond** (page 15) is an open basin with a permanent pool of water where sediment and pollutants settle to the bottom.

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## Underground facilities and structures

Underground catch basins/storm drains, man-holes, vaults and drywells are invisible except for a manhole cover or inlet grate.



**Drywell** (page 19) ▲

**Vault** (page 20) ▼

**Catch basins** (also called curb inlets or storm drains - see page 18) ►

*Underground structures are used to trap sediment and debris, allowing stormwater to soak into the ground and filter pollutants or are used as a junction between pipes to route stormwater.*



# biofiltration

## SWALE

A biofiltration swale uses grass or other dense plants to filter out sediment and oily materials. Swales often look like flat-bottomed channels with grass growing in them. A swale is usually dry, but after a storm, the runoff moves through it slowly and at a shallow depth. As stormwater passes through the plants, pollutants are removed by the combined effects of filtration, infiltration, and settling. Any standing water should drain fairly quickly.

Biofiltration swales provide treatment for pollution but do not control the amount of stormwater passing through them.



▲ **GOOD:** Well maintained biofiltration swale.

▼ **PROBLEM:** Noxious weeds have taken over this biofiltration swale.



**For signs that maintenance is needed, tips on how to fix problems, and general maintenance guidelines, see the next page.**



## FILTER STRIP

A filter strip is a straight swatch of grass that removes sediment and oils from stormwater. Usually, filter strips are along edges of paved areas such as parking lots and roads.



## RAIN GARDEN

A rain garden is a bowl-shaped garden where rainwater percolates into soil and native, deep-rooted plants. This garden can be vibrant and aesthetically pleasing and can do a better job of filtering stormwater than other facilities. The size of this garden can be small or big.

# biofiltration

## MAINTENANCE IS NEEDED if you see these signs

- Bare, exposed soil
- Clogged inlet and outlet pipes
- Bottom of swale is eroded
- Sediment buildup, usually near inlet
- Unhealthy or dead vegetation
- Honeysuckle or other problem vegetation
- Overgrown vegetation
- Leaves, trash and other debris

## TIPS FOR FIXING PROBLEMS and general maintenance

### **Vegetation**

- Remove weeds such as honeysuckle and thistle, then check for them on a regular basis and remove new honeysuckle sprouts.
- Remove all trees and saplings that block facility elements or are within 15 feet of structures.
- Mow grass as needed to keep height at 4 to 6 inches; remove clippings.
- Replace vegetation damaged or removed during maintenance.
- Avoid using fertilizers, herbicides or pesticides within or near the facility. These chemicals pollute the water and can cause unwanted plant growth.

### **Erosion**

- Control by reseeding areas where soil is exposed, especially on slopes.
- Fill in eroded areas and seed with grass.

### **Sediment**

- Removing sediment is best done in dry months before winter rains set in.
- If needed, seed and water during dry months to re-establish grass.

### **Trash and debris**

- Pick up leaves before rains begin.
- Inspect and remove debris regularly, particularly after storms.
- Remove any material clogging drains, outfalls and channels.

SWALES



**GOOD:** A biofiltration swale showing a sediment trap in the foreground.

# ponds

## DETENTION BASIN

A stormwater detention basin is an open basin built by excavating below ground or constructing above-ground berms or embankments. The detention basin temporarily stores stormwater runoff and slowly releases it through a specially designed outlet or control structure. Detention basins typically are designed to drain completely within a few hours or days. Styles vary greatly, from well manicured to natural in appearance. Generally, more natural-appearing vegetation is preferred for reduced maintenance and enhanced wild-life habitat. Some facilities are designed to appear as natural water bodies or park-like areas.



**GOOD:** Both photos show well maintained detention basins. Shortly after a rain storm, the pool of water, above, is slowly draining. On the left, the basin is dry between storms.

