Number:

SHORELAND PERMIT APPLICATION

City of Lake City Minnesota - Planning and Community Development
205 West Center Street, Lake City, MN 55041
Phone: (651) 345-6803 Fax: (651) 345-3208 Website: www.ci.lake-city.mn.us

1. GENERAL INSTRUCTIONS:

Type or print clearly. Attach all necessary documentation. Application packages missing required elements will be returned to the applicant in their entirety. Application packages that are accepted will proceed to review to insure the applicant has fulfilled all requirements as specified by the City's Shoreland Overlay provisions. This application becomes a valid permit upon the approval by the City of Lake City.

Applicant Information

____
Name of Applicant | Phone Number of Applicant

____
Address of Applicant | City | State | Zip Code

Property Information

____
Name of Property Owner | Phone Number of Property Owner

____
Site Address | Parcel Number

____
Legal Description (attach if necessary)

Project Information

Shoreland Area of the project (either partially or wholly)

☐ Lake Pepin ☐ Gilbert Creek ☐ Miller Creek ☐ Handshaw Coulee Creek

Zoning District the project is located in: _____________

Zoning District impervious surface coverage limit: _____________

2. CHECKLIST OF REQUIRED ITEMS TO BE SUBMITTED WITH THE SHORELAND APPLICATION

Unless specified, all ***items*** listed below are ***required***. Failure to provide the required items will delay a decision on your project and may result in permit denial.

A. Plans.

1. The scale, if any, used on the plan. If the plan is not to scale, the complete dimensions of all features
2. A north-pointing arrow, indicating orientation
3. A legend that clearly indicates all symbols, line types and shadings
4. The ordinary high water line(s)
5. All applicable setbacks lines
6. The dimensions and locations of all existing **pre-construction impervious areas**.
7. The dimension and locations of all **post-construction impervious areas**.
8. Proposed methods of erosion and siltation controls indicated graphically and labeled, or otherwise annotated as needed for clarity.

B. Shoreland Project Point System (SPPS) Worksheet

1. Project Details**.** Submit the SPPS worksheet with the details for the projects selected. If using native plant species a planting schedule with a plating list is required. If part of the stormwater management system involves the use of pervious technologies a plan is requires with specifications indicating how the pervious technologies will be installed and maintained. Details, including soil information are required for all below grade installations.

3. CALCULATING IMPERVIOUS AREAS:

Note: These calculations can be shown on a site plan or survey

Existing Impervious Surfaces: _____________________ %

Proposed Impervious Surface: _____________________ %

4. DETERMINING PROJECT POINT VALUE NEEDED

Percentage Increase ___________________

Project Points Required: ___________________

5. REQUIRED CERTIFICATIONS

By initialing each of the following statements, and signing below, you are certifying that: to the best of my knowledge, the information provided is true, complete and not misleading.

_____ I understand that any permit, waiver or variance granted based on false, incomplete, or misleading information shall be subject to revocation.

_____I am aware that obtaining a Shoreland Permit will not exempt the work I am proposing from other state, local or federal approvals.

____

Signature of Owner or Applicant Print name clearly Date

6. CITY APPROVALS AND CONDITIONS

a) All work must be completed within 6 months of the issuance of a certificate of occupancy as specified in Section 155.34 of the Zoning Ordinance.

b) Any changes to the site development plan after a shoreland permits issuance must be submitted to the City and approved prior to installation. Updated plans will be required for significant changes.

c) Maintenance of all shoreland projects must be completed regularly, or as needed for the life of the project. New and/or future property owners are responsible for ongoing maintenance.

d) Other:____

____

____

____

City Signature **Date**

APPENDIX TO ORDINANCE NO. 500

City of Lake City, Minnesota
Shoreland Project Point System (SPPS)
For Projects Exceeding Impervious Surface Coverage of 25%

Summary:

Properties located within Lake City's shoreland areas must comply with the State of Minnesota's Shoreland Rules, which are developed by the DNR and regulated through the City of Lake City's Shoreland Ordinance. One such requirement limits site impervious surface coverage to 25 percent. Due to existing and proposed development within Lake City, a provision for flexibility from this requirement is being offered for projects exceeding the 25% impervious surface coverage limit.

