National Perspective on Construction and Post-Construction Management

Nikos Singelis
U.S. EPA’s Stormwater Program
Overview

- Construction
  - Recent Developments
  - On the Horizon
- Post-Construction
  - Note-Worth Items
  - Integrating Low Impact Development and Smart Growth
Construction

• EPA’s SWPPP Guide
• Qualifying Local Programs
• Construction and Development Effluent Guideline
• EPA Construction General Permit
Developing Your Stormwater Pollution Prevention Plan
A Guide for Construction Sites

www.epa.gov/npdes/swpppguide
The SWPPP Process

SWPPP Development

Chapter 2 Getting started
Chapter 3 Site assessment and planning
Chapter 4 Selecting erosion and sediment control BMPs
Chapter 5 Selecting good housekeeping BMPs
Chapter 6 Inspections, maintenance, and recordkeeping

Appendix A Tools to assist in writing your SWPPP

SWPPP Implementation

Chapter 7 Clarification & Notification

Chapter 8 SWPPP Implementation

Chapter 9 Final Stabilization and Permit Termination

SWPPP Update
SWPPP Guide

• The Guide contains:
  – SWPPP Template (MS Word)
  – Sample Inspection Form (MS Word)

• Both should be customized for:
  – Site conditions
  – Permit requirements

• Webcast
  – 2 hour training can be accessed anytime at www.epa.gov/npdes/training
Qualifying Local Programs

• The Qualifying Local Program concept allows for streamlining construction requirements.

• A local program that meets the requirements of Section 122.44(s) can be designated as a QLP by the permitting authority (state or EPA).

• Construction site operators follow one set of requirements (local) and meet state (or EPA) NPDES permitting requirements.

• No extra burden on MS4s.

• EPA Assistant Administrator signed memo on May 8, 2006 encouraging use.

• [www.epa.gov/npdes](http://www.epa.gov/npdes)
How the QLP Provision Works

Objective:

• Streamline the requirements that construction site operators must follow

Implementation:

• Incorporate, by reference, local requirements (ordinances) in the state or EPA Construction General Permit

Result:

• One set of requirements (local) to read and follow
State or EPA writes
Construction General Permit

If ordinance meets requirements, permit writer incorporates it by reference

Permit writer reviews local ordinances

Annapolis City Ordinance
Stormwater: For discharges of stormwater associated with construction activity 1 acre or greater...

CGP directs construction site operators in these communities to read and follow local requirements (to comply with CGP)
Construction and Development Effluent Guideline

- This is a regulation that will apply nationally
- Focus will be on standardized requirements for construction. Could also contain requirements for post-construction
- Proposal due December 1, 2008
- Final due December 1, 2009
EPA’s Construction General Permit

- Current permit will expire on June 30, 2008
- Beginning process of developing a proposal
- Anticipating a spring publication of proposal in Federal Register
Post-Construction
Post-Construction

- Recent developments
  - Green Infrastructure
  - MS4 Evaluation
  - Stormwater and TMDLs
  - NPS Outreach Toolbox
  - Stormwater Manager’s Webcast Series
  - Post-Construction Guidance
  - Needs Survey
  - BMP Performance Tool
  - Stormwater Compliance Strategy
Green Infrastructure

- EPA is promoting the use of Green Infrastructure techniques as tools to address stormwater, NPS, and CSO problems
- Statement by EPA’s Assistant Administrator for Water
- Agreement and Statement of Intent signed by dozens of organizations and national groups
- [www.epa.gov/npdes/greeninfrastructure](http://www.epa.gov/npdes/greeninfrastructure)
EPA’s MS4 Program Evaluation Guidance

- Designed to help States and EPA Regional Offices review MS4 programs
- Can be used by MS4s to conduct self-audits
- [www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater)
Stormwater and TMDLs

- EPA is working on how to develop TMDLs for stormwater sources and then incorporating load allocations into stormwater permits

- Summary of 17 TMDLs with Stormwater Sources”
  www.epa.gov/owow/tmdl/17_TMDLs_Stormwater_Sources.pdf