**For signs that maintenance is needed,** tips on how to fix problems, and general maintenance guidelines, see page 16.

## Additional elements to detention ponds

### FIELD INLET

A field inlet is a concrete structure that collects stormwater and routes it through underground pipes. Fitted with a slanted, slotted grate, it often traps sediment and debris. Regular maintenance is important. Keep the opening clear of obstructions. A field inlet is usually cleaned by a truck with a vacuum hose but sometimes can be cleaned with hand tools.



stormwater at a specific rate. It is important to make sure they do not become plugged or damaged because the facility could release water too quickly or too slowly and overflow. They are usually found in manholes.

### DEBRIS AND ACCESS BARRIER

A debris or access barrier is a bar grate over the open end of a pipe larger than 18 inches in diameter that prevents large material, people or animals from entering. They typically are located on the outlet pipe from a detention basin to the control structure.

For safety purposes, only qualified personnel should remove debris from the barrier when water is flowing through the pipe.

### FLOW CONTROL STRUCTURE/FLOW RESTRICTOR

Underground flow control structures and flow restrictors direct or restrict flow in or out of facilities. They slowly release



# ponds

## INFILTRATION BASIN

A stormwater infiltration basin holds runoff and lets it soak into the ground. The basins are open facilities with grass or sand bases. They can either drain rapidly or act as permanent ponds where water levels rise and fall with stormwater flows. Infiltration facilities can be designed to handle all runoff from a typical storm but could overflow in a larger one. Since the facility is designed to soak water into the ground, anything that can clog the base will reduce performance and be a concern. Generally, infiltration basins are managed like detention basins but with greater emphasis on maintaining the ability to infiltrate stormwater.



**GOOD:** Above shows a dry infiltration basin. Unlike a detention basin, an infiltration basin has an underground structure that helps water soak into the ground. Below is a good basin shortly after a rain storm.

**For signs that maintenance is needed,** tips on how to fix problems, and general maintenance guidelines, see page 14.



# ponds

## RETENTION POND

A retention pond, or wetpond, is an open basin that has a pool of water year-round. The volume of the wetpond allows sediment to settle out as stormwater runs in. Wetland vegetation is typically planted to provide additional treatment by removing nutrients such as phosphorus and nitrogen.

Sometimes there are two pools. Stormwater flows into the first pool, where sediment settles before moving into the second pool. The water is then discharged to streams and groundwater.

Wetponds also have additional temporary storage above the permanent water level to detain and slowly release stormwater. They may be fenced for safety.



**GOOD:** Well maintained examples of wetponds. Above shows a two-pool wetpond.



**For signs that maintenance is needed, tips on how to fix problems, and general maintenance guidelines, see page 16.**

### Additional elements to wetponds:



#### FIELD INLET

A field inlet is a concrete structure that collects stormwater and routes it through underground pipes. Fitted with a slanted, slotted grate, it often traps sediment and debris. Regular maintenance is important. Keep the opening clear of obstructions. A field inlet is usually cleaned by a truck with a vacuum hose but sometimes can be cleaned with hand tools.

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For safety purposes, only qualified personnel should remove debris from the barrier when water is flowing through the pipe.



#### FLOW CONTROL STRUCTURE/FLOW RESTRICTOR

Underground flow control structures and flow restrictors direct or restrict flow in or out of facilities. They slowly release stormwater at

# ponds

## MAINTENANCE IS NEEDED if you see these signs

- Bare, exposed soil
- Slopes that are deteriorating
- Sediment that restricts flow or clogs inlet and outlet pipes
- Sediment buildup; the facility is not draining or conveying runoff
- Unhealthy or dead vegetation
- Honeysuckle or other problem weeds
- Overgrown vegetation
- Holes in berms or slopes
- Leaves, trash and other debris
- Water surface is discolored or has a sheen
- Bottoms of slopes show signs of seepage and leaking
- Trees, often alders, growing on the slopes