Instructions:

All projects that exceed the impervious surface coverage limit of 25% must complete and receive approval of this worksheet prior to commencing work. Applicants are allowed to select projects from two categories: stormwater and design. Both categories contain a number of options with associated point values intended to help mitigate the proposed project's impact on the community's public waters.

Materials Required For Submission:

1. A Shoreland Project Point System (SPPS) worksheet
2. A detailed site plan with percent coverage calculations and project details
3. Supplemental data as required (ex. surveys, elevations, soil information)

Point Value:

For a project to receive approval, the applicant must demonstrate the ability to meet a minimum point value based on the amount of increase in proposed impervious surface coverage. The system works by requiring higher point values for higher percentage increases in impervious surface coverage. A worksheet is attached to assist applicants in selecting projects, although the attached list and associated project detail sheets are not an extensive list of options and the City may consider alternatives and additions to the existing list.

Formula:

In all zoning districts, five (5) points are required for each five percent (5%) increase in total site impervious surface coverage, provided the underlying zoning requirements for maximum site impervious surface coverage are not exceeded.

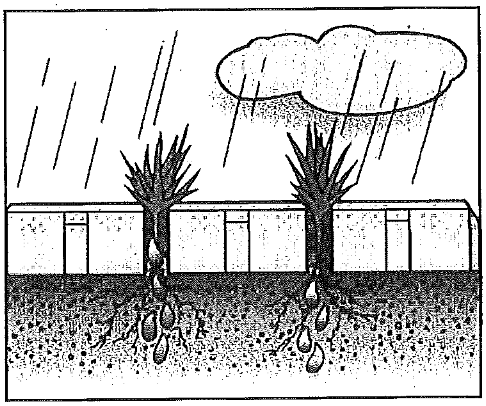
Proof of Installation:

The City may require proof of any of the projects' effectiveness before being awarded a point value, and may exercise the right to inspect the projects for failure to meet the awarded point value. If a projects point value is adjusted, and falls below the minimum required point value, the project will be required to make up the lost points in another area. These improvements shall be maintained throughout the life of the project.

Shoreland Project Point System (SPPS) Worksheet

Stormwater Projects Increased project treatment size, quantity, and quality may justify an increase in awarded points			
Project Description	Standard Points	Points Requested	Points Awarded
Bio-retention System Per standards of and review by the City Engineer	5		
Surface Sand Filter Per standards of and review by the City Engineer	5		
Filter Strip Per standards of and review by the City Engineer	5		
Dry Swale Per standards of and review by the City Engineer	5		
Use of local and native plant species As determined by the DNR	5		
Pervious Pavement (Turf Pavers) Per standards and review by the City Engineer	5		
Green Rooftop Per standards of and review by the City Engineer	5		
Infiltration Basin Per standards of and review by the City Engineer	5		
Infiltration Trench Per standards of and review by the City Engineer	5		
Shoreline Buffer Per Section 155.223 of the Shoreland Overlay Ord.	5		
Open Space 55% open space or more	5		
Rain water barrel 30 gal. or more, maintained, and used on-site	5		
Conservation of Existing Landscape No major grading, filling, or excavation	5		
Other As approved by the Director of Planning	5		
Design Projects Design Projects cannot exceed 50 percent of the project point value			
Project Description	Maximum Points	Points Requested	Points Awarded
Pedestrian Scale Signage Per sign, sized for pedestrians	5		
Context Sensitive Architecture Design and details to compliment area character	5		
Development Fits Neighborhood Scale Building height and bulk fit existing neighborhood	5		
Collaboration with Neighboring Properties In areas such as fences, shrubs, lighting, other	5		
Shared Amenities Driveways, parking, open space, garages, other	5		
Other Design or Landscaping As determined by the Director of Planning	5		
Total	100		

Turf Pavers



Source: SF Concrete Tech.

