

1" Volume Reduction Standard

in

Capitol Region Watershed District & Ramsey-Washington Metro Watershed District

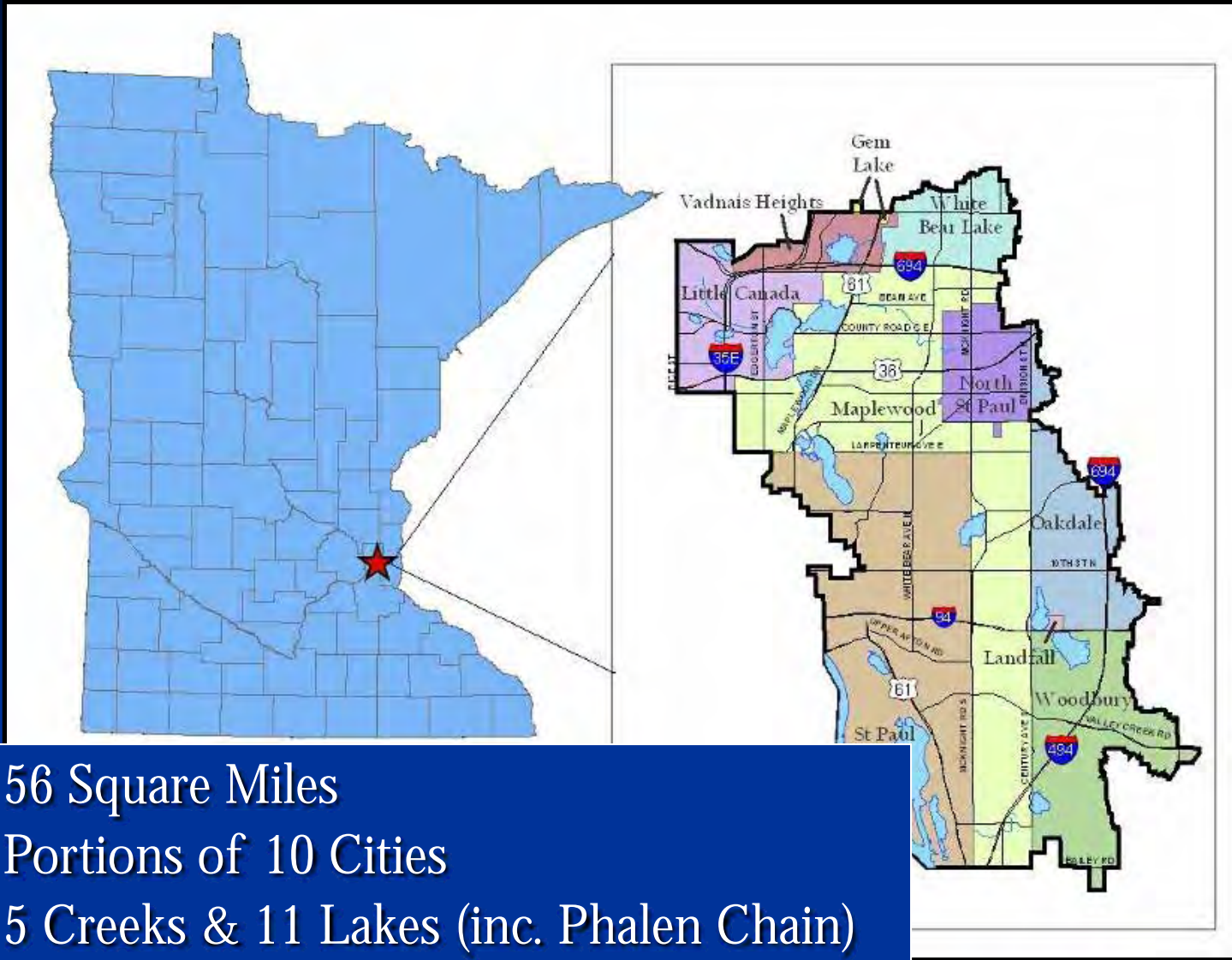
**MIDS Work Group Meeting
Mark Doneux and Cliff Aichinger
July 16, 2010**