## TIPS FOR FIXING PROBLEMS and general maintenance

### *Vegetation*

- Completely remove invasive species, such as honeysuckle and thistle; check on a regular basis to remove new honeysuckle sprouts.
- Remove cattails before they start to dominate a facility.
- Remove all unplanned trees or saplings that block parts of the facility or hinder maintenance.
- Make sure banks, slopes and areas designed for vegetation are planted with native or easy-to-maintain species. Avoid trees near the pond and on berms.
- Plant at appropriate times during the year so vegetation can get established.
- Replace vegetation damaged or removed during maintenance.
- Check access roads and fencing, if the facility has them. They should be free of overgrown vegetation and other materials so that the facility is easily accessible for maintenance.

### *Erosion*

- Control erosion by reseeding areas where soil is exposed, especially on slopes around a structure.
- Fill in eroded areas and cover them with sod, mulch or other erosion control materials.

### *Sediment*

- Removing sediment is best done in July and August before winter rains set in.

*continued on next page*



**PROBLEM:** This detention basin is overgrown with vegetation.

# ponds

### **Trash and debris**

- Pick up leaves before rains begin.
- Inspect and remove debris regularly, particularly after storms.
- Remove any material clogging drains, outfalls and channels.
- Avoid using fertilizers, herbicides or pesticides in or near the facility. Chemicals pollute the water and can cause unwanted plant growth.
- Identify sources of leaks or spills and contain them as quickly as possible.

### **Mosquitoes**

- Check inlets and any open or confined standing water for mosquito larvae (*see below*). If mosquitoes are a concern, contact the Warren County Combined Health District for information.



*Mosquito larvae.*

### **Fencing and access lanes**

- Check roads and fencing in the facility. They should be maintained to allow easy access.



**PROBLEM:** *The infiltration basin above still has water more than three days after the rain storm. This indicates a problem that slows infiltration.*

### **REPORT SPILLS**

Chemical spills such as oil, gasoline, paint or herbicides/pesticides may cause harm to surface or ground water. Spills **MUST** be reported to the Ohio Environmental Protection Agency and to your local city or county. Do not attempt to rinse away the spill until it's been checked.

Ohio Environmental Protection Agency  
24-hour Spill Response Number:  
(800)-282-9378.

# underground



## CATCH BASIN, CURB INLET, and MANHOLE

Catch basins and manholes are underground concrete structures typically fitted with a slotted grate but may have a solid lid. They collect stormwater runoff and route it through underground pipes, allowing sediment and debris to settle. They also can be used as a junction in a pipe system to allow access.

**Catch basin** – also called a storm drain, it can be a round structure but is typically square. It is used to collect stormwater from open areas.

**Curb inlet** – is a rectangular structure underneath the curb of a roadway. Openings may be rectangular or square and are located in the gutter.

**Manhole** – is a round, concrete structure typically ranging in diameter from 4 feet to 8 feet. It is an access point for underground pipe maintenance. Manholes generally have steps mounted on the side for easy access.

Catch basins, curb inlets, and manholes are built into almost all stormwater systems.



Above: Curb inlet.

Below: This manhole shows a well maintained interior.



**PROBLEM:** The photo below shows a catch basin with a lot of sediment built up in it.



**For signs that maintenance is needed, tips on how to fix problems, and general maintenance guidelines, see page 20.**

# underground



## DRYWELL

A drywell is an open-bottomed manhole used to infiltrate stormwater into the ground through holes in the walls. Drywells rely on the stormwater soaking into the surrounding soil. They trap sediment and oily pollutants in runoff, and they can fill with oily sediment in areas that lack treatment facilities. Because drywells can be clogged and tend to concentrate pollutants in one place, pollution and sediment control practices should be used to protect them.



For signs that maintenance is needed, tips on how to fix problems and general maintenance guidelines, see page 20.

