VERMONT

Overview of the NYS Stormwater Management Design Manual Runoff Reduction Standard

Vermont Stormwater Management Manual Update, Meeting #2

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Shelburne, Vermont Town Office

November 1, 2013

STONE ENVIRONMENTAL INC

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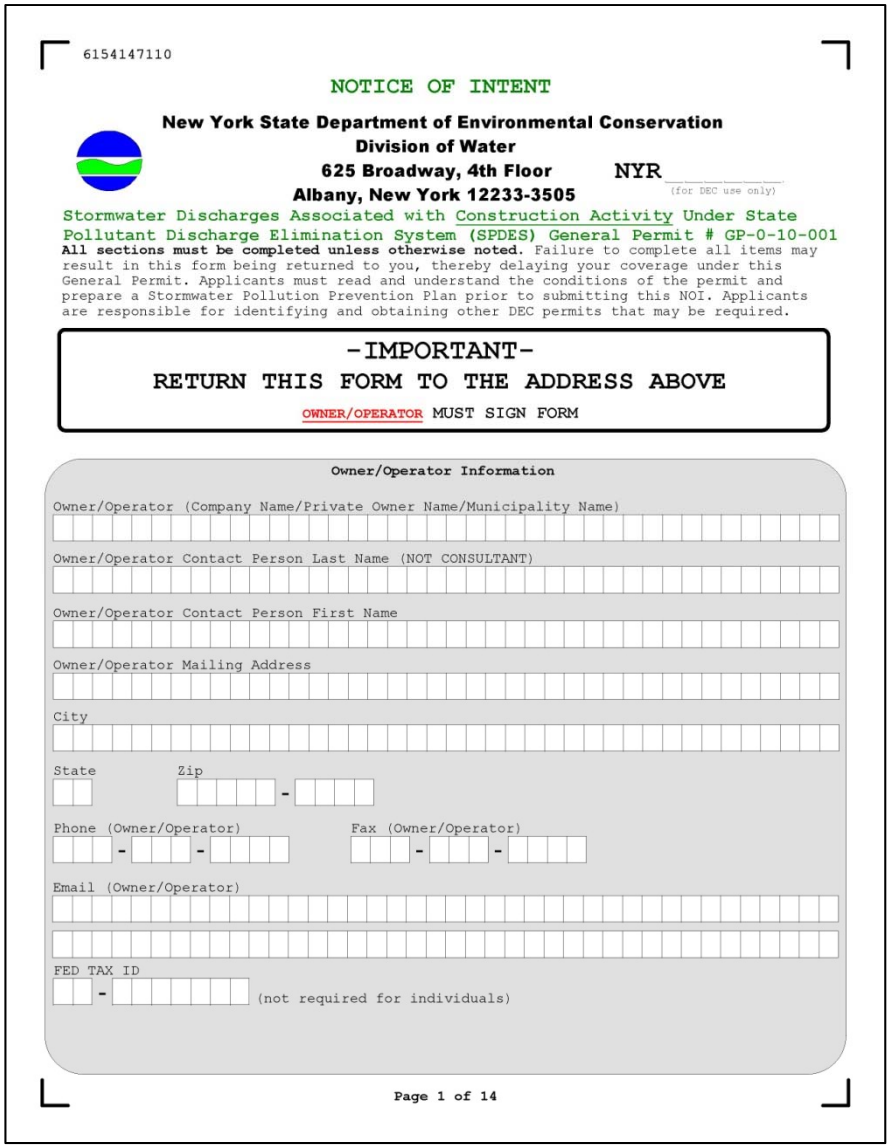
Sustainable Environmental Solutions

Adamant Accord

Meeting Facilitation and Mediation Services

Applicability in NY: New York SPDES Permit No GP-0-10-001



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NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR _____
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-10-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-
RETURN THIS FORM TO THE ADDRESS ABOVE
OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State Zip

Phone (Owner/Operator) Fax (Owner/Operator)

Email (Owner/Operator)

FED TAX ID (not required for individuals)

