

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

***Technical Subcommittee Meeting  
October 6, 2010***

# Technical Document *Update*

Sediment & Stormwater - Windows Internet Explorer  
http://www.swc.dnrec.delaware.gov/Pages/SedimentStormwater.aspx

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DNREC : Division of Soil & Water Conservation

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Services

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- Environmental Navigator
- Environmental Navigator (Revised - Beta version)
- Loans/Grants/Cost-Sharing
- Macroalgae Harvesting
- Permits/Licenses/Approvals
- Restoration

Information

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

Division of Soil & Water Conservation

### Delaware's Sediment And Stormwater Program

Delaware's Sediment and Stormwater Management program operates within the Division of Soil & Water Conservation's [Drainage and Stormwater Section](#). The program employs a comprehensive approach to sediment control (both during and after construction) and stormwater management that includes monitoring of stormwater quantity and water quality control. Program responsibilities include:

- Sediment control and inspection during construction
- Post-construction inspection of permanent stormwater facilities
- Stormwater quantity and water quality control
- Education/training relating to stormwater

[Regulation Revision Process](#)

- [New to Delaware's Sediment and Stormwater Process?](#)
- [Contact Us](#)
- [List of Delegated Agencies](#)

Laws, Regulations, and Policies

- [Sediment & Stormwater Law](#)
- [Sediment & Stormwater Regulations](#)
- [Plan Review Policy](#)
- [Construction Review Policy](#)
- [Turbid Discharge Policy for Best Available Technology \(BAT\)](#)
- [Enforcement Policy](#)
- [CCR Policy for State & Federal Projects](#)
- [Pond Code 378 for Urban Stormwater Management Ponds](#)

Certification Course Information

- [Contractors Certification \(Blue Card\)](#)
- [Certified Construction Reviewer \(CCR\)](#)
- [CCR Recertification](#)
- [Request Form for Duplicate Blue Card or CCR Card](#)
- [List of Current Blue Card Holders](#)

Certified Construction Reviewer (CCR) Resources



Applications

- [Application for Plan Approval](#)
- [Minor Land Disturbing Activity Application](#)
- [Utility Construction Application](#)
- [Certified Construction Reviewer Application](#)

Checklists

- [Sediment & Stormwater Plan Review Checklist](#)
- [Minimum Submittal Requirements for SWM Conceptual Plan](#)
- [Minimum Submittal Requirements for Pond Construction Plan](#)
- [Pond Construction Checklist](#)
- [Bioretention Construction Checklist](#)

Engineering/Plan Review Process

- [Plan Review Policy](#)
- [Pond Code 378 for Urban Stormwater Management Ponds](#)

start | Technical Subcommittee | Microsoft PowerPoint... | Sediment & Stormwat... | 11:21 AM

RegRevisions - Windows Internet Explorer  
http://www.swc.dnrec.delaware.gov/Drainage/Pages/RegRevisions.aspx

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Drainage & Stormwater Section

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**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**
- [September - 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](mailto:Elaine.Webb@state.de.us)

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

Technical\_document - Windows Internet Explorer  
http://www.swc.delaware.gov/Drainage/Pages/Technical\_document.aspx

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**Sediment & Stormwater Technical Document**

**DRAFT - Documents for review only**

**Article 1. Sediment and Stormwater Program Background**

- 1.01 Executive Summary
- 1.02 Federal Clean Water Act Requirements
  - Appx. 1.02.1 NPDES Construction General Permit Guidance
  - Appx. 1.02.2 Construction General Permit Implementation Flow Chart
- 1.03 State Requirements

**Article 2. Policies and Procedures**

- 2.01 Delegated Agencies
  - Appx. 2.01.1 Delegation Request Minimum Submittal Requirements
- 2.02 Plan Policies and Procedures
- 2.03 Fees, Financial Guarantees, Offsets, and Mitigation
- 2.04 Variances and Appeals
- 2.05 Easements

**Article 3. Plan Review and Approval**

- 3.01 Goals and Objectives
- 3.02 Plan Review Process - Detailed Plans
  - 3.02.1 Step 1 Project Application Meeting
    - Appx. 3.02.1.1 Stormwater Assessment Study Checklist**
    - Appx. 3.02.1.2 Project Application Meeting Discussion and Agreement Items
    - Appx. 3.02.1.3 Stormwater Assessment Report
    - Appx. 3.02.1.4 Workflow for Site Hydrologic Analysis
    - Appx. 3.02.1.5 Example Project Application Package
  - 3.02.2 Step 2 Preliminary Sediment and Stormwater Plan
    - Appx. 3.02.2.1 Preliminary Sediment and Stormwater Plan Checklist



Done Trusted sites 100%

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# Questions?

http://www.swc.dnrec.delaware.gov/Drainage/Documents/Sediment%20and%20Stormwater%20Program/Tech - Windows Internet Explorer

http://www.swc.dnrec.delaware.gov/Drainage/Documents/Sediment%20and%20Stormwater%20Program/Technical%20Document/3.02.1.1%20SAS%20Checklist%2010-09.pdf

DRAFT  
October 2009

**Office Use Only**

Date Received: \_\_\_\_\_  
Submittal Complete: Yes / No    Reviewer Initials: \_\_\_\_\_  
Meeting date/time: \_\_\_\_\_  
DelDOT Attendance Required? Yes / No

**Stormwater Assessment Study (SAS) Checklist**

Project Name: \_\_\_\_\_

Owner/Developer Name: \_\_\_\_\_  
Contact Person: \_\_\_\_\_

Owner/Developer Phone: \_\_\_\_\_  
Owner/Developer e-mail: \_\_\_\_\_

Consultant Name: \_\_\_\_\_  
Contact Person: \_\_\_\_\_

Consultant Phone: \_\_\_\_\_  
Consultant e-mail: \_\_\_\_\_

*This checklist is for guidance only. The Delegated Agency reserves the right to request additional information during the review process as it deems necessary. Compliance with the checklist in no way is meant to relieve the design professional of his/her professional responsibilities.*

1

Done

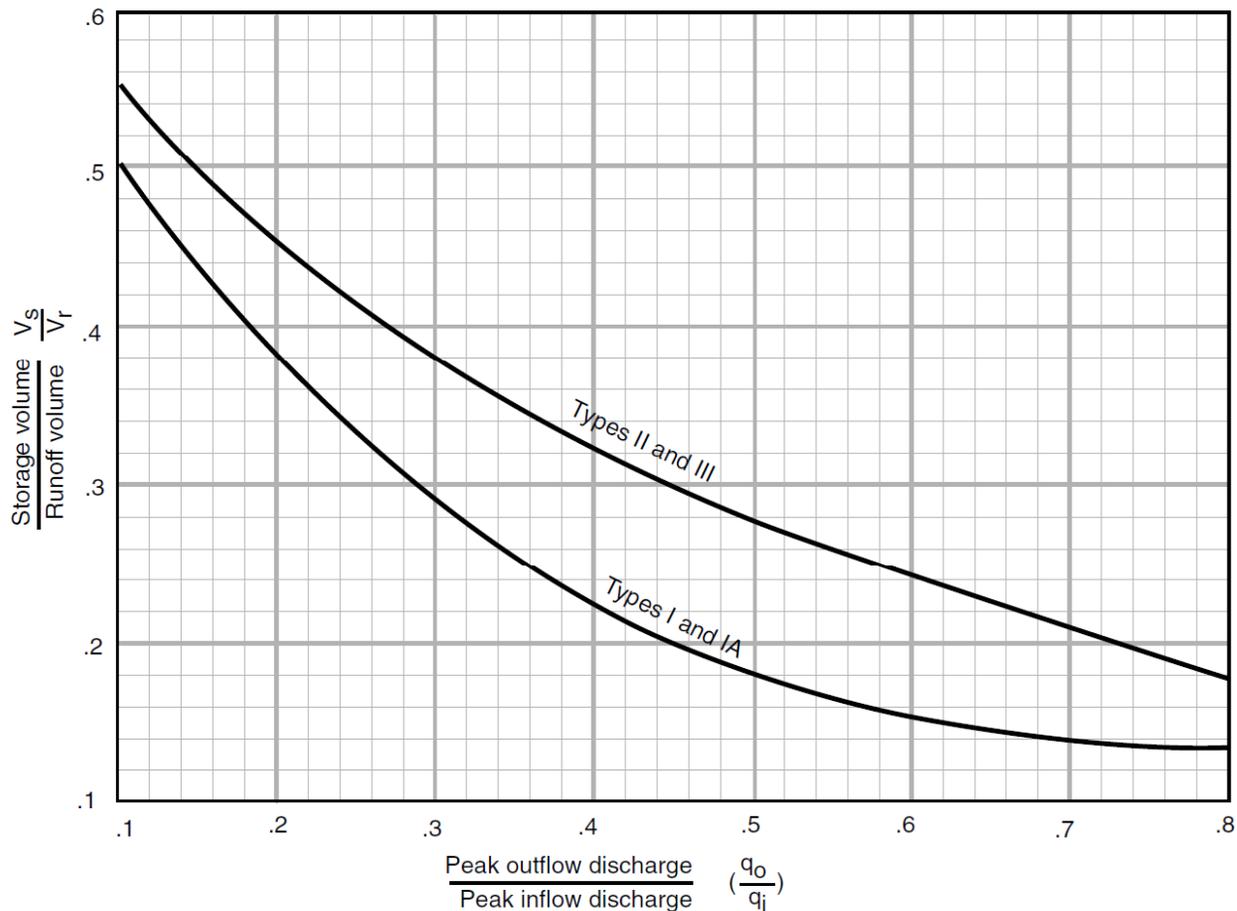
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# Unit Discharge Example

*errata*

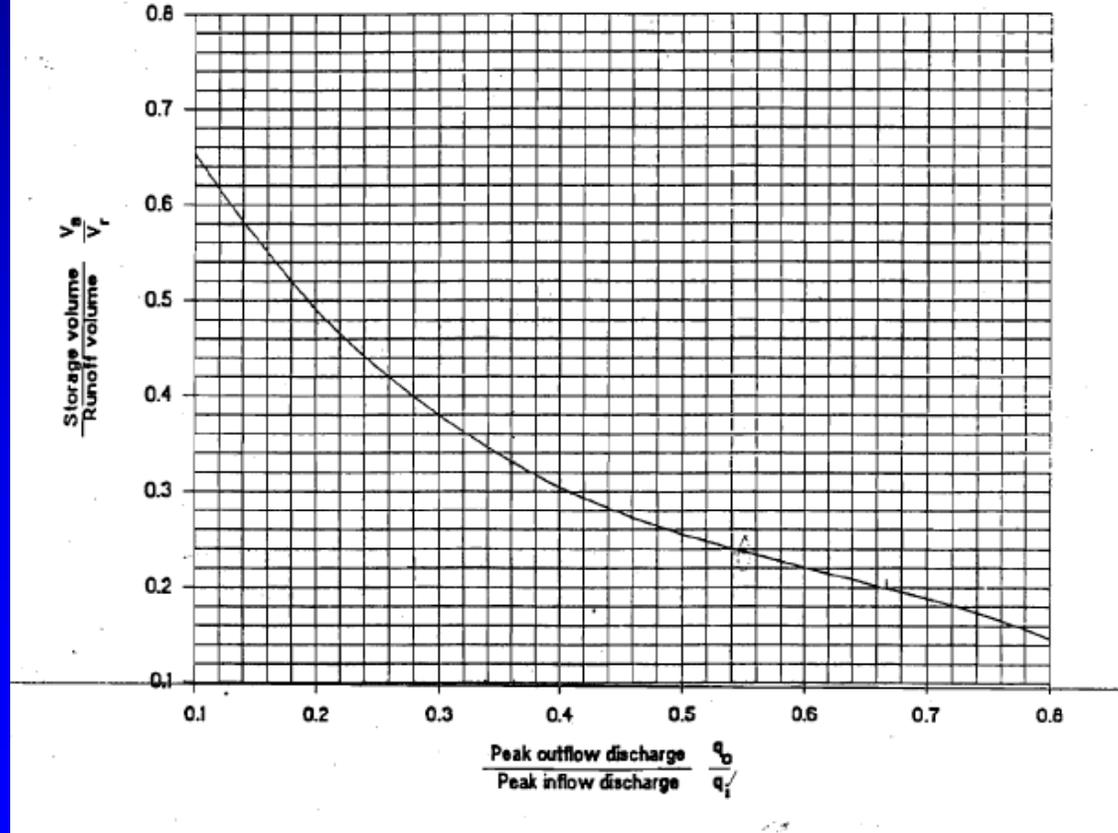
# Example: Unit Discharge Flooding Event (Fv)

