Module 4 of 4

Stormwater Management Design Review

NJ DEP Division of Water Quality
September 3, 2020

Agenda: Module 4

REVIEW

EXAMPLE 1

Plan

Review

Example 1

Brian Salvo
NJDEP Division of Water Quality
SWM/DR Training Module 4
September 3, 2020

NJ DEP Division of Water Quality,
Online Stormwater Management
Design Review Course
Presentation Goals

Goals
- Review site plans and stormwater management report
- Identify any errors with the design

Determining Applicable Design & Performance Standards

Does the Development
- Trigger the municipality’s SCO?
- Disturb one acre or more?
- Increase impervious coverage by ¼ acre or more?

Determining Applicable Design & Performance Standards

Municipal Stormwater Control Ordinance:
- Major Development:
  Any development that provides for ultimately disturbing one or more acres of land or more than 10,000 square feet of new impervious surface.
Familiarize Yourself with the Site

Where are the pre-construction conditions?
- Important in determining the requirements
- Existing land cover
- Has the existing land cover existed for the past 5 years?

---

Pre-Development Site

---

<table>
<thead>
<tr>
<th>Existing Coverage</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woods</td>
<td>19.71 acres</td>
</tr>
<tr>
<td>Open space</td>
<td>0.95 acres</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed Coverage</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road, Roof, Driveway</td>
<td>5.50 acres</td>
</tr>
<tr>
<td>Open space</td>
<td>8.25 acres</td>
</tr>
<tr>
<td>Woods</td>
<td>6.91 acres</td>
</tr>
</tbody>
</table>
Post-Development Site

Determining Applicable Design & Performance Standards

Disturbance & Increase in Impervious Area
- Total Disturbance: 13.5 acres
- Increase in impervious area: 5.5 acres
- Is the site a major development? Yes

Which standards are required?
- Water Quantity
  - Required
- Water Quality
  - Increase in impervious coverage > 0.25 acre
  - Required
- Groundwater Recharge
  - Planning Area 1 – Not “previously developed”
  - Required
- Nonstructural
  - Required for all major developments
Nonstructural Strategies Used

What nonstructural measures were provided?

- Maximize the protection of natural drainage features and vegetation (#3)
- Minimize land disturbance including clearing and grading (#5)
- Minimize soil compaction (#6)

What nonstructural measures were provided?

- Minimize impervious surface or disconnect the flow of runoff over impervious surfaces (#2)
- Provide low maintenance landscaping that encourages retention and planting of native vegetation that minimizes the use of lawns, fertilizers, and pesticides (#7)
Proposed Structural BMPs

Infiltration Basin
- Lower area of BMP is infiltration area
  - 6,000 square feet
- Upper area of BMP to remain as woods

Soil Testing

Infiltration basin
- 6,000 square foot infiltration area
  - Required – 2 soil profile pits in infiltration area
  - Provided – 1 soil profile pit in infiltration area
    - 4 soil profile pits nearby
  - Also need determination of permeability
    - Used undisturbed tube permeameter tests - Acceptable

Basin Detail
### Test Pit #1

<table>
<thead>
<tr>
<th>Depth (ft) below existing grade</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Organic layer</td>
</tr>
<tr>
<td>2</td>
<td>Gray (10YR 5/4) sand, single grain, loose</td>
</tr>
<tr>
<td>6</td>
<td>Bemis dark yellow (2.5YR 6/4) sandy sand, weak subangular to granular structure, fissile</td>
</tr>
<tr>
<td>10</td>
<td>Light gray (10YR 7/1) sandy sand, somewhat sandy, granular, yellow-brown (5YR 8/4) silt, subangular to disorderly, fissile, detached at 24 inches</td>
</tr>
<tr>
<td>34</td>
<td>White (2.5YR 8/1) sand, single grain, loose, compacted</td>
</tr>
</tbody>
</table>

Note: Test pit abandoned at 24 inches due to collapse from net erosion.

---

### Test Pit #2

<table>
<thead>
<tr>
<th>Depth (ft) below existing grade</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Organic layer</td>
</tr>
<tr>
<td>2</td>
<td>Gray (10YR 5/4) sand, single grain, loose</td>
</tr>
<tr>
<td>6</td>
<td>Light yellowish (10YR 6/4) sandy sand, weak subangular to granular structure, fissile</td>
</tr>
<tr>
<td>10</td>
<td>Bemis dark yellow (2.5YR 6/4) sandy sand, weak subangular to granular structure, fissile</td>
</tr>
<tr>
<td>34</td>
<td>Light gray (10YR 7/1) sandy sand, fine, granular, yellow-brown (5YR 8/4) silt, subangular to disorderly, fissile, detached at 24 inches</td>
</tr>
<tr>
<td>60</td>
<td>White (2.5YR 8/1) sand, single grain, loose, compacted</td>
</tr>
</tbody>
</table>

Note: Test pit abandoned at 24 inches due to collapse from net erosion.

---

### Test Pit #3

<table>
<thead>
<tr>
<th>Depth (ft) below existing grade</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Organic layer</td>
</tr>
<tr>
<td>2</td>
<td>Gray (10YR 5/4) sand, single grain, loose</td>
</tr>
<tr>
<td>6</td>
<td>Light yellowish (10YR 6/4) sandy sand, weak subangular to granular structure, fissile</td>
</tr>
<tr>
<td>10</td>
<td>Bemis dark yellow (2.5YR 6/4) sandy sand, weak subangular to granular structure, fissile</td>
</tr>
<tr>
<td>34</td>
<td>Yellow (10YR 7/6) sandy sand, subangular, disorderly, fissile, detached at 24 inches</td>
</tr>
<tr>
<td>60</td>
<td>White (2.5YR 8/1) sand, single grain, loose, compacted</td>
</tr>
</tbody>
</table>

Note: Test pit abandoned at 24 inches due to collapse from net erosion.
Test Pit Summary

<table>
<thead>
<tr>
<th>Test Pit</th>
<th>SHWT Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP #1</td>
<td>9.5 ft</td>
</tr>
<tr>
<td>TP #2</td>
<td>9.0 ft</td>
</tr>
<tr>
<td>TP #3</td>
<td>9.5 ft</td>
</tr>
<tr>
<td>TP #4</td>
<td>9.4 ft</td>
</tr>
<tr>
<td>TP #5</td>
<td>9.5 ft</td>
</tr>
</tbody>
</table>
Infiltration Rate Summary