- Total Maximum Daily Loads and National Pollutant Discharge Elimination System Storm Water Permits for Impaired Water Bodies: A Summary of State Practices”
  www.epa.gov/region5/water/wshednps/topic_tmdls.htm
NPS Outreach Toolbox

• Contains more than 700 viewable and/or audible TV, radio, and print ads and other outreach products

• [www.epa.gov/owow/nps/toolbox](http://www.epa.gov/owow/nps/toolbox)
EPA’s Stormwater Webcast Series

www.epa.gov/npdes/training

Bimonthly Webcasts for Municipal Stormwater Managers

Featuring leading experts on stormwater management from around the country!

Free! Training without travel!

Thousands of stormwater professionals have participated!

New topics offered every other month! Past webcasts are recorded and available anytime!

Great training tools for new staff!
Post-Construction Guidance

• Developing a comprehensive guide for Phase II communities
• Will include detailed guidance on program setup, creating an ordinance, sizing criteria, smart growth, low impact development, etc.
• Center for Watershed Protection leading effort
• Publication late 2007
• Draft Tools can be found at www.cwp.org/webcast/postconstruction.htm
Clean Watersheds Needs Survey

- Needs Survey is the Report to Congress on the capital needs for programs under the Clean Water Act
- Stormwater historically under-reported
- Enhanced effort starting to improve stormwater data collection for 2008 Survey
- Webcast scheduled for Tuesday October 23
- www.epa.gov/cwns/cwns2008.htm
BMP Performance Tool

• Developing a web-based tool to provide access to published and peer-reviewed studies of stormwater BMP performance

• Easy access to summaries of studies in International BMP database, California, Center for Watershed Protection, and other collections

• Launch by December, 2007

• www.epa.gov/npdes
Stormwater Compliance Strategy

• Under development by EPA’s Office of Enforcement and Compliance Assistance

• Will contain targets for #s of municipal, construction, and industrial audits and inspections

• Release soon...

• [www.epa.gov/oeca](http://www.epa.gov/oeca)
Post-Construction

Integrating Low Impact Development and Smart Growth
Post-Construction

- Permanent Stormwater Controls
- Most challenging of minimum measures to implement
  - Requires cooperation of many parts and many levels of local government
- We will have to live with the decisions we make now for ___ years
Who is responsible for maintenance of post-construction stormwater facilities?

- Do not have a regular inspection/maintenance program: 50%
- Local government responsibility: 10%
- HOA responsibility: 4%
- Private land owner: 13%
- Hybrid: 18%
- Other: 5%
What is your annual post-construction stormwater management program budget?

- $10K-50K: 26%
- $50K-100K: 11%
- greater than $100K: 20%
- no reported budget: 43%
Water Quality Impacts from Post-Construction Stormwater Runoff
Why is Stormwater a Problem?

Urban Runoff is the Source of Problems in:

- 34,871 miles or 13% of all Impaired Rivers and Streams
- 1,369,327 acres or 18% of all Impaired Lakes
- 5045 square miles or 32% of all Impaired Estuaries

* Note: The National Water Quality Inventory (305(b) Report) describes the quality of assessed waters. Many of the nation’s rivers, lakes and estuaries remain unassessed. The percentages above are based on assessed waters only.
### Effects of Development on Stormwater Runoff

**Increases:**
- Impervious surface area
- Stormwater volume
- Stormwater velocity
- Deposition of pollutants

**Decreases:**
- Stormwater quality
- Ground water recharge
- Baseflow
- Natural drainage systems including riparian vegetative cover
Common pollutants in urban stormwater

- Sediment
- Nutrients
- Oxygen-demanding substances
- Pathogens
- Trash
- Road Salts
- Oil and Grease
- Heavy Metals
- Heat
- PAHs
Consequences of Development to Urban Streams

- Large Storm
  - Higher Baseflow
  - Higher and More Rapid Peak Discharge
  - More Runoff Volume
  - Lower and Less Rapid Peak
  - Gradual Recession

- Small Storm
  - Pre-development
  - Post-development
70% increase in peak flow
170% increase in runoff volume
Former instantaneous peak flow now lasts ~4 hours
What are the benefits of a stormwater program?