**Figure 6-1** Approximate detention basin routing for rainfall types I, IA, II, and III



# TR-55, Fig. 6-1DMV Delmarva Unit Hydrograph

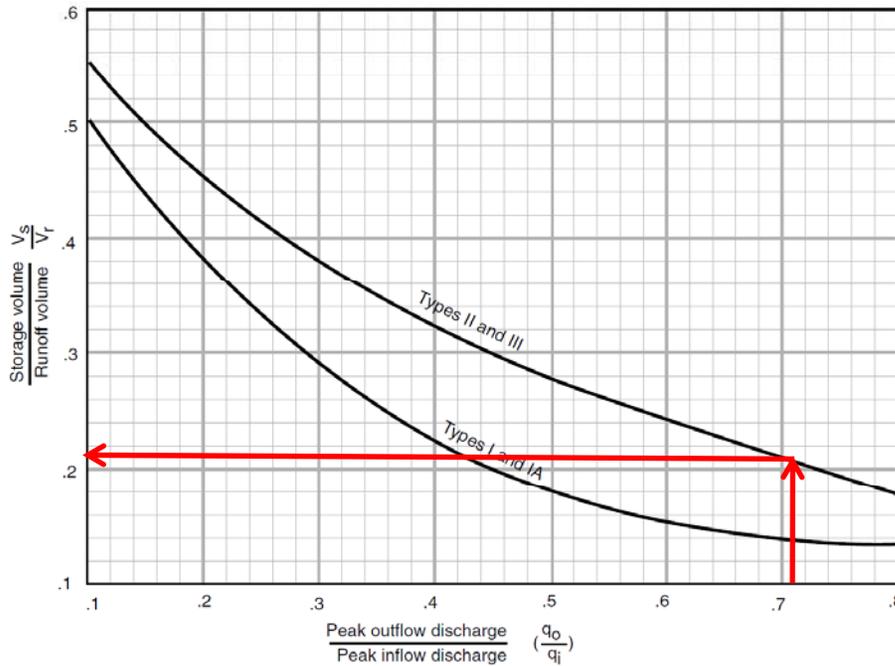
Figure 6-1DMV - Approximate detention routing for Delmarva Hydrograph



# TR-55, Fig. 6-1

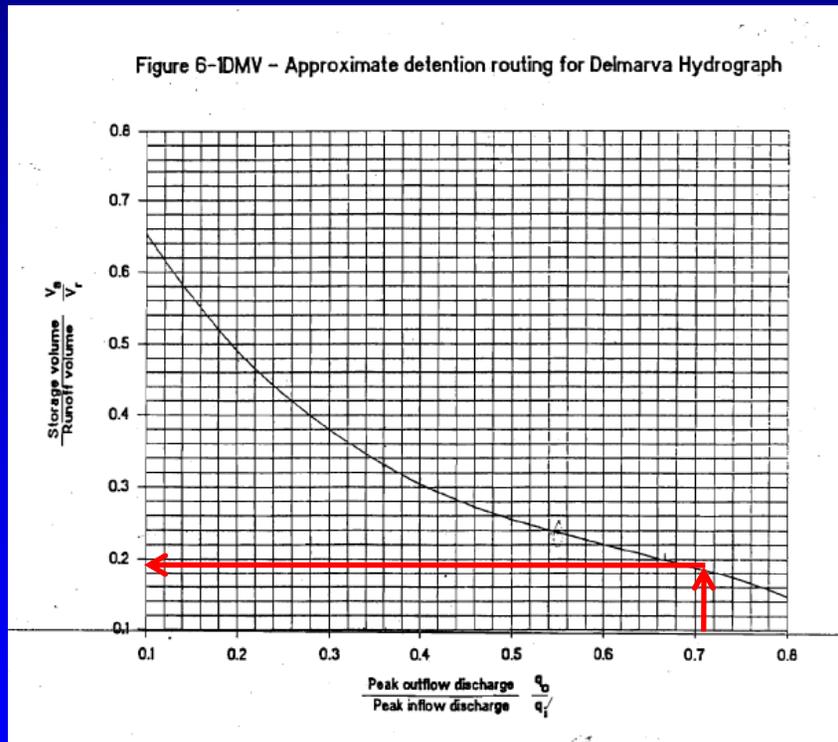
## Std. Unit Hydrograph

Figure 6-1 Approximate detention basin routing for rainfall types I, IA, II, and III



- $q_o = 85$  cfs
- $q_i = 120$  cfs
- $q_o/q_i = 0.71$
- $V_s/V_r = 0.21$

# TR-55, Fig. 6-1DMV Delmarva Unit Hydrograph



- $q_o = 85$  cfs
- $q_i = 120$  cfs
- $q_o/q_i = 0.71$
- $V_s/V_r = 0.19$

# Level 1 H&H Analysis Example Review

# Summary: Quantity Mgt. Compliance

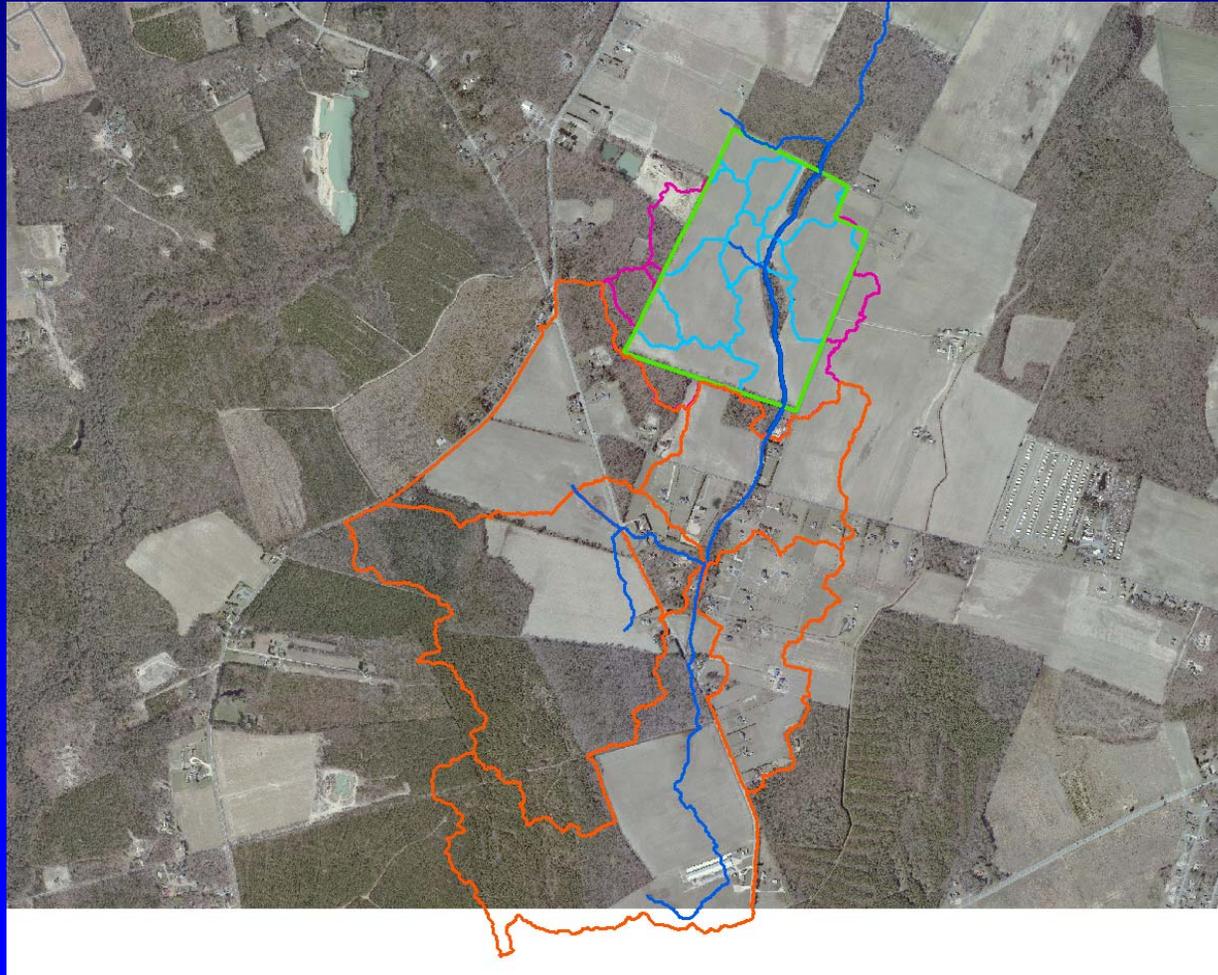


- Conveyance (Cv)
  - ✓ Compliance achieved based on unit discharge analysis
- Flooding (Fv)
  - ✓ Compliance achieved based on Level 1 H&H analysis

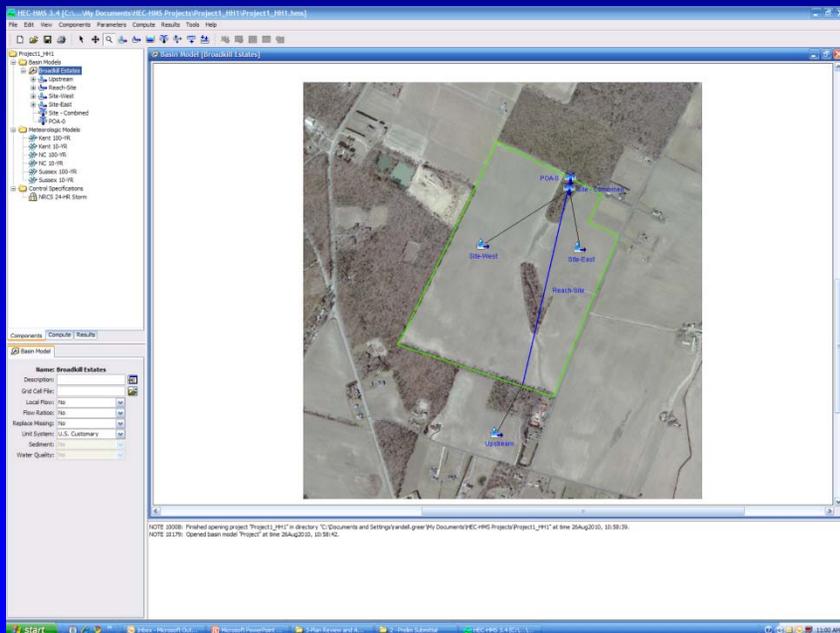
# Level 1 H&H Analysis Example:

Alternative Condition

# Example: Level 1 H&H Analysis Alternative Condition

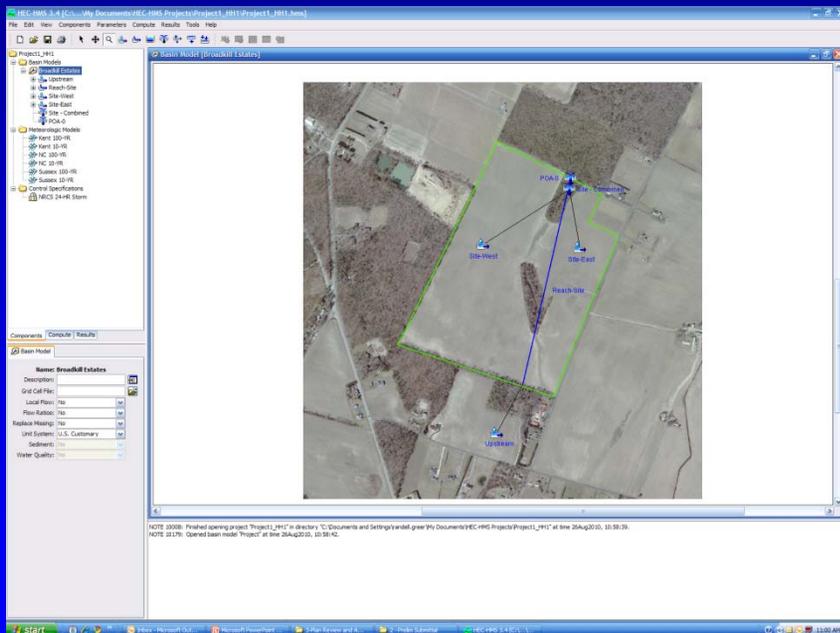


# Level 1 H&H Analysis - Alternative Hec-HMS Input Data



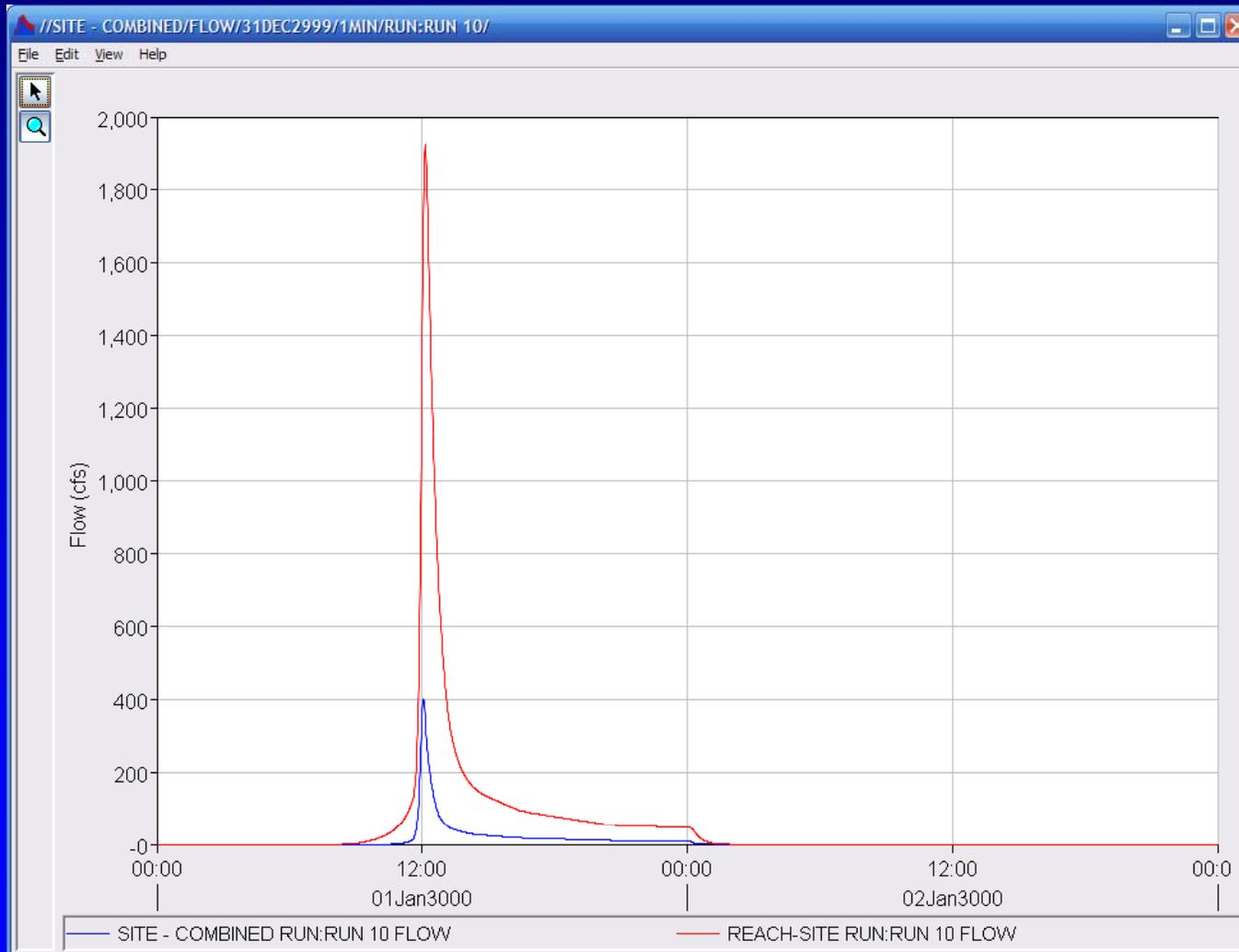
- Site – West
  - Area: 0.14216 mi<sup>2</sup>
  - RCN: 51
  - Lag: 7.2 min.
- Site – East
  - Area: 0.06547 mi<sup>2</sup>
  - RCN: 51
  - Lag: 7.2 min.

# Level 1 H&H Analysis - Alternative Hec-HMS Input Data (cont.)

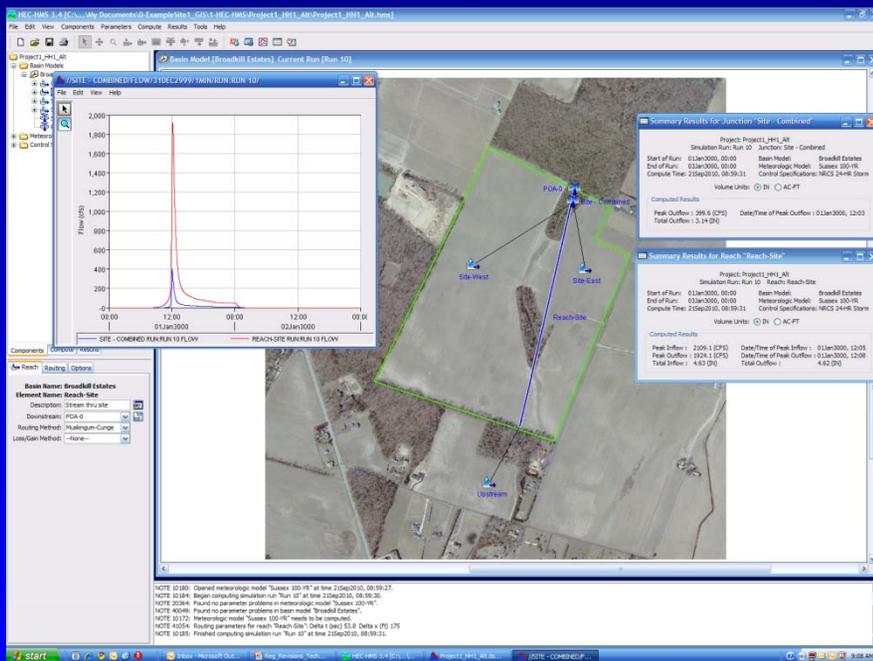


- Upstream
  - Area: 0.84688 mi<sup>2</sup>
  - RCN: 63
  - Lag: 10 min.
- Reach - Site
  - Length: 700 ft.
  - Slope: 0.002 ft/ft
  - Manning's "n": 0.06
  - Geometry: Trapezoid
    - BW = 10 ft.
    - Z = 10:1

# Level 1 H&H Analysis - Alternative Hec-HMS Results



# Level 1 H&H Analysis - Alternative Hec-HMS Results



- Site – Combined
    - $T_p = 12:03$
    - $T_c = 0.2 \text{ hr} = 12 \text{ min}$
    - $T_{inf} = T_p + 0.5665T_c$   
 $= T_p + 7 \text{ min}$   
 $= 12:10$
  - Reach – Site
    - $T_p = 12:08$
- ✘ Site  $T_{inf} > \text{Reach } T_p$

# H&H Analysis Procedure

DRAFT – 04/10

## Procedure for Conducting Hydrologic & Hydraulic Analyses For Preliminary Sediment & Stormwater Plans

### Background

The Hydrologic & Hydraulic (H&H) Analysis couples field collected data with desktop watershed modeling methodology to provide a tool for stormwater management agencies to help determine the most appropriate method to manage stormwater runoff from developing sites based on "No Adverse Impact" principles. The general approach is one of increasing level of detail and analysis depending on the complexity of the watershed. It is NOT intended to be a substitute for detailed Watershed Master Plans. When such detailed plans are available, the Watershed Master Plan shall take precedence. Additionally, the methodologies used for this analysis are not considered to be precise enough to be applied at the site level.

### Procedure

#### 1. Applicability

- 1.1. The H&H analysis will be required for all projects using the performance-based option and/or where a sump condition exists.

#### 2. Methodology

##### 2.1. Level 1 Analysis

- 2.1.1. The Level 1 Analysis combines field reconnaissance data with hydrologic modeling of the upstream watershed and site using latest soils, LULC, and terrain data. Hydrographs are then compared to check for coincidental peaking effects.
- 2.1.2. Limit of study shall be the most-downstream junction of the site and the upstream contributing area.
- 2.1.3. To comply at this level of analysis, hydrologic modeling must indicate no adverse impact due to coincidental peaking effects. For purposes of this policy, "no adverse impact" shall mean that the developed site hydrograph peak is less than, and the inflection point occurs before, the peak of the upstream hydrograph OR that it can be demonstrated that on-site detention would exacerbate downstream impacts. If compliance cannot be demonstrated, proceed to Level 2.

##### 2.2. Level 2 Analysis

- 2.2.1. The Level 2 Analysis combines field measurement data with hydraulic modeling of structures, channels, etc. using an expanded hydrologic model.
- 2.2.2. Limit of the study shall be the point downstream where the site is 10% of the total contributing drainage area. Points of Analysis

- Section 2.1.3  
... If compliance cannot be demonstrated, proceed to Level 2.

# Example: Level 2 H&H Analysis

# Example: Level 2 H&H Analysis

*Procedure for Conducting Hydrologic & Hydraulic Analyses for Preliminary Sediment & Stormwater Plans, Sect. 2.2.2:*

Limit of the study shall be the point downstream where the site is 10% of the total contributing drainage area.

Points of Analysis (POAs) shall be established at the site boundary and all hydraulic structures within the study reach. In cases where there are no hydraulic structures within the study reach, representative section(s) based on LiDAR data shall be used; locations to be determined at the Project Application Meeting.

