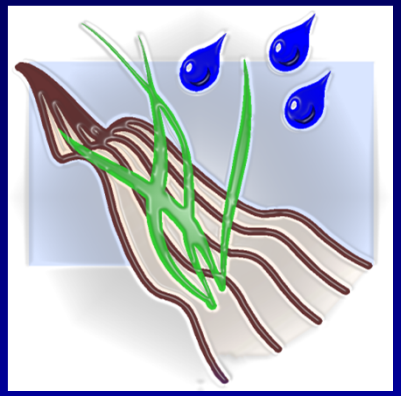


Revisions to the Delaware Sediment & Stormwater Regulations

Regulatory Advisory Committee Meeting

January 10, 2012

DelDOT Felton-Farmington Room

Chronology of Regulatory Development Process

Revisions to the
Delaware Sediment & Stormwater Regulations
Initial RAC Meeting
October 16, 2007

Q: “Why Is DNREC Doing This?”

Tropical Storm Henri (2003) - Wikipedia, the free encyclopedia - Windows Internet Explorer

http://en.wikipedia.org/wiki/Tropical_Storm_Henri_(2003)

File Edit View Favorites Tools Help

Google tropical storm henri Search Bookmarks Find Check AutoFill Sign In

Tropical Storm Henri (2003) - Wikipedia, the free ency... Page Tools

Log in / create account

article | discussion | edit this page | history

Tropical Storm Henri (2003)

From Wikipedia, the free encyclopedia

This article is about the 2003 tropical storm. For other storms of the same name, see Hurricane Henri

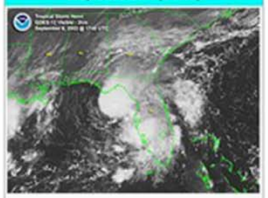
Tropical Storm Henri was a tropical storm that formed in the 2003 Atlantic hurricane season. The eighth storm of the season, Henri was one of six tropical cyclones to hit the United States in the year. Henri formed from a tropical wave in the Gulf of Mexico in early September, and crossed over Florida as a tropical depression. Its remnants later moved into the Mid-Atlantic before dissipating completely.

Henri caused little damage as a tropical cyclone. In Florida, it dropped heavy rainfall, though damage was limited to minor flooding damage. In Delaware and Pennsylvania, damage was greater, where heavy rainfall damaged hundreds of houses and businesses. The resulting floods in Delaware were described as a 1 in 500 year event. The total damage by Henri along its path amounted to $19.6 million (2003 USD, $21.5 million 2006 USD), but no deaths were reported.

Contents [hide]

Tropical Storm Henri

Tropical storm (SSHS)



Tropical Storm Henri near peak intensity

Formed	September 3, 2003
Dissipated	September 8, 2003
Highest winds	60 mph (95 km/h) (1-minute sustained)
Lowest pressure	997 mbar (hPa; 29.44 inHg)
Fatalities	None reported
Damage	$19.6 million (2003 USD) $22.96 million (2009 USD)
Areas affected	Florida, Delaware, Pennsylvania

Part of the **2003 Atlantic hurricane season**

Meteorological history [edit]

Storm path

On August 22, a tropical wave moved off the coast of Africa, and it moved westward across the Atlantic Ocean and Caribbean Sea without developing significantly. On September 1 the wave axis entered the Gulf of Mexico, and upon doing so convection steadily organized around a low-level center of circulation. The system moved northward and developed into Tropical Depression Twelve on September 3 while located about 300 miles (480 kilometers) west of Tampa, Florida. Embedded within a slow mid-latitude trough, the depression moved eastward and strengthened into Tropical Storm Henri on September 5.[1]

Despite strong southwesterly vertical shear, Henri continued intensifying while moving eastward, and reached a peak strength of 60 mph (95 km/h) later on September 5. Shortly thereafter, though, the shear greatly weakened the storm, and it was downgraded to a tropical depression. Henri was not able to recover its intensity, and made landfall near Clearwater, Florida on September 6 as a 35 mph (55 km/h) tropical depression, and quickly crossed the state as it accelerated to the northeast.[1] Despite initial predictions of re-intensification over open waters due to potentially lower shear,[2] Henri failed to re-strengthen and degenerated into a remnant low pressure area on September 8 off the coast of North Carolina.[1]

Remnants of Henri making landfall on North Carolina

The broad and disorganized remnant low remained nearly stationary due to a ridge of high pressure to its north.[1] Residual convection within the remnants of Henri remained disorganized, but forecasters kept watch for the potential for redevelopment.[3] However, it moved inland near Cape Hatteras on September 12 without reorganizing.[4] The remnants continued to the north and dissipated on September 17 over New England.[5]

Preparations [edit]

The National Hurricane Center issued a Tropical Storm Warning from Englewood to Indian Pass, Florida while Henri was a tropical depression; however, warnings were discontinued by the time Henri made landfall.[1] Flood warnings were issued across the state prior to the storm making landfall, with predictions of 5 to 10 inches (125 – 255 mm) of rainfall.[6] As a result of the storm's approach, twelve shelters were placed on standby. Similarly, the Hurricane Shelter Information Hotline was placed on standby and ready to be activated within 10 minutes.[7]

Levy County officials declared a state of emergency. There, sand bags and sand were sent to Cedar Key, Yankeetown, and Inglis in anticipation for storm surge and flooding.[8]

navigation
- Main page
- Contents
- Featured content
- Current events
- Random article

search
Go Search

interaction
- About Wikipedia
- Community portal
- Recent changes
- Contact Wikipedia
- Donate to Wikipedia
- Help

toolbox
- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link
- Cite this page

languages
- Français

Internet 100%

start Tropical Storm Henri (... Search Desktop


WE R DONE
BUY US OUT
9/15/03
12 NOOGE HOMEOWNER
1 PM HOMELESS


GLENVILLE, DE
SAYS
BUY US OUT!

"In the past four years NCC has been affected by three storm systems: Tropical Storm Henri (September 15, 2003), Tropical Storm Isabel (September 18, 2003) and Tropical Depression Jeanne (September 28, 2004). Tropical Storm Henri caused widespread damage to the community of Glenville spurring the largest housing purchase by State and County governments in Delaware's history due to storm damage: 171 homes were purchased just 8 months after the storm struck. Tropical Depression Jeanne spawned the first tornado New Castle County had seen in 15 years, ripping trees from the ground and severely damaging residential and business structures. Jeanne also initiated a buyout of the Newkirk Estates and Glendale communities. All in all, State and County governments spent over $34 million in two years to rectify storm damage."

Executive Order Number Sixty-Two
Establishing A Task Force On Surface Water Management

WHEREAS, in recent years, several areas of the State have been subject to chronic flooding and drainage problems; and

WHEREAS, such flooding and related problems can threaten the health, safety and welfare of our State's citizens, can damage private property, and can impose substantial costs on State and local governments, in the form of emergency response activities, property damage and infrastructure improvements; and

WHEREAS, it is appropriate to coordinate efforts within the State to ensure the best use of resources in enhancing flood prevention and control efforts and to develop a comprehensive strategy to address drainage and stormwater management issues.

NOW, THEREFORE, I, RUTH ANN MINNER, by virtue of the authority vested in me as the Governor of the State of Delaware, do hereby declare and order as follows:

1. The Task Force on Surface Water Management is created. Members of the Task Force shall include representatives of State and local governments and persons with special expertise on the issues of drainage, flood control and water management. Members of the Task Force shall be appointed by the Governor and serve at the Governor's pleasure.

2. The Task Force is directed to:

   a. Develop a statewide surface water management strategy to integrate drainage, flood control and stormwater management;

   b. Explore potential costs and funding sources for implementing a statewide surface water management strategy;

   c. Recommend appropriate changes to State or local laws, regulations and policies as appropriate;

   d. Recommend a statewide organizational structure to coordinate surface water management strategies and to respond to citizen, community and county needs;

   e. Integrate surface water management polices with federal and State clean water requirements; and

   f. Recommend strategies to preserve and enhance aquifer recharge, community, local government and State open space use and implement green infrastructure policies and goals, where applicable.

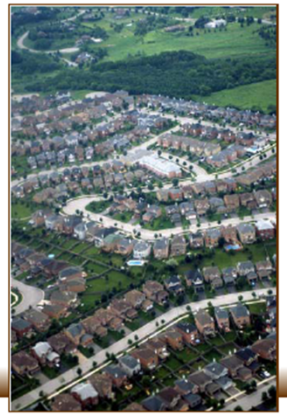
3. The Task Force is directed to submit its recommendations to me not later than April 1, 2005.

Task Force membership

John Hughes, Secretary of DNREC, Chair
The Honorable Robert L. Venables, co-chair, Bond Bill Committee
The Honorable Roger P. Roy, co-chair, Bond Bill Committee
The Honorable David B. McBride, chair, Senate Natural Resources Committee
The Honorable Joseph W. Booth, chair, House Natural Resources Committee
The Honorable Christopher A. Coons, New Castle County Executive
The Honorable David Burris, President, Kent County Levy County
Jared Adkins, District Engineer, Kent County Conservation District
Charles Baker, General Manager, New Castle County Land Use
Jeffrey Bross, P.E., President, Duffield Associates
Eileen Butler, Environmental Advocate, Delaware Nature Society
Stephanie L. Hansen Esq., Richards Layton & Finger
Larry Irelan, District Manager, New Castle Conservation District
Edward Bender, District Engineer, Sussex County Conservation District
Kash Srinivasan, Commissioner of Public Works, City of Wilmington
Scott Koenig, Director of Public Works, City of Dover
Paul Morrill, City Manager, Delaware City
Paul Petrichenko, Asst. State Conservationist, Natural Resources Conservation Service
Ralph Reeb, Director of Planning, DelDOT
Jeffrey Seemans, R.L.A., Land Resource Manager, Blenheim Homes
Gary Stabley, member, Lewes Board of Public Works
Robert Stickels, Administrator, Sussex County
John Talley, P.G., State Geologist, Delaware Geological Survey
Richard C. Woodin, P.E., Homebuilders Association of Delaware

Task Force Staff

Robert Baldwin, Director, Division of Soil and Water Conservation, DNREC
Frank J. Piorko, Environmental Program Administrator, Division of Soil and Water Conservation, DNREC
Kathy Osterhout, Administrative Specialist , Division of Soil and Water Conservation, DNREC
Lee Ann Walling, Environmental Policy Advisor, Office of the Governor
David Athey, Project Manager, URS Corporation, Wilmington
Bryan Pariseault, Project Engineer, URS Corporation, Wilmington



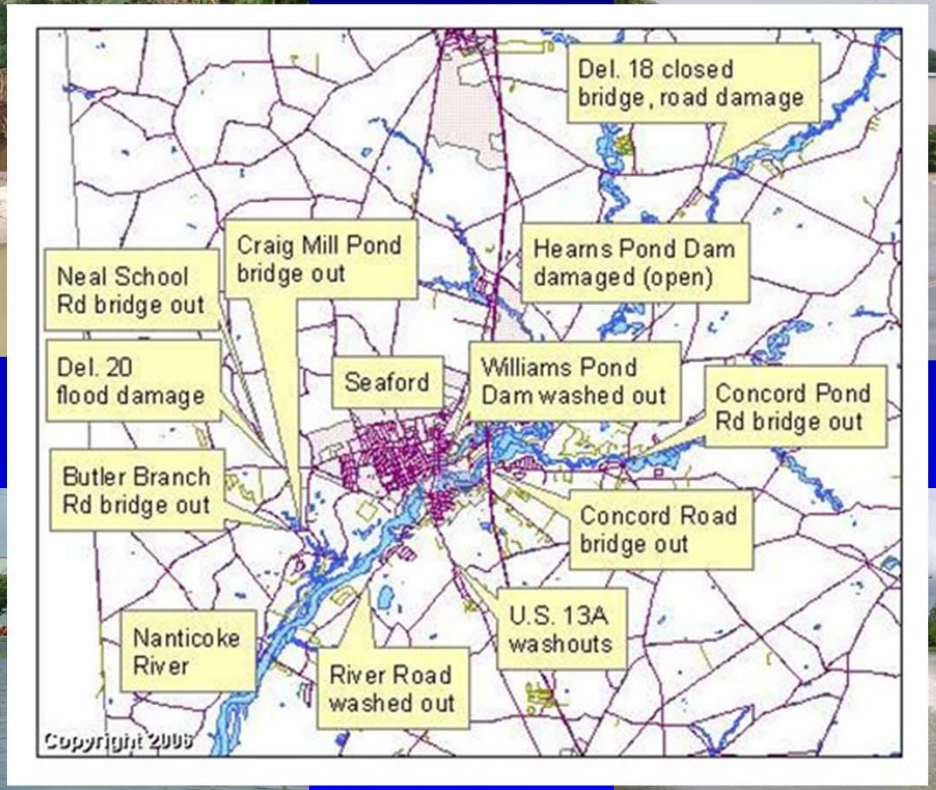
Governor Minner's Task Force on Surface Water Management

April 1, 2005

A report in response to Executive Order No. 62

Background

"The current stormwater regulations do not adequately address volume management of stormwater. This program deficiency has been recently addressed by surrounding states with new program requirements. Increased emphasis on recharge and infiltration of stormwater where technically and environmentally feasible, has to be endorsed by changes to the existing body of law."


