

WQ-10: OP LEVEL SPREADERS (Outlet Pipe Discharges)

1.0 Level Spreaders

1.1 Description

Use Level Spreaders for Outlet Pipe Discharges as an energy dissipater to disperse concentrated runoff uniformly. Use Level Spreaders for peak design flow rates up to 30 cubic feet per second (cfs). Level spreaders are constructed at a virtually zero percent grade across a slope consisting of a permanent structure used to disperse or “spread” concentrated flow thinly over the Level Spreader lip. The main purpose is to spread potentially erosive concentrated flow over a wide area to reduce erosion at the outlet.

Use Level Spreaders for Outlet Pipe Discharges to convey runoff from pipe outfalls uniformly onto downstream areas. Level Spreaders are applicable:

- As outlets for diversion structures.
- Where uniform, sheet flow can be achieved down slope of Level Spreaders.
- As a segment of a stormwater BMP treatment series.
- Where runoff from an impervious surface is uneven and/or runoff is released as concentrated flow, such as through curb cuts or slope drains.

Do not use Level Spreaders:

- Where discharge slopes exceed 6% for wooded/forested areas or 8% for thick ground cover/grass areas.
- Where there are draws or concentrated flow channels located within the down slope area of a proposed Level Spreader.
- Where the runoff water will re-concentrate after release from the level spreader before reaching an outlet designed for concentrated flow.
- Where there will be traffic over the Level Spreader.

Depending on the use, Level Spreader elements may include a forebay, Level Spreader lip, pipe drain and turf reinforcement matting (TRM) or Class A or B riprap. Ensure Level Spreaders not discharging to a specific stormwater BMP or designed stormwater conveyance system discharge to a stabilized area.

Level Spreader dimensions are derived from the design peak flow rates (cfs). Table 1 shows the minimum depth and minimum length of the level spreader lip based on the discharge pipe size.

Table 1: Level Spreader Dimensions

Pipe Size (inches)	Minimum Depth (ft)	Minimum Lip Length (ft)
12	1.0	11.0
18	1.5	16.5
24	2.0	22.0
30	2.5	27.5
36	3.0	33.0

1.2 Materials

1.2.1 Forebay / Excavated Swale

Use a forebay or excavated swale for the preliminary treatment of stormwater. Excavate the forebay as a bowl shaped feature to slow the influent before it reaches the level spreader lip. Reinforce the forebay with a turf reinforcement matting (TRM), Class A or B riprap, or transition mats

1.2.2 Level Spreader Lip

User a Level Spreader lip made of earth, gravel, or concrete. When the lip is constructed of earth or gravel, reinforce the level spreader lip with turf reinforcement matting. The level spreader lip is the main body of the Level Spreader that receives water from the forebay, directly from a BMP, or directly from a pipe outlet. Construct the lip so it is level along the entire length.

1.2.3 Drainage Pipe

Use Level Spreader drainage pipe when the underlying soil has an infiltration rate less than 2 in/hr or when water detained within the Level Spreader does not drain. Use a non-perforated PVC pipe underdrain with a minimum diameter of 4-inches.

1.2.4 Turf Reinforcement Matting (TRMs)

Stabilize the Level Spreader with turf reinforcement matting.

1.3 Construction Requirements

Construct Level Spreaders on undisturbed soil whenever possible. If the use of fill is unavoidable, compact the fill material to 95% of standard proctor tests. Protect the level spreader and downstream vegetated area from sediment and stormwater flows during construction.

1.3.1 Site Preparation

Before Level Spreader construction, ensure the ground contours are parallel to the Level Spreader location, slopes are less than 6 to 8 percent, and no draws are located downstream of the level spreader. Assess the downstream area and ensure the area stabilized prior to the construction of the Level Spreader. Ensure Level Spreader is actually level.

1.3.2 Installation

Install the Level Spreader with no greater than 0.05 percent grade on the spreader lip to ensure a uniform distribution of flow. A temporary stormwater diversion may be necessary until the Level Spreader is fully stabilized.

1.3.2.1 Forebay / Excavated Swale

Construct an excavation upstream of the Level Spreader lip acting as a stilling basin allowing runoff to pond. Excavate the forebay to the dimensions, side slopes, and elevations shown on the contract plans or as directed by the Engineer. The minimum depth of the forebay ranges from 1 to 3 feet. Do not operate heavy equipment for the excavation of the Level Spreader. Remove excavated materials from the Level Spreader and forebay and dispose of them properly.

