January 10, 11 & 12, 2011

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Coastal Stormwater Supplement (CSS)
History – A Decade of Progress


- GSMM required for Phase I & Phase II communities and all metro Atlanta communities.

- Georgia DNR 6217 Coastal Non-Point Source Program tasked with establishing post construction criteria in 2002.

- DNR enlists local partners to help draft the CSS.

- CSS Completed in 2009.

- CSS required for Phase I communities in Savannah metro area.
Better site design methods, site-specific applications and appropriate BMPs

Green infrastructure approaches at both the watershed and site level

Consideration EARLY in the site planning and design process

Stormwater BMP selection

BMPs with a proven track record of operation in the community and the region
The Stormwater Manual = Our Source of Guidance

Section 1 - Management and Planning
Section 2 - Hydrology
Section 3 - Structural Controls
Section 4 - Drainage System Design

Appendices:
- Rainfall & Soils Data
-Specifications and O&M Checklists
-Design Examples

- A great text book
- BMP selection and calculation sheets
- Step-by-step design examples
- PDF format!!!
From GSMM To CSS…

- GSMM not specific on coastal issues

- CSS builds on GSMM content to promote integrated, green infrastructure-based approach to natural resource protection and stormwater management
The Coastal Stormwater Supplement (CSS)

Coastal Stormwater Supplement to the Georgia Stormwater Management Manual

Review Draft #2
October 2008
Organization of the CSS

- Section 1.0: Introduction
- Section 2.0: Coastal Natural Resources
- Section 3.0: Need for Natural Resource Protection & Stormwater Management
- Section 4.0: Stormwater Management & Site Planning and Design Criteria
Organization of the CSS

- Section 5.0: Calculating the Stormwater Management Criteria
- Section 6.0: Meeting the Stormwater Management & Site Planning and Design Criteria
- Section 7.0: Green Infrastructure Practices
- Section 8.0: Stormwater Management Practices
6.8.4 Vegetated Filter Strips

Description
Vegetated filter strips are uniformly graded, densely vegetated areas of land designed to slow and remove stormwater runoff and reduce stormwater runoff rates, volumes, and pollutant loads. If properly designed, these undisturbed natural areas can help replicate pre-development site hydrology and can be used to address the post-construction stormwater management criteria presented in this Coastal Stormwater Supplement.

Key Considerations

- **Design Considerations**
  - Surface runoff must enter the vegetated filter strip as overland sheet flow.
  - Width of contributing drainage areas must be 1,500 feet or less (previous drainage areas) or 75 feet or less (impervious drainage areas).
  - Vegetated filter strips must have a slope of at least 0.5% to ensure adequate drainage.

- **Benefits**
  - Helps replicate existing hydrology on development sites and reduces post-development stormwater runoff rates, volumes, and pollutant loads.
  - Relatively low construction and maintenance costs.

- **Limitations**
  - Can be difficult to maintain overland sheet flow with a vegetated filter strip, which must be provided to ensure proper operation.

Stormwater Management Benefits

- **Runoff Reduction**
- **Aquatic Resource Protection**
- **Overbank Flood Protection**
- **Extreme Flood Protection**

- **Pollutant Removal**
  - Total Suspended Solids
  - Total Phosphorus
  - Total Nitrogen
  - Metals
  - Pathogens

Discussions
Vegetated filter strips (also known as filter strips, vegetated filters, or grass filters) can be effectively integrated into development and re-development sites as landscaping features and are well suited to treat stormwater runoff from streets and roadways, highways, roof downspouts, small parking lots, and disturbed areas such as (e.g., lawns, parks, community open spaces). They are ideal for use in the "outer zone" of non-urban areas (Section I.A.2), in the landscaped buffer strips commonly found between adjoining properties (e.g., setback areas) and incompatible land uses (e.g., residential and commercial land uses) and around the perimeter of parking lots.

Figure 6.33: Filter Strip around the Perimeter of a Parking Lot on a Commercial Site

There are two different filter strip designs that can be used on a development or re-development site. The first is a simple filter strip, while the second is more advanced, and includes a permeable barrier at the downstream end of the filter strip (Figure 6.31). The permeable barrier is used to store stormwater runoff within the filter strip, which reduces the residence time that it provides, and reduces the required width. Filter strips are typically designed on the stormwater management plan, and consideration should be given to the stormwater runoff rates and volumes generated by larger storm events (e.g., 25-year, 24-hour storm events) to help ensure that these storm events do not cause soil erosion or significant damage to the filter strip.

Stormwater Management Benefits

Vegetated filter strips can be used to help satisfy the post-construction stormwater management criteria presented in this Coastal Stormwater Supplement as described below:

- **Runoff Reduction**
  - Recent research shows that vegetated filter strips can reduce post-development stormwater runoff volumes, development, and re-development sites (Ekman et al., 2008).
  - Consequently, a runoff reduction "credit" can be taken when vegetated filter strips are used to manage stormwater runoff generated by new development and re-development sites. Under this "credit," site planning and design teams can assume that:
    - Vegetated filter strips located on hydrologic soil group A or B soils provide a 60% reduction in the stormwater runoff volume generated by the runoff reduction (e.g., 1.2 inch) rainfall event.
    - Vegetated filter strips located on hydrologic soil group C or D soils provide a 30% reduction in the stormwater runoff volume generated by the runoff reduction (e.g., 1.2 inch) rainfall event.
Effective Post-Construction Stormwater Management

- Green infrastructure-based approach to natural resource protection and stormwater management!