# Example: Level 2 H&H Analysis

Sediment & Stormwater  
Project Application Package  
for  
Broadkill Estates  
Sussex County, DE



Prepared by:  
GreenTech Consulting, Inc.  
Milton, DE

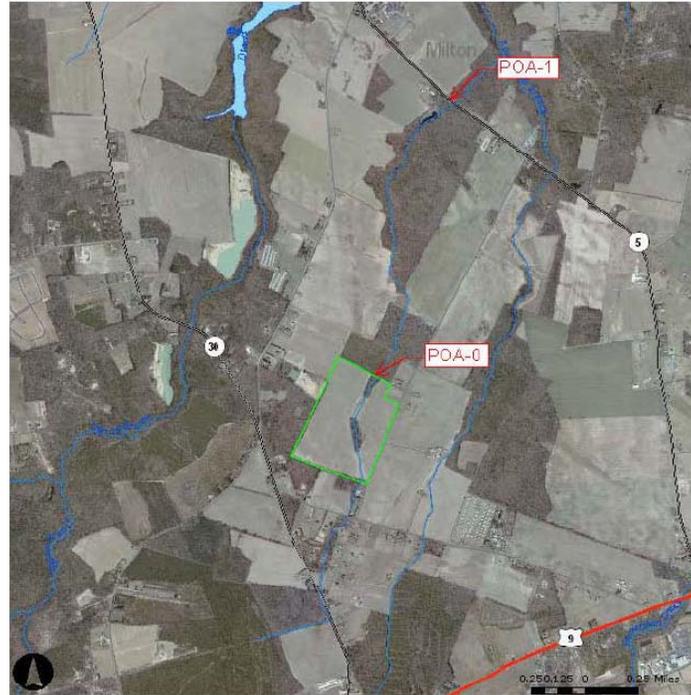


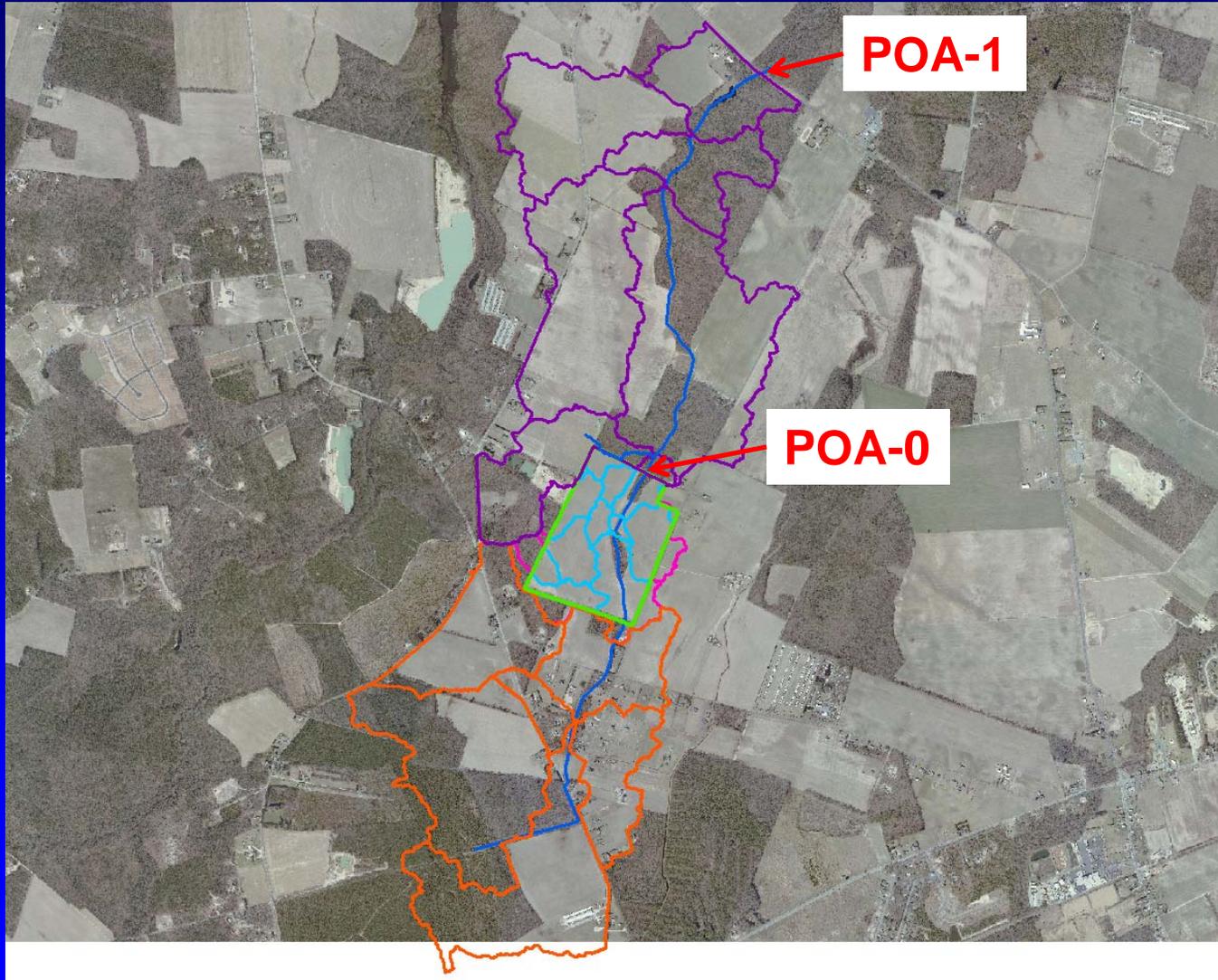
Fig. 1 Broadkill Estates – Points of Analysis (POAs)

# Example: Level 2 H&H Analysis

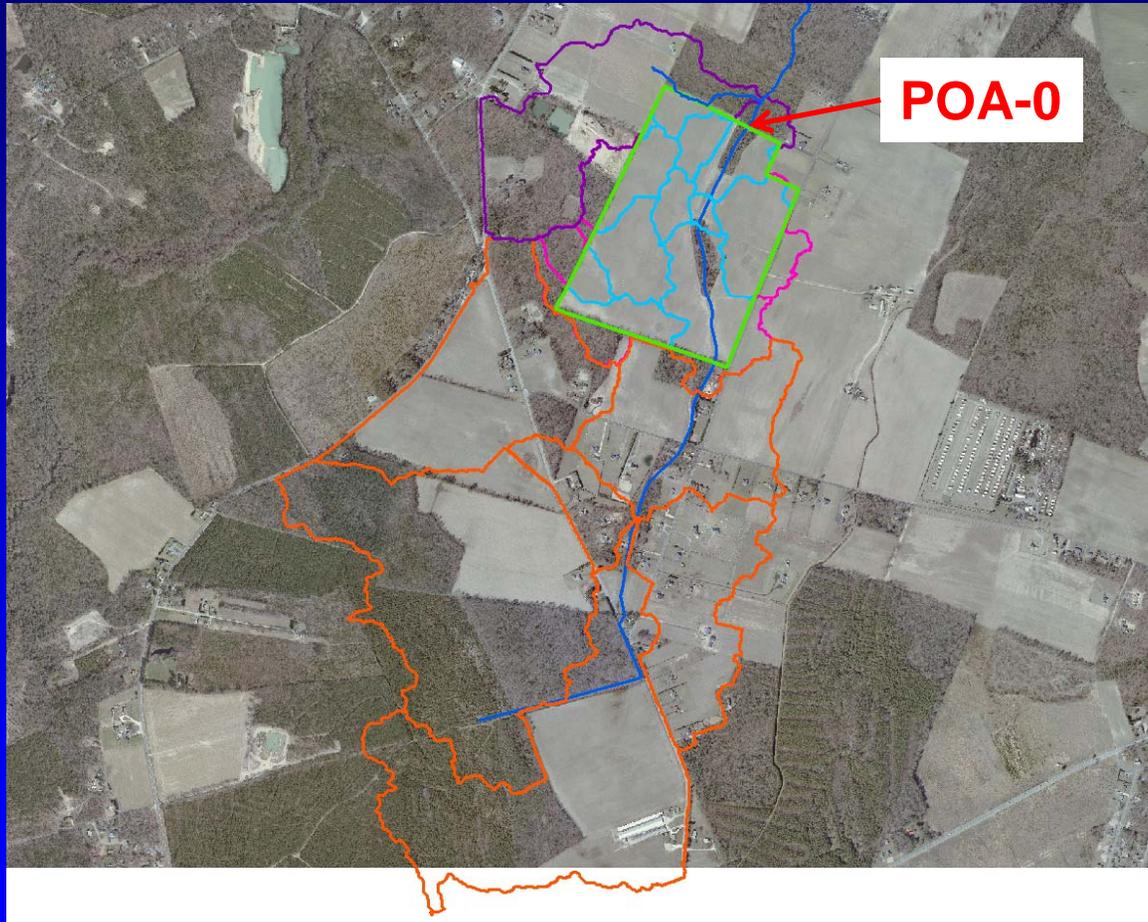
*Procedure for Conducting Hydrologic & Hydraulic Analyses for Preliminary Sediment & Stormwater Plans, Sect. 2.2.3:*

To comply at this level of analysis, steady flow hydraulic modeling must indicate no adverse impacts to headwater, water surface elevations and/or areas of inundation at designated POAs. For purposes of this policy, “no adverse impact” shall mean less than 0.05’ increase in water surface elevations in channels and/or in headwater at hydraulic structures for all points of analysis. In addition, the area of inundation shall not encroach upon buildings or similar structures previously not impacted.

# Example: Level 2 H&H Analysis



# Example: Level 2 H&H Analysis



# Example: Level 2 H&H Analysis

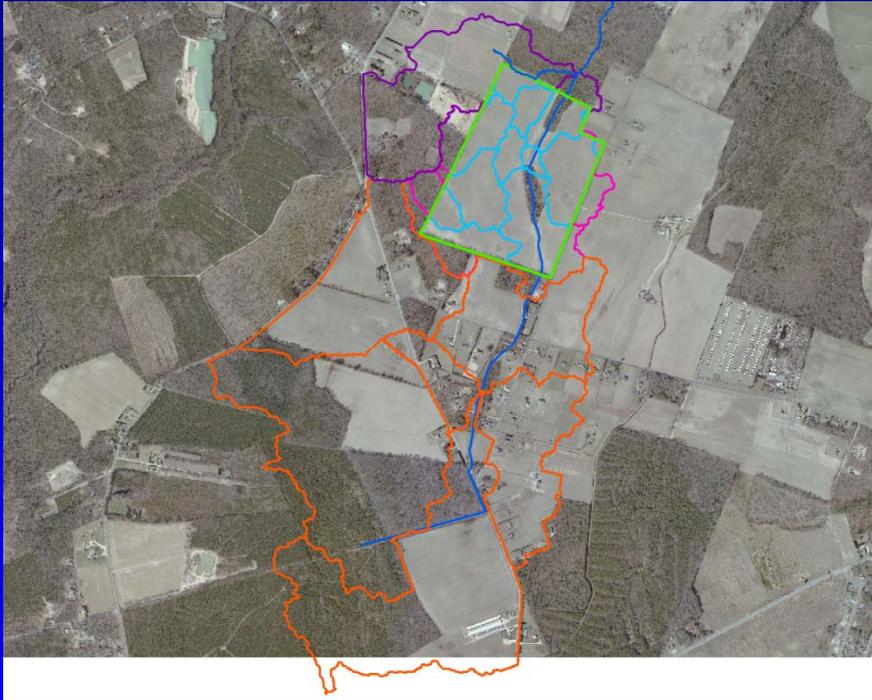
“The following procedure is based on what is considered the minimum requirements for the Level 2 H&H Analysis, which involves determining the water surface elevation for the pre-developed and post-developed conditions at the point of discharge from the site. **The hydraulic model consists of three (3) cross sections.** The middle cross section is established immediately downstream from the site discharge point. A minimum of one cross section upstream and one cross section downstream must be used to ensure the model will yield reasonable results. It may be necessary to analyze additional sections downstream to the “10% Rule” POA based on current Departmental guidance and/or policy.”

*Ref: “Workflow for Performing Level 2 H&H Analysis”, DNREC (draft)*

# Example: Level 2 H&H Analysis



# Example: Level 2 H&H Analysis



- Hydrologic Model
  - Upstream
  - Downstream
  - Site
    - Pre-Developed
    - Post-Developed

# Example: Level 2 H&H Analysis

HEC-HMS 3.4 [C:\...My Documents\0-ExampleSite1\_GIS\1-HEC-HMS\Project1\_HH2\_pre\Project1\_HH2\_pre.hms]

File Edit View Components Parameters Compute Results Tools Help

Project1\_HH2-pre

- Basin Models
  - Broadkill Estates
    - Upstream
    - Reach-Site
    - Site-West
    - Site-East
    - Site - Combined
    - POA-0
    - Downstream Reach 1
    - Downstream Reach 1
    - Downstream XSect 1
  - Meteorologic Models
  - Control Specifications

Basin Model [Broadkill Estates]

Downstream 1

Downstream XSect1

Downstream Reach 1

73.45

77.75

82.00

86.00

Site-West

Site-East

Site - Combined

Reach-Site

Upstream

Components Compute Results

Basin Model

Name: Broadkill Estates

Description:

Grid Cell File:

Local Flow: No

Flow Ratios: No

Replace Missing: No

Unit System: U.S. Customary

Sediment: No

Water Quality: No

NOTE 10008: Finished opening project "Project1\_HH2-pre" in directory "C:\Documents and Settings\andell.greer\My Documents\0-ExampleSite1\_GIS\1-HEC-HMS\Project1\_HH2\_pre" at time 22Sep2010, 11:15:10.

