

Module 6.

Our ESC and SW BMPs



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SAD

Spread runoff

- Keep it flat
- Keep it grassed
- Level spreader
- Outlet Protection

Accommodate runoff

- Channel
- Pipe
- Temporary slope drain

Divert runoff/run-on



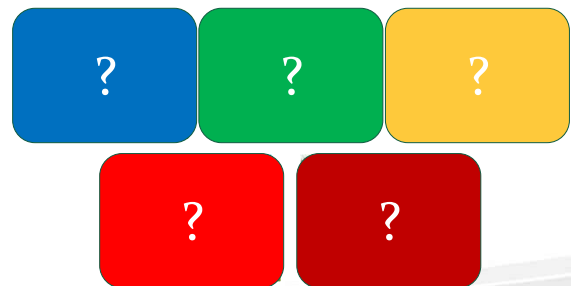
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Part 1 - SAD - Spread Runoff

- Keep it flat
 - Level spreader
 - Sheet flow
- Keep it grassed
- Outlet protection
- Bioretention
- Dry pond

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What are the 5 stages of erosion?



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Spreading the Runoff

Concentrated flow → Rill and gully erosion

Sheet flow → Sediment transport, but less erosion



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Spreading the Runoff

In ESC and SW the objective would be to convert concentrated flow into sheet flow!

How?

Level Spreader



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Problems with level spreaders

- Keeping them level
- Materials may warp, bend, settle, or bow
- Channel slope into a level spreader < 1%
- Flow end runs



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Problems with level spreaders

- May integrate a plunge pool
- Discharge < 10% slope, well vegetated
- Extended length up to 200'
- Frequent maintenance – debris



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Keep is grassed (covered/vegetated)

- Vegetation cover is the first line of defense against raindrop impact, sheet erosion and rill erosion!
- Mulch prevents raindrop impact



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Outlets

Principles of outlets:

- Discharge water into a drainageway
- Discharge water at controlled energy level



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Outlets

Principles of outlets:

How do we do that?

- Barrel diameter (size)
- Outlet protection



Must be installed according to plan



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Outlet Protection

- Correct configuration
- Correct stone
- 0% grade
- Filter cloth
- Smooth transition
- Discharge into a stable area



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Outlet Protection



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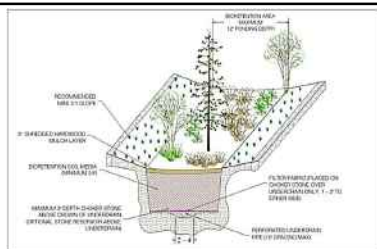
Bioretention

What do they do?

They treat stormwater

How?

Water flow over the area that is filled with a special soil mix that has a high infiltration rate. Plants are planted on the soil mix and this mixture of plants, roots and soil assist in treating pollutants in the stormwater runoff.



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Bioretention

Important!

- Maintain infiltration capacity of mix: Silt is the enemy of bioretention area! The site needs to be stable before it receives stormwater.

CONSTRUCTION SEQUENCE!

- Ensure the site is graded correctly and the bioretention area actually receives water or not too much. **IS THE PLAN BEING FOLLOWED?**



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Bioretention

Important!

- Is the bioretention media level or graded correctly.
IS THE PLAN BEING FOLLOWED?
- Bioretention media may settle some over time.
SLIGHT INNITIAL OVERFILLING IS RECOMMENDED! (Plans do not take this into account).



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Dry-Ponds

- They are still there and still being used!
- Low flow channel
- But, make sure they don't short circuit, but spread the water out
- We need residence time!



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But even in basins and traps!

We want to spread out that water and increase residence time to at least 24 hours to drop out the sediment.

How do we do that?

- Configuration
- Where does the water enter the pond?
- Baffles



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Part 2 - SAD - Accommodate Runoff

- Channels
- Check dams
- Pipes
- Temporary slope drains
- Grass channels
- Dry channels
- Wet swales

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Channels

What do they do?