1" Volume Reduction Standard

- Watershed District Quick Facts
- Rule Adoption Process
- Why One Inch?
- Linear Projects
- Alternative Compliance
- Permit Summary

Ramsey-Washington Metro Watershed District



- 56 Square Miles
- Portions of 10 Cities
- 5 Creeks & 11 Lakes (inc. Phalen Chain)
- Over 1,000 Wetlands
- 37% impervious

Both Drain to Mississippi River



Watershed's Mission

- To protect, manage, and improve the water resources of the Districts.
- RWMWD has had rules in place for many years.
- CRWD adopted Development Review Criteria in 2002
 - Rate, Water Quality, Volume, Erosion Control, Wetlands, Flooding, Integrated Resource Management
- From 2003—October 1, 2006, CRWD assumed an advisory role with cities

Criteria Compliance

- District Tracked Compliance with Review Criteria
 - Water Quality and Volume Reduction showed lowest levels of compliance
- Development Impact Assessment Done in 2004
 - Goals laid out in WMP were not being met
 - 60% P reduction actually 9% increase
- Non-enforceable Criteria Become “Suggestions”

Compliance?



Adopting Rules

- Jan. 5, 2005 Initiated Rulemaking Process
- April, 2005 Completed Joint Rulemaking Study
- Oct. 5, 2005 Distributed Draft Rules
- Jan. 4, 2006 Established Joint TAC
- Jun. 7, 2006 Distributed Second Draft Rules
- Sep. 6, 2006 Districts Adopt New Rules

Technical Advisory Committee

- Concerns arose during the initial draft review period
- Volume reduction standard seen as too aggressive, especially for linear projects
- Joint TAC Established
 - Members from cities, transportation authorities, and gov't agencies assembled
 - Discussion focused on standards' application to road projects