Del. 18 closed bridge, road damage
Craig Mill Pond bridge out
Hearns Pond Dam damaged (open)
Neal School Rd bridge out
Del. 20 flood damage
Seaford
Williams Pond Dam washed out
Concord Pond Rd bridge out
Butler Branch Rd bridge out
Concord Road bridge out
U.S. 13A washouts
Nanticoke River
River Road washed out
Copyright 2006

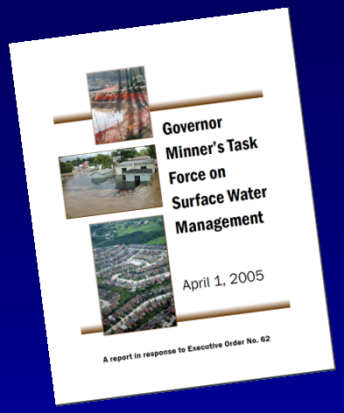
Q: "Why Is DNREC Doing This?"

Short Answer:

"Because We Were Directed To!"

Better Answer:

- The Task Force for Surface Water Management identified legitimate public health, safety and welfare concerns associated with drainage and stormwater management.
- The Task Force recommended specific actions for improvement.
- The “Draft Sediment and Stormwater Regulations” represents the Department’s efforts to address those concerns and recommendations through the State’s regulatory authority.



Task Force on Surface Water Management

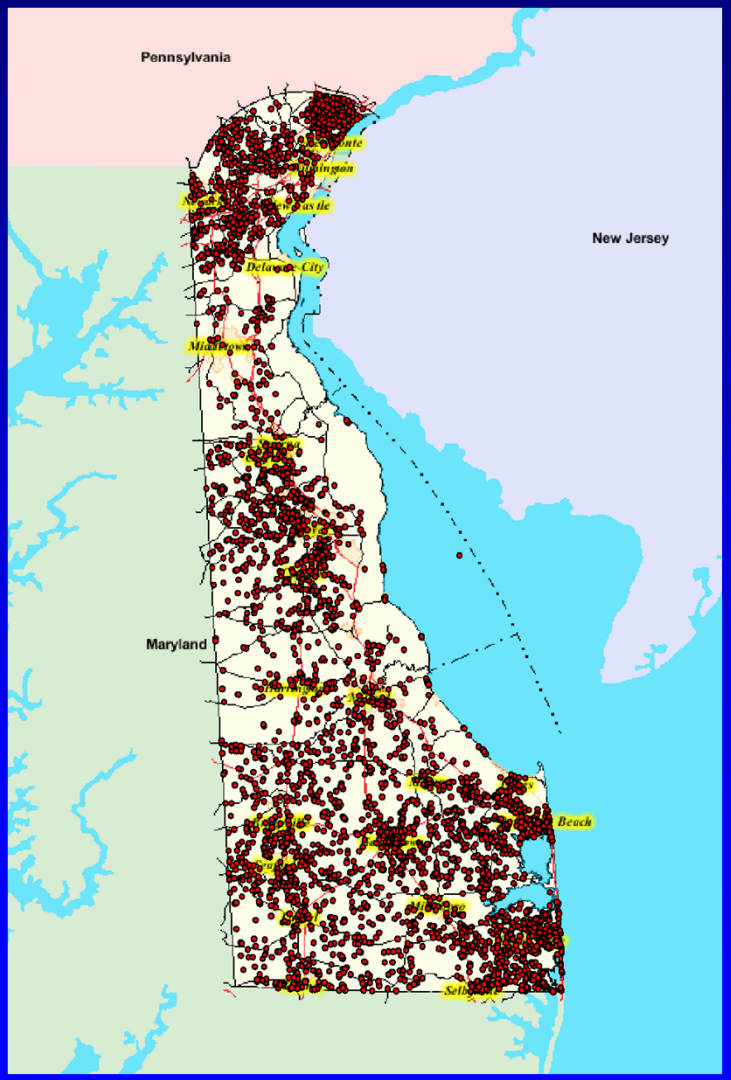
- Specific Recommendations for Drainage & Stormwater Section

Recommendation #2 (approved 3/17/05)

A central response unit coordinated by DNREC in conjunction with county or municipal utilities should be created for handling public calls related to drainage, stormwater, and flood control. A new process and response procedure for addressing citizen complaints related to stormwater facilities and flooding needs to be established. Citizens should be provided with a single point of contact.

Drainage & SW Assistance “Hotline”

Drainage & SW Assistance Database

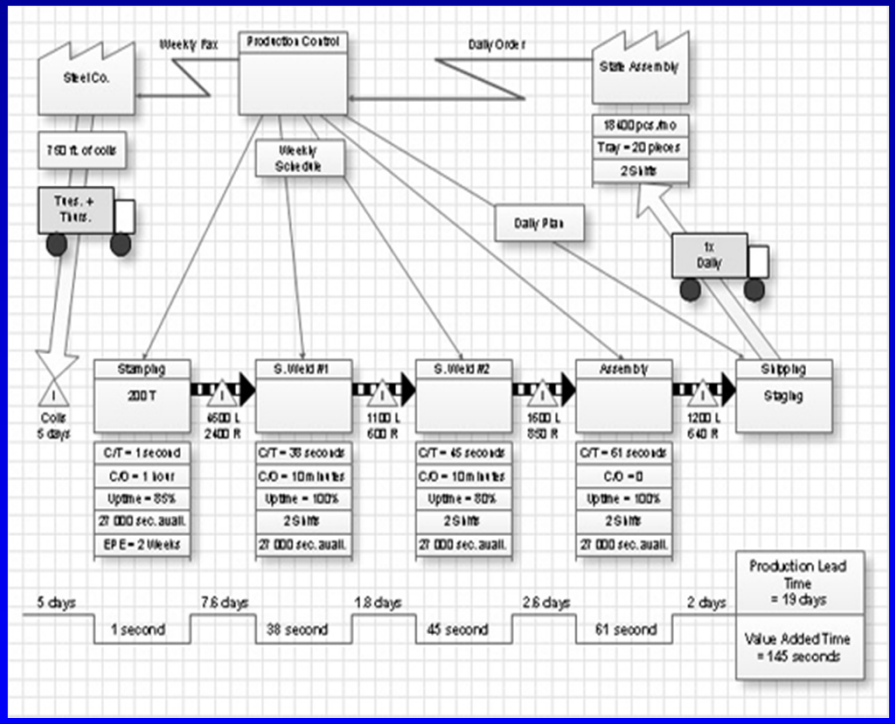


- System went live August, 2007
- Over 4,500 complaints logged into system to date
- Avg. 1,000 complaints/yr

Recommendation #10B (approved 3/24/05)

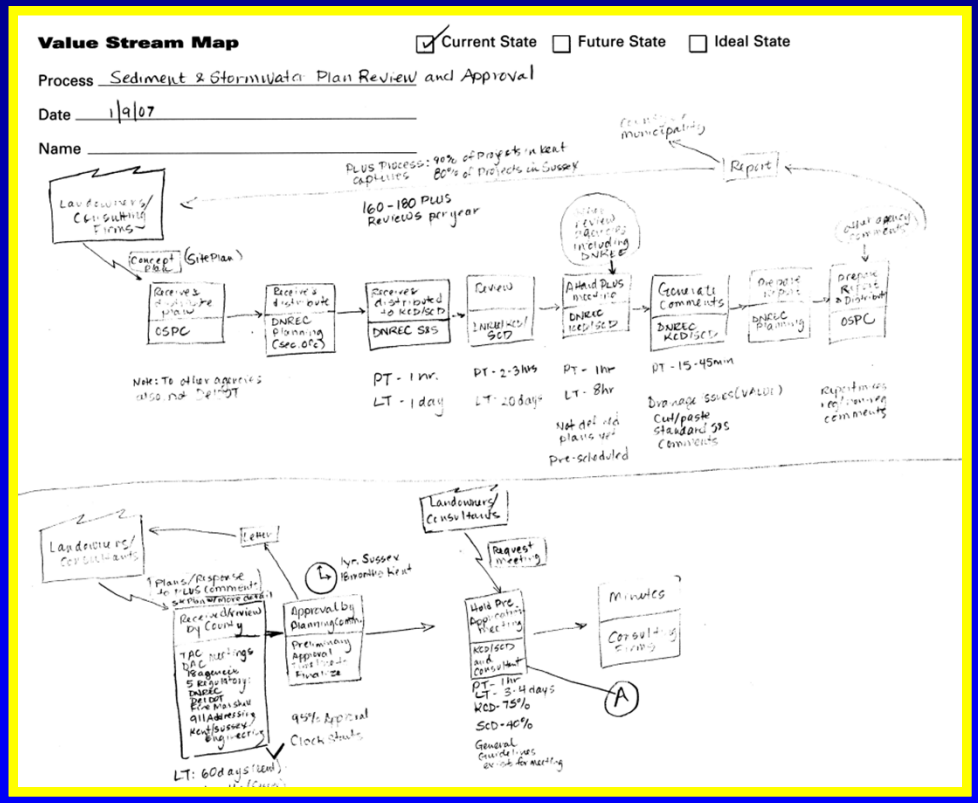
A quality improvement process should be implemented within the State Sediment and Stormwater Program, including all delegated agencies, for the purpose of improving the quality of sediment and stormwater plans submitted for review and approval. The improvement process should identify all current impediments to quality plan submittal and efficient review as well as specific measures to improve the process. The measurable outcome is a reduction in the number of plan submittals prior to approval with the goal of initial plan submittals meeting all applicable requirements and standards.

