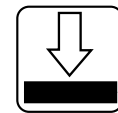


parking areas & impermeable landscape



impermeable soils



permeable soils

Description

A vegetated swale is a gently sloping landscaped depression that collects and conveys stormwater runoff, and is narrow and at least 100 feet in length. The densely planted swale filters stormwater as it flows the length of the swale and allows infiltration of water into the ground. The vegetated swale may discharge to a storm sewer or other approved discharge point where soils do not drain well.

Vegetated swales have a required minimum length, width and stormwater residence time. See Clean Water Services Design and Construction Standards Details 700 and 710.

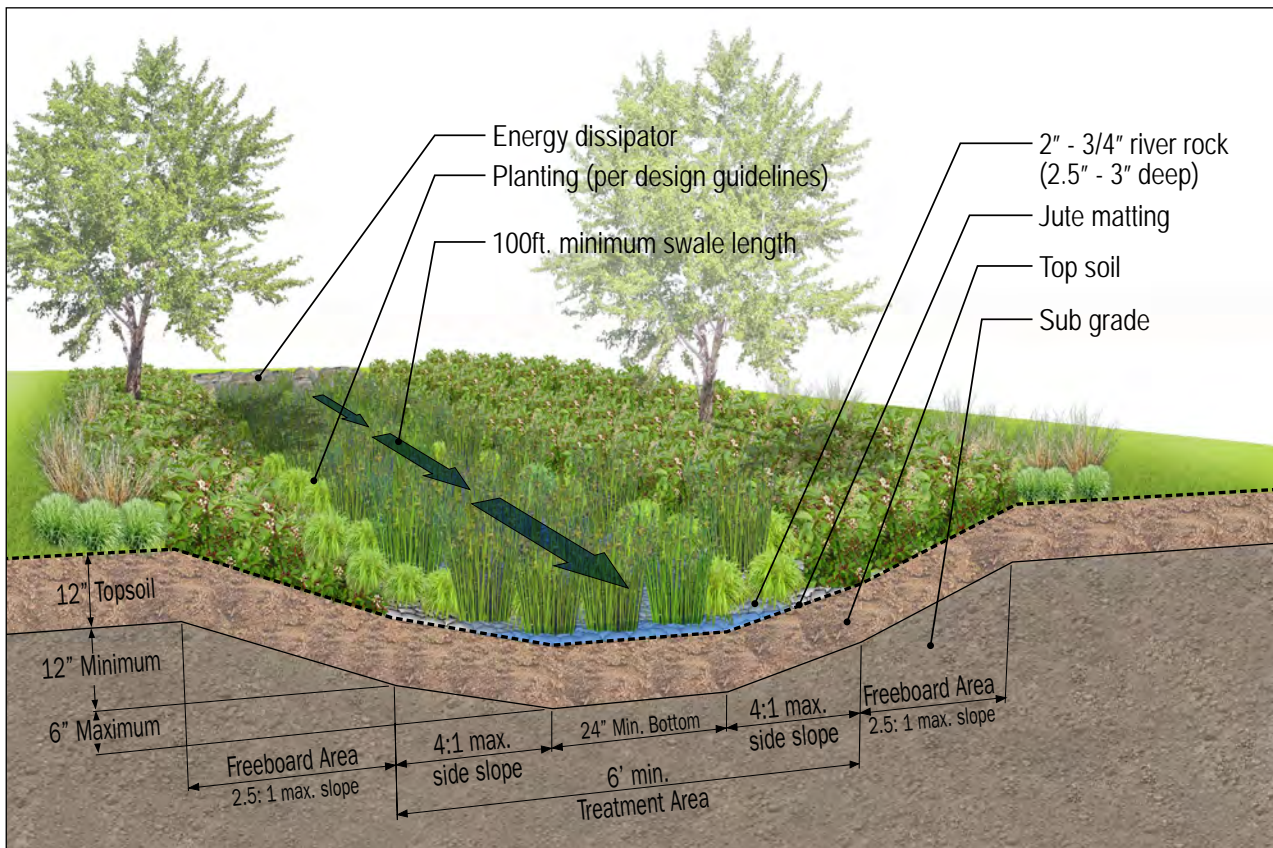
- Y - Public System Approvable
- Y - Quantity for Conveyance
- Y - Hydromodification Approach
- N - Water Quality Treatment Approach

Application & Limitations

Vegetated swales may help fulfill a site's landscaping area requirement. Vegetated swales are approved to treat stormwater from all types of impervious surfaces including private property and the public right-of-way, rooftops, parking lots and streets.



