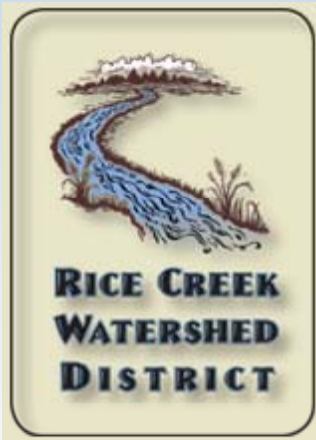


Volume Control Summary for Rice Creek Watershed District



February 2, 2011



Background

- History of the current RCWD rules.
 - Adopted on February 13, 2008
 - We know new rules work
 - JD 4 repair report example
 - ACD 31 and ACD 46 example
 - Repair reports show an 8% to 22 % decrease in growing season stormwater runoff volumes

Why Volume Control?

- Water quality load reduction (only?)
- Minimal Impact Development Hydrology?
 - Match pre-developed runoff peaks
 - Mimic pre-developed runoff volumes (and of course peaks)
 - Match pre-developed hydrograph shape and timing
- Geomorphology; i.e., stable open channels
- Groundwater recharge?
- RCWD is “Volume Constrained” (Montgomery Watson)

Impetus for Volume Control Analysis/Study

- Confusion from permit applicants leading to frustration
- Level of effort by RCWD staff relative to “rule interpretation” leading to frustration
- “Keep it Simple” would reduce frustration and lead to reduced level of effort (perhaps with same environmental outcome)
- Administration / implementation can be challenging for both RCWD and the applicant
- Volume control standard consistency across cities or adjacent watersheds

RCWD's Volume Control Standard

- Summary of RCWD's Current Rule C, Part 5 Water Quality and Volume Control
 - References Better Site Design in Chapter 4 of MN Stormwater Manual
 - Standard depends upon development type
 - Street and Utility Improvements
 - Land Development
 - Full Site Design
 - Rule C.5(b): Infiltrate and / or retain runoff generated within the contributing drainage area by a two-year (2.8-inch storm) under developed conditions
 - Rule C.5(c): For redevelopment, 0.8-inch event over redeveloped impervious surface
 - Rule C.2(e): For redevelopment, if more than 50% new or disturbed impervious, then requirements of C.5(b) and C.5(c) apply to all impervious surface onsite

Public Linear Projects

- Public linear projects depend on roadway classification and amount of construction (**Table 2**)
 - ≥ 1 acre New Construction
 - Arterial, County or Highway 2.8-inches from new and 0.8-inches from reconstructed impervious surface
 - Collector, subcollector and access 2.8-inches from new and 0.8-inches from reconstructed impervious plus directly connected impervious surface
 - < 1 acre New Construction or Reconstruction
 - Arterial, County or Highway 1-inch from new and reconstructed impervious surface
 - Collector, subcollector and access 0.8-inches from new and reconstructed impervious plus directly connected impervious surface
 - Rehabilitation – No volume control
 - Mill and overlay no Rule C permit
- BMP sequencing if not suitable soils (A/B) for infiltration

Purpose of Analysis

- Purpose of the volume control analysis
 - Evaluate methods with equivalent volume reduction to get to same environmental outcome
 - Easier to administrate
 - Reduced cost for applicant and RCWD
 - Consistency with adjacent WD (helps out the cities and permit applicants)
- Perhaps the basis for a future rule revision

Introduction and Goals

- Infiltration volume requirements of surrounding watersheds and RCWD (**Table 3**)
- Two general categories of volume control standards
 - 1-inch runoff depth over new and existing impervious surface
 - Difference between pre-and post- developed rainfall events
- Goal is to answer the question: Can we simplify the current volume control standard in the rule and still achieve an amount of volume control equivalent to the current rule?

Data Used for Evaluating the Volume Control Standard

- Historic RCWD Permit Data
- Permit selection process
 - Type (FSD, LD or S&UP) and size (small, medium and large) of permits
- Permit data was gathered from 25 RCWD permits
 - 10 FSD permits
 - 11 S&UP permits
 - 4 LD permits

Volume Control Standards

- Volume control standards analyzed (**Table 4**)
 - New impervious runoff volume
 - Total project impervious runoff volume
 - 2.8" pre and post project runoff volume
 - RCWD requirement (2.8"/0.8" event) for runoff volume (Simple Calculation Method) (current standard)
 - Wisconsin requirements
 - Sufficient infiltration runoff volume so that the post-developed infiltration volume shall be at least 90% of the pre-development infiltration volume, based on an average annual rainfall; or
 - Infiltration volume equivalent to 25% of the post-development runoff volume from a 2-year, 24 hour design storm with a type II distribution.
- Method of calculating each standard
 - Applied to actual permits using an excel spreadsheet

Results

- Methods for comparing alternative volume control standards from permitted volume
 - Absolute difference –Change in cubic feet required by permitted project when compared to the ER’s permitted volume requirement. Averaged across permit type category and all permits. This method quantifies the net effect as a volume if a different standard is applied. This also can be “weighted” based on number of permits by type (**Tables 6**)
 - Percentage difference –Percentage change in required volume when compared to the ER’s permitted volume requirement. This method essentially shows the net additional volume control demands on the permittee, disregarding the size of project. (**Tables 7**)
- Historic permit type distribution
 - Weighted average assuming historic permit distribution of permits from 1998-2009:
 - 54% Final site design
 - 23% Land development
 - 23% Street and Utility projects
- Trends of results for each type of permit