1.3.2.2 Level Spreader Lip

Install the Level Spreader lip with a minimum top width of 6-inches. Install the Level Spreader lip with a minimum 6-inch drop to the existing downstream ground allowing water to pass over the lip without interference from vegetation. Extend a TRM a minimum of 3 feet downstream of the Level Spreader lip,

then anchor and trench the TRM into place as required. The TRM limits erosion from occurring as water discharges from the top of the level spreader to the downstream vegetated area.

1.3.3 Inspection and Maintenance of Level Spreaders

Regular inspection and maintenance is critical to the effective operation of Level Spreaders. During the first year after construction, inspect Level Spreaders for proper distribution of flows and signs of erosion during and after all major rainfall events. After the first year, inspect Level Spreaders annually or biannually.

Summary of maintenance requirements:

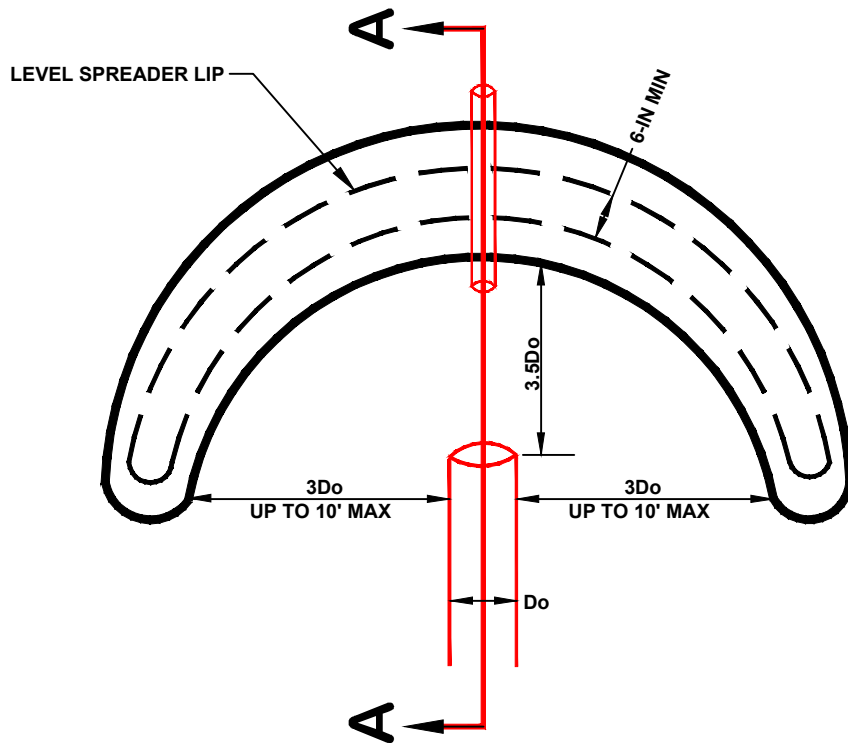
- Maintain Level Spreaders annually and after all major storm events.
- Check the Level Spreader and downstream areas for signs of erosion.
- Address erosion that is discovered in downstream areas through the application of turf reinforcement matting (TRM) and through re-grading if necessary.
- Remove sediment and debris from the forebay and from behind the Level Spreader lip.
- Maintain the grass in the forebay and around the Level Spreader to a height of approximately 3 to 6 inches.

Other required maintenance includes, but is not limited to:

- Mowing and trimming as needed.
- Replacing or replenishing vegetation as needed.
- Removing trash and debris periodically as needed.
- Re-grade and re-seed Level Spreader upslope edges and the forebay as a result of deposited sediment. (Depositing sediment may kill grass and change the Level Spreader elevation.)