Purpose

Water Quantity	
Flow attenuation	Secondary design benefit
Runoff volume reduction	Primary design benefit

Water Quality	
Pollution prevention	
Soil erosion	Little or no design benefit
Sediment control	Secondary design benefit
Nutrient loading	Secondary design benefit

- ■ Primary design benefit
- ◧ Secondary design benefit
- □ Little or no design benefit

Description

Turf paving includes several techniques that reduce impervious surfaces, thus increasing infiltration and reducing runoff. The options include modular paving blocks or grids, cast-in-place concrete grids and soil enhancement technologies. All of these methods increase a site's load-bearing capacity, allowing for foot and vehicle traffic along with healthy grass growth. But they are not always appropriate for year-round use or in heavily trafficked areas.

Common applications include roadside right-of-ways, emergency access lanes, delivery access routes and overflow parking areas.

Traffic volume, typical vehicle loads and need for snow plowing can limit application. For these reasons, turf pavers for parking are recommended only for summer overflow areas. In residential areas, alternative surfaces can be used for driveways and walkways, but, due to their texture, are not ideal for areas that require accessibility for handicapped people.

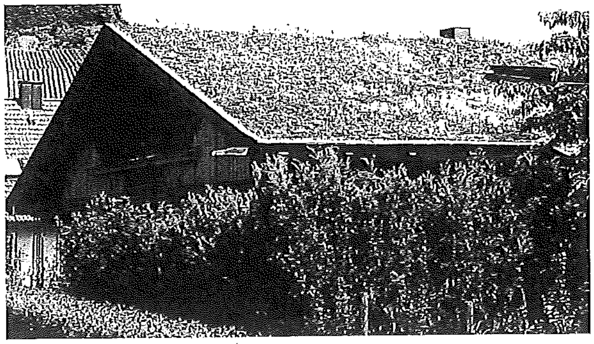
(Porous asphalt or concrete are not included in this discussion, due to their limitations in cold climates.)

Modular Paving Blocks and Grids

Modular paving blocks or grass pavers consist of concrete or plastic interlocking units that provide structural stability while a series of gaps planted with turf grass allow for infiltration. Some blocks may also be filled with gravel and left unplanted. (See Fig. 1) Depending on the use and soil type, a sand setting bed and gravel subbase is often added underneath to help further infiltration and prevent settling.

Products include rigid rectangular modules that are installed like paving stones and flexible rolled material that is cut to size and snapped together.

Green Rooftops



Description

Green rooftops are veneers of living vegetation installed atop buildings, from small garages to large industrial structures. Green rooftops (sometimes called eco-roofs) help manage stormwater by mimicking a variety of hydrologic processes normally associated with open space. Plants capture rainwater on their foliage and absorb it in their root zone, encouraging evapotranspiration and preventing much stormwater from ever entering the runoff stream. What water does leave the roof is slowed and kept cooler, a benefit for downstream water bodies. Green roofs are especially effective in controlling intense, short-duration storms and have been shown to reduce cumulative annual runoff by 50 percent in temperate climates.

Key considerations for implementing green roofs include structural and load-bearing capacity, plant selection, waterproofing and drainage or water storage systems.

All green rooftops include the following basic component layers, listed from the bottom up:

- Waterproofing and root barrier
- Insulation (optional)
- Drainage and filter layer
- Soil and plants

Green rooftops can be built in a variety of ways, but the simplest involves a relatively light system of drainage and filtering components and a thin layer of soil mix (2 to 4 inches), which is installed and planted with drought-tolerant herbaceous vegetation. Roofs built this way are called *extensive* systems.