Lean Tools



- Value Stream Mapping (VSM) is a Lean technique used to analyze the flow of materials and information currently required to bring a product or service to a consumer. At Toyota, where the technique originated, it is known as "Material and Information Flow Mapping".
- Steps to Implementation
  - Identify the target product, product family, or service.
  - Draw a current state value stream map, which shows the current steps, delays, and information flows required to deliver the target product or service. This may be a production flow (raw materials to consumer) or a design flow (concept to launch). There are 'standard' symbols for representing supply chain entities.
  - Assess the current state value stream map in terms of creating flow by eliminating waste.
  - Draw a future state value stream map.
  - **Implement the future state.**

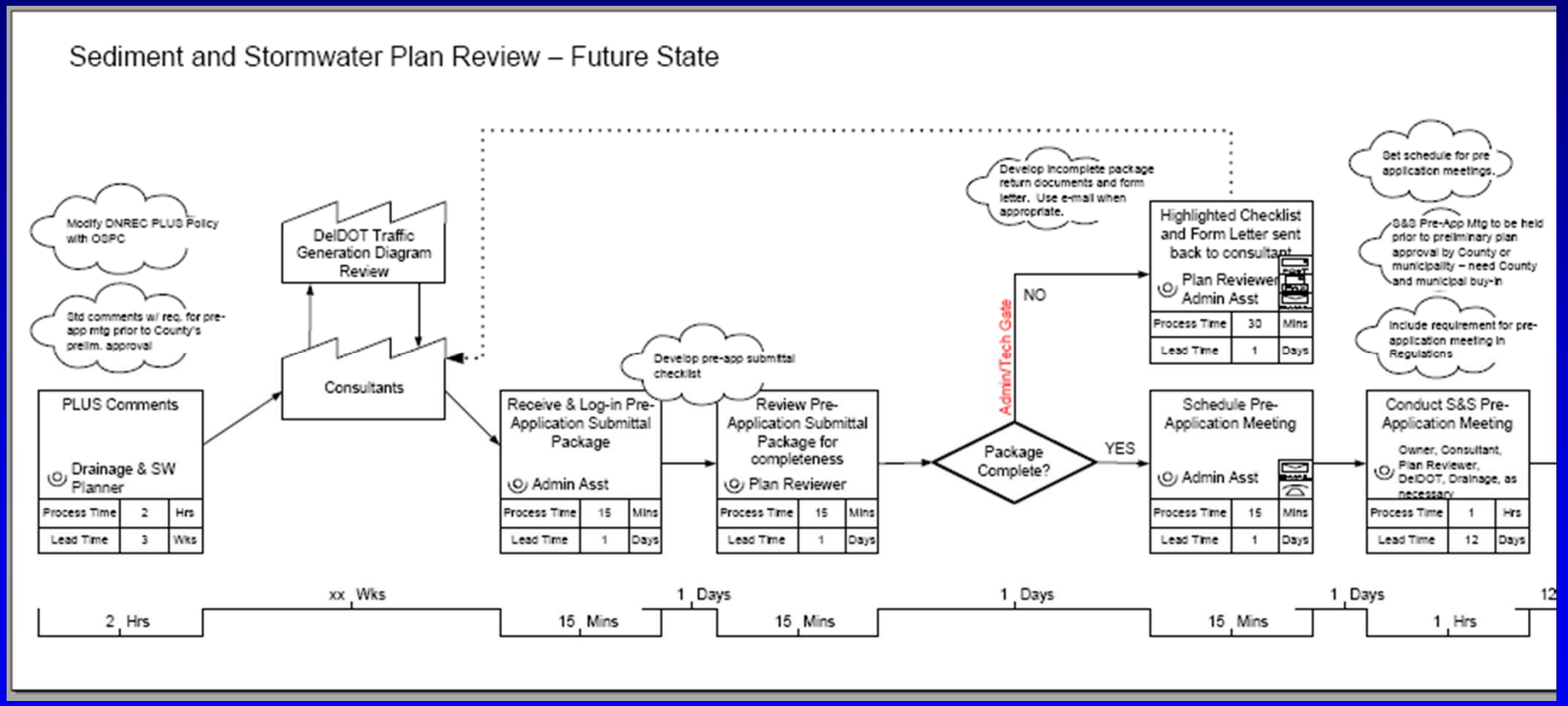
S&S Plan Approval Process: Current State

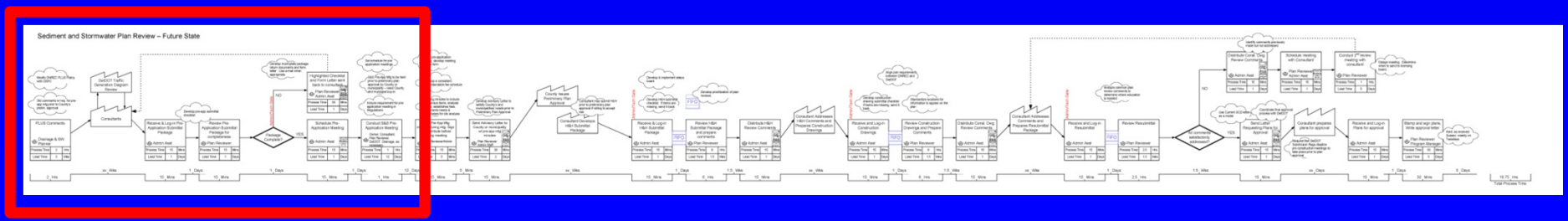


Mapping Participants:

Div of Soil and Water Cons
DNREC Sediment & Stormwater
DNREC Secretary's Office
Kent Conservation District
Sussex Conservation District
DelDOT Stormwater
DelDOT Subdivisions
DelDOT South District
Kent County Planning
Sussex County Planning
Private Consulting Engineer
VSM Consulting Team

S&S Plan Approval Process: Future State





Recommendation #25 (approved 3/24/05)

Aquifer recharge should be considered as part of the design, construction, operation, and maintenance of stormwater facilities.

Recharge of surface water in developed areas with impervious surfaces will result in reduction of overland runoff (surface water volume reduction), improved surface and ground-water quality, and increased base flows of streams.

Stormwater BMP Toolbox (*c. 1990's*)

- Ponds
- Infiltration
  - Basins
  - Trenches

Stormwater BMP Toolbox (*c. 2000's*)

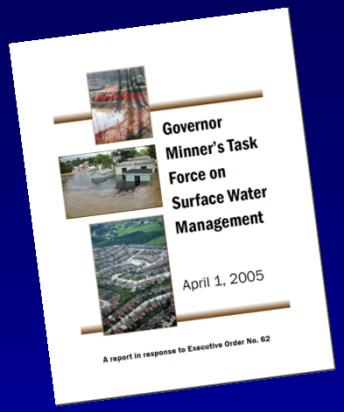
- Ponds
- Infiltration
  - Basins
  - Trenches
- GTBMPs
  - Bioretention
  - Biofiltration swales
  - Filter strips

Stormwater BMP Toolbox (*2012*)

- Post-Construction SWM BMPs
  - 16 general categories
  - Variants within each category
  - **Total of 41 options!**

Recommendation #9 (approved 3/17/05)

"Design and engineering standards at the State level should be strengthened through a revision to the Sediment and Stormwater Regulations. Minimum standards should address volume management, conveyance adequacy, pollutant loadings, floodplain management, strict standards for operation and maintenance of structures and management areas."



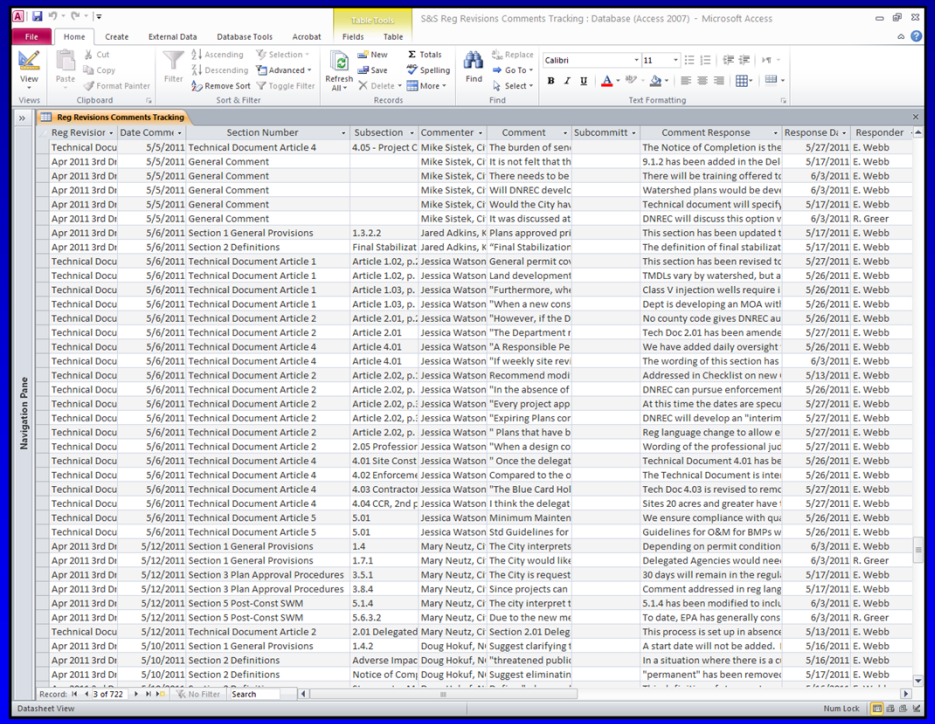
History of Reg Revisions

- Governor's Task Force – April 2005
- RAC first meeting – October 2007
- Reg Revisions Outline – January 2008
- First Working Draft – February 2009
- Second Draft – May 2010
- Draft Technical Document – Sept 2010
- Final Draft – June 2011

By the Numbers: Outreach

- RAC Meetings: 8
- Subcommittee Meetings: 37
  (Technical Subcommittee: 20 meetings)
- Interested Parties: 223

By the Numbers: Comments



- 722 comments received and considered
- Tracked in a database
- Responses provided

Guiding Principals

- Peak-based to Volume-based management
- Site-level to Watershed-level management
- Separate regulatory language from technical requirements
- Streamline plan review/approval process

Plan Review & Approval Process

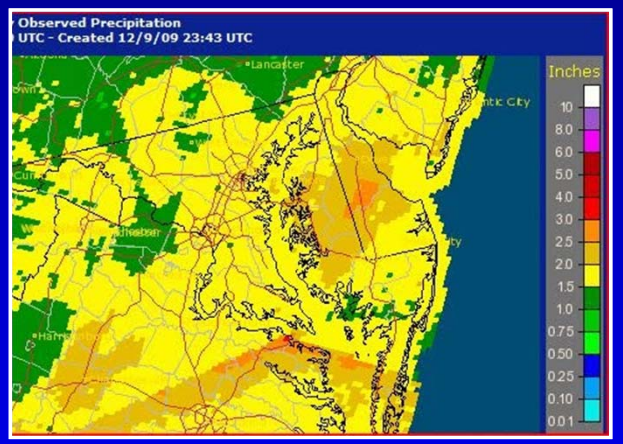
- Current Regs
  - 3 Step Process as defined through policy
    - Pre-Application Meeting
    - Sediment & Stormwater Conceptual Plan
    - Sediment & Stormwater Construction Plan
- Proposed Regs
  - 3 Step Process as defined in Regulations
    - Step 1: Project Application Meeting
    - Step 2: Preliminary Sediment & Stormwater Plan
    - Step 3: Sediment & Stormwater Plan

Erosion & Sediment Control

- Current Regs
  - Max. 20 ac. disturbance
- Proposed Regs
  - Disturbance > 20 ac. requires engineered design based on 2-YR bare earth condition

Stormwater Management

- Current Regs
  - 4 Regulatory Storm Events
    - WQ (2” rainfall)
    - 2-YR
    - 10-YR
    - 100-YR
- Proposed Regs
  - 3 Regulatory Storm Events
    - 1-YR (Resource Protection Event - RPv)
    - 10-YR (Conveyance Event - Cv)
    - 100-YR (Flooding Event - Fv)