Contamination

Land Acquisition

Costs

Utility Constraints

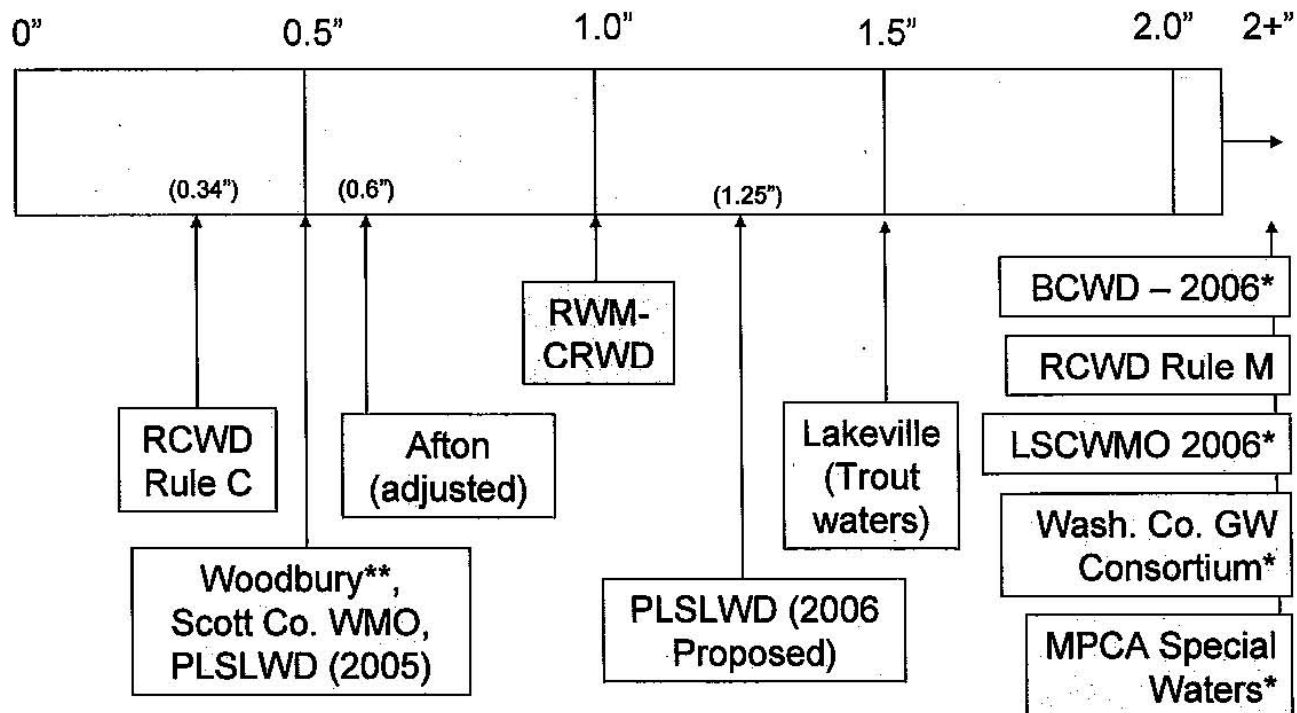
Maintenance

CRWD & RWMWD Rules

- Stormwater Management Rule C
 - Rate Control
 - Water Quality (90% TSS Removal)
 - Volume Reduction

What others have done (2006)