- They move water away from areas we do not want it
- They move water towards BMPs
- They move water from BMPs to an outfall or stable area



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Channels

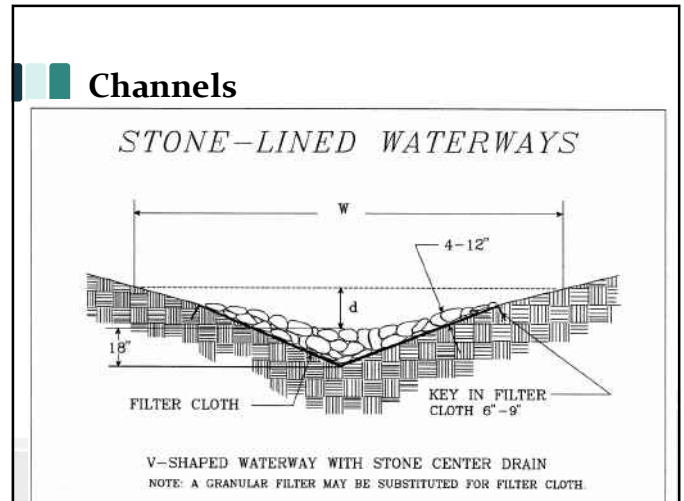
- Are engineered
- Need to be installed according to plan
- Watch out for overfilling with riprap
- The need to have fall (a grade)
- Need to have filter cloth
- Needs to have outfall protection



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Check dams

What do they do?

- Slow down runoff
- Pond water
- Settle sediment

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Slope Drains

What do they do?

Bring water down a slope in a controlled fashion without eroding the slope

 Needs outlet protection & energy dissipater



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Temporary Slope Drains

What do they do?

- Bring water down a slope in a controlled fashion without eroding the slope
- Usually part of a (temporary) diversion

 Needs outlet protection



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Grass Channels

What do they do?

- Convey stormwater
- Treat stormwater
- Infiltrate stormwater

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Grass Channels

What do they need?

- Pitch(2-4%)
- Dimensions
- Grass



- Constructed according to plan
- Sediment is the enemy of infiltration

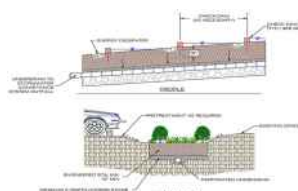



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Dry Swales

What do they do?

- Convey stormwater
- Treat stormwater
- Infiltrate stormwater

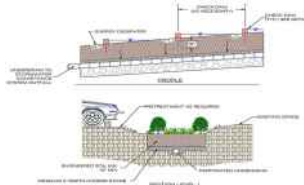



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Dry Swales

What do they need?

- Pitch(<4%)
- Dimensions
- May need vegetation
- Constructed according to plan
- Sediment is the enemy of infiltration



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Wet Swales

What do they do?

- Convey stormwater
- Treat stormwater



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Wet Swales

What do they need

- Pitch(<2%)
- Dimensions
- Need to be vegetated
- Constructed according to plan
- Sediment is the enemy of infiltration



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Part 3 - SAD - Divert Run-on Run-off

- Temporary diversions
- Temporary fill diversions
- Temporary slope drains

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Temporary diversions

What do they do?

- Convey stormwater, either
 - Away from a project, or
 - To a trap or a basin
- Used to break up drainage areas



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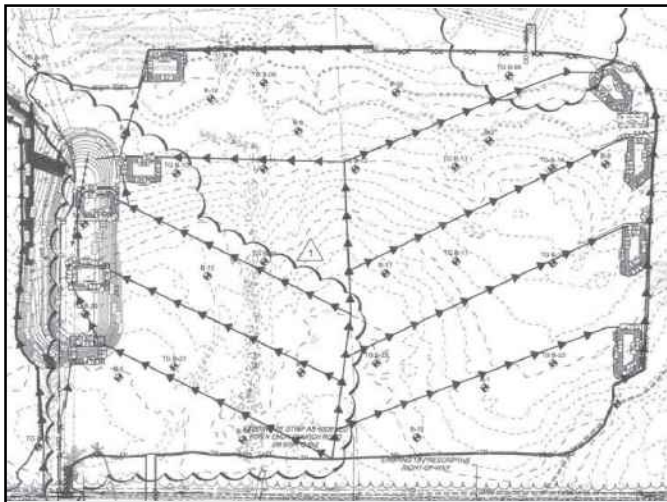
Temporary diversions

What do they need

- Pitch
- Height and width requirements
- Stabilized (MS-5)



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Temporary fill diversions

What do they do?