<table>
<thead>
<tr>
<th>Test Pit</th>
<th>Permeability Results (in/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP #1</td>
<td>2.67 (A)</td>
</tr>
<tr>
<td>TP #2</td>
<td>0.28 (A)</td>
</tr>
<tr>
<td>TP #3</td>
<td>6.54 (A)</td>
</tr>
<tr>
<td>TP #4</td>
<td>2.45 (A)</td>
</tr>
<tr>
<td>TP #5</td>
<td>12.73 (A)</td>
</tr>
</tbody>
</table>
Test Pit #2

Soil Replacement

Drain Time

- 6 inch orifice @ 13.2 ft
- Bottom of basin @ 12.0 ft
- Ponding depth 1.2 ft
- Infiltration rate = 1in/hr
- Drain Time = 14.4 hr
For example purposes only: use published default values from the guidance document.
Infiltration Basin Requirements

- Distance from SHWT > 2 ft
  - Distance = 2 ft
- Infiltration rate > 1 in/hr
  - Soil Replacement
- Max. standing water depth < 2 ft
  - 6 in orifice @ 13.2 ft, basin bottom 12.0 ft
- Infiltrate water quality storm
  - WQDS elevation = 12.5 ft
  - Recharge design storm elevation= 13.2 ft
- Drain Time (with mounding analysis) < 72 hr
  - BMP merits 80% TSS removal rate

Water Quantity

<table>
<thead>
<tr>
<th>Design Storm</th>
<th>Pre-developed Onsite Peak Runoff (cfs)</th>
<th>Pre-developed Offsite Peak Runoff (cfs)</th>
<th>Allowable Onsite Peak Runoff (cfs)</th>
<th>Allowable Total Peak Runoff (cfs)</th>
<th>Proposed Total Peak Runoff (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-year</td>
<td>2.3</td>
<td>1.5</td>
<td>1.15</td>
<td>2.65</td>
<td>2.5</td>
</tr>
<tr>
<td>10-year</td>
<td>12.9</td>
<td>3.7</td>
<td>9.675</td>
<td>13.375</td>
<td>5.1</td>
</tr>
<tr>
<td>100-year</td>
<td>48.5</td>
<td>9.6</td>
<td>38.8</td>
<td>48.4</td>
<td>34.7</td>
</tr>
</tbody>
</table>

What to check? (NRCS Method Used)

- Do the numbers in the table match calculation results?
- Were pervious and impervious calculated separately?
- Is the rainfall depth/distribution correct?
- Are the Times of Concentration correct?
- Do the land covers/HSGs match the field?
- Was the appropriate unit hydrograph used?
- Does the basin model match the plans (volume, outlets, etc.)?
- Was infiltration included in routings?
### Water Quantity

**Do the numbers in the table match results?**

<table>
<thead>
<tr>
<th>Design Storm</th>
<th>Pre-developed Onsite Peak Runoff (cfs)</th>
<th>Pre-developed Offsite Peak Runoff (cfs)</th>
<th>Allowable Onsite Peak Runoff (cfs)</th>
<th>Allowable Total Peak Runoff (cfs)</th>
<th>Proposed Total Peak Runoff (cfs)</th>
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<tr>
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<td>1.5</td>
<td>1.15</td>
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<td>2.5</td>
</tr>
<tr>
<td>10-year</td>
<td>12.9</td>
<td>3.7</td>
<td>9.675</td>
<td>13.375</td>
<td>5.1</td>
</tr>
<tr>
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<td>48.5</td>
<td>9.6</td>
<td>38.8</td>
<td>48.4</td>
<td>34.7</td>
</tr>
</tbody>
</table>

### Water Quantity

**Were pervious and impervious surfaces calculated separately?**

- Easiest way to see this is usually the subcatchment diagram (ask for this if they haven’t provided it)

- Note that some programs may allow pervious and impervious on the same subcatchment but still calculate separately
Water Quantity

Were the correct rainfall depths/distribution used?

Calculations used:

Type III

- 2-year = 3.3 in
- 10-year = 5.2 in
- 100-year = 8.9 in
**Water Quantity**

Are the Tc calculations correct?

- Existing – 23.5 minutes

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (ft)</th>
<th>Slope</th>
<th>Velocity (fps)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.3</td>
<td>100</td>
<td>0.050</td>
<td>0.60</td>
<td>270</td>
<td>Sheet Flow, Woods/Light brush n=0.400 P=3.20'</td>
</tr>
<tr>
<td>5.2</td>
<td>875</td>
<td>0.050</td>
<td>2.70</td>
<td></td>
<td>Shallow Concentrated Flow, Unperked X=15.10'</td>
</tr>
<tr>
<td></td>
<td>23.5</td>
<td>975</td>
<td></td>
<td>1000</td>
<td>Total</td>
</tr>
</tbody>
</table>

- Proposed – 6 minutes for all impervious surfaces

**Water Quantity**

Do the land covers/HSGs match the field?

- What is the HSG?
  - They should have provided soil map
  - If not, visit the web soil survey

- Remember if web soil survey shows no HSG or defines the material on-site as fill, testing is required in accordance with appendix E to determine HSG
### Water Quantity

#### Existing Coverage

<table>
<thead>
<tr>
<th>Coverage Type</th>
<th>Area</th>
<th>Curve Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woods</td>
<td>19.71  acres</td>
<td>30/55</td>
</tr>
<tr>
<td>Open space</td>
<td>0.95   acres</td>
<td>39/61</td>
</tr>
</tbody>
</table>

#### Proposed Coverage

<table>
<thead>
<tr>
<th>Coverage Type</th>
<th>Area</th>
<th>Curve Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road, Roof, Driveway</td>
<td>5.5 acres</td>
<td>98/98</td>
</tr>
<tr>
<td>Open space</td>
<td>8.25   acres</td>
<td>39/61</td>
</tr>
<tr>
<td>Woods</td>
<td>6.91   acres</td>
<td>30/55</td>
</tr>
</tbody>
</table>

### Water Quantity

Was the appropriate unit hydrograph used?
- Application used DelMarVa unit hydrograph
  - Site is in coastal plain
  - Site is largely undisturbed
  - No steep slopes

- Can DelMarVa be used in proposed conditions too?
  - Yes, just not when sizing MTDs

