Date: April 11, 2011

From: Tom Schueler, CSN

To: MN MIDS Workgroup

Re: Status of Runoff Reduction Implementation in the Bay states

This memo provides an update on the status of implementation of runoff reduction in the Bay states, and more importantly, some of the key technical issues that needed to be resolved to gain acceptance from the design community. Despite some pushback and administrative delays, all of the Bay States are on the road to runoff reduction as shown in Table 1.

Table 1 Status of Runoff Reduction in the States of the Chesapeake Watershed

Bay STATE	Runoff Reduction?	Required RR Volume [1]	Channel Protection?	Status [2]	Notes
DC	**YES**	1.1 to 2.7	**No**	**2011**	2.7 in for small area of the city
EPA	**YES**	1.5 to 1.7	**YES**	**2010**	Federal projects only
DE	**YES**	1.5 to 2.6	**YES**	**2011**	Manual coming out this year
MD	**YES**	1.0 to 2.6	**YES**	**2010**	
PA	**YES**	1.0 to 2.5	**YES**	**2010**	Guidance being converted to regs
NY	**YES**	0.2 to 0.6	**YES**	**2010**	RR part of Total WQv of 1 inch
VA	**YES**	1.0	**YES**	**2011**	Also has a P-based load req
WV	**YES**	1.0	**No**	**2010**	Manual coming out this year

Notes:
[1] the rainfall depth for which the runoff reduction volume is computed
[2] Estimated year in which the regulations are adopted, actual implementation may be later due to grandfathering

As can be seen, the runoff reduction levels in the Bay states are about the same or somewhat higher than that contemplated for MN, based on the most recent modeling by your consultant. Our rainfall is a bit more intense than yours and we average about 42 inches in a year. We also see a similar range in required rainfall depths based on the four hydrological soil groups. So I think you are on the right track.

What Prompted the Shift to Runoff Reduction in the Bay States?

While the precise reasons differ a bit in each state, there are some recurring themes in why they have made the shift.

- More reliable pollutant removal to protect the Bay
- Shift the technology away from ponds and towards LID practices
- Better replicate pre-development hydrology
- Improve stream channel protection
- Protect biodiversity in streams

Technical Issues Involved in Runoff Reduction Implementation

Some of the delays encountered in getting runoff reduction adopted in the states allowed us to tackle several technical issues in on the ground implementation. Some of the key lessons learned include:

Provide a flexible definition of runoff reduction. A few states started with a narrow definition of runoff reduction that involved only infiltration, water reuse and evapo-transpiration. Over time, all have shifted toward a broader definition that allows for extended filtration. Extended filtration includes practices with under drains where soils are not permeable (e.g., bioretention, permeable pavers). The basic idea is that while runoff is not completely retained on-site, it is so effectively disconnected from the storm event that it matches the predevelopment hydrograph (think interflow). The broader definition enables a broader range of practices to be used, which helps compliance at sites with poor soils.

Define conditions where infiltration is not allowed. States have moved toward an approach where certain categories of development or redevelopment are exempted from infiltration (such as brown fields, hotspots, certain urban fill soils and high bedrock/water table conditions. In these instances, developers are asked to use non-infiltrating runoff reduction practices (rainwater harvesting, green roofs, bioretention or pavers with under drains and bottom liners). If these are insufficient, they are allowed to use traditional treatment practices (e.g., sand filters and wet ponds.

Small is not always beautiful. While some states started out with the assumption that LID practices should have micro-drainage areas, and set maximum contributing drainage area (CDA) limits of 5000, 10000 or 20,000 square feet), they now realize that as long as a practice provides runoff reduction there is no need for arbitrary limits on CDA. Bioretention, swales, permeable pavers and other LID practices are allowed to treat 1 2 or even 5 acres of CDA.

Allow for practice over-control: States have allowed designers to over control within individual practices, such that they direct up to the channel protection volume (2.6 inches) in a bioretention, paver or dry swale. This helps designers

comply with the regulations without having to treat every square inch of impervious cover at the site.