- Protects a fill slope from runoff from upgradient area by conveying stormwater away from the slope

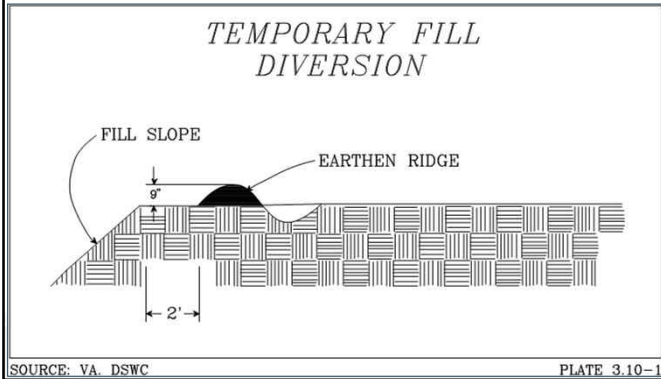
What do they need

- Placed at the end of a working day
- Height, width and offset requirements
- Renewed daily



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Temporary fill diversions



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Diversions

What do they do?

- Often combination of a berm and channel
- They convey stormwater, either
 - To break up a drainage area
 - To channelize a drainage way
 - Away from or around a project, or
 - To or between stormwater BMPs



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Diversions

What do they need?

- Installed according to plan (invert etc.)
- Stabilized (MS-5)



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Some additional design principles of our BMPs

Slow or standing water causes sediment to settle.

- Silt fence
- Inlet protection
- Sediment traps and basins



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Some additional design principles of our BMPs

Inlet Protection works by ponding

- Ponding can cause road hazards
- Balance between ponding and draining



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Don't forget

Forebays or other pre-treatments are forms of inlet protection.

What do they do?

Slow the water down

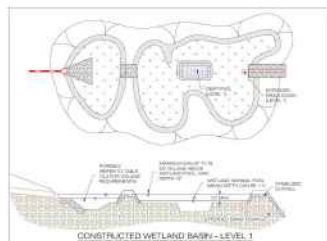


- settle sediment and trash
- filter water
- reduced energy (scouring)



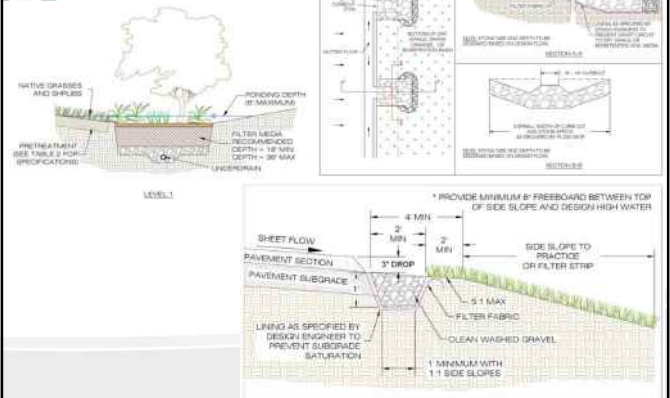
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Forebay



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Pre-Treatment



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QuickPoll - SAD



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Poll Questions (6)

According to Module 6, SAD is short for:

- Spread, Accommodate, and Divert Runoff
- Sediment Accumulation Device
- Statistically Accurate Diversions
- Simply Another Day (In Paradise)



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SAD

Spread runoff

- Keep it flat
- Keep it grassed
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Accommodate runoff

- Channel
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- Temporary slope drain

Divert runoff/run-on



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Module 1



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