### Water Quantity

Does the basin model match the plans?
- Outlet structure

<table>
<thead>
<tr>
<th>Design</th>
<th>Rating</th>
<th>Invert</th>
<th>Outlet Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Primary</td>
<td>0.52</td>
<td>GRP &quot;x&quot; 51.8&quot; long 36&quot; Fluent KE=0.500</td>
</tr>
<tr>
<td>#2</td>
<td>Davos 1</td>
<td>13.27</td>
<td>4.0&quot;x 4.07&quot; Horiz. Type E S=0.080 Limited to wear flow</td>
</tr>
<tr>
<td>#3</td>
<td>Davos 1</td>
<td>14.00</td>
<td>4.0&quot;x 4.07&quot; Horiz. Type E S=0.080 Limited to wear flow</td>
</tr>
<tr>
<td>#4</td>
<td>Primary</td>
<td>14.00</td>
<td>2&quot; Grooved Joint, Cr=3.10 Head loss 0.100 0.20 1.00 VanH (feet) 20.0 31.20 27.20</td>
</tr>
</tbody>
</table>
Water Quantity

• Outlet structure

---

Water Quantity

Does the basin model match the plans?

• Volume

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Areal Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#7</td>
<td>12.00</td>
<td>270,256 cfs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Surf Area (sq ft)</th>
<th>Inc Side (sq ft)</th>
<th>Cum Side (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.00</td>
<td>36,400</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13.00</td>
<td>40,300</td>
<td>41,383</td>
<td>41,383</td>
</tr>
<tr>
<td>14.00</td>
<td>72,393</td>
<td>103,783</td>
<td>103,783</td>
</tr>
<tr>
<td>15.00</td>
<td>84,341</td>
<td>179,125</td>
<td>179,125</td>
</tr>
<tr>
<td>16.00</td>
<td>97,505</td>
<td>270,256</td>
<td>270,256</td>
</tr>
</tbody>
</table>

---

Water Quantity

180 x 200 = 36,000 sq ft
Water Quantity

Does the basin model match the plans?

- Volume

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Surf Area (sq ft)</th>
<th>Inc Store (cubic ft)</th>
<th>Cum Store (cubic ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.00</td>
<td>36,436</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13.00</td>
<td>49,305</td>
<td>41,363</td>
<td>41,363</td>
</tr>
<tr>
<td>14.00</td>
<td>72,386</td>
<td>58,453</td>
<td>100,815</td>
</tr>
<tr>
<td>15.00</td>
<td>89,345</td>
<td>76,426</td>
<td>176,571</td>
</tr>
<tr>
<td>16.00</td>
<td>97,305</td>
<td>90,263</td>
<td>277,535</td>
</tr>
</tbody>
</table>

200 x 480 = 96,000 sq ft
Water Quantity

Was infiltration used in the routings?

- Check outlet structure for infiltration, exfiltration, custom outlets, or discarded flow

<table>
<thead>
<tr>
<th>Device</th>
<th>Routing</th>
<th>Inlet</th>
<th>Outlet Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>#1</td>
<td>9.50</td>
<td>24&quot; x 31.37 long 24&quot; Cobert CPP, square edge headwall, R=0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 in. diameter</td>
</tr>
<tr>
<td>#2</td>
<td>Device 1</td>
<td>13.25</td>
<td>60&quot; x 7.24&quot; Office, Dh=2500</td>
</tr>
<tr>
<td>#3</td>
<td>Device 1</td>
<td>14.00</td>
<td>4.00&quot; x 4.00&quot; Horizontal Type E, Q=200.00</td>
</tr>
<tr>
<td>#4</td>
<td>Primary</td>
<td>14.82</td>
<td>26&quot; Broadmoor Valve, D=3.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Valve (feet) 20.00, 21.20, 27.20</td>
</tr>
</tbody>
</table>

Water Quantity

Summary

- Need to fix detail of outlet structure on plan
- Otherwise everything looks OK

The water quantity requirement is met

Water Quality

- 5.5 acres of new impervious coverage
  - Only roadways, parking areas, etc. require treatment

Simplest thing to do is look back at the plans and determine if the entire roadway/parking network is directed to the basin
Post-Development Site

Water Quality

Summary
• Since BMP is granted 80% TSS removal rate
  AND
• All of the new roadway/parking/driveways drain to the BMP

  The water quality requirement is met

Groundwater Recharge

Engineer has opted to infiltrate the difference in the 2-year storm
• Existing 2-year runoff volume = 40,825 cf
• Proposed 2-year runoff volume = 100,218 cf
• Difference = 59,393 cf
• Volume below lowest outlet = 59,400 cf
Module 4 of 4, September 3, 2020

Maintenance Plan

- Responsible party – Developer
  - Will probably need updating after construction
- Preventative maintenance tasks and schedules - OK
- Cost estimates – OK
- Blank maintenance logs - OK
- Needs to be recorded on deed

Stormwater Management Report

Total Summary
- Nonstructural – OK, need to require restriction
- BMP Design - OK
- Water Quantity – OK, with change to outlet detail
- Water Quality - OK
- Groundwater Recharge - OK
- Maintenance Manual - OK

Meets the stormwater control ordinance and can be approved

Contact Information

Bureau of Nonpoint Pollution Control
Division of Water Quality
401 East State Street
PO Box 420, Mail Code 401-2B
Trenton, NJ 08625-420
Tel: 609-633-7021
www.njstormwater.org

Brian Salvo
Brian.Salvo@dep.nj.gov
Presentation Goals

Goals
• Review site plans and stormwater management report
• Identify any errors with the design
• Suggest potential solutions

Determining Applicable Design & Performance Standards

Does the Development
• Trigger the municipality’s SCO?
• Disturb one acre or more?
• Increase impervious coverage by ¼ acre or more?
Determining Applicable Design & Performance Standards

Municipal Stormwater Control Ordinance:

• Major Development:

  "Any development that provides for ultimately disturbing one or more acres of land or would create ¼ acre or more of impervious surface."

Familiarize Yourself with the Site

Where are the pre-construction conditions?

• Important in determining the requirements

• Existing land cover

• Has the existing land cover existed for the past 5 years?

Pre-Development Site Condition
A runoff coefficient for existing conditions...

May be used if the design engineer verifies that
the hydrologic condition has existed on the site for
at least five years

If more than one land cover has existed...

During the five years immediately prior to the time
of applications, the land cover with the lowest
runoff potential shall be used for the computations
Pre-Development Site

Which has the lowest runoff potential?

Pre-Development Conditions

What does this mean for stormwater management of the site?