- Focus on:
  - **Linking** a development project with its surroundings
  - **Identifying** and **protecting** existing green infrastructure
  - **Limiting** land disturbance and the creation of new impervious and disturbed pervious cover
  - **Preventing**, rather than simply managing increases in post-construction stormwater runoff rates, volumes and pollutant loads
What do we mean by green infrastructure?

- An interconnected network of undisturbed natural areas and open space
- Helps preserve the values and functions of our watersheds and provides a wide array of benefits to both people and wildlife.
- Connectivity of ecosystems and landscapes in a system of hubs, links, and sites.
**Guiding Principles**

**Use a green infrastructure-based approach that will help protect both terrestrial and aquatic resources!**

- Green infrastructure at both the watershed and site scales
- Impacts of land development can be effectively controlled with land use planning and green infrastructure practices, as well as with traditional stormwater BMPs
- Green infrastructure practices need to be considered EARLY in the site planning and design process
- BMP selection affects performance, cost and long-term maintenance burden
- Local programs should adopt an approach that will minimize the negative impacts of land development
If we can use all of these BMPs...
Why do we always get these?
The Fact Is, We Ask For It!

- We encourage them with our:
  - Existing Stormwater Management Criteria
  - Traditional “One Size Fits All” Approach to Stormwater Management
  - Failure to Demonstrate New Stormwater Practices
  - Lack of Innovation with our Local Design Guidance & Construction Specifications
With our existing criteria, we encourage this...
So how do we get something that looks more like this?

Better Site Planning

Better Site Design

Low Impact Development Practices

Stormwater Management Practices

Receiving Waters
Manage stormwater runoff from the rooftop to the stream...

- To get to that point, we have to:
  - Place less reliance on individual stormwater management practices (e.g., ponds)
  - Put an emphasis on using green infrastructure practices (e.g., better site planning & design techniques, low impact development practices)
  - Integrate natural resource protection and stormwater management with the site planning and design process
First: Reduce Stormwater Runoff By Design

- Better Site Planning & Design Techniques
  - Preserve natural areas
  - Conservation design
  - Reduce clearing & grading limits
  - Reduce roadway widths
  - Use alternative cul-de-sacs
  - Promote redevelopment
  - And more…
Second: Reduce Pollution and Stormwater Runoff Rates, Volumes & Pollutant Loads

- Source Control Practices
  - Storm drain marking
  - Street sweeping
  - And more…

- Low Impact Development Practices
  - Soil restoration
  - Site reforestation/ revegetation
  - Downspout disconnection
  - Rain gardens
  - Rainwater harvesting
  - Permeable pavement
  - And more…
Third: Intercept & Manage Remaining Stormwater Runoff

- Stormwater Management Practices
  - Stormwater ponds
  - Stormwater wetlands
  - Bioretention areas
  - Sand filters
  - Infiltration practices
  - Swales
  - And more…
Technical Methodology – Hydrologic Framework

1. Extreme Flood Protection
2. Overbank Flood Protection
3. Aquatic Resource Protection
4. Water Quality Protection
5. Stormwater Runoff Reduction
6. Natural Resources Inventory & Use of Green Infrastructure Practices
Bankfull

Q critical

biggest flows to consider

most destructive flows

most erosive/disruptive flows

most polluted flows

infiltrated flows

Extreme Flood (Floodplain) Criteria

Overbank Flooding Criteria

Aquatic Protection Criteria

Water Quality Criteria

Stormwater Better Site Design
Nested Stormwater & Site Design Criteria (1 & 2)

25-year post- to pre- AND
100-year post- to pre-
Nested Stormwater & Site Design Criteria (3)

Aquatic Resource Protection

Flood Control

24-hour extended detention of 1-year, 24-hour storm event +
<table>
<thead>
<tr>
<th>Low Impact Development Practice</th>
<th>Aquatic Resource Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Restoration</td>
<td>&quot;Credit&quot;: Assume that the post-development hydrologic conditions of any restored areas are equivalent to those of open space in good condition.</td>
</tr>
<tr>
<td>Site Reforestation/Revegetation</td>
<td>&quot;Credit&quot;: Assume that the post-development hydrologic conditions of any reforested/revegetated areas are equivalent to those of a similar cover type in fair condition.</td>
</tr>
<tr>
<td>Soil Restoration with Site Reforestation/Revegetation</td>
<td>&quot;Credit&quot;: Assume that the post-development hydrologic conditions of any restored and reforested/revegetated areas are equivalent to those of a similar cover type in good condition.</td>
</tr>
<tr>
<td>Green Roofs</td>
<td>&quot;Credit&quot;: Proportionally adjust the post-development curve number (CN) to account for the runoff reduction provided by a green roof when calculating the aquatic resource protection volume (ARP_v) on a development site.</td>
</tr>
<tr>
<td>Bioretention Areas, No Underdrain</td>
<td>&quot;Credit&quot;: Proportionally adjust the post-development curve number (CN) to account for the runoff reduction provided by a bioretention area when calculating the aquatic resource protection volume (ARP_v) on a development site.</td>
</tr>
</tbody>
</table>
Nested Stormwater & Site Design Criteria (4)