Stormwater Quality Management

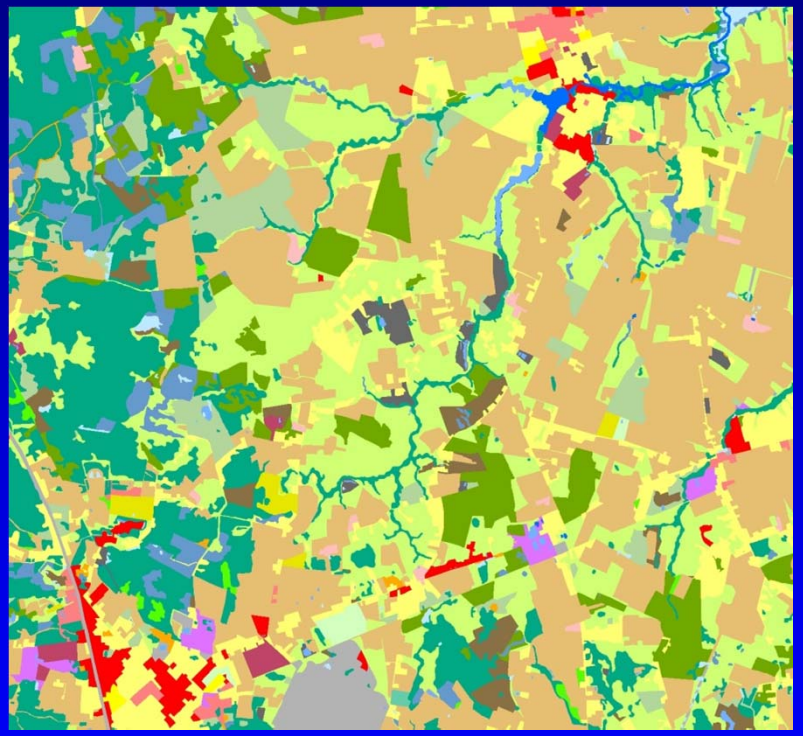
- Current Regs
  - 2” Rainfall event (~6 month freq.)
  - Preferential hierarchy of BMPs
  - 80% reduction in TSS
- Proposed Regs - Resource Protection (RPv)
  - Annualized runoff for all storms up to the 1-YR Storm event (~2.7” rainfall)
  - Runoff reduction performance standard

Stormwater Quantity Management

- Current Regs
  - 2-YR, 10-YR, 100-YR (above C&D Canal)
  - Analyze pre-dev. and post-dev. conditions always
  - Match post-dev. peak discharge to pre-dev. peak discharge
  - Same management strategy for all sites
- Proposed Regs
  - 10-YR, 100-YR (State-wide)
  - Analyze pre-dev. conditions only as needed
  - Performance standard based on “no adverse impact”
  - Management options available depending on SAS results & location within watershed

Options for Quantity Management

- Option 1
  - Standards-based
    - Unit Discharge (cfs/ac)
- Option 2
  - Performance-based
  - Criteria based on:
    - hydrograph timing
    - channel stability
    - system capacity
  - H&H analysis required
    - 3 levels of increasing detail



Revised Regulations

- Exemptions, Variances & Waivers
  - Incremental 5,000sf disturbances
  - Variance procedures
  - Waivers eliminated
    - Compliance options offered
- Offset provisions
  - Full or partial compliance with RPv
  - Fee-in-lieu

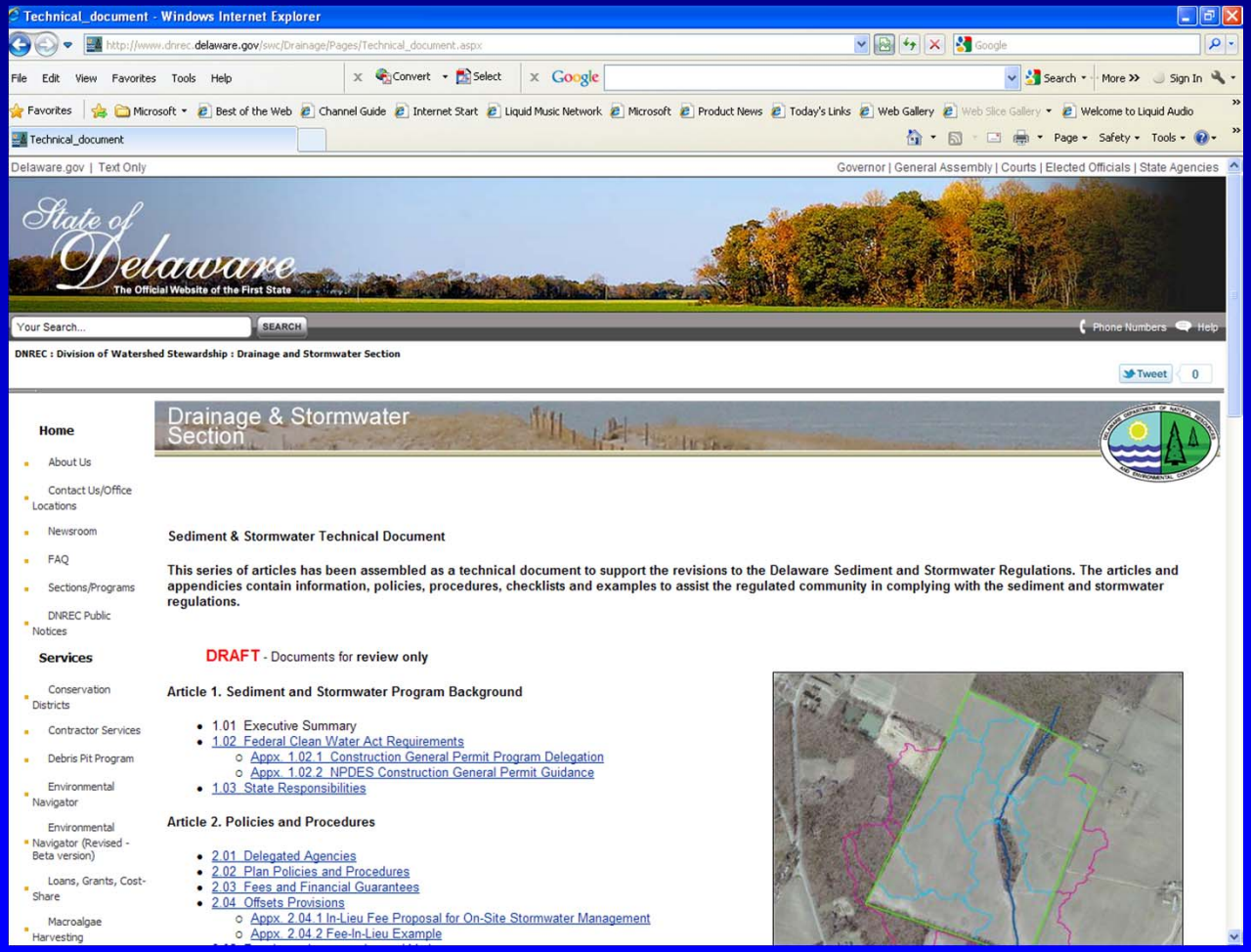
Regulations = WHAT

Technical Document = HOW

Technical Document

- Information supports regulation language
- Public process with regulations
- Future changes will also go through public review process
- Completed portions posted on DNREC Technical Document website

Technical Document Website



Technical Document Articles

- Article 1. Sediment and Stormwater Program Background
- Article 2. Policies and Procedures
- Article 3. Plan Review & Approval
- Article 4. Construction Review & Compliance
- Article 5. Maintenance of Permanent Stormwater Management Systems

Article 2. Policies and Procedures

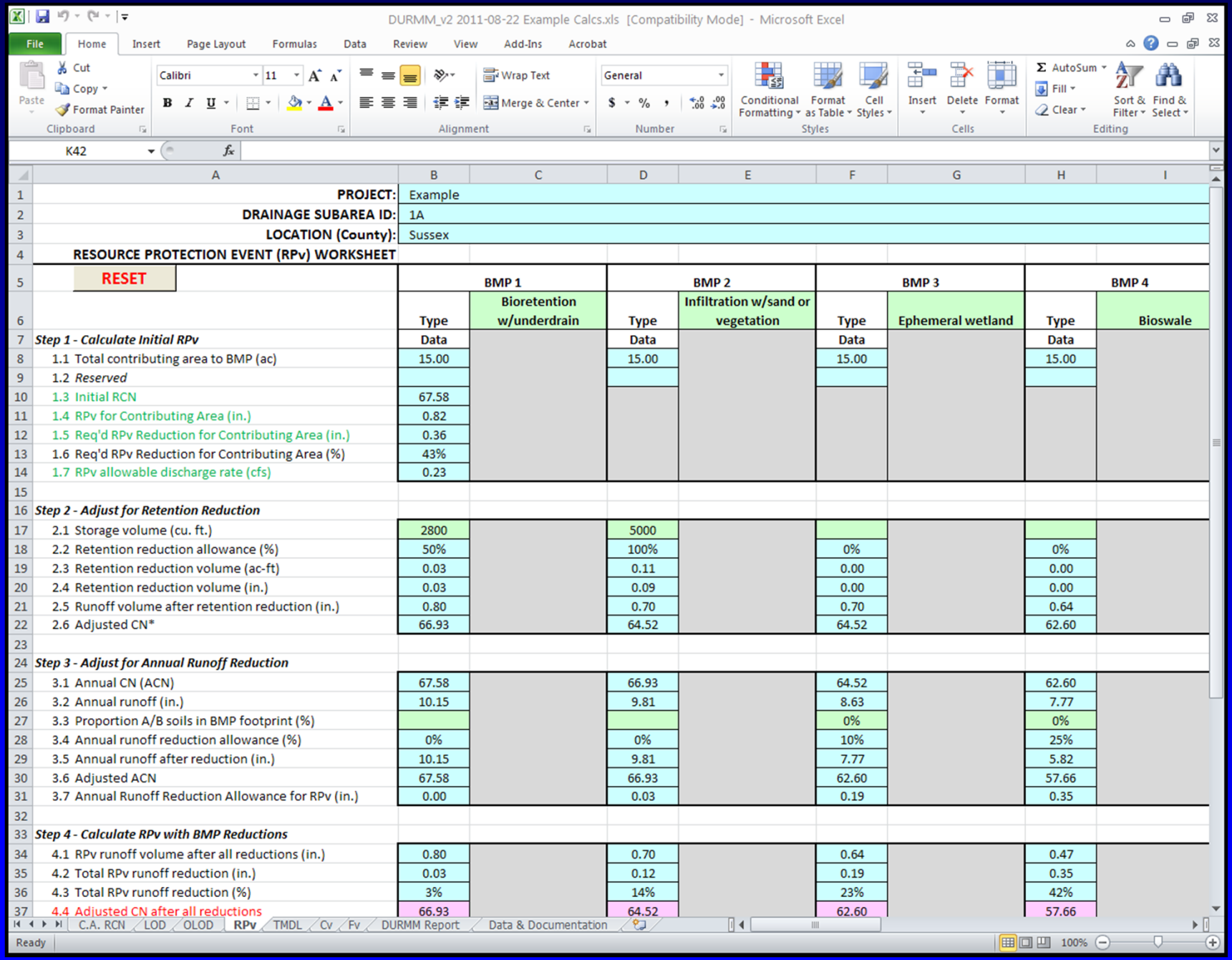
- Delegated Agencies
- Plan Policies and Procedures
- Fees and Financial Guarantees
- Offsets
- Variances

Article 3. Plan Review & Approval

- 3.01 Project Types
- 3.02 Plan Review Process
- 3.03 Construction Site SWM
- 3.04 Post Construction SWM
- 3.05 General Plan Requirements
- 3.06 Sediment & Stormwater BMP Standards & Specifications