- Meet regulatory requirements
- Reduce flooding
- Improve water quality
- Prevent erosion
- Preserve biological populations
- Sustainable infrastructure
What are the benefits of a stormwater program?

- Improve aesthetics
- Protect riparian areas
- Increase property values
- Educate the community
- Reduce infrastructure and maintenance costs
Phase II Minimum Control Measure:
Post-Construction Stormwater Management in New Development and Redevelopment

• Develop a program, using an ordinance or other regulatory means, to address runoff from new development and redevelopment projects that disturb ≥ 1 acre

• Implement strategies with a combination of structural and/or non-structural BMPs

• Ensure adequate long-term operation & maintenance (O&M) of BMPs
Phase II Minimum Control Measure:
Post-construction Stormwater Management in New Development and Redevelopment

- The BMPs chosen should:
  - be appropriate for the local community
  - minimize water quality impacts
  - attempt to maintain pre-development runoff conditions

- Participate in watershed planning efforts

- Assess existing ordinances, policies, and programs that address stormwater runoff quality

- Provide opportunities for public participation
Smart Growth and Low Impact Development

Integrating into the Stormwater Management Framework
Overview

• Trends in Development
  – Smart Growth
• Low Impact Development
• EPA Expectations for MS4 Post-Construction Programs
Trends in New Development
Smart Growth
Trends in Development

• Are we focused at the right level?
Trends in Development

- Need to consider what is happening at a broader scale - neighborhoods, cities, watersheds
Current development trends are characterized by low-density housing, farmland conversion, and dependence on cars, which:

- Consumes land at a faster rate
- Transforms farmland
- Separates houses from stores, businesses, and other land uses
- Increases time spent in cars
It’s how and where we are growing that are driving our significantly increasing rate of land consumption, not domestic population growth.
Development patterns

- 80% of residential development occurs on urban fringe or beyond
- 94% of that development on 1 acre or more
Which is Better for Water Quality on a Watershed Basis?

Low Density  OR  Higher Density
EPA Research on Smart Growth & Water

**Scenario A:**
1 unit/acre

- Impervious cover = 20%
- Runoff/acre = 18,700 ft³/yr
- Runoff/unit = 18,700 ft³/yr

**Scenario B:**
4 units/acre

- Impervious cover = 38%
- Runoff/acre = 24,800 ft³/yr
- Runoff/unit = 6,200 ft³/yr

**Scenario C:**
8 units/acre

- Impervious cover = 65%
- Runoff/acre = 39,600 ft³/yr
- Runoff/unit = 4,950 ft³/yr
Accommodating the same number of houses (8) at varying densities

**Scenario A: 1 unit/acre**
- Impervious cover = 20%
- Total runoff = 149,600 ft³/yr
- Runoff/house = 18,700 ft³/yr

**Scenario B: 4 units/acre**
- Impervious cover = 38%
- Total runoff = 49,600 ft³/yr
- Runoff/house = 6,200 ft³/yr

**Scenario C: 8 units/acre**
- Impervious cover = 65%
- Total runoff = 39,600 ft³/yr
- Runoff/house = 4,950 ft³/yr
And at the watershed level...

Accommodating 10,000 units on a 10,000 acre watershed at different densities

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
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<tbody>
<tr>
<td>![Diagram A]</td>
<td>![Diagram B]</td>
<td>![Diagram C]</td>
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</tbody>
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### Scenario A
- 10,000 houses built on 10,000 acres produce:
- 10,000 acres x 1 house x 18,700 ft³/yr of runoff = 187 million ft³/yr of stormwater runoff
- Site: 20% impervious cover
- Watershed: 20% impervious cover

### Scenario B
- 10,000 houses built on 2,500 acres produce:
- 2,500 acres x 4 houses x 6,200 ft³/yr of runoff = 62 million ft³/yr of stormwater runoff
- Site: 38% impervious cover
- Watershed: 9.5% impervious cover