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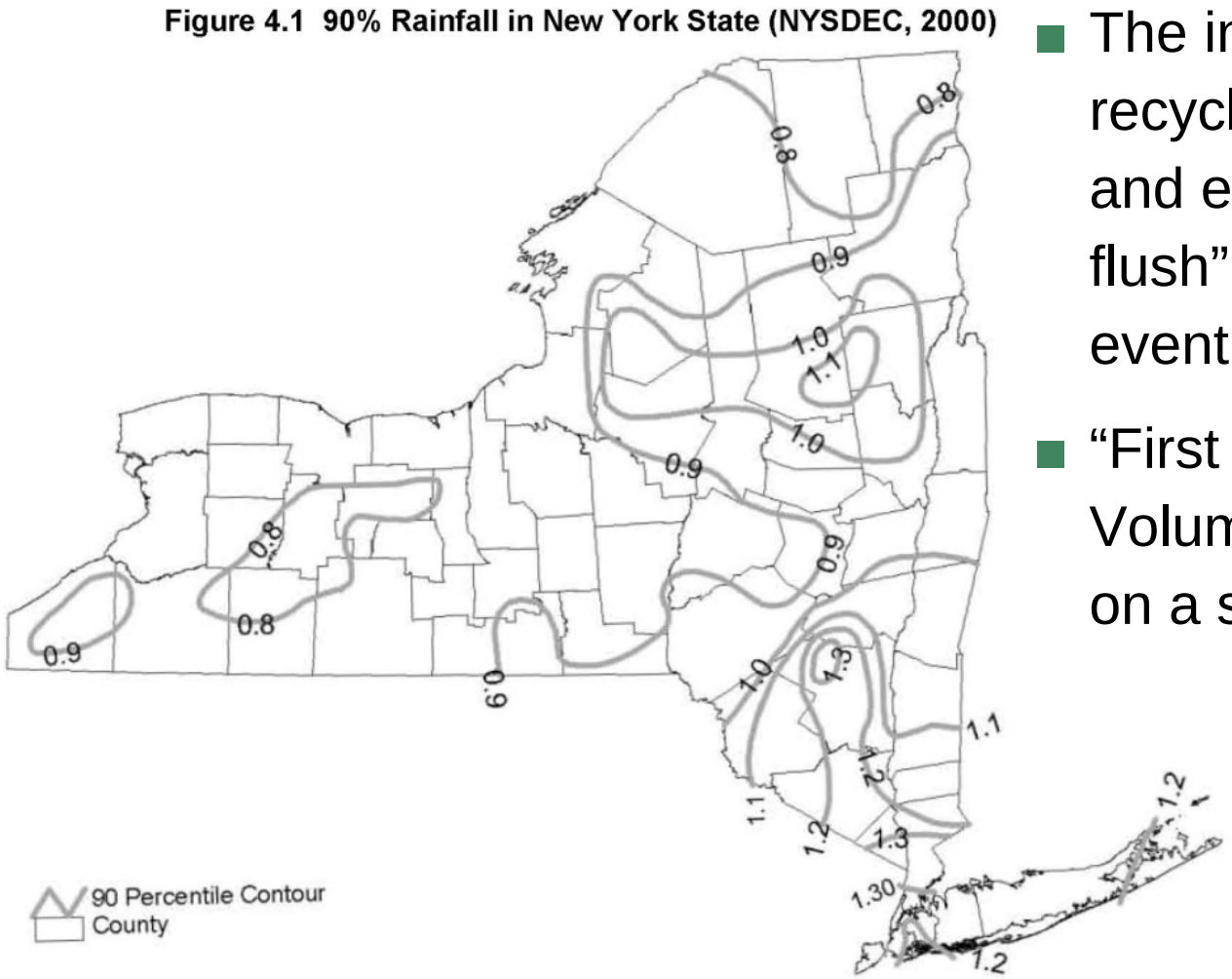
- New development and redevelopment projects that result in a land disturbance of one acre +
- Includes projects less than one acre that are part of a larger common plan of development or sale, OR if controlling such activities in a watershed is required by NYSDEC
- Standards apply statewide, administered by NYSDEC
- Single NOI and Stormwater Pollution Prevention Plan (SWPPP) for construction and post-construction

What is “Runoff Reduction” (RR) in NY?



- The infiltration, reuse, recycling, evapotranspiration, and evaporation of the “first flush” of runoff during a rainfall event
- “First flush” = Water Quality Volume = 90% of all the runoff on a site = 0.8 to 1.3 inches

Where does RRv fit in standards / sizing criteria? (P.4-1)

Table 4.1 New York Stormwater Sizing Criteria[1]	
Water Quality Volume (WQv)	**90% Rule:** WQ_v(acre-feet) = [(P)(Rv)(A)] /12 Rv = 0.05+0.009(I) I = Impervious Cover (Percent) Minimum Rv = 0.2 if WQv > RRv P(inch) = 90% Rainfall Event Number (See Figure 4.1)[2] A = site area in acres
Runoff Reduction Volume(RRv)	RRv (acre-feet)= Reduction of the total WQv by application of green infrastructure techniques and SMPs to replicate pre-development hydrology. The minimum required RRv is defined as the Specified Reduction Factor (S), provided objective technical justification is documented.