Table 6
Effect of Various Stormwater Rules on Required Project Infiltration Volume

	Runoff Volume Over New Impervious Surfaces				Runoff Volume Over Total Site Impervious Surfaces				RCWD Impervious Requirements	Change in Rainfall Runoff Volume	Wisconsin Requirements for Residential Development	
	0.5-inch	1.0-inch	1.5-inch	2.0-inch	0.5-inch	1.0-inch	1.5-inch	2.0-inch	2.8" new / 0.8" existing ⁽¹⁾	2.8 -inch ⁽²⁾	90% rule ⁽³⁾	25% 2-year ⁽⁴⁾
<i>Average Change in Volume Treated Per Project When Compared to Current Rule Application (cubic feet) ⁽⁵⁾</i>												
Final Site Design Projects	-12,459	-10,919	-9,379	-7,839	-7,274	-548	6,177	12,903	-633	-2,390	35,228	-3,433
Land Development Projects	-18,919	-15,066	-11,214	-7,362	-18,919	-15,066	-11,214	-7,362	-3,355	-6,812	117,830	-16,822
Street and Utility Projects	-22,638	-20,705	-18,772	-16,838	-15,902	-7,234	1,434	10,102	-5,706	-3,383	10,885	-8,587
Historic Permit (1998-2009) Weighted Average Change in Required Infiltration Volume ⁽⁶⁾	-16,286	-14,123	-11,961	-9,799	-11,937	-5,425	1,086	7,598	-2,426	-3,635	48,628	-7,698

Notes:

1. Infiltration volume required by RCWD rule derived from a 2.8" runoff event over new impervious surface plus 0.8" over redeveloped impervious surfaces.
2. Difference between proposed and existing runoff resulting from a 2.8" rainfall event (over entire site).
3. 90% of the predeveloped average annual infiltration across the site, minus 100% of the postdeveloped average annual infiltration (over entire site)
4. 25% of the post-developed runoff volume from the 2-year, 24-hour rainfall event (over entire site).
5. Sampling of projects initiated after adoption of current District rules (2008-2010).
6. Weighted average assumes the following historic distribution of projects by type, from 1998-2009:
 - Final Site Design Projects: 54%
 - Land Development Projects: 23%
 - Street and Utility Projects: 23%

Table 7
Relative Increase in Per-Project Required Infiltration Volume Resulting from Various Stormwater Rules ⁽¹⁾

	Runoff Volume Over New Impervious Surfaces				Runoff Volume Over Total Site Impervious Surfaces				RCWD Impervious Requirements 2.8" new / 0.8" existing ⁽²⁾	Change in Rainfall Runoff Volume 2.8 -inch ⁽³⁾	Wisconsin Requirements for Residential Development	
	0.5-inch	1.0-inch	1.5-inch	2.0-inch	0.5-inch	1.0-inch	1.5-inch	2.0-inch			90% rule ⁽⁴⁾	25% 2-year ⁽⁵⁾
<i>Average Percentage Change in Required Volume Per Project When Compared to Current Rule Application (percent) ⁽⁶⁾</i>												
Final Site Design Projects	-96	-91	-87	-82	-2	97	195	294	6	2	24	74
Land Development Projects	-80	-60	-40	-19	-80	-60	-40	-19	1	-3	632	-70
Street and Utility Projects	-92	-83	-75	-66	-46	7	61	115	5	39	-18	9
Historic Permit (1998-2009) Weighted Average Change in Required Infiltration Volume ⁽⁷⁾	-91	-82	-73	-64	-30	40	110	181	5	9	154	26

Notes:

1. Disregarding size of project.
2. Infiltration volume required by RCWD rule derived from a 2.8" runoff event over new impervious surface plus 0.8" over redeveloped impervious surfaces.
3. Difference between proposed and existing runoff resulting from a 2.8" rainfall event.
4. 90% of the predeveloped average annual infiltration across the site, minus 100% of the postdeveloped average annual infiltration
5. 25% of the post-developed runoff volume from the 2-year, 24-hour rainfall event.
6. Sampling of projects initiated after adoption of current District rules (2008-2010).
7. Weighted average assumes the following historic distribution of projects by type, from 1998-2009:

Final Site Design Projects:	54%
Land Development Projects:	23%
Street and Utility Projects:	23%

Conclusion and Recommendations

- The alternative volume control standards that most closely mimics the current RCWD volume control standard are:
 - 1.0-inch runoff event over total site impervious surface for Final Site Design permits;
 - 1.5-inch runoff event over total site impervious surface for Street and Utility permits;
 - RCWD Simple Calculation Method for Land Development permits; and
 - Change in Rainfall Runoff Volume (2.8-inch) for Land Development permits
- Results are somewhat dependent upon permit type
- Assumes standard purpose is Minimal Impact Hydrology

Perceived Benefits

- Reduce frustrations felt by applicants and their consultants and affected public entities
- Reduce level of effort for rule administration and review time
- Potential permitting review cost savings
- Get to the same water quality and volume control endpoint

Questions?