More complex green rooftops, or *intensive* systems, employ deeper soils to accommodate tree and shrub root systems and structures to support human use. They require higher structural load capacity as

Purpose

	Water Quantity
Flow attenuation	■
Runoff volume reduction	■

	Water Quality
Pollution prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

Landscape Design & Maintenance

Fred Rozumalski

Purpose

	Water Quantity
Flow attenuation	Secondary design benefit
Runoff volume reduction	Secondary design benefit

	Water Quality
Pollution prevention	
Soil erosion	Primary design benefit
Sediment control	Secondary design benefit
Nutrient loading	Secondary design benefit
Pollutant removal	
Total suspended sediment (TSS)	Secondary design benefit
Total phosphorus (P)	Secondary design benefit
Nitrogen (N)	Secondary design benefit
Heavy metals	Secondary design benefit
Floatables	Secondary design benefit
Oil and grease	Secondary design benefit
Other	
Fecal coliform	Secondary design benefit
Biochemical oxygen demand (BOD)	Secondary design benefit

Legend: ■ Primary design benefit; ◧ Secondary design benefit; □ Little or no design benefit

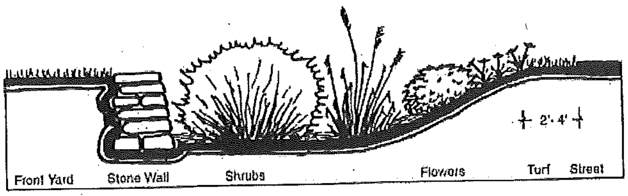
Description

Numerous landscape design and maintenance practices negatively impact runoff quantity and downstream water body quality. Overapplication and misapplication of lawn fertilizer can result in nitrogen- and phosphorus-laden runoff to end up in the runoff stream and downstream water bodies, where they contribute to excess algae growth. Leaves, grass clippings and other plant debris can be carried away by runoff, finding their way into natural water bodies, where they decompose and release nutrients.

Due to their high aquatic toxicity, pesticides and herbicides can be a significant source of water quality impairment in streams, lakes and wetlands. U.S. pesticide usage was estimated at more than 1.2 billion pounds of active ingredients in 1995. A portion of this finds its way into stormwater runoff and ultimately into receiving water bodies through spray drift, transport with soils, solubilization by runoff and by spillage, dumping and improper disposal of containers and residuals.

A naturally diverse landscape discourages outbreaks of disease or insects, thus reducing or eliminating the need for chemical controls. Using plants that are well-adapted to local soil conditions, especially native plants with deep root systems, can eliminate the need for fertilizer, herbicides and pesticides. These plants also encourage infiltration and help prevent erosion.

On-Lot Infiltration



General Description

On-lot infiltration systems promote infiltration at the individual lot level, controlling runoff at its source. These systems are off-line and generally receive sheet flow runoff. The main feature that distinguishes these systems from other infiltration systems (such as infiltration basins and trenches) is scale. These small systems accept runoff from a single residential lot. Although infiltration basins and trenches have many design features in common with on-lot infiltration systems, the Infiltration Basins and Infiltration Trenches BMP Sections refer to larger lot, end-of-pipe facilities.

On-lot infiltration systems' primary function is to mitigate the normal impacts of urbanization on the natural water balance. This is done by turning water that would normally become surface runoff (a waste product) into a resource that waters trees, recharges groundwater and provides stream baseflows. On-lot infiltration systems also function to improve water quality by removing some pollutants from the runoff as it infiltrates. Also, because these systems serve to reduce the volume of runoff, they contribute to both erosion protection and flood control. Lastly, the use of these systems reduces the size and cost of downstream water control facilities.

On-lot infiltration systems include:

- Reduced lot grading (Figure 1)
- Directing roof leaders to soakaway pits (Figures 2 through 4)
- Directing roof leaders to rain barrels (Figure 6)
- Directing roof leaders or other surface runoff to other vegetated areas, such as rainwater gardens (Figures 7 through 10)

These source controls address measures that can be applied by the developer or the homeowner. Public education programs within municipalities can help to educate citizens on the role they can play in the application of these systems.