Use compliance spreadsheets. Each of the Bay states has developed their own compliance spreadsheet or model. These have been very important to give designers a tool to experiment with what combination of credits and LID practices will be needed at the site. They can then pick the most cost-effective combination of practices to uses. Most of the spreadsheets also re-compute a new CN to reflect the aggregate impact of the LID practices of reducing (or even eliminating the need for channel protection. I have attached a copy of the draft District of Columbia LID spreadsheet to give you all a sense of how they work. The other benefit of spreadsheet development is that they reveal a lot of bugs, inconsistencies and implementation issues created by the regulations that need to be resolved. I am now in the sixth version of the MD spreadsheet for example.

Redevelopment. The bay states diverge quite a bit when it comes to redevelopment stormwater requirements. Some of the key differences are shown in Table 2.

Table 2.
Comparison of redevelopment and green-field stormwater requirements in the Chesapeake Bay States

Bay States	Redevelopment Requirements		Redevelopment Requirements as a % of "Green-field" Requirements [4]
	Water Quality Requirement [3]	Offset Fee or Offsite Mitigation	
District of Columbia [1]	1.2 inch	Yes	50%
Delaware [1]	0.5 inch	Yes	21%
Federal Facilities [2]	1.7 inch	?	71%
Maryland [2]	0.5 inch	Yes	21%
New York [2]	0.25 inch	Yes	11%
Pennsylvania [2]	0.2 inch	?	8%
Virginia [1]	0.2 inch	Yes	8%
West Virginia [2]	0.5 to 1.0 inch [5]	Yes	21 to 42%

[1] proposed redevelopment criteria, may be subject to change
[2] adopted redevelopment criteria, actually 1"' treatment over 50% of the site,
[3] treating the runoff from a storm of this depth
[4] for purposes of general comparison, "green-field" treatment is defined here as providing water quality and channel protection equivalent to the runoff generated from a 2.4 inch storm.
[5] the depth varies depending on the number of redevelopment credits the project qualifies for, see text for an explanation

While redevelopment stormwater requirements are almost always lower than new development, you can see that there is a fair amount of divergence. The highest redevelopment stormwater requirements are for DC where CSOs are a problem, and the receiving waters are listed for various pollutants. Redevelopment has been the area of the greatest pushback from both developers and smart growth advocates. Most states allow or an offset fee to mitigate stormwater impacts in the event that on-site compliance is not possible. Some of the special issues associated with redevelopment and stormwater are dealt with in Technical Bulletin No. 5, which is attached.

Non-structural runoff reduction credits. Most bay states explicitly allow credits for things like sheet flow to buffers, impervious cover disconnection and reforestation. Designers soon realize that these are great, particularly on low density residential sites. The big issue is defining the minimum conditions to qualify for the credit, and outlining how to accept them, inspect them and maintain them. This is still a work in progress, although I should be putting out some guidance on this topic in the next few months. The key idea is that LID practices fundamentally change our maintenance paradigm, and we are just figuring what changes in local programs are needed to accommodate this change.

Intensive training is essential. We have done more than 45 workshops and webcasts across the watershed to train engineers and plan reviewers on the new runoff reduction approach. Most involve small group exercises to solve the stormwater problem using real world development sites and the appropriate sate spreadsheet. We have done a number of surveys of the design community and they were much further behind the learning curve than we had suspected...very few have any experience with green roofs, rainwater harvesting, dry swales, permeable pavers and fancy bioretention. The training has made a considerable impact, and should be a key element of your implementation strategy

Summary

Runoff reduction and LID is on its way to becoming standard practice in the Bay watershed, with some issues still to be resolved (as noted above). The best thing for us has been the downturn in the economy the last few years, which gave us a breather to work out the kinks of its real world implementation. Hopefully, you can benefit from some our hard won lessons. I hope I can get in on the Friday meeting to answer any additional questions