3.02 Plan Review Process

- Documents & Checklists:
  - Step 1 – Project Application Meeting
  - Step 2 – Preliminary S&S Plan
  - Step 3 – Sediment and Stormwater Plan
- Example documents
  - Project Application Package
  - Preliminary S&S Plan Submittals



DURMM_v2 2011-08-22 Example Calcs.xls [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	F	G	H	I
1	**PROJECT:**	Example							
2	**DRAINAGE SUBAREA ID:**	1A							
3	**LOCATION (County):**	Sussex							
4	**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**								
5	RESET	**BMP 1**		**BMP 2**		**BMP 3**		**BMP 4**	
6		**Type**	**Bioretention w/underdrain**	**Type**	**Infiltration w/sand or vegetation**	**Type**	**Ephemeral wetland**	**Type**	**Bioswale**
7	***Step 1 - Calculate Initial RPv***	**Data**		**Data**		**Data**		**Data**	
8	1.1 Total contributing area to BMP (ac)	15.00		15.00		15.00		15.00	
9	1.2 *Reserved*								
10	1.3 Initial RCN	67.58							
11	1.4 RPv for Contributing Area (in.)	0.82							
12	1.5 Req'd RPv Reduction for Contributing Area (in.)	0.36							
13	1.6 Req'd RPv Reduction for Contributing Area (%)	43%							
14	1.7 RPv allowable discharge rate (cfs)	0.23							
15									
16	***Step 2 - Adjust for Retention Reduction***								
17	2.1 Storage volume (cu. ft.)	2800		5000					
18	2.2 Retention reduction allowance (%)	50%		100%		0%		0%	
19	2.3 Retention reduction volume (ac-ft)	0.03		0.11		0.00		0.00	
20	2.4 Retention reduction volume (in.)	0.03		0.09		0.00		0.00	
21	2.5 Runoff volume after retention reduction (in.)	0.80		0.70		0.70		0.64	
22	2.6 Adjusted CN*	66.93		64.52		64.52		62.60	
23									
24	***Step 3 - Adjust for Annual Runoff Reduction***								
25	3.1 Annual CN (ACN)	67.58		66.93		64.52		62.60	
26	3.2 Annual runoff (in.)	10.15		9.81		8.63		7.77	
27	3.3 Proportion A/B soils in BMP footprint (%)					0%		0%	
28	3.4 Annual runoff reduction allowance (%)	0%		0%		10%		25%	
29	3.5 Annual runoff after reduction (in.)	10.15		9.81		7.77		5.82	
30	3.6 Adjusted ACN	67.58		66.93		62.60		57.66	
31	3.7 Annual Runoff Reduction Allowance for RPv (in.)	0.00		0.03		0.19		0.35	
32									
33	***Step 4 - Calculate RPv with BMP Reductions***								
34	4.1 RPv runoff volume after all reductions (in.)	0.80		0.70		0.64		0.47	
35	4.2 Total RPv runoff reduction (in.)	0.03		0.12		0.19		0.35	
36	4.3 Total RPv runoff reduction (%)	3%		14%		23%		42%	
37	4.4 Adjusted CN after all reductions	66.93		64.52		62.60		57.66	

C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

Ready

100%

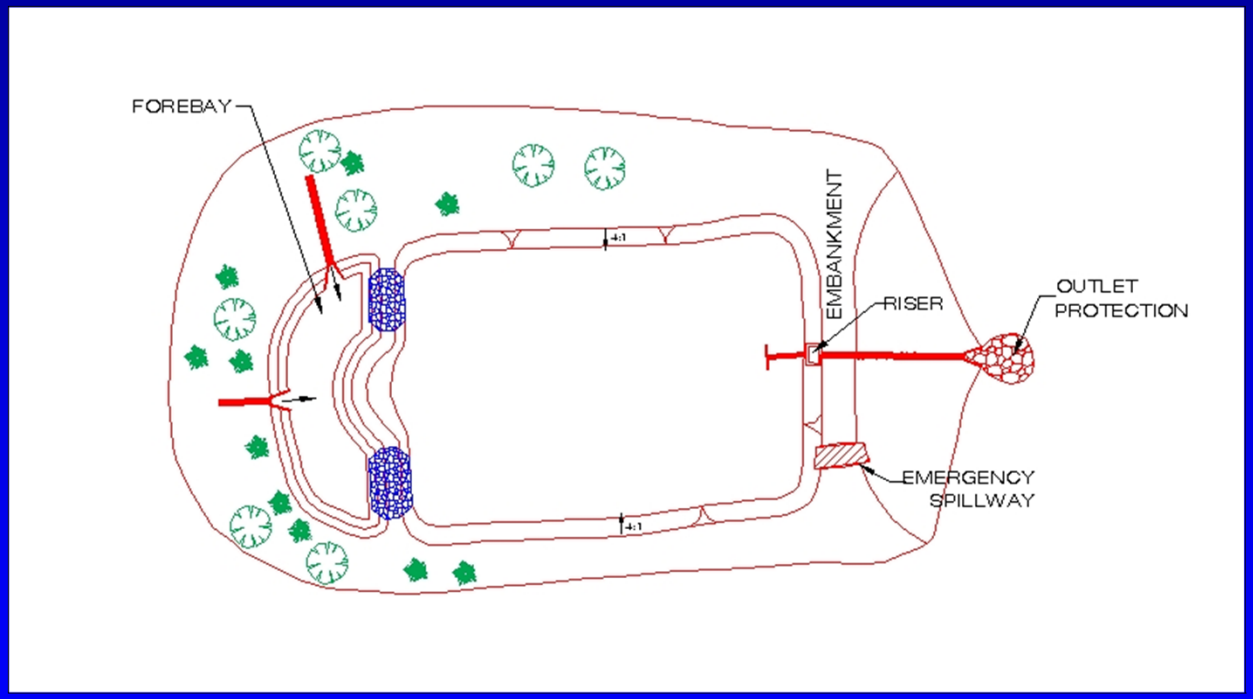
3.06 Sediment and Stormwater BMP Standards and Specs

- Revisions to Delaware E&S Handbook
- New Standards and Specs for BMPs
- Appendices
  - Soil Investigation Procedures
  - Landscaping Criteria
  - Hotspots

BMP Standards & Specs

- Definition
- Typical details
- Stormwater Credits
- Design Summary Table
- Feasibility Criteria
- Conveyance Criteria
- Pretreatment Criteria
- Design Criteria
- Landscaping Criteria
- Construction Sequence
- Maintenance Criteria

Example Graphic



Stormwater Credit Table

10.1 Detention Practices Stormwater Credit Calculations

Both Dry Detention Ponds and Dry Extended Detention Basins receive a pollutant removal credit, while Dry Extended Detention Basins receive partial runoff reduction credit as well. Underground Detention Facilities receive no credit for runoff reduction or pollutant removal.

Table 10.1 Dry Detention Pond Performance Credits

Runoff Reduction	
Retention Allowance	0%
RPv -A/B Soil	0%
RPv - C/D Soil	0%
Cv	0%
Fv	0%
Pollutant Reduction	
TN Reduction	5%
TP Reduction	10%
TSS Reduction	10%

Table 10.2 Dry Extended Detention Basin Performance Credits

Runoff Reduction	
Retention Allowance	0%
RPv -A/B Soil	10%
RPv - C/D Soil	10%
Cv	1%
Fv	0%
Pollutant Reduction	
TN Reduction	20%
TP Reduction	20%
TSS Reduction	60%

Since detention practices are designed for larger storm events, rather than the RPv, the credits above are "fixed" credits – they are not based on the relative size of the practice. To receive these credits, the practice must be designed using the guidance detailed in ***Section 10.6. Detention Practices Design Criteria.***

Design Summary Table

10.2 Detention Practices Design Summary

Table 10.3 summarizes design criteria for detention practices. For more detail, consult Sections 10.3 through 10.7. Sections 10.8 and 10.9 describe practice construction and maintenance criteria.

Table 10.3 Dry Detention Pond (10-A) and Dry ED Basin (10-B) Design Summary

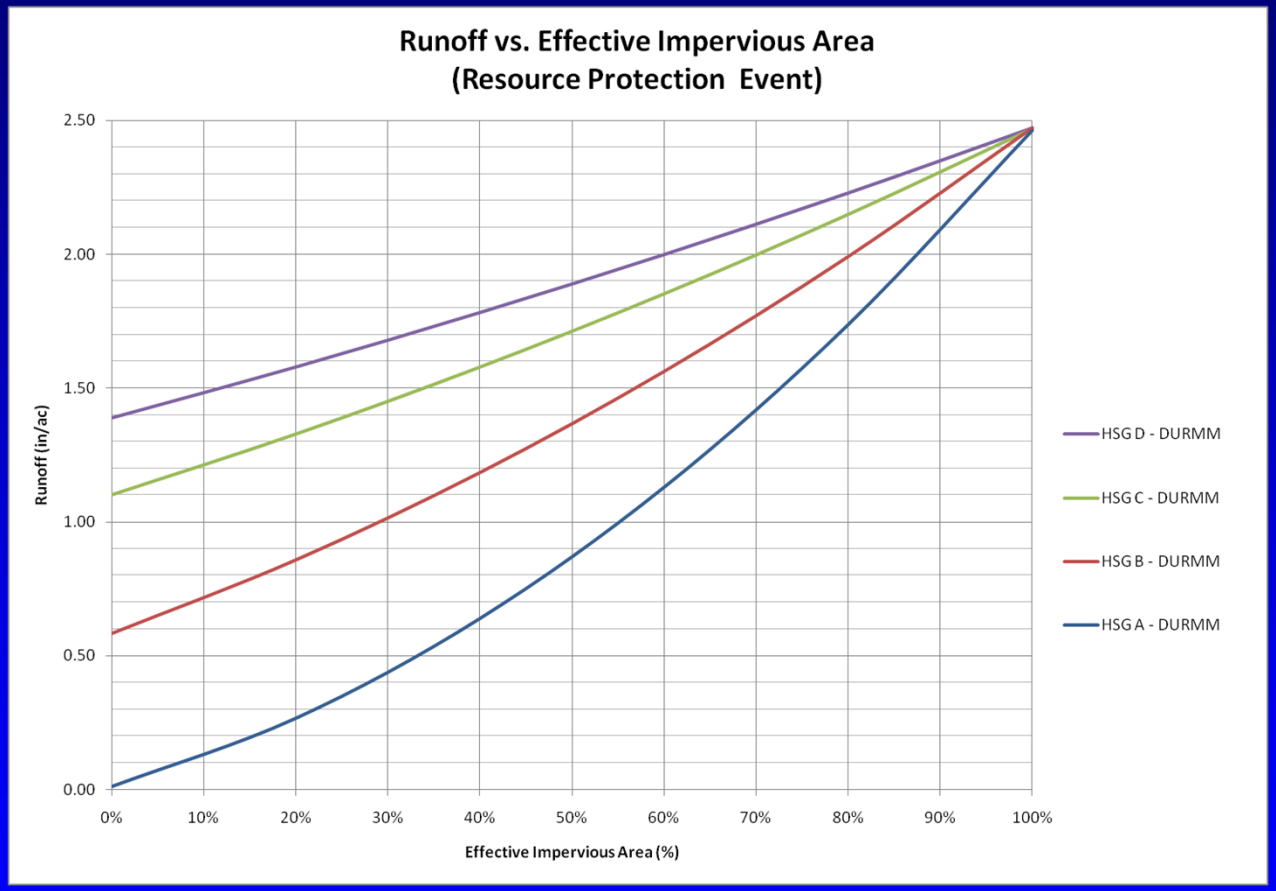
Feasibility (Section 10.3)	• 1%-3% of CDA for footprint • Minimum CDA = 10 acres • Setbacks from property lines = 20', buildings=25', septic fields=100', and wells=150' • Minimum 2' separation to groundwater or bedrock • Geotechnical investigations required • Soil tests on HSG A and B soils to determine infiltration rates • No utilities within embankments • 10' horizontal clearance from utilities • Permit required if located on perennial streams • Community and environmental concerns
Conveyance (Section 10.4)	• Designed in accordance with NRCS Small Pond Code 378 • Use accepted hydrologic and hydraulic routing computations • Principal spillway designed to release flow rates from Cv • Principal spillway must be accessible by dry land, include anti-floatation, anti-vortex devices, trash racks, and contain watertight joints. • Dry ED design must include an orifice to drain the Rpv over 12- to 24-hours • Minimize tree clearing at outlets • Non-clogging outlets (>3" or internal orifice control) • Outlets non-erosive for the Fv (100-year storm) event. • Emergency spillway cut in fill must be lined • If no emergency spillway, 3 square feet minimum for principal spillway • Provide inlet protection
Pretreatment (Section 10.5)	• Forebays at major inlets – those contributing >10% runoff volume • Forebays designed to capture minimum 0.1" of runoff from the CDA • Exit velocity from forebay non-erosive • Direct maintenance access provided
Sizing (Section 10.6)	• Store volume equivalent to RPv (1-year, 2.7") • Detain RPv minimum 24 hours, not to exceed 48 hours
Geometry/ Features (Section 10.6)	• Flow evenly distributed across the pond bottom • Maximum longitudinal slope: HSG A/B – 1%, HSG C/D – 2% • Side slopes no steeper than 3:1 • Irregular shape and long flow path increase performance
Safety (Section 10.6)	• Prevent access by small children • Restrict access to principal spillway and lock maintenance access points • 1' freeboard above the Fv elevation; 2' freeboard if no emergency spillway • End walls above pipe outfalls > 48" in diameter must be fenced
Maintenance (Section 10.6)	• Accessible for annual maintenance • Minimum 15' wide maintenance access provided Maintenance set aside area provided
Landscaping (Section 10.7)	• No woody vegetation within 15' of toe of embankment or 25' of pipes • Landscaping plan required