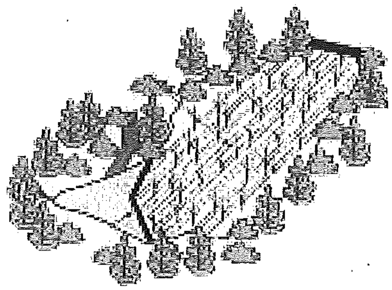
On-lot infiltration systems are not to be used for infiltrating any

Purpose

Water Quantity	
Flow attenuation	◧
Runoff volume reduction	■
Water Quality	
Pollution Prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A
Pollutant Removal (Soakaway Pits and Rainwater Gardens)	
Total suspended sediment (TSS)	■
Total phosphorus (P)	■
Nitrogen (N)	■
Heavy metals	■
Floatables	◧
Oil and grease	■
Other	
Fecal coliform	◧
Biochemical oxygen demand (BOD)	◧

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

Infiltration Basins



Description

An infiltration basin is stormwater runoff impoundment designed to capture a stormwater runoff volume, hold this volume and infiltrate it into the ground over a period of days. It does not retain a permanent pool of water. Infiltration basins are typically off-line, end-of-pipe BMPs. A flow splitter or weir is usually used to divert runoff from a storm sewer system into the infiltration basin.

Infiltration basins in this BMP Section refer to end-of-pipe infiltration systems that treat stormwater runoff from a few lots or properties as opposed to rainwater gardens which are primarily used for a single lot application (see the On-Lot Infiltration BMP Section for information on this type of BMP).

A key feature of an infiltration basin is its vegetation. It is important to vegetate the bottom of the basin with deep-rooted plants to increase the infiltration capacity of the basin. Roots create small conduits for water to infiltrate. The root penetration and thatch formation of the vegetation maintains and may enhance the original infiltration capacity. Dense vegetation will also impede soil erosion and scouring of the basin floor.

Infiltration basins are not appropriate for areas that contribute high concentrations of sediment, or suspended solids, without adequate pretreatment. Excessive sediment can clog the basin and take up storage volume.

Infiltration basins require pretreatment of stormwater in order to remove as many of the suspended solids from the runoff as possible before the water enters the basin. Pretreatment, such as grit chambers, swales with check dams, filter strips, or a sedimentation basin should be a fundamental component of any BMP system relying on infiltration. Good housekeeping measures should also be investigated (e.g., street sweeping, reduction of sanding or salting practices, etc.). Public education with respect to street and driveway sediments should be provided in areas where an infiltration basin is proposed.

Purpose

Water Quantity

Flow attenuation ◧
Runoff volume reduction ■

Water Quality

Pollution prevention

Soil erosion N/A

Sediment control N/A

Nutrient loading N/A

Pollutant removal ■

Total suspended sediment (TSS) ■

Total phosphorus (P) ■

Nitrogen (N) ◧

Heavy metals ◧

Floatables

Oil and grease ◧

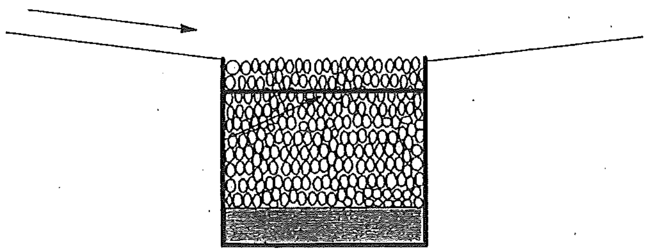
Other ◧

Fecal coliform

Biochemical oxygen demand (BOD)

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

Infiltration Trenches



Description

Infiltration trenches are shallow (3- to 12-foot) excavations that are lined with filter fabric and filled with stone to create underground reservoirs for stormwater runoff from a specific design storm. The runoff gradually percolates through bottom and sides of the trench into the surrounding subsoil over a period of days. Infiltration trenches are typically implemented at the ground surface to intercept overland flows. Runoff can be captured by depressing the trench surface or by placing a berm at the down gradient side of the trench.

Infiltration trenches in this BMP Section refer to surface trenches that collect sheet flow from a few lots or properties as opposed to soakaway pits which are primarily used for a single lot application (see the On-Lot Infiltration BMP Section for information on this type of BMP).