1.3.4 Acceptance

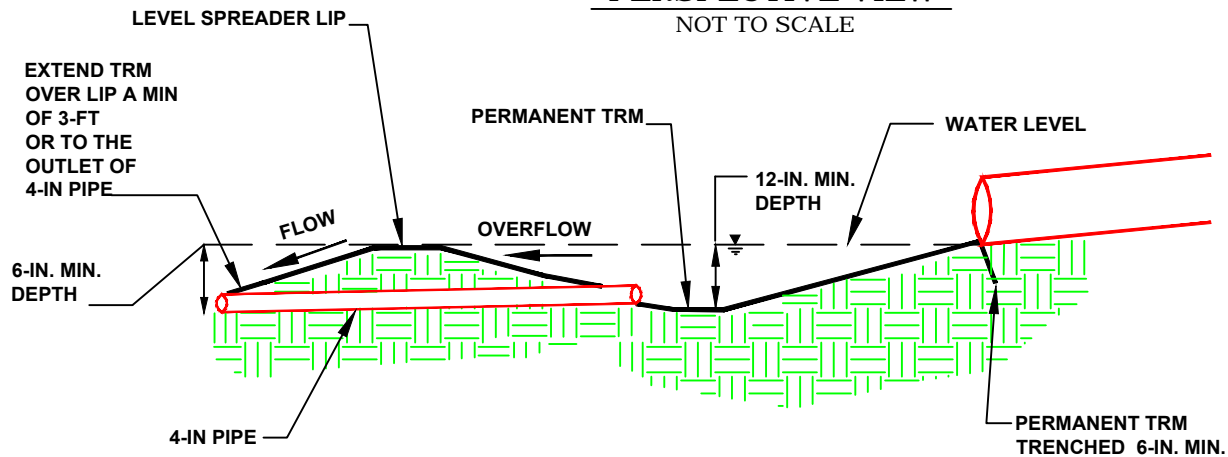
Obtain Engineer acceptance and approval for all Level Spreader installations.



OUTLET PROTECTION LEVEL SPREADER

NOTE;
Install TRM per RECP specifications.

PERSPECTIVE VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE

Anderson County, SC

OP LEVEL SPREADER

STANDARD DRAWING NO. WQ-10

APPROVED BY: _____
Anderson County, SC

January, 2013
DATE

LEVEL SPREADER MAINTENANCE AND RESPONSIBILITY AGREEMENT

The Permanent *Stormwater System Maintenance and Responsibility Agreement* requires adequate maintenance for stormwater management/Best Management Practices (BMP) facilities including Level Spreaders. Document Level Spreaders deficiencies during **annual** inspections. Complete any necessary repairs and/or preventive maintenance procedures in a timely manner to ensure proper functioning as Level Spreaders.

Important maintenance procedures:

- Immediately after the installation, water newly planted vegetation twice weekly as needed until the vegetation becomes established (typically six weeks).
- Ensure the grass cover is dense and healthy. Re-sod or re-seed if necessary to ensure a dense stand of grass.
- Maintain stable groundcover in the drainage area to reduce the sediment load.
- Two to three times per year, grass filter strips will be mowed and the clippings harvested to promote the growth of thick vegetation with optimum pollutant removal efficiency. Turf grass should not be cut shorter than 3 to 5 inches and may be allowed to grow as tall as 12 inches depending on the aesthetic requirements. Forested filter strips do not require this type of maintenance.
- Once a year, the soil will be aerated if necessary.
- Once a year, soil pH will be tested and lime will be added if necessary.
- Annually inspect the BMP to ensure proper function and effectiveness as a stormwater best management practice.

After vegetation is established, perform inspections once a quarter and after every storm event greater than 1.0 inch, and annually thereafter. Keep operation and maintenance records in a known location and make them available upon request.

Perform recommended maintenance activities as follows:

Required Maintenance	Frequency
Periodic pruning and weeding.	As needed
Remove trash and debris.	As needed
Inspect inflow points for clogging. Remove any sediment.	Every 6-months
Repair eroded areas. Re-seed or sod as necessary.	Every 6-months
Inspect trees and shrubs to evaluate their health.	Every 6-months
Remove and replace dead or severely diseased vegetation.	Every 6-months
Removal of evasive vegetation.	Every 6-months
Nutrient and pesticide management.	Annual, or as needed
Water vegetation, shrubs, and trees.	Every 6-months

Perform trouble shooting activities as follows:

Field Condition	Common Solutions
Trash/ Debris is present	Remove trash/ debris
Water is channelizing and causing erosion.	Re-grade if necessary to smooth it over and Provide additional erosion protection as needed such as erosion control blankets and turf reinforcement matting to prevent future erosion problems.
Too much sediment has accumulated.	Remove accumulated sediment to recover capacity. A sediment forebay may be required. Remove sediment that exceeds 2 inches on more than 10% of the vegetated treatment area, or anywhere that it is interfering with performance.
The flow control device is clogged or damaged	Unclog and properly dispose of any sediment off site. Make any necessary repairs or replace device if necessary.
Grass is too long or too short.	Maintain grass at a height of approximately three to six inches.
Plants are desiccated, dead, diseased or dying	Determine the source of the problem (soils, hydrology, disease, etc.). Remedy the problem and replace plants. Provide a one-time fertilizer application. Provide additional irrigation and fertilizer as needed.
Nuisance vegetation is choking out desirable species	Remove vegetation by hand if possible. If pesticide is used, do not allow it to get into the receiving water (stream, pond, etc.).