Stormwater Management Report

Based on 2007 conditions...

<table>
<thead>
<tr>
<th>Coverage Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof &amp; Paved Driveway</td>
<td>60,342 sf</td>
</tr>
<tr>
<td>Gravel</td>
<td>6,495 sf</td>
</tr>
<tr>
<td>Lawn</td>
<td>4,664 sf</td>
</tr>
</tbody>
</table>

Based on 2012 conditions...

<table>
<thead>
<tr>
<th>Coverage Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof &amp; Paved Driveway</td>
<td>46,342 sf</td>
</tr>
<tr>
<td>Gravel</td>
<td>6,495 sf</td>
</tr>
<tr>
<td>Lawn</td>
<td>18,664 sf</td>
</tr>
</tbody>
</table>

Proposed Coverage

<table>
<thead>
<tr>
<th>Coverage Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof &amp; Paved Driveway</td>
<td>59,626 sf</td>
</tr>
<tr>
<td>Gravel</td>
<td>0 sf</td>
</tr>
<tr>
<td>Lawn</td>
<td>11,875 sf</td>
</tr>
</tbody>
</table>
Stormwater Management Report

Based on 2007 conditions...
• Impervious coverage was reduced, the time of concentration was maintained
• The post-construction hydrographs did not exceed the pre-construction hydrographs
• Water quantity was met
• Water quality was not required
• No groundwater recharge was required

Stormwater Management Report

Based on 2012 conditions...
• Impervious coverage was increased by greater than ¼ acre, time of concentration was decreased
• Water quantity was not met
• Water quality was required
• Groundwater recharge was required

Post-Development Site
Stormwater Management Report

What are some ways to meet the requirements?

• Water quantity:
  o Underground detention system

• Water quality?
  o Green infrastructure

Post-Development Site

Contact Information

Bureau of Nonpoint Pollution Control
Division of Water Quality
401 East State Street
PO Box 420, Mail Code 401-28
Trenton, NJ 08625-420
Tel: 609-633-7021
www.njstormwater.org

Changl Wu
Chang.I.Wu@dep.nj.gov
Presentation Goals

Goals
• Review site plans and stormwater management report
• Identify any errors with the design
• Suggest potential solutions

Determining Applicable Design & Performance Standards

Which standards are required?
• Stormwater Control Ordinance for Municipality
• Amount of Disturbance
• Tidal Water Body Discharge
  - Water Quantity is required?
• Urban Redevelopment Area
  - Ground Water Recharge is required?
• Increase in Impervious Coverage
  - Water Quality is required?
Familiarize Yourself with the Site

Where are the pre-construction conditions?
• Important in determining the requirements
• Existing land cover

Pre-Development Site

Stormwater Management Report

<table>
<thead>
<tr>
<th>Existing Coverage</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking Lot, Roof, Driveway</td>
<td>258 sf</td>
</tr>
<tr>
<td>Lawn</td>
<td>66,224 sf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed Coverage</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking Lot, Roof, Driveway</td>
<td>37,064 sf</td>
</tr>
<tr>
<td>Lawn</td>
<td>29,418 sf</td>
</tr>
</tbody>
</table>
Post-Development Site

Determining Applicable Design & Performance Standards

Which standards are required?
- Stormwater Control Ordinance for Municipality
- Amount of Disturbance
- Tidal Water Body Discharge
  - Water Quantity is required?
- Urban Redevelopment Area
  - Ground Water Recharge is required?
- Increase in Impervious Coverage
  - Water Quality is required?

Soil Logs

<table>
<thead>
<tr>
<th>Depth</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3&quot;</td>
<td>Gray/Organic</td>
</tr>
<tr>
<td>3-6&quot;</td>
<td>15-YR-6A Yellowish Brown Fine Sand, Leda Silt, Tove Clay</td>
</tr>
<tr>
<td>6-9&quot;</td>
<td>15-YR-1A Dark Gray Silt, Leda Fine Sand</td>
</tr>
<tr>
<td>12-15&quot;</td>
<td>15-YR-4A Dark Gray, 41-YR-4B Brownish Yellow Silt, Sama Clay, Tove Fine Sand, (Pseudogley Features)</td>
</tr>
<tr>
<td>15-18&quot;</td>
<td>15-YR-1A Dark Clay, Sama Silt</td>
</tr>
<tr>
<td>18-21&quot;</td>
<td>15-YR-2A Very Grayish Brown Clay, Sama Silt, Tove Fine Sand</td>
</tr>
</tbody>
</table>
WATER QUANTITY

Engineer’s Claim

The discharges of the proposed stormwater management systems will result in no increases, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100 year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site, therefore, the project meets the water quantity standard.

Peak Flow Rates

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>2-Year Storm</th>
<th>10-Year Storm</th>
<th>100-Year Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAST</td>
<td>0.40 cfs</td>
<td>0.82 cfs</td>
<td>1.66 cfs</td>
</tr>
<tr>
<td>WEST</td>
<td>0.34 cfs</td>
<td>0.70 cfs</td>
<td>1.43 cfs</td>
</tr>
<tr>
<td>SOUTH</td>
<td>0.51 cfs</td>
<td>1.04 cfs</td>
<td>2.12 cfs</td>
</tr>
<tr>
<td>DA-1 (EAST)</td>
<td>0.37 cfs</td>
<td>0.65 cfs</td>
<td>1.31 cfs</td>
</tr>
<tr>
<td>DA-2 (SOUTH)</td>
<td>0.46 cfs</td>
<td>0.79 cfs</td>
<td>1.42 cfs</td>
</tr>
</tbody>
</table>
### Difference in Peak Discharges

<table>
<thead>
<tr>
<th>Storm</th>
<th>EAST</th>
<th>DA-1 (EAST)</th>
<th>Difference in Peak Discharges</th>
<th>2-year</th>
<th>0.40 cfs</th>
<th>0.37 cfs</th>
<th>-0.03 cfs (92.5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year</td>
<td>0.85 cfs</td>
<td>0.66 cfs</td>
<td>-0.17 cfs (93.2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-year</td>
<td>1.66 cfs</td>
<td>1.31 cfs</td>
<td>-0.35 cfs (78.7%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storm</th>
<th>SOUTH</th>
<th>DA-2 (SOUTH)</th>
<th>Difference in Peak Discharges</th>
<th>2-year</th>
<th>0.51 cfs</th>
<th>0.46 cfs</th>
<th>-0.05 cfs (90.2%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year</td>
<td>1.04 cfs</td>
<td>0.79 cfs</td>
<td>-0.25 cfs (76.0%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-year</td>
<td>2.12 cfs</td>
<td>1.42 cfs</td>
<td>-0.70 cfs (67.0%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Curve Numbers