BMP Standards & Specs

- Infiltration
- Bioretention
- Permeable Pavement
- Vegetated Roofs
- Rainwater Harvesting
- Restoration Practices
- Rooftop Disconnection
- Vegetated Channels
- Sheet Flow to Open Space
- Detention Practices
- Filtering Practices
- Constructed Wetlands
- Wet Ponds
- Soil Amendments
- Proprietary Practices
- Source Controls

Summary

Proposed Minimum RR for New Development



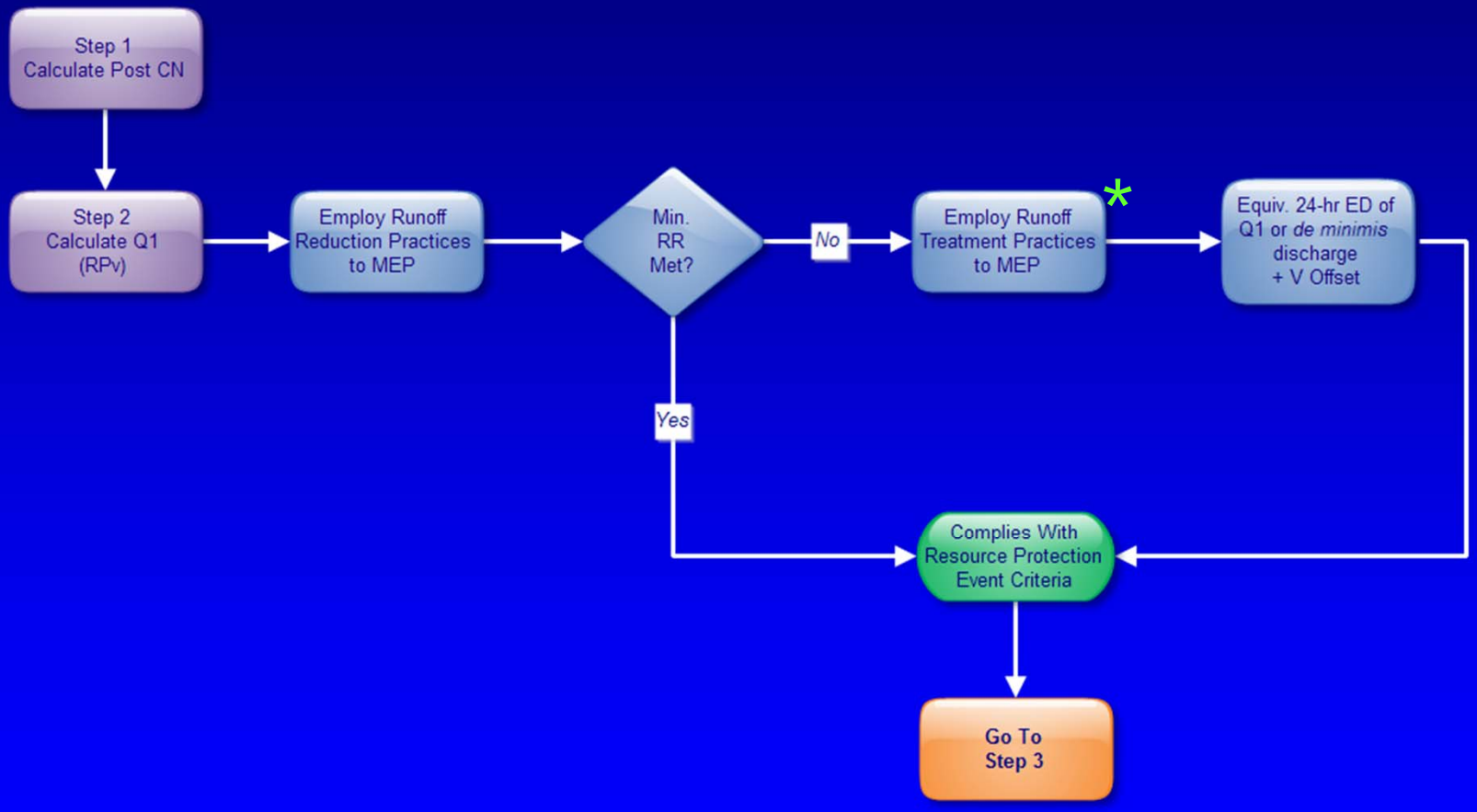
Equivalent 0% Effective Imperviousness in LOD

Proposed Minimum RR for New Development

	Req. Runoff Reduction for 0% Effective Imp.(in)			
% Imp	HSG A	HSG B	HSG C	HSG D
10%	0.15	0.13	0.11	0.09
20%	0.27	0.27	0.23	0.19
30%	0.43	0.43	0.35	0.29
40%	0.62	0.60	0.48	0.39
50%	0.85	0.78	0.61	0.50
60%	1.10	0.97	0.75	0.61
70%	1.39	1.18	0.90	0.72
80%	1.71	1.40	1.05	0.83
90%	2.06	1.63	1.20	0.95
100%	2.45	1.88	1.36	1.07

Equivalent 0% Effective Imperviousness in LOD

5.2 Resource Protection Event Criteria



*Treatment practice credit toward fee-in-lieu

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

- 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 not managed

Proposed Revisions to Delaware Sediment & Stormwater Regulations

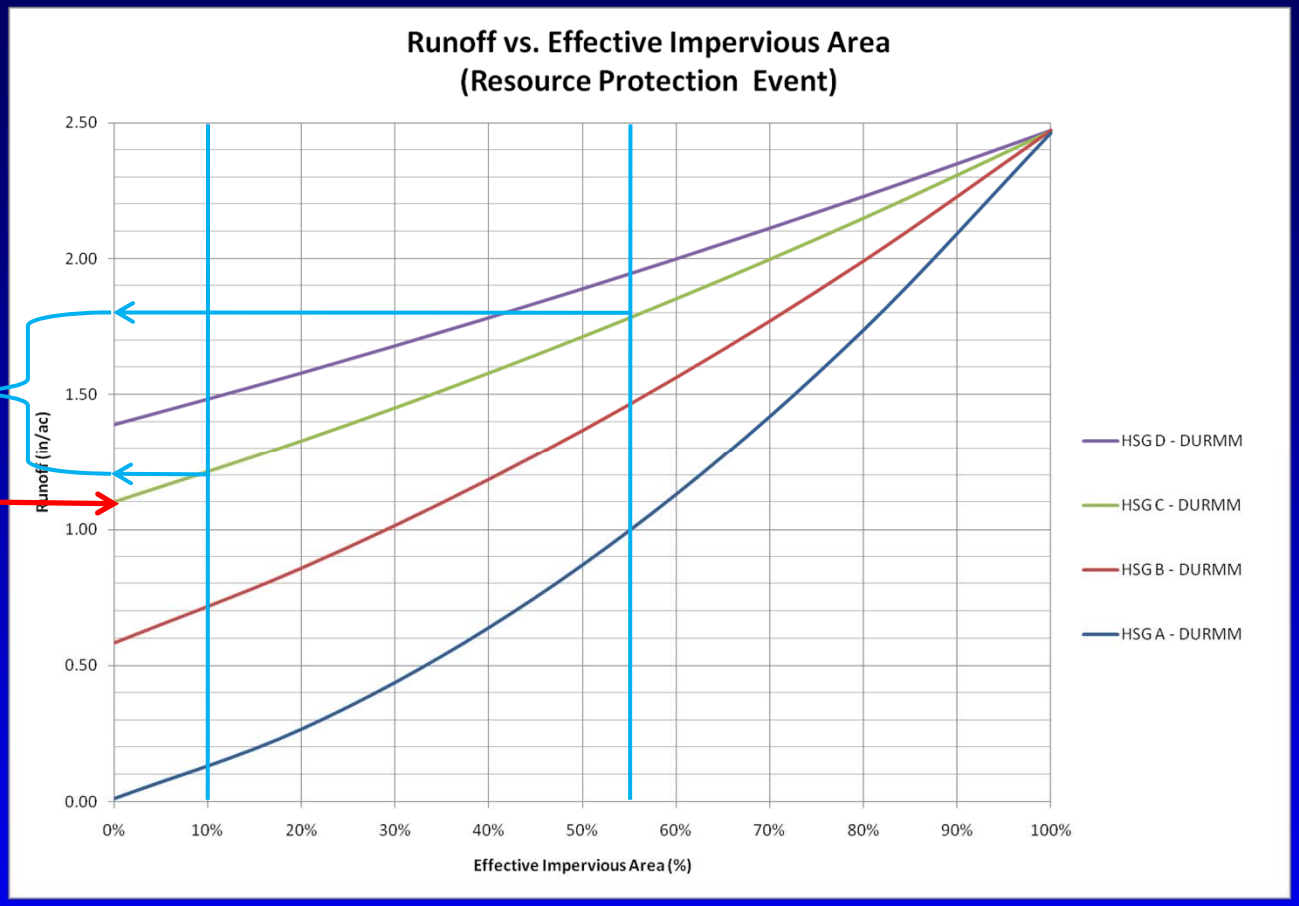
Fee-In-Lieu Example

Example Site

- Site Data
  - 55% Imperviousness
  - HSG C Soils
- After Runoff Reduction to MEP
  - 10% Effective Imperviousness