NOTE 10179: Opened basin model "Broadkill Estates" at time 22Sep2010, 11:15:15.

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Microsoft PowerPoint ...

ExampleSite1.mxd - ...

Broadkill Estates

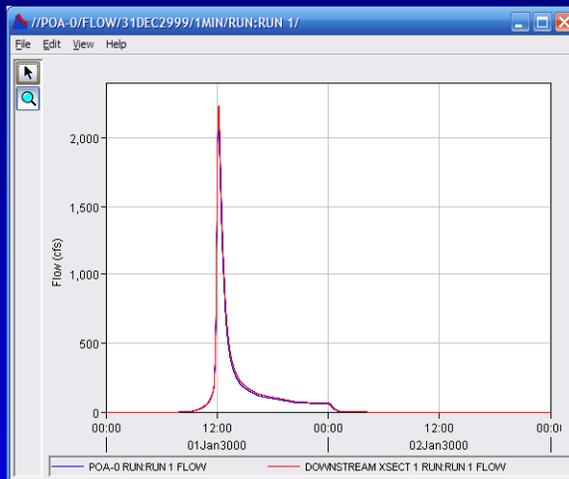
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HH2 Analysis Proced...

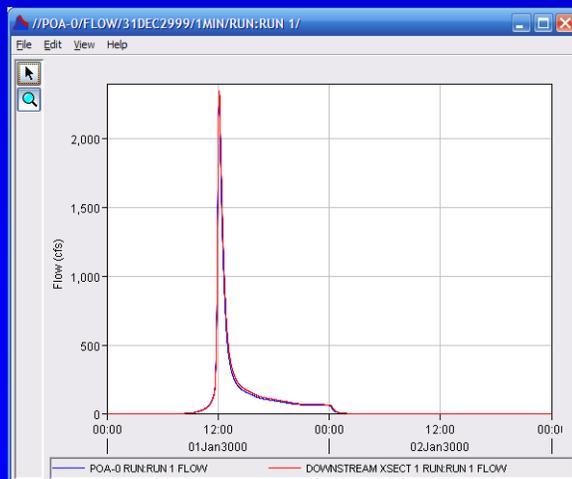
HEC-HMS 3.4 [C:\...]

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# Example: Level 2 H&H Analysis

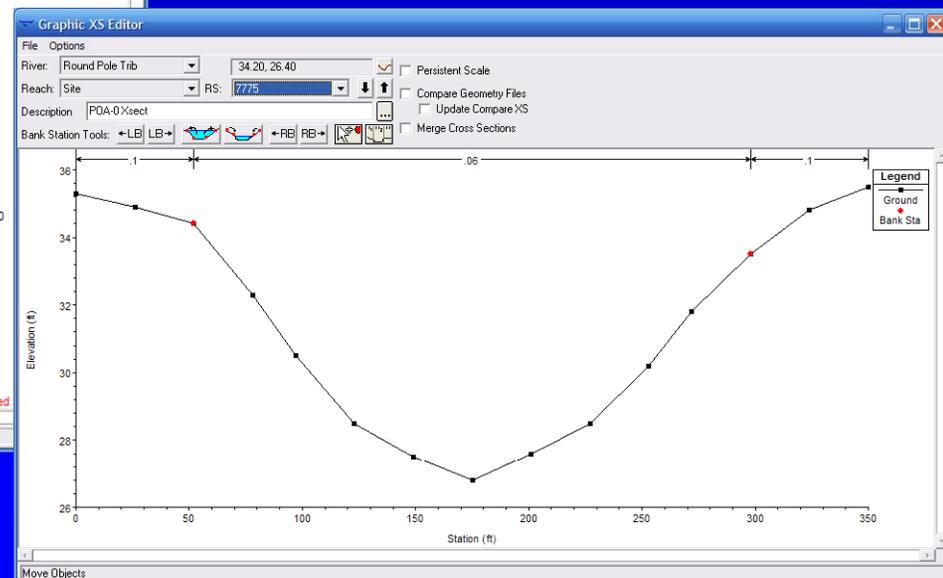
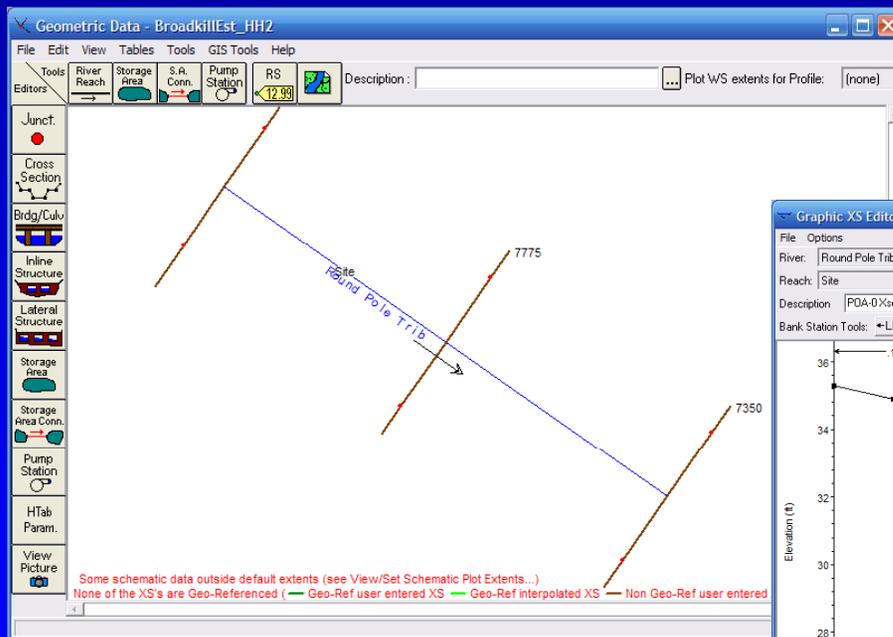
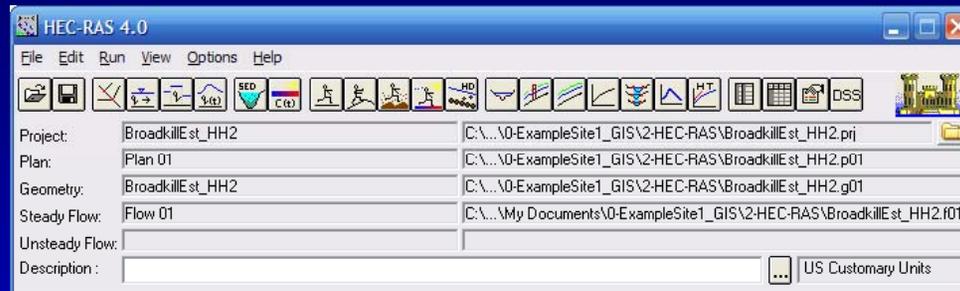


- 100-YR (Pre-Dev.)
  - POA-0: 2,152 cfs
  - Sta. 73+50: 2,233 cfs

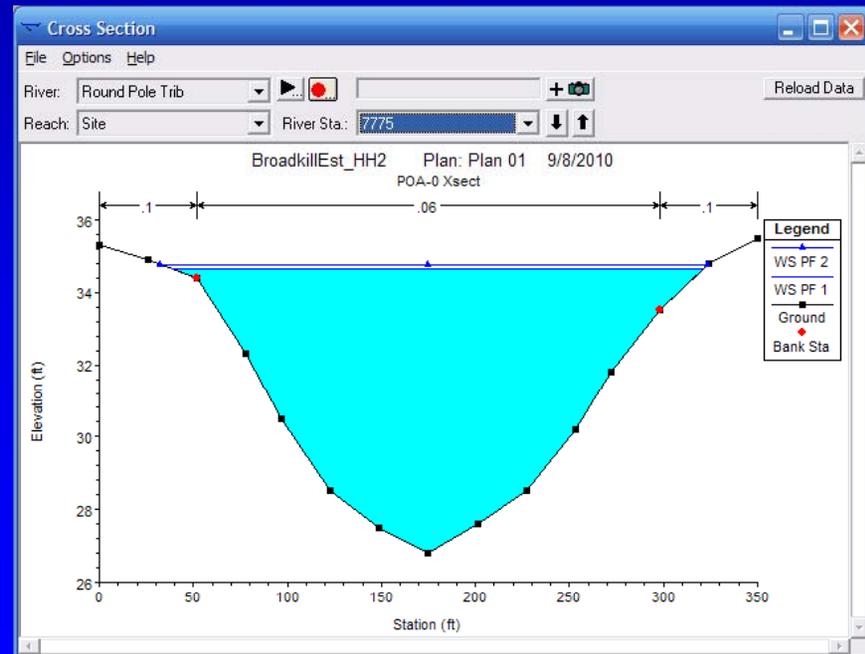
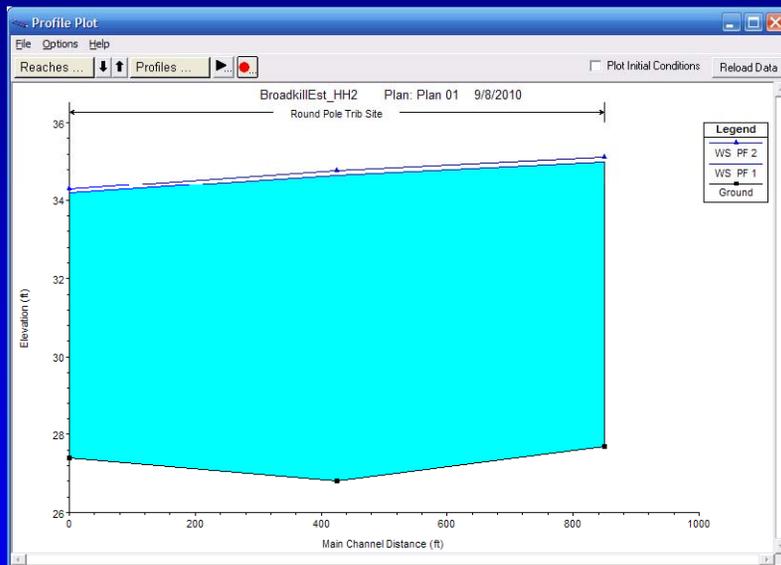