## Additional elements to drywells

### FIELD INLET

A field inlet is a concrete structure that collects stormwater and routes it through underground pipes. Fitted with a slanted, slotted grate, it often traps sediment and debris. Regular maintenance is important. Keep the opening clear

of obstructions. A field inlet is usually cleaned by a truck with a vacuum hose but sometimes can be cleaned with hand tools.



◀▲ **GOOD:** Left photo shows the typical lid of a drywell. Above is a well maintained interior.

▼ **PROBLEM:** Trash has collected inside the drywell.



### CONFINED SPACE WARNING FOR UNDERGROUND FACILITIES

Due to potential dangers, only trained and certified persons

should enter confined spaces. These are defined as:

- Large enough that an individual could fully enter the space and work.
- Having limited or restricted entry or exit.
- Not primarily designed for human occupancy.

For more information, visit [www.osha.gov/publication/osha3138.pdf](http://www.osha.gov/publication/osha3138.pdf).

# underground



## VAULTS

### Closed detention system

A closed detention system is an underground structure, typically a concrete vault or series of large diameter pipes, which temporarily stores stormwater and releases it slowly. They typically are used on sites that do not have space for a pond. These underground detention systems are enclosed spaces where harmful chemicals and vapors can accumulate. Therefore, the inspection and maintenance of these facilities can **only** be done by individuals trained and certified to work in hazardous, confined spaces.



**GOOD:** Lid and entrance to an underground detention facility.

### MAINTENANCE IS NEEDED if you see these signs

- The facility drains slowly after a rain storm.
- Leaves, trash and other debris slow or stop out-flow or filtration.
- There is sediment or debris accumulated in storage area.

### TIPS FOR FIXING PROBLEMS and general maintenance

#### Access to facility

- Remove any vegetation covering the lid.

#### Maintenance

- Inspection or maintenance that requires entering the underground facility can only be done by individuals trained and certified to work in hazardous confined spaces.
  - Remove trash and debris regularly.
  - Identify sources of leaks or spills and contain them as quickly as possible.
  - Remove sediment.

#### Mosquitoes

- Check inlets and any open or confined standing water for mosquito larvae. If mosquitoes are a concern, contact the Warren County Combined Health District for information.

### Additional elements to vaults

#### FLOW CONTROL STRUCTURE/FLOW RESTRICTOR

Underground flow control structures and flow restrictors direct or restrict flow in or out of facilities. They slowly release stormwater at a specific rate. It is important to make sure they do not become plugged or damaged because the facility could release water too quickly or too slowly and overflow. They are usually found in manholes.



#### REPORT SPILLS

Chemical spills such as oil, gasoline, paint or herbicides/pesticides may cause harm to surface or ground water. Spills **MUST** be reported to the Ohio Environmental Protection Agency and to your local city or county. Do not attempt to rinse away the spill until it's been checked.

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(800)-282-9378.

# managing stormwater at home

## TIPS FOR MANAGING STORMWATER AT HOME

Homeowners can help maintain shared stormwater facilities and protect the health of our streams by managing the quality and quantity of rainwater that flows off their property.

- Keep leaves, clippings, bark dust and soil on your property.
- Build a rain garden to keep runoff on your site.
- Reduce fertilizer, herbicides and pesticide use.
- Plant native trees and plants; remove invasive plant species.
- Sweep patios, driveways and other paved areas rather than hose them off. Bag or compost debris, don't sweep it into the street.
- Take your vehicle to a commercial car wash that treats and recycles water.
- Make sure wastewater from washing the exterior of your home or roof is not discharged into the street. Get permission to pump it to a sanitary sewer or infiltrate it directly into the grass or gravel.
- Dispose of yard and lawn trimmings properly such as composting, recycling or yard debris pick-up.
- Install permeable surfaces for sidewalks, patios and driveways.
- Collect roof runoff in a rain barrel to use for watering plants and garden.

## RESOURCES

For information about rain gardens, native plants, natural gardening and much more, visit <http://www.wceo.us/pages/Stormwater-District.html>.