Infiltration trenches require pretreatment of stormwater in order to remove as much of the suspended solids from the runoff as possible before it enters the trench. Pretreatment practices, such as grit chambers, swales with check dams, filter strips, or sediment fore-bays/traps should be a fundamental component of any BMP system relying on infiltration. Source controls should also be investigated (e.g., eliminate excessive sanding/salting practices). Public education with respect to street/driveway sediments should be provided in areas where an infiltration trench is proposed.

The design storm for an infiltration trench is typically a frequent, small storm such as the 1-year event. This provides treatment for the "first flush" of stormwater runoff. Infiltration trenches provide total peak discharge, runoff volume and water quality control for all storm events equal to or less than the design storm. This infiltration reduces the volume of runoff, removes many pollutants and provides stream baseflow and groundwater recharge.

Infiltration trenches have limited capabilities for controlling peak discharge for storms greater than the design storm. Because infiltra-

Purpose

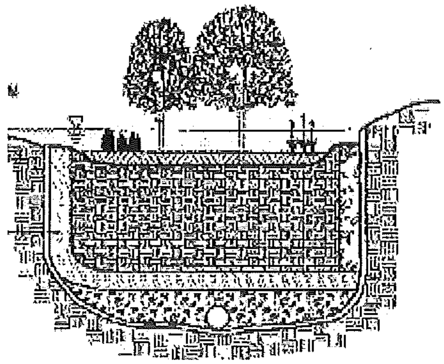
Water Quantity	
Flow attenuation	◧
Runoff volume reduction	■
Water Quality	
Pollution prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A
Pollutant removal	
Total suspended sediment (TSS)	■
Total phosphorus (P)	■
Nitrogen (N)	■
Heavy metals	■
Floatables	◧
Oil and grease	◧
Other	
Fecal coliform	◧
Biochemical oxygen demand (BOD)	◧

■ Primary design benefit

◧ Secondary design benefit

□ Little or no design benefit

Bioretention Systems



The Bioretention Concept

For the purposes of this manual, Bioretention Systems are presented as a general concept, rather than a specific type of BMP. The Bioretention concept uses biologic activity (plants and microbes) to filter/clean stormwater.

This concept can be incorporated into many different kinds of infiltration or filtration BMP designs, such as:

- Infiltration Basins
- Rainwater Gardens (an On-Lot Infiltration system)
- Surface Sand Filters

In general, Bioretention Systems can be described as shallow, landscaped depressions commonly located in parking lot islands or within small pockets in residential areas that receive stormwater runoff. Stormwater flows into the bioretention area, ponds on the surface, and gradually infiltrates into the soil bed. Pollutants are removed by a number of processes including adsorption, filtration, volatilization, ion exchange and decomposition (Prince George's County, MD, 1993). Filtered runoff can either be allowed to infiltrate into the surrounding soil (functioning as an infiltration basin or rainwater garden), or collected by an under-drain system and discharged to the storm sewer system or directly to receiving waters (functioning like a surface sand filter). Runoff from larger storms is generally diverted past the area to the storm drain system.

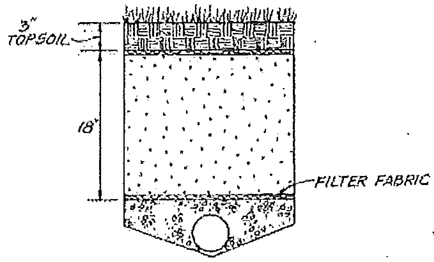
Some examples of bioretention areas are shown in Figures 1 through 3. In Figure 1, the bioretention system resembles an infiltration basin enhanced with planting soil and sand media. The bioretention system shown in Figure 2 could be considered a rainwater garden in a parking lot. The bioretention example in Figure 3 is essentially a surface sand filter design with planting soil comprising most of the filter's cross section.