- 100-YR (Post-Dev.)
  - POA-0: 2,278 cfs
  - Sta. 73+50: 2,345 cfs

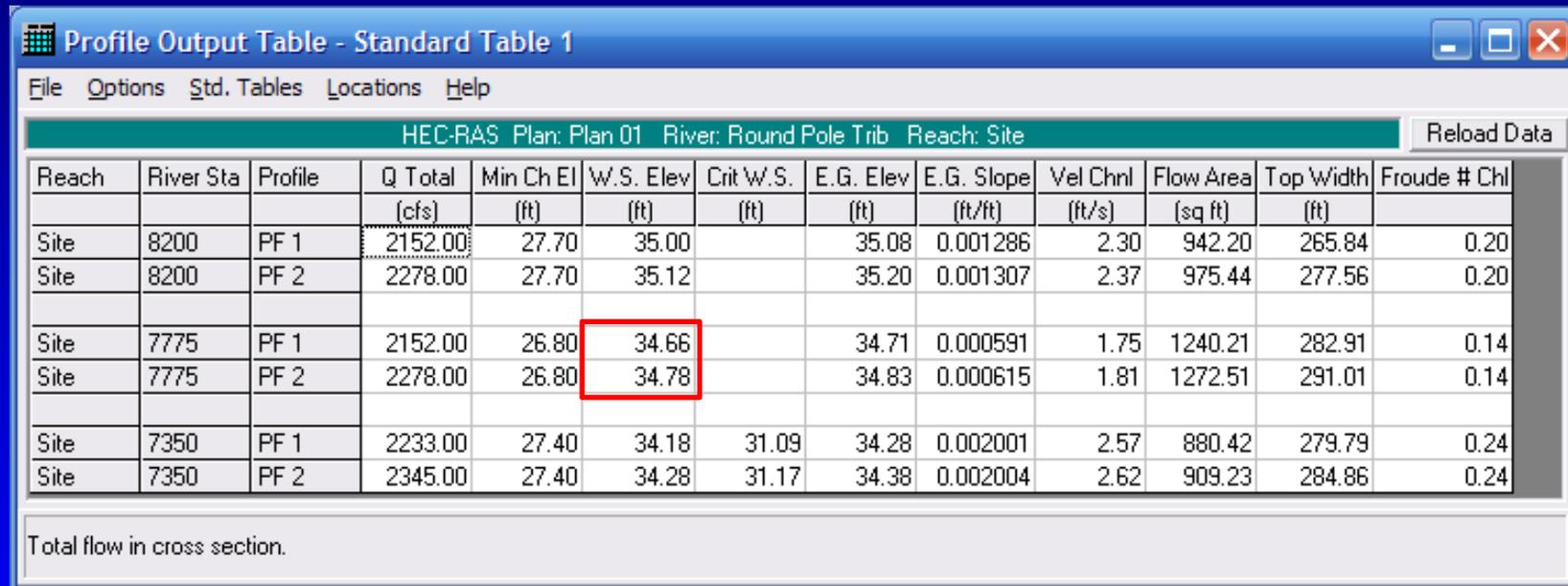
# Example: Level 2 H&H Analysis



# Example: Level 2 H&H Analysis Results



# Example: Level 2 H&H Analysis Results



Profile Output Table - Standard Table 1

HEC-RAS Plan: Plan 01 River: Round Pole Trib Reach: Site

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Site	8200	PF 1	2152.00	27.70	35.00		35.08	0.001286	2.30	942.20	265.84	0.20
Site	8200	PF 2	2278.00	27.70	35.12		35.20	0.001307	2.37	975.44	277.56	0.20
Site	7775	PF 1	2152.00	26.80	34.66		34.71	0.000591	1.75	1240.21	282.91	0.14
Site	7775	PF 2	2278.00	26.80	34.78		34.83	0.000615	1.81	1272.51	291.01	0.14
Site	7350	PF 1	2233.00	27.40	34.18	31.09	34.28	0.002001	2.57	880.42	279.79	0.24
Site	7350	PF 2	2345.00	27.40	34.28	31.17	34.38	0.002004	2.62	909.23	284.86	0.24

Total flow in cross section.

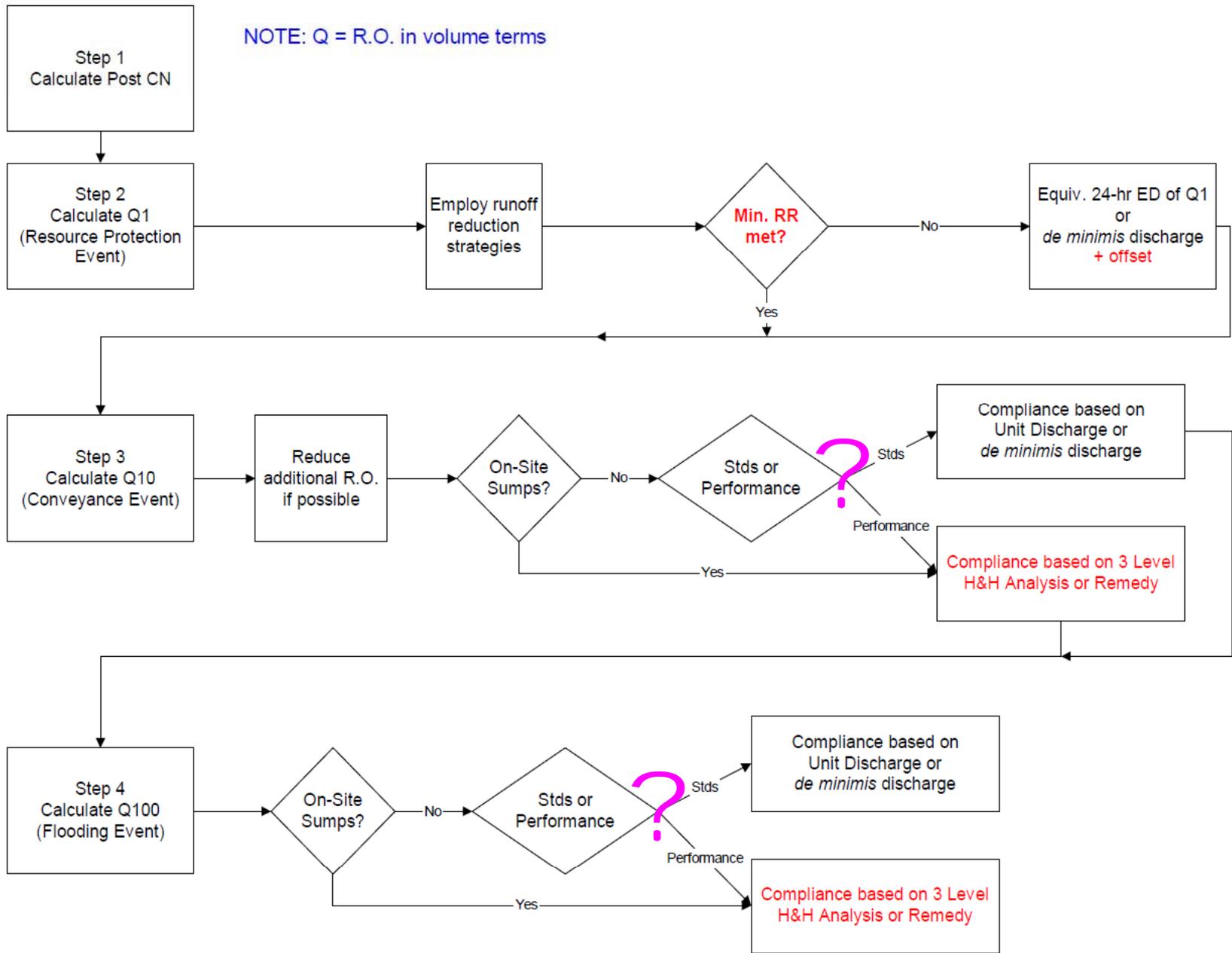
Compliance Check:

- $34.78' - 36.66' = 0.12'$

✘  $0.12' > 0.05'$

Questions???

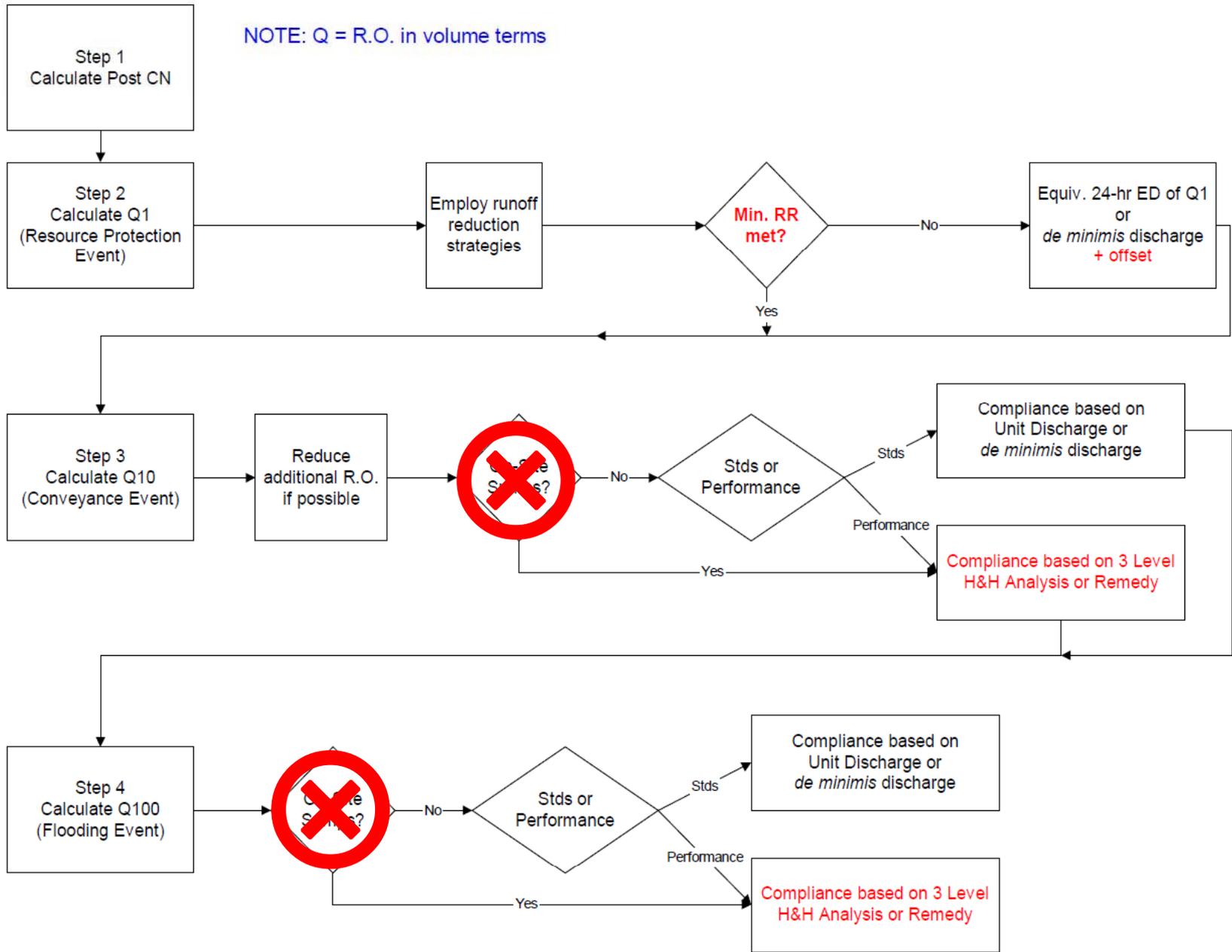
# Plan Review Process: Update



DRAFT - August 2009

Assessment Item	Rating Criteria		
	Minor	Moderate	Significant
1. Soils - On-site soils have low permeability, high water table, or other limitations that could adversely affect adequate stormwater management for the proposed project.	<15% of developed portion of the site has soils with limitations to development (i.e. high water table, erosivity, excavations)	15% - 50% of developed portion of the site has soils with limitations to development (i.e. high water table, erosivity, excavations)	>50% of developed portion of the site has soils with limitations to development (i.e. high water table, erosivity, excavations)
2. Runoff Potential - Change in land cover due to removal of trees, increases in impervious cover, etc. could adversely affect adequate stormwater management for the proposed project.	<25% existing woods/meadow to be disturbed  OR  <25% proposed impervious area	25%-50% existing woods/meadow to be disturbed  OR  25%-50% proposed impervious area	> 50% existing woods/meadow to be disturbed  OR  > 50% proposed impervious area
3. Water Quality - Pollutant loadings associated with proposed project could adversely affect adequate stormwater management.	Targeted pollutants capable of treatment with standard BMPs	Targeted pollutants will require treatment train approach to achieve reduction goals	Targeted pollutants will require a Best Available Technology solution to achieve reduction goals
4. Sump Conditions - Existing topography of site creates depressional areas (closed 2' contours) where runoff tends to collect without direct discharge.	<15% of site area drains to sump areas	15% - 50% of site area drains to sump areas	>50% of site area drains to sump areas
5. Discharge Points - Areas where stormwater runoff leaves the site have limitations due to low gradient, backwater effects, lack of a defined channel or other hydraulic limitations.	Zero (0) site discharge points with identified problems  OR  <10% of site area drains to a discharge point with an identified problem	At least one (1) site discharge point with an identified problem  OR  10% - 50% of site area drains to a discharge point with an identified problem	Multiple (more than 1) discharge point with an identified problem  OR  >50% of site area drains to a discharge point with an identified problem  OR  Lack of easements and/or alteration of drainage patterns could raise potential "right-to-discharge" issues.
6. Off-Site Drainage - Areas draining into the site could adversely affect adequate stormwater management for the proposed project.	<25% offsite area relative to site area draining onto site	5% - 50% offsite area relative to site area draining onto site	>50% offsite area relative to site area draining onto site
7. Conveyance - Downstream conditions such as inadequate pipe or channel capacity could limit adequate drainage from the site.	Zero (0) known historic drainage problems  OR  Zero (0) in-line structures prior to the 10% analysis point	At least one (1) known historic drainage problem  OR  At least one (1) in-line structure prior to the 10% analysis point	Multiple (more than 1) known historic drainage problems  OR  Multiple (more than 1) in-line structures prior to the 10% analysis point  OR  Stream channel condition degraded due to vegetation, slope, erosion, etc.