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Channel Protection Volume(Cpv)	**Default Criterion:** Cp_v(acre-feet)= 24 hour extended detention of post-developed 1-year, 24-hour storm event; remaining after runoff reduction. Where site conditions allow, Runoff reduction of total CPv , is encouraged **Option for Sites Larger than 50 Acres:** Distributed Runoff Control - geomorphic assessment to determine the bankfull channel characteristics and thresholds for channel stability and bedload movement.
Overbank Flood (Q_p)	Q_p(cfs)=Control the peak discharge from the 10-year storm to 10-year predevelopment rates.
Extreme Storm (Q_f)	Q_f(cfs)=Control the peak discharge from the 100-year storm to 100-year predevelopment rates. Safely pass the 100-year storm event.
Alternative method (WQv):	Design, construct, and maintain systems sized to capture, reduce, reuse, treat, and manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 95th percentile rainfall event, computed by an acceptable continuous simulation model.

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RRv Requirements

- Green Infrastructure (GI) planning practices are to be employed “to the Maximum Extent Practicable (MEP)”
- RR target is to reduce 100% of the WQv
- Projects that cannot meet target must provide a justification that evaluates each GI technique and identifies specific limitations

RRv Infeasibility Criteria

- Physical constraints
  - Hydraulic conditions, soil testing, steep slopes, other existing technical limitations must be objectively documented
- Feasibility CANNOT based on
  - Cost of implementation measures
  - Lack of space for required practice footprint

RRv Minimums

This pilot wet meadow and infiltrating bioswale facility at Spring Creek MTA Bus Terminal in NYC is retaining 100% of measured inflow for storm depths up to 4 inches.
www.nyc.gov/html/dep/html/stormwater/gi_pilot_monitoring_report.shtml

1. Reduce the WQv by:
   - 55% on A soils
   - 40% on B soils
   - 30% on C soils
   - 20% on D soils
   - Weighted average of above
2. Provide treatment for all of the (remaining) WQv

Treatment practices can be oversized to provide additional RR (up to 100% of initial size or 100% of WQv)

Stormwater Management Practices for RR

- Area Reduction
  - Conservation of natural areas
  - Riparian buffers / filter stips
  - Tree planting / preservation
  - Rooftop disconnection
- Volume Reduction
  - Infiltration trench
  - Drywell
  - Infiltration basin
  - Bioretention
  - Dry swale
  - Vegetated swale
  - Rain garden
  - Planters
  - Green roof
  - Cisterns / rain barrels
  - Porous pavement

Three ways to provide computable RR

- **Area Reduction** – Area deducted from watershed computations for WQv
- **Volume Reduction** – 0 to 100% of volume deducted from WQv. (Depends on native soils for soil-based practices.)
- **Impervious Reduction** – disconnected impervious surfaces are reduced for WQv

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Stormwater Management Practices for RR

STORMWATER MANAGEMENT PRACTICES FOR RUNOFF REDUCTION

Date: 11/11/11

NOTE: This table provides only a general overview of each practice. Reference the New York State Stormwater Design Manual for complete standards, details, specifications, and design variations.