# businesses

Commercial properties could have unique stormwater features in addition to those typically found in residential areas. These features include pervious pavement, which allows rain on parking lots and walkways to soak into the ground rather than run off; oil/water separators, underground structures typically located in parking lots and at automotive businesses; and exfiltration trenches.

Because these features often are out of sight or blend into their surroundings, maintenance can easily be forgotten or overlooked. Regular inspection and cleaning are important to keep these structures functioning properly and avoid potentially costly repairs. Maintenance is a requirement of state stormwater rules and local stormwater ordinances.

**REMEMBER:** To fully comply with local laws, you need to check the maintenance manual for your area (see page 27 for local agency contacts). It contains comprehensive lists for recognizing potential problems and how to maintain facilities.



## PERVIOUS PAVEMENT

Pervious pavement allows water to pass through it and soak into the ground, reducing runoff and mimicking the natural hydraulic cycle. Pervious pavement typically is a layer of specially formulated concrete, asphalt or pavers on top of a thick layer of gravel (8 – 24 inches). As water passes through the pavement and gravel, contaminants are filtered out. The water is stored in the gravel layer until it can soak into the ground. Pervious pavement requires regular maintenance to allow water to pass freely.

### MAINTENANCE IS NEEDED if you see these signs:

- Standing water during or after rainfall (see photo below)
- Visible debris or sediment on pavement surface
- Height of gravel between pavers depleted by more than ½-inch (permeable pavers only)



**PROBLEM:** This pervious concrete needs attention; there should be no standing water.

**GOOD:** Pervious asphalt, note the coarse appearance.



# businesses

## TIPS FOR FIXING PROBLEMS and general maintenance:

- Vacuum or sweep pavement frequently, preferably at least twice a year.
- Wash pavement using high pressure water at least once a year.
- Do not allow dirt or landscaped areas to drain or erode onto pervious pavement.
- Repair and patch pervious pavement with similar pervious material and gravel layer.
- Permeable pavers only: distribute gravel over pavement and sweep into joints between pavers.
- Replace broken pavers as needed to prevent structural instability.



*Pervious pavers, note the spaces between the pavers.*

## OIL/WATER SEPARATOR

An oil/water separator treats stormwater by trapping oil at the surface of the water and sediment at the bottom, allowing treated water to pass through. It is most commonly used as the first pre-treatment facility in a series of stormwater management facilities and is usually found in parking lots, service and fuel stations. A unit should be inspected monthly and after a major storm. Make sure to keep records of your inspections and maintenance activities.

### MAINTENANCE IS NEEDED if you see these signs

- Discharge water shows obvious signs of oil or other contaminants
- Thick layer of oil (more than 1 inch) on surface of water in vault
- Sediment accumulation of more than 6 inches on the bottom of the vault
- Accumulation of trash or debris



**Problem:** Some oil/water separators include coalescing plates (wavy-edged sheets shown above) that separate oil from water, so it can then be skimmed off. Plates should be white when clean.

# businesses

## Exfiltration Trench

An exfiltration trench is a feature built in to the curb and gutter system to infiltrate stormwater. The first layer of an exfiltration trench is made up of porous concrete which allows road runoff to soak in. The water is then filtered through other porous material (such as gravel and sand) below the surface of the concrete before it enters into a perforated pipe. The perforated pipe then carries the clean water to the stormwater system underground. Exfiltration trenches are used most commonly in roadways where there is not space available for traditional ponds or swales.

### MAINTENANCE IS NEEDED if you see these signs:

- Standing water during or after rainfall (see photo below).
- Visible debris or sediment on pavement surface.
- Vegetation growth in porous material.