NOTE: Q = R.O. in volume terms

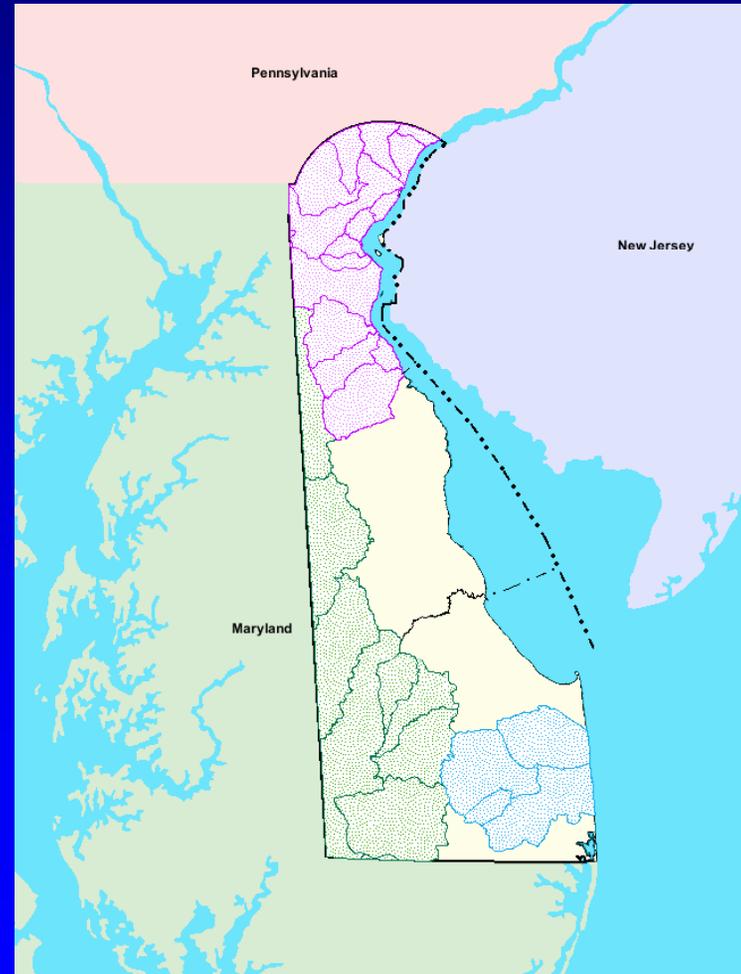




Executive Order 13508  
**Draft Strategy for**  
**TMDLs in**  
**the Chesapeake Bay**

November 9, 2009

Developed by the Federal Leadership Committee for the Chesapeake Bay



# Chesapeake Bay Model

## Chesapeake Bay Watershed Model

- **Development History:**

- First version in 1982
- Current version is phase 5.3



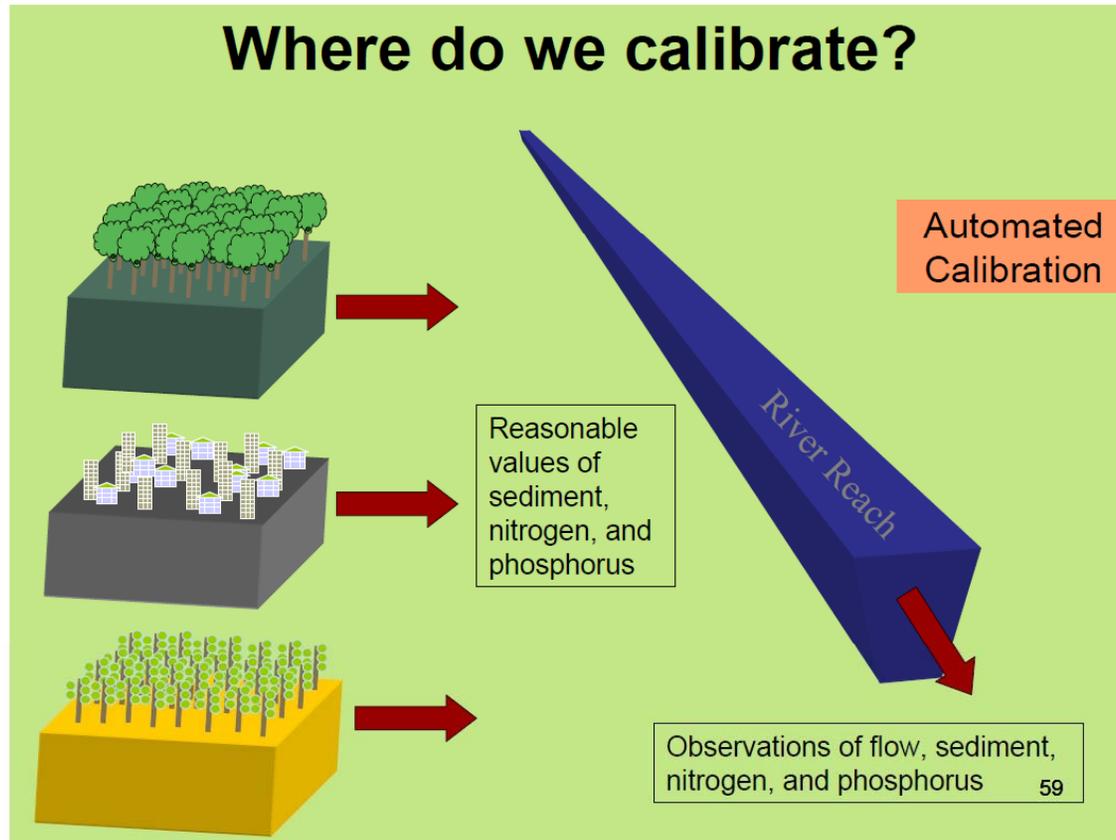
- **Peer Review Status:** CBP STAC independent peer reviews of Phase 5 model conducted in 2007 and 2009

- **More Information:**

- <http://ches.communitymodeling.org/models/CBPhase5/index.php>
- <ftp://ftp.chesapeakebay.net/modeling/phase5/community/p52An/>

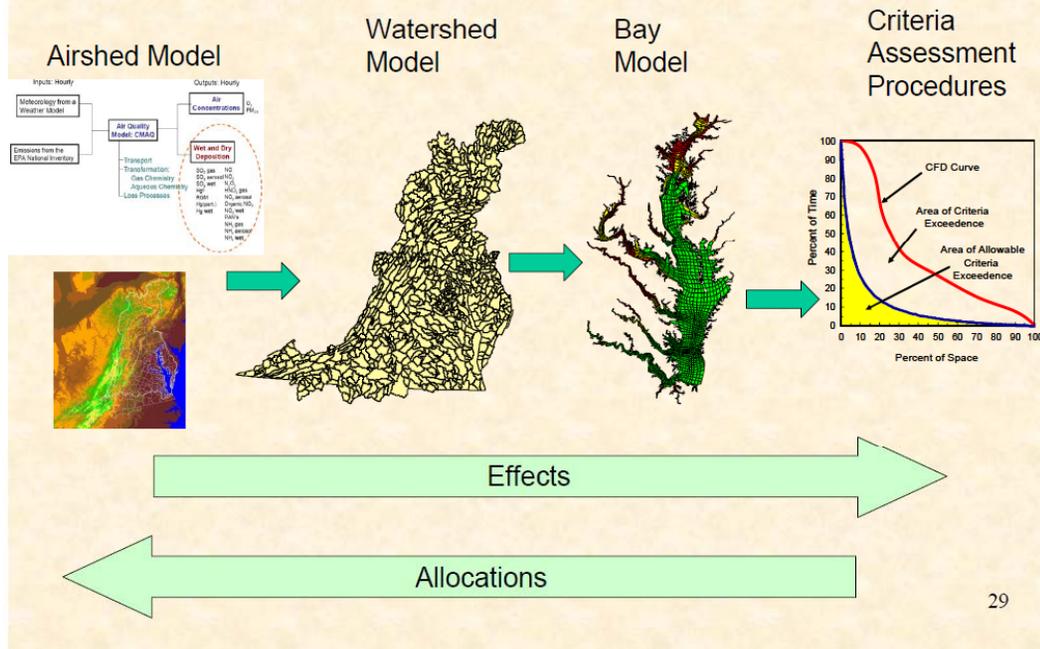
# Chesapeake Bay Model

## Where do we calibrate?



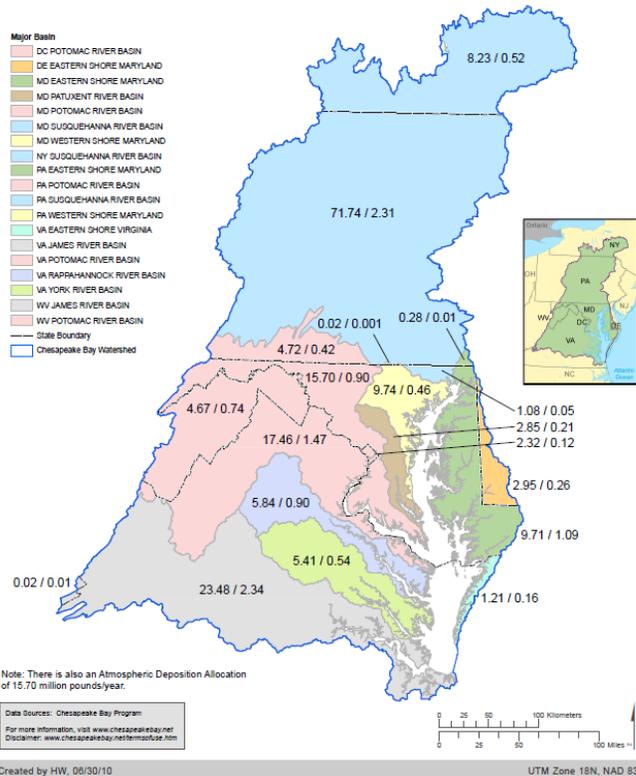
# Chesapeake Bay Model

## Nutrient Allocation Decision Support System



# Chesapeake Bay Model

**Chesapeake Bay Major River Basin Nitrogen and Phosphorus July 1, 2010 Proposed Allocations**  
(N / P in million pounds per year)



**Table 1. Chesapeake Bay Watershed Sediment Draft Allocations by Basin**

Basin/Jurisdiction	Sediment Allocation Range (million pounds total suspended solids (TSS) per year)
<b>SUSQUEHANNA</b>	
NY	293-322
PA	1,660-1,826
MD	60-66
<b>SUSQUEHANNA Total</b>	<b>2,013-2,214</b>
<b>EASTERN SHORE</b>	
DE	58-64
MD	166-182
PA	21-23
VA	11-12
<b>EASTERN SHORE Total</b>	<b>256-281</b>
<b>WESTERN SHORE</b>	
MD	155-170
PA	0.37-0.41
<b>WESTERN SHORE Total</b>	<b>155-171</b>
<b>PATUXENT</b>	
MD	82-90
<b>PATUXENT Total</b>	<b>82-90</b>
<b>POTOMAC</b>	
PA	221-243
MD	654-719
DC	10-11
VA	810-891
WV	226-248
<b>POTOMAC Total</b>	<b>1,920-2,113</b>
<b>RAPPAHANNOCK</b>	
VA	681-750
<b>RAPPAHANNOCK Total</b>	<b>681-750</b>
<b>YORK</b>	
VA	107-118
<b>YORK Total</b>	<b>107-118</b>
<b>JAMES</b>	
VA	837-920
WV	15-17
<b>JAMES Total</b>	<b>852-937</b>
<b>Total Basinwide Draft Allocation<sup>1</sup></b>	<b>6,066-6,673</b>

<sup>1</sup> The basinwide allocation range rounds up to 6.1-6.7 billion pounds per year.