Figure 1. Volume Reduction Required in Various Minnesota Rules



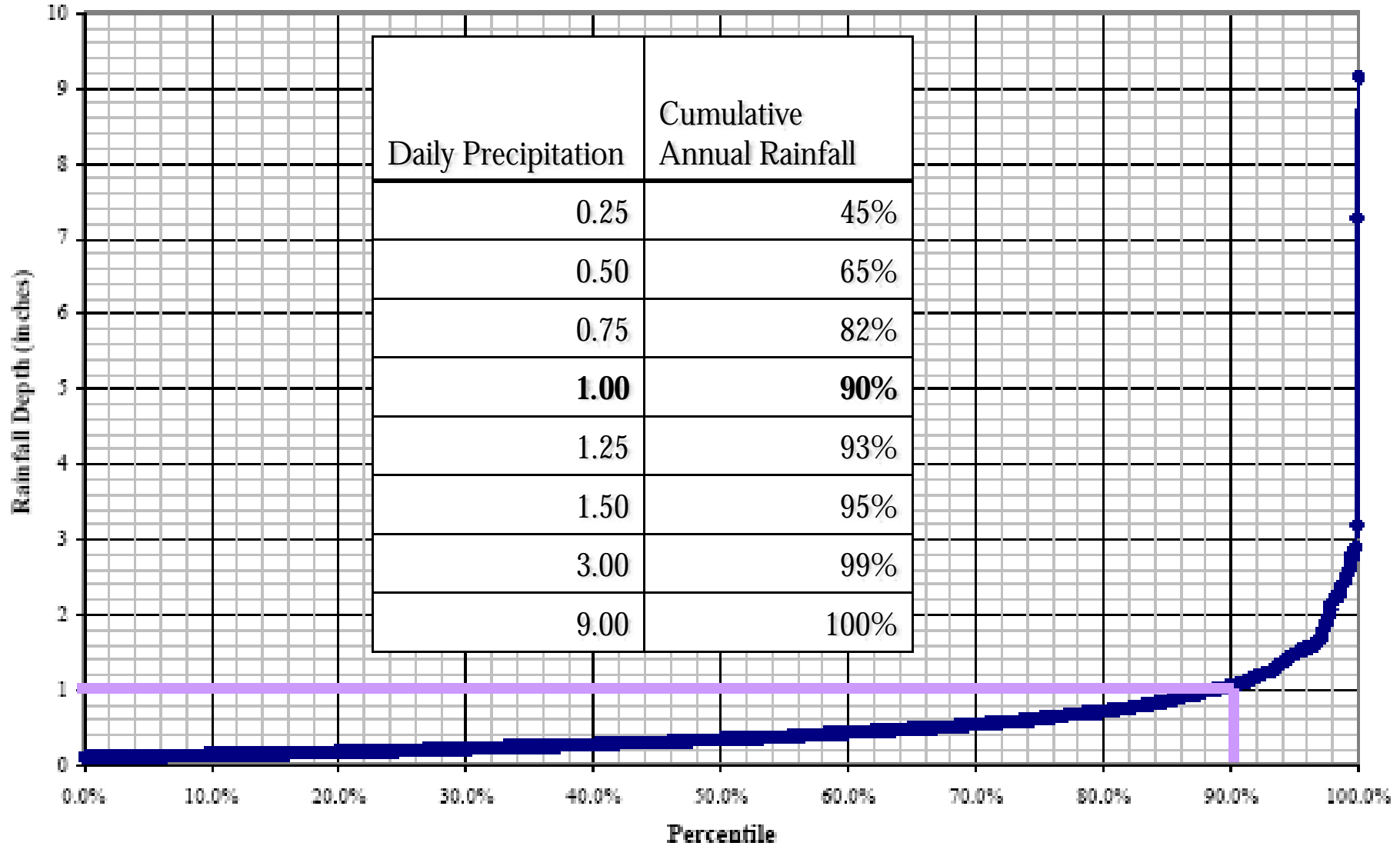
*Requires control of pre- vs. post-development volume difference over project area for this event; **Standard is 1/2" over entire site