### Volume

<table>
<thead>
<tr>
<th>Storm</th>
<th>EAST</th>
<th>DA-1 (EAST)</th>
<th>Difference in Volume</th>
<th>2-year</th>
<th>2,581 cf</th>
<th>10,747 cf</th>
<th>+8,166 cf</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year</td>
<td>5,199 cf</td>
<td>18,316 cf</td>
<td>+13,117 cf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-year</td>
<td>10,634 cf</td>
<td>33,182 cf</td>
<td>+ 22,548 cf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storm</th>
<th>SOUTH</th>
<th>DA-2 (SOUTH)</th>
<th>Difference in Volume</th>
<th>2-year</th>
<th>3,310 cf</th>
<th>2,352 cf</th>
<th>-958 cf</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year</td>
<td>6,669 cf</td>
<td>4,011 cf</td>
<td>-2,658 cf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-year</td>
<td>13,640 cf</td>
<td>7,273 cf</td>
<td>-6,367 cf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GROUNDWATER RECHARGE

Engineer’s Claim

Soil test pits were performed in the vicinity of each stormwater management basin. The soil logs show that the existing soil is primarily clay, with low permeability. The clayey soils restrict groundwater recharge. Therefore, groundwater recharge has not been provided for this project.

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Map soil symbol</th>
<th>Map soil name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clayey loam</td>
<td>CLA</td>
<td>Kilauea clayey loam, 5 to 12 percent slope</td>
<td></td>
</tr>
</tbody>
</table>

Determining Applicable Design & Performance Standards

Which standards are required?

- Stormwater Control Ordinance for Municipality
- Amount of Disturbance
- Tidal Water Body Discharge
  - Water Quantity is required?
- HSG D Soils
  - Ground Water Recharge is required?
- Increase in Impervious Coverage
  - Water Quality is required?
Contact Information

Bureau of Nonpoint Pollution Control
Division of Water Quality
401 East State Street
PO Box 420, Mail Code 401-2B
Trenton, NJ 08625-420
Tel: 609-633-7021
www.njstormwater.org

Brian Salvo
Brian.Salvo@dep.nj.gov
Project Information

- Development ≥ 1 acre disturbance
- Major development
  - Water quality is required
- Increase of impervious surface ≥ 0.25
  - Water quality is required
- Groundwater recharge is required unless exempt
  - PA1 area, but whether a part of the property is “previously developed” is questionable
Recharge Exemption

- Groundwater recharge requirement does not apply to projects within the "urban redevelopment area."

- "Urban Redevelopment Area" is defined as previously developed portions of areas:
  1. Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;
  2. Designated as CAFRA Centers, Cores or Nodes;
  3. Designated as Urban Enterprise Zones; and
EXAMPLE 4b

Project Information

- Development ≥ 1 acre disturbance
- Major development
  - Water quantity is required
- Increase of impervious surface ≥ 0.25
  - Water quality is required
- Groundwater recharge is required unless exempt
  - PA1 area, but whether a part of the property is “previously developed” is questionable
Minimum Length to Width Ratio 1:1
One inlet is too close to the outlet

Extended constructed wetland
Other Issues

- Nonstructural strategies were incorporated
- Water Quantity Calculation was underestimated

<table>
<thead>
<tr>
<th>Network Rain Collection</th>
<th>Union County, NJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall Type</td>
<td>Normal Flow</td>
</tr>
<tr>
<td>Synthetic Curve</td>
<td>Type II</td>
</tr>
</tbody>
</table>

NRCS County Ave.

Maintenance Plan

- No responsible party contact information
- No specific preventative tasks for constructed wetland
  - Wetland Vegetation
  - Depth Settled
  - Sinuous path pattern
  - Channelization
- No cost estimate
  - Regular maintenance
  - Dredge
  - Permit

EXAMPLE 4c
Infiltration Basin
- Bottom from EL. 89 to EL. 88 &
- Sand bed 0.5 ft
- Lowest point = EL. 87.5
- Basin area = 6,540 sf
- Max. water quality storm depth EL. 89.1
- Soil Test Pits, TP#1 & TP #2

- No. of soil test pits
  - 6,540 sf
- Location
  - In the infiltration area

Soil profit pit depth from basin’s sand bottom
- Greater of 8 ft or 2x max water depth (1.18 ft)
- Sand bottom is at EL. 87.5 ft
- Required depth = 8 ft below EL. 87.5 ft

TP#1 Depth
- GL is EL. 93.8 ft,
- The required depth = 93.8 – 87.5 + 8 = 14.3 ft (176 in from GL)

SHWT separation
- SHWT at 96 in from GL:
- Sand bottom at EL. 87.5 ft (75.9 in from GL)
- Separation = 20.1 in (1.68 ft)
- Separation is not enough
Permeability Test

TP #2 Depth
- GL is EL. 91.8,
- Required depth = 91.8 - 87.5 + 8 ft
  = 12.3 ft (147.6 in) from GL

SHWT separation
- SHWT at 56 in (EL 87.13 ft)
- sand bottom at EL 88.5 ft
  (39.6" from GL)
- Separation = 88.5 - 87.13 = 1.37 ft
- Permeability rate test depth
- below sand bottom but above SHWT
  - Most restrictive horizon is Sandy Loam
  - Tested at sandy soil layer

Consequences

Other Issues

- Infiltration basin has a sloped bottom
  - Infiltration basin needs to have a level basin bottom in order to even distribute runoff over entire basin bottom for even infiltration
- K4 sand was used for the sand layer of infiltration basin
  - Sand layer must meet the specification of K5 sand
Maintenance Plan

Contact Information

Bureau of Nonpoint Pollution Control
Division of Water Quality
401 East State Street
PO Box 420, Mail Code 401-28
Trenton, NJ 08625-420
Tel: 609-633-7021
www.njstormwater.org

Changi Wu
Chang.i.wu@dep.nj.gov
Presentation Goals

Goals

- Review site plans and stormwater management report
- Identify any errors with the design
- Suggest potential solutions

Determining Applicable Design & Performance Standards

Does the Development

- Trigger the municipality’s SCO?
- Disturb one acre or more?
- Increase impervious coverage by ¼ acre or more?
Determining Applicable Design & Performance Standards

Municipal Stormwater Control Ordinance:

- Major Development:
  "Any development that provides for ultimately disturbing one or more acres of land or would create ¼ acre or more of impervious surface."