Purpose

Water Quantity	
Flow attenuation	◧
Runoff volume reduction (for infiltration systems only)	◧
Water Quality	
Pollution prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A
Pollutant removal	
Total suspended sediment (TSS)	■
Total phosphorus (P)	■
Nitrogen (N)	■
Heavy metals	■
Floatables	◧
Oil and grease	■
Other	
Fecal coliform	◧
Biochemical oxygen demand (BOD)	◧

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

Surface Sand Filters



Description

Also known as filtration basins, filter systems, or media filtration facilities, surface sand filters consist of a pretreatment basin, a water storage reservoir, flow spreader, sand and underdrain piping. A basin liner may also be needed if the treated runoff is not to be allowed to infiltrate into the soil underlying the filtration basin because of groundwater concerns. A related type of filtration system employs organic materials such as peat or compost combined with sand or other materials. The latter types are not discussed in this publication.

Sand filters are intended to address the spatial constraints that can be found in intensely developed urban areas where the drainage areas are highly impervious. They can be used on small urban sites where space is at a premium and where the soils or groundwater concerns would not support an infiltration device.

Sand filters have been demonstrated to be effective in removing many of the common pollutants found in urban stormwater runoff, especially those found in particulate form. They have also been shown to have at least a moderate level of bacterial removal. They have not been effective at removing total dissolved solids and nitrate-nitrogen (subsets of total suspended sediment and nitrogen, respectively).

There are two basic components of a sand filter design: the pretreatment basin and the sand filter. They are both important parts of the design, and neither can be omitted. The pretreatment basin reduces the amount of sediment that reaches the sand filter and helps ensure that stormwater reaches the sand filter as sheet flow. The sand filter traps the finder sediment and sediment-bound pollutants and provides a media for microbial removal of bacteria.

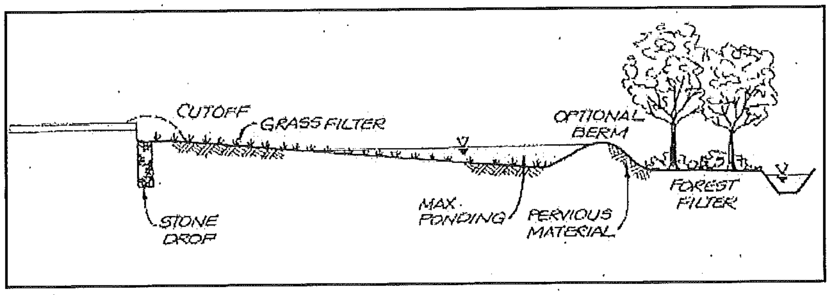
Sand filters work by receiving the first flush of runoff and settling out the heavier sediment in the pretreatment basin. Water flows to and is spread over the sand filter, where pollutants are either trapped or strained out. Sand filters are to be used only for drainage that has been stabilized. Sediment suspended in runoff during construction could quickly clog the sand filter and render it useless.

Purpose

Water Quantity	
Flow attenuation	☐
Runoff volume reduction	☐
Water Quality	
Pollution prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A
Pollution removal	
Total suspended sediment (TSS)	■
Total phosphorus (P)	◧
Nitrogen (N)	◧
Heavy metals	■
Floatables	◧
Oil and grease	◧
Other	
Fecal coliform	◧
Biochemical oxygen demand (BOD)	◧

■ Primary design benefit
◧ Secondary design benefit
☐ Little or no design benefit

Filter Strips



Description

Filter strips (also known as vegetated filter strips, grass filter strips and grassed filters) are densely vegetated, uniformly graded areas that treat sheet flow from adjacent impervious surfaces. Filter strips function by slowing runoff velocities, trapping sediment and other pollutants and providing some infiltration. While frequently planted with turf grass, filter strips may also employ native vegetation, such as meadow or prairie, which may be more effective in treating nutrients. In addition, trees and shrubs may be incorporated into portions of the strip to create visual screening as well as a physical barrier. (See Figure 1.)