# Chesapeake Bay Model

## CBP Urban/Suburban BMPs

### Other Urban/Suburban BMP

- Forest Conservation
- Impervious Surface and Urban Growth Reduction
- Forest Buffers (Urban)
- Tree Planting (Urban)
- Grass Buffers (Urban)
- Stream Restoration (Urban)
- Erosion and Sediment Control
- Nutrient Management (Urban)
- Street Sweeping
- Forest Buffers (Mixed Open)
- Wetland Restoration (Mixed Open)
- Tree Planting (Mixed Open)
- Nutrient Management (Mixed Open)
- Abandoned Mine Reclamation
- Non-Urban Stream Restoration (Mixed Open)
- Dirt and Gravel Road Erosion and Sediment Control (Mixed Open)

### Stormwater Management

- Wet Ponds and Wetlands
- Dry Detention Ponds and Hydrodynamic Structures
- Dry Extended Detention Ponds
- Urban Infiltration Practices
- Urban Filtering Practices
- Recent/Retrofit Stormwater Management

### Septic BMPs

- Septic Connections
- Septic Denitrification
- Septic Pumping

# Chesapeake Bay Model



## BMPs With Nutrient and Sediment Reduction Efficiencies

### How Efficiency BMPs Are Credited In The Model:

$$\text{Reduction} = \frac{\text{acres treated by BMP}}{\text{total segment acres}} * \text{BMP efficiency}$$

- By Landuse and Model Segment

# DURMM v.2

DURMM\_V0\_2020-07-26\_locked.xlsx (Compatibility Mode) - Microsoft Excel

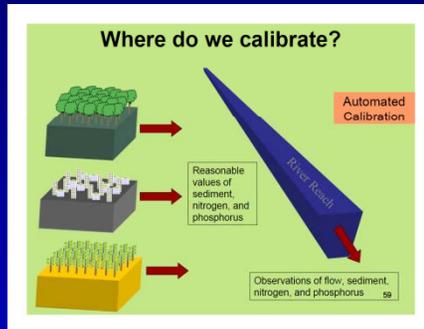
Broadkill River

PROJECT: Broadkill Estates  
 DRAINAGE SUBAREA ID: East Drainage  
 TMDL WATERSHED: Broadkill River

	BMP 1			BMP 2			BMP 3			BMP 4			BMP 5		
	Type:	RfDisnet		Type:	DBIoswale		Type:	Infiltration		Type:	0		Type:	0	
1.1 Total contributing area to BMP (ac)	Data	N	P	Data	N	P	Data	N	P	Data	N	P	Data	N	P
1.2 Contributing area RCN	41.90														
1.3 Runoff volume (in)	53														
1.4 Runoff volume (liters)	0.33														
1.4 Runoff volume (liters)	1418241														
2.1 EMC (mg/l)	2.0	0.26													
2.2 Load (mg)	2836482	368743		2669958	347095		2519817	327576		1639682	213159		#N/A	#N/A	
2.3 Load (lb)	6.25	0.81		5.89	0.77		5.56	0.72		3.62	0.47		#N/A	#N/A	
3.1 BMP Runoff Reduction (%)	6%			12%			46%			#N/A			#N/A		
3.2 Adjusted load (lb)	5.89	0.77		5.56	0.72		3.61	0.47		#N/A	#N/A		#N/A	#N/A	
4.1 BMP Removal Efficiency	0%	0%		0%	0%		0%	0%		#N/A	#N/A		#N/A	#N/A	
4.2 Adjusted load (lb)	5.89	0.77		5.56	0.72		3.61	0.47		#N/A	#N/A		#N/A	#N/A	
5A.1 Required Reduction for TMDL (%)	40%	40%		40%	40%		40%	40%		40%	40%		40%	40%	
5A.2 BMP pollutant reduction (%)	6%	6%		11%	11%		42%	42%		#N/A	#N/A		#N/A	#N/A	
5A.3 Reduction met?	No	No		No	No		OK	OK		#N/A	#N/A		#N/A	#N/A	
5B.1 Irreducible concentration (mg/l)	1.2	0.11		1.2	0.11		1.2	0.11		1.2	0.11		1.2	0.11	
5B.2 Load (mg)	2669958	347095		2519817	327576		1639682	213159		#N/A	#N/A		#N/A	#N/A	
5B.3 Adjusted runoff volume (liters)	1334728	1334728		1254724	1254724		759179	759179		#N/A	#N/A		#N/A	#N/A	
5B.4 Effluent concentration (mg/l)	2.00	0.26		2.01	0.26		2.16	0.28		#N/A	#N/A		#N/A	#N/A	
5B.5 Effluent $\leq$ irreducible concentration?	No	No		No	No		OK	OK		#N/A	#N/A		#N/A	#N/A	

**NOTE: The TMDL sheet contained in the demo version is patterned after the process developed under the Inland Bays Pollution Control Strategy for a flat percentage pollutant reduction. This is likely to change under the proposed revisions to the DSSR.**

# DURMM v.2 - TMDLs



### CBP Urban/Suburban BMPs

Other Urban/Suburban BMP	Stormwater Management
<ul style="list-style-type: none"> <li>Forest Conservation</li> <li>Impervious Surface and Urban Growth Reduction</li> <li>Forest Buffers (Urban)</li> <li>Tree Planting (Urban)</li> <li>Grass Buffers (Urban)</li> <li>Stream Restoration (Urban)</li> <li>Erosion and Sediment Control</li> <li>Nutrient Management (Urban)</li> <li>Street Sweeping</li> <li>Forest Buffers (Mixed Open)</li> <li>Wetland Restoration (Mixed Open)</li> <li>Tree Planting (Mixed Open)</li> <li>Nutrient Management (Mixed Open)</li> <li>Abandoned Mine Reclamation</li> <li>Non-Urban Stream Restoration (Mixed Open)</li> <li>Dirt and Gravel Road Erosion and Sediment Control (Mixed Open)</li> </ul>	<ul style="list-style-type: none"> <li>Wet Ponds and Wetlands</li> <li>Dry Detention Ponds and Hydrodynamic Structures</li> <li>Dry Extended Detention Ponds</li> <li>Urban Infiltration Practices</li> <li>Urban Filtering Practices</li> <li>Reconstruct/Retrofit Stormwater Management</li> </ul>
<ul style="list-style-type: none"> <li>Septic BMPs</li> <li>Septic Connections</li> <li>Septic Denitrification</li> <li>Septic Pumping</li> </ul>	

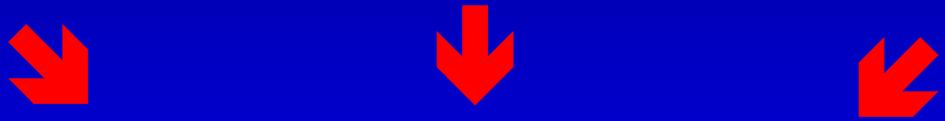
86

### BMPs With Nutrient and Sediment Reduction Efficiencies

How Efficiency BMPs Are Credited In The Model:

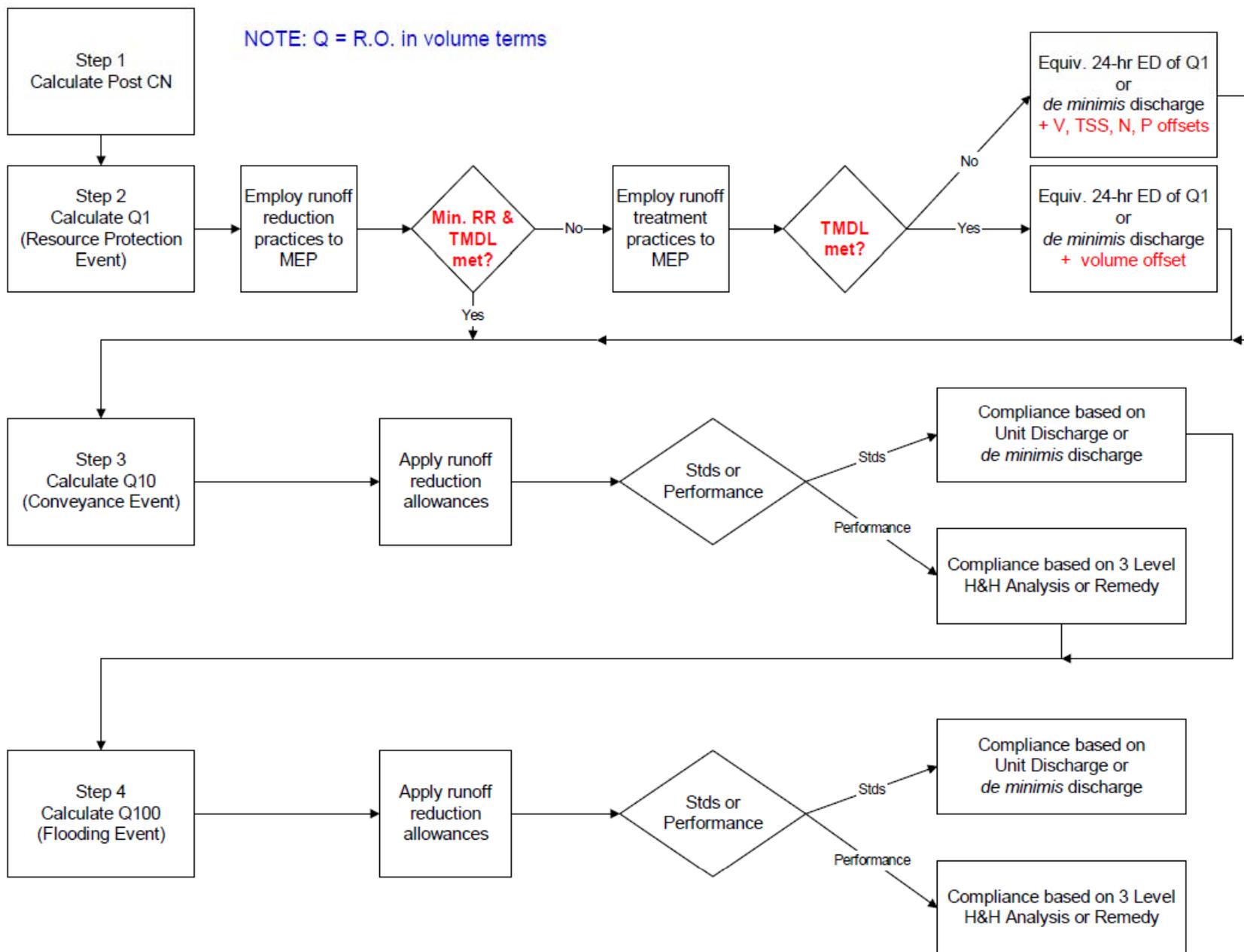
$$\text{Reduction} = \frac{\text{acres treated by BMP} \times \text{BMP efficiency}}{\text{total segment acres}}$$

- By Landuse and Model Segment



Step	Category	Subcategory	Value	Unit
1	Calculate-Point Source	1.1 Point Source Load	1000000	lbs/yr
2	Calculate-Nonpoint Source	2.1 Nonpoint Source Load	2000000	lbs/yr
3	Calculate-Total Load	3.1 Total Load	3000000	lbs/yr
4	Calculate-Point Source	4.1 Point Source Load	1000000	lbs/yr
5	Calculate-Nonpoint Source	5.1 Nonpoint Source Load	2000000	lbs/yr
6	Calculate-Total Load	6.1 Total Load	3000000	lbs/yr





# Questions???

The screenshot shows a Windows Internet Explorer browser window displaying the website <http://www.swc.delaware.gov/Drainage/Pages/RegRevisions.aspx>. The page features a header with the State of Delaware logo and a search bar. The main content area is titled "Revisions To The Delaware Sediment And Stormwater Regulations" and includes a sidebar with navigation links, a central text block, and a list of documents.

**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

**Drainage & Stormwater Section**

## 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](mailto:Elaine.Webb@state.de.us).

# *Discussion*