Familiarize Yourself with the Site

What are the pre-construction conditions?
- Important in determining the requirements
- Existing land cover
- Has the existing land cover existed for the past 5 years?

Pre-Development Site
**Pre-Development Site**

**Stormwater Management Report**

<table>
<thead>
<tr>
<th>Coverage Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Coverage</td>
<td></td>
</tr>
<tr>
<td>Parking Lot, Roof,</td>
<td>1.61 acres</td>
</tr>
<tr>
<td>Driveway</td>
<td></td>
</tr>
<tr>
<td>Lawn</td>
<td>0.52 acres</td>
</tr>
<tr>
<td>Proposed Coverage</td>
<td></td>
</tr>
<tr>
<td>Parking Lot, Roof,</td>
<td>1.836 acres</td>
</tr>
<tr>
<td>Driveway</td>
<td></td>
</tr>
<tr>
<td>Lawn</td>
<td>0.294 acres</td>
</tr>
</tbody>
</table>

**Pre-Development Site**
Determining Applicable Design & Performance Standards

Disturbance & Increase in Impervious Area
- Total Disturbance:
  - 2.13 acres
- Increase in impervious area:
  - 0.226 acres
- Is the site a major development?
  - Yes
Determining Applicable Design & Performance Standards

Which standards are required?
- Water Quantity
  - Required
- Water Quality
  - Increase in impervious coverage <0.25 acre
    - Not required
- Groundwater Recharge
  - Urban redevelopment area
    - Not required, provided anyway

Proposed Site Plan
Post-Development Site

Pre-Development Conditions

What does this mean for this site?

Determining Applicable Design & Performance Standards

Which standards are required?

- Water Quantity
  - Required

- Water Quality
  - Increase in impervious coverage > 0.25 acre
  - Required

- Groundwater Recharge
  - Urban redevelopment area
  - Not required, provided anyway
GROUNDWATER RECHARGE

Groundwater Recharge

What is required?
- Site was exempt from groundwater recharge, designer provided it anyway
- Submitted groundwater recharge spreadsheet
- Soil testing required for any proposed infiltration BMP

Groundwater Recharge

Soil Testing
- No soil testing data submitted
- Stormwater management report:
  
  "...the only soil present on site is Urban land-Boonton complex (UbB). Boonton soils are classified as a type C soil and are not well suited for infiltration due to their slow permeability."

  - This is not true! UL-Boonton soils are not HSG C
Groundwater Recharge

Soil Testing

• Soil testing required to determine the permeability and separation from SHWT

• Small stream traverses the site via a culvert

• Basin will likely not drain fast enough
Groundwater Recharge

Post-D Impervious Area

- Set to the impervious area draining to recharge BMP

- Post-D:
  - From NJGRS: 26,789 sf
  - From stormwater management report: 23,784 sf

- DA to recharge basin (including pervious): 26,092 sf

Groundwater Recharge

BMP Area

- Measured from site plan

- Infiltration volume must be equal to BMP Area times effective depth

- Provided effective depth = 2.4 inches
Groundwater Recharge

BMP Effective Depth

- Infiltration depth = 6 inches
- Storage media porosity = ?
- Provided effective depth = 2.4 inches

Groundwater Recharge

dBMPu and dEXC

- dBMPu: depth to upper level of BMP surface
- dEXC: depth to lower level of BMP surface
- Found using elevations on the plan and/or detail sheets
- Bottom of chambers: El. 97 ft
- Maximum infiltration elevation: El. 97.5 ft
- Ground surface: El. 102-105 ft
Groundwater Recharge

dBMPu and dEXC
- dBMPu: 54 inches
- dEXC: 60 inches
- As a quick check, the difference should be the maximum infiltration depth (6 inches)

Groundwater Recharge

SegBMP
- Land segment on which BMP is located
- Located on segment 2 (impervious area)
- Important to properly assign soil data, even for impervious areas

Groundwater Recharge

Review Issues:
- No soil testing
- Post-development conditions do not match plans
- Overestimated amount of impervious area to recharge BMP
- Did not provide sufficient information to verify effective depth
WATER QUANTITY

Water Quantity

What needs to be reviewed?
- Time of concentration
- Curve numbers
- Proper routing
- Basin design

Time of Concentration
- Assumed to be 0.167 hours (10 minutes)
- Minimum time of concentration in NRCS method is 0.1 hours (6 minutes)
- No calculations to verify this under existing conditions
Water Quantity

Curve Numbers and Routing

<table>
<thead>
<tr>
<th>Soil/Surface Description</th>
<th>CN</th>
<th>Area</th>
<th>Adjustment</th>
<th>Adjusted CN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good condition; grass cover &gt; 75%</td>
<td>74</td>
<td>1.260</td>
<td>10.00</td>
<td>90.00</td>
</tr>
<tr>
<td>Paved parking lots, roofs, driveways</td>
<td>94</td>
<td>1.350</td>
<td>90.00</td>
<td>90.00</td>
</tr>
<tr>
<td>短</td>
<td>短</td>
<td>短</td>
<td>短</td>
<td>短</td>
</tr>
<tr>
<td>COMPOSITE AREA &amp; WEIGHTED CN</td>
<td>2.530</td>
<td>90.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>短</td>
<td>短</td>
<td>短</td>
<td>短</td>
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</tbody>
</table>

Water Quantity

Curve Numbers and Routing

<table>
<thead>
<tr>
<th>Soil/Surface Description</th>
<th>CN</th>
<th>Area</th>
<th>Adjustment</th>
<th>Adjusted CN</th>
</tr>
</thead>
<tbody>
<tr>
<td>短</td>
<td>短</td>
<td>short</td>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>短</td>
<td>short</td>
<td>short</td>
<td>short</td>
<td>short</td>
</tr>
</tbody>
</table>

Water Quantity Analysis:

- Stormwater management report:
  
  "Infiltration occurring within the basin has not been considered in the calculations to be conservative."

