Continuing Education Associated with Maintaining CPESC and CESSWI Certification

Module 2: Stormwater Management Principles for Earth Disturbing Activities

Sponsors: ODOTs–Local Technical Assistance Program (LTAP)/ODOT
November 2012- March 2013
Agenda: Stormwater Management Principles for Earth Disturbing Activities

- What is Stormwater?
- Erosion and Sedimentation
- Other Stormwater Pollutants Associated With Construction Activities
- Erosion and Sediment Control Practices
- Discussion
WHAT IS STORMWATER?

STORMWATER – Is precipitation runoff, snow melt, surface runoff and drainage.
Natural drainage systems **use, delay and drain** stormwater.

**Typical Hydrograph (storm water runoff graph) for “Undeveloped “areas**

- **Drain**: swales, rills, channels, streams
- **Delay**: roughness, storage (in floodplains)
- **Use**: infiltration, evapotranspiration
Historically, ODOT treated stormwater as a hazard, to be disposed quickly . . .
... but caused downstream flooding. Next, detention was used to reduce peaks ...
... but did not solve flooding watershed-wide.
More detention further reduced peaks . . .

What’s Next:
1. This solved the flooding issues but not erosion and water quality
2. This lead EPA to regulate water quality of storm water discharges
3. Controls to restore natural hydrology, removed volume, but where not feasible
4. May result in extended detention to address volume/flow issues
Erosion and Sedimentation

What is Erosion?

Erosion is the process that by actions of wind or water, soil particles are detached and transported.
Erosion and Sedimentation
Factors that Influence Erosion

- Topography
- Vegetation
- Hydrologic Soil Groups
- Climate – Precipitation, Wind
- Land use – Impervious cover
Erosion and Sedimentation

Types of Erosion

Splash Erosion

Raindrop impact energy is enough to dislodge surface sediments.

Sheet Erosion
Sheet erosion is caused by rain splash detaching soil particles, lifting them up and removing them by shallow “sheets” of water flowing down a sloped soil surface.
As flow concentrates, small channels begin to form in the soil surface.
Erosion and Sedimentation
Types of Erosion

Rill Erosion to Gully Erosion
Erosion and Sedimentation
Types of Erosion

Gully Erosion

Gullies are formed when runoff cuts rills deeper and wider or when flows from several rills come together and form a large channel.
Channels may become unstable due to increased flows or changes in upstream sediment load.
Looking at different Erosion and Sediment Control BMPs. Understanding which BMPs to be used for what you are trying to control.
Erosion and Sedimentation
Erosion causes Sedimentation
Erosion and Sedimentation
What is Sediment?

Sediment is eroded material suspended in wind or water.
Erosion and Sedimentation
What is Sedimentation

Sedimentation is the deposition of eroded material.
Erosion and Sedimentation
Impacts of Sedimentation

- Deposited on adjoining property and roadways, affects health, safety, and welfare.
- Fills storm inlets, storm sewers, and detention basins, reducing their capacity and increasing maintenance.
- Smothers benthic habitat / life, disrupting aquatic ecosystems.
- Others?????
Let’s Take a Look at Other Impacts

**Impacts**

- Forty percent of all U.S. waters are not fishable or swimmable, according to the U.S. EPA.

- “Even a partial accounting shows that hundreds of millions of dollars are lost each year...due to urban stormwater pollution”

  *Natural Resources Defense Council*
Let’s Take a Look at Other Impacts

**Impacts**

- “On a unit basis, construction sites export sediment at 20 to 1,000 times the rates of other land uses.” According to the EPA

- “An estimated 80 Million Tons of solids are discharged annually from construction sites into receiving waters” According to the EPA
Dewatering is now a permitted activity under the CGP – Dewatering discharge can no longer be directly discharged to storm systems or receiving waters.
Other Stormwater Pollutants Associated with Construction Activities
Construction Materials, Wastes and Storage