Actual RR

Min. RR



Site Data: 55% Impervious, HSG C Soil, 10% Effective Impervious after RR

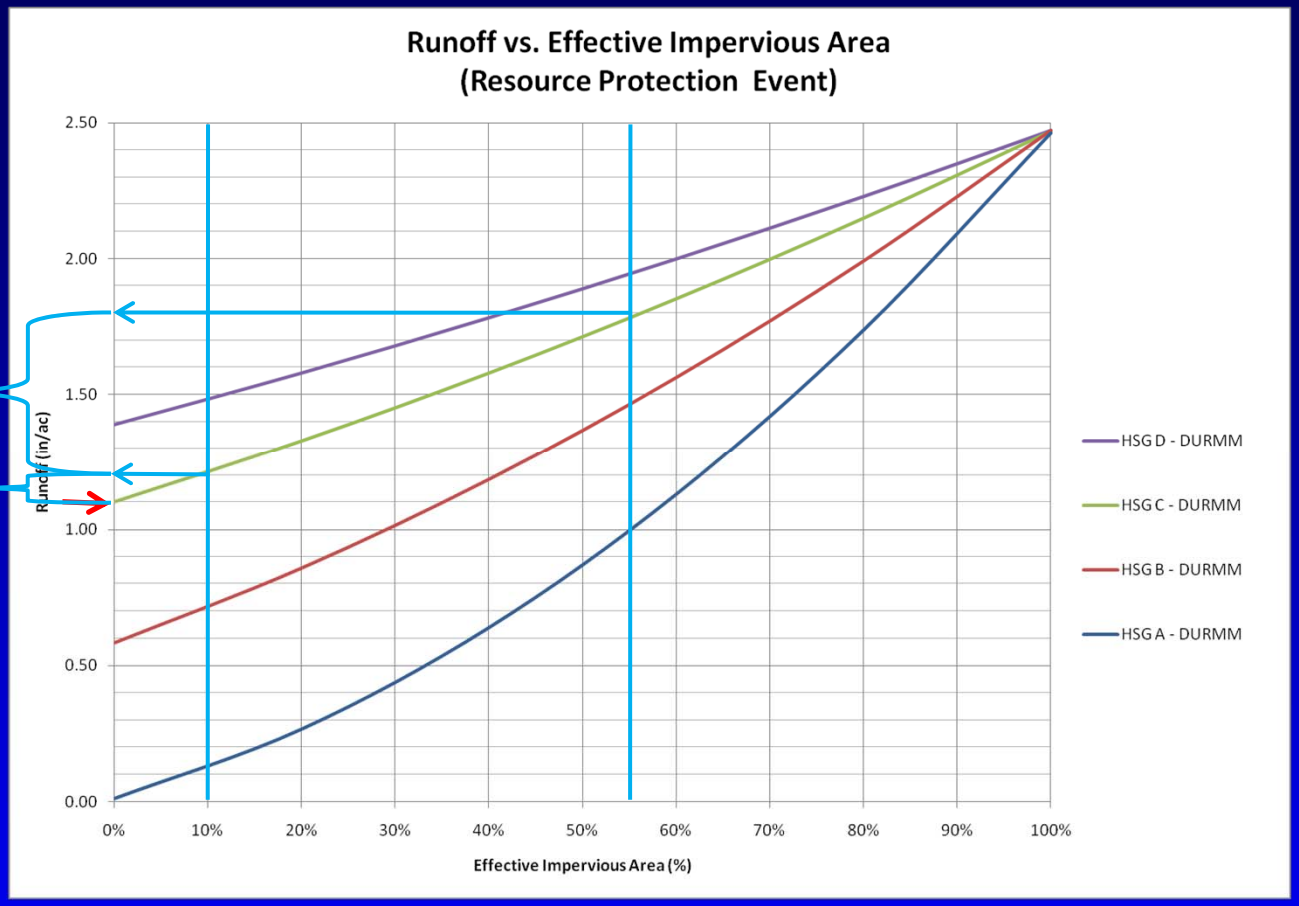
Runoff = 1.8”

Minimum RR = 1.8” – 1.1” = 0.7” (38% Reduction)

Actual RR = 1.8” – 1.2” = 0.6” (33% Reduction)

Actual RR

Offset



Site Data: 55% Impervious, HSG C Soil, 10% Effective Impervious after RR

Runoff = 1.8”

Minimum RR = 1.8” – 1.1” = 0.7” (38% Reduction)

Actual RR = 1.8” – 1.2” = 0.6” (33% Reduction)

Offset Volume = 1.2” – 1.1” = 0.1” = 0.1 ac-in/ac = 363 cf/ac

Offset Fee = $23/cf x 363 cf/ac = $8,349/ac

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

- RPv offset fee-in-lieu may be further reduced by implementing additional water quality treatment practices
- Offset fee-in-lieu reduction shall be equivalent to the combined **TN** removal for those practices

Treatment BMP Removal Efficiencies*

BMP Standards and Specifications — Detention Practices

10.0 Detention Practices

Definition: Detention Practices are storage practices that are explicitly designed to provide stormwater detention for the Conveyance Event, Cv (10-year) and Flooding Event, Fv (100-year). Design variants include:

- 10-A Dry Detention Pond
- 10-B Dry Extended Detention Basin
- 10-C Underground Detention Facilities

Dry Detention Ponds and Dry Extended Detention Basins are widely applicable for most land uses and are best suited for larger drainage areas. An outlet structure restricts stormwater flow so it backs up and is stored within the basin. The temporary ponding reduces the maximum peak discharge to the downstream channel, thereby reducing the effective shear stress on the bed and banks of the receiving stream. Dry Detention Ponds receive some credit for pollutant removal, while Dry Extended Detention Basins receive both runoff reduction and pollutant removal credits.

The key difference between Dry Detention Ponds and Dry Extended Detention Basins is that, in addition to management of the Cv and Fv, a Dry Extended Detention Basin provides up to a 24-hour detention of all or a portion of the Resource Protection Volume (RPv). An under-sized outlet structure restricts stormwater flow so it backs up and is stored within the basin. The temporary ponding enables particulate pollutants to settle out and reduces the maximum peak discharge to the downstream channel, thereby reducing the effective shear stress on banks of the receiving stream. Extended detention differs from a Dry Detention Pond's stormwater detention, since it is designed to achieve a minimum drawdown time, rather than a maximum peak rate of flow. Dry Detention Ponds, which are designed only to manage the larger Conveyance Event and Flooding Event will often detain smaller storm events for only a few minutes or hours.

Underground Detention Facilities include vaults and tanks. Underground Detention Vaults are box-shaped underground stormwater storage facilities typically constructed with reinforced concrete. Underground Detention Tanks are underground storage facilities typically constructed with large diameter metal or plastic pipe. Both serve as an alternative to surface dry detention for stormwater quantity control, particularly for space-limited areas where there is not adequate land for a dry detention basin or multi-purpose detention area. Prefabricated concrete vaults are available from commercial vendors. In addition, several pipe manufacturers have developed packaged detention systems. Underground detention vaults do not receive any runoff reduction or pollutant removal credit, and should be considered only for management of larger storm events.