- This is not just conservative, it is required!
Water Quantity

Water Quantity Analysis:

• Proposed peak flows:
  - 2-year storm: 47% pre-development
  - 10-year storm: 63.3% pre-development
  - 100-year storm: 76.1% pre-development

• Water quantity not met – all of the inputs were wrong!
Program Update

Introduction

Topics
- Rule Amendments
- MS4 Permit Renewals
- Permit Overview
- NJDEP Assistance/Guidance
- MS4 Audit Program
- BMP Manual Updates

Amendments to Stormwater Management Rules

- March 2, 2020: Adoption of Rules
  - One year delayed operative date, effective 3-2-2021
  - Current rules are in effect until 3-1-2021
  - Same timeframe municipalities have to update ordinances in accordance with MS4 permits
MS4 Permit Universe – Tier A & B

Permittees

• Tier A Municipalities (462)
  o urbanized or along or near the coast
• Tier B Municipalities (104)
  o rural and non-coastal
• Permits Renewed 2018

MS4 Permit Universe – Public Complex

Public Complex Permittees

• Sixty-Nine Permittees (69)
  o Colleges
  o Universities
  o Hospitals
  o Prisons
• Permit Renewed 2019

MS4 Permit Universe – Highway Agencies

Highway Agencies

• Thirty-Three Permittees (33)
  o Counties
  o 3 N.J. DOT (North, Central, South)
  o Transportation Agencies
    o Turnpike
    o Parkway
    o Bridge Commissions
• Permit Renewed
  • 1/1/2020

MS4 Permits:
https://www.nj.gov/dep/dwq/msrp_home.htm
National Map of Regulated MS4s


Public Education and Outreach

Involve Public in Reducing Pollutants in Stormwater

- Implement Public Education Program
- Increased annual points from 10 to 12
- Maintain Documents
- Certify Annually

Now Allows For:

- Updated activities (social media, web pages, etc.)
- More Opportunities Available to Align with Current Municipal Activities

Post Construction Runoff Control

Review of Stormwater Management Designs for Major Development

- Local Review to Ensure consistency with NJ Stormwater Rules
  - Quantity, Quality, GW Recharge
- Utilize Attachment D Checklist to ensure compliance with Design and Performance requirements under the Stormwater Rules
- Maintain Records and Certify Annually
- Updated BMP Manual for easier comprehension and understanding of design requirements
- Updated Training videos on Stormwater BMPs
- FREE DEP training for local review of stormwater designs ("Engineers training")
POLLUTION PREVENTION/GOOD HOUSEKEEPING

Community Wide Ordinances and Measures

- Retains six existing ordinance requirements
- Catch Basin Inspection and Cleaning
  - At least every five years
  - Focus on problematic areas certify annually
- Street Sweeping
  - Miles swept & tons collected
- Maintain records and certify annually
- Less prescriptive
- Discretion to municipality to prioritize

Municipal Maintenance Yards and Ancillary Operations

- Expanded list to cover common activities at MMY
  - Aggregate materials and construction debris storage
  - Street sweepings, catch basin clean out material
  - Yard trimmings & wood waste management
- Containment of vehicle wash water
  - Maintain logs
    - Annual engineers inspection & certification
    - Storage tank use & pump-out log
    - Integrity testing every 3 years
    - Attachment E of the permit
- Maintain records and certify annually
**PP/GH-Training Requirements**

**Employee Training**
- Specific to the Employee’s Job Title and Duties
- Within Three (3) Months of Commencement of Duties
- Every Two (2) Years Thereafter
- Maintain Records and Certify Annually
- More Specific/Targeted
- DEP Training Materials Posted On-line

---

**PP/GH-Training Requirements**

**Stormwater Management Design Review**
- Required Training for Stormwater Management Design Reviewers
  - (e.g. Municipal Engineers)
- Training Required Every Five Years
- Register/DEP Maintains Records
- FREE NJDEP Training – Twice per Year

---

**PP/GH-Training Requirements**

**Board & Council Member Training (Tier A & B)**
- Required Training by All Board and Council Members
- Overview of Stormwater Permit Requirements
- “Asking the Right Questions”
- Maintain Records and Certify Annually
- FREE On-line Class (45 minutes)
### Mapping, Illicit Discharge and Scouring

**Localized Stream Scouring**
- Develop, Update, Implement a Program
- Inspect Every Outfall Once Per 5 Years (Tier A &B)/Annually (R11)
- Mapping App
- Document Inspections
  - Location
  - IF Scouring
    - Repairs Prioritized
    - Repairs Scheduled

### Mapping, Illicit Discharge and Scouring

**Illicit Discharge Detection and Elimination**
- Develop, Update, Implement, and Enforce Ongoing Program
- Inspect Every Outfall Once Per 5 Years (Annually for R11)
- Mapping App
- Document Inspections
  - Location
  - Illicit Connection Inspection Report Form

### Other Control Measures – Maintenance

**Maintenance of Stormwater BMPs (e.g. basins, MTDs, GI, etc.)**
- Maintain all publicly owned stormwater BMPs
- Ensure maintenance of all privately owned BMPs built after 1984
  - Location
  - Illicit Connection Inspection Report Form
- Inspection and Maintain per maintenance Plan to Ensure proper function and operation
  - Maintain a Log
  - Location Information
  - Date
  - Findings
  - Maintenance Performed
- Prioritize Repairs
Maintenance of Stormwater BMPs (e.g., basins, MTDs, GI, etc.)

Assistance:
- Mapping Application and License
- Extensive new O & M checklist and guidance posted on-line
- Town-wide Land Use GP for basin maintenance
- Letter from Department to support municipality gaining information about and access to private stormwater facilities

TMDL

Incorporation of TMDL information into SPPP
- Identify impaired waterways in municipality
- Identify and develop strategies to address sources of pollutants
- Update SPPP annually to include optional measures
- Prioritize stormwater facility maintenance & repairs
- TMDL Look-up Tool posted on-line
- Summarized strategies already posted

<table>
<thead>
<tr>
<th>Module 4 of 4, September 3, 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Control Measures – Maintenance</td>
</tr>
<tr>
<td>Maintenance of Stormwater BMPs (e.g., basins, MTDs, GI, etc.)</td>
</tr>
<tr>
<td>Assistance:</td>
</tr>
<tr>
<td>• Mapping Application and License</td>
</tr>
<tr>
<td>• Extensive new O &amp; M checklist and guidance posted on-line</td>
</tr>
<tr>
<td>• Town-wide Land Use GP for basin maintenance</td>
</tr>
<tr>
<td>• Letter from Department to support municipality gaining information about and access to private stormwater facilities</td>
</tr>
</tbody>
</table>

| TMDL |
| Incorporation of TMDL information into SPPP |
| Identify impaired waterways in municipality |
| Identify and develop strategies to address sources of pollutants |
| Update SPPP annually to include optional measures |
| Prioritize stormwater facility maintenance & repairs |
| TMDL Look-up Tool posted on-line |
| Summarized strategies already posted |

| NJ DEP Division of Water Quality, Online Stormwater Management Design Review Course |
| Page 7 |
NJ DEP Mapping and Inventory Assistance