Why One Inch?

- 90% of all rainfall events are 1 inch or less
- Cost increases from 0.5” to 1” are low
(pipe, rock, excavation, plants)
- Simple calculation, no % impervious or curve numbers
- 60% Total Phosphorus Removal

Why One Inch?

Minneapolis - St. Paul International Airport



One Inch Standard

- Volume Reduction in the Amount Equal to One Inch of Runoff from the Newly Constructed Site Impervious Surfaces

$1'' \times 0.9 \times \text{Impervious Surface (ft}^2) \times 1/12 \text{ (ft/in)}$

Regardless of Existing Conditions

This applies to all site impervious areas

NOT just new impervious areas

2010

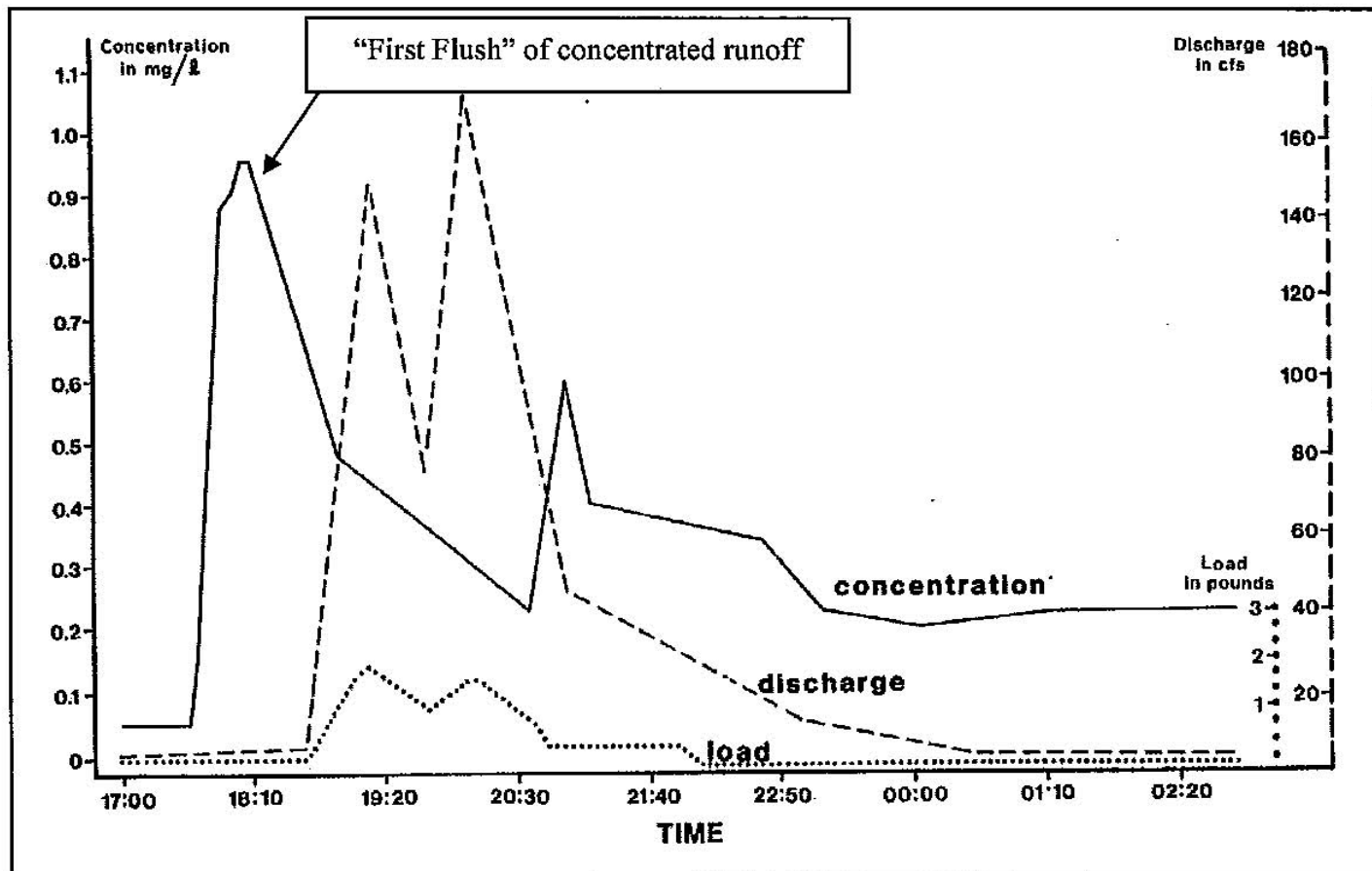
- Most Metro Watershed Districts have adopted volume reduction standards
- Many use 1” as the standard for volume reduction.
- Many states are adopting volume reduction requirements ranging from 0.80” – 1.5”
- Green Infrastructure, LID etc. are tools to achieve volume reduction.

First Flush and Pollutant Loading

- “First Flush” of runoff has the highest concentration of pollutants.
- “First Flush” is a small part of the total load of pollutants.
- Total Load is the real water resource issue.
- Pollutant load is tied to largest “slug” of runoff or discharge.
- Volume control is needed to reduce pollutant load to receiving waters

First Flush and the Pollutant Loading

Figure 1. Total Phosphorus Pollutograph for June Rainfall Event, Highway 100, Golden Valley (showing volume and pollutant concentration behavior relative to loading).



Variable Load

- More loading is associated with higher rain fall depths.
- Example:
 - Total Phosphorous -38% with 0.5” rain event and 70% with 1.0” rain event.
 - Total Suspended Solids - 18% with 0.5” rain event and 55% with 1.0” rain event.