	PRACTICE (Design Manual Page)	LAND USE	CONTRIBUTING DRAINAGE AREA	DESIGN ELEMENTS	SLOPE	SOILS	HEAD	GROUND WATER SEPARATION	ALLOWABLE RUNOFF REDUCTION
Area Reduction	Conservation of Natural Areas (5-47)	Commercial/ Residential	If any contributing area, maximum contributing length = 75-180′ (depending on soil & impervious)	• Minimum size = 10,000 s.f. • Sheet flow inlet	< 8%	Native	---	> 6″	Area and contributing area deducted
	Reparian Buffers/Filter Strips (5-51)	Commercial/ Residential	Maximum contributing length = 75-180′ (depending on soil & impervious) Maximum 5,000 s.f. for filter strip	• Sheet flow inlet or flow dissipation • Minimum width = 50-100′ (Depends on slope)	< 15%	Native	---	> 6″	Area and contributing area deducted
	Tree planting/Preservation (5-64)	Commercial/ Residential	Maximum contributing area = ½ crown diameter or maximum 100 s.f. impervious area/tree	• Minimum 4″ caliper – existing • Minimum 2″ caliper – new deciduous or 6′ high (new conifer)	< 5%	Native/ constructed	---	> 6″	100 s.f./tree
	Rooftop Disconnection (5-69)	Commercial/ Residential No hotspots	Maximum contributing area = 2,000 s.f. Maximum length = 75′	• Flow dissipation required for discharges from > 500 s.f. • Minimum vegetated area width – 50′	< 5%	Native/ constructed	---	> 6″	Impervious area changed to pervious for R_v
Volume Reduction	Infiltration Trench (6-31)	Commercial/ Residential No hotspots	Maximum 5 acres	• 25-100% pre-treatment • Monitoring required • Soil testing required	< 15%	k> 0.5″/hr.	1′	> 3′	90% contributing WQ_v
	Drywell (6-31)	Commercial/ Residential No hotspots	Maximum 1 acre	• Roof top runoff only • Pre-treatment - sump • Soil testing required	< 15%	k> 0.5″/hr.	1′	> 3′	90% contributing WQv
	Infiltration Basin (6-31)	Commercial/ Residential No hotspots	Maximum 10 acres	• 25-100% pre-treatment • Monitoring required • Soil testing required	< 15%	k> 0.5″/hr.	3′	> 3′	90% contributing WQv
	Bioretention (6-44)	Commercial/ Residential	Maximum 5 acres	• Sheet drainage/flow inlet dissipation • Monitoring required • Sized using Darcy's Law	< 6%	Constructed	5′	> 2′	80% contributing WQv for A & B soils, 40% for C & D soils
	Dry Swale (6-59)	Commercial/ Residential/ Highway	Maximum 5 acres	• Non erodible 2-year flows • Check dams if slope is > 2% • Minimum 30-minute retention time • 10% pre-treatment • Maximum depth 18″	< 4%	Constructed	3-5′	> 2′	40% contributing WQv for A & B soils, 20% for C & D soils
	Vegetated Swale (5-58)	Commercial/ Residential/ Highway	Maximum 5 acres	• Peak WQ_v flow < 3cfs • Convey at < 1.0 fps at depth of < 4″ • Minimum length – 100′ • 10 minute retention time	< 0.5% to 4%	Native	1-4′	> 2′	20% contributing WQv for A & B soils, 10% for C & D soils
	Green Roof (5-86)	Commercial	Roof area	• Roof loading 16-200 lb/s.f.	<30%	Constructed	.25′- 2.0′	---	100% contributing WQv
	Rain Garden (5-76)	Residential/ Commercial	Maximum 1,000 s.f.	• Located within 30′ of contributing source • Max. loading ratio of 5:1 (DA to surface area) • Max. ponding depth = 6″	< 6%	Constructed	2-3′	> 2′	100% contributing WQv for A & B soils 40% for C & D soils
	Planters (5-97)	Commercial	< 15,000 s.f.	• Underdrain for "flow through" & C & D soils • Sized using Darcy's Law	---	Constructed	3.5′	> 2′	100% contributing WQv
	Cisterns/Rain Barrels (5-106)	Commercial/ Residential	Roof area	• Require use of collected water • Approximately 625 gal/1,000 s.f. of roof/1″ rain	---	---	---	---	100% contributing WQv
	Porous Pavement (5-114)	Commercial/ Residential No hotspots	Surface area plus small adjacent area	• Requires loading analysis • Sheet flow for contributing area	<5%	Constructed over HSG A, B, or C	2-3′	> 3′	100% contributing WQv

Stormwater Site Planning and Practice Selection Process (p. 3-18):