Mapping App
• All Drop Down Menus
• Smart Phone/Tablet/GIS
• Multiple Collection Methodologies
• Guidance Pending
• In Person Training and Assistance

Mapping App – Feature Classes
• Outfall Pipe
• Stormwater Management Basin
• Subsurface Infiltration/Detention System
• MTDs
• Green Infrastructure
• Storm Drain Inlet

TMDL Look-Up Tool

The tool was developed to assist local, county, and municipal stormwater managers with the development of plans and strategies to reduce stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s). This tool is also meant to assist with the development of stormwater management plans (SWMPs) for stormwater discharges from MS4s.

To use the TMDL Look-Up Tool, go to the drop-down feature below and locate your municipality. The Tool will display a list of selected TMDLs that have been approved or adopted by the NJDEP for the listed municipality. In order to use the TMDL, document the implementation strategies, data for the associated TMDL, and the TMDL. The document can be used to conduct the implementation to document the implementation of the TMDL.
New/Updated BMP Chapters

- Bioretention Systems
- Standard Constructed Wetlands
- Dry Wells
- Extended Detention Basins
- Infiltration Basins
- MTDs
- Pervious Paving Systems
- Blue Roofs

NJ BMP Manual Updates

**Comment Period Closed 5/1/20**

- Chapter 5 – Stormwater Mgmt Quantity and Quality Standards and Computations
- Chapter 12 – Soil Testing Criteria

**Recently Posted Final Updates**

- Chapter 13 – Groundwater Table Hydraulic Impact Assessments for Infiltration BMPs
- Appendix D – Model Municipal SCO
Edits in Progress
- Chapter 3 – Municipal and Regional SW Mgmt Planning
- Chapter 4 – Stormwater Pollutant Removal Criteria
- Chapter 9 – GI BMPs
- Chapter 10 – GI BMPs with Waiver
- Chapter 11 – Non-GI BMPs


New/Updated BMP Chapters (cont’d.)
- Sand Filters
- Vegetative Filter Strips
- Wet Ponds
- Grass Swales
- Subsurface Gravel
- Wetlands
- Rain Garden
- Cistern
- Green Roofs

9.4 EXTENDED DETENTION BASINS

<table>
<thead>
<tr>
<th>Water Quality Mechanisms and Corresponding Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settling</td>
</tr>
<tr>
<td>Suspended Sediment for Calculation of TS Removal</td>
</tr>
<tr>
<td>Calculation of TP Removal Rate</td>
</tr>
<tr>
<td>Calculation of TN Removal Rate</td>
</tr>
</tbody>
</table>

NJ DEP Division of Water Quality,
Online Stormwater Management Design Review Course
Stormwater Maintenance Guidance and Website

- Templates and Field Manuals
- Maintenance Plan
- Tour to Templates of Field Manuals for Various Types of Stormwater Management Systems
- One Template Maintenance Log

Maintenance Website - Resources and Information

- Stormwater Maintenance Process
- Stormwater Maintenance Manuals
- Maintenance Plan
- Tour to Resources and Information

- Resources
- Resources for Maintenance
- Tour to Resources for Maintenance

- Webinars for Maintenance of Stormwater Management Systems
- Tour to Webinars for Maintenance

- Resources for Maintenance
- Tour to Resources for Maintenance

- Resource Directory
- Tour to Resource Directory

- Tour to Maintenance Website

Stormwater Training

- Live Training Courses
- New Training Page at DEP Website
- Videos & Interactive Tools
- Training for NJDOH

www.njstormwater.org/training.htm

Manufactured Treatment Devices (MTD) Certification Process

- NJDOE
- NJCAT
- Certified MTD

NJ DEP Division of Water Quality, Online Stormwater Management Design Review Course
Module 4 of 4, September 3, 2020

**MS4 Permit Audit Program**

- Audit Selection Process (Annual Reports/Supplemental Questionnaires; Enforcement Consulted; Construction Permits; Impaired Waterbodies)
- Audit Process (Schedule Date of Audit; Request for Documents; Pre-Audit Preparation; On-Site)

**Goals of the MS4 Audit Program**

- Permit Compliance
- Compliance Assistance
  - Education
  - Training
  - Outreach
- Effectiveness of the Permit
  - Permit Modifications
  - Rule Changes
  - BMPs
  - Guidance

**MS4 Audit Selection**

- Advance Notice and Coordination
  - Minimum 30 days notice
  - www.nj.gov/dep/dwa/tier_a_guidance_other.htm
- Solicitation of Project Plans
- On-site Discussion and Review
  - 1 or 2 Days
  - Stormwater Coordinator/Twp. Engineer, etc.
- Areas of Focus
  - MS4 Permit Conditions - SBRs, Ordinances, etc.
  - Post Construction Requirements under NJAC 7:8
Moving Forward

- Ongoing MS4 Stormwater Audits
- Outreach Activities
  - Mapping App
  - Engineers Training
- Appendix A = Permit Summary Table
- Tools Are the Key
  - Training
  - Updated BMPs
  - GI Guidance Document
  - Inspection/Field Manual Templates
  - Mapping

Important Links

NJDEP Stormwater Web Page
- http://www.nj.gov/dep/dwq/fd.htm
  - BMP Manual
  - Stormwater Training
  - TMDL Look-up Tool
  - Maintenance Guidance
  - MS4 Permit Documents
  - Mapping and Inventory
  - Educational Resources
- MTDs
  - https://www.njstormwater.org/treatment.html
- Tools Are the Key
  - http://www.nj.gov/dep/dwq/msrp_home.htm

Important Reminders

Course Survey
- Will be emailed within the next two weeks
  - Complete and Send Back
- Survey Required for Course Certificate of Completion
  - No Survey = No Certificate
- Provide Copy of Certificate to Stormwater Program Coordinator
- Complete this Course Every Five Years
- Handouts Available on the NJDEP Webpage
  - https://www.njstormwater.org/training.htm