Variable Load

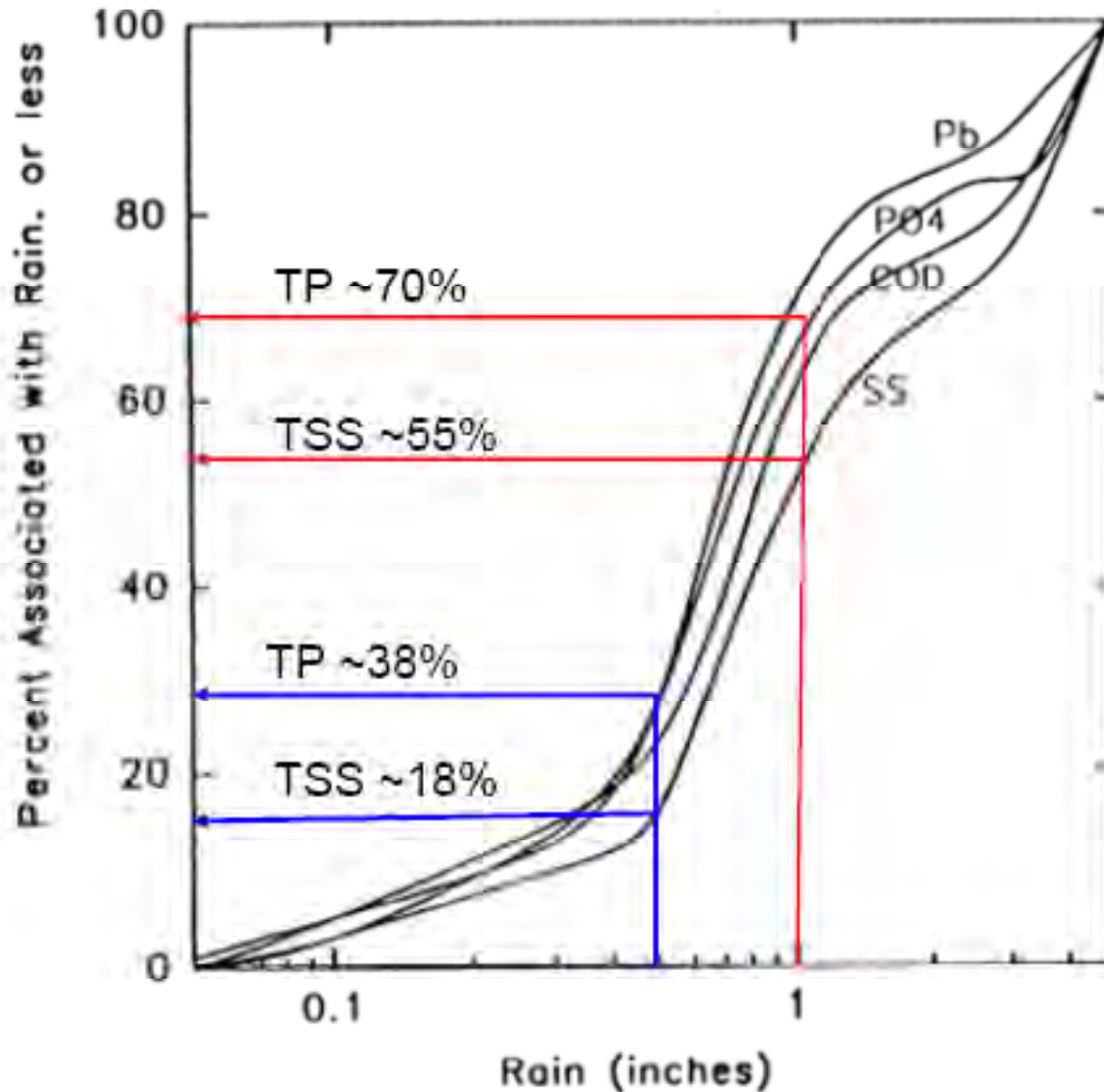


Figure 3. From: Pitt *et al.*, 1999 for Milwaukee, WI data collected (early 1980s) by Bannerman for medium density residential area

Pollutant Load Reduction based on Variable Load Behavior

- Reaching Total Phosphorous Goal of 60% can be achieved with 1” Volume Reduction Std.
- TSS reduction is ~ 55% with 1” Volume Reduction Std. Pretreatment requirements within BMPS achieves at or near 90% TSS reductions.
- Lower standards do not meet water quality goals

Pollutant Load Reduction based on Variable Load Behavior

Table 2. Pollutant Load Reductions Based on Figure 3 Variable Load Behavior.