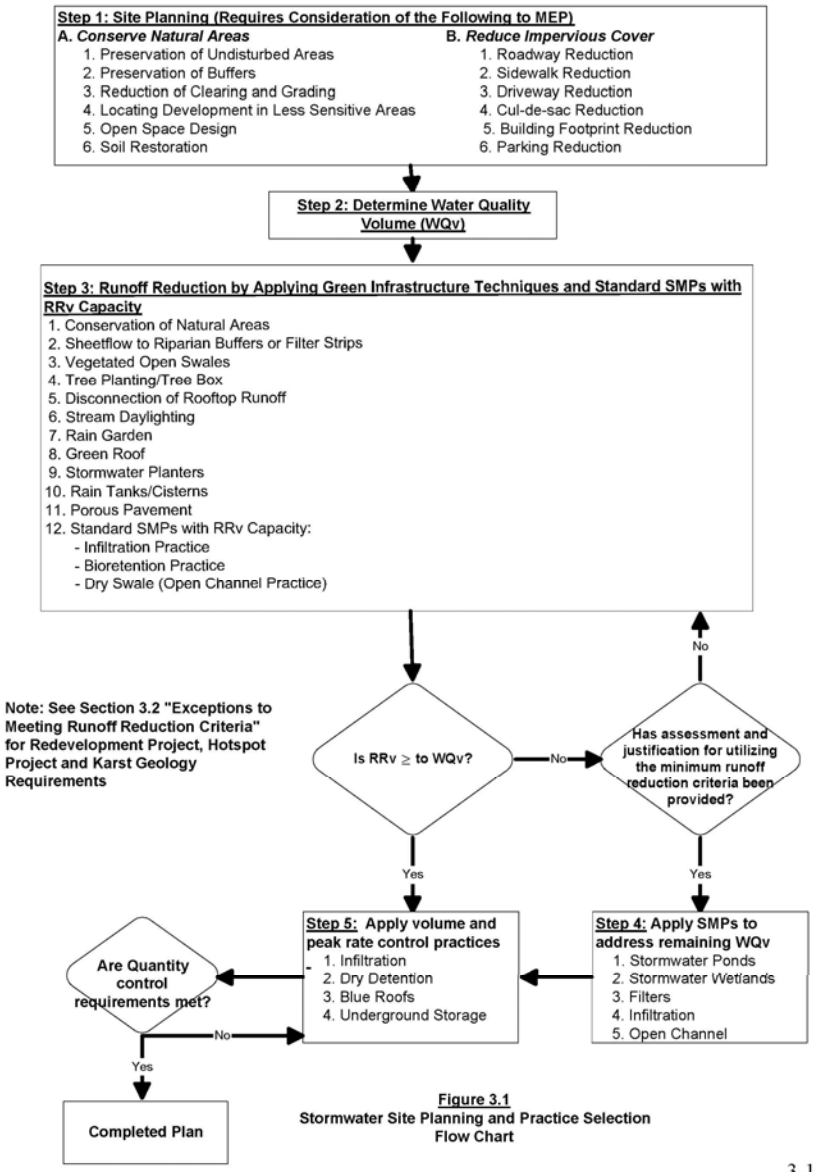
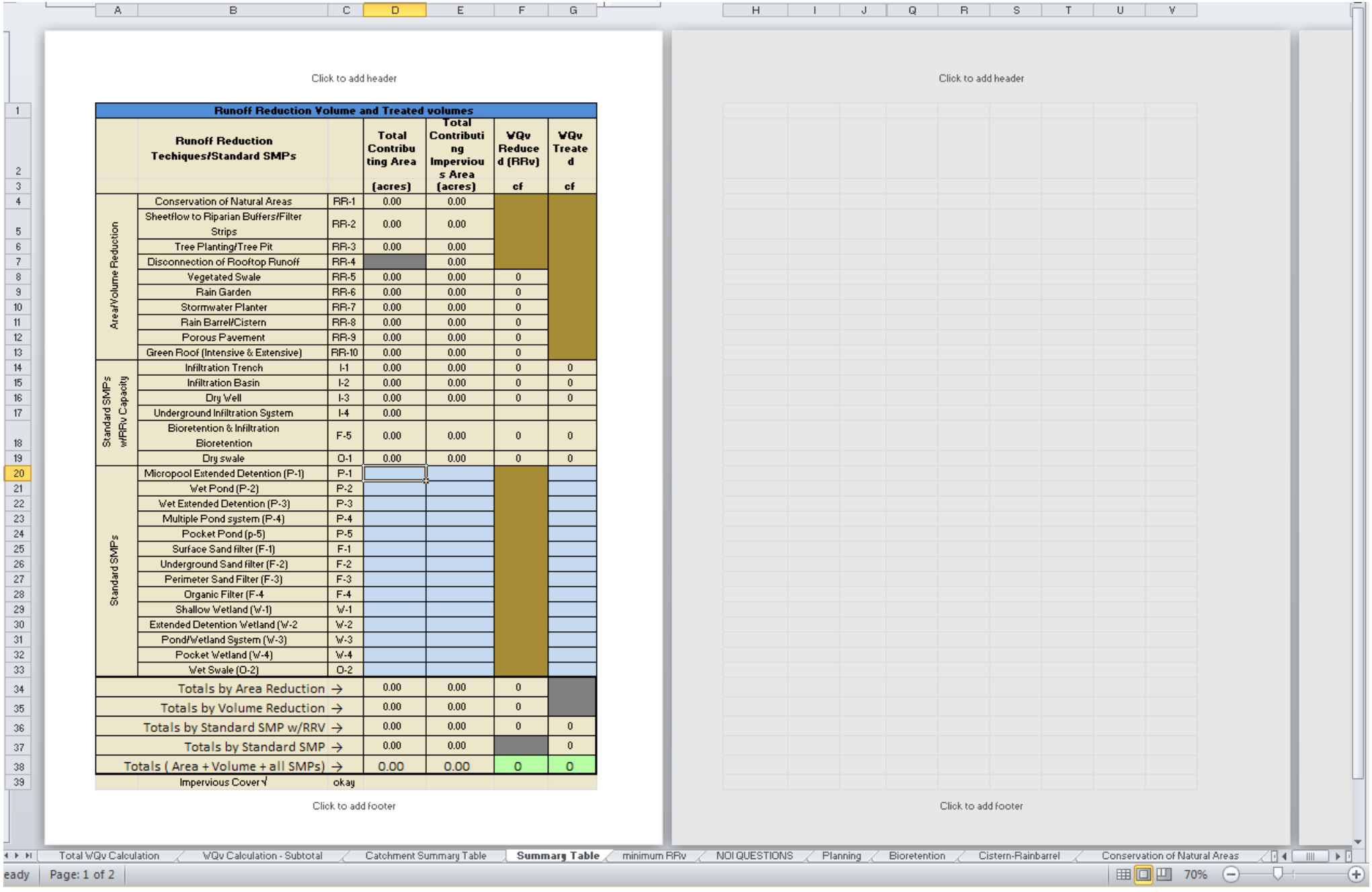