### Scenario C
- 10,000 houses built on 1,250 acres produce:
- 1,250 acres x 8 houses x 4,950 ft³/yr of runoff = 49.5 million ft³/yr of stormwater runoff
- Site: 65% impervious cover
- Watershed: 8.1% impervious cover

The lower density scenario creates more runoff and consumes 2/3 more land than the higher density scenario.
Smart Growth Principles

• Mix land uses
• Take advantage of compact building design
• Create a range of housing opportunities and choices
• Create walkable neighborhoods
• Foster distinctive, attractive communities with a strong sense of place
• Preserve open space, farmland, natural beauty, and critical environmental areas
Smart Growth Principles (con’t)

• Strengthen and direct development towards existing communities
• Provide a variety of transportation choices
• Make development decisions predictable, fair, and cost-effective
• Encourage community and stakeholder collaboration in development decisions
Water Quality & Smart Growth

• Density and imperviousness are not equivalent
• Lawns do not equal undisturbed land, such as forests or meadows
• Low-density developments have more impervious infrastructure

• Growth is coming to the region—limiting density on a site doesn’t eliminate that growth
Which is Better for Water Quality on a Watershed Basis?

Housing like this....

...is, by design, served by retail and roads like this.
Smart Growth Resources

• Using Smart Growth Techniques as Stormwater Best Management Practices - December 2005
• Protecting Water Resources with Higher-Density Development - January 2006
• Parking Spaces/ Community Places, Finding the Balance through Smart Growth Solutions - January 2006

www.epa.gov/smartgrowth
Low Impact Development
Good site design is critical to successful stormwater management.
Site Design

• Traditional stormwater management that focuses on moving water off the landscape often exacerbates the stormwater problem

• Techniques that manage stormwater on-site and promote infiltration result in:
  – Pollution reduction
  – Volume reduction
Basic Premise of Low Impact Development

• Design site to minimize pollutant loadings and runoff volumes and velocities
• Use distributed small scale treatment systems
• Maximize infiltration/ground water recharge
• Reduce infrastructure costs
• Protect ecosystem functions and values
Low Impact Development
Minimize Development Impacts

- Reduce storm pipes, curbs and gutters
- Reduce building footprints
- Preserve sensitive soils
- Reduce road widths
- Minimize grading
- Limit lot disturbance
- Reduce impervious surfaces
Design standards should encourage alternatives to curb and gutter where practical.
Common LID Management Practices

- Disconnectivity
- Bioretention (Rain Gardens, Infiltration Trenches)
- Permeable and Porous Pavements
- Green Roofs
- Soil Amendment
- Open Swales
- Rain Barrels
Disconnectivity

Runoff Storage Filtration
Open Swales
Bioretention
Parking Lot Infiltration
Rain Gardens
Permeable and Porous Pavements
Green Roofs
Soil Amendment

Soils amended to a depth of 12 inches

Soil aeration
Other Local Ordinances

- Modifying other local ordinances is the key to successful implementation of LID and Smart Growth

- Look at:
  - Fire codes
  - Street codes
  - Building codes
  - Parking requirements
  - Etc.
Post-Construction
Smart Growth
Low Impact Development
Post-Construction Guidance

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- Will include detailed guidance on program setup, creating an ordinance, sizing criteria, smart growth, low impact development, etc.
- Working with the Center for Watershed Protection to develop
- Publication late 2007
Resources

- EPA’s Green Infrastructure page
  www.epa.gov/npdes/greeninfrastructure
- Education and Outreach Materials
  www.epa.gov/npdes/stormwatermonth
- Training resources
  www.epa.gov/npdes/training
  www.epa.gov/owow/watershed/wacademy/
- Menu of BMPs
  www.epa.gov/npdes/menuofbmtps
- Smart Growth
  www.epa.gov/smartgrowth
- Low Impact Development
  www.epa.gov/owow/lid
- Center for Watershed Protection
  www.cwp.org
- CWP’s Stormwater Manager’s Resource Center
  www.stormwatercenter.net
- MS4 Case Studies—approximately 20
  www.epa.gov/npdes/casestudies
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