**GOOD:** Exfiltration trench.



## TIPS FOR FIXING PROBLEMS and general maintenance:

- Inspection or maintenance that requires entering the underground facility must be performed by a trained and certified expert. Cleaning and proper disposal of sediments and oils can be done by most environmental contractors. Be sure to keep copies of the disposal records.
- Remove trash and debris regularly.
- Identify sources of leaks or spills and contain them as quickly as possible.
- Oils and sediment should be removed and properly disposed of (not in the trash)
- Secured, floating, oil-absorbent pads can be used to extend the maintenance period.



**GOOD:** A well maintained oil/water separator.

# glossary

**Best Management Practices or BMPs** – Multiple treatment methods, activities, facilities and structures that, used together, help protect water quality by preventing or reducing pollution of stormwater and removing pollution from runoff before it is discharged to ground or surface water.

**Biofiltration swale** – A broad, open, vegetated channel that filters flowing stormwater. The most common form is a wide, shallow, inclined depression planted with grasses.

**Catch basin or storm drain** – A round or square structure typically fitted with a slotted grate that is used to collect stormwater runoff from open areas and route it through underground pipes. It allows sediment and debris to settle out of the runoff and can have inserts or other fittings to trap oils and floatables. A catch basin also can be used as a junction in a pipe system and have a solid lid. Maintaining a catch basin often requires special expertise and equipment.

**Closed detention system** – An underground structure, typically a concrete vault or series of large diameter pipes, that temporarily stores stormwater and releases it slowly. A system typically is used for sites that do not have space for an above-ground system. It is accessed through a manhole lid.

**Covenants, Conditions, and Restrictions (CC&Rs)** – Non-governmental rules and requirements specific to a condominium or homeowners association. Requirements for residents range from lawn upkeep to financial responsibility for maintaining common areas, potentially including stormwater management facilities.

**Curb inlet** – A rectangular structure underneath the curb of a roadway. Openings may be rectangular or square and are located in the gutter (see right).

**Detention facility** – A pond, vault or pipe which temporarily stores stormwater runoff and slowly releases it through a specially designed outlet. Detention facilities are designed to drain completely within a few hours or days.

**Detention pond/basin** – An open basin built by excavating below ground or constructing above-ground embankments. It temporarily stores stormwater runoff and slowly releases it through a specially designed outlet.

**Discharge point/outfall** – The place where a stormwater system empties into a stream or other body of water.

**Drywell** – An underground, concrete structure that allows stormwater to soak into the ground through holes in the walls and/or open bottom. Maintenance often requires special expertise and equipment.

*Curb inlet.*





**Exfiltration system** - A strip of pavement that drains stormwater into a pipe that transports stormwater.

**Field Inlet** - A concrete structure, fitted with a slanted, slotted grate that collects stormwater and routes it through underground pipes.

**Filter strip** - A strip of grass, usually along edges of parking lots and roads, that filters stormwater by removing sediment and oils before the water soaks into the ground.

**Filter vaults or stormwater filters** - Underground vaults, manholes or specialized catch basins that include a series of filter cartridges to capture sediment and pollutants before stormwater flows into a pipe system. Types of pollutants removed depends on the medium used in the filter cartridge.

**Flow control structure/flow restrictor/outlet structure** - A structure that restricts or slowly releases stormwater at a specific rate to reduce flooding and stream erosion and filters pollutants. May utilize an orifice plate for additional flow restriction.

**HOA** - Home Owner Association.

**Infiltration basin** - An open basin built by excavating below ground or constructing above-ground berms, or embankments. It temporarily stores stormwater runoff and disposes of it by letting it soak into the ground.

**Manhole** - An underground, concrete structure that provides maintenance access to pipes that transport stormwater runoff. It is usually found in paved areas and has a solid lid.

**Oil/water separator** - An underground vault that treats stormwater by mechanically separating oil from water. The oil rises to the surface and floats on the water and sediment settles to the bottom. *(continued)*

Oil/water separators are typically used where high oil concentrations are anticipated in the stormwater runoff. For example, parking lots, service and fuel stations.

**Permeable pavement** - Specially constructed paving surfaces that allow water to pass through and soak directly into the ground.