Figure 3.1
Stormwater Site Planning and Practice Selection Flow Chart

3-19

1. Site Planning to M.E.P.
2. Calculate Water Quality Volume
3. Apply Runoff Reduction Practices and compute RRv.
4. Subtract RRv from WQv.
5. Apply “Standard” Treatment Practices for remaining, non-reduced WQv.
6. Apply Quantity Control Practices

RRv Accounting: Spreadsheet Tool (Summary Table)



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Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		Total Contributing Area (acres)	Total Contributing Impervious Area (acres)	VQv Reduced (RRv) cf	VQv Treated cf
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4	0.00			
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
Totals by Area Reduction →			0.00	0.00	0	
Totals by Volume Reduction →			0.00	0.00	0	
Totals by Standard SMP w/RRV →			0.00	0.00	0	0
Totals by Standard SMP →			0.00	0.00		0
Totals (Area + Volume + all SMPs) →			0.00	0.00	0	0
Impervious Cover √		okay				

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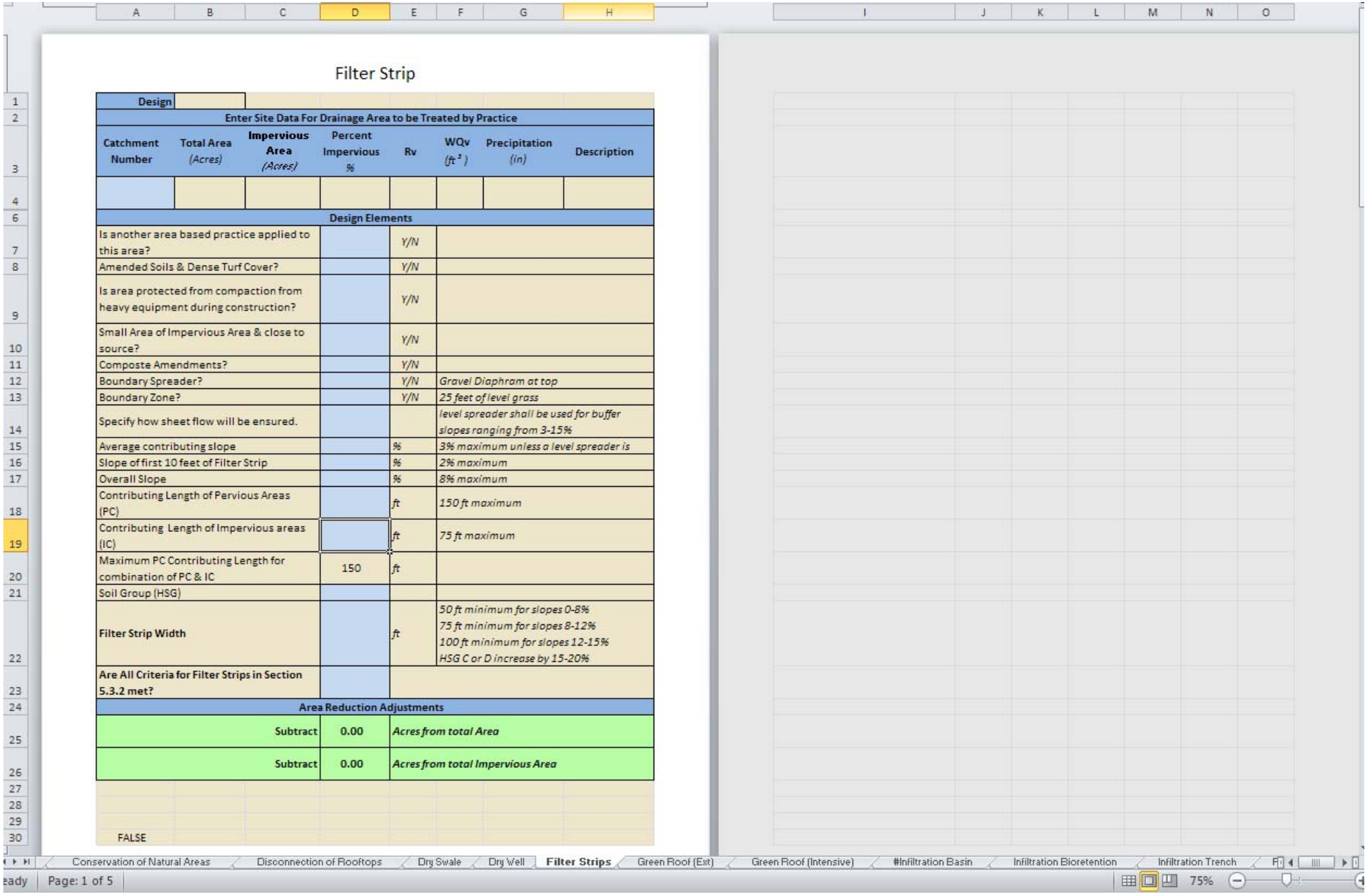
Total WQv Calculation | WQv Calculation - Subtotal | Catchment Summary Table | **Summary Table** | minimum RRv | NOI QUESTIONS | Planning | Bioretention | Cistern-Rainbarrel | Conservation of Natural Areas