Adequately treat stormwater runoff from 85th percentile (1.2 inch) storm event
Nested Stormwater & Site Design Criteria (5)

- Runoff Reduction
- Water Quality
- Aquatic Resource Protection
- Flood Control

Reduce stormwater runoff volume from 85th percentile (1.2 inch) storm event
<table>
<thead>
<tr>
<th>Low Impact Development Practice</th>
<th>Stormwater Runoff Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil Restoration</strong></td>
<td>“Credit”: Subtract 50% of any restored areas from the total site area and re-calculate the runoff reduction volume ($RR_v$) that applies to a development site.</td>
</tr>
<tr>
<td><strong>Site Reforestation/Revegetation</strong></td>
<td>“Credit”: Subtract 50% of any reforested revegetated areas from the total site area and re-calculate the runoff reduction volume ($RR_v$) that applies to a development site.</td>
</tr>
<tr>
<td><strong>Soil Restoration with Site Reforestation/Revegetation</strong></td>
<td>“Credit”: Subtract 100% of any restored and reforested/ revegetated areas from the total site area and re-calculate the runoff reduction volume ($RR_v$) that applies to a development site.</td>
</tr>
<tr>
<td><strong>Green Roofs</strong></td>
<td>“Credit”: Reduce the runoff reduction volume ($RR_v$) conveyed through a green roof by 60%.</td>
</tr>
<tr>
<td><strong>Bioretention Areas, No Underdrain</strong></td>
<td>“Credit”: Subtract 100% of the storage volume provided by a non-underdrained bioretention area from the runoff reduction volume ($RR_v$) conveyed through the bioretention area.</td>
</tr>
<tr>
<td><strong>Bioretention Areas, Underdrain</strong></td>
<td>“Credit”: Subtract 50% of the storage volume provided by an underdrained bioretention area from the runoff reduction volume ($RR_v$) conveyed through the bioretention area.</td>
</tr>
</tbody>
</table>
Nested Stormwater & Site Design Criteria (6)

- Natural Resources
- Inventory & Use of Green Infrastructure
- Water Quality
- Aquatic Resource Protection
- Flood Control

ID natural resources prior to site planning & design
Use GI practices to protect natural resources
Supporting an Integrated Approach

To support an integrated approach to natural resource protection, stormwater management and site design, we’ve got to be asking for the right things in our stormwater management criteria:

- Technical Guidance Documents
- Local Stormwater Management Ordinance
- Local Construction Standards (Specifications)
Coastal Stormwater Supplement

Implementation
Obstacles to Local Implementation

- Understanding of watershed impacts from development.
- Perception of difficulty or expense of implementation.
- Inadequate Funding for code update.
- Lack of priority given to stormwater regulation.
- No Regulatory Agency support or requirements.
Drivers for Adoption

- NPDES Phase I Permit Requirements
  - Savannah area Phase I Permits Issued April 2010.
  - Require adoption of CSS or equivalent by 2012.
  - Require “green infrastructure review” of all development codes by 2012.
    - CWP checklist

- Phase II Permits to be reissued in 2013 with similar requirement.

- Coastal Comprehensive Plan encourages CSS adoption.
  - Training Program

- Green Developers are aware of it… LEED, Earth Craft, etc also support green infrastructure approach.
What if local governments don’t comply with NPDES MS4 regulations?

- EPD Enforcement – Hammer & Carrot
  - Administrative Fines ($50,000/day/violation)
  - Conditional Compliance with NPDES Discharge Permits & Water Withdrawal Permits
  - Loss of Qualified Local Government Status
  - State Funding
  - Public Relations “Challenge”
CSS Implementation in Coastal GA
Stormwater Runoff Management Strategy for Local Governments

- Stormwater Runoff Management Ordinance
- Legal Authority to Regulate Local Stormwater Management Activities
- Local Design & Construction Standards
- Community Specific Policies, Criteria & Standards for Design & Construction
- GSMM & CSS
- Technical Reference Handbooks for Stormwater Management Analysis, Design & Maintenance
CSS Model Stormwater Ordinance

- Establish SOP for Stormwater Management
- Define & Codify Local Requirements
- Regulate Future Growth & Development
- Mitigate Flooding & Water Quality Impairments
- Establish Long Term Inspection & Maintenance Requirements
- Natural Resources Protection
- Maintain Local Quality of Life Standards
- Does Not Address all NPDES Requirements, i.e. Illicit Discharge
Local Design Manual

- Local or basin specific requirements
- Preferred materials of construction
- Recommended BMPS
- Local Levels of Service requirements, i.e. does a local road need a 100-yr LOS if the collector is only 50-yr!
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