Westhaven Subdivision, Washington County, Oregon



Design Factors

Sizing

A vegetated swale must be at least 100 feet in length and detain stormwater for at least nine minutes for treatment as specified in Clean Water Services Design and Construction Standards.

Geometry/Slopes

A vegetated swale's slope end to end is at least 0.5% and the maximum velocity for a 25-year storm flow is 2 feet per second. Side slopes within the treatment area are 25% (4 horizontal: 1 vertical) or less; side slopes of the freeboard area above the treatment zone are 40% (2.5 horizontal: 1 vertical) or less. While the bottom of the swale is at least 2-feet wide, the treatment area is at least 6-feet wide and no more than ½ foot in depth. The freeboard area has at least one foot of vertical height. All swales have an energy dissipater such as boulders at the entrance to reduce velocities and spread the flow across the treatment area. The minimum length of the energy dissipater is 4 feet. See Clean Water Services Design and Construction Standards – Standard Details.

Piping for Vegetated Swales

Flows coming into the vegetated swale facility are pretreated by a water quality manhole in accordance with the Design and Construction Standards. Other pretreatment may include an approved proprietary treatment device, filter strip, trapped catch basin, or other method approved by the District or City. An approved outlet structure must be provided for all flows. If location would make access for maintenance difficult, the swale may be a flow-through facility with unsumped structures.



Arbor Oaks Subdivision, Washington County, Oregon



Tanasbourne Office Building, Washington County



Aloha Huber Park Elementary School, Washington County

Design Factors (continued)

Setbacks

Check with the local building department to confirm site-specific requirements.

Soil Amendment/Mulch

The treatment area has $\frac{3}{4}$ " to 2-inch river run rock placed 2.5 to 3 inches deep on high density jute or coconut matting over 12 inches of native topsoil. The river rock, topsoil and high density jute or coconut matting extends to the top of the treatment area,; topsoil and low density jute matting extends to the edge of the water quality tract or easement area.

Vegetation

The entire facility including freeboard and treatment areas is vegetated according to the Standards with vegetation appropriate for the soil conditions. Planting conditions vary from wet to relatively dry within the swale. The flat bottom will be inundated frequently and should be planted with species such as rushes, sedges, perennials and ferns. Shrubs that are well-suited to moist soil conditions can

be planted on the side slope where moisture gradient varies from moist toward the bottom and relatively dry near the top.. The moisture gradient will vary depending upon the designed water depth, swale depth and side slope steepness. The transition zone from the bottom of the swale to the designed high-water line or top of freeboard should be planted with sedges, rushes, perennials and ferns, as well as shrubs that can tolerate occasional standing water and wet-to-moist planting conditions. The areas above the designed high water line and immediately adjacent to the vegetated swale will not be regularly inundated and should be planted with self-sustaining, low-maintenance grasses, perennials and shrubs suitable for the local climate and site. Native plants are encouraged, but non-invasive ornamentals that add aesthetic and functional value are acceptable upon approval. All vegetation should be densely and evenly planted to ensure proper hydrological function of the swale. For a complete list of allowable plants refer to page 76.



Broadview, Seattle



PCC Rock Creek Campus, Beaverton

Design Factors (continued)

Plant Spacing

A) Vegetated swales in tracts or easements less than 30 feet wide are planted as follows to achieve the specified per acre densities:

- i. Treatment area = 6 plugs per square foot (min. 1-inch diameter by 6-inch tall)
- ii. Total number of shrubs per acre = area in square feet x 0.05
- iii. Groundcover = plant and seed to achieve 100% coverage

B) Vegetated swales in tracts or easements 30 feet wide or more are planted as follows to achieve the specified per acre densities:

- i. Treatment area = 6 plugs per square foot (min. 1-inch diameter by 6-inch tall)
- ii. Total number of trees per acre = area in square feet x 0.01
- iii. Total number of shrubs per acre = area in square feet x 0.05
- iv. Groundcover = plant and seed to achieve 100% coverage

Required Maintenance Period

- Water-efficient irrigation should be applied for the first two years after construction of the facility, particularly during the dry summer months, while plantings become established. Irrigation after these two years is at the discretion of the owner.



Sandy Boulevard, Portland

- If public, the permittee is responsible for the maintenance of the vegetated swale for a minimum of two years following construction and acceptance of the facility.

Long-Term Maintenance

If private, the property owner will be responsible for ongoing maintenance per a recorded maintenance agreement (see page 88 for example maintenance agreement).

For detailed Operation and Maintenance Plans that describe proper maintenance activities, please refer to page 91.

All publicly maintained facilities not located in the public

References

Clean Water Services Design and Construction Standards