Infiltration Standard	% of All Events	% Volume up to Infiltration Value	% TP/TSS Associated with Infiltration Standard from Fig. 3	Percent Watershed Load Reduction Due to Infiltration**		
				TP %	SP %*	TSS %
1.5"	96	79	75/65	68	56	64
1.0"	90	65	70/55	63	52	54
0.8"	82	54	58/42	52	44	42
0.5"	64	32	38/18	34	28	18
0.34"	45	16	15/10	14	11	10

* Assume that SP distribution is same as TP; SP could be extremely variable depending upon time of year, source areas, pre-treatment, etc.

** The TP, SP and TSS treatment reductions are 90%, 75% and 99%, respectively, times the load captured (from Figure 3) and treated.

Linear Project Compliance

- Linear Projects Deal with Unique Challenges
 - Construction Limits constrained to ROW
 - Roads Often Loaded with Utilities
 - High Percentage of Impervious
 - Municipalities on Fixed Budget from Year to Year

Cap on Costs for Volume Reduction

- Rules Established a Cost Cap for Linear Projects
- Cap Set Annually by the Board of Managers
- \$30,000/Acre of Impervious in 2008
- Provides Road Authorities a Benchmark for Budgeting
- All Other Standards Applied the Same as Standard Developments

St. Paul Streets 2007

- 3 Street Reconstruction Projects in CRWD
- 31 Acres of Impervious = 101,277 cu-ft
- Achieved 85,707 cu-ft
 - Infiltration Trenches, Cost Cap, Volume Banking

Alternative Compliance

- Infiltration not Feasible on All Sites
 - PSHs and Contamination
 - Type D Soils
 - Bedrock
 - High Groundwater
 - Utilities
 - Wells

Alternative Compliance

1. Partially Comply Onsite through Alternative Methods (Filtration)
2. Provide Off-site Volume Reduction or Utilize Approved Banking Credits
3. Lastly, Contribute to the Stormwater Impact Fund (\$40,000/Impervious Acre)
4. Linear Project Cost Cap (\$30,000/Impervious Acre) 2008

Filtration

- Sand Filters, Bio-filtration, Filter Media Cartridges, Proprietary Devices
- Not True Volume Reduction
 - Runoff is Filtered through media, then discharged to storm sewer
- 70% “Credit” for Filtration BMPs, Must Filter 1.3 Inches of Runoff from Impervious Surfaces

CRWD & RWMWD PERMIT SUMMARY (2007-2008)

	CRWD	RWMWD
Applications Received	55	66
Acres Disturbed	170	450
Acres Impervious	124	219
Alternative Compliance	24	14
Standard Compliance	22	49
Street Projects	9	23
Total Street Imperv	71.20	108.15
Total Street Vol. Red.	93,149	353,116
Variances Requested	5	3
Variances Approved	4	3
Total Volume Infiltrated	324,535	820,506
Total Volume Filtrated	147,335	126,775

Rule Revision Process

- Agreed that TAC Should Meet on an Annual Basis
- 2 Meetings Held in 2007, One Meeting in 2008
- Concerns and Topics for Discussion were Compiled by Staff and TAC Members throughout the Permitting Process

2007 Major Rule Changes

- Volume Bank Credits now Carry the Associated Water Quality Benefits
- Minimum Practice of Gross Pollutant Removal Required
- Special Interest Subwatersheds were Created
- Water Quality BMPs now Eligible for Cost Cap Calculations

Next Steps

- Continue TAC Meetings to Gather Input on Rules and Permitting
- Continue BMP Inspections to Ensure Proper Function and Monitor Maintenance Activities

Questions?