Proper handling, clean up, disposal, and management of construction materials and debris is important!
Other Stormwater Pollutants Associated with Construction Activities

Spills

These examples are not all inclusive. As the SWPPP designer or CESSWI inspector these pollutants shall be addressed as part of the SWPPP plan and documented/identified during inspection.
Stormwater Management Principles for Earth Disturbing Activities

EROSION AND SEDIMENT CONTROL PRACTICES
Erosion and Sediment Control Practices
Minimize Areas of Disturbance and take advantage of Erosion Controls

1. Identify existing conditions and natural resources.

2. Plan project to minimize footprint / impacts to resources.

3. Delineate existing / proposed drainage areas.

4. Determine limits of grading and clearing.

5. Sequence and/or phase construction activities (i.e., underground, at grade and vertical).
Erosion and Sediment Control Practices: Protecting the Perimeter

At limits of construction and surrounding resources to protect

Points of ingress / egress
Erosion and Sediment Control Practices: Internal and External Controls

Run-on at construction limits

Internal drainage and protection
Erosion and Sediment Control Practices: Implement Erosion and Sediment Controls

**Sediment Controls**
- Sediment Fence
- Inlet Protection
- Temporary Sediment Basin/Trap

**Erosion Controls**
- Ditch Check
- Construction Entrance
- Slope Drains
Erosion and Sediment Control Practices: Manage Construction Materials / Wastes

On-site / Off-site Staging/Borrow/Waste Areas

Active Construction Areas
Erosion and Sediment Control Practices: What’s the Purpose?

- Effective erosion controls MUST:
  - Prevent the dislodging of soil particles
- Effective sediment controls MUST:
  - Prevent sediment from leaving the site
    - Pond runoff
    - Release it slowly
Erosion and Sediment Control Practices:
Internal Project Drainage – Concentrated Flow

So, this is what “really” happens when it rains!

Site Evaluation - Drainage

It is essential to understand site run-off, run-on dynamics and control the drainage.

Caused this gully

Runoff here

Module 2 – Stormwater Management Principles for Earth Disturbing Activities
Erosion and Sediment Control Practices: Implement Controls Appropriately...

- Contractors need to understand:
  - Intent of control
  - How to use appropriately

- One example for appropriate use of sediment control
  - (Silt Fence) Only for small upslope drainage area / flow path length

<table>
<thead>
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<th>Maximum Slope Length Above Silt Fence</th>
<th>Slope Length (ft.)</th>
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<td>0% - 2%</td>
<td>Flatter than 50:1</td>
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<tr>
<td>&gt; 50%</td>
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Note: For larger drainage areas, see standards for temporary diversions, sediment traps and sediment basins.
Erosion and Sediment Control Practices:
Implement Controls Appropriately...

Table 6.3.1 Maximum area contributing area using slope length

<table>
<thead>
<tr>
<th>Slope</th>
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<th>Slope Length (ft.)</th>
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<tr>
<td>0% - 2%</td>
<td>Flatter than 50:1</td>
<td>250</td>
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<td>33% - 50%</td>
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<td>&gt; 50%</td>
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<td>25</td>
</tr>
</tbody>
</table>

Note: For larger drainage areas, see standards for temporary diversions, sediment traps and sediment basins.
Erosion and Sediment Control Practices:
Before You Leave...

1. Temporarily stabilize site when earth-disturbance suspended:
   - Winter
   - Rainy / high flow conditions
   - Construction phasing considerations

2. Use proper method for post-construction conditions:
   - Seed
   - Mulch

3. Check effectiveness and maintain / replace as needed

4. Remove temporary controls
Erosion and Sediment Control Principles

EVALUATION

Group Discussion on the following:

1. Erosion Control Practices that are working and effective – Name them and why they are working well.

2. Sediment Control Practices that are working and effective – Name them and why they are working well.

3. Run off Control Practices that are working and effective – Name them and why they are working well.

Discussion – 10 - Minutes
Questions

END OF MODULE 2