Bowling Green, Kentucky
Stormwater Best Management Practices (BMPs)
Sediment Management Practices (SMPs)

SMP-09

Activity: Temporary Diversions, Drains and Swales (TD)

PLANNING CONSIDERATIONS:

Design Life:
Permanent

Acreage Needed:
Minimal

Estimated Unit Cost:
Medium

Monthly Maintenance:
N/A

→ TD → TD

TD

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ◇

Sediment ♦ Heavy Metals ♦ Nutrients ♦ Oxygen Demanding Substances ♦ Toxic Materials ◇
Oil& Grease ♦ Bacteria & Viruses ◇ Floatable Materials ◈ Construction Waste ◇

Description

These temporary drains offer features such as conveyance for runoff down cut or fill slopes, subsurface drains that drain off excessive soil saturation, minimization of sheet flow over slope surfaces and reduced sedimentation. Once stabilized, diversions require relatively little maintenance.

Suitable Applications

- Provide drains to prevent slope failures, damage to adjacent property, erosion and sediment control and removes excess water from soil.
- Diversions to catch runoff at the end of an undisturbed slope before entering a bared area, direct runoff, preserve stable conveyance and to prevent overflow.

Installation Procedures

A diversion prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversions should not adversely impact adjacent properties and must conform to local floodplain management regulations. This practice should not be used in areas with slopes steeper than 10%. The advantages of the temporary earth dike include the ability to handle flows from large tributary areas. Additionally, they are relatively inexpensive to install since the soil material required for construction may be available on-site, and can be constructed as part of the initial grading operations, while the equipment is on-site.

Temporary swales will effectively convey runoff and avoid erosion if constructed and maintained properly:

- Size temporary swales in the same manner as a permanent channel.
- A permanent channel must be designed by a licensed professional civil engineer.
- At a minimum, the swale should conform to predevelopment flow patterns and capacities.
- Construct the swale with an uninterrupted, positive grade to a stabilized outlet.

Installation Procedures (cont'd)

Drains

Diversion drains are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost-effective diversion.

- Can be placed on or buried underneath the slope surface.
- Should be anchored at regular intervals of 50 to 100 ft.
- If a slope drain conveys sediment-laden water, direct flows to a sediment trap or basin.
- When using slope drains, limit tributary area to 2 acres per pipe. For larger areas, use a rock-lined channel or a series of pipes.
- Maximum slope generally limited to 2:1 (H: V), as energy dissipation below steeper slopes is difficult.
- Drain or swale should be laid at a minimum grade of 1%, but not more than 15%.
- The swale must not be overtopped by the 10-year, 24-hour storm, meeting or exceeding the design criteria stated above.
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Direct surface runoff to slope drains with diversion swales, dikes and berms.
- When installing slope drains:
  - Install slope drains perpendicular to slope contours.
  - Compact soil around and under entrance, outlet, and length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - Check to ensure that pipe connections are watertight.
  - Protect inlet and outlet of slope drains: use standard flared end section at entrance for pipe slope drains 12 in. and larger.
  - Protect area around inlet with filter cloth.
  - Protect outlet with geosynthetics and rip-rap or other energy dissipation device. For high-energy discharges, reinforce rip-rap with concrete or use reinforced concrete devices.
- When installing subsurface drains:
  - Slightly slope subsurface drain towards outlet.
  - Check to ensure that pipe connections are watertight.
  - Review relative size of soil and slot/perforation size in the pipe to prevent sediment from entering pipe.
  - Relief drains lower groundwater table. Install parallel to slope and drain to side of slope. Use gridiron, herringbone or random pattern.
  - Interceptor drains prevent excessive soil saturation on sensitive slopes. Install perpendicular to slope and divert discharge to the side of the slope.