Ready | Page: 1 of 2 | 70%

RRv Accounting: Spreadsheet Tool (Practice-Specific Worksheets)



Filter Strip

Design							
Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	Total Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (ft^3)	Precipitation (in)	Description
Design Elements							
Is another area based practice applied to this area?				Y/N			
Amended Soils & Dense Turf Cover?				Y/N			
Is area protected from compaction from heavy equipment during construction?				Y/N			
Small Area of Impervious Area & close to source?				Y/N			
Composte Amendments?				Y/N			
Boundary Spreader?				Y/N	*Gravel Diaphram at top*		
Boundary Zone?				Y/N	*25 feet of level grass*		
Specify how sheet flow will be ensured.					*level spreader shall be used for buffer slopes ranging from 3-15%*		
Average contributing slope				%	*3% maximum unless a level spreader is*		
Slope of first 10 feet of Filter Strip				%	*2% maximum*		
Overall Slope				%	*8% maximum*		
Contributing Length of Pervious Areas (PC)				ft	*150 ft maximum*		
Contributing Length of Impervious areas (IC)				ft	*75 ft maximum*		
Maximum PC Contributing Length for combination of PC & IC			150	ft			
Soil Group (HSG)							
Filter Strip Width				ft	*50 ft minimum for slopes 0-8%* *75 ft minimum for slopes 8-12%* *100 ft minimum for slopes 12-15%* *HSG C or D increase by 15-20%*		
Are All Criteria for Filter Strips in Section 5.3.2 met?							
Area Reduction Adjustments							
		Subtract	**0.00**	***Acres from total Area***			
		Subtract	**0.00**	***Acres from total Impervious Area***			

FALSE

Conservation of Natural Areas | Disconnection of Rooftops | Dry Swale | Dry Well | **Filter Strips** | Green Roof (Ext) | Green Roof (Intensive) | #Infiltration Basin | Infiltration Bioretention | Infiltration Trench

Page: 1 of 5

75%

How is it working?

- Allowable percentage of RR assigned to treatment measures is (overly) complicated – tie to science
- Biggest challenge is RR on D soils (20% of WQv)
- Local codes can “interfere” with implementation of LID/GSI practices
- MS4s / local officials or NYSDEC Regional Offices review applications
- Distributed practices require location-specific tracking

Another way to get more infiltration/GSI?