Filter strips are best suited to treating runoff from roads and highways, roof downspouts and small parking lots, and they are ideal components of the "outer zone" of a stream buffer. In addition, filter strips are frequently used as a pretreatment system for stormwater destined for other BMPs such as filters or bioretention systems.

A challenge associated with filter strips is the difficulty of maintaining sheet flow. Urban filter strips are often short-circuited by concentrated flows, which results in little or no treatment of stormwater runoff. To avoid this problem, filter strip design can incorporate a level spreader to distribute concentrated flow along the width of the strip.

Filter strips were originally used as an agricultural treatment practice and have more recently evolved into an urban practice. Studies in agricultural areas indicate that a 15-foot wide grass buffer can achieve a 50 percent removal rate of nitrogen, phosphorus and sediment and that a 100-foot buffer can remove 70 percent of these constituents. Urban runoff studies suggest a minimum removal rate of 35 percent of solids and 40 percent of nutrients. This assumes a filter strip that is properly designed, constructed and maintained.

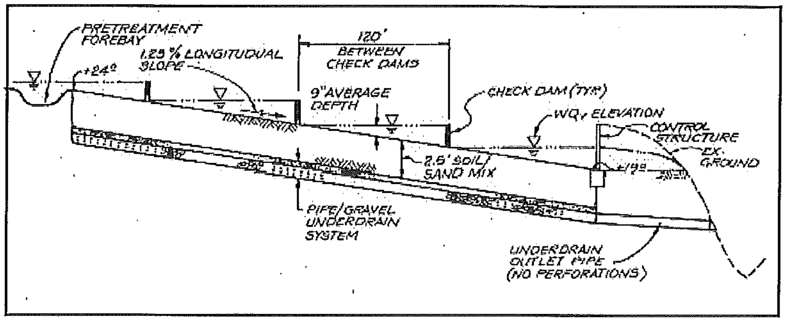
Purpose

Water Quantity	
Flow attenuation	◧
Runoff volume reduction	◧

Water Quality	
Pollution prevention	
Soil erosion	□
Sediment control	◧
Nutrient loading	◧
Pollutant removal	
Total suspended sediment (TSS)	◧
Total phosphorus (P)	□
Nitrogen (N)	□
Heavy metals	□
Floatables	◧
Oil and grease	◧
Other	
Fecal coliform	□
Biochemical oxygen demand (BOD)	□

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

Dry Swales



Description

The dry swale (also called a grassed swale) is a type of open vegetated channel used to treat and attenuate the water quality volume of stormwater runoff as well as convey excess stormwater downstream. In dry swales, the entire water quality volume of a given storm is temporarily held in a pool or series of pools created by permanent checkdams or ditchblocks. This holding time serves to settle pollutants, especially sediment.

Dry swales are good options in residential settings, as they discourage long-standing water, thus making it possible to mow the area even shortly after a rainfall. Dry swales are typically located in a drainage easement at the back or side of a residential lot or along roadsides in place of curb and gutter.

Dry swales may be treated as an extension to a mown lawn or be planted in native grasses and allowed to grow longer (though still mown at least annually), potentially increasing filtration/infiltration as well as habitat value. Unless existing soils are highly permeable, they are replaced with a sand/soil mix that meets minimum permeability requirements.

An underdrain system is also installed under the soil bed. Typically, the underdrain system is created by a gravel layer which encases a perforated pipe. Stormwater treated by the soil bed flows into the underdrain, which conveys treated stormwater back to the storm drain system. The dry swale is related to the wet swale, though the latter does not have an underlying filtering bed.

Advantages

- Traps sediment and other pollutants.
- Controls peak discharges by reducing runoff velocity and promoting infiltration.

Purpose

Water Quantity	
Flow attenuation	◧
Runoff volume reduction	□

Water Quality	
Pollution prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A
Pollutant removal	
Total suspended sediment (TSS)	■
Total phosphorus (P)	■
Nitrogen (N)	■
Heavy metals	■
Floatables	□
Oil and grease	◧
Other	
Fecal coliform	□
Biochemical oxygen demand (BOD)	◧

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit