

***Revisions to the
Delaware Sediment & Stormwater Regulations***

***Technical Subcommittee Meeting
March 8, 2011***

DURMM v.2

Runoff Reduction Allowances & BMP Removal Efficiencies

DURMM v.2: BMP Categories

- Volume Management Practices
 - Reduce pollutant load
 - Retention Practices
 - Design criteria based on storage capacity for 1-YR event
 - ex.; infiltration trench
 - Runoff Reduction Practices
 - Design criteria based on reduction of annual runoff
 - ex.; filter strip
- Stormwater Treatment Practices
 - Reduce pollutant concentration
 - Design criteria based on empirical removal efficiency data
 - ex.; wet pond

DURMM v.2: R Pv Sheet

Retention Practices →

RR Practices →

	A	B	C
1		PROJECT:	0
2		DRAINAGE SUBAREA ID:	0
3		LOCATION (County):	0
4			
5	RESET		BMP 1
6		Type:	
7	Step 1 - Calculate Initial R Pv	Data	
8	1.1 Total contributing area to BMP (ac)	0.00	
9	1.2 C.A. RCN	#DIV/0!	
10	1.3 Total Contributing Area DURMM Runoff (in)	#DIV/0!	
11	1.4 R Pv for Contributing Area (in)	#DIV/0!	
12	1.5 Req'd R Pv Reduction for Contributing Area (in)	#DIV/0!	
13	1.6 Req'd R Pv Reduction for Contributing Area (%)	#DIV/0!	
14	1.7 C.A. allowable discharge rate (cfs)	#DIV/0!	
15			
16	Step 2 - Adjust for Retention Reduction		
17	2.1 Storage volume (cu. ft.)		
18	2.2 Retention reduction allowance (%)	#N/A	
19	2.3 Retention reduction volume (ac-ft)	#N/A	
20	2.4 Retention reduction volume (in)	#N/A	
21	2.5 Runoff volume after retention reduction (in)	#DIV/0!	
22	2.6 CN*	#DIV/0!	
23			
24	Step 3 - Adjust for Annual Runoff Reduction		
25	3.1 Annual CN (ACN)	#DIV/0!	
26	3.2 Annual runoff (in.)	#DIV/0!	
27	3.3 Proportion A/B soils in BMP footprint (%)		
28	3.4 Annual runoff reduction allowance (%)	0%	
29	3.7 Annual runoff after reduction (in.)	#DIV/0!	
30	3.8 Adjusted ACN	#DIV/0!	
31			
32	Step 4 - Calculate R Pv with BMP Reductions		
33	4.1 R Pv runoff volume after all reductions (in.)	#DIV/0!	
34	4.2 Total R Pv runoff reduction (in)	#DIV/0!	
35	4.3 Total R Pv runoff reduction (%)	#DIV/0!	
36	4.4 Equivalent TR-55 RCN for H&H modeling	#DIV/0!	
37	4.5 Req'd reduction met?	#DIV/0!	
38			

DURMM v.2: TMDL Sheet

	A	B	C	D	E
1	PROJECT:	0			
2	DRAINAGE SUBAREA ID:	0			
3	TMDL WATERSHED:				
4					
5		BMP 1			
6	Type:	0			
7	<i>Step 1 - Calculate Annual Runoff Volume</i>	Data	TN	TP	TSS
8	1.1 Total contributing area to BMP (ac)	0.00			
9	1.2 Contributing area RCN	#DIV/O!			
10	1.3 Annual runoff volume (in)	#DIV/O!			
11	1.4 Annual runoff volume (liters)	#DIV/O!			
12					
13	<i>Step 2 - Calculate Annual Pollutant Load</i>				
14	2.1 EMC (mg/l)		2.00	0.27	80
15	2.2 Load (mg/yr)	#DIV/O!	#DIV/O!	#DIV/O!	
16	2.3 Load (lb/ac/yr)	#DIV/O!	#DIV/O!	#DIV/O!	
17					
18	<i>Step 3 - Adjust for Runoff Reduction</i>				
19	3.1 BMP Runoff Reduction (%)	#DIV/O!			
20	3.2 Adjusted load (lb/ac/yr)		#DIV/O!	#DIV/O!	#DIV/O!
21					
22	<i>Step 4 - Adjust for BMP Treatment</i>				
23	4.1 BMP Removal Efficiency		#N/A	#N/A	#N/A
24	4.2 Adjusted load (lb/ac/yr)		#DIV/O!	#DIV/O!	#DIV/O!
25					
26	<i>Step 5 - Calculate Pollutant Reduction</i>				
27	5.1 TMDL (lb/ac/yr)		#N/A	#N/A	#N/A
28	5.2 Reduction met?		#DIV/O!	#DIV/O!	#DIV/O!
29					

Load Reduction →

Concentration Reduction →

DURMM v.2

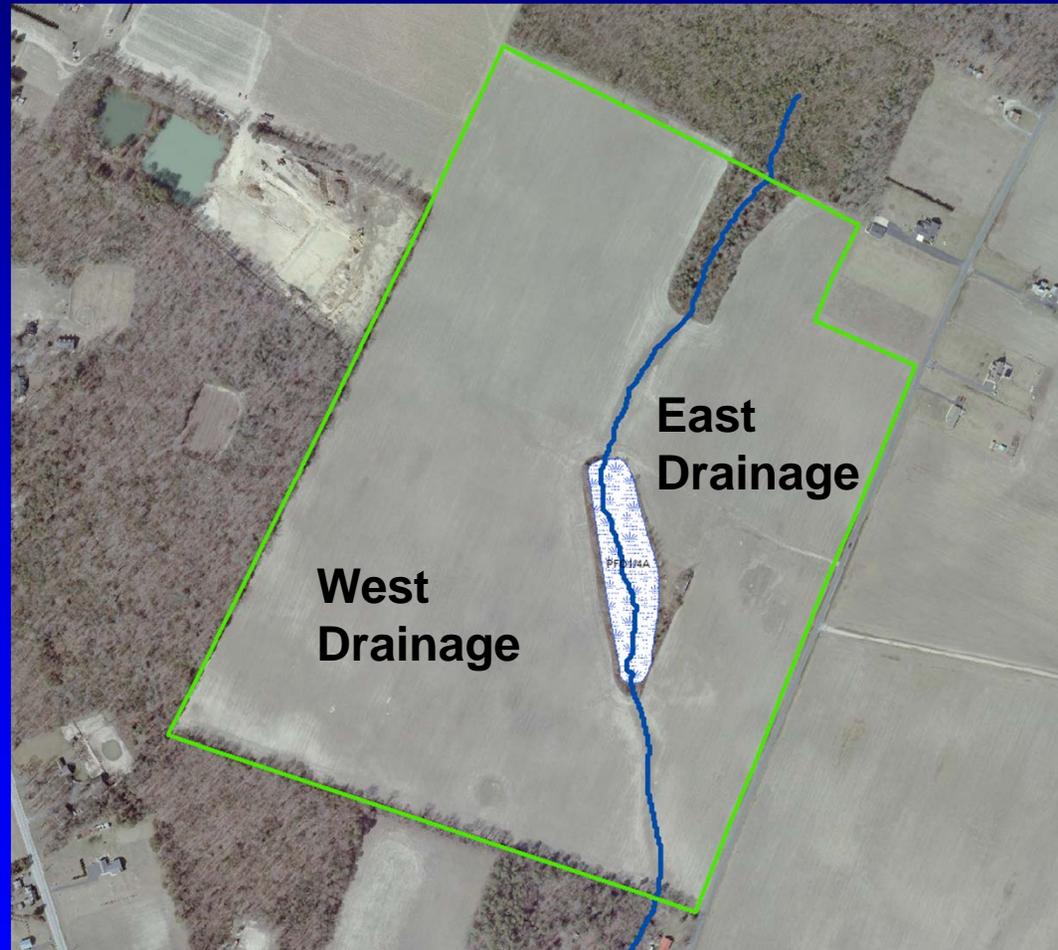
“Broadkill Estates” Example Site

Ex. #2: Design Level Analysis (*Updated*)

Design Level Analysis



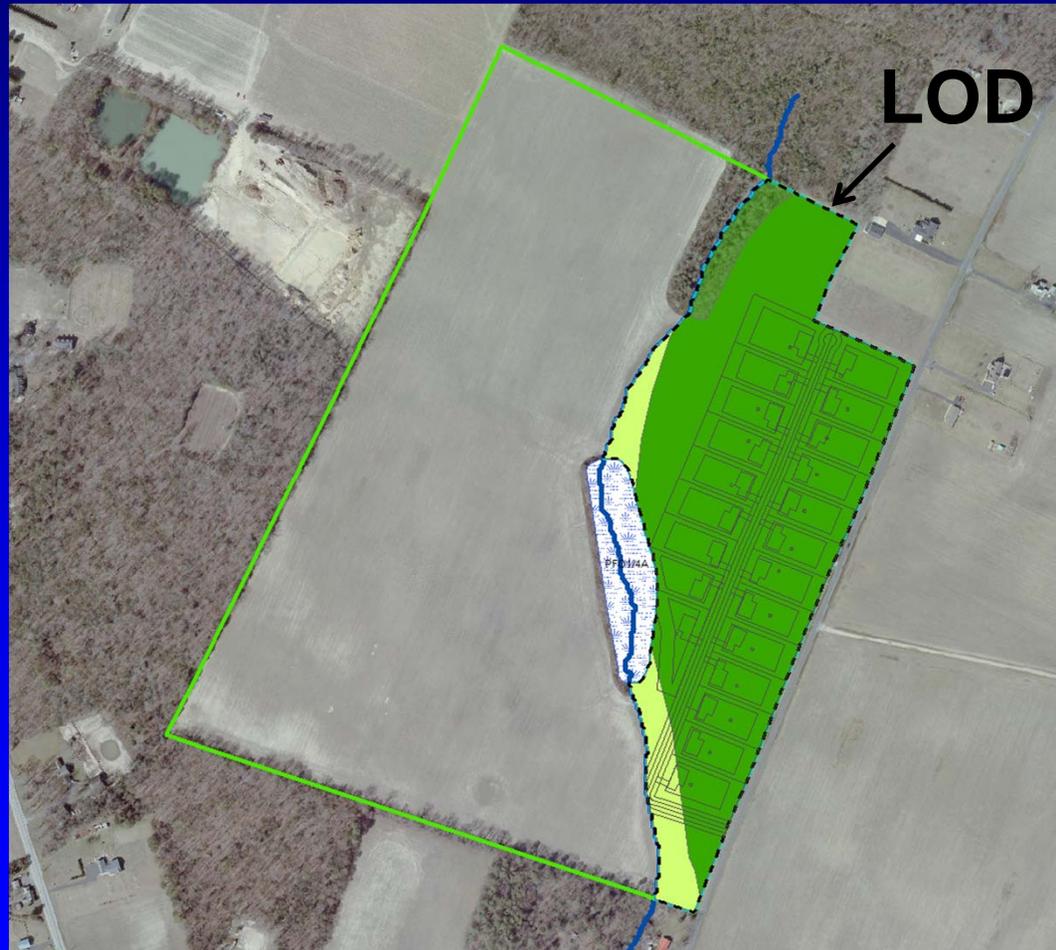
Design Level Analysis



Design Level Analysis

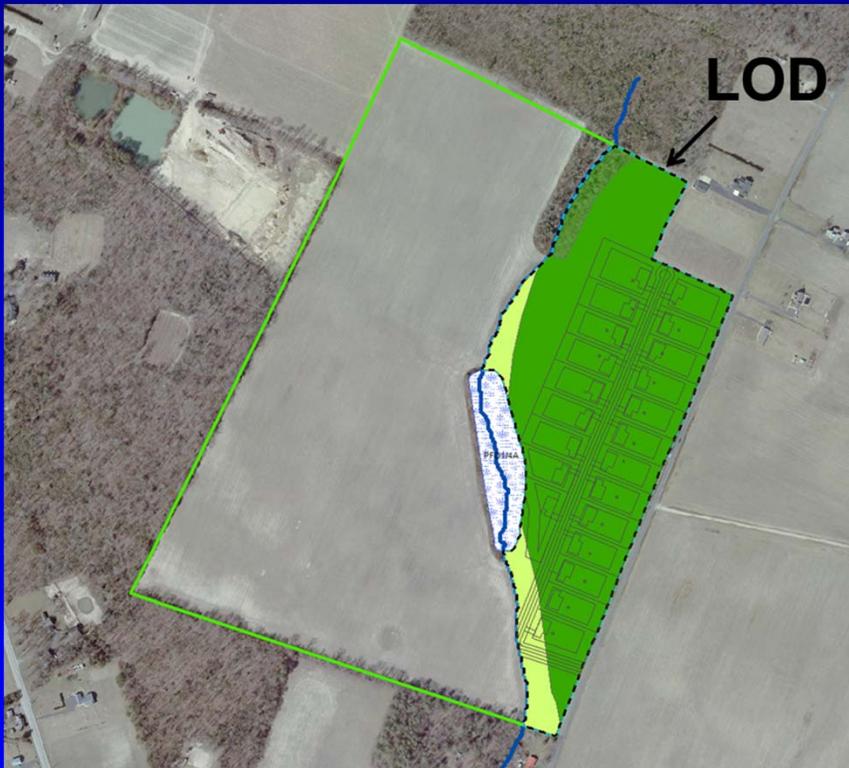


Design Level Analysis



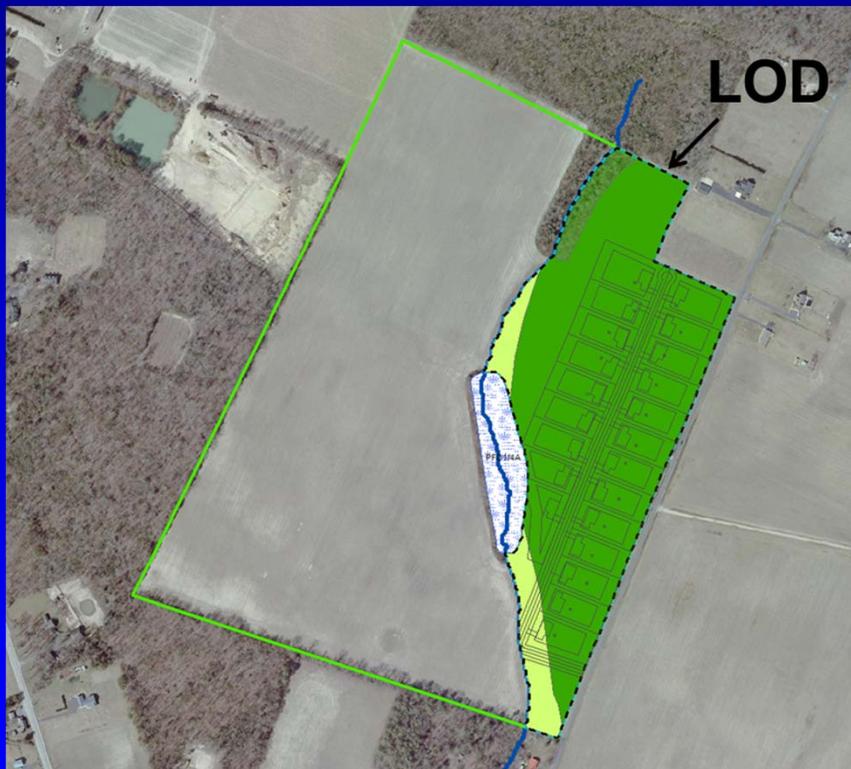
Design Level Analysis

Site Data



- C.A. RCN Tab
 - 1-ac. residential (20 % imperv.)
 - HSG A: 21.17 ac.
 - HSG B: 0.73 ac
 - Open space
 - HSG A: 8.06 ac.
 - HSG B: 2.26 ac

Design Level Analysis Site Data (cont.)



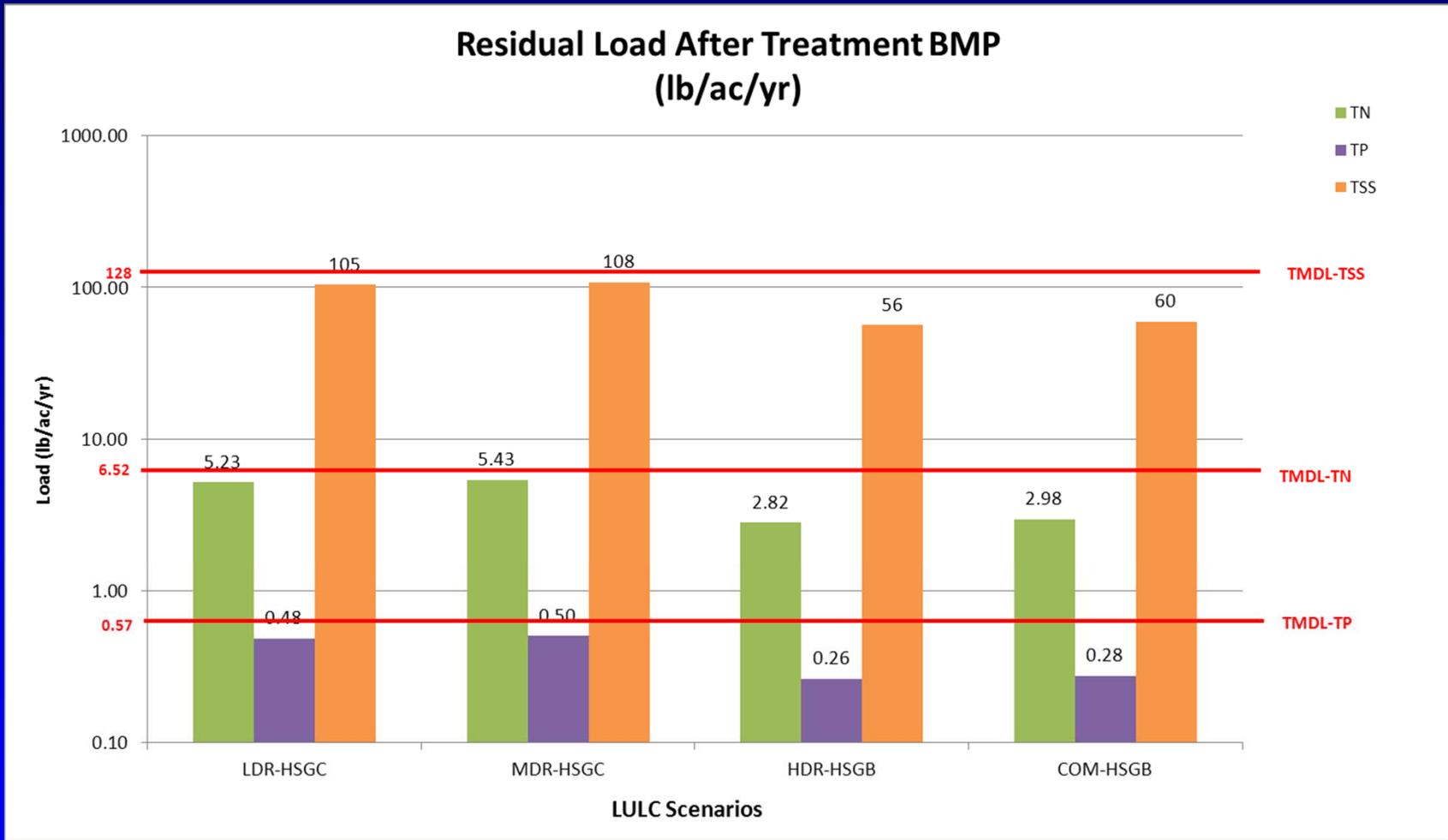
- LOD Tab
 - HSG A
 - LOD area: 29.22 ac.
 - Pre-Dev. Woods: 1.55 ac.
 - Post-Dev. Impervious: 4.23 ac.
 - HSG B
 - LOD area: 2.99 ac.
 - Pre-Dev. Woods: 0 ac.
 - Post-Dev. Impervious: 0.15 ac.

DURMM v.2 Demo

Proposed Revisions to Delaware Sediment & Stormwater Regulations:

Offset Provisions

Runoff Reduction + Treatment BMP



Proposed Revisions to Delaware Sediment & Stormwater Regulations

- 1.7 Offset Provisions

1.7.1 The Department may require an offset as an alternate for full or partial compliance with the Resource Protection Event requirements as provided in Sections 5.2 and 5.6.3 of these regulations.

1.7.2 Offset requirements shall be subject to Departmental review and approval as well as the public notice requirements of 7. Del. C. Ch. 60 §6004.

Proposed Revisions to Delaware Sediment & Stormwater Regulations

- **2.0** As used in these regulations, the following terms shall have the meanings indicated below:

“**Offset**” means an alternate to strict adherence to the regulations including, but not limited to trading, banking, fee-in-lieu, or other similar program that serves as compensation when the requirements of these regulations cannot be reasonably met on an individual project basis.

Proposed Revisions to Delaware Sediment & Stormwater Regulations

- **2.0** As used in these regulations, the following terms shall have the meanings indicated below:

“**Offset**” means an alternate to strict adherence to the regulations including, but not limited to trading, banking, fee-in-lieu, or other similar program that serves as compensation when the requirements of these regulations cannot be reasonably met on an individual project basis.

Proposed Revisions to Delaware Sediment & Stormwater Regulations: Fee-In-Lieu Options

- Option 1
 - Common “currency” for all shortfalls
- Option 2
 - Different currencies for runoff volume, TN, TP, and TSS shortfalls

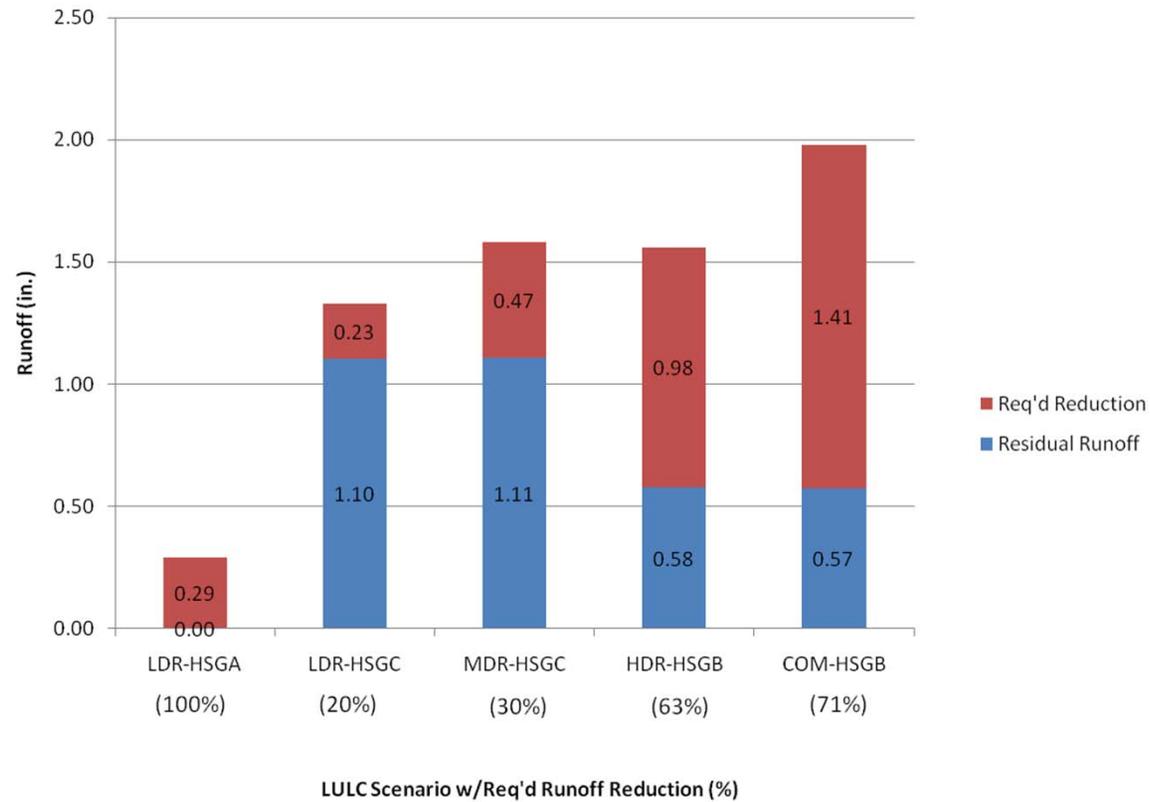
Proposed Revisions to Delaware Sediment & Stormwater Regulations: Fee-In-Lieu Options

- Option 1
 - Common “currency” for all shortfalls
 - Equivalent to cost to treat runoff volume not managed
 - Based on land acquisition, construction, and maintenance costs for bioretention
 - Analysis was performed by Center for Watershed Protection using regional data
 - Fee = **\$23/cu.ft.** runoff volume

Proposed Revisions to Delaware Sediment & Stormwater Regulations

Fee-In-Lieu Example

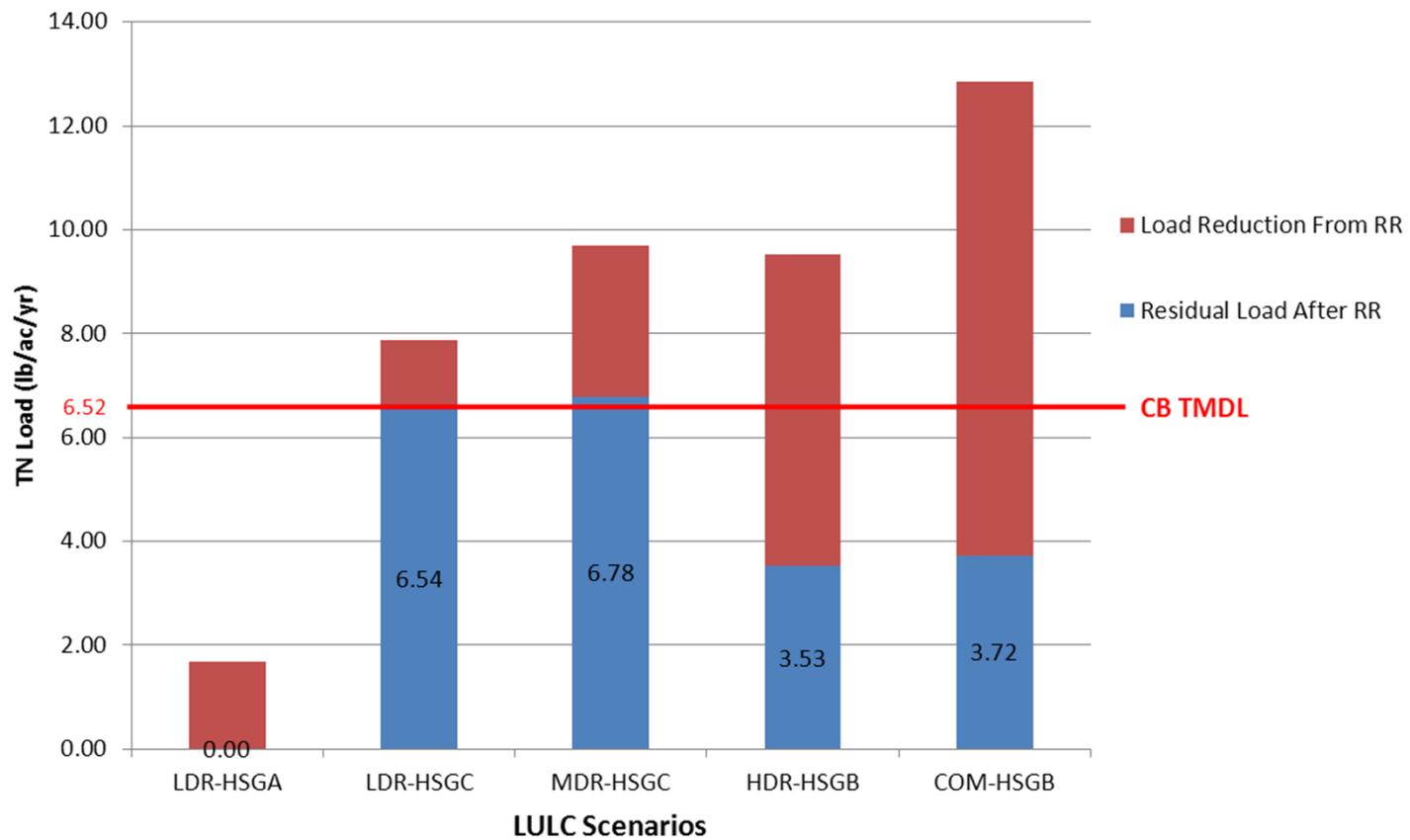
Runoff Reduction for Various LULC Scenarios



Key

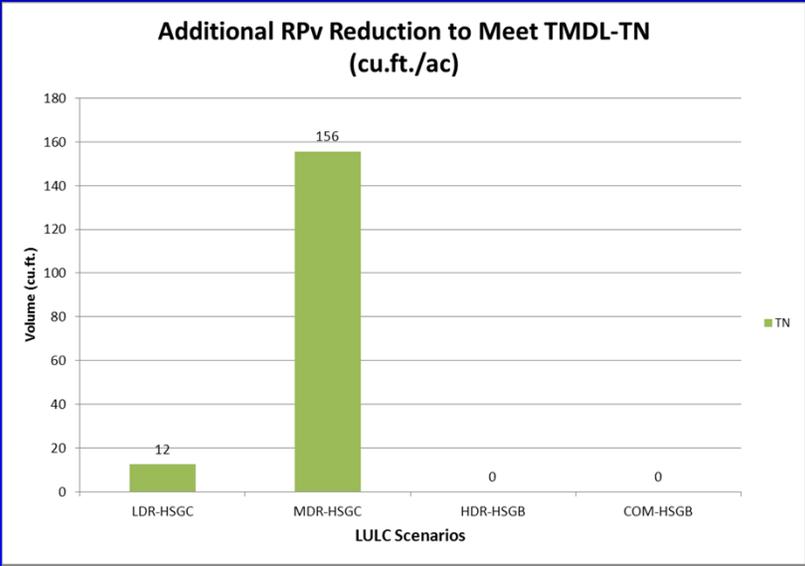
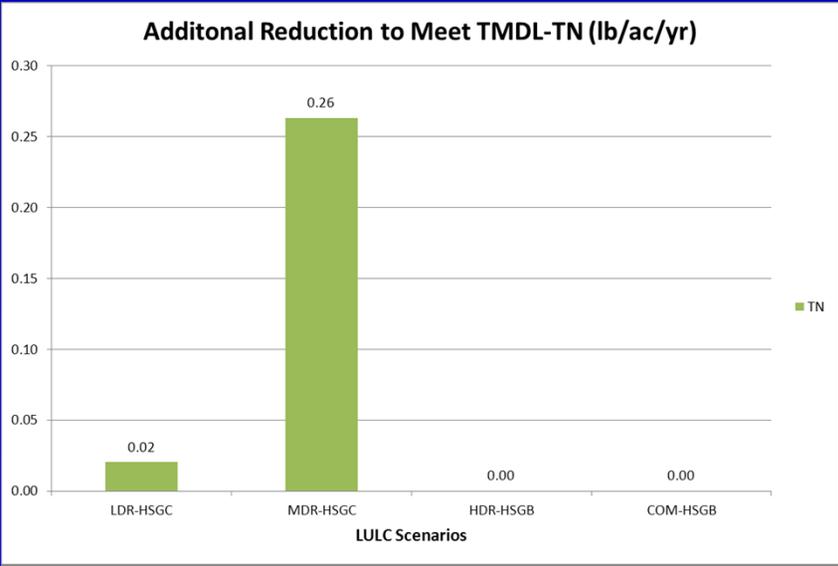
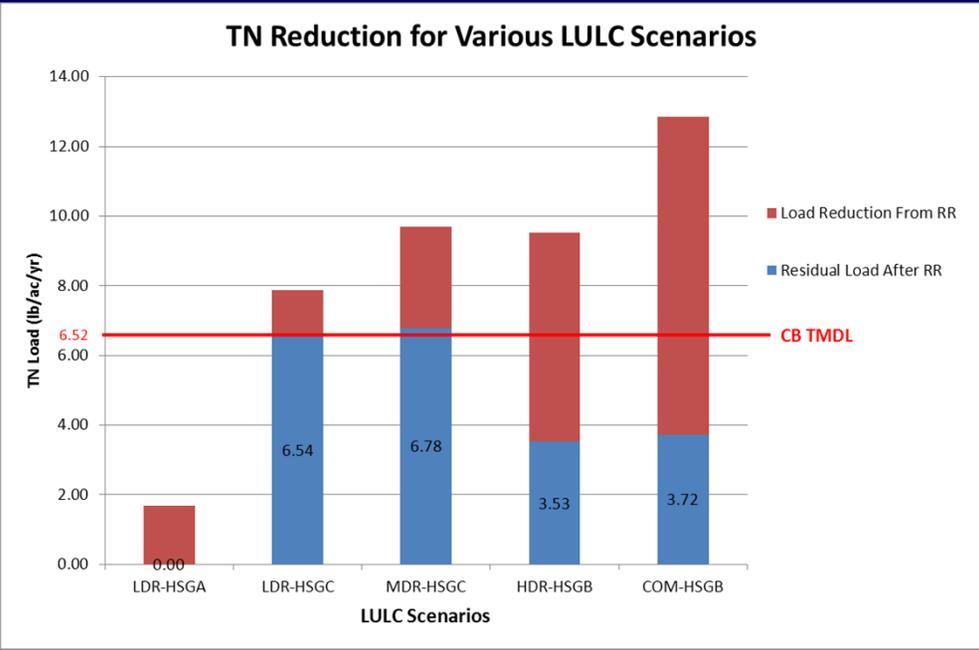
LDR-HSGA: Low Density Residential, 20% Imp., HSG A
 LDR-HSGC: Low Density Residential, 20% Imp., HSG C
 MDR-HSGC: Medium Density Residential, 40% Imp., HSG C
 HDR-HSGB: High Density Residential, 60% Imp., HSG B
 COM-HSGB: Commercial, 80% Imp., HSG B

TN Reduction for Various LULC Scenarios

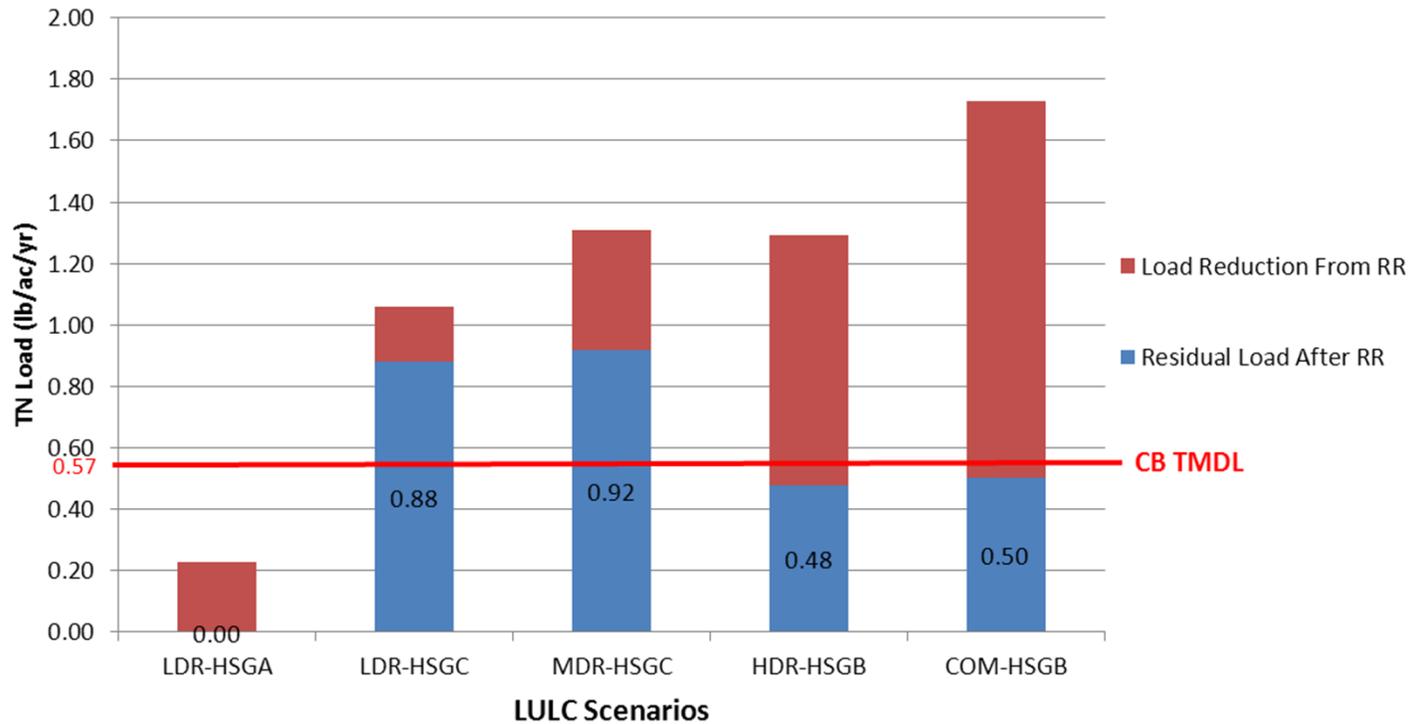


Key

LDR-HSGA: Low Density Residential, 20% Imp., HSG A
LDR-HSGC: Low Density Residential, 20% Imp., HSG C
MDR-HSGC: Medium Density Residential, 40% Imp., HSG C
HDR-HSGB: High Density Residential, 60% Imp., HSG B
COM-HSGB: Commercial, 80% Imp., HSG B

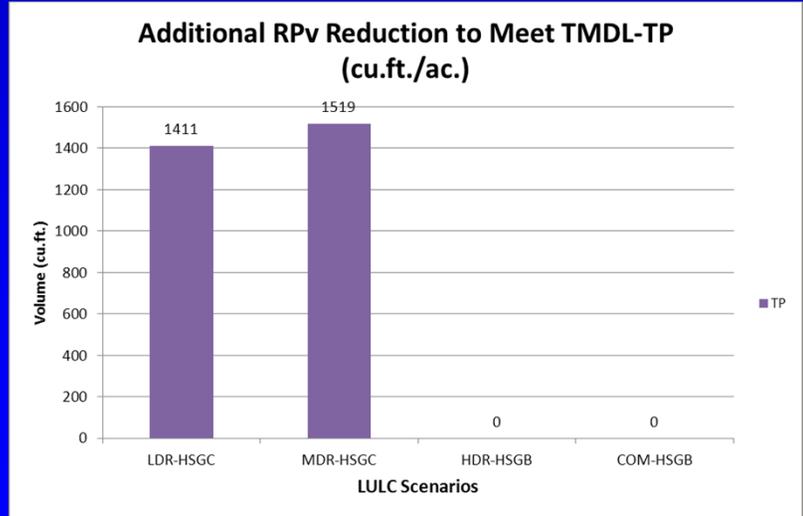
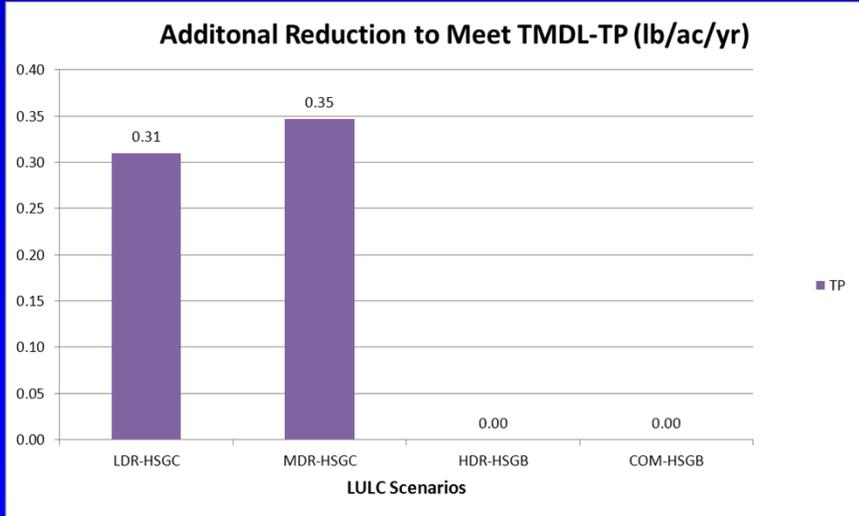
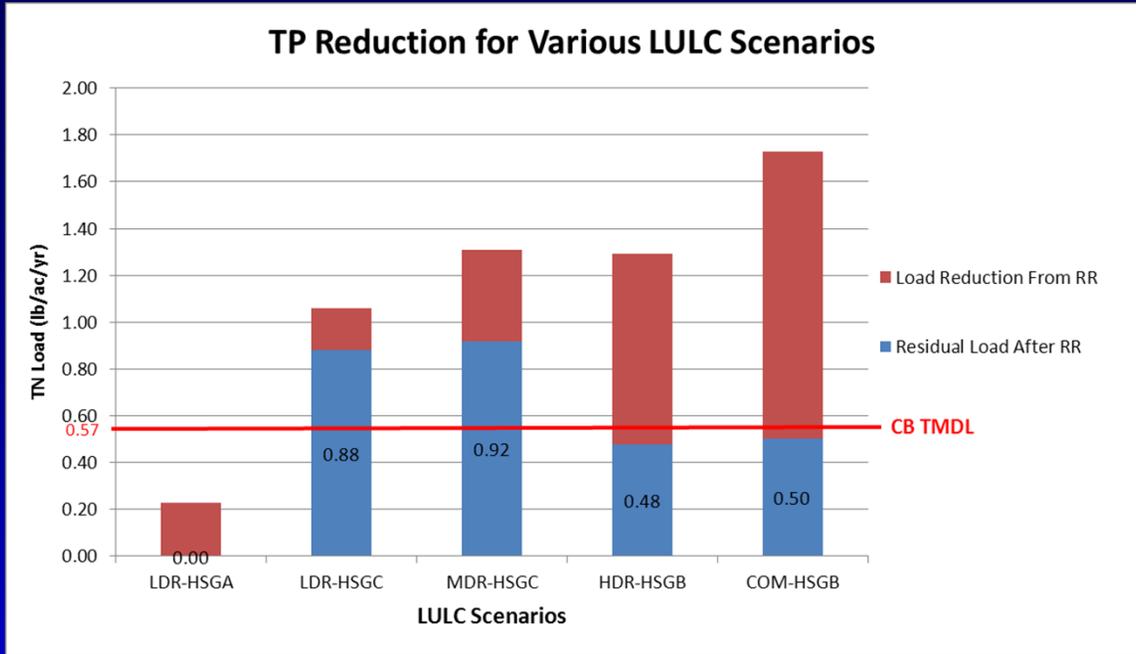


TP Reduction for Various LULC Scenarios

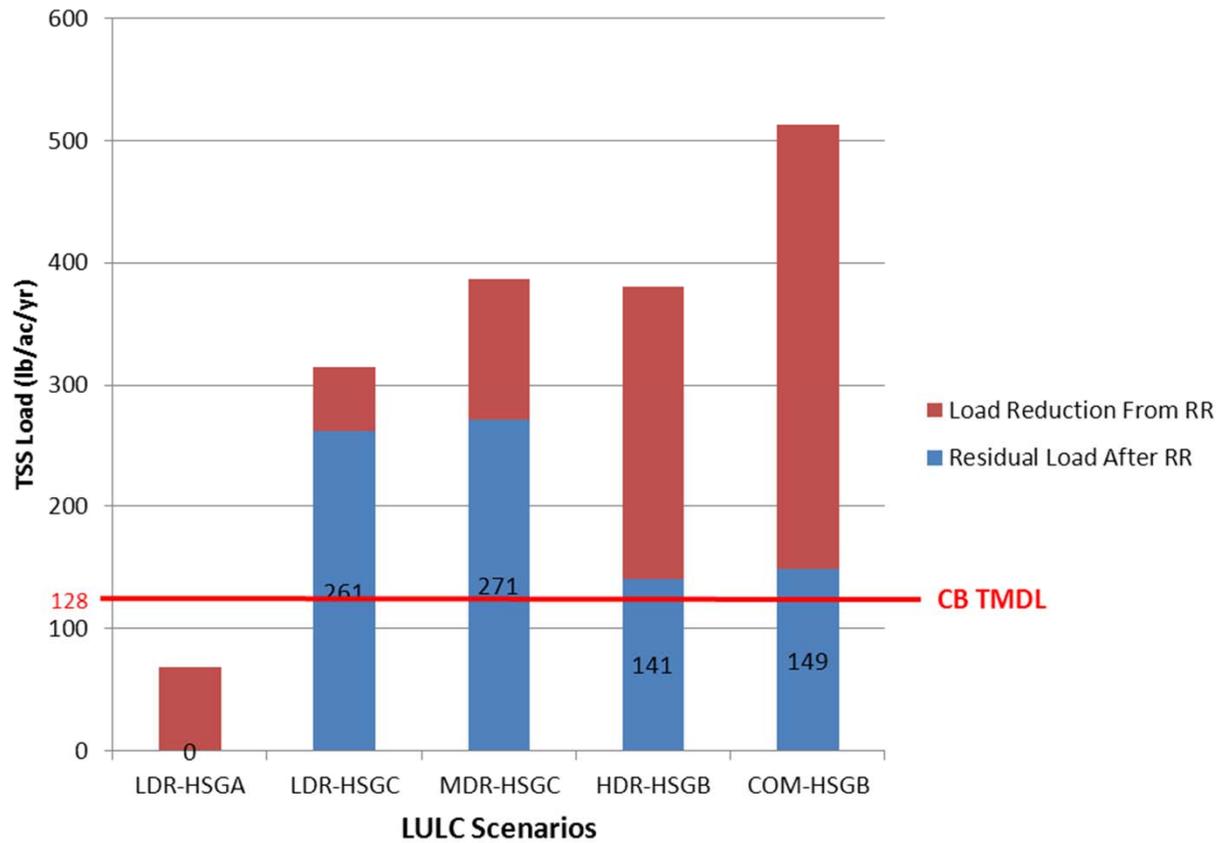


Key

LDR-HSGA: Low Density Residential, 20% Imp., HSG A
LDR-HSGC: Low Density Residential, 20% Imp., HSG C
MDR-HSGC: Medium Density Residential, 40% Imp., HSG C
HDR-HSGB: High Density Residential, 60% Imp., HSG B
COM-HSGB: Commercial, 80% Imp., HSG B



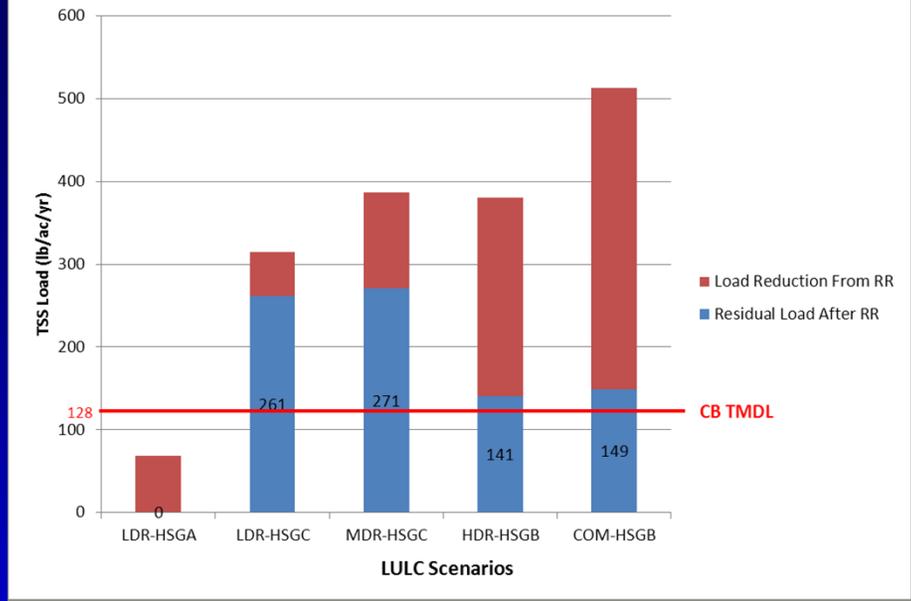
TSS Reduction for Various LULC Scenarios



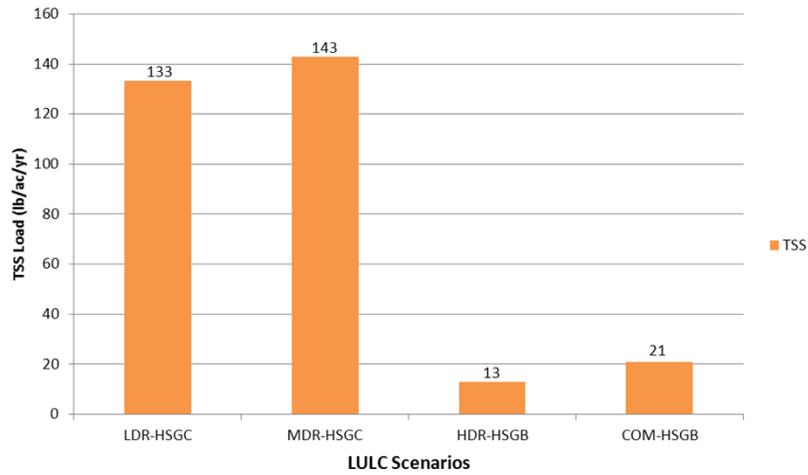
Key

LDR-HSGA: Low Density Residential, 20% Imp., HSG A
LDR-HSGC: Low Density Residential, 20% Imp., HSG C
MDR-HSGC: Medium Density Residential, 40% Imp., HSG C
HDR-HSGB: High Density Residential, 60% Imp., HSG B
COM-HSGB: Commercial, 80% Imp., HSG B

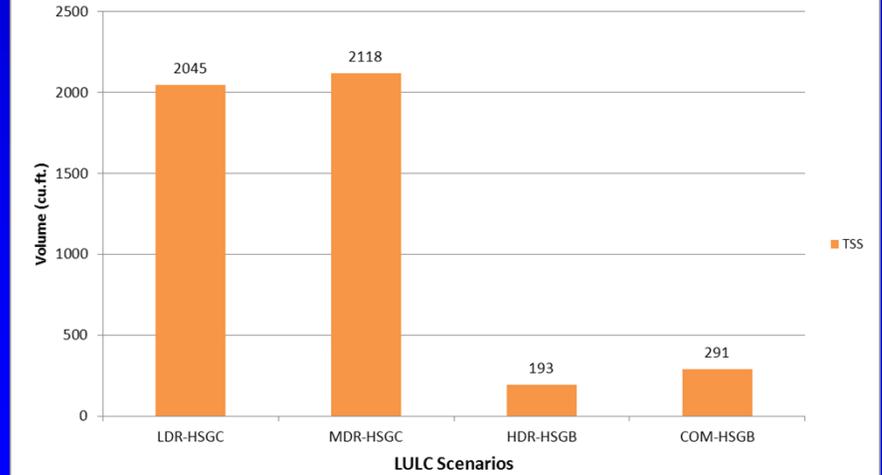
TSS Reduction for Various LULC Scenarios



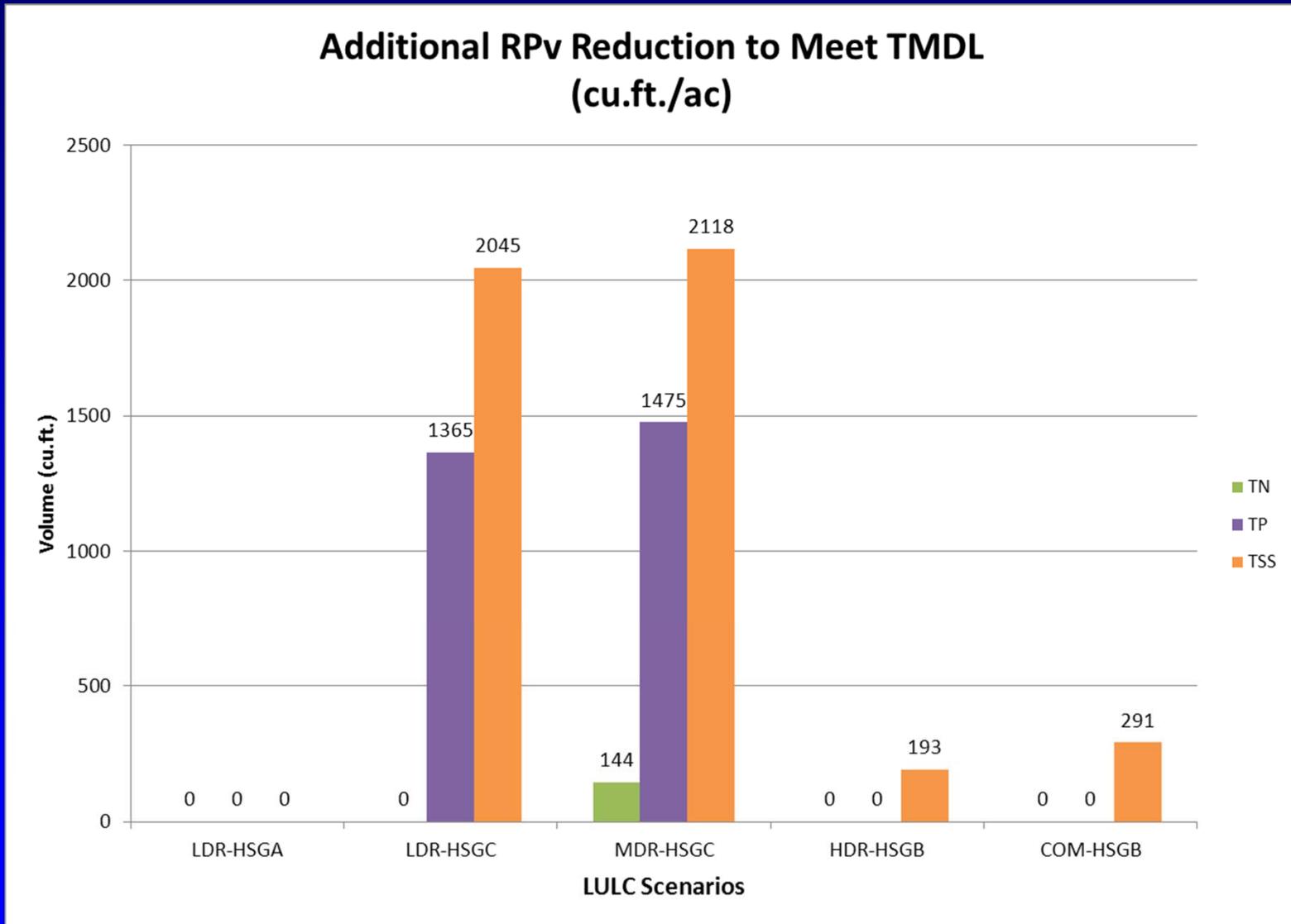
Additional Reduction to Meet TMDL-TSS (lb/ac/yr)



Additional Rpv Reduction to Meet TMDL-TSS (cu.ft./ac.)



w/Minimum Runoff Reduction



Treatment BMP Removal Efficiencies*

Knox County
Tennessee

Knox County
Tennessee Stormwater Management Manual

General Application
Stormwater BMP

4.3.3 Dry Extended Detention Ponds



Description: A surface storage basin or facility designed to provide water quantity control through detention of stormwater runoff. A dry extended detention pond can be used for water quality treatment purposes as well as for flood control.

KEY CONSIDERATIONS	STORMWATER MANAGEMENT SUITABILITY
<p>DESIGN GUIDELINES:</p> <ul style="list-style-type: none"> Maximum contributing drainage area of 75 acres. A sediment forebay or equivalent upstream pretreatment must be provided. Minimum flow length to width ratio for the pond is 1.5:1. The pond shall be sized to detain the volume of runoff to be treated for a minimum of 24 hours. Side slopes to the pond shall not exceed 3:1 (h:v) on one side of the pond to facilitate access. Slopes as steep as 2:1 will be allowed for other areas, with proper stabilization. <p>ADVANTAGES / BENEFITS:</p> <ul style="list-style-type: none"> Moderate removal rate of urban pollutants. High community acceptance. Useful for water quality treatment and flood control. <p>DISADVANTAGES / LIMITATIONS:</p> <ul style="list-style-type: none"> Potential for thermal impacts/downstream warming. Dam height restrictions for high relief areas. Pond drainage can be problematic for low relief terrain. <p>MAINTENANCE REQUIREMENTS:</p> <ul style="list-style-type: none"> Remove debris from inlet and outlet structures. Maintain side slopes and outlet structure. Remove invasive vegetation. Monitor sediment accumulation and remove periodically. <p>OTHER CONSIDERATIONS:</p> <ul style="list-style-type: none"> Outlet clogging Safety bench Landscaping 	<p><input checked="" type="checkbox"/> Water Quality</p> <p><input checked="" type="checkbox"/> Channel/Flood Protection</p> <p><input checked="" type="checkbox"/> Overbank Flood Protection</p> <p><input checked="" type="checkbox"/> Extreme Flood Protection</p> <p>Accepts runoff from SPAP land uses: Yes</p> <p>FEASIBILITY CONSIDERATIONS</p> <p><input type="checkbox"/> M-H Land Requirement</p> <p><input type="checkbox"/> L Capital Cost</p> <p><input type="checkbox"/> L Maintenance Burden</p> <p>Residential/Subdivision Use: Yes</p> <p>High Density/Ultra-Urban: No</p> <p>Drainage Area: 75 acres max.</p> <p>POLLUTANT REMOVAL</p> <p><input type="checkbox"/> M Total Suspended Solids</p> <p><input type="checkbox"/> L Nutrients: Total Phosphorus / Total Nitrogen</p> <p><input type="checkbox"/> L Metals: Cadmium, Copper, Lead, and Zinc</p> <p><input type="checkbox"/> No Data Pathogens: Coliform, Streptococci, E.Coli</p> <p>L=Low M=Moderate H=High</p>

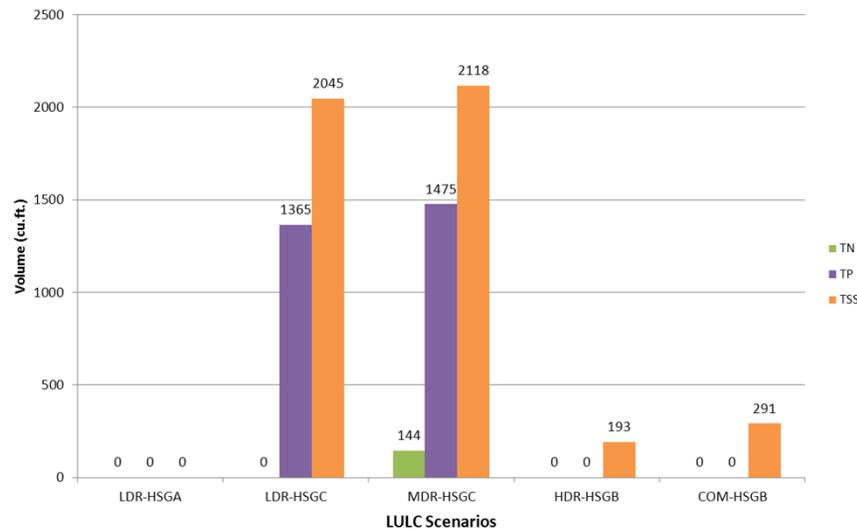
Volume 2 (Technical Guidance) Page 4-57

- TN: 20%
- TP: 20%
- TSS: 60%

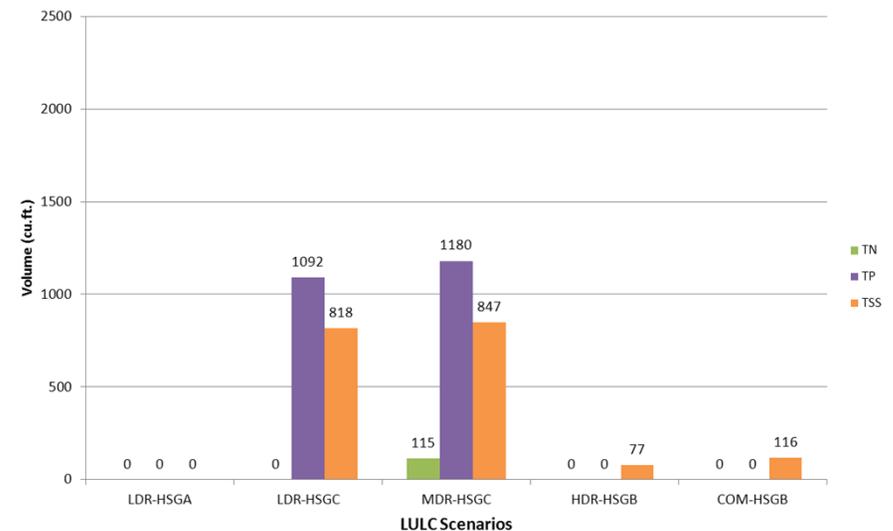
*EPA CBP Scenario Builder Documentation

w/Treatment BMP

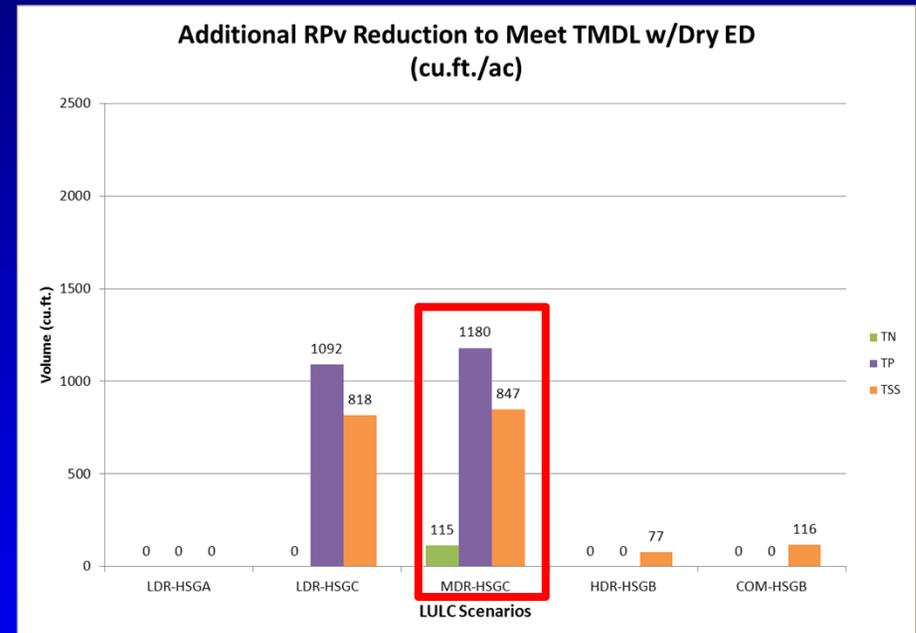
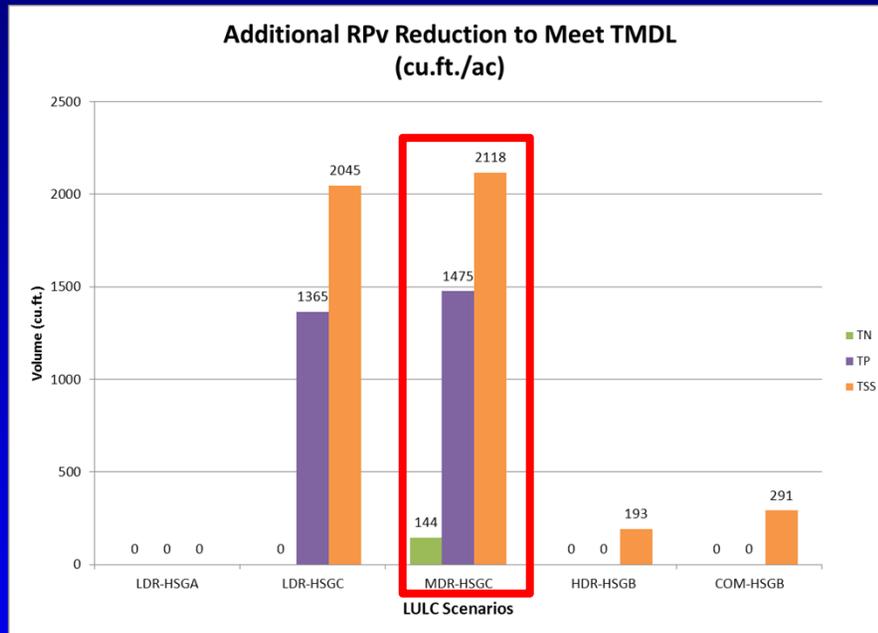
Additional RPv Reduction to Meet TMDL
(cu.ft./ac)



Additional RPv Reduction to Meet TMDL w/Dry ED
(cu.ft./ac)



Fee Comparison for MDR-HSGC



- Runoff Reduction Only: 5 ac. x 2118 cu.ft./ac x \$23/cu.ft = \$243,570
- RR + Treatment BMP: 5 ac. x 1180 cu.ft./ac x \$23/cu.ft = \$135,700

DURMM v.2: Rpv Sheet

1	PROJECT:	0
2	DRAINAGE SUBAREA ID:	0
3	LOCATION (County):	0
4		
5	RESET	BMP 1
6		Type:
7	Step 1 - Calculate Initial Rpv	Data
8	1.1 Total contributing area to BMP (ac)	0.00
9	1.2 C.A. RCN	#DIV/0!
10	1.3 Total Contributing Area DURMM Runoff (in)	#DIV/0!
11	1.4 Rpv for Contributing Area (in)	#DIV/0!
12	1.5 Req'd Rpv Reduction for Contributing Area (in)	#DIV/0!
13	1.6 Req'd Rpv Reduction for Contributing Area (%)	#DIV/0!
14	1.7 C.A. allowable discharge rate (cfs)	#DIV/0!
15		
16	Step 2 - Adjust for Retention Reduction	
17	2.1 Storage volume (cu. ft.)	#N/A
18	2.2 Retention reduction allowance (%)	#N/A
19	2.3 Retention reduction volume (ac-ft)	#N/A
20	2.4 Retention reduction volume (in)	#N/A
21	2.5 Runoff volume after retention reduction (in)	#DIV/0!
22	2.6 CN*	#DIV/0!
23		
24	Step 3 - Adjust for Annual Runoff Reduction	
25	3.1 Annual CN (ACN)	#DIV/0!
26	3.2 Annual runoff (in.)	#DIV/0!
27	3.3 Proportion A/B soils in BMP footprint (%)	
28	3.4 Annual runoff reduction allowance (%)	0%
29	3.7 Annual runoff after reduction (in.)	#DIV/0!
30	3.8 Adjusted ACN	#DIV/0!
31		
32	Step 4 - Calculate Rpv with BMP Reductions	
33	4.1 Rpv runoff volume after all reductions (in.)	#DIV/0!
34	4.2 Total Rpv runoff reduction (in)	#DIV/0!
35	4.3 Total Rpv runoff reduction (%)	#DIV/0!
36	4.4 Equivalent TR-55 RCN for H&H modeling	#DIV/0!
37	4.5 Req'd reduction met?	#DIV/0!
38		
39	Step 5 - Determine Runoff Reduction Offset	
40	5.1 Runoff Reduction Shortfall (in)	#DIV/0!
41	5.2 Runoff Reduction Shortfall (cu.ft./ac)	#DIV/0!
42	5.3 Total Offset Volume (cu.ft.)	#DIV/0!
43		

Rpv Offset
Calculation

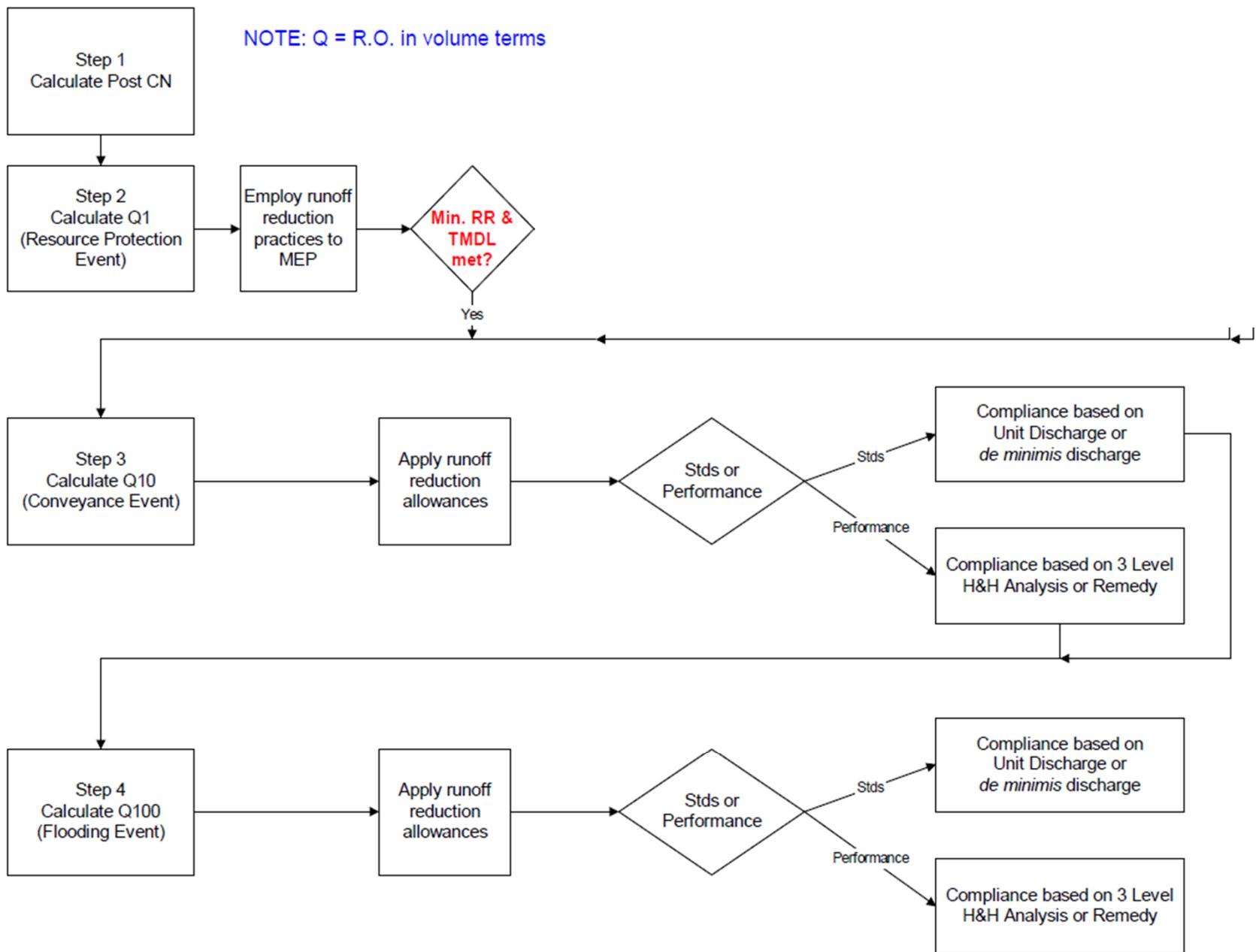


DURMM v.2: TMDL Sheet

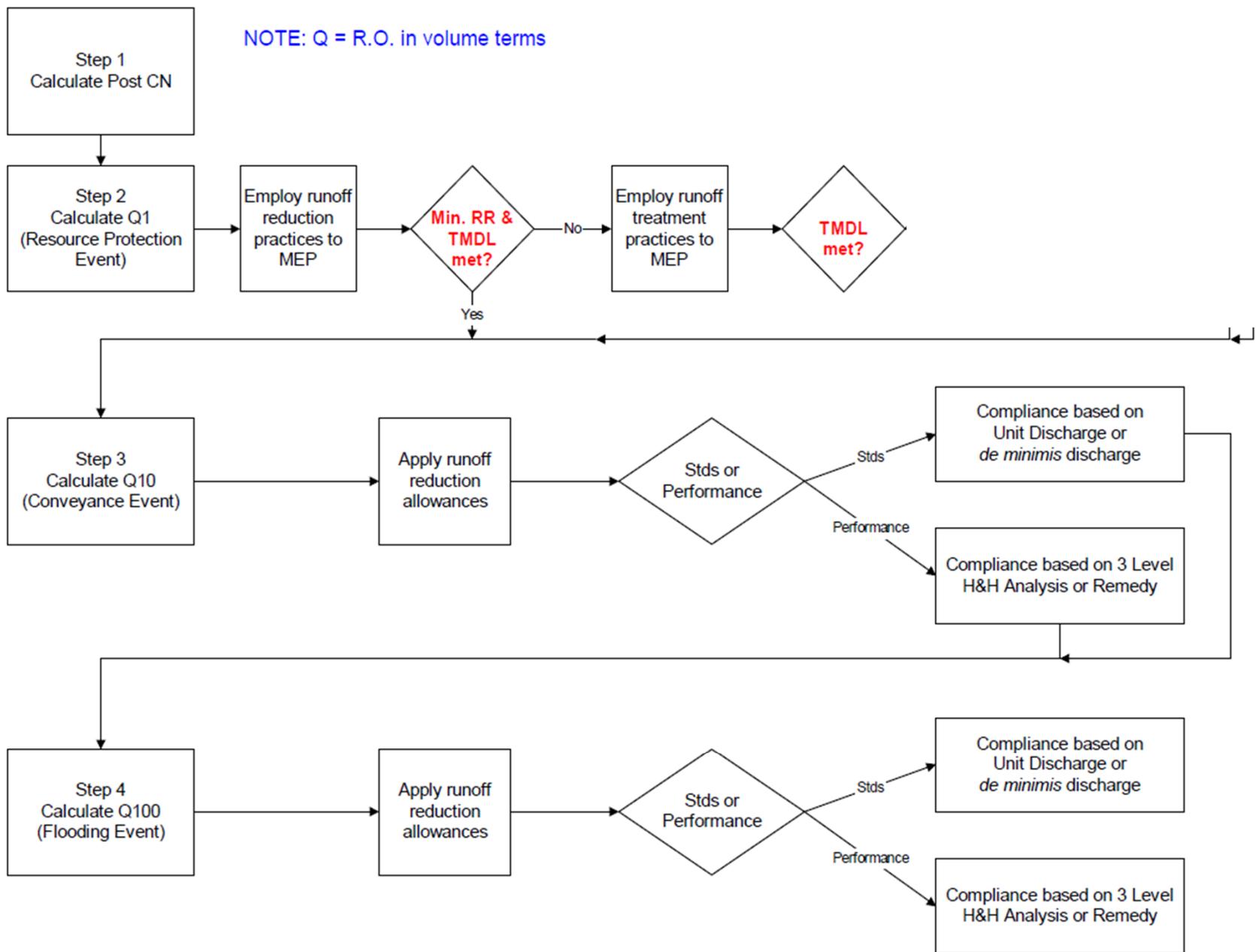
TMDL Offset
Calculation



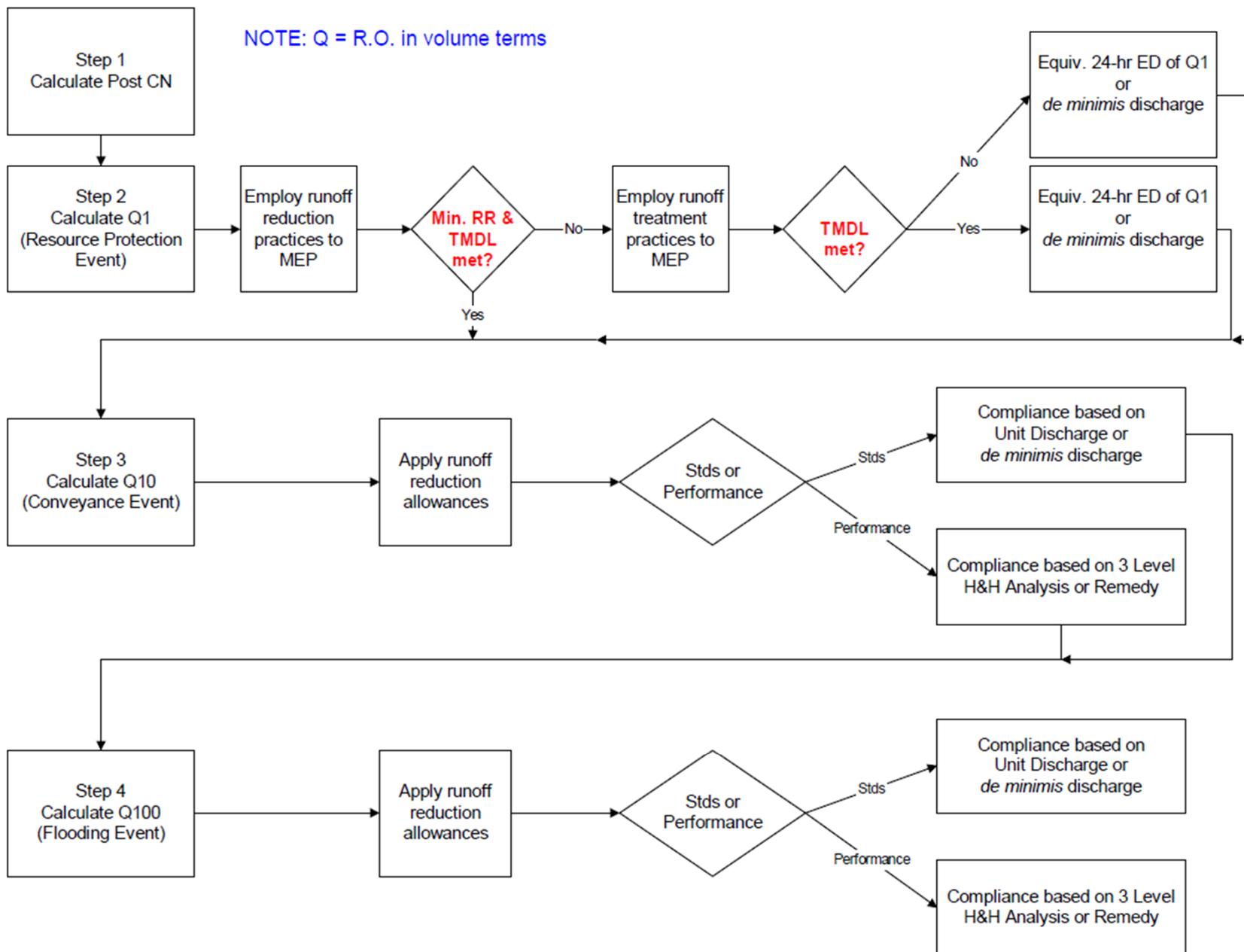
	A	B	C	D	E
1	PROJECT:	0			
2	DRAINAGE SUBAREA ID:	0			
3	TMDL WATERSHED:				
4					
5		BMP 1			
6		Type:	0		
7	Step 1 - Calculate Annual Runoff Volume	Data	TN	TP	TSS
8	1.1 Total contributing area to BMP (ac)	0.00			
9	1.2 Contributing area RCN	#DIV/0!			
10	1.3 Annual runoff volume (in)	#DIV/0!			
11	1.4 Annual runoff volume (liters)	#DIV/0!			
12					
13	Step 2 - Calculate Annual Pollutant Load				
14	2.1 EMC (mg/l)		2.00	0.27	80
15	2.2 Load (mg/yr)		#DIV/0!	#DIV/0!	#DIV/0!
16	2.3 Load (lb/ac/yr)		#DIV/0!	#DIV/0!	#DIV/0!
17					
18	Step 3 - Adjust for Runoff Reduction				
19	3.1 BMP Runoff Reduction (%)	#DIV/0!			
20	3.2 Adjusted load (lb/ac/yr)		#DIV/0!	#DIV/0!	#DIV/0!
21					
22	Step 4 - Adjust for BMP Treatment				
23	4.1 BMP Removal Efficiency		#N/A	#N/A	#N/A
24	4.2 Adjusted load (lb/ac/yr)		#DIV/0!	#DIV/0!	#DIV/0!
25					
26	Step 5 - Calculate Pollutant Reduction				
27	5.1 TMDL (lb/ac/yr)		#N/A	#N/A	#N/A
28	5.2 Reduction met?		#DIV/0!	#DIV/0!	#DIV/0!
29					
30	Step 6 - Determine TMDL Offset				
31	6.1 TMDL Shortfall (lb/ac/yr)		#DIV/0!	#DIV/0!	#DIV/0!
32	6.2 TMDL Shortfall (%)		#DIV/0!	#DIV/0!	#DIV/0!
33	6.3 Residual R _{Pv} Volume (in)		#DIV/0!	#DIV/0!	#DIV/0!
34	6.4 Req'd Additional RR to meet TMDL (in)*		#DIV/0!	#DIV/0!	#DIV/0!
35	6.5 Req'd Additional RR to meet TMDL (cu.ft./ac)		#DIV/0!	#DIV/0!	#DIV/0!
36	6.6 Total Offset Volume (cu.ft.)		#DIV/0!	#DIV/0!	#DIV/0!
37					



draft 09/2010



draft 09/2010



draft 09/2010

What's Next?

Timeline to Promulgation

Revisions to *Delaware Sediment and Stormwater Regulations*

Date	Step
✓ February 8, 2011	Technical Subcommittee Meeting
✓ March 8, 2011	Technical Subcommittee Meeting
May 19, 2011 (day)	Full RAC Meeting
May 19, 2011 (evening)	Public Workshop
July 2011	Submit to Registrar
August 2011	Published in State Register as proposed
September 2011	Public Hearing and Public Comment Period
December 2011	Published in Register of Regulations as final
January 2012	Effective Date

What's Next?

- Contract w/CWP to update GTBMP Stds & Specs
- Work with several consulting firms to develop sample site designs
- Training sessions during 2011Q3

Questions???

RegRevisions - Windows Internet Explorer

http://www.swc.dnrec.delaware.gov/Drainage/Pages/RegRevisions.aspx

Delaware.gov | Text Only

Governor | General Assembly | Courts | Elected Officials | State Agencies

State of Delaware
The Official Website of the First State

Your Search... SEARCH

Phone Numbers Help

DNREC : Division of Soil & Water Conservation : Drainage and Stormwater Section

Drainage & Stormwater Section

Home

- About Us
- Contact Us/Office Locations
- Newsroom
- FAQ
- Sections/Programs
- DNREC Public Notices

Services

- Conservation Districts
- Contractor Services
- Debris Pit Program
- Environmental Navigator
- Environmental Navigator (Revised - Beta version)
- Loans/Grants/Cost-Share
- Macroalgae Harvesting
- Permits/Licenses/Approvals
- Restoration

Information

- Alphabetical Listing of Information
- Delaware Estuarine Research Reserve
- Regs/Laws
- Request for Qualifications
- SWC Publications & Newsletters

Revisions To The Delaware Sediment And Stormwater Regulations

Revisions to the Delaware Sediment and Stormwater Regulations are currently under way. To assist with this effort, the Delaware Sediment and Stormwater Program has contracted with a consultant team consisting of the Center for Watershed Protection, Johnson, Mirmiran & Thompson, and the Horsely Witten Group.

[Regulatory Advisory Committee \(RAC\)](#)
The Regulatory Advisory Committee (RAC) was formed to help guide the revisions to the Delaware Sediment and Stormwater regulations.

Upcoming RAC Meetings: TBD
[Find details on all DNREC meeting locations and times](#)

RAC Meeting Summaries To Date

- May 27, 2010 [Agenda, Meeting Notes, Presentation](#)
- Feb. 25, 2010 [Agenda, Meeting Notes, Presentation](#)
- Feb. 9, 2009 [Agenda, Meeting Notes, Presentation](#)
- March 27, 2008 [Agenda, Meeting Notes](#)
- Jan. 22, 2008 [Agenda, Meeting Notes](#)
- Oct. 16, 2007 [Agenda, Meeting Notes](#)

RAC Subcommittees & Meeting Summaries

Documents

- [DRAFT Technical Document](#) - Sept. 2010
- [DURMM/2](#) - July 2010
- [Second Draft](#) - May 2010
- [First draft comment responses](#) - May 2010
- [September 2009 RAC Update Memo](#)
- [Stormwater Assessment Report \(Final\)](#)
- [First working draft of Sediment and Stormwater Regulations](#) Feb. '09
- [See comments on first working draft regs under RAC Subcommittees](#)
- [Update memo to RAC](#) Aug. '08
- [Subcommittee Outline Comments](#) March '08
- [Gov. Minner's Task Force on Surface Water Management](#) April 2005

Sign Up to Receive Updates
If you wish to receive regulatory revision updates and notices of public meetings related to revisions to the regulations, please send an e-mail containing your contact information to Elaine.Webb@state.de.us.

start | 0-Data | Technical Subcommittee | Microsoft PowerPoint ... | RegRevisions - Windo... | 11:21 AM

Discussion