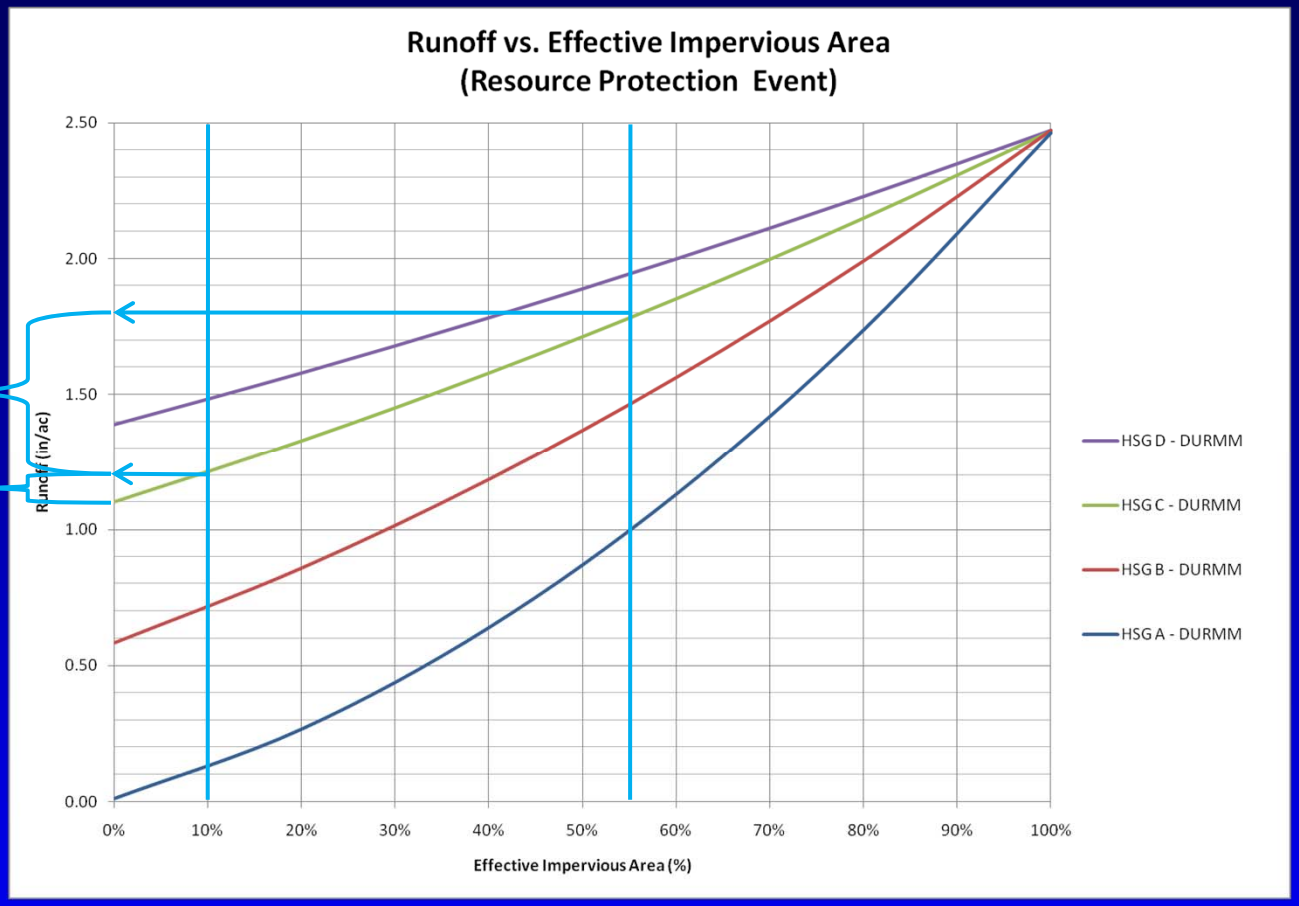
10.1

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

**EPA CBP Removal Efficiencies As Used In DURMM v.2*

Actual RR

Offset



Original Offset Fee = $23/cf x 363 cf/ac = $8,349/ac

Offset Fee w/Dry Extended Detention Treatment BMP

Removal Efficiency for TN = 20%

Fee Adjustment = 0.20 x $8,349 = $1,670

Adjusted Fee = $8,349 – $1,670 = $6,679/ac

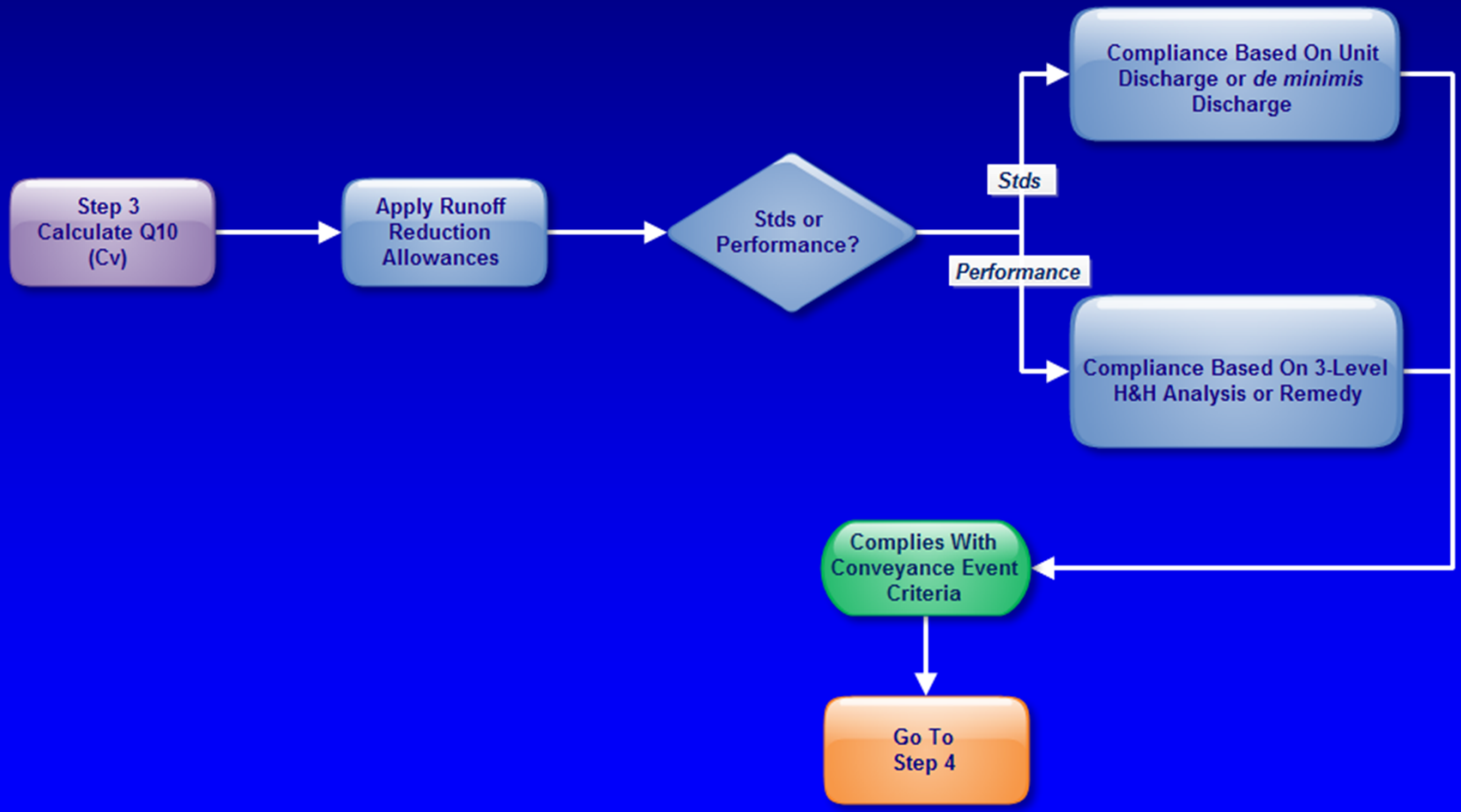
Overall Objectives for Fee-In-Lieu

- The offset fees collected will be used to mitigate the negative impacts associated with urban stormwater runoff at the watershed level.
- Potential uses should be prioritized based on their benefits at the watershed level.

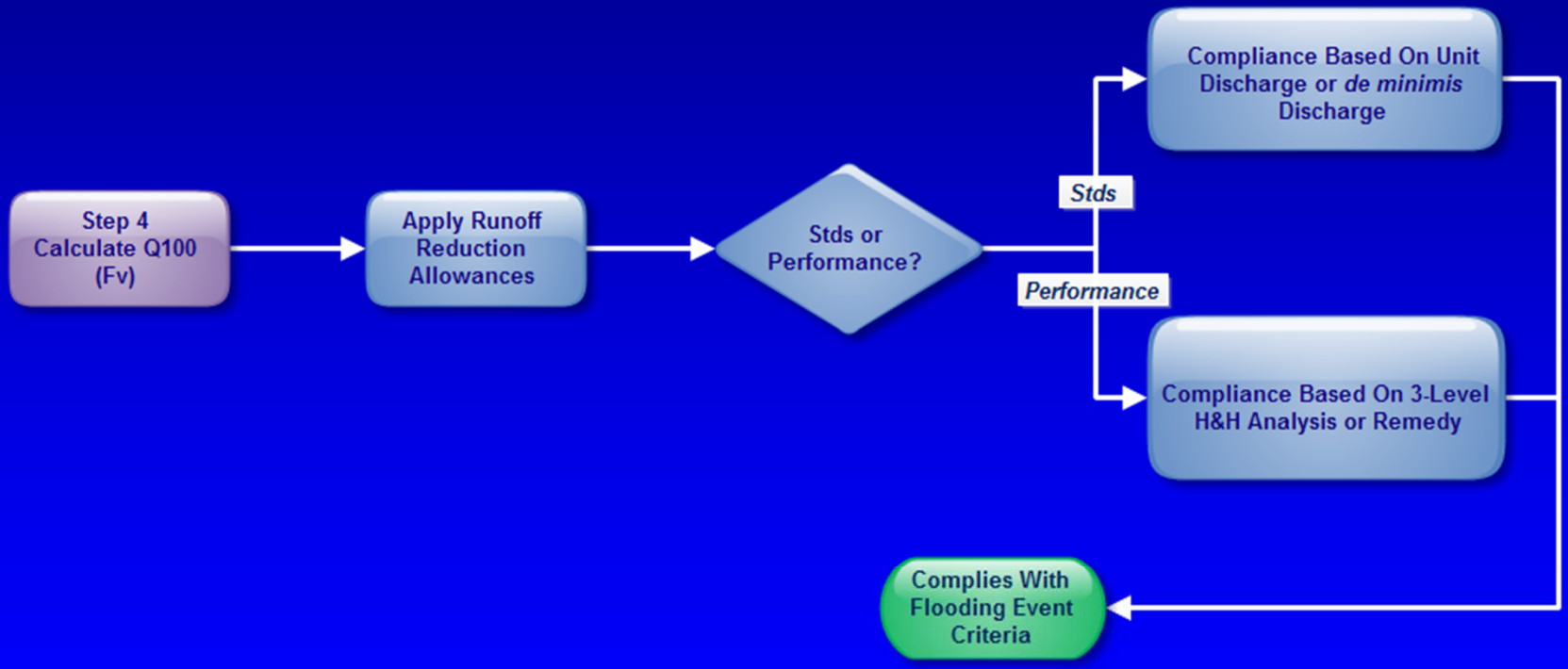
Potential Uses of Fee-In-Lieu

- Implement recommendations of Watershed Management Plans
- Stormwater BMP retrofit projects
- Stream restoration projects
- Regional facilities
- Volume/Nutrient reductions from other sources
- Others????

5.3 Conveyance Event Compliance



5.4 Flooding Event Criteria



Timeline

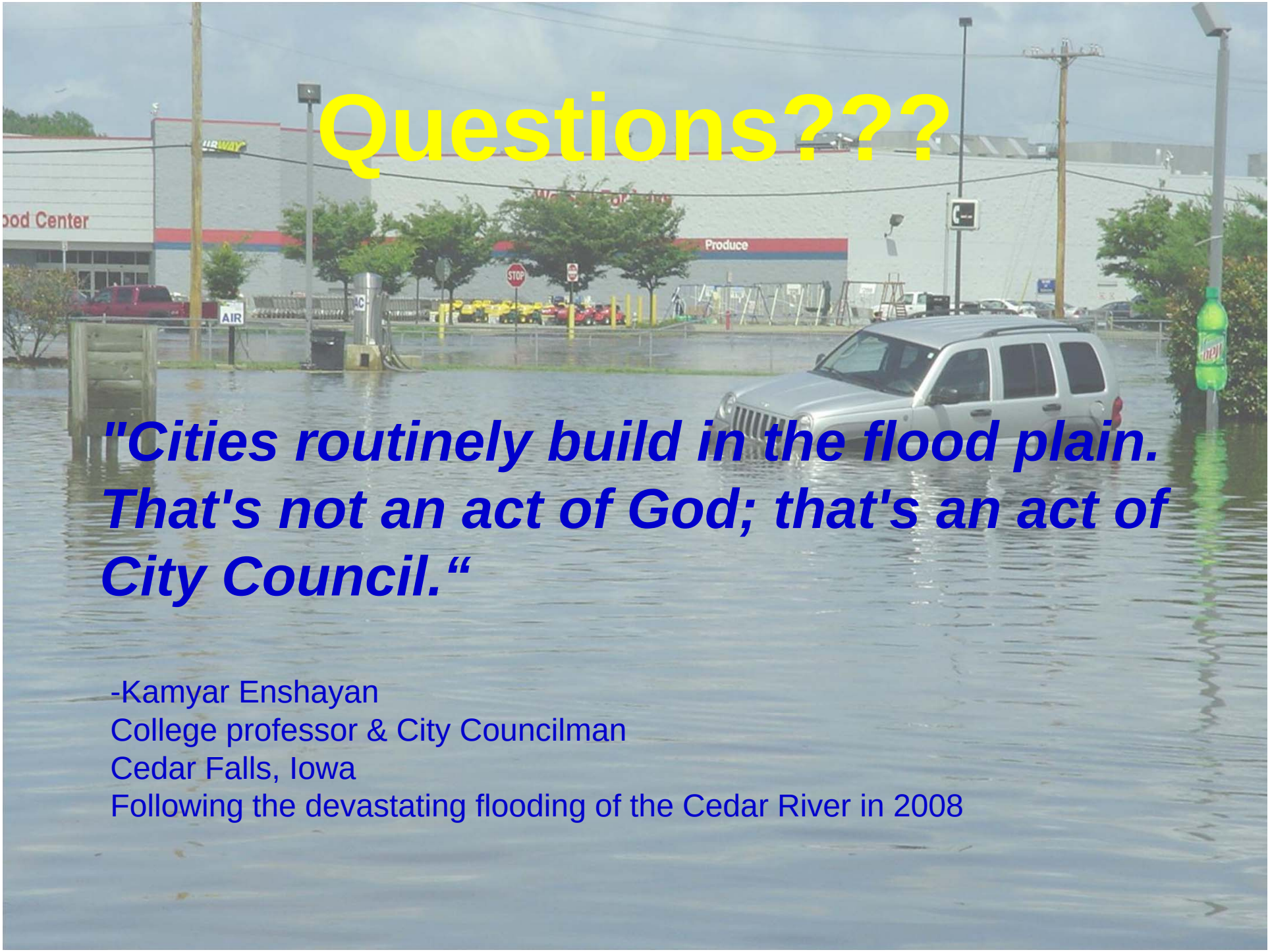
- February 1, 2012: Delaware Register
- February 2012: Public Comment Period
- March 1, 2012: Public Hearing
- May 2012: Promulgation
- Aug 2012: Effective Date

Summer 2012

- Promulgation in May 2012
- Training throughout summer
  - DURMM v.2
  - Standards & Specifications
- Effective in August 2012

Training and Outreach

- Contract with Center for Watershed Protection; 4 training sessions
- Example plans prepared by consultants
- Training offered to Delegated Agencies first
- Circuit Rider Trainer for DURMMv.2
- CBP Partnership Training Grant



Questions???

"Cities routinely build in the flood plain. That's not an act of God; that's an act of City Council."

-Kamyar Enshayan
College professor & City Councilman
Cedar Falls, Iowa
Following the devastating flooding of the Cedar River in 2008