**Rain garden** - Specially designed, site-specific stormwater facility that use plants and soils to capture pollutants and allow stormwater to soak into the earth.

**Retention pond** - An open basin, built by excavating below ground, that has a year-round pool of water. The volume allows sediment to settle out. A wet-pond also detains water using additional temporary storage above the permanent water level to store and slowly release it.

**Storm drain or curb inlet** - A type of catch basin that collects and conveys stormwater runoff.

**Stormwater treatment facility** - A landscaped feature or structure that captures, conveys, slows, detains and/or treats stormwater. They include detention facilities and retention facilities.

**Stormwater runoff** - Water from rainstorms, irrigation or other sources, that flow across and off a hard area, such as a street, paved lot, roof or sidewalk, that prevents it from soaking into the ground.

**Stormwater system** - A system of catch basins, pipes and/or facilities for conveying, detaining or treating stormwater. Not to be confused with a sanitary sewer, which carries wastewater to a treatment facility.

**Treatment wetland** - A shallow man-made pond designed to treat stormwater through the biological processes associated with aquatic plants. These facilities use dense wetland vegetation and settling to filter sediment and other pollutants out of stormwater.

# contacts and resources

## WARREN COUNTY

**Warren County  
Engineer's Office, Stormwater District**  
210 W. Main St.  
Lebanon, OH 45036

(513) 695-3301

*Website:* [www.wceo.us/pages/  
Stormwater-District.html](http://www.wceo.us/pages/Stormwater-District.html)

*E-mail:* Savannah.Shafer@co.warren.oh.us

**Warren County Stormwater Facility  
Maintenance Manual**  
[http://www.wceo.us/pages/  
Stormwater-District.html](http://www.wceo.us/pages/Stormwater-District.html)

**Warren County  
Soil and Water Conservation District**  
320 E. Silver St.  
Lebanon, OH 45036

(513) 695-2830

*Website:* [www.warrenswcd.com](http://www.warrenswcd.com)

*E-mail:* Caitlin.Botschner@co.warren.oh.us

**Warren County  
Combined Health District,  
Environmental Health**  
416 S. East St.  
Lebanon, OH 45036

(513) 695-1228

*Website:* [www.wcchd.com/environmental-  
health.aspx](http://www.wcchd.com/environmental-health.aspx)

## DEERFIELD TOWNSHIP

**Deerfield Township  
Public Works Department**  
4900 Parkway Dr., Suite 150  
Mason, OH 45040

(513) 701-6958

*Website:* [www.choosedeerfield.com](http://www.choosedeerfield.com)

*E-mail:* [erein@deerfieldtwp.com](mailto:erein@deerfieldtwp.com)

**Deerfield Regional Storm Water District**  
(513) 701-6958

*Website:* [deerfieldstormwater.com](http://deerfieldstormwater.com)

*E-mail:* [admin@deerfieldstormwater.com](mailto:admin@deerfieldstormwater.com)

## OHIO EPA

Ohio EPA  
Division of Surface Water  
Mailing address:  
PO Box 1049  
Columbus, OH 43216-1049  
Street address:  
50 West Town St., Suite 700  
Columbus, OH 43215

(614) 644-2001

*Website:* [www.ohio.epa.gov/dsw](http://www.ohio.epa.gov/dsw)

*E-mail:* [dsw.webmail@epa.state.oh.us](mailto:dsw.webmail@epa.state.oh.us)

To report spills or for environmental  
emergencies please call the Emergency  
Response Hotline: (800) 282-9378

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## RESOURCES

Find links to all agency stormwater manuals, comprehensive maintenance checklists that also show how to recognize and fix problems for all facilities in this book and other less common facilities, videos, the information in this guidebook, news and workshops schedule and more...

...at [www.wceo.us/pages/stormwater-district.html](http://www.wceo.us/pages/stormwater-district.html)

# notes