Activity: Temporary Diversions, Drains and Swales	SMP-09

Installation Procedures (cont'd)

Diversions

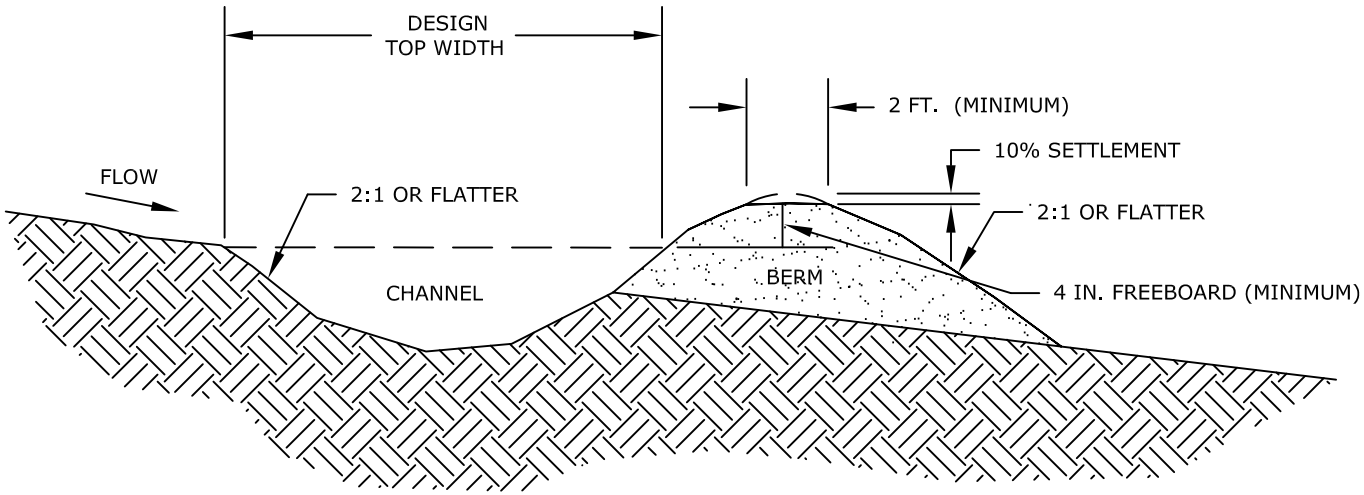
- Select design flows and safety factor based on careful evaluation of risks due to erosion of the measure, over topping, flow backups, or washout.
- High flow velocities may require the use of a lined ditch, or other methods of stabilization.
- When installing diversion ditches and berms:
  - Protect outlets from erosion.
  - Utilize planned permanent ditches/berms early in construction phase when practicable.
- All dikes and berms should be compacted by earth-moving equipment.
- All dikes should have positive flow to a stabilized outlet.
- Top width may be wider and side slopes may be flatter at crossings for construction traffic.
- Dikes should direct sediment-laden runoff into a sediment trapping device.
- Dikes should be stabilized with vegetation, chemicals, or physical devices.
- Compact any fills to prevent unequal settlement.
- Dikes should remain in place until disturbed areas are permanently stabilized.
- Examine the site for run-on from off-site sources (control off-site flows through or around site).
- Select flow velocity limit based on soil types and drainage flow patterns for each project site
- Establish a maximum flow velocity, shear stress or 3-5 ft/s, for using earth dikes and swales, above which a lined ditch must be used.
- Design an emergency overflow section or bypass area for larger storms that exceed the 10-year design storm.
- Conveyances must be lined or reinforced when velocities exceed allowable limits for soil. Consider use of geotextiles, engineering fabric, vegetation, rip-rap or concrete.

Maintenance

- Inspect drains before and after each storm event
- Inspect weekly until drainage area is stabilized
- Maintain drains and swales to eliminate erosion, accumulation of debris and sediment
- Check status of water ponding activities. Remove water if such activities occur
- Temporary conveyances should be removed when surroundings become stable or when the construction is complete

Inspection Checklist

- ☐ Routine visit after every heavy rain water event.
- ☐ No evidence of washout, accumulated debris and build up in ditches or berms.



SOURCE: LOUISVILLE MSD

City of Bowling Green
Public Works Planning and Design
1011 College Street
Bowling Green, Kentucky 42101

TEMPORARY DIVERSION CHANNEL

STANDARD DRAWING NO. SMP-09-01

APPROVED BY: _____ DIRECTOR OF ENGINEERING _____ DATE