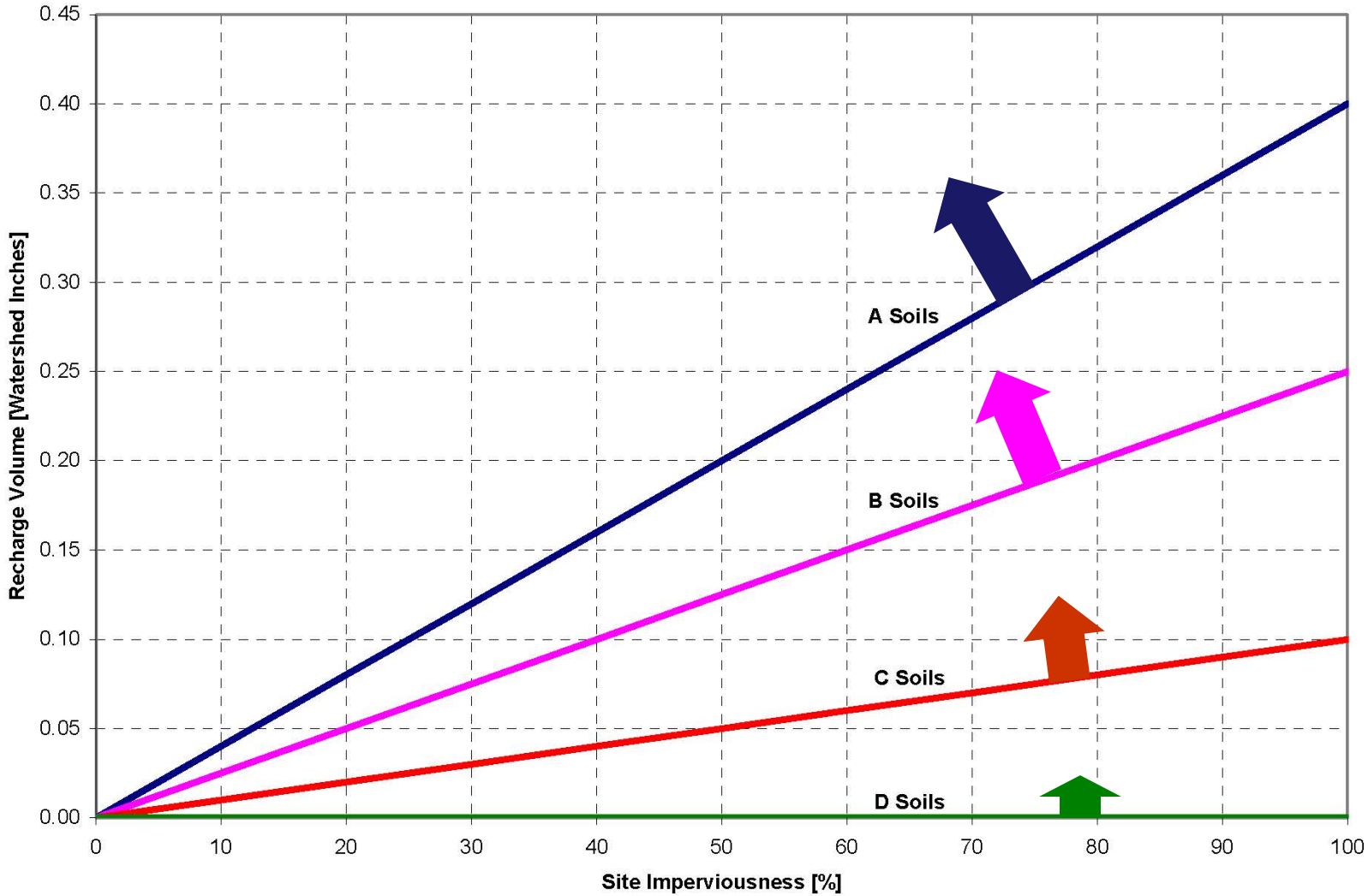


Figure 1.2 Relationship Between Recharge Requirement and Site Impervious Cover

RR - Phosphorus (P) Removal Effectiveness?

- Application of RR techniques can minimize runoff volumes needing treatment – and thus P reaching surface waters
- Some jurisdictions (NY, MN, ME, VA, etc.) have developed higher BMP performance standards and/or increased sizing and design features for use in P-impaired watersheds
- …but how do BMPs compare?

RR - Phosphorus Removal Effectiveness?

Comparative Summary of P Removal Performance – MN Manual

BMP Group	BMP Design Variation	Average TP Removal Rate (%)[b]	Maximum TP Removal Rate (%)[c]	Average Soluble P Removal Rate (%)[dg]
Bioretention	Underdrain	50	65	0
	Infiltration	100	100	100
Filtration	Media Filter	50	55	0
	Vegetative Filters (dry)	0	55	0
	Wet Swale	0	40	0
Infiltration[f,i]	Infiltration Trench	100	100	100
	Infiltration Basin	100	100	100
Stormwater Ponds	Wet Pond	50	75	0
	Multiple Pond	60	75	0
Stormwater Wetlands	Shallow Wetland	40	55	0
	Pond/Wetland	55	75	0

Source: http://stormwater.pca.state.mn.us/index.php/Comparative_BMP_phosphorus_removal

Caution: Removal rates shown here are composite averages intended solely for use in comparing performance between BMP designs and for use in calculating load reduction in site-based TP models.

Questions / Discussion